Republic of the Union of Myanmar
Central Bank of Myanmar

Preparatory Survey for the Project for Development of ICT system for Central Banking (Phase 2) Final Report

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Preface

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to a joint consulting team consisting of Mitsubishi Research Institute, Inc. and Promontory Financial Group Global Services Japan, LLC.

The survey team held a series of discussions with the officials concerned of the Government of the Republic of the Union of Myanmar, and conducted field investigations. As a result of further studies in Japan, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of the Union of Myanmar for their close cooperation extended to the survey team.

February 2018

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Executive Summary

1. Overview of the Project

1.1 Background

Central Bank of Myanmar (hereinafter, CBM) introduced Central Bank of Myanmar Financial Network System (hereinafter, CBM-NET) in January 2016 under the Japanese official development aid "THE PROJECT FOR DEVELOPMENT OF ICT SYSTEM FOR CENTRAL BANKING" (E/N: October 2013, JPY 5.1 billion) (hereinafter, Phase 1). CBM-NET makes a series of manual-based operations such as the management of current account and its outstanding, issuance/interest payment/redemption of government bond and its balance into system-based ones. In addition, as a result of financial system reform, for example dematerialization of government bond and the introduction of government bond book-entry system etc., the financial infrastructure in Myanmar has been developed step by step.

On the other hand, comparing to the situation when the first project preparatory survey was conducted in November 2013, the environment surrounding financial infrastructure has been widely changed along with the economic growth.

- Changes in the retail environment in Myanmar: The country has entered a transition period from payment on a cash basis to an electronic settlement basis because of the penetration of mobile banking services.
- Changes in trends outside Myanmar: There are some moves towards building a cross-border settlement infrastructure within the ASEAN region, such as activities of the ASEAN + 3 Bond Market Forum (ABMF).
- Sophistication of systems of commercial banks in Myanmar: The Core Banking System (hereinafter, CBS) is being introduced, and the needs of STP[1] are increasing.
- Improvement of functions of the central bank system in other countries: The RTGS[2] system with liquidity-saving features, function of forward dating

[1] Straight Through Processing: To process with connecting CBSs and systems in central bank directly via network.
[2] Real Time Gross Settlement: A settlement method to process every single payment instruction in real time (immediately after the instruction arrives at central bank).

transactions, and 24-hour operation support are being introduced.

- Improvement in efficiency and BPR[3] of CBM internal operations and the introduction of an accounting system are underway; however, automatic data linkage between CBM-NET and accounting system has not been implemented, which is a barrier to operational efficiency and the reduction of operational errors.

1.2 Project information

In order to cope with the environmental changes such as in 1.1, the enhancement of functions on CBM-NET will be conducted in this project.

The outline of the project is as follows:

Table 1: Project Summary

Item	Description
Project name	Project for Development of ICT system for Central Banking (Phase 2) (hereinafter, Phase 2, or this project)
Base objective	Establish the financial environment to accomplish efficient and steady policies and businesses at CBM.
Objective of the project	Accelerate the efficiency of the entire settlement process of both CBM and FIs and accomplish further modernization of the financial markets and policies of Myanmar.
Outcome of the project	The new functions based on international standards have been installed in CBM-NET.

[3] Business Process Re-engineering: An approach to redesign business processes such as business flow, organization structure and business rules.

Item	Description
Project Scope	1. Implementation of new functions (a) STP (b) ISO 20022 adaptation (c) Liquidity Saving Feature and Message Queuing (d) ACH[4] (e) Cheque Truncation (f) Alert and Dashboard function (g) Disaster Recovery (h) Redundancy of the data (i) User Authentication (j) Automatic Data Exchange 2. Introduce the equipment to accomplish the above functions (a) Modify or re-establish the infrastructure for the information system (b) Modify or re-establish the network system for the information system 3. Design and build for operation and maintenance for the systems corresponding to the above functional request 4. Support for user acceptance test and running test 5. Establish system operation and maintenance plan and manuals 6. Conduct explanatory training for the officials of CBM and FIs 7. Technical Support for AHRD[5] officials

2. Scope of the development

2.1 Overview of the Current System

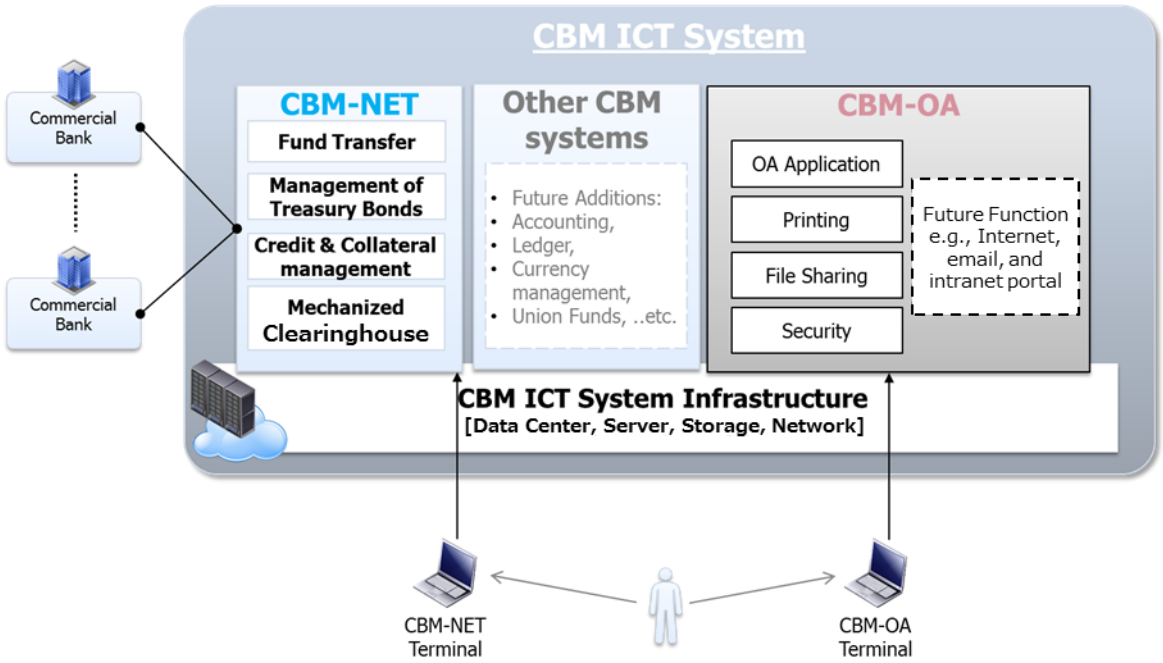
CBM installed CBM-NET in January 2016 by Japanese ODA grant.

CBM-NET is the central banking system referring to Japanese system (BOJ-NET) and provides the comprehensive functions consist of funds settlement by RTGS, management of government bonds (DVP[6] function), and management of collateral. In addition, MCH[7] which provides mechanized sorting, clearing and netting of cheque was also introduced as a subsystem of CBM-NET.

The CBM-OA which provides office automation (OA) applications, printing functions, file sharing services, and security mechanisms was introduced besides the CBM-NET.

[4] Automated Clearing House: A method of electronic payments between bank's accounts. ACH is more familiar for processing retail payment.
[5] Administration & Human Resource Development Department: The department in CBM which is responsible for operation, maintenance and management of ICT system infrastructures.
[6] Delivery Versus Payment: A settlement system that stipulates that cash payment must be made simultaneously with the delivery of the security.
[7] Mechanized Clearing House: The system to conduct clearing and netting of cheque by using machine-readable magnetic ink printed on paper cheque.

To install these systems, the CBM ICT System infrastructure consists of a data center, servers, storages, and network infrastructure was implemented as well as terminals for the systems in CBM and FIs in Myanmar.



Source: Preparatory Survey Team of Phase 1

Figure 1: CBM-NET Phase 1 and CBM-OA

2.2 Overview of the Development Scope of this project

In addition to adding the functions listed in Table 2 to the current functions implemented in the Phase 1 project, introduce the equipment necessary to introduce functions and accomplish infrastructure functions in Table 3.

Table 2: System scope of Application

1. STP	● STP will use SOAP/XML protocols (Transactions will be encrypted.)
2. ISO 20022 adaptation	● ISO 20022 will be applied to all applicable messages.
3. Liquidity Saving Feature and Message Queuing	● Accelerate use of CBM-NET by Increasing settlement availability within current deposit volume. ● LSF settles the payment instructions by event-driven (such as change of liquidity) BLOS and time-driven MLOS. ● The queue will be managed by priority and posted time of instructions.

4. ACH	● ACH covers payment instruction exchange among FIs, specifically direct credit and direct debit. ● ACH receive payment instructions all time, except system maintenance time. ● Calculation of instruction is simultaneously conducted when ACH receives instructions from FIs. ● Calculation of net position will be conducted at the designated time (DTNS); the result will be settled by RTGS*. ● ACH will receive payment instructions via STP GW and Automatic Data Exchange function (as below) * Frequency of settlement will be defined by CBM
5. Cheque Truncation	● Receive payment and image data from the presenting bank, net the payment data, and send payment and image data to the issuing banks. The result will be settled by RTGS*. ● Thirty-one cheque image scanners will be provided to CBM for use of FIs * Frequency of settlement will be defined by CBM
6. Anti-money laundering function	● AML that detects and suspends suspicious transactions should be responsibility of FIs and will NOT be introduced to systems in CBM.
7. Alert and dashboard function	● Basic alert (such as received messages, large amount transaction) and dashboard (such as operational data, financial data) functions will be implemented to CBM-NET ● Further functions will be implemented by the PSSD System (System for supporting PSSD business) with data from CBM-NET

Table 3: System scope of Infrastructure

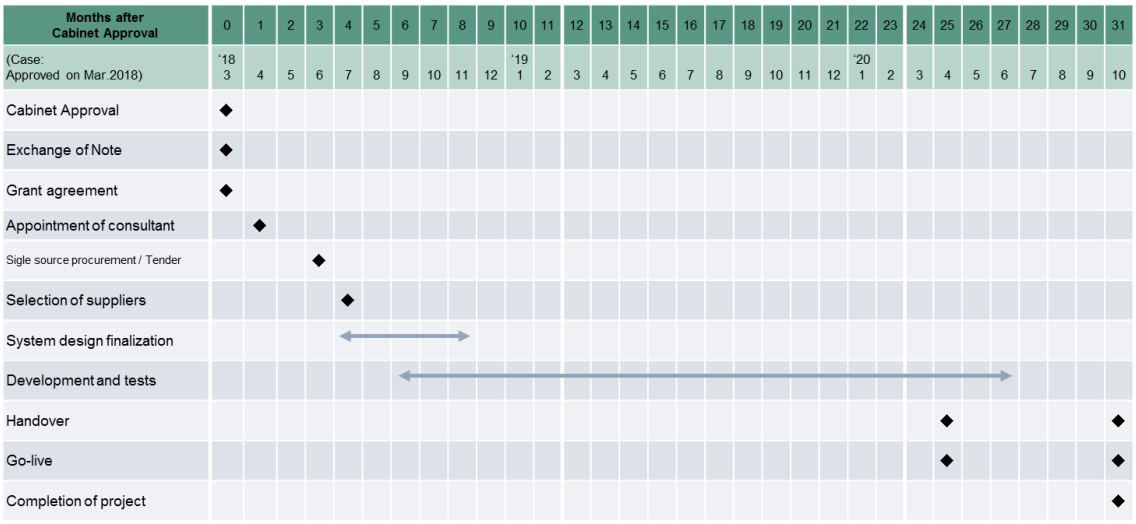
8. Disaster recovery	● A remote Disaster Recovery (DR) site for CBM-NET[8] will be set up at Nay Pyi Taw head office with active standby (that can activate immediately). ● Data of CBM-NET will be replicated asynchronously by database functions. ● The target RPO (the expected time gap between backup file and original file) will be Near-zero[9] and the target RTO (the expected time to be restored) will be 2 hours.[10].
9. Redundancy of the data	● Database servers are configured with the HA function (a failure response mechanism), SAN storage provides redundant elements to avoid single point of failure (SPOF), and data is backed up daily.

[8] CBM-OA, MCH and Accounting System will not be set up at the DR site.
[9] This may vary depending on the quality of network connection
[10] The RTO will be determined after verification in an actual environment

10.User authentication	● In addition to current ID/password authentication, USB token authentication will be implemented. ● This will be applied not only to CBM branches but also to FIs. ● Security will be strengthened by controlling and issuing USB tokens by CBM.
11.Automatic Data Exchange	● A standard file interface (for accounting, MCH, PSSD system, Myanmar Payment Union (MPU), T-Bond/Bill auction system, Foreign exchange (FX), (interbank) deposits). ● File upload functions via web browsers or data import functions[11] (for settlement of clearing data from ACH or Cheque Truncation, credit/deposit funds, T-Bond/Bill settlement information etc.). ● The method for providing data to the dashboard.

2.3 Project Timetable

The design and development phase ("System design finalization" and "Development and tests" of below Figure) will commence from the 4th month after the signing of G/A and will continue for 17 months. The system will be handed over to CBM by the 22nd month after the signing of G/A. System operation will commence with the first go-live from the 25th month and then the second go-live will take after the first one in the 31st month from the signing of G/A.



Source: Preparatory Survey Team

Figure 2: Overall timetable of the project

[11] Depending on verification of procedures, functions will be determined after consulting the vendor.

3. Evaluation of the Project

3.1 Relevance

Following the first project of CBM, the number of bank accounts grew by more than 10% per year along with economic development in Myanmar, and financial transactions are rapidly increasing and becoming more diversified, as seen in the introduction to mobile banking services, etc. Against this backdrop, the need for enhanced functionality of CBM-NET is increasing, such as improvement of settlements by direct connections between CBM-NET and each commercial banking system, as well as the liquidity saving function, and handling point-in-time settlements to respond to the needs for small-lot transfers by mobile banking and internet banking. Also, it is necessary to promote responses to international trends in Myanmar, such as ISO 20022, the international standard for financial service transactions, and the principle for financial market infrastructure (PFMI).

With an aim to facilitate financial transactions, what the Myanmar government positions as important initiatives are to respond to increasing and diversifying financial transactions by expanding the function of the Myanmar Central Bank's funds and securities settlement system, and to comply with international standards.

In the policies for economic cooperation to Myanmar enacted in April 2012, Japan considers support for improving the capacity of human resources supporting the economy and society, and for establishing institutions as one of the priority areas. Also, in the Japan-Myanmar Cooperation Program announced in November 2016, financial system development support is listed as one of the nine pillars. This project is consistent with these policies and will contribute to the stabilization and facilitation of the financial transaction in Myanmar by expanding the settlement system of the central bank of Myanmar, and it is highly likely that the grant aid will support this project.

3.2 Effectiveness

(1) Expected Effects

The effects to be brought by the second project are as follows:

- Transactions between FIs become more active.
- CBS implementation in Myanmar FIs will increase and networking of

financial systems will be promoted.

With the above effects, lending of funds to businesses and individuals by commercial banks is also promoted, contributing to the economic development in Myanmar. Indicators for measuring effectiveness are set as a means for confirming the effect of the performance of the project. These indicators can be categorized into quantitative indicators (measurable by numerical value) and qualitative indicators (unmeasurable by numerical value).

(2) Quantitative indicators

(A) Settlement amount on CBM-NET

The settlement amount per day processed on CBM-NET is 6,610 (hundred million MMK) at present, and is expected to grow to 12,438 (hundred million MMK) after the implementation of the second project (assumed to be three years from the completion of project in 2023).

In particular, as current Phase 1 system will be used continuously, it is deduced to increase according to the current growth rate (10.3% per year) until 2013. Meanwhile, after the go-live of CBM-NET Phase 2, by the solution of current barrier avoiding from using CBM-NET and the utilization of STP, an interbank transfer services which are covered by CBM-NET Phase 2 will be conducted on the CBM-NET. Therefore, the settlement amount on CBM-NET will increase in proportion of Myanmar's GDP growth prediction (13.95% per year[12]). In result, the average settlement amount on CBM-NET will be raise up to 12,438 (hundred million MMK) per day in 2023.

Table 4 Growth of the settlement amount on CBM-NET

Year	2018	2019	2020	2021	2022	2023
Growth rate (per year)	10.3%	10.3%	10.9%*	13.95%	13.95%	13.95%
Settlement amount (hundred million MMK per day)	6,973	7,692	8,490	9,579	10,915	12,438

* 10.3% per year growth until the go-live of CBM-NET Phase 2 (Oct. 2020), 13.95% per year growth after the go-live.

[12] On the assumption that GDP growth based on 6 year growth average including latest GDP growth which is announced after IMF Article IV Consultation with Myanmar (Jan. 25, 2017)

(B) Number of FIs implementing STP connection

For implementing STP connection, the applicable FI needs to have a CBS prepared. Currently, major commercial banks have introduced a CBS, and according to the survey, about 1/3 of banks are developing or planning it. In particular, 13 banks out of 40 answered that the CBS is already developed and capable (and wish) to connect STP. However, 4 banks out of those 13 banks could not answer actual or too long (more than 2 years) duration for modification of CBS to connect, so that currently 9 banks are surely possible to connect via STP.

Given this situation, it is expected that about 9 banks will have STP connection by 2023.

Table 5 Capability for connection to CBM-NET via STP

(n=40)		Development of CBS	
		Done	Not yet
Capability to connect via STP	Capable (not actual)	13* (4)	3
	Not Capable	10	14

* 4 FIs out of 13 answered the necessary period too long (more than 2 years) or not actual.

Table 6 Quantitative target indicators

Indicator name	Reference value (Actual value in 2017)	Target value (2023) [Three years after project completion]
Settlement amount on CBM-NET (hundred million MMK per day)	6,610*	12,438*
Number of FIs implementing STP connection	0	9

* The amounts are provisional values, and will be finalized after the announcement of 2017 statistics.

(3) Qualitative indicators

The qualitative effects of CBM-NET's second project are as follows:

- Improvement of efficiency in settlement operations by the commercial banks:

At commercial banks that shifted to STP, it used to be required to enter settlement information into CBM-NET after the internal payment process. Operation efficiency improves because these tasks are automated by STP. In addition, CBM-NET also supports the international standard format, so it is easier to design procedures when processing received messages at the bank. Moreover, optimization of work (such as the efficient use of deposit by introduction of LSF, reduction of re-sending instruction by queueing function, avoiding of manual works by introduction of automatic data exchange function) will be offered to all FIs in Myanmar.

- Improvement in system availability:
  Since CBM-NET's business continuity site for disaster recovery is prepared, even if the main site in Yangon suffered damage, the data center in Nay Pyi Taw can take over the settlement processing; thus, the commercial banks can continue settlement. The development of FI's DR site will be promoted by the implementation of CBM's DR site since it will provide the direction for the development.

- Improvement of the implementation status of Principles for financial market infrastructures (PFMI):
  CBM and some commercial banks will secure the operational safety of settlement through the development of disaster recovery sites and back-up systems. This is not just an improvement of the information system, but also a review including the system and procedure of the administrative operation. Such arrangement will lead to a reduction in settlement risk pointed out by PFMI. In particular, the "Principle 15: General business risk" requires monitoring and control for business continuity, it contains the stability of ICT system in the broad sense. In addition, the system redundancy provided by this project will meet "Principle 17: Operational risk".

- Revitalization of interbank transactions (increased transactions in the money market and the capital market):
  The money market will be revitalized because of the progress of lending and borrowing between FIs, and so capital procurement by FIs and

companies will lead to the fostering of capital markets.

- Stabilization of the financial system:
  The functions such as STP or LSF with queueing will be implemented by Phase 2. These functions will promote funds settlement between FIs., The financial system in Myanmar will be more stabilized by the improvement of transactions on stable platform provided by CBM, instead of current settlement situation which is limited to cash or transactions among few FIs.

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Source: Based on United Nations Department of Field Support Cartographic Section Map

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Acronyms

ABMI	Asian Bond Markets Initiative
ABMF	ASEAN+3 Bond Market Forum
A/C	Account
ACH	Automated Clearing House
AHRD	Administration and Human Resource Development Department
ALM	Asset Liability Management
AML	Anti-Money Laundering
API	Application Interface
ASEAN	Association of South-East Asian Nations
BCP	Business Continuity Plan
BIS	Bank for International Settlements
BLOS	Bilateral offsetting
BOJ	Bank of Japan
BOJ-NET	Bank of Japan Financial Network System
BPR	Business Process Re-engineering
CBM	Central Bank of Myanmar
CBM-NET	Central Bank of Myanmar Financial Network System
CBM-OA	Central Bank of Myanmar Office Automation System
CBS	Core Banking System
CCP	Central Counter Party
CFT	Combating the Financing of Terrorism
CHAPS	The Clearing House Automated Payment System
CMD	Currency Management Department
CNAPS	China National Advanced Payments System
CPU	Central processing unit
CSD	Central Securities Depository
CSV	Comma-Separated Values
CT	Cheque Truncation
CTS	Cheque Truncation System
DB	Database
DC	Data center
DNS	Domain name system
DR	Disaster Recovery
DTNS	Designated time net settlement

DVP	Delivery versus payment
E/N	Exchange of Notes
EU	European Union
EUR	Euro (currency)
EPC	Extended Product Code
FEMD	Foreign Exchange Management Department
FI	Financial institution
FIX	Financial Information Exchange
FMD	Financial Market Department
FTP	File Transfer Protocol
FTS	Funds Transfer System
FX	Foreign exchange
G/A	Grant Agreement
GDP	Gross Domestic Product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GW	Gateway
HA	High Availability
HDD	Hard disk drive
HTTP	Hypertext Transport Protocol
HW	Hardware
ICT	Information Communication Technology
ID	Identification
IMF	International Monetary Fund
IP	Internet protocol
IPSEC	Security Architecture for Internet Protocol
ISO	International Organization for Standardization
JPY	Japanese Yen (currency)
L2SW	Layer 2 switch
L3SW	Layer 3 switch
LAN	Local Area Network
LBA	Link Bank Agreement
LSF	Liquidity Saving Features
LTO	Linear Tape-Open
MCH	Mechanized Clearinghouse
M/D	Minutes of Discussion

MDR	Message Definition Report
MDY	Mandalay
MEB	Myanmar Economic Bank
MEPS+	MAS (Monetary Authority of Singapore) Electronic Payment System
MICR	Magnetic Ink Character Recognition
MLOS	Multilateral offsetting
MMK	Myanmar Kyat (currency)
MOFR	Ministry of Finance and Revenue
MPSP	Mobile Payment Service Provider
MPT	Myanmar Post and Telecommunications
MPU	Myanmar Payment Union
MQ	Message Queueing
NAS	Network Attached Storage
NW	Network
NPT	Nay Pyi Taw
O&M	Operation and Maintenance
OA	Office Automation
OJT	On-the-Job Training
OS	Operating System
PC	Personal Computer
PDF	Portable Document Format
PSP	Payment Service Provider
PSSD	Payment & Settlement System Department
Q/O	Queuing and Offsetting
RDBMS	Relational Database Management System
RPO	Recovery Point Objective
RRP	Rapid Retail Payment
RTGS	Real-time gross settlement
RTO	Recovery Time Objective
SAN	Storage Area Network
SFTP	Secure File Transfer Protocol
SGD	Singapore Dollar (SGD)
SOAP	Simple Object Access Protocol
SPDC	Simultaneous Processing of DVP and Collateralization
SPOF	Single point of failure
STP	Straight Through Processing

SW	Software
SWIFT	Society for Worldwide Interbank Financial Telecommunication
Target2	Trans-European Automated Real-time Gross Settlement Express Transfer System
TLS	Transport Layer Security
UPS	Uninterruptible Power Supply
USB	Universal Serial Bus
USD	US Dollar (currency)
XML	eXtensible Markup Language
VPN	Virtual Private Network
WAL	Write-Ahead Logging
WAN	Wide Area Network
YGN	Yangon
YSX	Yangon Stock eXchange

1 Background of the Project

1.1 Current situation of the financial sector

1.1.1 Overview of the financial sector

Currently (as of September 2017), in Myanmar, a total of 41 banks are in operation in the three categories: commercial banks, foreign banks, and state-owned banks. The number of banks by category is shown in the table below.

Table 1-1 Banks in Myanmar

No.	Category	Banks
1	Commercial Bank	24
2	Foreign Bank	13
3	State-Owned Bank	4
	Total	41

Source: Preparatory Survey Team

The table below shows the number of branches and accounts as indicators of each bank's business scale.

Table 1-2 Business scale of Banks in Myanmar (Establishment order in each category)

No.	Banks	Abbrev.	Category	Branches	Saving a/c	Checking a/c
1	Myanmar Citizens Bank Ltd	MCB	Commercial	15	27,657	43,190
2	First Private Bank	FPB	Commercial	31	44,582	7,508
3	Co-operative Bank Ltd	CB BANK	Commercial	173	107,729	929,286
4	Yadanabon Bank	YDB	Commercial	2	4,523	2,983
5	Myawaddy Bank Ltd	MWB	Commercial	30	133,485	9,070
6	Yangon City Bank Ltd	YCBC	Commercial	3	18,314	1,651
7	Yoma Bank Ltd	YOMA	Commercial	55	169,909	122,241

8	Myanmar Oriental Bank Ltd	MOB	Commercial	24	59,789	44,267
9	Asia Yangon Bank Ltd	AYBL	Commercial	10	2,039	1,761
10	Tun Foundation Bank Ltd	Tun	Commercial	31	53,944	6,341
11	Kanbawza Bank Ltd	KBZ	Commercial	391	3,036,525	205,176
12	Smaill & Medium Industrial Development Bank Ltd	SMIDB	Commercial	17	15,671	6,818
13	Global Treasure Bank	GTB	Commercial	124	146,821	21,994
14	Rural Development Bank Ltd	RDB	Commercial	2	3,131	2,360
15	Innwa Bank Ltd	Innwa	Commercial	35	112,637	54,081
16	Asia Green Development Bank	AGDB	Commercial	51	115,217	150,570
17	Ayawaddy Bank Ltd	AYA	Commercial	199	837,023	207,322
18	United Amara Bank Ltd	UAB	Commercial	74	234,793	53,039
19	Myanma Apex Bank	MAB	Commercial	89	N/A	N/A
20	Nay Pyi Taw Sibin Bank Ltd	NSB	Commercial	7	2,465	774
21	Myanma Microfinance Bank Ltd	MMB	Commercial	3	6,527	850
22	Construction and Housing Development Bank Ltd	CHD	Commercial	9	8,404	2,901
23	Shwe Rural and Urban Development Bank Limited	SRUDB	Commercial	1	5,770	617
24	Ayeyarwaddy Farmers Development Bank	ABANK	Commercial	4	3,261	828
25	Bank of Tokyo-Mitsubishi UFJ Ltd	BTMU	Foreign	1	N/A	N/A
26	Overseas-Chinese Banking Corporation	OCBC	Foreign	1	0	119

27	Sumitomo Mitsui Banking Corporation	SMBC	Foreign	1	67	176
28	United Overseas Bank Limited	UOB	Foreign	1	132	0
29	Bangkok Bank	BKKB	Foreign	1	37	68
30	Industrial and Commercial Bank of China	ICBC	Foreign	1	N/A	N/A
31	Malayan Banking Berhad	MAYBANK	Foreign	1	0	79
32	Mizuho Bank (Japan)	MIZUHO	Foreign	1	121	292
33	Australia and New Zealand Banking Group	ANZ	Foreign	1	N/A	N/A
34	The Joint Stock Commercial Bank for Investment and Development of Vietnam	BIDV	Foreign	1	0	45
35	Shinhan Bank	Sinhan BANK	Foreign	7	0	46
36	E.Sun Commercial Bank Limited	ESUN	Foreign	1	N/A	N/A
37	State Bank of India	SBI	Foreign	1	N/A	N/A
38	Myanma Foreign Trade Bank	MFTB	State-Owned	1	0	104,561
39	Myanmar Investment and Commercial Bank	MICB	State-Owned	1	6,527	1,034
40	Myanma Economic Bank	MEB	State-Owned	41	873,709	179,018
41	Myanma Agricultural Development Bank	MADB	State-Owned	4	860	94

Source: Based on Commercial Banks survey by Preparatory Survey Team

1.1.2 Challenges of the financial sector

In this survey, we focused on surveying the current situation based on interviews and questionnaires to FIs in Myanmar, including MPU and others in addition to the banks mentioned above. According to the survey, the main issues in the financial sector in Myanmar are listed as follows: (1) Cash oriented mindset, cash society, (2) delay in systematization of FIs, (3) undeveloped settlement risk management, and (4) immature financial markets.

(A) Cash oriented mindset, cash society

Cash is particularly preferred and used in Myanmar. At the windows of the FI, you often come across the scene where people hand a clipped wad of cash over the counter whether it is in the city or not, and there is also a survey result that most salary payments are made in cash. ("The Global Findex Database 2014" by the World Bank shows that 95% of non-regular employees receive salaries in cash.) Credit card usage is increasing in merchant stores, hotels, and other retail establishments, but the need for cash seems to be deeply rooted. One of the reasons is the low bank account holding rate. (The account holding rate for 15 years or over is 23%, surveyed by Roland Berger in 2016.) Although the means for transfer not through bank accounts are gradually expanding, the advantage of bank accounts is unshakable, from the viewpoint of AML/CFT, as well as multipurpose use as means for receipt, payment, and transfer, thus, it is indispensable for the finance and economy of Myanmar to steadily promote to raise the bank account holding rate.

Initiatives are also necessary to strengthen the institution and systems so that payroll payments, utility fee withdrawals, tax payments, public benefit payments, and other payments can be made via a bank account instead of paying in cash. At present, automatic transfer and automatic withdrawal across FIs are seldom carried out, and the institutions and systems to realize this are still undeveloped. What is considered to be one of the important steps for the society to de-cash is to develop payment system infrastructure similar to the so-called ACH and to enable automatic transfer and automatic withdrawal across FIs. Meanwhile, MEB, a national tax collection agency, is proceeding with the introduction of a CBS by the World Bank Project. If the transfer related to national tax payment can be done online by connecting the CBSs of MEB and the commercial banks in the future, it is assumed

that it can be an incentive for Myanmar nationals to hold a bank account.

(B) Delay in systemization of FIs

Concerning the status of introduction of the CBS in FIs, it is known that there are significant differences between major banks, foreign banks, state-owned, semi-private, municipal, small, and medium-sized banks. When looking to sophisticate the payment systems throughout Myanmar, it is not sufficient to merely strengthen the function of CBM-NET, which is a node, but FIs as nodes also need to proceed with systemization properly. However, only about half of the domestic banks were able to introduce CBSs that connect the head office and branch offices online, in particular, most of the state-owned banks (state-owned, semi-private, municipal banks) cannot make the system online. For example, Yadanarbon Bank managed by Mandalay City uses an old-fashioned system built by its employees, but customers cannot deposit or withdraw money at other branches because the head office and branches are not connected online, and account information is maintained by each office separately. Since the above-mentioned state-owned banks and small and medium-sized banks do not have sufficient investment capacity, it is still uncertain when to introduce an online CBS.

Another trend is the penetration of Mobile Payment Service Provider (MPSP). MPSP indicates a mobile payment service provider that follows in the wake of so-called FinTech, and Wave Money, which is a joint venture with Telenor, a mobile phone company, is a typical example in Myanmar. In Myanmar, where the penetration rate of smartphones is high, individuals can transfer money between individuals through Wave Money without having a bank account if you have a smartphone and a dedicated application. Personal accounts are associated with telephone numbers in the form of mobile accounts, and transfer is made by designating the telephone number of the transferee on the dedicated application. The mobile account balance can be used for the top-up of mobile phones and the payment of some utilities. You can also deposit or withdraw from the account via agents (such as mom and pop store). This movement seems to be beneficial as part of the financial inclusion in Myanmar where the bank account penetration has not progressed. Although the CBM regulates the upper limits of the transfer amount and the balance, (Mobile Financial Services Regulation), more convenient, innovative financial services can partially erode the banking business. For FIs that cannot keep up with these innovations, especially for the above-mentioned state-owned banks and small and

medium-sized banks, it may be a threat.

How should we advance systematization of such state-owned and small and medium-sized banks being very behind the times, whether to steer to a joint center system like Japan (joint banking centers for regional banks, joint centers for shinkin banks, etc.), whether we should promote reorganization by consolidation and abolition. This point is one of our challenges. The deployment of CBM-NET terminals to branches is another challenge to be considered.

(C) Undeveloped settlement risk management

Through interviews with CBM officials and FIs, we had the impression that an understanding of settlement risk was scarce in Myanmar, in fact, it seemed that the settlement risk management was not controlled strictly.

For example, there is a settlement practice called the Link Bank Agreement (hereinafter "LBA") among commercial banks. This is based on contracts between two banks and is a mechanism that enables remittances between two banks within the range of deposits made to each other in advance as collateral. As for problems on the settlement risk of LBA, there are risks associated with the transportation of cash deposits (we occasionally came across the scene where cash was put in a sack and carried in a light truck) and uncertainties as to how the LBA settlement finality is secured. (It seems that positions for a couple of days are cleared collectively.) In foreign countries, it is recommended to conduct interbank settlement on the current account at the central bank to reduce the settlement risk as well as PFMI is also recommending using funds settlement service, security settlement service and collateral management service that provided by central bank. However, the LBA and transportation of cash are remarkably opposed to that trend. CBM should encourage interbank settlement based on the current account at the central bank as a supervisory authority on settlement risk and as the administrator of the settlement system. It is also considered necessary to devise ways to raise incentives for this, such as improvement in functions and user-friendliness of CBM-NET, abolishment of commission for cash deposits and withdrawals, paying interest to excess reserves on the current account at the central bank, and other ways.

As another example, there is also a problem of the settlement risk related to the central settlement at MPU and MCH. At present, the mechanism is to centrally

settle the netted amount at CBM as CCP, where the transfer from the bank with a settlement loss to a bank with a settlement profit takes place even when the bank with a settlement loss does not have sufficient funds in the account. CBM has not adopted the risk management method that it should as CCP (such as acceptance of collateral in case of bankruptcy of the bank with losses, setting the overdraft limit), so CBM is obliged to compensate for effectively unlimited losses for the bank with a settlement loss, and it is necessary to consider and improve the current system.

CBM is required to continue making constant efforts to establish a safe and secure settlement system after overviewing the current settlement system this way.

(D) Immature financial markets

Although CBM-NET, equipped with functions to settle funds and government bonds, began operation in January 2016, it can hardly be said that its usage has been expanded as originally expected unfortunately. In mid-2017, the government bond repurchases transactions between commercial banks finally began, but the work volume of CBM-NET has not shown any significant growth. There are several reasons for this, which are pointed out as follows: institutional problems (institutions and practices of money markets are not developed, etc.), issues in using the current account at the central bank (banks not wanting to deposit its extra reserves without interest granted, there are restrictions on receipt and withdrawal of cash, etc.), regulatory issues (foreign banks cannot offer time deposit products, so they cannot effectively hold government bonds from the perspective of ALM[13], etc.), problems with the fee (high usage fee of CBM-NET, unable to divide the fee proportionately between the originator and the receiver, etc.), system problems (CBM-NET and the CBSs have no STP connection, so manual input is required every time, etc.). In order to foster a mature financial market, it is necessary to clarify the issues to be cleared, and then remove obstacles to activate financial markets. Although the project focuses on system problem solving, that is, the latter issues, this project assumes the institutional and regulatory approaches are taken concerning the former issues, and the active involvement and encouragement of CBM are considered necessary.

[13] Asset Liability Management: The risk management for the value fluctuation of asset and liability against market interest rate.

1.2 Background of the project

After shifting to civilian rule and open-door policy for foreign direct investment in 2011, Myanmar has faced historical turnaround such as the regime change from the military to NLD (National League for Democracy) and the lifting of US economic sanction in 2016. In comparison with other ASEAN countries, Myanmar achieved significant economic growth (real GDP growth rate: 7.3% in 2012, 8.4% in 2013, 8.7% in 2014, 7.0% in 2015). Therefore, capital demands from domestic companies, foreign direct investment and demands of retail banking services have grown. In addition, "Economic Policy" released by the new administration in July 2016 made mention that the stability of finance and currency should be one of the most important policy challenges.

Central Bank of Myanmar (hereinafter, CBM) introduced Central Bank of Myanmar Financial Network System (hereinafter, CBM-NET) in January 2016 under the Japanese official development aid "THE PROJECT FOR DEVELOPMENT OF ICT SYSTEM FOR CENTRAL BANKING" (E/N: October 2013, JPY5.1billion) (hereinafter, phase1 project). CBM-NET makes a series of manual-based operations such as the management of current account and its outstanding, issuance/interest payment/redemption of government bond and its balance into system-based ones. In addition, as a result of financial system reform, for example dematerialization of government bond and the introduction of government bond book-entry system etc., the financial infrastructure in Myanmar has been developed step by step.

On the other hand, comparing to the situation when the first project preparatory survey was conducted in November 2013, the environment surrounding financial infrastructure has been widely changed along with the economic growth.

The first point is the environmental changes of retail banking in Myanmar. Banking account holding rate in Myanmar is still 23% (15-year-old and above, Roland Berger survey 2016), lower than the ones of other ASEAN countries (Thailand: 78%, Malaysia: 81%, Indonesia: 36%, Vietnam: 31%, Roland Berger survey 2016). So, the rate in Myanmar has possibility to expand, in fact, the numbers of banking account have increased 10% annual basis. Furthermore, as mobile banking services using smartphone have become widespread and Fintech boom has been risen, retail

banking system in Myanmar has been moving forward from the traditional cash-based settlement to electric-based settlement. However, a domestic retail funds transfer system corresponding to Zengin-Net in Japan isn't existing in Myanmar, so the development of small payment system hasn't caught up with the current retail banking improvement.

The second point is the transformation of overseas movement. Typical case is "Progress Report on Establishing a Regional Settlement Intermediary and Next Steps: Implementing Central Securities Depository-Real-Time Gross Settlement Linkages in ASEAN+3" released by ASEAN+3 CSIF (Cross-Border Settlement Infrastructure Forum). This report shows a roadmap and time schedule for the development of cross-border settlement infrastructure within the region. CBM may also be required to go along with the roadmap, for example, adapting ISO20022, developing CDS-RTGS link and connecting with other central banking systems.

The third point is the movement of upgrading CBS by commercial banks in Myanmar. Commercial banks have introduced packaged core banking software and improved the efficiency and autonomy of their business process. On the other hand, as CBM-NET isn't connected to CBSs of commercial banks, STP (straight through processing) between CBM-NET and commercial bank's systems isn't currently applicable, thus it may lead to less transaction volumes than expected.

The fourth point is the movement of upgrading central bank payment/settlement systems in foreign countries. One example is liquidity saving facilities (LSF) that allow banks to settle transactions with low liquidity. LSF has been introduced mainly among developed countries which have large transaction volume (Japan: 2008, Korea: 2009, UK: 2013). Other requirements from CBM such as warehouse function of forward dating transactions and 24-hour operation seem to be in the same context.

The fifth point is the further requirement of promoting efficiency and BPR (business process re-engineering) of CBM internal operations. Introduction of CBM-NET and accounting system enable CBM staff to transform their operations from manual-based into system-based. However, automatic data linkage between CBM-NET and accounting system hasn't been implemented yet, and the data transfer is conducted manually. Implementing automatic data linkage may have beneficial effect on the

operations effectiveness and the deduction of operational risks.

2 Project Environment

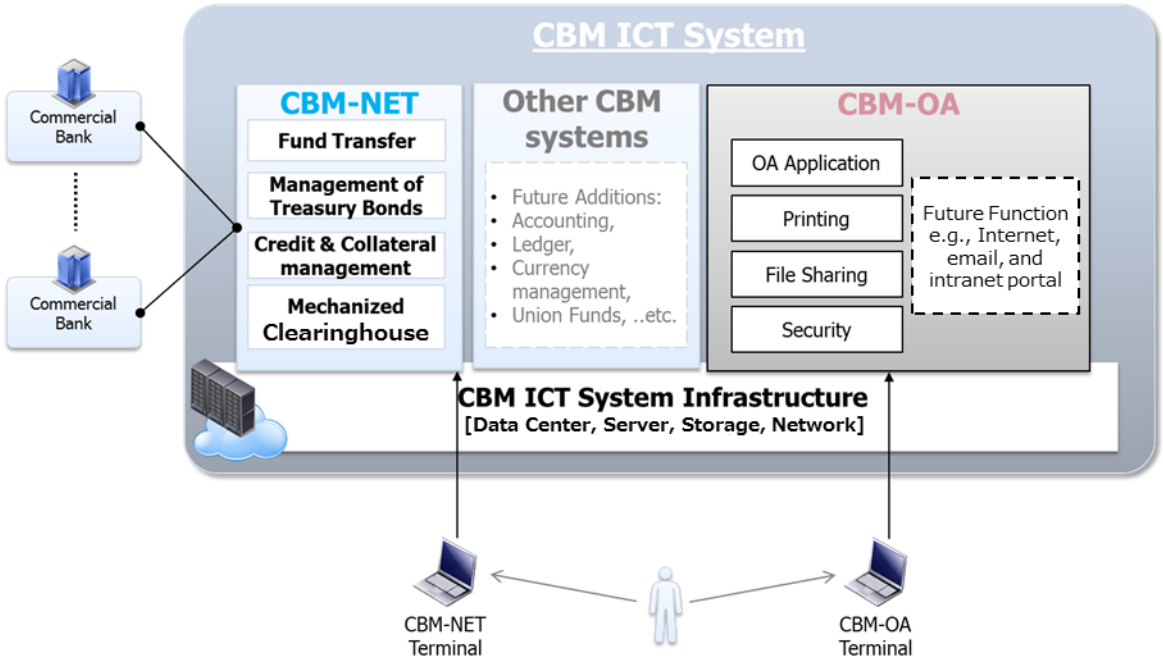
2.1 Situation of the Current System

2.1.1 Overview of the Current System

CBM installed CBM-NET in January 2016 by Japanese ODA grant.

CBM-NET is the central banking system referring to Japanese system (BOJ-NET) and provides the comprehensive functions consist of funds settlement by RTGS, management of government bonds (DVP function), and management of collateral. In addition, MCH which provides mechanized sorting, clearing and netting of cheque was also introduced as a subsystem of CBM-NET. The CBM-OA which provides office automation (OA) applications, printing functions, file sharing services, and security mechanisms was introduced besides the CBM-NET.

To install these systems, the CBM ICT System infrastructure consists of a data center, servers, storages, and network infrastructure was implemented as well as terminals for the systems in CBM and FIs in Myanmar.



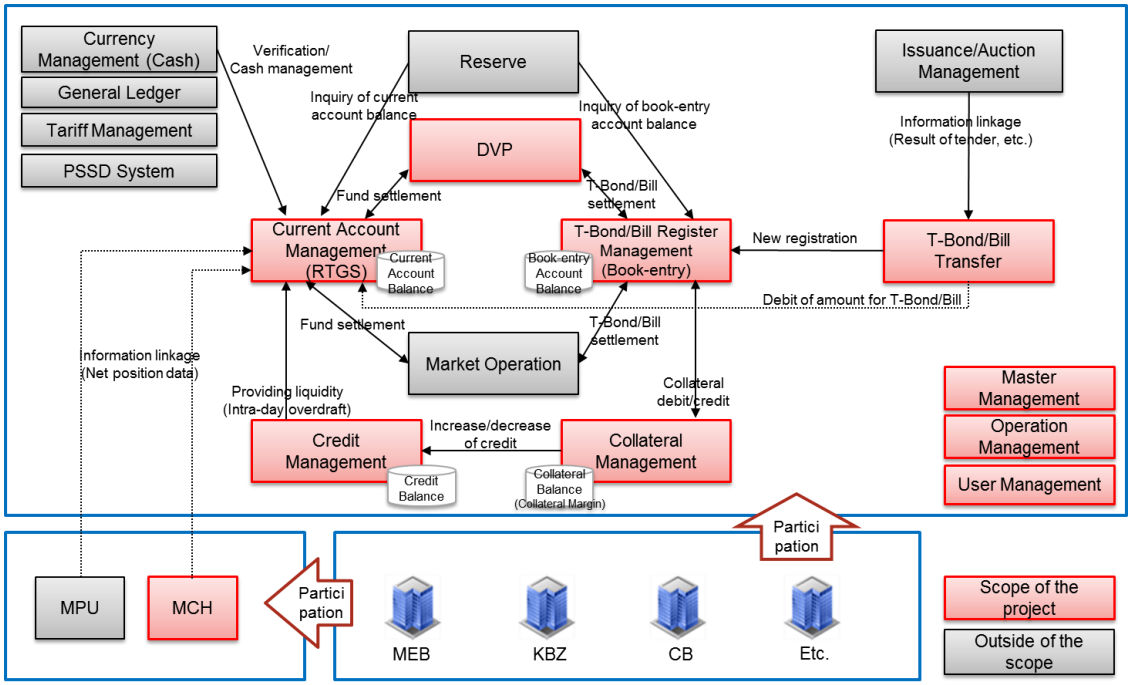
Source: Preparatory Survey Team of Phase 1

Figure 2-1 CBM-NET Phase 1 and CBM-OA

2.1.2 Overview of the Current System Application

CBM-NET Phase 1 covers funds transactions, treasury bond/bill transactions, credit and collateral management, mechanized clearinghouse, and master/operation/user management. Funds transactions by RTGS in the system include cash deposits, withdrawals (MMK, USD, EUR, SGD, JPY), and funds transfers (MMK, USD, EUR, SGD, JPY). Treasury bond/bill transactions within the system consist of new issuance, T-Bond/Bill selling, T-Bond/Bill transfers, T-Bond/Bill DVP, and interest payments and redemption.

Moreover, the connection with MPU has been implemented with support of JICA Technical Assistance after Phase 1.



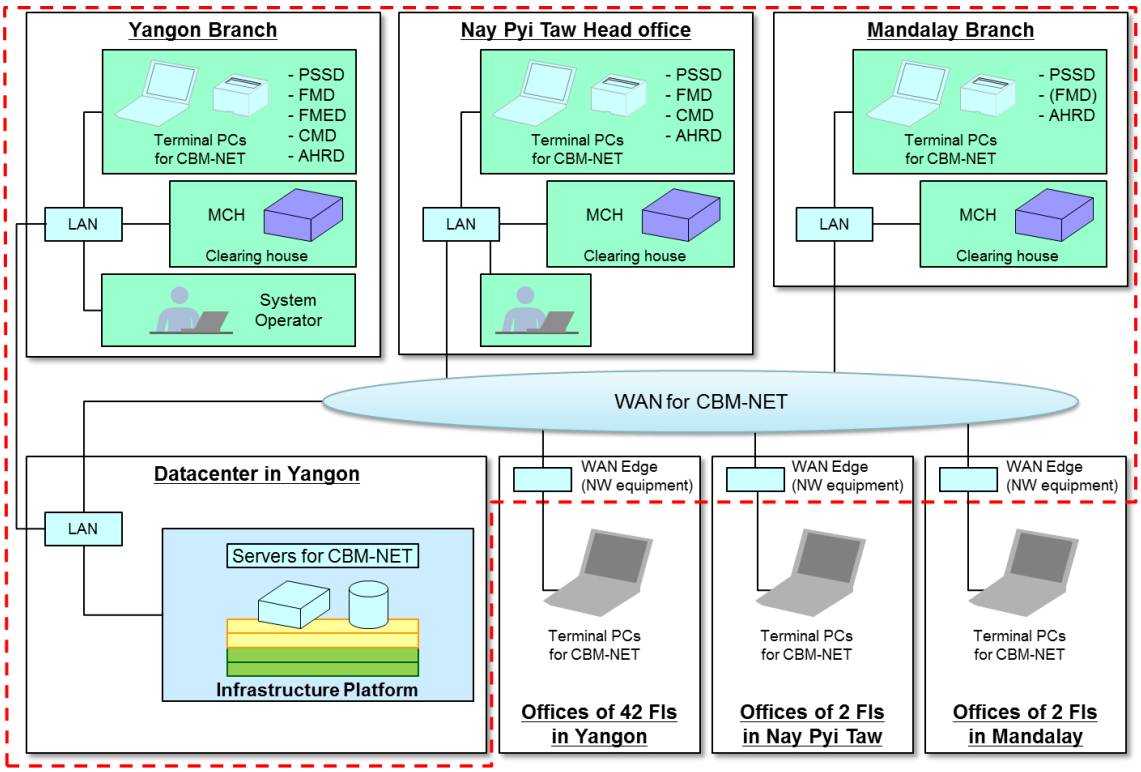
Source: Updated by preparatory Survey team based on Preparatory Survey of Phase 1

Figure 2-2 Coverage of CBM-NET Phase 1 applications

2.1.3 Overview of the Current System Infrastructure

The infrastructure for CBM-NET Phase 1 consists of servers, network equipment, and terminal PCs. Servers for CBM-NET Phase 1 are placed at the container data center in Yangon. Terminal PCs for CBM-NET Phase 1 are connected to the datacenter through the WAN for CBM-NET Phase 1.

Terminals for CBM-NET Phase 1 are installed in three offices of CBM and the offices of FIs, which are state-owned banks, private banks, and foreign banks.



Source: Preparatory Survey Team of Phase 1

Figure 2-3 CBM-NET Phase 1 infrastructure design

3 Contents of the Project

3.1 Basic Concept of the Project

3.1.1 Summary of the Project

In comparison to the situation when the first preparatory survey project was conducted in November 2013, the environment surrounding the financial infrastructure has changed significantly along with economic growth, the implementation of CBS of FIs, and the need to adapt to international standards.

In order to adapt to the changes in the surrounding environment, the enhancement of the functions on CBM-NET will be conducted in this project.
An overview of the project is summarized in the following table.

Table 3-1 Overview of the project

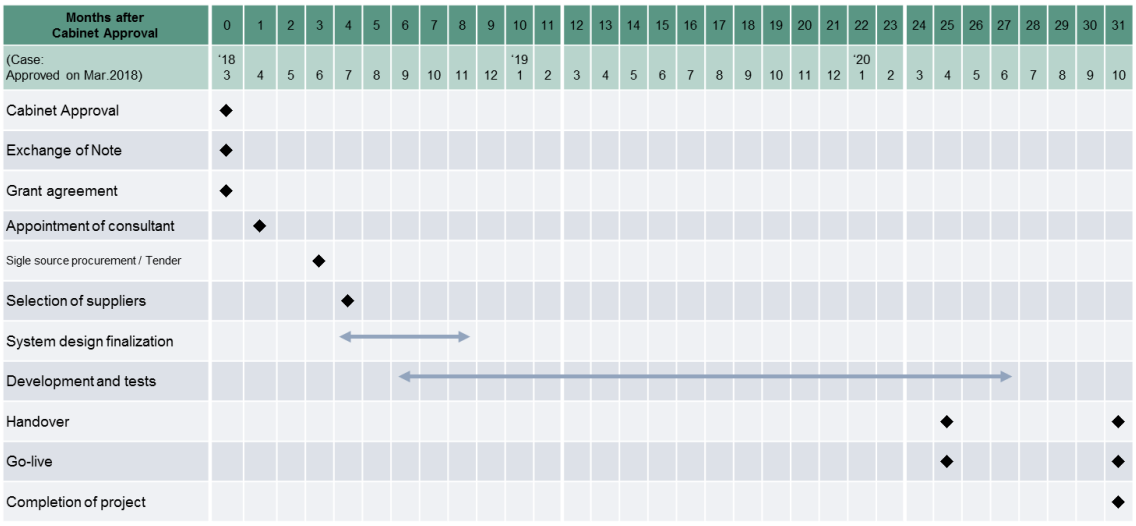
Item	Description
Project name	Project for Development of ICT system for Central Banking (Phase 2) (hereinafter, Phase 2, or this project)
Base objective	Establish the financial environment to accomplish efficient and steady policies and businesses at CBM.
Objective of the project	Accelerate the efficiency of the entire settlement process of both CBM and FIs and accomplish further modernization of the financial markets and policies of Myanmar.
Outcome of the project	The new functions based on international standards have been installed in CBM-NET.
Project Scope	1. Implementation of new functions (k) STP (l) ISO 20022 adaptation (m) Liquidity Saving Feature and Message Queuing (n) ACH (o) Cheque Truncation (p) Alert and Dashboard function (q) Disaster Recovery (r) Redundancy of the data (s) User Authentication (t) Automatic Data Exchange 2. Introduce the equipment to accomplish the above functions (c) Modify or re-establish the infrastructure for the information system (d) Modify or re-establish the network system for the information system 3. Design and build for operation and maintenance for the systems corresponding to the above functional request

Item	Description
	4. Support for user acceptance test and running test 5. Establish system operation and maintenance plan and manuals 6. Conduct explanatory training for the officials of CBM and FIs 7. Technical Support for AHRD officials
Relevant organizations of recipient country	Responsible Agency/Principal organization: Ministry of Finance and Revenue, (MOFR) Implementing organization: CBM
Beneficiary	Direct beneficiary: CBM Indirect beneficiary: FI (state-owned bank, private bank), Bank's customer
Undertakings by the Myanmar side	1. Application (CBM-NET software) (a) Any costs related to the payment for technical support for application & infrastructure after the go-live (b) Any costs related to the maintenance of the application after the period of 2 (b) below (c) Any costs for changes and addition of specification after the definition of system requirements for the system (d) Any costs for development of systems of agencies other than CBM (e) Any costs for modification of the existing systems, including those outside CBM to be connected to the new system (f) Any costs for the system after the go-live due to changes in the system environment, such as upgrades to the OS and middle ware (g) Any costs for changes (upgrades and expansion) of the application after the go-live (h) Control of users by issuing and managing USB tokens (i) Any costs to expand the number of users or area after the go-live (j) Cost of the application process for use from the FIs (k) Distribution of documents for users of FIs and CBM (l) Preparation for running tests (including confirmation of the test plan, business operation manual, system operation manual, DR manual, assignment of staff to educate and train, confirmation of condition for go-live assessment) before the running test 1 working with Technical Cooperation Project (m) Connection test after connection test 2 and running test after running test 2 (for FIs that cannot prepare the STP environment until the above period) 2. Hardware and facilities (a) Any costs related to payments for technical support for hardware and facilities after the go-live (b) Any costs related to the payment for maintenance of hardware and facilities after 5 years from purchase of equipment (c) Arrangement and preparation of the datacenter facilities (include both primary site and DR site) ● Include the design, purchase, and installation of security for the datacenter, firefighting system, electric power supply, air conditioner, measures for small animals, etc. ● Arrangement for continuous use of current datacenter as a primary site (see 3.2.4.3.4(A)) ● Arrangement and preparation of server room in Nay Pyi Taw Head Office as a DR site (see 3.2.4.3.4(B)) ● Preparation of operation room for DR site (see 3.2.4.3.4(C)) (d) Any other costs for running the system after the go-live and includes the costs related to the datacenter facilities (primary site and DR site) (e) Arrangement and any costs for WAN connections for CBM-NET (f) System maintenance and operation after the go-live (helpdesk, system monitoring staff, maintenance staff, etc.) (g) Any costs for the system after the go-live, such as expansion, upgrade, or replacement of the system infrastructure

Item	Description
	(h) Any costs for the system after the go-live, such as changes in the settings for enhancing the function of the system 3. Other (a) All other obligations written in Annex 4 "Major undertakings to be taken by the government of Myanmar" (b) Collaboration on discussion and decision on system features (c) Correspondence and communication with the users of FIs and CBM (d) Issuance of new rules regarding to Phase 2 development functions (e) Issuance of business continuity plan (BCP)

3.1.2 Project Timetable

The design and development phase ("System design finalization" and "Development and tests" of below Figure) will commence from the 4th month after the signing of G/A and will continue for 17 months. The system will be handed over to CBM by the 22nd month after the signing of G/A. System operation will commence with the first go-live from the 25th month and then the second go-live will take after the first one in the 31st month from the signing of G/A.



Source: Preparatory Survey Team

Figure 3-1 Overall timetable of the project

3.2 Outline Design of the Japanese Assistance

3.2.1 Former requested items

3.2.1.1 Former requested Items for Phase 2

According to the results of consultations between CBM and JICA, the following items are listed as initial requirements from CBM that must be considered an enhancement for the current CBM-NET.

(A) To add the following new functions into CBM-NET
  (a) Compatible for ISO 20022 standards (including data interface)
  (b) Direct linkage system between CBM-NET and the other external systems
  (c) Liquidity saving facilities (LSF) that allow FIs to settle transactions with low liquidity
  (d) Automatic data exchange within the subsystems of CBM-NET
  (e) Reinforced user authorization function
  (f) Implement clustering for the existing database management system
  (g) Establish a retail payment system
  (h) Function of forward dating transactions
  (i) Cheque settlement with digital image data
  (j) 24-hour operation
  (k) Anti-money laundering function
  (l) Alert
  (m) Data backup for disaster recovery
(B) To introduce the equipment to accomplish the above functions
  (a) Modify or re-establish the infrastructure for the information system
  (b) Modify or re-establish the network system for the information system

3.2.1.2 Relation Between Requested Items and Phase 2 Components

From the functional relation, all the above requirements in (A) can be categorized

into the following application components or infrastructure special features. Hereafter, the system scope and design features will be considered in each application component or infrastructure special feature. The requirements related to (B) above will be introduced according to consideration of the infrastructure special features in Table 3-3.

On the other hand, CBM-OA – a part of the CBM ICT system providing office automation (OA) applications and other basic office functions – will not be included in the Phase 2 development scope. In addition, MCH, the subsystem under the current CBM-NET, which is under stable operation, will be outside the scope as well.

Table 3-2 Relation between application components and requirements

Application Components	Requirements
1. STP	(b) Direct linkage system between CBM-NET and the other financial systems
2. ISO 20022 adaptation	(a) Compatible for ISO 20022 standards
3. Liquidity saving feature and message queuing	(c) Liquidity saving facilities (LSF) that allow FIs to settle transactions with low liquidity (h) Function of forward dating transactions
4. ACH	(g) Establish retail payment system (h) Function of forward dating transactions (j) 24-hour operation
5. Cheque Truncation	(i) Cheque settlement with digital image data
6. Anti-money laundering function	(k) Anti-money laundering function
7. Alert and dashboard function	(l) Alert

Source: Preparatory Survey Team

Table 3-3 Relation between infrastructure special features and requirements

Infrastructure Special Features	Requirement
8. Disaster Recovery	(m) Data backup for disaster recovery
9. Redundancy of the data	(f) Implement clustering for the existing database management system
10. User authentication	(e) Reinforced of user authorization function
11. Automatic data exchange	(d) Automatic data exchange within subsystems of CBM-NET

Source: Preparatory Survey Team

3.2.2 Design Policy

To promote Phase 2 development and effectively use grant aid, it is important to select a pragmatic approach and solutions based on the situation in the Myanmar financial sector instead of simply covering previous all requirements. According to these requirements and considering the challenges in 1.1.2 or the change of environment in 1.2, the following must be noted as the basic policy for implementing Phase 2 development:

- Consider that an enhancement by Phase 2 development to be a key driver for the accelerating use of CBM-NET
- Consider the current situation of settlement business processes and practices of CBM and FIs
- Communicate with stakeholders (especially with user FIs) and share the progress, technical information, and issues with them
- Consider a reduction in operating and maintenance costs and then make a choice for easy maintenance and flexible infrastructure to reduce the burden of IT officials of CBM
- Refer the trend of neighborhood and relevant institutes

The major policy for systemization of central banking in Myanmar is to introduce a system that adopts the following functions, facilities, and technologies.

Table 3-4 Design policy for CBM-NET Phase 2

Design policy	Approach
To adopt international standard	Support of ISO 20022 standard ● Since ISO 20022 is an international standard which will be used for cross-border transactions and massages related to cross-border transactions, it should be supported on related messages.
Efficient for high volume transaction	Introduction of STP ● To pursue the goal of handling more transactions, STP should be promoted to FIs which have CBS and wish to connect. ● To take in the participation and utilization of FIs who have strong active needs, the modification of CBS for connecting STP should be borne by FIs. Introduction of Liquidity saving features and message queuing ● To promote the use of CBM-NET, this function will be implemented with consideration of the operation suitability in Myanmar (ex. to integrates with RTGS account to simplify the operation work for FIs, etc.).

Design policy	Approach
	● Due to the affinity for users, this function should be designed to be realized and utilized as an expansion of current RTGS. ● Not only the liquidity for funds settlement but also for T-Bond/Bill by speeding up collateralization (pledge/release) process should be considered. Introduction of ACH ● To promote the use of CBM-NET including retail payment, this function will be implemented with consideration of the operation suitability in Myanmar (ex. to simplify the operation work for FIs, etc.). Introduction of Cheque Truncation ● Considering the consistency of operation, this function should be implemented as a subsystem of CBM-NET (similar to MCH, etc.) and connect to CBM-NET by handover the netting result. ● To accomplish the rapid deployment and transition (from current method), this function should be provided with necessary equipment.
Latest infrastructure architecture	SOAP/XML protocol for STP ● The protocol will be used for STP between CBM-NET and CBS should be focused on its response rapidity and flexibility. ● Regarding to the designing of messages, not only adopting ISO20022 as above but also flexibility and ease of deployment for FI should be considered. Development of DR Site in Nay Pyi Taw ● The DR site should be applied the configuration to minimize RPO and RTO to be a model for DR site development of FIs. ● In addition, redundancy of total infrastructure which avoids SPOF should be considered.
Minimization of O&M cost	Minimization of O&M cost, encouragement of in-house operation ● Considers minimizing the operation and maintenance costs of the system installed in Phase 2 to decrease the burden on CBM after handover. ● Allows CBM to maintain the application and infrastructure as much as possible by the AHRD.

Source: Preparatory Survey Team

3.2.3 Outline Design Drawing (Scope of works)

Based on the Preparatory Survey, the scope of Phase 2 development was discussed between stakeholders and concluded as shown below.

3.2.3.1 Application Components

Application Components are the functions that will be added to the current CBM-

NET by application development. The scope overview of Phase 2 development for each application component is as shown in the table below. The details of the functions for each application component are described in Table 3-5 below.

Table 3-5 Scope of application components

1. STP	● STP will use SOAP/XML protocols (Transactions will be encrypted.)
2. ISO 20022 adaptation	● ISO 20022 will be applied to all applicable messages.
3. Liquidity Saving Feature and Message Queuing	● Accelerate use of CBM-NET by Increasing settlement availability within current deposit volume. ● LSF settles the payment instructions by event-driven (such as change of liquidity) BLOS and time-driven MLOS. ● The queue will be managed by priority and posted time of instructions.
4. ACH	● ACH covers payment instruction exchange among FIs, specifically direct credit and direct debit. ● ACH receive payment instructions all time, except system maintenance time. ● Calculation of instruction is simultaneously conducted when ACH receives instructions from FIs. ● Calculation of net position will be conducted at the designated time (DTNS); the result will be settled by RTGS*. ● ACH will receive payment instructions via STP GW and Automatic Data Exchange function (as below) * Frequency of settlement will be defined by CBM
5. Cheque Truncation	● Receive payment and image data from the presenting bank, net the payment data, and send payment and image data to the issuing banks. The result will be settled by RTGS*. ● Thirty-one cheque image scanners will be provided to CBM for use of FIs * Frequency of settlement will be defined by CBM
6. Anti-money laundering function	● AML that detects and suspends suspicious transactions should be responsibility of FIs and will NOT be introduced to systems in CBM.
7. Alert and dashboard function	● Basic alert (such as received messages, large amount transaction) and dashboard (such as operational data, financial data) functions will be implemented to CBM-NET ● Further functions will be implemented by the PSSD System (System for supporting PSSD business) with data from CBM-NET

Source: Preparatory Survey Team

3.2.3.2 Infrastructure Special Features

Infrastructure special features are functions that must be realized by the design of hardware, software, and networks. The scope overview of Phase 2 development for each infrastructure special feature is as shown in the table below. The details of the functions for each infrastructure special feature are described in Table 3-6 below.

Table 3-6 Scope of infrastructure special features

8. Disaster recovery	● A remote Disaster Recovery (DR) site for CBM-NET will be set up at Nay Pyi Taw head office with active standby (that can activate immediately). ● Data of CBM-NET will be replicated asynchronously by database functions. ● The target RPO (the expected time gap between backup file and original file) will be Near-zero and the target RTO (the expected time to be restored) will be 2 hours.
9. Redundancy of the data	● Database servers are configured with the HA function (a failure response mechanism), SAN storage provides redundant elements to avoid single point of failure (SPOF), and data is backed up daily.
10. User authentication	● In addition to current ID/password authentication, USB token authentication will be implemented. ● This will be applied not only to CBM branches but also to FIs. ● Security will be strengthened by controlling and issuing USB tokens by CBM.
11. Automatic Data Exchange	● A standard file interface (for accounting, MCH, PSSD system, Myanmar Payment Union (MPU), T-Bond/Bill auction system, Foreign exchange (FX), (interbank) deposits). ● File upload functions via web browsers or data import functions (for settlement of clearing data from ACH or Cheque Truncation, credit/deposit funds, T-Bond/Bill settlement information etc.). ● The method for providing data to the dashboard.

Source: Preparatory Survey Team

3.2.4 Implementation Plan

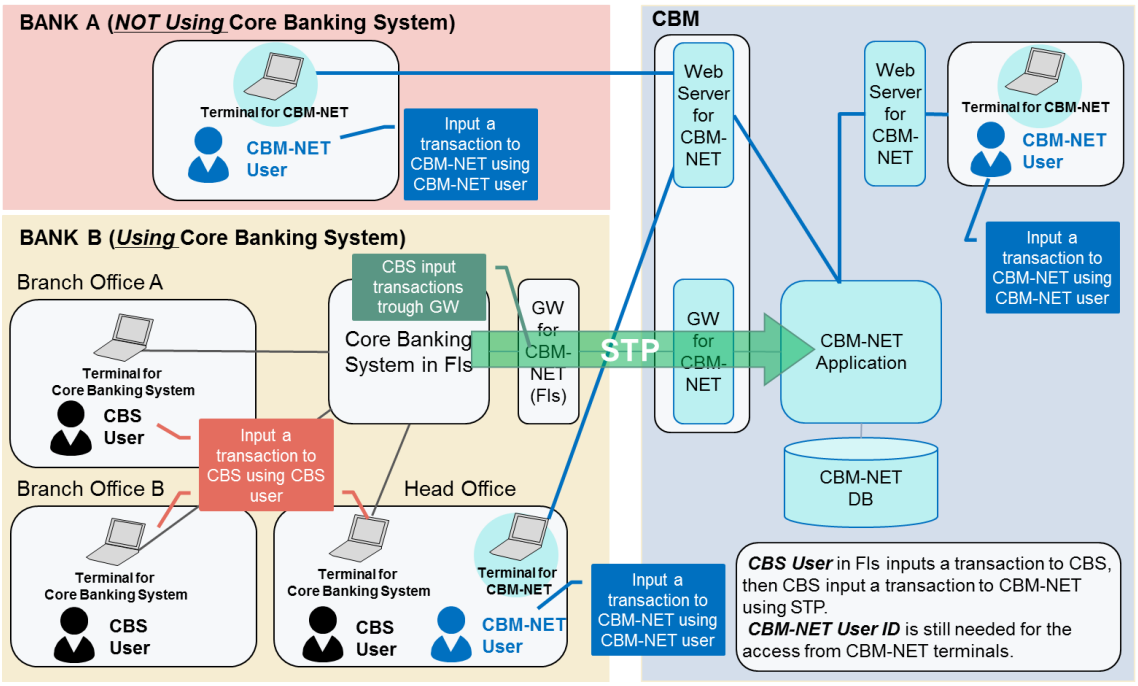
3.2.4.1 Implementation Policy and Conditions of Application

3.2.4.1.1 STP

(1) System Function

STP connects the CBS of FIs and CBM-NET Phase 2 to automate FI-to-FI transactions. FIs without a CBS can continue to process transactions through their CBM-NET terminals.

Large volume transactions and cross-border transactions are suitable for STP, while low volume transactions or balance enquiries are still able to handle manual entry from terminals.



Source: Preparatory Survey Team

Figure 3-2 Overview of STP

Messages for the following function will be covered by STP. All functions not shown below will not be covered by STP.

Table 3-7 Message covered by STP

Function name	Transaction name*
Funds Transfer System	Bank Transfer (RTGS)
	Customer credit transfer (RTGS)
Liquidity Saving Features	Bank Transfer (LSF)
	Customer credit transfer (LSF)
Securities Settlement Systems	T-Bond/Bill transfer
	DVP request
	DVP instruction
ACH	Customer direct credit & debit
	Rapid retail payment
Common	Settlement notification

*Output messages derived from these transactions can be exchanged by STP.

Source: Preparatory Survey Team

FIs using the web browser from CBM-NET terminal to process transactions will have additional file input/output functions by PDF and XML as shown below.

Table 3-8 File input/output in web browser

Function name	Transaction name	Input		Output	
		Web	File-UL	PDF	XML
Funds Transfer System	DTNS for MCH/MPU/CT	✓	CSV	✓	-
	Bank transfer (RTGS)	✓	-	✓	✓
	Customer credit transfer (RTGS)	✓	-	✓	✓
Liquidity Saving Features	Banks transfer (LSF)	✓	-	✓	✓
	Customer credit transfer (LSF)	✓	XML	✓	✓
Securities Settlement System	T-Bond/Bill transfer	✓	-	✓	✓
	File interface with bond primary auction system	✓	XML	✓	✓
	File interface with bond secondary trading system	✓	XML	✓	✓
ACH	Customer direct credit & debit	-	XML	✓	✓
	Rapid retail payment	-	XML	✓	✓

Source: Preparatory Survey Team

(2) Screen Requirement

The system screen will be designed by the CBM-NET Phase 2 application vendor and will be confirmed by CBM in the external design phase.

(3) Form Requirement

The STP function does not have form requirements to be considered.

(4) Data and Information Requirement

System-related data and information will be designed by the CBM-NET Phase 2 application vendor and will be confirmed by CBM in the external design phase.

(5) External Interface Requirement

The message protocol to transfer data between GW[14] of FIs and GW of CBM will be SOAP/XML. There are other options such as MQ[15] or FTP[16] which are also used broadly. Since STP will process urgent transaction such as RTGS, SOAP/XML protocols on web service is more suitable from the viewpoint of real time capability.

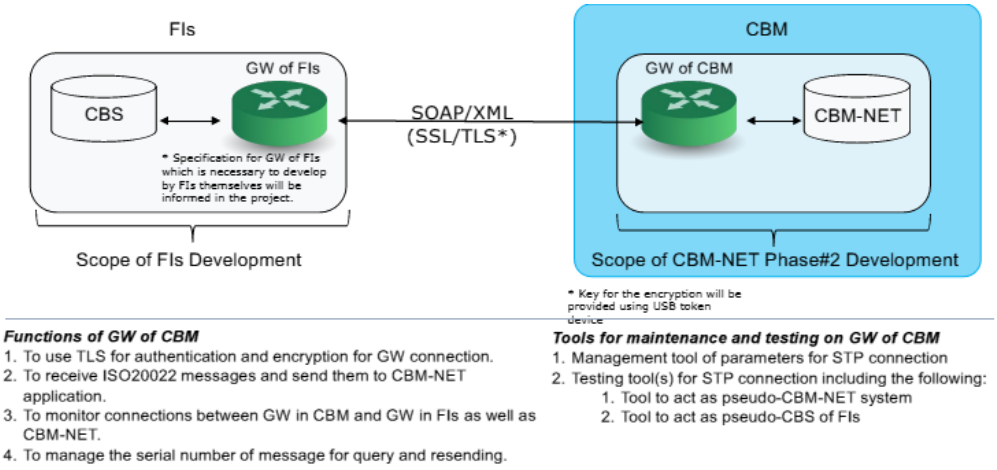
Table 3-9 Message protocol (1)

Name	Brief Description	Merits	Demerits
SOAP/XML (Simple Object Access Protocol)	Protocol to transfer data as XML format for Web services over network. SOAP is mostly used over HTTP(S).	Business application on client /server **can get response from each other in real-time**. **Message format is flexible** because XML is used.	**Stable network is necessary** because HTTP(S) can't keep its session long. Transferring large size of data is inefficient.

Source: Preparatory Survey Team

[14] Gateway is a communication system provided by CBM-NET to handle messages and data send/receive via networks and interact with application programs.
[15] Message Queue: A standard for messaging across multiple platforms by queueing messages. It is more familiar for connecting with host systems.
[16] File Transfer Protocol: A standard network protocol used for the transfer of computer files. This protocol is broadly used from beginning of internet.

The development of a GW of CBM is within the scope of CBM-NET Phase 2. The GW of FIs will be developed by each FI based on the specifications disclosed by CBM.



Source: Preparatory Survey Team

Figure 3-3 Message protocol (2)

(6) Prerequisite

For the specification, CBM will conduct required review and confirmation in timely manner. This project provides the technical information support to the FIs which can finish the modification of CBS before either of connection tests conducted two times. The API specification will be disclosed during external design phase (approximately 2 months after the start of external design), then the meeting (explanation) and follow up to the FIs will be coordinated by CBM. The agreement between CBM and FIs regarding to STP, CBM may have to determine based on technical conditions provided from consultant and vendors.

Moreover, as a part of 3.3(2)(E), CBM is requested to complete (coordinate) WAN connections between CBM-NET and FIs (which request to connect via STP) within 5 months after contract with infrastructure vendor.

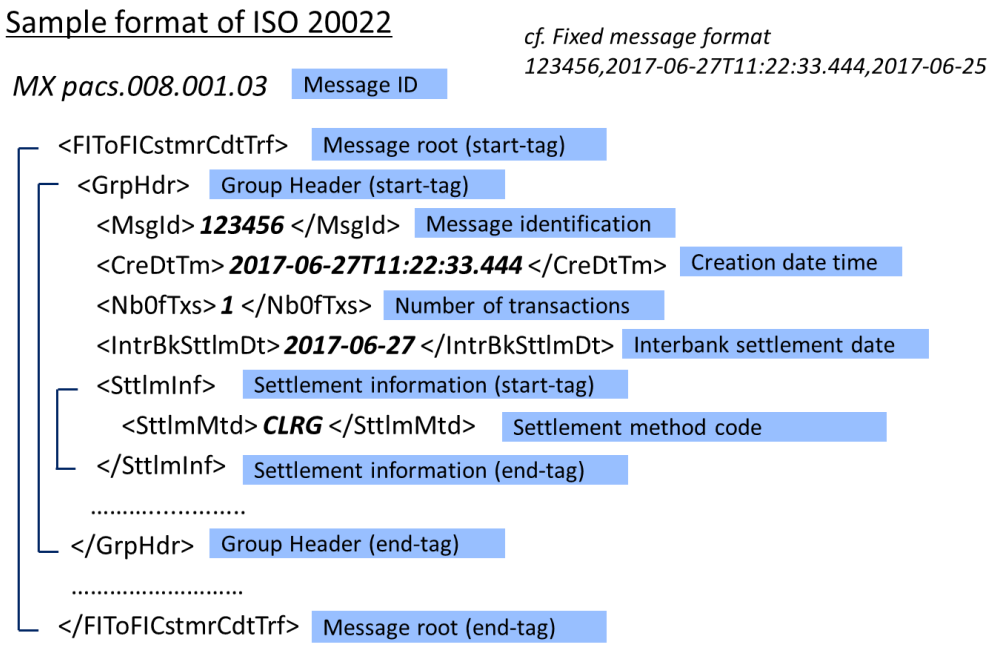
3.2.4.1.2 ISO 20022 adaptation

(1) System Function

(A) Overview of ISO 20022

ISO 20022 is the standard framework for financial services based on XML (eXtensible Markup Language) and other technologies established by ISO/TC68. The ISO 20022 message format has been or will be widely applied to various payment and settlement systems such as Target-2 (EU), CNAPS (China), Fedwire (US), and BOJ-NET (Japan) because of its flexibility, extensibility, and standardization. In addition, the ABMI member economies decided to adopt ISO 20022 as an international message standard for CSD-RTGS linkage.

Therefore, CBM-NET Phase 2 will be compatible with the ISO 20022 message format.



Source: Preparatory Survey Team

Figure 3-4 ISO 20022 message instance (sample)

Message ID: MX pacs.008.001.03
a b c d

a: Business area [pacs]
b: Message number [008]
c: Variant [001]
d: Version [03]

Message ID List in pacs (Payments, clearing, and settlement) area

Message Name	Msg ID (Schema)	Submitting Organization	Msg Def Report
FIToFIPaymentStatusReportV08	pacs.002.001.08	SWIFT	Message Definition Report Maintenance 2016/2017 – Approved by ISO 20022 Payments SEG on 17 January 2017
FIToFICustomerDirectDebitV07	pacs.003.001.07	SWIFT	
PaymentReturnV07	pacs.004.001.07	SWIFT	
FIToFIPaymentReversalV07	pacs.007.001.07	SWIFT	
FIToFICustomerCreditTransferV06	pacs.008.001.06	SWIFT	
FinancialInstitutionCreditTransferV06	pacs.009.001.06	SWIFT	
FinancialInstitutionDirectDebitV02	pacs.010.001.02	SWIFT	
FIToFIPaymentStatusRequestV01	pacs.028.001.01	SWIFT & EPC	

Source: Preparatory Survey Team

Figure 3-5 Message ID and business area on ISO 20022

(B) Adoption policy of ISO 20022

The following chart shows the advantages and disadvantages of ISO 20022 adoption.

From the viewpoint of the use of the ISO 20022 message format, at least, messages that can be exchanged across boarders may apply to ISO 20022. Otherwise, FIs shall use different message formats in each country when sending and receiving payment instructions via CSD-RTGS linkage.

As for ACH, including the rapid retail payment deemed "Fast Payment" as defined in the BIS report[17], payment instructions are exchanged within the country. However, in consideration of the future trends for RRP, ACH will also apply the ISO 20022 message formats.

STP messages other than ISO 20022 may be applied to XML formats, which partly consist of the elements of ISO 20022 messages for bank convenience, because most of these messages are not correspondent to ISO 20022 messages. Moreover, ISO

[17] "Fast payments – Enhancing the speed and availability of retail payments" (Nov. 2016) Committee on Payments and Market Infrastructures, Bank for International Settlement (BIS)

20022 messages have higher complexity and require too much work for implementation and continuous upgrading by CBM (refer to the "Message Definition Report" published by ISO 20022.org). In addition, receiving messages that can be downloaded through CBM-NET terminals are compatible with the XML message formats.

Messages, except as described below, may not be converted to XML message formats because these will be used only inside CBM-NET.

Advantage

- **Common Language**: ISO 20022 covers a wide range of areas, not only Payments but also other areas such as Securities, Trade Services, Cards and FX.

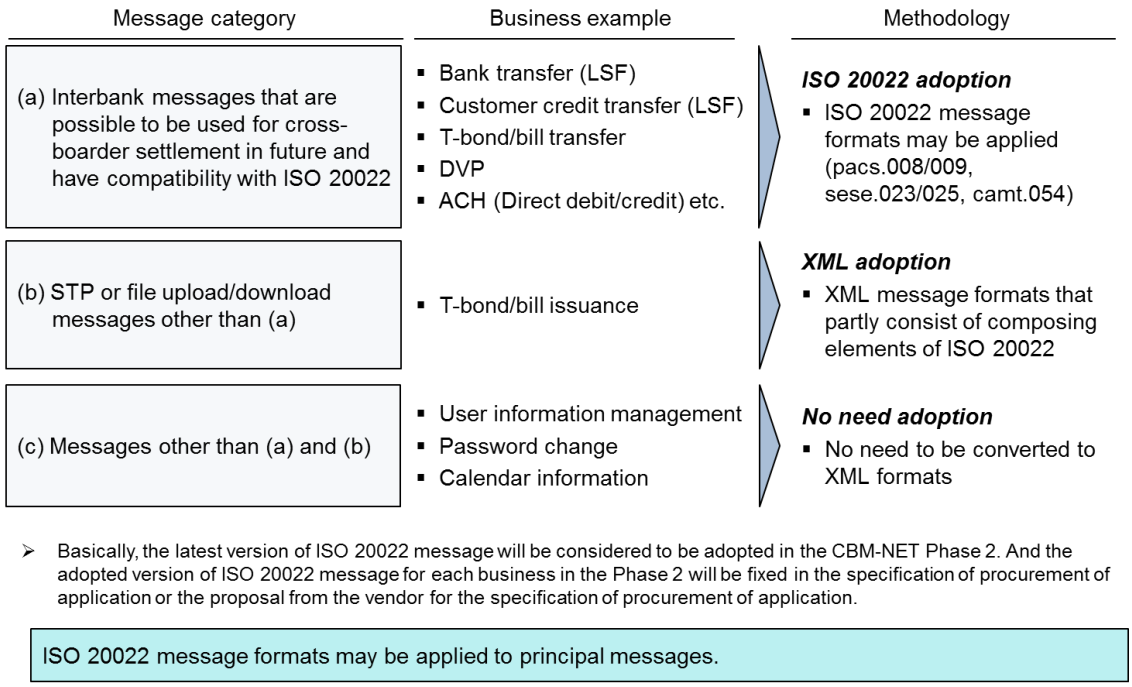
- **Interoperability**: Prior to the establishment of ISO 20022, many of message formats were existing (e.g. Swift-MT, FIX, ISO 15022).
  In case many institutions apply to ISO 20022, their services will have capabilities for the connection with each other.

- **Flexibility**: ISO 20022 applies to XML, tag-based mark-up language. Former message format ("MT") has strict message definitions with fixed data fields; in comparison, ISO 20022 ("MX") has flexibility for the future updating of message formats.

Disadvantage

- **Complexity**: ISO 20022 message formats include a huge variety of items, layers and tags; some items are set as required items whether they are need or not (as well CBM must define what kind of value should be set in each item). Therefore, the use of ISO 20022 messages tends to put a load on computer resources.

- **Continuous upgrade**: ISO 20022 message formats are reviewed and changed annually, and their versions are changed if needed. So, after the initial implementation on ISO 20022, in a few years, CBM may need to upgrade the message formats in line with international trends by itself.



Source: Preparatory Survey Team

Figure 3-6 ISO 20022 adoption policy

(C) Target ISO 20022 messages are as below

Based on the ISO 20022 adoption policy described below, the following eight categories are suited for ISO 20022 adoption. The following table shows the relations between categories and MX message IDs on ISO 20022.

Table 3-10 ISO 20022 compatible messages

Category	MX message ID
Bank transfer (RTGS)	pacs.009/camt.054
Customer credit transfer (RTGS)	pacs.008/camt.054
Bank transfer (LSF)	pacs.009/camt.054
Customer credit transfer (LSF)	pacs.008/camt.054
T-Bond/Bill transfer	sese.023/sese.025
DVP request/ DVP instruction	sese.023/sese.025
ACH: Direct credit	pacs.008/camt.054*
ACH: Direct debit	pacs.003/camt.054*
ACH: Rapid retail payment	pacs.008/camt.054*

*As for ACH, “camt.054” is used for net settlement notification of DTNS.

Source: Preparatory Survey Team

(2) Screen Requirement

It must be difficult to prepare all input items in ISO 20022 messages for the CBM-NET terminal screen because each ISO 20022 message contains more than one hundred tags and items. Therefore, in the external design phase, CBM should discuss with participant FIs which input items to implement on the CBM-NET terminal screen.

(3) Form Requirement

ISO 20022 adoption does not have particular documents or forms.

(4) Data and Information Requirement

As described above, ISO 20022 messages have versions and each version may be updated annually. Once the version is set, it will be unchanged at the time of go-live at least. The version should be defined at the beginning of the external design phase. For any changes (such as version upgrades) in the messages after go-live, CBM must follow up the latest status and upgrade the system if necessary.

(5) External Interface Requirement

The external interface specification will be designed by the CBM-NET Phase 2 application vendor based on the ISO 20022 standard of each message type and will be confirmed by CBM in the external design phase.

(6) Prerequisite

For the specification, CBM will conduct required review and confirmation in timely manner. Since detail of adopted ISO20022 messages will be included to the STP specification, it will be disclosed and provided to the FIs with coordination of CBM

as descripted in 3.2.4.1.1(6). Since the standard of ISO20022 may change, update of message format after external design phase will be considered by CBM, and the status of the update will be noticed to FIs. In particular, CBM is required to watch and grasp the update of ISO20022 continuously, and if it is upgraded, CBM will decide to or not to follow the upgrade and modify the message format of CBM-NET by considering the needs of FIs. Then, CBM will upgrade CBM-NET with caring about the impact to each function of CBM-NET.

3.2.4.1.3 Liquidity Saving Features and Message Queuing

(1) System Function

(A) Overview of liquidity saving features and message queuing

Liquidity saving features (LSF) allow participant FIs to settle interbank payment instructions with less settlement liquidity. Most developed countries have already introduced pure RTGS systems as well as RTGS with LSF systems (called hybrid systems). Central banking systems have gradually progressed from the DTNS (Designated Time Net Settlement) system to a pure RTGS system; currently, the hybrid system is deemed the international standard (EU: Target 2, UK: CHAPS, Singapore: MEPS+, Korea: BOKWire, and Japan: BOJ-NET).

Liquidity saving features consist of event driven bilateral offsetting (BLOS) and time driven multilateral offsetting (MLOS). BLOS and MLOS can settle with less liquidity; therefore, these offsetting mechanisms strongly contribute to the settlement progress compared to the pure RTGS mechanism.

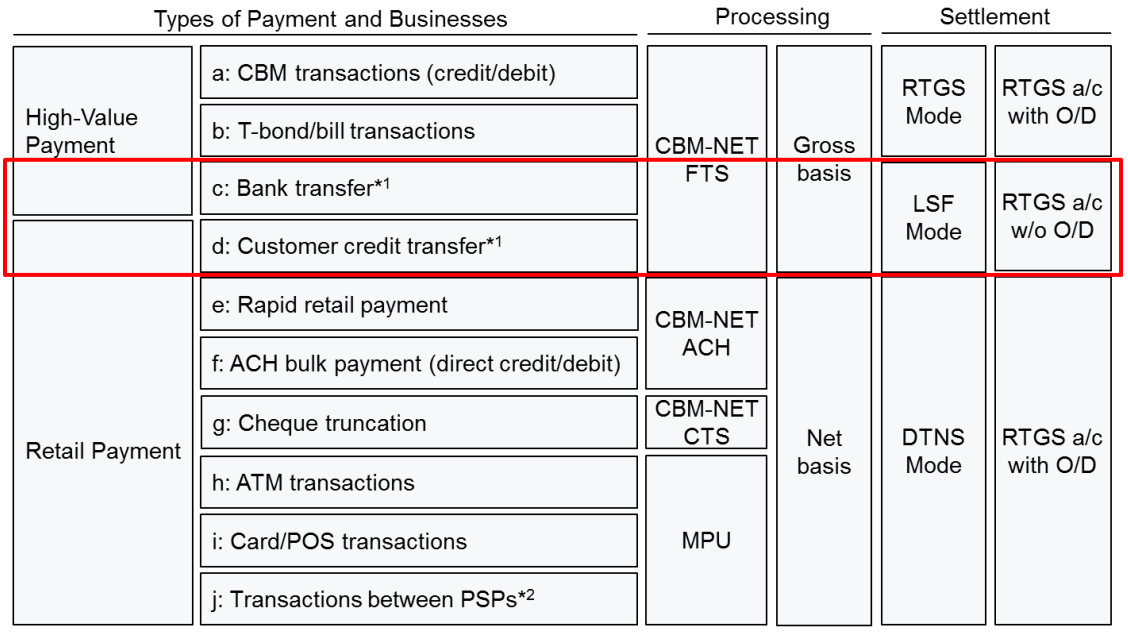
(B) LSF transactions

Transactions with LSF mode are composed of interbank funds transfer (hereinafter "bank transfer") and customer credit transfer (hereinafter "customer transfer"), and these types of transactions are mainly not urgent and suited for a queue or offsetting algorithm. However, urgent payment instructions can be selected and processed by RTGS mode with intra-day O/D facility.

(C) Account structure

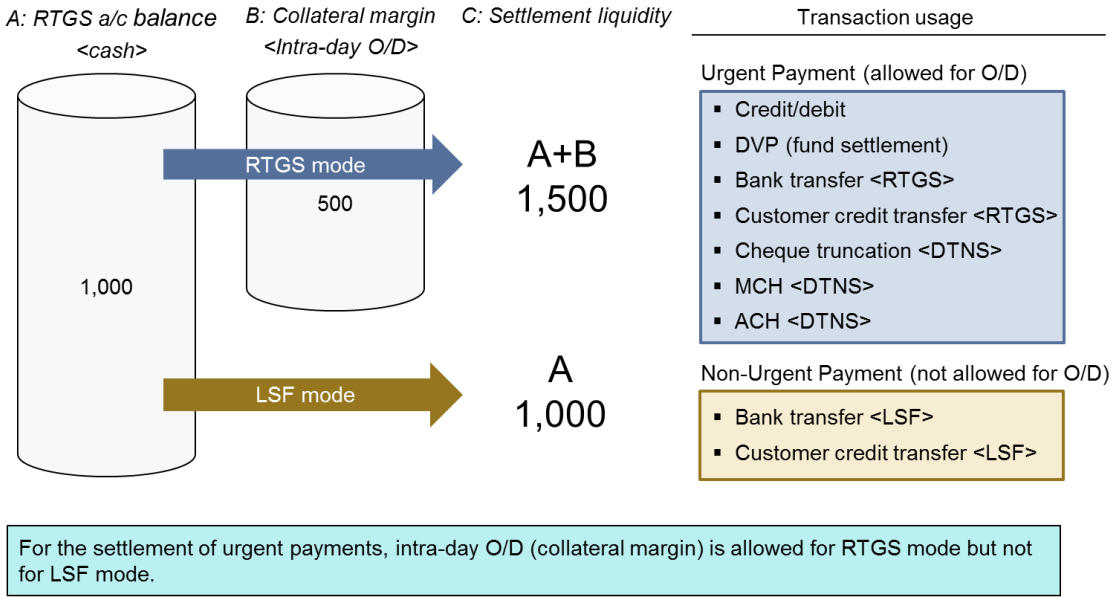
All types of transactions, including LSF transactions, are settled in RTGS a/c (=

current a/c), but LSF transactions cannot make use of intra-day overdrafts for settlement liquidity. Since settlements other than LSF transactions (cash withdrawal, DTNS for ACH/CT/MCH/MPU) shall be settled immediately with both RTGS a/c balance and intra-day overdrafts occur despite the RTGS a/c balance shortage by LSF transactions. To conduct LSF in one single a/c (RTGS a/c) due to the request of CBM, all kinds of transactions with RTGS a/c (on the same a/c) are forced to wait during the settlement process of MLOS (during MLOS calculation and clearing process, the transactions with RTGS a/c can be processed). Any future increase in transactions may cause system performance issues derived from the transaction concentration of the RTGS a/c. To avoid this, segregation of the a/c for LSF settlement will be one of solution. However, a countermeasure for this problem may have to be considered and solved by CBM. In particular, CBM-NET may have to be modified to equip the sub account that is able to move funds easily from/to the current RTGS account, and LFS settlement should be conducted on the sub account.



Source: Preparatory Survey Team

Figure 3-7 Relations between payment types and settlement methods



Source: Preparatory Survey Team

Figure 3-8 Settlement liquidity for RTGS/LSF mode

(D) Operating hours

Operating hours for LSF processing is the same as for other FI transactions.

During the MLOS processing time, LSF transactions will be held at GW because the calculation and settlement process of MLOS will lock all queued payment instructions.

When the closing time for LSF processing comes, all queued payment instructions are automatically cancelled.

(E) Settlement flow

When participant FIs send payment instructions with LSF, CBM-NET Phase 2 processes a trial run of bilateral offsetting.

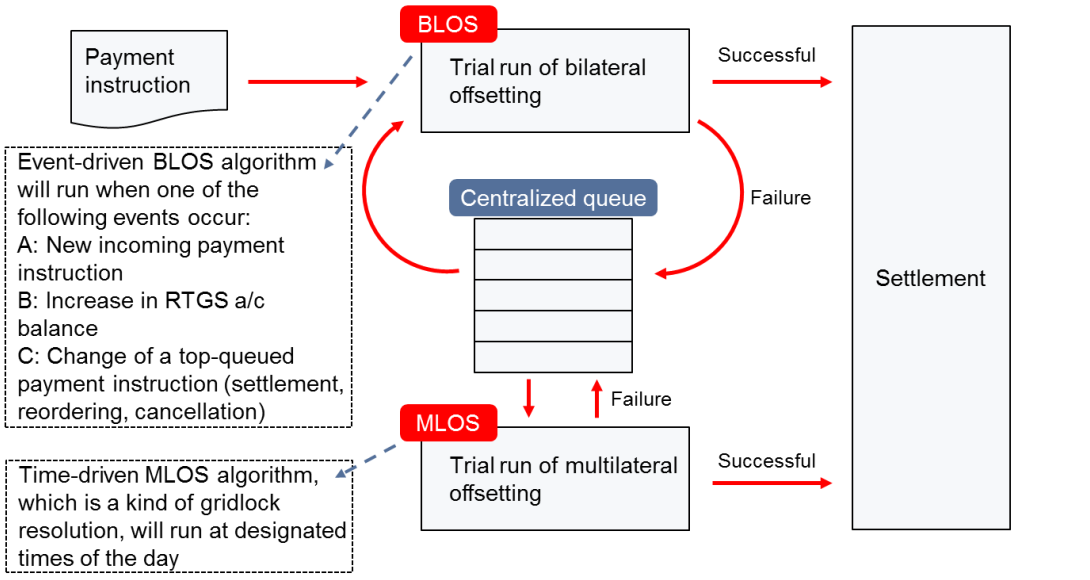
First, BLOS searches the adverse queued payment instructions from the creditor's queue in order and attempts simultaneous settlement of a combination of two payment instructions. If the RTGS a/c balances of both the debtor and the creditor will become positive, the two payment instructions are settled all together. If the RTGS a/c balance will become negative, BLOS continues to search for other adverse queued payment instructions. If there are no adverse queued payment instructions

in the creditor's queue, BLOS tries to settle the incoming payment instructions independently. If BLOS fails to settle because of the RTGS a/c balance shortage, the incoming payment instruction is queued.

Second, when the following event occurs, BLOS tries to settle the top-queued payment instructions using the same method as mentioned previously.

- Increase in RTGS a/c balance
- Change of a top-queued payment instruction (queue order can be changed by reordering, cancellation, and settlement)

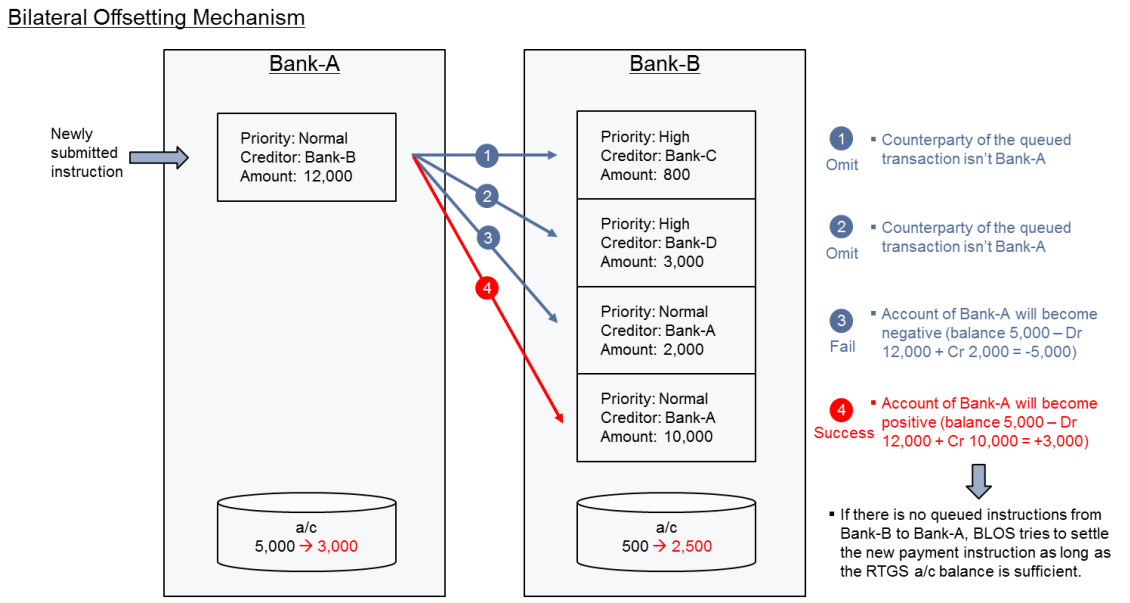
Third, when the designated time comes, MLOS tries to settle multi-combinations of queued payment instructions. The following chart shows the details of the MLOS algorithm. The removed queued payment instructions from the MLOS calculation process remain in the original order. CBM can set the number of MLOS times and the designated time by itself.



Liquidity saving features consists of two types of algorithm, event-driven BLOS (Bilateral Offsetting) and time-driven MLOS (Multilateral Offsetting).

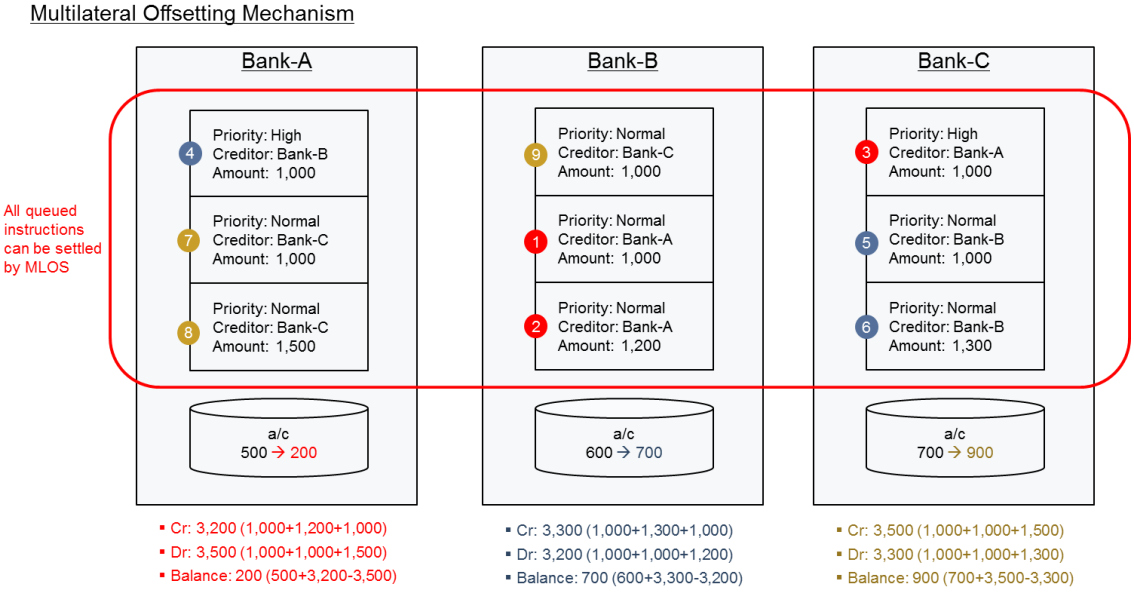
Source: Preparatory Survey Team

Figure 3-9 Overview of liquidity saving features



Source: Preparatory Survey Team

Figure 3-10 BLOS mechanism



Trigger

- CBM-NET activates MLOS more than once in a day at the designated time (e.g. 11:00/13:00/15:00).
- CBM personnel can change the number of times and the designated time of MLOS by preliminarily using CBM-NET operation management tool.

Multilateral Offsetting algorithm in case banks with insufficient settlement liquidity exist

a) MLOS algorithm continuously calculates the total net position among queued instruction.
b) When the designated time comes, MLOS tries to settle the calculated total net position.
   In case the RTGS a/c balance of all the participants will become positive, all queued transactions are settled simultaneously to finish process.
   In case of participants with a negative RTGS a/c balance, proceed to c).
c) Remove the queued instructions of the participant with a negative a/c amount until it becomes positive. The queued instructions that should be removed are specified in descending order of settlement amount. (In case two or more instruction with the same settlement amount exist, the lower queued instruction preferentially should be removed.) Continue these processes for all the participants with negative RTGS a/c balance until their RTGS a/c balance become positive.
d) After the completion of c), retry settlement as b). In case the participants with negative RTGS a/c balances exist, continue and proceed c) and b).

Incidentally, all kinds of transactions with RTGS a/c are forced to wait during the settlement period described in b) and d). (in comparison, transactions with RTGS a/c can be processed during the MLOS calculation and clearing processes described in a), b), and c).

Source: Preparatory Survey Team

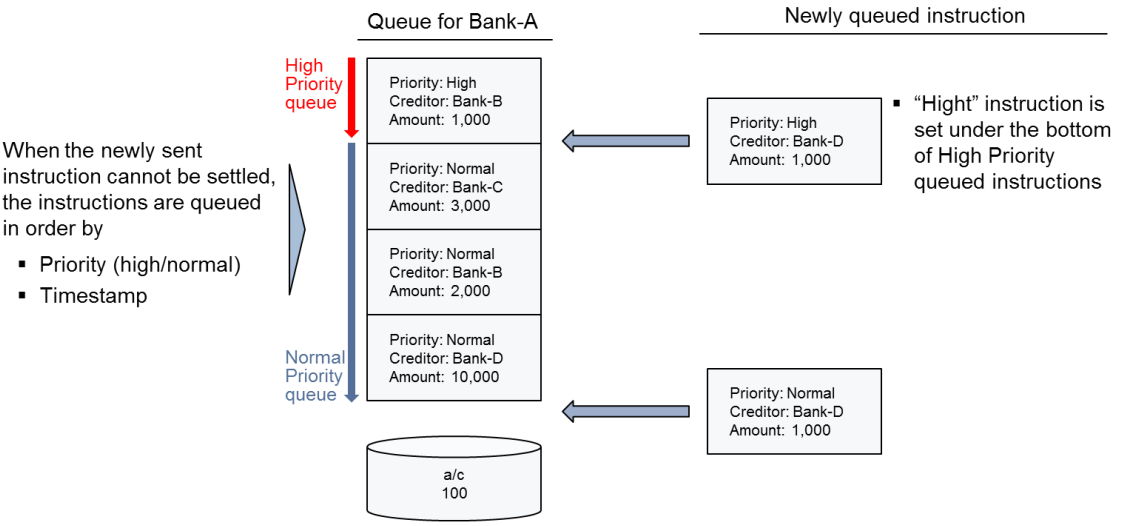
Figure 3-11 MLOS function overview

(F) Queue management

Participant FIs can manage their own queued payment instructions.

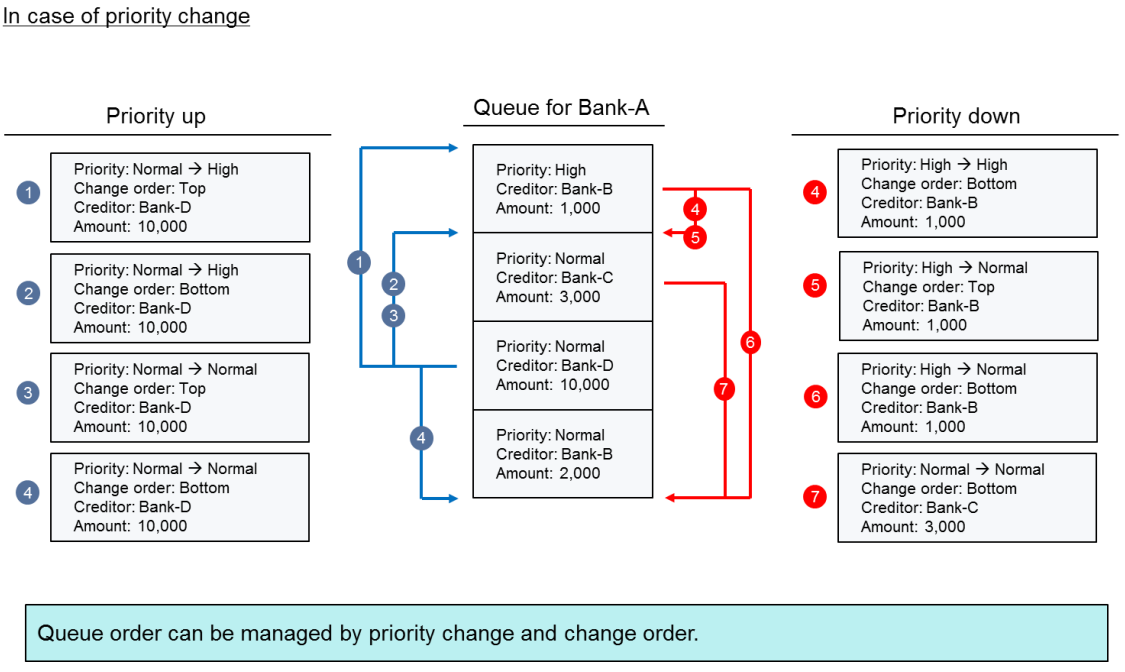
When participant FIs send payment instructions in LSF mode, they can choose the priority as high or normal. If the newly incoming payment instruction cannot be settled, first, the instruction will be queued at the bottom of each priority queue.

Participant FIs can change the queue order by using two parameters: one is priority change (normal/high), and another is change order (top/bottom). It allows them to process urgent queued payment instructions with “high” and “top.” They can also cancel the queued payment instructions.



Source: Preparatory Survey Team

Figure 3-12 Queue ordering



Source: Preparatory Survey Team

Figure 3-13 Changed queue order by priority change

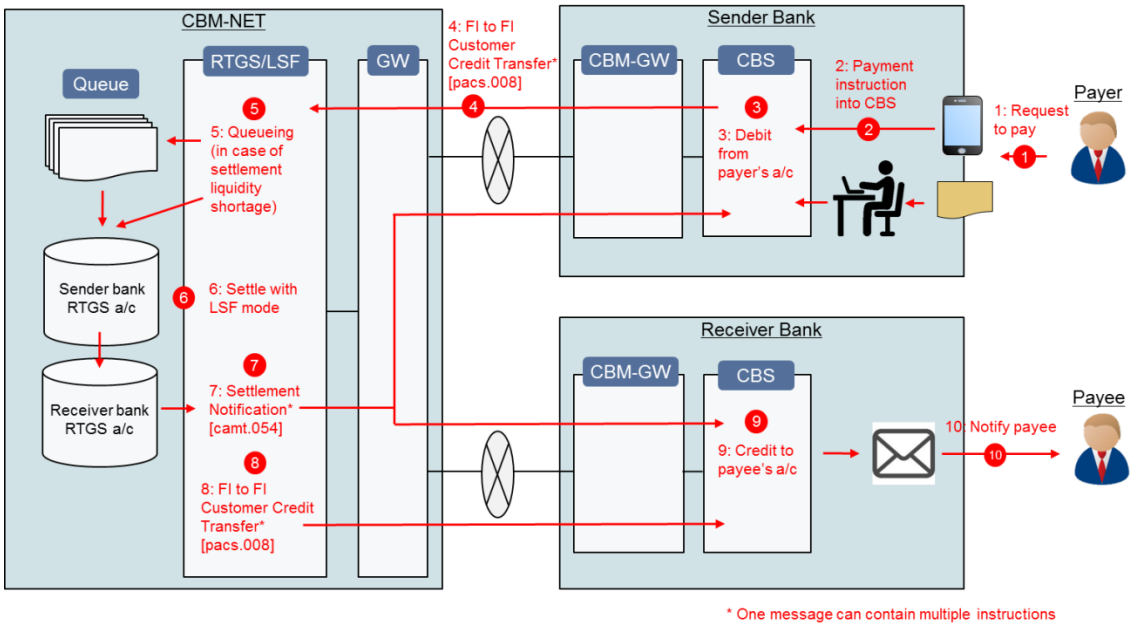
(G) Business process flow

1) Customer credit transfer with LSF mode

Once the sender bank receives a payment request from the payer (1), the sender bank debits from the payer's a/c through its CBS (2, 3), and sends the payment instruction message "Customer credit transfer" (pacs.008) to CBM-NET FTS (4). Then, CBM-NET FTS tries to settle the payment instructions in LSF mode (5, 6). After the completion of settlement, CBM-NET FTS sends the notification messages to both the sender bank and the receiver bank (7) and the customer credit transfer (pacs.008) to the receiver bank (8). According to the customer credit transfer, the receiver bank credits the payee's a/c (9) and notifies the payee (10).

2) Bank transfer with LSF mode

The business process flow is the same as noted except (1, 2, 3, 9, and 10).



Source: Preparatory Survey Team

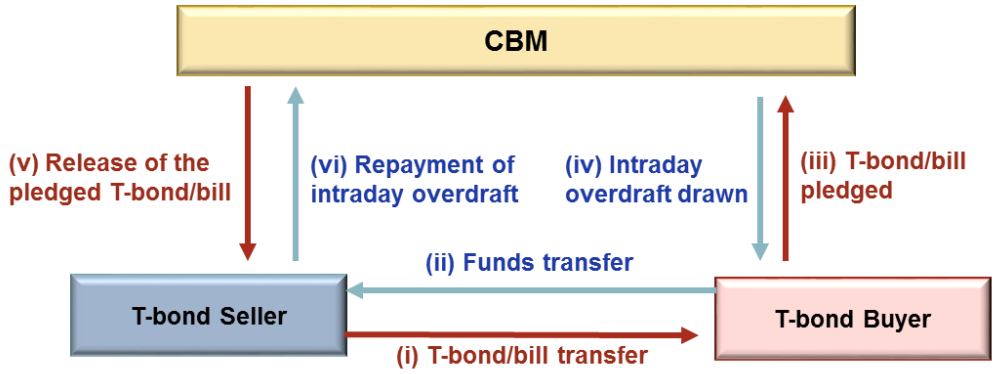
Figure 3-14 Business process of customer credit transfer with LSF mode

(H) Simultaneous Processing of DVP and Collateralization (SPDC)

SPDC, which is a kind of function for saving settlement liquidity not only for funds but also for T-Bond. SPDC worked efficiently and effectively when the global financial crisis happened in 2008. More specifically, the financial market, which had

a financial market infrastructure with this application, did not experience a serious liquidity shortage but stayed relatively calm without financial problems by brokers and banks. Later, other financial markets in Europe and Hong Kong tried to implement this kind of application for a better liquidity saving facility. This will help to foster a secondary market for T-Bond/Bill.

SPDC allows T-Bond buyers to provide T-Bond/Bill that will be received from T-Bond sellers as collateral for an intra-day O/D from CBM and simultaneously use the funds drawn to pay the seller. In addition, T-Bond sellers can repay the intra-day O/D amount from the proceeds of pledged T-Bond, which means that SPDC simultaneously releases pledged T-Bond and conducts repayment of the intra-day O/D. Moreover, both T-Bond buyers and sellers can use the SPDC function at the same time.



- A participant bank (T-bond buyer) that does not have sufficient funds (balance) can (i) buy T-bond/bill (iii) by pledging the T-bond/bill as collateral to CBM and (iv) receiving an intraday overdraft from CBM, then immediately (ii) paying for the T-bond/bill (Funds transfer) to seller. The seller makes (vi) repayment of the intraday overdraft by the funds (v) to release the pledged T-bond/bill.
- The six processes from (i) to (vi) can be processed simultaneously. The four processes (i), (ii), (iii), and (iv) can also be processed simultaneously. Or the four processes (i), (ii), (v), and (vi) can be processed simultaneously.

Source: Preparatory Survey Team

Figure 3-15 Process flow of SPDC

(I) Forward Date Transaction

- CBM can set the no. of days allowed for forward date transaction for RTGS/LSF and ACH respectively. (i.e. Number of days for RTGS and ACH can be set differently)

- Transactions with past settlement date will be rejected.
- FIs can set not only forward date but also time frame for the processing (e.g. Date: Dec-12th 2017, Time frame: 10:00-11:00)
- One business day before the settlement day, CBM-NET Phase 2 notifies FIs of the following information.
  credit/debit amount, netting amount, number of credit/debit instructions, designated time for settlement
- Forward date transactions are, "Bank transfer (LSF)", "Customer credit transfer (LSF)", "DVP request", "ACH direct credit" and "ACH direct debit".

Table 3-11 Forward Date Transaction

		PNG	FI Request	CBM-NET 2 (Proposed)
RTGS	No. of Days in Advance	10 days	KBZ: 1-2 days CB: 5 days	10 business days (CBM can change in future as required)
ACH(*)		5 days		

* Including bulk payments

Source: Preparatory Survey Team

(2) Screen Requirement

The message format for the bank transfer (LSF) is compatible with ISO 20022 pacs.009. The message format for the customer credit transfer (LSF) is compatible with ISO 20022 pacs.008.

Input items on the screen are almost in line with each ISO 20022 message format. Output data can be downloaded in both PDF and XML formats.

These details will be drafted in the external design phase.

(3) Form Requirement

The system related form will be designed by the CBM-NET Phase 2 application vendor and will be confirmed by CBM in the external design phase.

(4) Data and Information Requirement

The system-related data and information will be designed by the CBM-NET Phase 2 application vendor and will be confirmed by CBM in the external design phase.

(5) External Interface Requirement

Bank transfer (LSF) and customer credit transfer (LSF) can be sent and received via the terminal screen and the STP connections. Additionally, the customer credit transfer (LSF) is allowed to be sent via the file upload function.

(6) Prerequisite

For the specification, CBM will conduct required review and confirmation in timely manner.

For the related rules regarding to introduction of this function, CBM is requested to determine the operation policy (includes the timing of conducting MLOS) before start of operation and put into configuration if it necessary. On the other hand, regarding to introduction of this function, if the current agreement between CBM and FIs must be revised (the temporally suspension of RTGS during the MLOS settlement process or the handling process of unsettled instruction queue, for example. The necessity of agreement will be decided by CBM), CBM may have to determine based on technical conditions provided from consultant and vendors.

3.2.4.1.4 ACH

(1) System Function

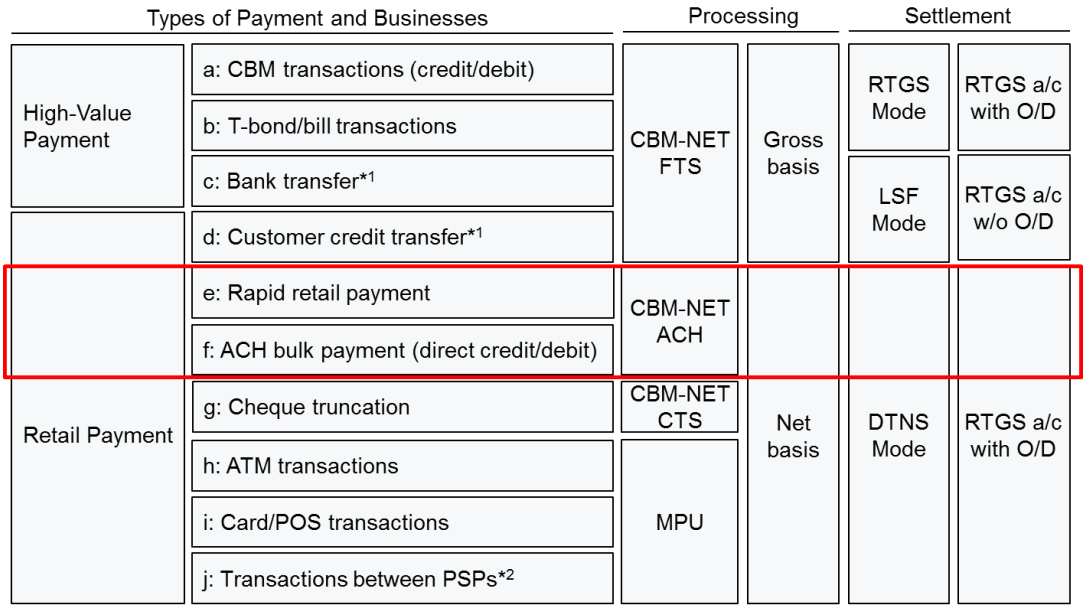
(A) Basic Concept

In line with the advances in the introduction of CBSs among FIs, the automated clearinghouse (ACH) function will be implemented. ACH is a payment and

settlement infrastructure that enables FIs to exchange interbank bulk payment instructions on payroll, utility payments, and government payments. Clearing and settlement are conducted on the DTNS basis.

Basic concepts of ACH are;

- ACH provides a payment instruction exchange function for direct credit (e.g. payroll, pension payment) and direct debit (e.g. utility payment, tax payment) with FIs.
- The clearing process is simultaneously conducted when ACH receives payment instructions from FIs. The sender net debit cap is set up for the balance and monitored by the system to mitigate any settlement risk. The settlement process is conducted by DTNS in view of saving settlement liquidity.
- ACH will receive payment instructions all day, except during the system maintenance period. In case that necessary system maintenance will take 2 hours, clearing time can be extended up to 22 hours a day; as a practical matter, it depends on the operation and monitoring structure of CBM. (In case CBM extends the operation hours for CBM-NET, an appropriate number of operation personnel will need to be assigned.)
- ACH will receive payment instructions via the STP GW and the file upload/download function via the CBM-NET terminals.



Source: Preparatory Survey Team

Figure 3-16 Relations between payment types and settlement methods

(B) Comparison of RTGS and DTNS on Retail Payment

Considering the efficient use of liquidity and the compatibility with other settlement system such as MPU or MCH, ACH for retail payments will be processed in DTNS mode. The frequency of settlement can also be set by CBM.

Table 3-12 Comparison of RTGS and DTNS

Evaluation Criteria	RTGS	DTNS	Note
Efficiency (liquidity volume)		✔	▪ DTNS requires less liquidity for the settlement. Most countries apply DTNS for bulk retail payments on ACH.
Flexibility Extensibility	✔		▪ RTGS mode applies the one-by-one simple settlement method. The Reserve Bank of Australia decided to apply RTGS mode for the newly developed retail payment infrastructure with its forward-looking strategy.
Settlement Risk Management	✔		▪ DTNS mode should implement complex and appropriate settlement risk mitigation methods in line with PFMI, such as sender debit cap, net credit limit, central counter parties, and the Lamfalussy standards.
Compatibility with current systems		✔	▪ CBM-NET ACH will be implemented newly. Also, MPU and MCH settlement are currently conducted by DTNS mode.

Source: Preparatory Survey Team

(C) Risk mitigation schemes in ACH

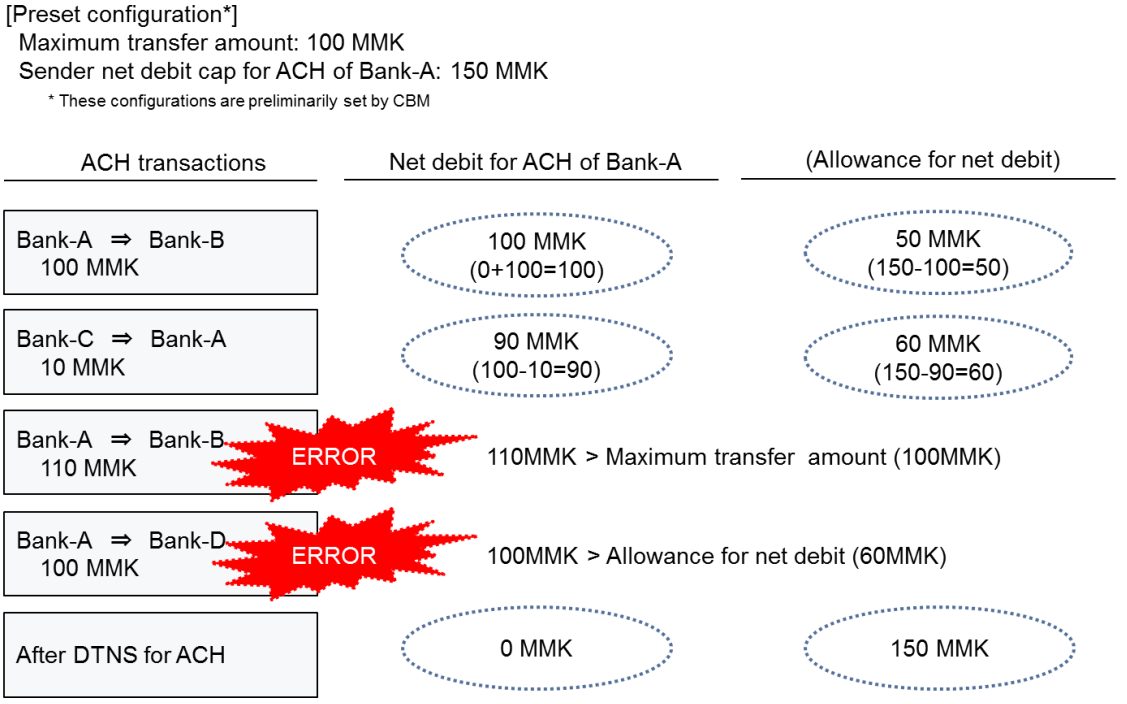
To operate ACH with risk reduction methods, sender net debit cap and maximum transfer amount are implemented in ACH. The policy[18] to guarantee the net deficit of a debtor will be considered separately by CBM, which will not be managed by the collateral management functions of CBM-NET due to a request from CBM (the collateral management functions of CBM-NET Phase 2 will not manage collateral for ACH even if CBM start to reserve the collateral for ACH[19]).

In addition, the establishment of Policy for Net Debit Cap, sharing with FIs and parameter setting on the system must be completed before go-live.

- ACH clearing process, which automatically calculates net debit position of a debtor bank and checks whether the net debit position surpasses sender net debit cap or not, also works all day except the system maintenance period.
- Sender net debit cap can be changed all day except the system maintenance period.

[18] The selection of method (survivors pay arrangement or defaulters pay arrangement), contribution and management method of collateral, establishment of liquidity provider (bank to temporary reimburse deficit amount by default banks), and method to dispose collateral should be considered.

[19] In case of managing the collateral reserve (collateral appointed and reserved from total collateral for RTGS) for ACH in future, management body of the collateral, the method (or the system) to manage with sender net debit cap, and collateral disposing process in case of deficit bank's default.



Source: Preparatory Survey Team

Figure 3-17 Example of maximum transfer amount and sender net debit cap

(D) ACH direct credit

1) Business Requirements

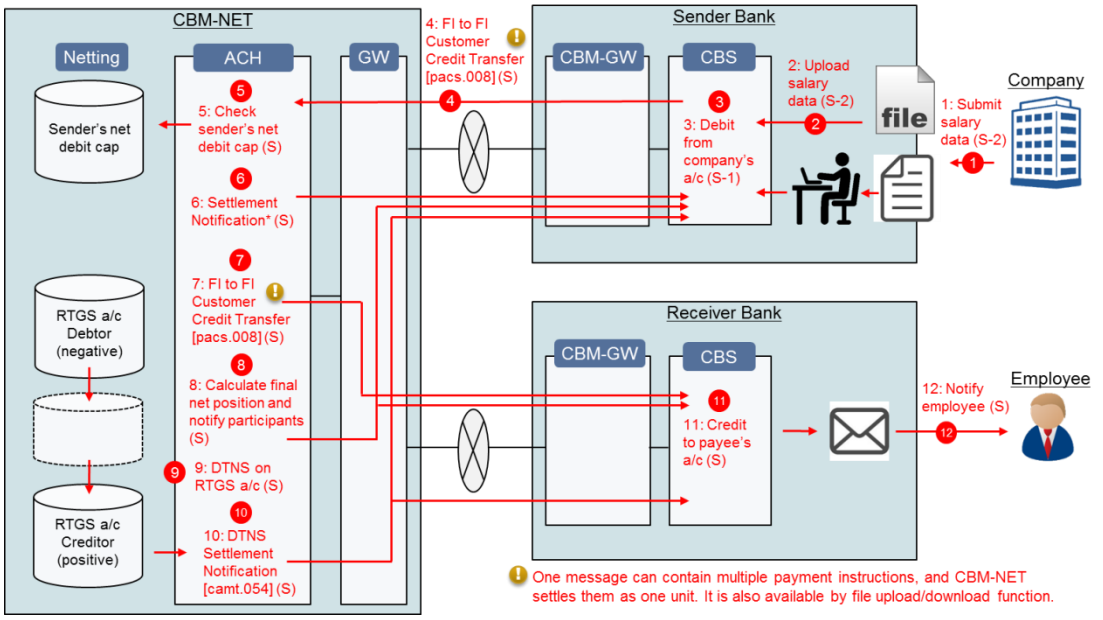
- ACH implements the direct credit function and enables FIs to exchange interbank payment instructions for direct credit.
- Once the sender bank receives payroll data from companies or public organizations, the sender bank extracts interbank direct credit data from them and sends the data to ACH.
- ACH checks the sender net debit cap, and if applicable, sorts the data by receiving banks and sends them to each receiving bank. Receiving banks credit, the payroll into the payee's a/cs.

2) Functions

- The message formats of payment instructions received from sender banks and sent to receiving banks are compatible with pacs.008 of ISO 20022.
- The sender net debit cap is set up by CBM preliminarily. Settlement is conducted on the RTGS a/c in DTNS mode a few times a day.
- ACH will accept forward-dating payment instructions.

- In the case of errors such as unidentified payee's a/cs, receiving banks notify sender banks about the errors and send reverse transactions to ACH.
- ACH will receive payment instructions all day, except during the system maintenance period. Clearing time can be extended up to 22 hours a day; as a practical matter, it depends on the operation and monitoring structure of CBM.
- The payment instructions received during closing time of the clearing time, except during the system maintenance time, will be accepted and settled at the next designated settlement time after opening the clearing time.

3) Flow chart of ACH direct credit (interbank payroll)



Source: Preparatory Survey Team

Figure 3-18 Flow chart of ACH direct credit (interbank payroll)

(E) ACH direct debit

1) Business Requirements

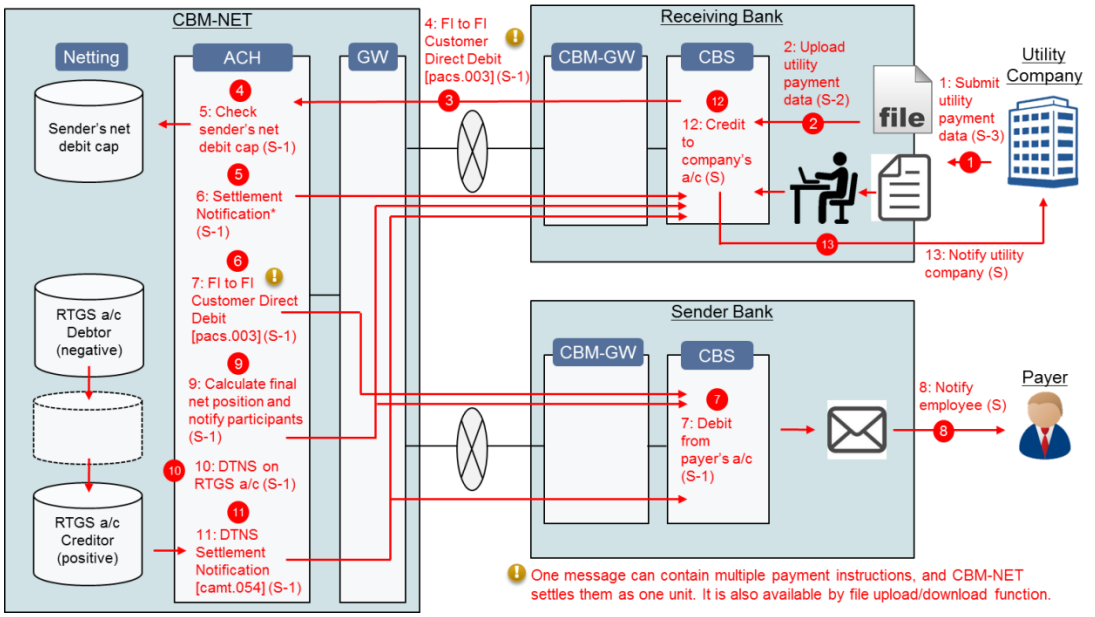
- ACH implements the direct debit function and enables FIs to exchange interbank payment instructions for direct debit.
- Once the receiving bank receives utility payment data from companies or public organizations, the receiving bank extracts interbank direct debit data from them and sends the data to ACH.

- ACH checks the sender net debit cap, and if applicable, sorts the data by sender banks and sends them to each sender bank. Sender banks debit utility payments from the payer's a/c. After the DTNS settlement, receiving banks credit the utility amount to the utility company's a/c.

2) Functions

- The message formats of payment instructions received from receiving banks and sent to sender banks are compatible with pacs.003 of ISO 20022.
- Specifications and operations regarding the sender net debit cap, forward-dating, operating hours, and exchanging payment instructions among FIs are the same as the ones for direct credit.
- In the case of unsuccessful debits from the payer's a/c, sender banks notify receiving banks about the errors and send reverse transactions to ACH.

3) Flowchart of ACH direct debit (utility payment)



Source: Preparatory Survey Team

Figure 3-19 Flowchart of ACH direct debit (utility payment)

(F) Rapid retail payments with ACH

1) Business Requirements

- By use of the ACH direct credit function, CBM-NET Phase 2 provides RRP.

- Message flows, business operations, clearing, and settlement process on CBM-NET Phase 2 are similar to the process of direct credit.

2) Functions

- The function is same as direct credit as above.

3) Additional Requirement

- To apply CBM-NET RRP to fast payments, some of the value added-services of smart addressing, mobile access channels, and payment requests may be implemented by MPU or other PSPs and link these external systems to the CBSs on FIs. This scheme, which divides the roles with CBM-NET and MPU, allows RRP for future function enhancement. If CBM could not determine and present the specification of those external systems before the beginning of external design phase, those external systems should follow the specification defined in CBM-NET Phase 2.
- To achieve continuous service availability and rapid funds availability 24/7, there are difficulties to be discussed and solved by CBM, especially how to deal with the operational framework to monitor the activities by CBM personnel for non-business hours and holidays.

Table 3-13 Characteristic of RRP

Category		Note
Basic concepts	Continuous service availability	▪ The exchange of payment messages can be occur on a 24/7 (almost 24-hour and seven-day) basis.
	Rapid final funds availability	▪ The availability of final funds to the payee can occur on a real-time basis.
Value-added services	Smart addressing	▪ Customers can use simple and rememberable address, such as email or mobile number for direct payments and, therefore, may no longer need to provide their bank account information to their counterparties.
	Mobile access channels	▪ Customers can access fast payments services through not only physical channels (bank branch, ATM) but also online (traditional internet banking) and mobile channels (mobile banking, mobile wallets and mobile payments which can be made using SMS/apps).
	Richer payment information	▪ More information with a payment can be embedded (e.g. pdf, links to externally hosted documents).
	Request for payment	▪ Based on the payment request from payee, payer sends payment instruction by himself (comparing to direct debit, input errors may decrease).
	Open systems	▪ Be open to the connection with non-traditional PSPs and overseas payment platforms via API etc.

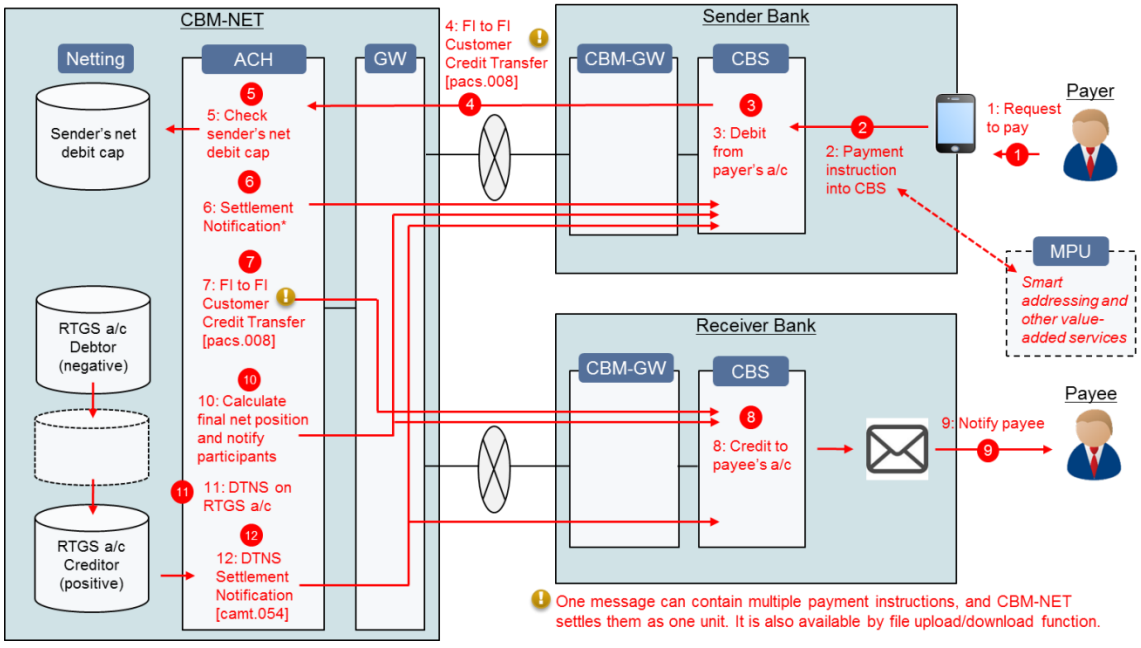
Source: Preparatory Survey Team

Table 3-14 Implementation strategy for RRP in CBM-NET Phase 2

Business Requirements		CBM-NET	MPU	Implementation Strategy
Basic concepts	Continuous service availability	✔		▪ CBM-NET will have the capability for continuous service provision.
	Rapid final funds availability	✔		▪ CBM-NET can process clearing and settlement for CCT between banks rapidly via RTGS/LSF or ACH function.
Value-added services	Smart addressing		✔	▪ MPU or PSPs may implement this function if needed.
	Mobile access channels		✔	▪ MPU or PSPs may implement this function if needed.
	Richer payment information	✔		▪ CBM-NET will apply ISO 20022 message format.
	Request for payment		✔	▪ MPU or PSPs may implement this function if needed.
	Open systems		✔	▪ MPU or PSPs may implement this function if needed.
We propose that most of the value-added service may be implemented by MPU or other PSPs.				

Source: Preparatory Survey Team

4) Flowchart of Rapid retail payments with ACH



Source: Preparatory Survey Team

Figure 3-20 Flowchart of rapid retail payments with ACH

(G) Forward date transaction

- ACH supports forward date transactions
- Refer 3.2.4.1.3(1)(I) for the detail of forward date transaction.

(2) Screen Requirement

System screens of payment instructions, when they are input from CBM-NET terminals, will be designed by the CBM-NET Phase 2 application vendor and will be confirmed by CBM in the external design phase.

(3) Form Requirement

Forms of payment instructions, when they are output from CBM-NET terminals, will be designed by the CBM-NET Phase 2 application vendor and will be confirmed by CBM in the external design phase.

(4) Data and Information Requirement

The system-related data and information will be designed by the CBM-NET Phase 2 application vendor and will be confirmed by CBM in the external design phase.

(5) External Interface Requirement

The message formats of ACH direct credit or rapid retail payments received from sender banks and sent to receiving banks are compatible with pacs.008. The message formats of ACH direct debit received from sender banks and sent to receiving banks are compatible with pacs.003 (refer to 2.2 ISO 20022 adoption).
Other data and information will be designed by the CBM-NET Phase 2 application vendor and will be confirmed by CBM in the external design phase.

(6) Prerequisite

For the specification, CBM will conduct required review and confirmation in timely manner. In addition, regarding to the consideration of new rules below, it should not affect to the specification in this document.

For the rules regarding to introduction of this function, CBM is requested to determine the operation policy (includes the configuration policy such as timing or frequency of settlement, operation hour, maximum transfer amount, sender net debit cap amount), notice it to FIs and put it into configuration if it is necessary before start of operation. Moreover, CBM may have to determine the risk mitigation schemes described in (1)(C), and agree with FIs before the running test starts.

3.2.4.1.5 Cheque Truncation

(1) System Function

(A) Basic Concept and function overview

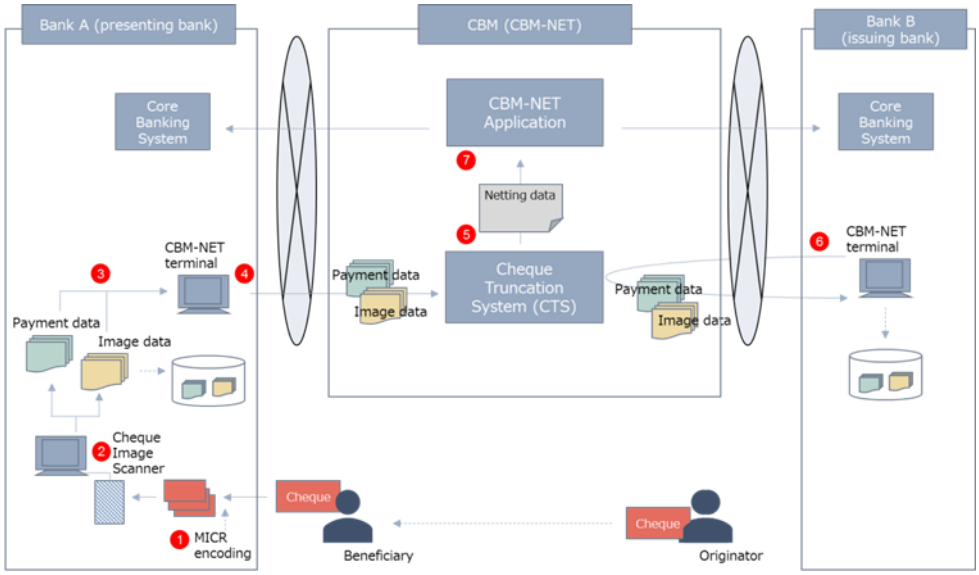
For more convenient cheque clearing operation for FIs, the cheque truncation system can settle cheques using its images data and will be implemented.

To implement the cheque truncation function, the following items will be scope of Phase 2 development.

- The cheque truncation system (CTS) will be implemented to receive payment and image data from presenting banks, net the payment data, and send payment and image data to issuing banks.
- Netting will be conducted within the designated time by CTS and the result will be input to CBM-NET and settled by RTGS[20].
- Thirty-one cheque image scanners will be provided to FIs (4 state-owned banks, 24 Myanmar private banks, and 3 for CBM).

The following diagram is an overview of the cheque truncation system (CTS).

[20] Frequency of settlement will be defined by CBM



Source: Preparatory Survey Team

Figure 3-21 Overview of the cheque truncation system

Encoding MICR on cheques after receiving from the beneficiary (optional).

1. Scanning cheques and creating image data and payment data using cheque image scanners.
2. Confirming image data and modifying payment data before uploading to CTS.
3. Uploading payment data and image data on the web interface of CTS using CBM-NET terminals. For accessing this web interface, browsers on the CBM-NET terminals are assumed to be used, because the network for accessing the CTS will be shared with the network for CBM-NET Phase 2.
4. Netting payment data on a regular schedule on the CTS.
5. Downloading payment data and image data from CTS and validating cheques using image data and payment data.
6. Settled on the CBM-NET Phase 2 using netting data.

Users of this system must scan physical cheques to create image data and payment data from MICR. Basically, equipment for scanning cheques and other equipment for cheque truncation are requested to be prepared by FIs. However, for encouraging and supporting the transition of local banks to cheque truncation, some cheque image scanners will be provided in the budget of this project. Further equipment necessary for each FI's condition or expansion to branches will be through investments by the FIs themselves.

- The number of cheque image scanners provide to CBM: 31 (28 lent to each local bank: 4 state-owned banks and 24 private banks, and 3 of the CBM branches)
- To involve FIs who will not be provided cheque image scanners, a technical briefing to support those FIs will be required in coordination with CBM.

(B) Consideration in CBM and FIs

The following points must be considered, implemented and shared by CBM and FIs before the cheque truncation system goes live.

Table 3-15 Consideration in CBM and FIs

1 Making legislative preparations	● In addition to current law description about cheque truncation, more detailed rules and guidelines for handling physical and image cheques will be prepared by discussion and agreement of CBM and FIs. (ex. specs of image format, store policy, invalidation method of physical cheques, etc.).
2 Additional installation of equipment in FIs	● The basic set (a unit of cheque image scanner for each domestic FI) will be provided in Phase 2. The following shall be done by each FI; ✓ Setting and operation based on guideline provided from application vender. ✓ Since the cheque image will be handled as a original, the cheque image must be stored for the designated period at the issuing bank. Therefore, each FI must prepare enough storage facilities. ✓ Further upgrade or enrichment that FIs require (such as cheque collection via network, extra image scanners, etc.). ● To process cheque truncation, all FIs must consider the process to concentrate cheques (physical or data) from their branches to the head office. Furthermore, it is needed to prepare internal rules and train for personnel.
3 Transition from MCH to cheque truncation	● Considering deployment of the cheque clearing system to all over the country, newly introduced cheque truncation system should replace the current MCH. Therefore, it is necessary to consider how to design and promote the transition.

Source: Preparatory Survey Team

(2) Screen Requirement

CTS provides a web interface for users. Users can access the CTS and upload/download image data and payment data using this interface.

(3) Form Requirement

The cheque format will be discussed and defined with the CBM-NET Phase 2 application vendor in the external design phase.

(4) Data and Information Requirement

The requirement on image data and payment data for CTS will be presented and confirmed in the design phase. The implementation and operation work in FIs will be described in the user guidelines prepared by the application vendor.

(5) External Interface Requirement

CTS will have an interface with the CBM-NET Phase 2 application vendor for transferring the netting data. This interface will follow the ISO 20022 standard in the same way as the MCH netting information. The details will be confirmed in the development phase.

Further enhancement of FI's environment related to the cheque truncation system (such as a connection with the FI's internal system) will be considered and upgraded by each FI if it is necessary.

(6) Prerequisite

For the specification, CBM will conduct required review and confirmation in timely manner. If any change on process described in (1)(A) required (such as the last custodian of cheque image), CBM may have to determine specification prior to make contract with Application vendor.

For the rules regarding to introduction of this function, CBM is requested to determine the items listed in Table 3-15 by self or with consultation with FIs. In particular, the establishment of 1 and agreement of 2 have to be finished before running test, and 3 may have to be determined as soon as possible (with enough time for FIs to prepare). Moreover, CBM may have to determine the frequency and timing of settlement, and notice it to FIs prior to go-live.

3.2.4.1.6 Alert and Dashboard function

(1) System Function

(A) Basic Concept and function overview

- The alert function provides warnings or information to both CBM and FIs for transactional data monitoring.
- The dashboard function displays operational data and financial data using charts and graphs for easy viewing by both CBM and FIs.
- Basic alert and dashboard functions will be implemented by the CBM-NET Phase 2 while other alert and dashboard functions will be implemented by the PSSD system,[21] which will have more flexibility in development.

(2) Screen Requirement

The following alert (such as (4)(A)) and dashboard (such as (4)(B)) will be shown and able to check details in screen.
The system screen will be designed by the CBM-NET Phase 2 application vendor and will be confirmed by CBM in the external design phase.

(3) Form Requirement

The alert and dashboard functions will focus on information provided on the system screen. Therefore, although all screens can be printed, the document format will not be defined as system requirement.

(4) Data and Information Requirement

(A) Alert Function
Information handled in the alert function is as follows, for example. CBM is

[21] The system developed with technical cooperation from JICA which contains function for supporting PSSD personnel.

requested to submit a list of the necessary alerts prior to the external design phase.

- Received messages
- Large amount transaction
- No transactions posted by FI
- Pending transactions by FI
- Failed login attempts
- Withdrawal of intra-day O/D by FI
- Debtor with insufficient funds in DTNS
- Uncompleted file based settlement
- Insufficient balance for reserve requirement
- Excess of net debit cap

(B) Dashboard function

Requirements for the dashboard function are as follows, for example. CBM is requested to submit a list of the necessary dashboard information prior to the external design phase.

- Operational data
  - Start of Day: Executed
  - Cutoff for FI: Not executed
  - End of Day: Not executed
- Financial data
  - Settlement summary
    - Complete (Volume, Amount)
    - Pending (Volume, Amount)
    - Cancelled (Volume, Amount)
  - Intra-day O/D balance (FI name, balance)
  - LSF, ACH related information
  - Total FI balance
    - Opening balance
    - Settled amount (+: credit, -: debit)
    - Available balance (opening balance + settled amount)

(5) External Interface Requirement

The system external interface between the CBM-NET and PSSD system will be

designed by the CBM-NET Phase 2 application vendor and will be confirmed by CBM in the external design phase.

(6) Prerequisite

For the specification, CBM will conduct required review and confirmation in timely manner. CBM is requested to submit a list of the necessary alert and dashboard functions prior to the external design phase.

3.2.4.2 Implementation Policy and Conditions of Infrastructure

3.2.4.2.1 Disaster Recovery

(1) Disaster Recovery

To provide a means to continue CBM-NET services if the that primary site is affected by disasters or incidents, the disaster recovery system will be implemented in this project.

A remote disaster recovery (DR) site will be set up in the server room of the CBM Nay Pyi Taw Head Office. At the DR site, infrastructure for CBM-NET Phase 2 will be installed and configured. The CBM-NET system will be up and running at the DR site.

Business data of CBM-NET will be replicated asynchronously between the primary site and the DR site, by using the database function. Asynchronous replication is adopted because it can be used regardless of the distance between the primary and DR sites. In addition, near-zero data loss can be achieved by using the database replication function.

When DR is activated, necessary work must be done to recover the CBM-NET system at the DR site.

The Targeted Recovery Point Objective (RPO) and Recovery Time Objective (RTO)

will be as follows:

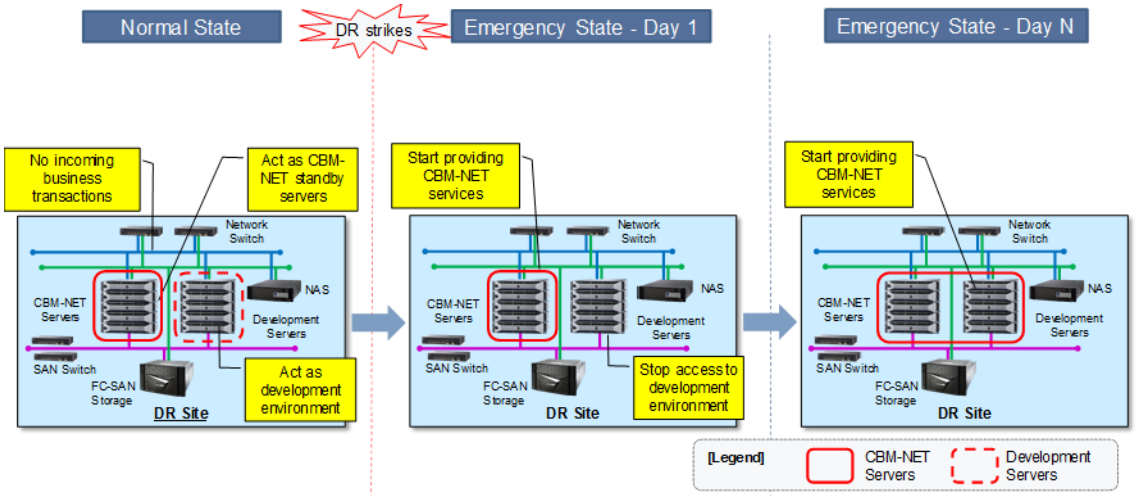
- RPO: Near-zero (This may vary depending on the quality of the network connection.)
- RTO: 2 hours (To be determined after verifying recovery procedures in an actual DR environment, even if the system will be recovered within 2 hours but it will take a few hours [totally up to half a day] for verification from the business point of view.)

Table 3-16 Measures for DR

DR site location	Nay Pyi Taw	● DR site will be set up in the server room of the CBM Nay Pyi Taw Head Office.
DR site design	Hot standby	● At the DR site, infrastructure for CBM-NET will be installed and configured. The CBM-NET system will be up and running at the DR site.
Data replication	Asynchronous data replication	● Business data of CBM-NET will be replicated asynchronously between the primary site and the DR site, by using the database function. ● Asynchronous replication is adopted because it can be used regardless of the distance between the primary and DR sites. ● In addition, near-zero data loss can be achieved by using the database replication function.
Redundancy	Same as Primary Site	● Basically, DR Site has the same configuration of Primary Site. When the system is operated in the primary site, these servers are also used for development environment.
Resource usage	Resources will be shared between DR system and development system.	● At the DR site, there will be two sets of servers. ● In the normal state, one set will be up and running as CBM-NET standby servers, replicating data with its counterpart at the primary site. There will be no incoming access to CBM-NET servers at the DR site. ● Another set will act as the development environment for CBM-NET.
Target systems	CBM-NET	● CBM-OA, MCH, and the accounting system will not be set up at the DR site.

Source: Preparatory Survey Team

The DR environment will be as follows respectively in the normal and emergency states.



Source: Preparatory Survey Team

Figure 3-22 DR environment in normal and emergency state

(A) Features of Normal State

- At the DR site, there will be two sets of servers.
- In the normal state, one set will be up and running as CBM-NET standby servers, replicating data with those at the primary site. Networks will be configured to deny access to CBM-NET servers at the DR site from FIs and CBM branches.
- Another set will act as the development environment for CBM-NET Phase 2. (ICT system development vendors may connect to the CBM-NET Phase 2 development environment.)

(B) Features in Emergency State

When DR is activated after a disaster or incident, the following tasks will be done at the DR site;

- Emergency State – Day 1
  - ➢ Check DB state.
  - ➢ Check unprocessed settlement transactions such as STP, ACH, etc. and do necessary process for unprocessed transactions.
  - ➢ Test system verification.
  - ➢ Change network configurations to allow access to CBM-NET servers from FIs and CBM branches.
  - ➢ Change network configurations to deny access to development servers.
- Emergency State – Day N
  - ➢ At some point after DR is activated, the second server set can be reconfigured

as the CBM-NET servers, to make the CBM-NET system redundant.

- At that point, CBM-NET at the DR site can provide the same service level as the one at the production site.

(2) Options of disaster recovery system configuration

In the current situation, the business data is backed up to LTO tape daily as a data backup measure. However, there is no disaster recovery measure for CBM-NET Phase 1. CBM only has one data center in Yangon. CBM considers using the server room at the CBM Nay Pyi Taw Head Office for the DR data center. CBM aims not only to have a data backup at the DR site but also to have a system so that they could continue their business in the event of a disaster.

(A) Backup/Standby option

There are some options to define the system design for DR. Hot standby is a better way as shown in the following comparison table.

Table 3-17 Backup/Standby options

Option	Brief description	Cost	Tasks for recovery	Downtime	Evaluation
Hot standby	• DR site is a duplicate of Production site. • All HW/SW/NW are installed and configured. • Data is mirrored continuously from Production site to DR site. • System in DR site is up and running.	Expensive	• Activate network access	Short	○
Warm standby	• Remote site (data center) is prepared. • HW/SW/NW is installed and configured. • Back up tapes are sent periodically from Production site.		• Restore data from tape • Start application • Activate network access		△
Cold standby	• Remote site (data center) is prepared. • HW/SW/NW is installed and configured. • Power to system is switched off. • Back up tapes are sent periodically from Production site.		• Switch power on • Restore data from tape • Start application • Activate network access		×
Remote data backup only	• Data backup is stored at remote location. • No HW/SW/NW for application is installed.	Cheap	• Prepare location for HW/SW/NW installation • Procure the equipment • Install and configure HW/SW/NW • Restore data from tape • Start application • Activate network access	Long	×

Source: Preparatory Survey Team

(B) Data Replication option

There are also some options for data replication between the production site and DR site. Replication by database server is a much better way for CBM-NET.

Table 3-18 Data Replication options

Method		Suitable Distance	Data to be Replicated	Performance Impact	Data Loss	Evaluation
Replication by database server	Asynchronous	Any distance	**Business data** stored in database	Small	In-flight data could be lost	◎
	Synchronous	Less than 100 km	**Business data** stored in database	Large (Application has to wait for confirmation of data write to DR site)	No data loss	△
Replication by storage	Asynchronous	Any distance	**Both business and system data** in selected storage volumes	Small	In-flight data could be lost	○
	Synchronous	Less than 100 km	**Both business and system data** in selected storage volumes	Large (Application has to wait for confirmation of data write to DR site)	No data loss	△
Send backup data to remote location periodically		Any distance	**Both business and system data**	No impact	Can be huge depending on the frequency and timing of transporting backup data	×

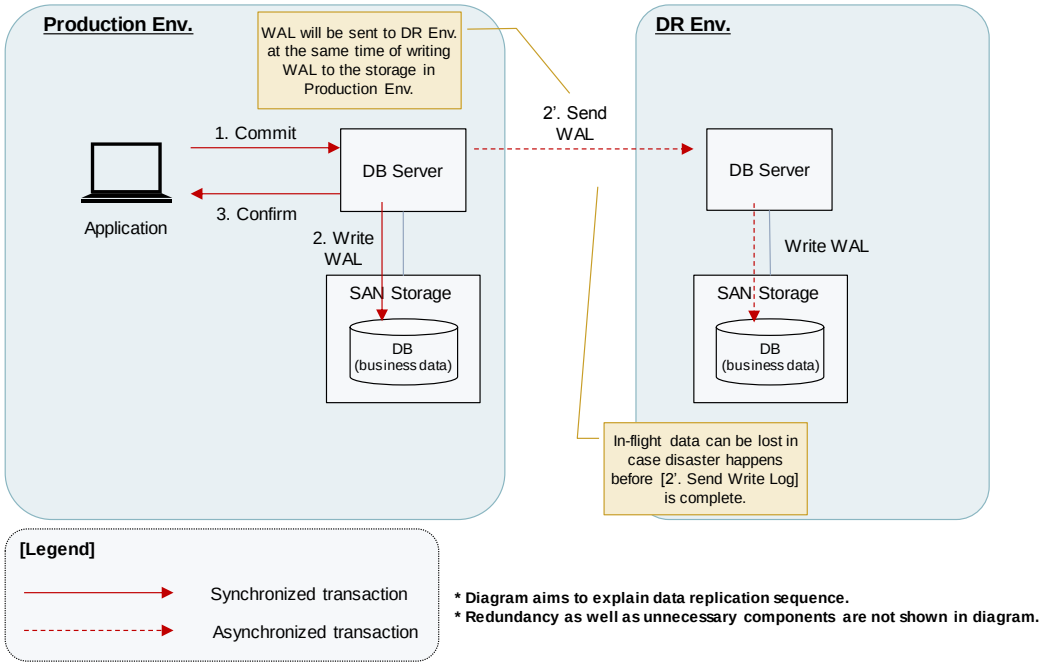
Source: Preparatory Survey Team

Reasons for adopting this replication by database server are as follows:

- No limitation of distance
- Near-zero data loss
- Smaller performance impact
- Only business data needs to be replicated (System data will be replicated only when changes are applied to production environment.)
- For CBM-NET Phase 2 environment, cost of replication by database server's function can reduce the cost more than replication by storage function.

The following figure shows the data replication (asynchronous replication by database).

* Replication used here is namely “Real-time” Asynchronous Replication

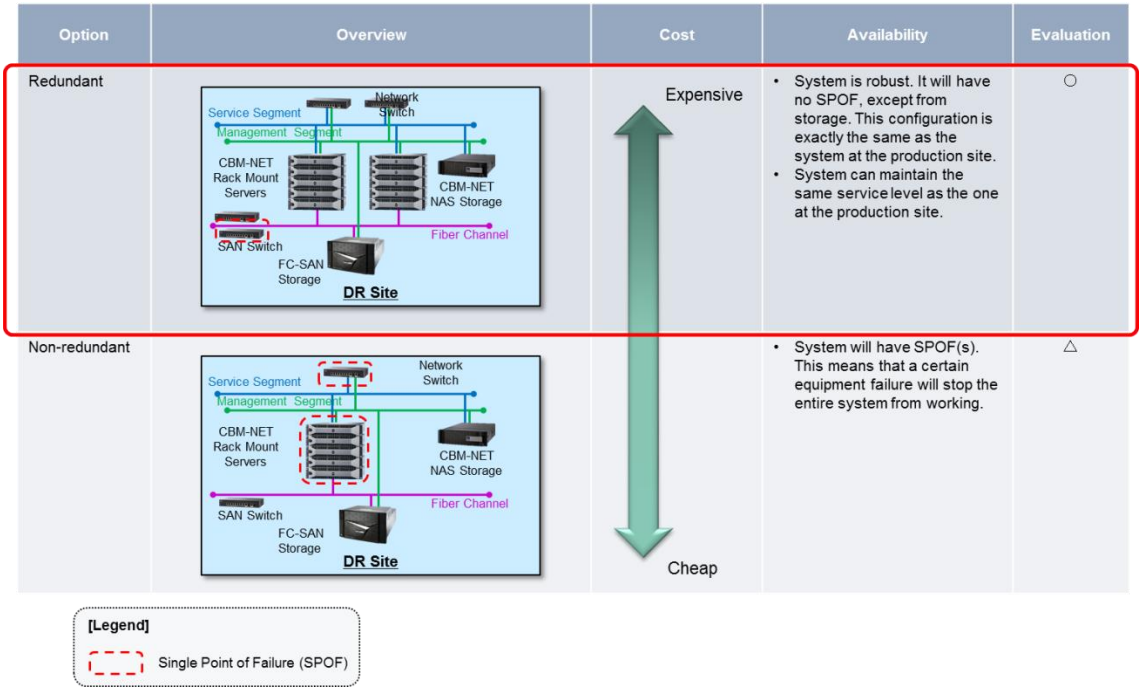


Source: Preparatory Survey Team

Figure 3-23 Data replication (asynchronous replication by database)

(C) Configuration Option

There are two options for system configuration at the DR site. A redundant configuration is better than a non-redundant configuration.



Source: Preparatory Survey Team

Figure 3-24 Configuration options

(3) Prerequisite

For the specification, CBM is required to determine a space for DR site prior to start procurement of infrastructure, and develop necessary facility and connect network between primary site before Jan. 2019. As a part of 3.3(2)(E), CBM is requested to complete WAN connections between CBM-NET and FIs (including with DR site) within 5 months after contract with infrastructure vendor.

For the rules regarding to introduction of this infrastructure function, CBM may have to establish BCP includes switch over process and verification process before connection test 1, then appoint staffs for operation.

3.2.4.2.2 Redundancy of the Data

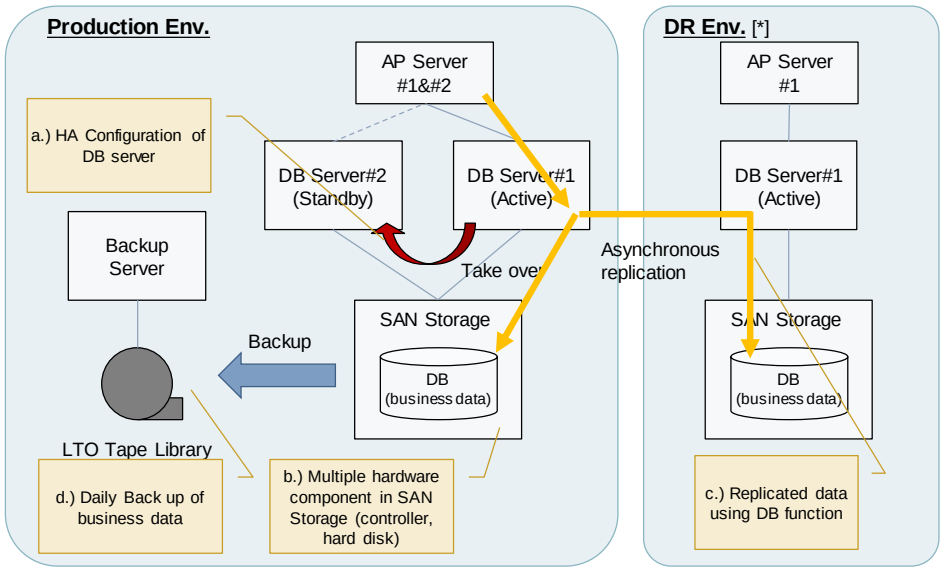
The data in the database for CBM-NET is very important and must not be lost in any case. From the view of importance of data, the data redundancy for CBM-NET

in the database should be secured by applying the appropriate methods. The methods for recovery of the data should be confirmed for any failure.

For redundancy of the data in the database for CBM-NET, the following methods and configurations are applied to the CBM-NET system.

a. Database Servers are configured with the HA function (already available in Phase 1).
b. SAN Storage has a redundant configuration and is selected as the equipment for the data area of the database to avoid single point of failure (SPOF) (already available in Phase 1).
c. The data in the database[22] is replicated to the database at the DR site (added in Phase 2).
d. The business data is backed up at end of day to the LTO tape library (already available in Phase 1).

Requirements for the data recovery in case of failure are satisfied by applying the above methods.



(*) Some of the components including DB Server #2 and Backup Server are omitted to simplify the diagram

Source: Preparatory Survey Team

Figure 3-25 Conceptual diagram of redundancy of the data in database

[22] Data from both Front DB and Main DB will be replicated to those at the DR site.

(1) Prerequisite

For the specification, CBM will conduct required review and confirmation in timely manner.

3.2.4.2.3 User Authentication

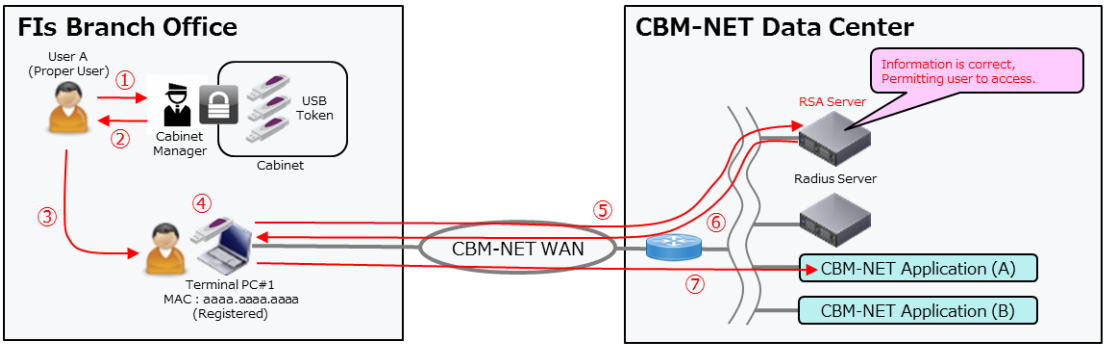
To strengthen user authentication for CBM-NET, two-factor authentication will be introduced in Phase 2. USB token authentication will be adopted in addition to the current ID / password authentication.

(A) Prerequisites

- In CBM-NET data center (both in production/primary environment and DR environment), RSA servers should be installed.
- In each location where CBM-NET terminals are used, the secure place (e.g. locked cabinet, appointment of staff in charge) should be prepared to store USB tokens.
- CBM shall issue and control USB tokens.
- Five hundred tokens will be provided in Phase 2 development. Extra tokens should be procured by the Myanmar side if necessary.

(B) Structure

The following diagram shows how user authentication works after Phase 2. One-time password and the digital certification from a USB token will be used.



① When user uses CBM-NET terminal, he asks the cabinet manager for lending tokens.
② The manager checks whether the requestor is a proper user and lends the token recording the user name and time.
③ User moves to the place where the registered PC is located.
④ User attaches token to terminals.
⑤ Terminal sends information required for authentication in token to RSA server.
⑥ RSA server checks sent information and permits only if it is correct.
⑦ User enters ID and password when logging in to each application in the way as the current procedure.

Source: Preparatory Survey Team

Figure 3-26 How user authentication works after Phase 2

(C) Advantages

Two-factor user authentication will bring the following advantages and strengthen security.

a. Reducing the risk of unauthorized access because the user can pass the authentication only when all the three conditions below are fulfilled.
   - User logs in from a registered Terminal PC.
   - User possesses USB token physically.
   - User inputs valid ID and password.

b. Easy to track an offender by comparing record for lending tokens with authentication logs on RSA server.

(2) Prerequisite

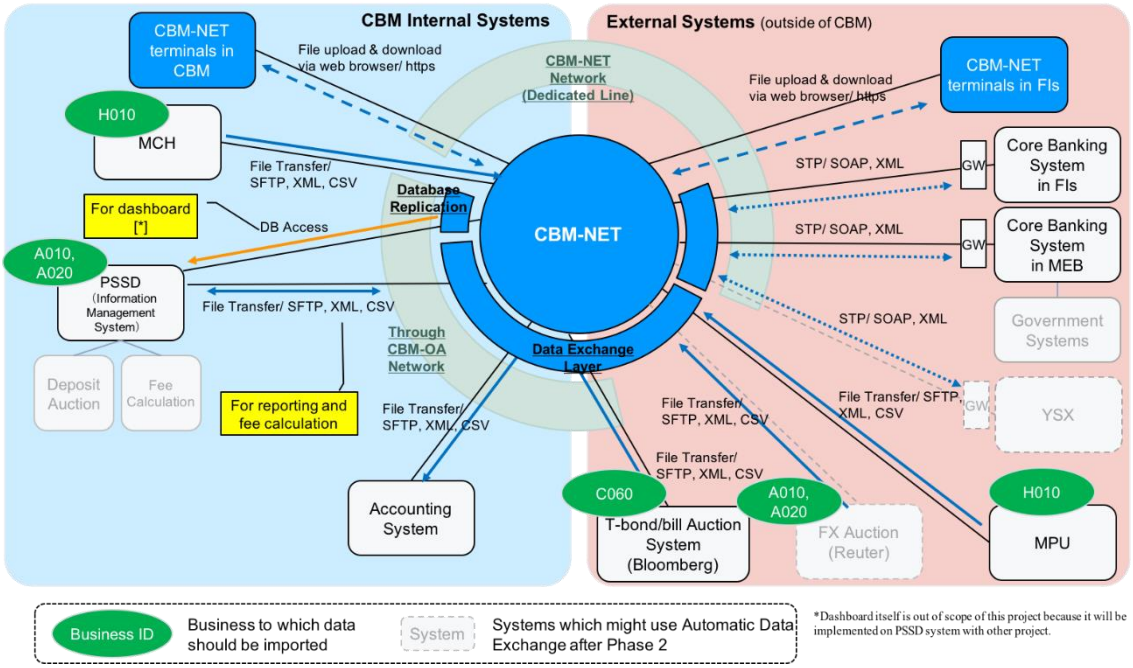
For the specification, CBM will conduct required review and confirmation in timely manner.

For the rules regarding to introduction of this infrastructure function, CBM will determine the control process rules and notice it to FIs. Then CBM is requested to control (register and issue to new users, deregister and collect from deregistered users, change user profile, etc.) USB tokens. The initial registration and issuing will be done before go-live, and further control is requested to be done by CBM. In

addition, however 500 USB tokens will be procured in this project, CBM will procure if additional USB tokens are necessary.

3.2.4.2.4 Automatic Data Exchange

System context of CBM-NET after Phase 2 Launching is as follows.



Source: Preparatory Survey Team

Figure 3-27 System context of CBM-NET Phase 2

To provide a means to exchange data automatically between related systems and CBM-NET Phase 2, the following features will be introduced in Phase 2.

(A) Standardized File Interface
(B) File Upload/Download Function via Web browser
(C) Data Import Function
(D) Database Replication for Dashboard

(A) Standardized File Interface

An FTP server will be introduced for file transfers between the following systems and CBM-NET Phase 2. Features of files will be discussed and defined in the design phase.

a. Subsystems owned by CBM (Accounting system, MCH)
b. PSSD System
c. External related systems (MPU, T-Bond/Bill auction system, FX auction system)

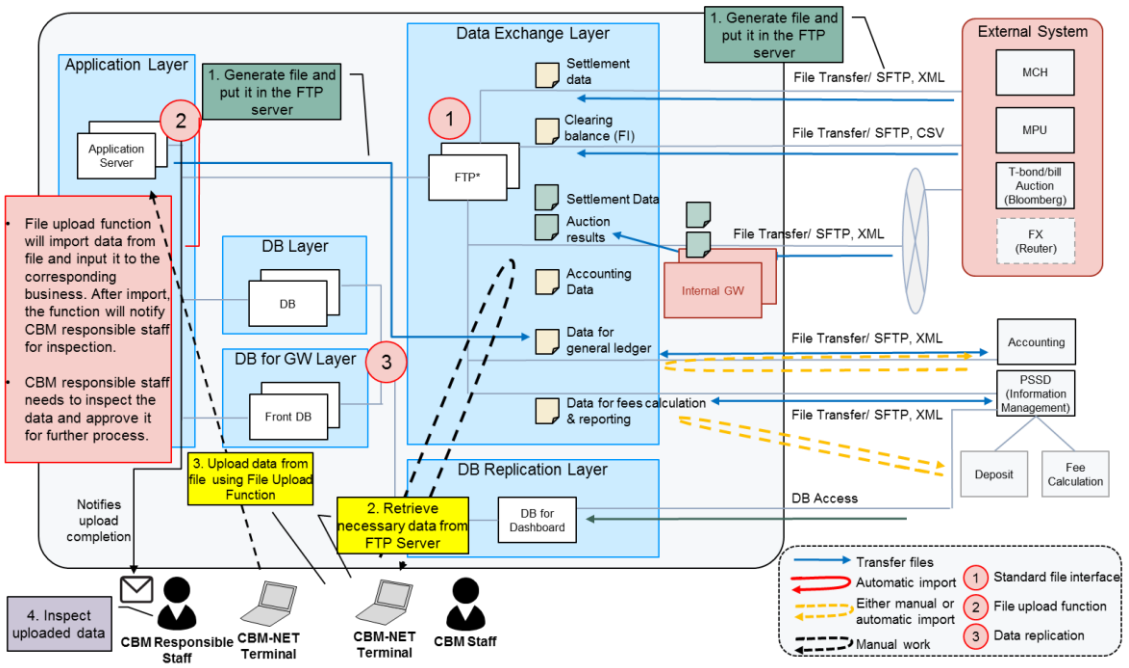
The Secure File Transfer Protocol (SFTP) will be used for file transfers. File formats supported by automatic data exchange will be XML, CSV, and PDF, where PDF will be used for report files.

(B) File Upload/download Function via Web browser
File upload and download functions similar to the existing CBM-NET functions will be implemented for some business additionally (please refer to Table 3-8), Once a file is uploaded via the web browser, the data from the file will be imported to the corresponding business. When the import is done, the function will notify CBM-NET responsible personnel for inspection.

(C) Data Import Function
The data import function will check the FTP server at a predefined interval and import data from the file to the corresponding business, such as credit/deposit funds settlement or T-Bond/Bill settlement information registration. When the import is done, the function will notify CBM responsible personnel for inspection.

(D) Database Replication for Dashboard
For the dashboard function to be added to the PSSD System, the PSSD System requires updated business data. A database server will be introduced to which business data will be replicated from the main databases of CBM-NET. Database replication will enable the PSSD System to access necessary data for the dashboard function.

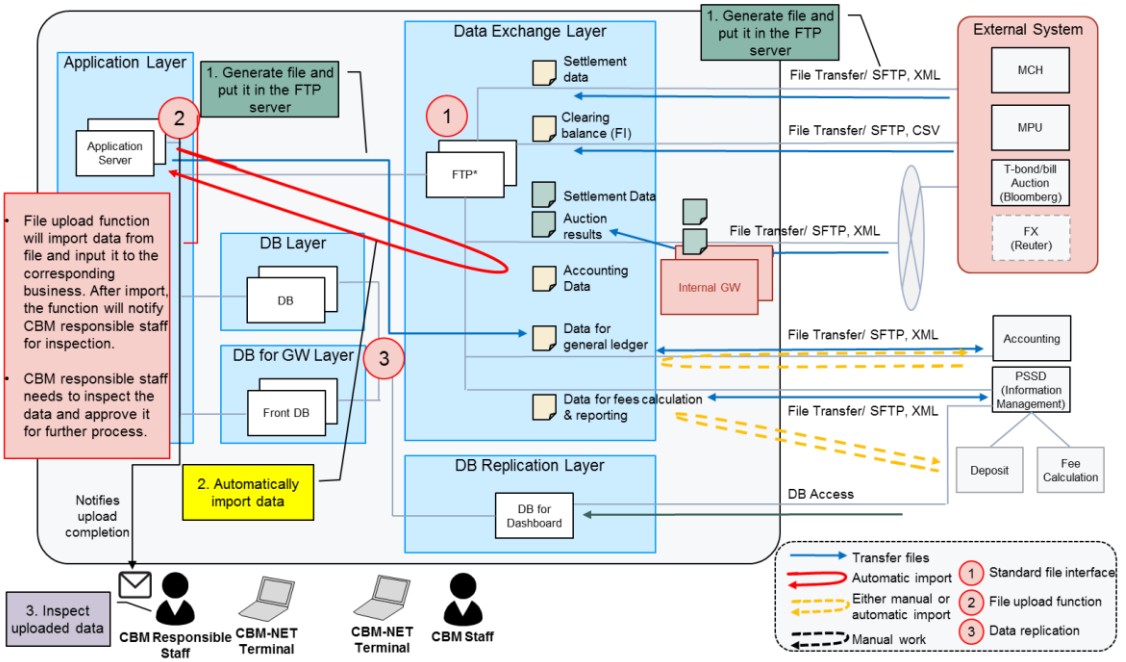
The following diagram shows the flow of data exchange after Phase 2 using (B) the file upload function. Files will be generated in specified format by related systems and will be sent to the FTP server in the CBM-NET system. CBM personnel will retrieve necessary files from the FTP server and upload data from the file to CBM-NET by using the (B) file upload function. Once data is imported, CBM responsible personnel will be notified for data inspection and further processes.



Source: Preparatory Survey Team

Figure 3-28 Flow of data exchange after Phase 2 using file upload function

The following diagram shows the flow of data exchange after Phase 2 using the (C) data import function. Files will be generated in specified format by related systems and will be sent to the FTP server in the CBM-NET system. The (C) data import function will periodically check the FTP server and import data to CBM-NET. Once data is imported, CBM responsible personnel will be notified for data inspection and further processes.



Source: Preparatory Survey Team

Figure 3-29 Flow of data exchange after Phase 2 using data import function

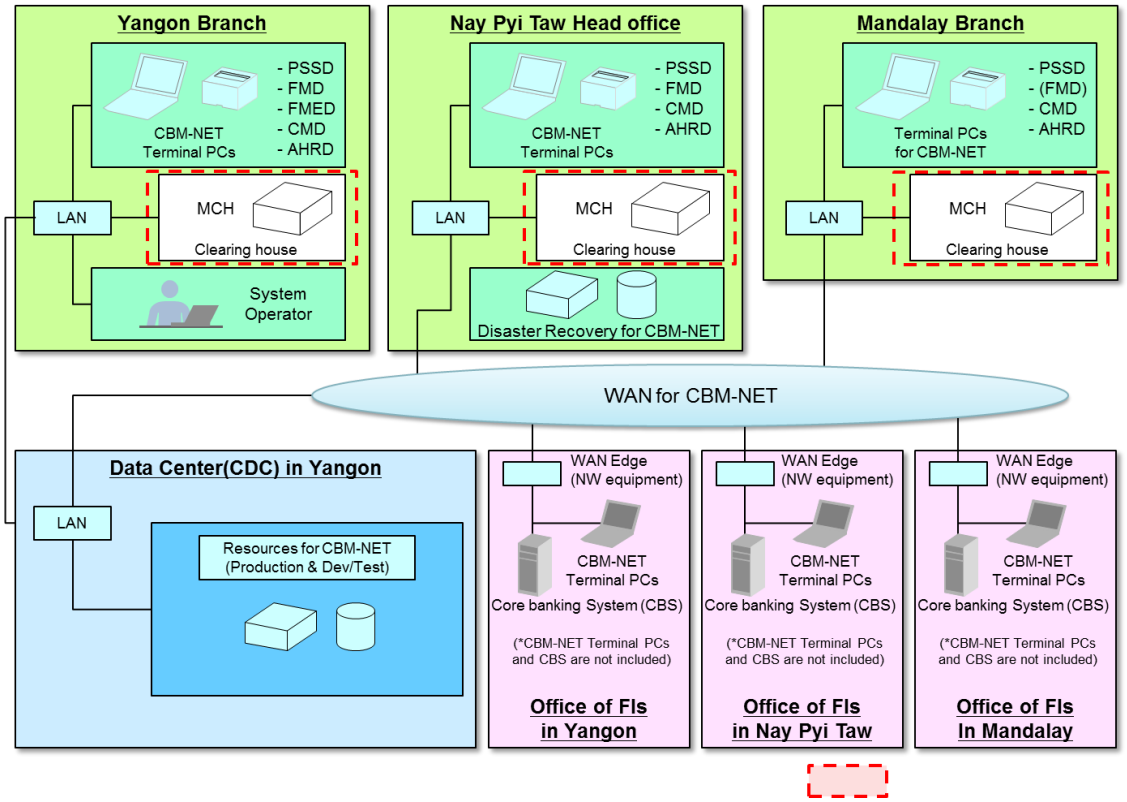
(2) Prerequisite

CBM will conduct required review and confirmation in timely manner. If it is necessary to connect systems other than expected in this section after the completion of external design, it should follow the specification of CBM-NET.

3.2.4.3 System infrastructure

3.2.4.3.1 System Infrastructure Overview

Basically, the configuration of the CBM-NET Phase 2 system will almost be the same as the current configuration. The hardware for the system will be replaced.
The remote disaster recovery (DR) site will be set up in the server room of the CBM Nay Pyi Taw Head Office.



Source: Preparatory Survey Team

Figure 3-30 Overview of CBM-NET Phase 2 Infrastructure

3.2.4.3.2 Hardware and Software Components

Basically, the configuration of the new CBM-NET system will almost be the same as the current configuration. The hardware of the system will be replaced.

Regarding system equipment, network devices, UPS, and racks, which can be procured in Myanmar as much as possible, will be preferentially adopted. Especially, equipment requiring additional procurement and expendable items, such as printer toner, must be procured at a reasonable price in Myanmar.

Here are the lists of hardware and software that will be provided by the infrastructure vendor, excluding network devices, racks, and UPSs.

Table 3-19 Hardware list for Yangon DC

(including CBM-NET terminal PCs for 3 CBM sites)

No.	Descriptions
1	Physical servers for Application, Operation management
2	Physical servers for DB
3	Physical servers for RSA Manager
4	Physical servers for RADIUS
5	Physical servers for Backup Management
6	Physical servers for Internal GW (CBM YGN Office Floor)
7	SAN Storage
8	Tape Library
9	SAN switch
10	NAS Storage
11	PCs for operational management (Operation Administrator terminal)
12	PCs for CBM-NET terminal
13	Printers

Table 3-20 Hardware spare list for Yangon DC

No.	Descriptions
1	LTO media and label
2	SPF+ Module for SAN Switch
3	PCs for CBM-NET terminal (YGN, NPT, MDY)
4	Toners for Printers (YGN, NPT, MDY)

Table 3-21 Software list for Yangon DC

(including CBM-NET terminal PCs for 3 CBM sites)

No.	Descriptions
1	Hardware Monitoring
2	Hypervisor
3	Hypervisor Management Server
4	Windows Server
5	Linux Server
6	RDBMS for operation management
7	Backup software
8	Antivirus
9	Microsoft Office
10	Monitoring and Job Management Support

Table 3-22 Hardware list for Nay Pyi Taw DR site

No.	Descriptions
1	Physical servers for Application, Operation management
2	Physical servers for DB
3	Physical servers for RSA Manager
4	Physical servers for RADIUS
5	Physical servers for Backup Management
6	Physical servers for Internal GW (CBM NPT Office Floor)
7	SAN Storage
8	Tape Library
9	SAN switch
10	NAS storage
11	PC for operational management (Operation Administrator terminal)

Table 3-23 Hardware spare list for Nay Pyi Taw DR site

No.	Descriptions
1	LTO media and label
2	SPF+ Module for SAN Switch

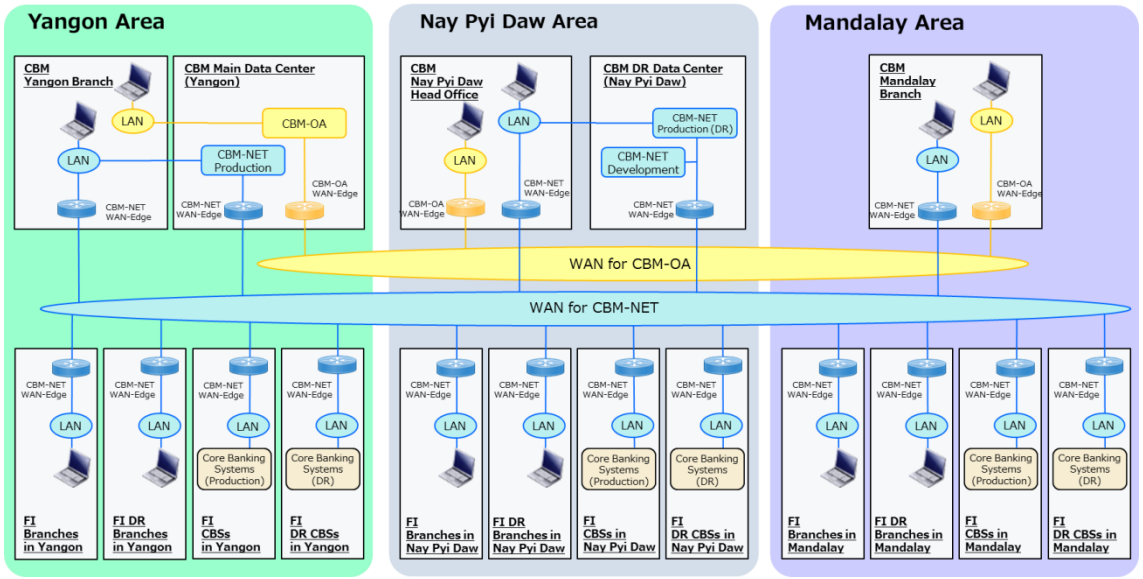
Table 3-24 Software list for Nay Pyi Taw DR site

No.	Descriptions
1	Hardware Monitoring
2	Hypervisor
3	Hypervisor Management Server
4	Windows Server
5	Linux Server
6	RDBMS for operation management
7	Backup software
8	Antivirus
9	Monitoring and Job Management Support

3.2.4.3.3 Network Architecture

Network architecture of the new CBM-NET system will also be almost the same as the current configuration. Network equipment will be replaced. As for the DR environment, the configuration will be the same as the production (primary) environment.

Here are the summarized network diagrams for the new CBM-NET environment.

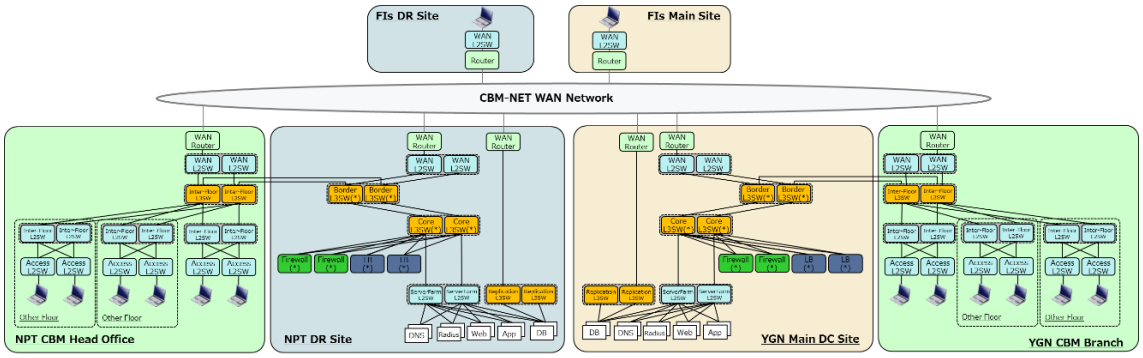


Source: Preparatory Survey Team

Figure 3-31 Network overview for CBM-NET Phase 2/CBM-OA WAN[23]

[23] CBM-OA is not included in Phase 2 scope

Each DC and branches of CBM and FIs are connected through the WAN network provided by a local network carrier, Myanmar Post and Telecommunications (hereinafter MPT).

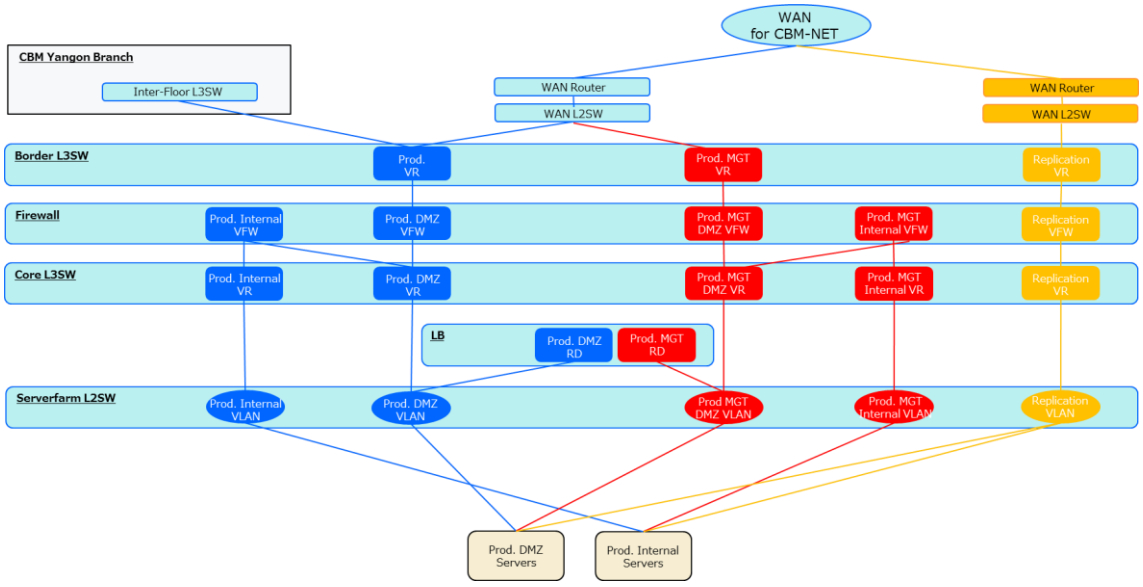


Source: Preparatory Survey Team

Figure 3-32 Physical network diagram for CBM-NET Phase 2

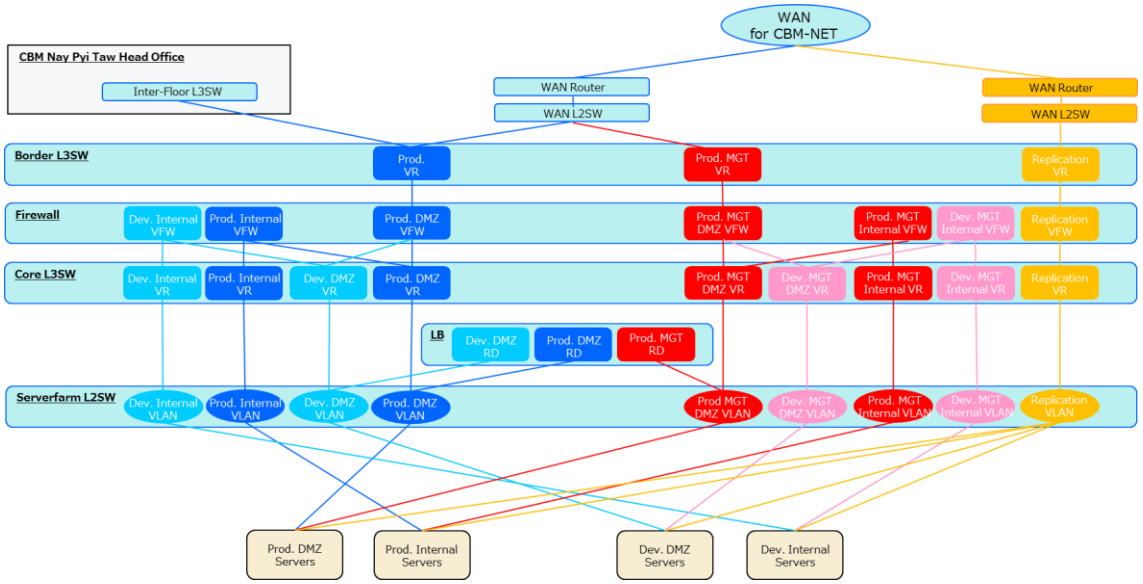
In each location of DC and CBM branches, devices and cables will be redundant to minimize downtime in case of a hardware failure.

Some multiple devices are virtually integrated as a single device to enhance the level of redundancy and reduce the management workload. On the other hand, some devices are virtually divided to function as multiple devices to utilize the resources efficiently and reduce the number of physical hardware devices. For example, a firewall, load balancer, and core L3SW are shown as single pairs at each DC site in the diagram above. However, in the logical view as follows, they appear multiple times as multiple devices with different roles.



Source: Preparatory Survey Team

Figure 3-33 Logical network diagram for CBM-NET Phase 2 (YGN Main DC)



Source: Preparatory Survey Team

Figure 3-34 Logical network diagram for CBM-NET Phase 2 (NPT DR)

Here are the lists of network devices, cables, racks, and UPSs supposed to be provided by the infrastructure vendor.

Table 3-25 Network devices list for CBM Offices

No.	Descriptions
1	WAN Router
2	Layer 3 switch (Inter-Floor)
3	Layer 2 switch (Inter-Floor & Access)
4	SFP Module for 1000 BASE-T
5	SFP Module for 1000 BASE-SX
6	Media converter (CBM NPT to DR)
7	Power Distribution Unit for Half Rack
8	Uninterruptible Power Supply
9	UTP RJ-45 LAN Cable
10	MM Optical Fiber Cable
11	Optical Fiber Patch Panel

Table 3-26 Network spare devices list for CBM Offices

No.	Descriptions
1	SFP Module for 1000 BASE-T
2	SFP Module for 1000 BASE-SX

Table 3-27 Network devices list for Yangon DC

No.	Descriptions
1	WAN Router
2	Layer 3 switch (Border & Core)
3	Layer 2 switch (WAN & Server Access)
4	Firewall
5	Firewall (for Bloomberg ADE)
6	Load balancer
7	SFP Module for 1000 BASE-T
8	SFP Module for 1000 BASE-SX
9	SFP+ Module for 10G BASE-SR
10	Full Size Rack
11	Power Distribution Unit for Half Rack
12	Power Distribution Unit for Full Rack
13	Uninterruptible Power Supply
14	GPS Time Server
15	UTP RJ-45 LAN Cable
16	MM Optical Fiber Cable

Table 3-28 Network spare devices list for Yangon DC

No.	Descriptions
1	SFP Module for 1000 BASE-T
2	SFP Module for 1000 BASE-SX
3	SFP+ Module for 10G BASE-SR
4	Media converter
5	Power Distribution Unit for Half Rack
6	Uninterruptible Power Supply
7	GPS Time Server

Table 3-29 Network devices list for Nay Pyi Taw DR Site

No.	Descriptions
1	WAN Router
2	Layer 3 switch (Border & Core)
3	Layer 2 switch (WAN & Server Access)
4	Layer 2 switch (Operation Room)
5	Firewall
6	Firewall (for Bloomberg ADE)
7	Load balancer
8	SFP Module for 1000 BASE-T
9	SFP Module for 1000 BASE-SX
10	SFP+ Module for 10G BASE-SR
11	Media converter
12	Full Size Rack
13	Power Distribution Unit for Half Rack
14	Power Distribution Unit for Full Rack
15	Uninterruptible Power Supply
16	GPS Time Server
17	UTP RJ-45 LAN Cable
18	MM Optical Fiber Cable

Table 3-30 Network spare devices list for Nay Pyi Taw DR Site

No.	Descriptions
1	SFP Module for 1000 BASE-T
2	SFP Module for 1000 BASE-SX
3	SFP+ Module for 10G BASE-SR

Table 3-31 Network devices list for FIs

No.	Descriptions
1	WAN Router
2	WAN L2 Switch
3	UTP RJ-45 LAN Cable

Table 3-32 Network spare devices list for FIs

No.	Descriptions
1	WAN Router
2	WAN L2 Switch

3.2.4.3.4 Facility and Environment

(A) Requirements and plan about Container Data Center (CDC)

For continuous service of CBM-NET Phase 2 & CBM-OA (including the accounting system):

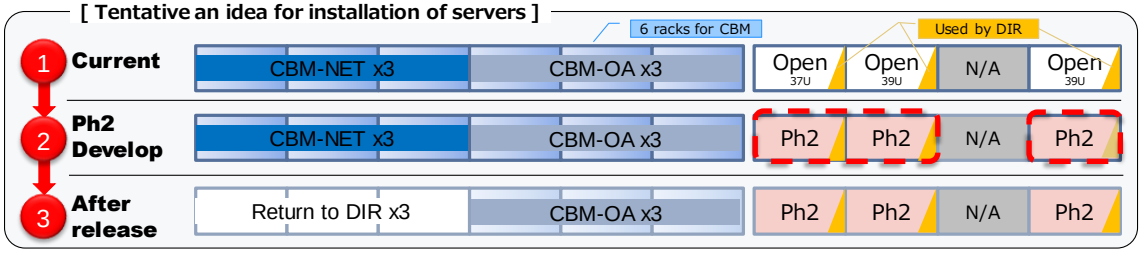
- CBM shall ask the CDC provider to share their three racks for installing Phase 2 equipment.
- CBM shall return the current three racks used for Phase 1 equipment after

removal.

- For continuous use of CDC, CBM shall confirm with the CDC provider on renewing the contract of CDC (which expires in September 2019).

CBM has the right to use six racks in the CDC in YGN, and all racks are being used for the current environment (CBM-NET Phase 1: 3 racks, CBM-OA: 3 racks) based on the contract with CDC provider.

In CDC, there are three available racks for the CDC Provider. However, some spaces are already being used for the equipment for CDC management. In Phase 2, the racks will be used as follows to install new equipment.



Source: Preparatory Survey Team

Figure 3-35 Transition plan of the rack usage

1. Current
   Three racks are used for CBM-NET Phase 1, three racks are used for CBM-OA, and three racks are partially vacant.

2. Phase 2 Development
   The last partially vacant three racks will be installed as the new equipment for Phase 2.

3. After release
   After the new system of Phase 2 goes live in the last three racks, the current CBM-NET system running on the first three racks will be taken away and then those racks will be returned to the owner.

(B) Requirements about new server room for DR site

The server space at the Nay Pyi Taw Head Office is required as the DR site for Phase 2. Four racks will be placed in this room for servers, storage, network devices and UPSs.

CBM shall prepare the space to satisfy the following requirements.

- The space must be lockable.
- The floor area of the space requires enough room to place four racks and other equipment. It should also have extra space for operators to do installation work.
- The load capacity of the space floor should be more than 800 kg/m2.
- AC 100 V and AC 200 V power supplies should be provided.
- Power supply should be more than 9 kVA/rack.
- Air conditioning equipment should be installed that can keep the temperature 20ºC to 26 ºC and the humidity at 35% to 65%.
- Gas fire extinguishing equipment and smoke sensing facility must be provided to the space.
- Flooding prevention should be applied to the space.
- The lightning protection facility should be installed in the building and the space.
- The emergency private power generation facility must be able to supply power to the space prior to other rooms and supply power for a few hours.

(C) Requirements and plan about the operation room for DR site

The operation room is necessary at the Nay Pyi Taw Head Office to operate and manage the DR systems.

- The operation room must be lockable.
- Desks and chairs are necessary to place four PCs for operation and management.
- AC 100 V power supply should be provided.

Network ports are necessary to connect the four PCs to the DR system.

3.2.4.4 Consultant Supervision

Once the project has been officially approved under the conclusion of Exchange of Notes (E/N) and Grant Agreement (G/A), CBM will have to pursue the procurement of developers and vendors. Because that procedure requires specialized skills, CBM will be requested by JICA to hire management consultant who will support CBM with detailed designs and development supervision.

The following are the tasks assumed to be pursued by the management consultants:

(A) Detailed Design:

- Support for Confirmation of the development plan
- Support for Procurement of suppliers / vendors
- Support for the execution of preparation and undertaking by CBM

(B) Supervision of Development:

- Support for logistics
- Support for confirmation of specification
- Support for tests done by CBM
- Support for system development process management
- Support for acceptance
- Support for operation rehearsal
- Support for decision making on service commencement

(C) Supervision of Development (Soft Component):

- Support for drafting of business manuals
- Support for user trainings
- Support for communications with the FIs
- Support for setting up of operation and maintenance structure

The consultants will be supporting CBM on the items listed above throughout the procurement and development period of the systems.

As will be mentioned in the following procurement batches and methodologies section, the management consultants will be appointed by CBM based on JICA recommendations. This is the standard procedure for JICA Grant Aid. A contract between CBM and the management consultants will be concluded by means of the standard contract format offered by JICA.

JICA expects CBM to appoint and hire the management consultants just after G/A and E/N so that the procurement and detailed design procedures can be started in an efficient manner. The consultants, on the other hand, are expected to start negotiating the contract with CBM soon after the conclusion of the Grant Agreement.

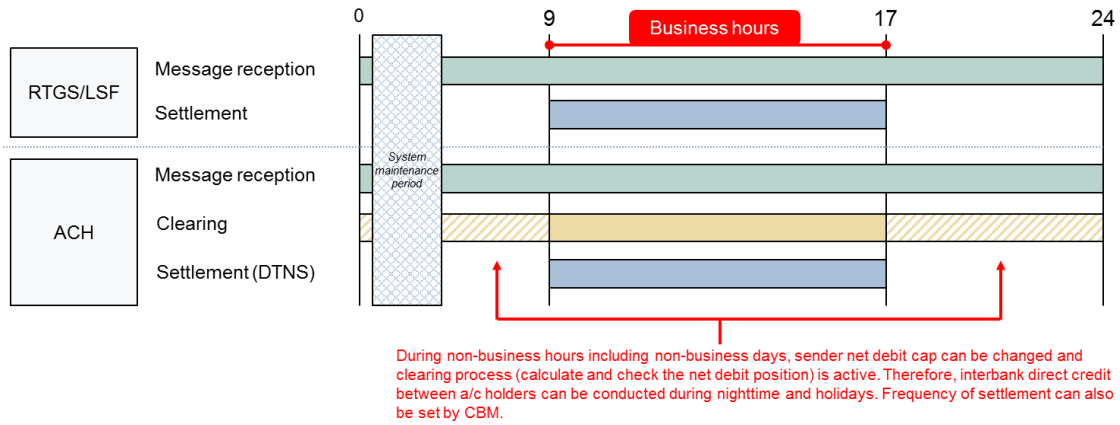
3.2.4.5 System Non-functional Requirements

(1) System Scale

(A) Currently, 136 client PCs are used in 46 FIs and 25 client PCs are used in CBM offices for CBM-NET. FIs must procure their own client PCs if they need additional CBM-NET terminals.
(B) The maximum number of FIs sites connecting to CBM-NET Phase 2 is 184. Each FI will connect to CBM-NET Phase 2 from a maximum of four locations. Two of them will be from the location of CBM-NET terminals and that of STP in FIs' primary sites. The other two will be from FIs' DR sites.
(C) The maximum number of each FI user is 60 for CBM-NET. Current CBM-NET registered users are approximately 1,000, including FIs users and CBM users.

(2) System Operating Hour

(A) CBM-NET Phase 2 has a capability to receive payment instructions all day including non-business days except system maintenance period (e.g. maximum two hours per a day).
(B) With considering the system maintenance time, business hours can be extended up to 22 hours.
(C) To extend the operating hour, CBM should assign operation personnel for the system monitoring during the business hours.



Source: Preparatory Survey Team

Figure 3-36 Time chart on business days

Table 3-33 Operating hours of the other central banking systems

Name (country)	Operating hours (h)
Fedwire (US)	19.5
TARGET (EU)	11.0
BOJ-NET (Japan)	12.5
CHAPS (UK)	10.3
MEPS+ (Singapore)	10.0
CHATS (Hong Kong)	10.0
RITS (Australia)	15.5
CNAPS (China)	8.5

Source: Preparatory Survey Team

(3) System Performance

(A) CBM-NET Phase 2 servers will be able to process transactions from client PCs and STP GWs.

(B) The storage capacity includes the system area, business data area, and backup data area.

(C) Five years of business data will be stored by RDBMS.

(4) System Reliability

(A) System components of servers, storage and network devices must have appropriate redundant configurations to avoid SPOF.
(B) The service level of this system will be the best effort level (Maintenance time is expected and system downtime might occur in case of a critical failure.)
(C) In order to verify the results of processes, logs will be maintained.
(D) A remote disaster recovery (DR) site will be set up in the server room of the CBM Nay Pyi Taw Head Office. See also (7).
(E) Data backups will be stored on tape in preparation for data corruption and for system audits.

(5) System Scalability/Flexibility

(A) Appropriate server resource allocations will be possible using virtualized servers, and physical servers can be added for extra workloads.
(B) Storage resources can be extended by adding HDDs and drawer units.[24]

(6) System Neutrality

(A) Regarding system equipment, network devices, UPS and racks, which can be procured in Myanmar, will be preferentially adopted. Especially, equipment requiring additional procurement and expendable items, such as printer toner, must be procured at an appropriate price in Myanmar.
(B) As far as possible, the system should not depend on specific manufacturers and products.

(7) Business Continuity

(A) A remote disaster recovery (DR) site will be set up in the server room of the CBM

[24] The drawer unit is an equipment for install HDDs for expanding storage resources, and is connected with the storage controller unit.

Nay Pyi Taw Head Office.

(B) At the DR site, infrastructure for CBM-NET Phase 2 will be installed and configured. The CBM-NET system will be up and running at the DR site.

(C) Business data of CBM-NET will be replicated asynchronously between the primary site and the DR site by using the database function. Asynchronous replication is adopted because it can be used regardless of the distance between the primary and DR sites. In addition, near-zero data loss can be achieved by using the database replication function.

(D) When the DR is activated, necessary work must be done to recover the CBM-NET system at the DR site. The necessary work should be defined in the BCP (such as who will declare DR, who will do what and where, when to do what, and so on).

(E) The Targeted Recovery Point Objective (RPO) and Recovery Time Objective (RTO) will be as follows.

- RPO: Near-zero (This may vary depending on the quality of network connections.)
- RTO: 2 hours (To be determined after verifying recovery procedures in an actual DR environment, even if the system can be recovered within 2 hours but it will take a few hours [totally up to half a day] for verification from the business point of view.)

(8) System Availability for Operation and Maintenance

(A) The CBM-NET Phase 2 system can be operated and managed at both sites of the primary site at the Yangon branch and the DR site in the Nay Pyi Taw Head Office.

(B) The CBM-NET Phase 2 operation and management system will have the following functionalities:

- System Monitoring (log & data collection, problem detection, notification and visualization, log management, etc.)
- Virtualized server management (high availability management, etc.)
- Backup & restore (system area, business data area)
- Security and patch management (antivirus pattern and OS patch distribution, etc.)
- Job management (batch job execution, etc.)

- System management from primary site to the DR site and from the DR site to the primary site.

(C) System operation and management items by person will be follows:
- Change and modification management (requirements changes)
- Release and deployment management (release and deployment plan)
- System configuration management (equipment version and number)
- Incident management (problems and issues)

(D) System should be designed and configured as the local vendors could support its operation and management.

(E) For ease of maintenance, the same kinds of equipment will be unified in the same vendor as much as possible.

(9) Information Security

(A) In principle, comply with the security policy of CBM.

(B) Manage authority to access CBM-NET Phase 2 and implement two-factor authentication using USB tokens with digital certification.

(C) Use VPN for communication circuit and line of WAN

(D) Use firewalls to deny unauthorized protocols and communications for both of internal networks and external networks.

(E) Use antivirus and anti-malware software and always update them to the latest.

(F) Manage logs and keep system date and time accurate.

3.2.4.6 Procurement Plan

3.2.4.6.1 Procurement Batches and Method

The basic policy for procurement in the project aims for competitive pricing, reliability of integrated systems, and minimizing the total cost of ownership. As such, the preparatory survey team has set the following approaches: The first approach is the competitive pricing approach that separates the procurement items into small components for tender bids. The second approach is bundling the procurement items to ensure the reliability of the integrated systems. The third approach is to procure, wherever possible, the systems including operation and maintenance service with

the aim to minimize the total cost of ownership.

Procurement will be conducted in following four batches.

- Procurement of Management consultants
- Procurement of CBM-NET Phase 2 application
- Procurement of renting racks in the container data center
- Procurement of system infrastructure

Among these four batches, procurement for the CBM-NET Phase 2 application should be conducted under the single source procurement method because of the highly specialized nature of the applications that only the application vendor of Phase 1 can satisfy following conditions.

- The application vendor with understanding and experience of CBM-NET Phase 1 because of the following:
  - Implementation of additional function in Phase 2 will require modification and adjustment of Phase 1 programs
  - Limited time for implementation
  - Current operating CBM-NET Phase 1 system must not be affected by mistakes during Phase 2 development
- The application vendor with development experience of existing referable system (BOJ-NET of Japan)

To achieve consistency and continuity, the management consultants for the detailed design and development supervision must be well acquainted with the background of this project. Against this background, the management consultants for detailed design and development supervision will be recommended by JICA to CBM. CBM will therefore be required to hire the consultants with particular experience in this project through the single source method.

In addition, procurement for renting racks in the container data center should be conducted under the single source procurement method. This is due to the necessity of using current datacenter from the viewpoint of continuity and O&M capability of the system.

On the other hand, the system infrastructure is procured by competitive tender bids. This is because the equipment to be supplied from this batch is mostly composed of off-the-shelf products. The equipment therefore may be procured from a number of suppliers. It is for this reason that this batch is procured under the competitive tendering procedure.

3.2.4.7 Operational Guidance Plan

3.2.4.7.1 Test and Transition Plan

Implementation of CBM-NET Phase 2 will conform to the following tests steps:

1. Unit Test/Integration Test (integrated functional test)
2. System Test
3. Connection Test with FIs for STP
   Connection tests will be held two times. Connection Test 1 (start from Oct. 2019) is a connection test with group 1 FIs and Connection Test 2 (start from Jun. 2020) is with group 2 FIs.
   The definition of each group is as follows;
   - Group 1: FIs that can prepare their STP environment (ready to connect) prior to the Oct. 2019.
   - Group 2: FIs that can prepare their STP environment (ready to connect) prior to the Jun. 2020.
4. User Acceptance Test
5. Running Test
   Running tests will be held two times. Running Test 1 is for group 1 (will be go-live from Mar. 2020) and Running Test 2 is for group 2 (will be go-live from Sep. 2020).

Unit test/integration test, system test, and connection test with FIs for STP will be carried under the CBM-NET Phase 2 application vendor's responsibility.

Connection tests after Connection Test 2 and running tests after Running Test 2 (for FIs that cannot prepare their STP environment until test/integration test, system test, and connection test with beginning of the Connection Test 2) will not be included

within the scope of Phase 2 and shall be conducted in coordination with CBM based on the experience of above tests.

The user acceptance tests and running tests will be conducted under CBM's responsibility with support from the CBM-NET Phase 2 application vendor and infrastructure vendor. Consultants will support CBM activities.

Data Migration will be done before system's go-live.

(A) Test and Transition Schedule

Unit tests/integration tests, system tests, and connection tests with FIs for STP will be planned and performed under the CBM-NET Phase 2 application vendor's responsibility. Therefore, the schedule will be planned by the application vendor except for the following tests:

- User Acceptance Test: Must be started from Jan. 2020, completed before the Feb. 2020.
- Running Test 1: Must be started from Mar. 2020, completed before May 2020.
- Transition 1: Must be completed not later than May 2020.
- Running Test 2 (for FIs group 2): Must be started from Sep. 2020, completed before Nov. 2020.
- Transition 2: Must be completed not later than Nov. 2020.

(B) Unit Test and Integration Test

The unit test and integration test will be carried under the CBM-NET Phase 2 application vendor's responsibility.

The vendor develops the test plan and conducts these tests according to the vendor's implementation and management methodology.

(C) System Test

System tests will be carried under the CBM-NET Phase 2 application vendor's responsibility.

The CBM-NET Phase 2 application vendor shall develop the test plan, conduct the system test, and report the test result to CBM according to the vendor's implementation and management methodology. The system test must be conducted in Myanmar using the new system environment.

All functions shall be tested and non-function verification of system operation and performance shall be cleared by the CBM-NET Phase 2 application vendor. The infrastructure vendor will support the operation of the hardware and software. In this test, the following items must to be confirmed in addition to normal operation.

- Switching to DR system
- Processing using disaster recovery system after switching

(D) Connection Test 1

Connection Test 1 is a test with group 1 FIs and will be carried out in parallel with the system test.

In the connection test, the test performer confirms that the STP transaction is processed according to the specification in an environment where the CBS of each participating FI and CBM-NET are connected via GWs.

This test is carried out under the responsibility of the CBM-NET Phase 2 application vendor with the participation of FIs. The CBM-NET Phase 2 application vendor will develop the test plan and lead this test.

Processing in the CBS and GW of each participating FI must be confirmed under the responsibility of each participating FI before this test is started.

In this test, the CBM-NET Phase 2 application vendor and each participating FI will

verify that the series of operation processes from the start to the closing of the STP process are correctly processed with no existence of process performance problems.

CBM shall understand and learn the test method and process as well as coordinating communication among related organizations including Group 1 FIs.

(E) User acceptance Test

CBM shall confirm that the functions and non-functions of the system provided by the vendor work as specified. After confirming, the CBM accepts the delivered system.

Since this test is for accepting the delivered system, the test shall be carried out under the responsibility of CBM. Therefore, CBM prepares the test plan and conducts the test. Consultant will support CBM in developing test plans and conducting tests. Also, the application vendors will support the execution of the tests.

(F) Running Test 1

In Running Test 1, CBM shall confirm that it can carry out daily tasks in accordance with manuals preparations in advance, such as normal operation of the CBM-NET system, disaster response operation, backup operation etc. CBM shall also conduct the go-live readiness assessment.

Before starting Running Test 1, CBM shall complete the following preparations.

- Develop Test plan
- Create/Revise business operation manual
- Create system operation manual
- Create system operation manual and disaster recovery manual including business operation, which are based on manuals of each function delivered by the CBM-NET Phase 2 application vendor and system infrastructure vendor
- Educate and train personnel in charge
- Coordinate participation of FIs

- Define conditions for the go-live readiness assessment

Running Test 1 is carried out under the responsibility of CBM. Consultants will support CBM in developing the test plan, creating manuals, education and training, preparation for participation of FIs, and conducting tests and defining conditions for the go-live readiness assessment. The CBM-NET Phase 2 application vendor and system infrastructure vendor will also support in performing this test.

(G) Connection Test 2

Connection Test 2 is a test with FIs group 2 to test STP connect functions. It will be started after CBM-NET Phase 2 is in operation. The purpose of the test, items performed, and responsibilities are the same as the Connection Test 1.

(H) Running Test 2

Running Test 2 is a test with FIs group 2. The purpose of the test, items performed, and responsibilities are the same as the Running Test 1.

(I) Transition

Preparation and performance of the transition will be carried out two times. One is at the point of CBM-NET Phase 2's go-live (in Running Test 1) and another is at the point of FIs group 2 participation to STP (in Running Test 2).

For transition of the system, in addition to confirming the function and non-function of the target system and building the system environment of infrastructure and network, it is necessary that the data migration from the current system and all preparations for master data are complete.

These are carried out by CBM during the running test period with support for the consultants.

3.2.4.7.2 Training Plan

While the training plan will be detailed in the planning phase of the management guidance, the following is the outline of the training plan. The training will be coordinated and conducted as a part of soft component with support from the application vendor and the infrastructure vendor.
The practical On-the-Job training (OJT) to the personnel assigned by CBM during implementation of the project will be also included.

(A) Variety of training courses
The consultant will conduct training for business process including following functions based on business manuals.

- ISO 20022
- STP
- LSF/Queuing
- ACH
- Cheque truncation
- Alert/Dashboard
- DR operation
- User Authentication
- Interface with subsystems
- Infrastructure (servers, networks, datacenter, etc.)

(B) Training type

- Basic lecture
- Hands on training with actual system operation

3.2.4.8 Soft Component Plan

3.2.4.8.1 Soft Component

Other than the training that the applications and equipment suppliers will provide, technical support for ensuring smooth operation of CBM-NET will be required. Soft components of the project will therefore be included in the terms of reference for the

project management consultants. Four topics of technical supports are as follows:

- Support for drafting of business manuals
- Support for user training
- Support for communications with the FIs
- Support for setting up of operation and maintenance structure

3.2.4.8.2 Technical Cooperation

The Technical Cooperation Project for "Modernizing Funds Payment and Securities Settlement Systems" has been implementing in parallel with the development of the CBM-NET system from February 2014 to August 2020. The Technical Cooperation Project is a form of technical transfer activity conducted by JICA with the main activities of the institutional development and the human resource development of CBM.

The overall goal of the project is to modernize financial market in Myanmar. To this end, the project purpose is to support modernization of funds payment and securities settlement by establish the necessary environment for securing proper operation and maintenance of the new ICT system for central banking through capacity development and formulation of organization.
Outputs of the project are as follows:

- To develop necessary rules and manuals corresponding to the introduction and operation of the ICT system for funds payment and securities settlement.
- To enhance capacity of the commercial banks to operate funds payment and securities settlement properly in accordance with the new ICT system.
- To enhance capacity to plan, operate, maintain and manage the new ICT system for central banking properly.
- To acquire necessary user knowledge and skills to utilize the ICT/PC properly
- To strengthen capacity to fulfill assigned tasks related to monetary policy properly by promoting above items.

The project is expected to support CBN-NET Phase 2 in the following areas;

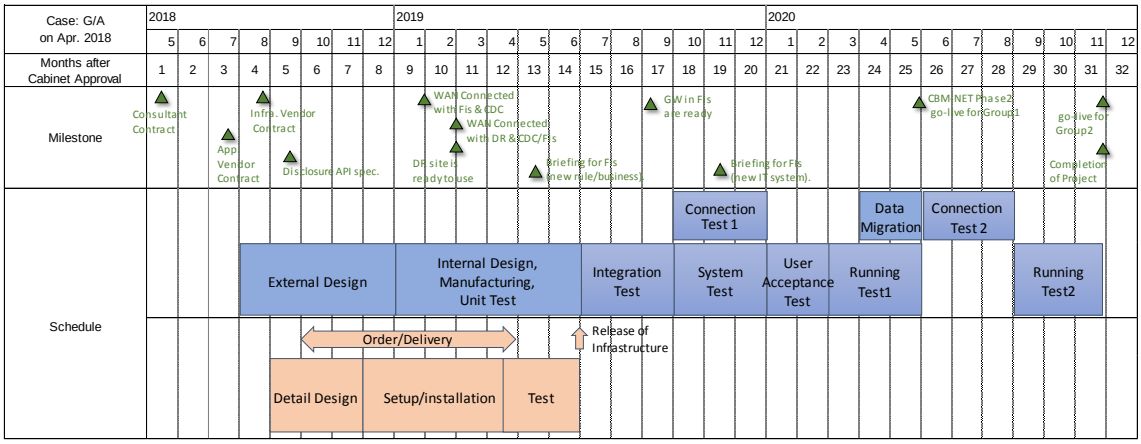
1) Further development of policy, rules and regulations, business operations and guidelines of funds settlement for CBM-NET Phase 2.

- System security policy
- Cheque Truncation
- Disaster Recovery (Business Continuity Plan), etc.

2) Advise to facility development of CBM-NET Phase 2
   - Server room in Nay Pyi Taw for DR site
   - New CBN-NET WAN for CBM-NET Phase 2
3) Development of supporting system for CBM-NET Phase 2
   - PSSD system
   - Connecting with external systems
4) Development of capacity of operation and maintenance of CBM-NET Phase 2
   - In-house maintenance service
   - Maintenance cost reduction measures

3.2.4.9 Implementation Schedule

The schedule for system development is assumed as shown in the figure below. Starting from the completion of the consultant contract (expected in May 2018), CBM will conclude a contract with application developers about two months later (Jul. 2018) and start development from the third month (Aug. 2018). On the other hand, for infrastructure suppliers who will be selected by competitive bidding, it is assumed that the selection of suppliers and the conclusion of contracts are completed at the end of the third month, and infrastructure development will be started from the fourth month (Sep. 2018). The development period of infrastructure is assumed to be about ten months (Jun 2019), and after completion, the environment is released to the application developers, and the application test is carried out. Application development is assumed to be completed by the 19th month (Dec. 2019), the environment will be open to CBM from the 20th month (Jan. 2020), and the acceptance tests will be carried out. At the end of the 24th month (May 2020), the first release is conducted, and the services with major functions are provided. The additional functions and preparation of the STP with the FI of the second group are conducted afterwards, and the second release will be conducted by the 30th month (Nov. 2020), then it is assumed that the project is completed.



Source: Preparatory Survey Team

Figure 3-37 Detailed schedule of the design and development phase

3.3 Obligations of Recipient Country

In addition to the undertakings mentioned in Annex 4 "Major Undertakings to be taken by the government of Myanmar" attached to M/D, CBM is requested to decide for the following points. All items listed below which are explained and confirmed with M/D exchanged in Dec. 2017, is critical for completion of this project and all arrangement will be precondition of this project execution.

(1) Application (CBM-NET software)

(A) Any Costs related to the payment for technical support for application & infrastructure after the go-live
According to 3.4.2.1, any of these costs shall be borne by CBM.

(B) Any Costs related to the maintenance of the application after the period of (2)(B) below (5 years after purchase of hardware and equipment)
According to 3.4.2.1, any of these costs shall be borne by CBM.

(C) Any Costs for changes and addition of specification after the definition of system requirements for the system
The system definition will be discussed and defined within the scope of this

Outline Design during external design phase. After the external design, the internal design and manufacturing process will run based on the result of external design. Therefore, any changes of external design will affect to the process comes after and an additional cost may be incurred.

(D) Any costs for development of systems of agencies other than CBM
Since this grant aid will be agreed as an assistance to CBM, any funds for this project must not be applied to an agency other than CBM.

(E) Any costs for modification of the existing systems, including those organization outside CBM to be connected to the new system
As explained in (D), a system owned by an organization other than CBM will not be in scope of this project. It includes the following.

- The development of GW in FIs for connecting STP as explained in3.2.4.1.1(5).
- The Client PC for FIs if they need additional CBM-NET terminals.

(F) Any costs for the system after the go-live, due to changes in the system environment, such as upgrades to the OS and middle ware
Since this cost is not categorized to the hardware and software product maintenance cost explained in 3.4.2.1, any other costs will be incurred after the go-live shall be borne by CBM.

(G) Any costs for changes (upgrades and expansion) of the application after the go-live
Since this cost is not categorized to the hardware and software product maintenance cost explained in 3.4.2.1, any other costs will be incurred (Version upgrade of ISO 20022 messages, for example) after the go-live shall be borne by CBM.

(H) Control of users by issuing and managing USB tokens
As explained in 3.2.4.2.3, CBM shall issue and control USB tokens as a part of CBM's operation on CBM-NET. In addition to this, additional units of token (other than 500 tokens which will be provided in Phase 2) should be procured by CBM.

(I) Any costs to expand the number of users or area after the go-live
Since this cost is not categorized to the hardware and software product maintenance cost explained in 3.4.2.1, any other costs will be incurred after the go-live shall be borne by CBM.

(J) Cost of the application process for use from the FIs
As explained in (D), a system owned by an organization other than CBM will not be in scope of this project.

(K) Distribution of documents for users of FIs and CBM
As explained in below (3)(C), the communication with users will be a role of CBM. The distribution of documents for those users is also the role of CBM. The support for the preparation of documents descripted in 3.2.4.8 will be covered by Phase 2.

(L) Preparation for running tests (including confirmation of the test plan, business operation manual, system operation manual, DR manual, assignment of staff to educate and train, confirmation of condition for go-live assessment) before the running test 1 working with Technical Cooperation Project
The schedule of running tests are descripted in 3.2.4.7.1 and some of the preparation items will be able to have a support from soft component as descripted in 3.2.4.8.

(M) Connection test after connection test 2 and running test after running test 2 (for FIs that cannot prepare the STP environment until the above period)
As explained in 3.2.4.7.1, the connection test and the running test for FIs after group 2 will not be included to Phase 2 scope and shall be conducted by coordination of CBM, based on the experience of above tests.

(2) Hardware/Facilities, etc.

(A) Any costs related to payments for technical support for hardware and facilities after the go-live
According to 3.4.2.1, any of these costs shall be borne by CBM.

(B) Any costs related to the payment for maintenance of hardware and facilities after 5 years from purchase of hardware and equipment
According to 3.4.2.1, any of these costs shall be borne by CBM.

(C) Arrangement and preparation of the datacenter facilities (include both primary site and DR site)
Similar to Phase 1 project, the space and facilities necessary for installation of equipment shall be prepared by CBM. The preparation includes the designing, purchase and installation of security, firefighting system, electric power supply, air conditioner, measures for small animals, etc. for datacenter.
More specifically, the following arrangements will be expected.

- Arrangement for continuous use of current CDC as descripted in 3.2.4.3.4(A) is primary expected to operate CBM-NET and CBM-OA (including accounting system) continuously
- Arrangement of server space for DR site;
  - To select DR site where CBM can ensure to prepare space for four server racks
  - To prepare necessary facilities for DR site (refer 3.2.4.3.4(B) for more detail)
  - To ensure that the server space is available for installing equipment before January 2019.
- Preparation of operation room for DR site as written in 3.2.4.3.4(C).

(D) Any other costs for running the system after the go-live and includes the costs related to the datacenter facilities (primary site and DR site)
In addition to datacenter prepared by CBM in above (C), any other costs related to the datacenter (include power supply and other expense) shall be covered by CBM.

(E) Arrangement and any costs for WAN connections for CBM-NET
Arrangement of WAN connections for CBM-NET Phase 2 (Work owner: MPT/ Budget: CBM) will be covered by CBM within the following conditions

- To prepare WAN connections between primary data center and DR data center by CBM own budget. It must be available before January 2019.
- To arrange preparation of WAN connections from FIs to CBM-NET Phase 2 sites (among FI's CBS, DR system and CBM-NET terminals, according to

FIs' requirements). It must be available before December 2018.

(F) System maintenance and operation work after the go-live (helpdesk, system monitoring staff, maintenance staff, etc.)
Continuing from Phase 1, the operation & maintenance and related works shall be conducted by CBM.

(G) Any costs for the system after the go-live, such as expansion, upgrade or replacement of the system infrastructure
Since this cost is not categorized to the hardware and software product maintenance cost explained in 3.4.2.1, any other costs will be incurred after the go-live shall be borne by CBM.

(H) Any costs for the system after the go-live, such as changes in the settings for enhancing the function of the system
Since this cost is not categorized to the hardware and software product maintenance cost explained in 3.4.2.1, any other costs will be incurred after the go-live shall be borne by CBM.

(3) Other

(A) All other obligations written in Annex 4 "Major Undertakings to be taken by the government of Myanmar" which attached to the M/D exchanged in Dec. 2017

(B) Collaboration on discussion and decision on system features
For smooth and certain execution of the project, CBM shall collaborate with a necessary discussion and decision on system features in the design phase ("Prerequisite" in each section under 3.2.4 for detail). In addition, the necessary actions as follows shall be conducted by CBM in a timely manner.

- The procurement process including hiring the consultants.
- User acceptance test and running tests, which shall be conducted under CBM's responsibility (refer 3.2.4.7.1).
- Transition that shall be carried out by CBM (refer 3.2.4.7.1)

(C) Correspondence and communication with the users of FIs and CBM

The correspondence and communication, such as an arrangement of the FIs participation to the project will be done by CBM ("Prerequisite" in each section under 3.2.4 for detail). For example, as follows.

- To share the information of project with FIs in a timely manner
- To coordinate meetings with FIs. A single meeting with all FIs is not enough. CBM shall make the time to meet with each FI to discuss the project work, such as a technical issue for system connection, etc.
- To involve FIs that will not be provided above cheque image scanners, a technical briefing to support those FIs will be required under coordination.

(D) Issuance of new rules regarding to Phase 2 development functions

The new rules regarding to Phase 2 development functions as follows shall be established by CBM ("Prerequisite" in each section under 3.2.4 for detail).

- An establishment of new rule on how to control the settlement risk especially but not limited to ACH, Cheque Truncation, MCH, MPU before the go-live (such as a policy for net debit cap setting,)
- An establishment of operational framework to monitor the non-business hour system activities (including holidays) if CBM extend the reception hour.
- An establishment of actual detail rule (such as operational guidelines) for cheque truncation (especially includes the handling of image cheque, refer 3.2.4.1.5(1)(B) for related issues) before the go-live
- An establishment of the scheme to guarantee the net deficit of debtors

(E) Issuance of business continuity plan (BCP)

CBM shall come up with business continuity plan (BCP) which includes but not limited to the following contents.

- The scope of business continuity plan
- The business continuity management duty persons
- The disaster response: Including but not limited to the detection and determination of a disaster condition, notification to the responsible persons, initiation of BCP, activation of the DR site, dissemination of the public information and support services for the recovery

3.4 Project Operation Plan

3.4.1 Operation and Maintenance Structure

System operation after go-live is assumed to be performed mainly by AHRD members of CBM. Daily system operation and monitoring are carried out by AHRD members. When a problem occurs, the AHRD member identifies the location of the problem, sends inquiries to the appropriate vendor, and receives the necessary support for problem solving. According to the contract with CBM, the vendor provides technical support and product maintenance services (product maintenance services are provided as the scope of this project for five years after the purchase of equipment) to support system operation. Regarding the maintenance operations after this project, it is assumed that maintenance work is carried out by local personnel as much as possible and involvement of Japanese engineers is minimized in efforts to reduce the system operation cost.

3.4.2 Operation and Maintenance Cost

3.4.2.1 Composition of Operation and Maintenance Cost

Cost for operation and maintenance of the ICT system will incur from the handover of system to CBM. Under the current timetable, operation and maintenance cost will incur after the completion of project.

The operation and maintenance cost consists of four categories. They are operation support fees for infrastructure, application maintenance fees for developed applications, hardware and software product maintenance fees, and network usage fees for MPT.

Table 3-34 Categories of operation and maintenance cost

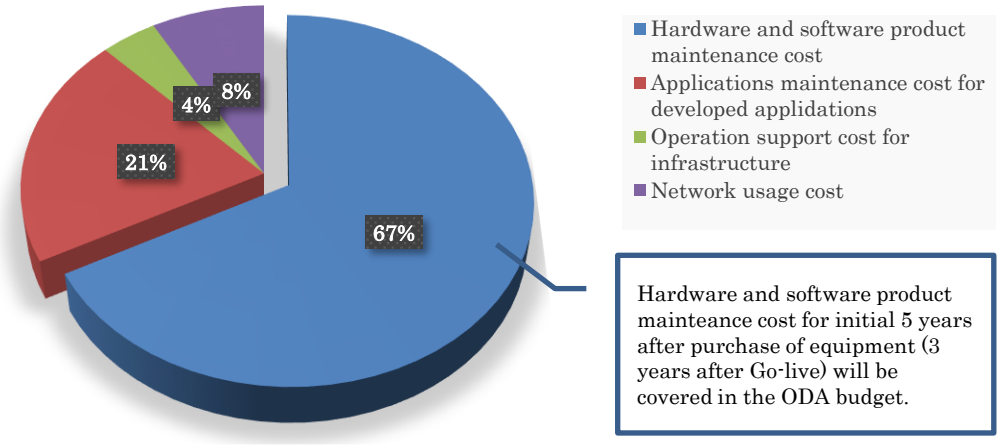
	Category	Description
1	Operation support cost for infrastructure	• Fee for the operational work for infrastructure as provided by IT Vendor for supporting operation work of CBM personnel. • Engineers from IT vendor support and help system operation and conduct maintenance work of CBM personnel. • Work includes support for operations for a cause analysis of problems related to system infrastructure, support for the operation for fixing the problems related to system infrastructure, etc.
2	Applications maintenance cost for developed applications	• Fee for technical support and solution work for issues on applications provided by IT vendor. • Engineers from IT vendor support and help system operation and maintenance work of CBM personnel related to the applications. • Work includes support for operations for a cause analysis of problems in applications, support for operation for fixing the problems in applications, providing fixed modules for the applications, etc.
3	Hardware and software product maintenance cost	• Fee for maintenance support for hardware products (server, storage, network equipment etc.) provided by hardware product vendors and software product (framework, middle ware, operation system) provided by software product vendors. • Service includes providing parts (hardware), fixed modules and update modules (software), using call center support, etc. • Some software may not be used without paying an annual fee because the fee includes authorization for use. • Products include servers, storages, network equipment, OS, virtualization SW, middleware, framework, package software, SW for operational functions like data backup, etc.

4	Network usage cost (to be paid to MPT)	• Usage fees for WAN as provided by MPT. • Cost includes: - Usage fees for long distance NW (between cities: YGN, NPT and MDY) - Usage fees for short distance NW (between CBM and FIs)

Source: Preparatory Survey Team

Annual operation and maintenance costs for the system installed in the Phase 2 project, including all the above-mentioned categories, are expected to reach about JPY 245 million. Among the following figures, hardware maintenance and software maintenance costs comprise approximately 67% of the total O&M cost. However, the hardware maintenance and software maintenance for the initial five years after the purchase of equipment (three years after go-live) will be included to initial cost.

JICA, therefore, asks CBM to start preparing to secure the rest of the budget (33% of total) for the expense of the O&M cost for CBM-NET, which is upgraded in the Phase 2 project.



Source: Preparatory Survey Team

Figure 3-38 Operation and maintenance cost for Phase 2

More specifically, the details of annual O&M cost for Phase 2 (after the completion of project) estimation are as follows.

Table 3-35 Annual O&M cost for Phase 2 (detail)

(Million JPY per year)

Item	The Scope of Phase 2				NOT in scope of Phase 2		
	CBM-NET Application	CBM-NET Infrastructure		CBM-WAN (VPN)	CBM-OA	MCH	Total
		Primary site	DR site				
HW & SW product maintenance cost *	45*	60*	60*	－	40	10	215
Technical Support	50	10		－	10	10	80
Network fee	－	－	－	20			20
Total for CBM	50	10		20	50	20	150
Total for Grant aid	45	120		0	0	0	165
Total	95	130		20	50	20	315

*Hardware & software license fee of the Phase 2 project will be covered by the grant aid for the initial 5 years after purchase of equipment (approximately until 2023)

Source: Preparatory Survey Team

Before go-live, the O&M cost, which CBM shall bear will be approximately 100 M yen per year. After go-live of CBM-NET Phase 2, hardware and software maintenance costs for CBM-NET Phase 1 will take over by applications maintenance costs for developed applications and operation support costs for infrastructure and increase to about 60 M yen because of the additional function and infrastructure for the DR site.

3.4.2.2 Possibility for Mitigating the Operation and Maintenance Cost

The operation and maintenance costs are necessary to handle any issues on the system during system operation. On the other hand, paying it continuously is not a light burden for CBM. In addition, the hardware and software product maintenance cost will be added to the burden of CBM after the 5th year from purchase of equipment (the 3rd year from go-live). Therefore, for minimizing the operation and

maintenance cost, the following matters will be considered as much as possible in the Phase 2 project.

- Appropriate system architecture and products: The system architecture will be simplified to avoid unnecessary hardware and software product installation.
- Effective use of hardware: Using the virtualization technology, multiple virtualization servers are consolidated and installed on a physical server to minimize the physical hardware devices. And hardware of DR is planned to be used for the development environment, as a result, the number of dedicated hardware devices for development environment is minimized.
- Use of local vendor and personnel: The products where the maintenance services are provided by local vendor are preferred because the chance to choose reasonable services are given to CBM after being handed over to the system. Therefore, considering the availability of maintenance services by local vendors is recommended, the products are selected by bidding vendors.
- Appropriate services: The cost of operation fees and application maintenance fees will be different depending on the service levels requested. Therefore, CBM can avoid paying unnecessary service fees by requesting appropriate service levels and menus from the vendors based on requirements of CBM. In addition, these services are possible as in-house operations with capacity development efforts by CBM.

3.4.3 Financial Sustainability of the Project

The initial investment amount of this project will be covered by JICA grant aid. Therefore, the financial sustainability depends on how to manage expenditures on operation and maintenance. One of the options for securing sustainability is that CBM provides a business ICT system useful for FIs so that CBM can charge fees and secure its own revenue sources. On the other hand, there is another view that CBM should keep the fee low so that many users can use the service with aims for speeding up financial settlement, securing safety, and promoting transition to electronic payment. The following table shows examples of the fees imposed by the operators of the large-value settlement systems. As shown in the table, the level and structure of the fee collection method is different by country, but representative patterns

include fixed fee and fee per transaction. In many cases, fees per transaction are charged in multiple patterns. The fee per transaction ranges from USD 0.099 to 3.063.

Table 3-36 Fee Structure for Large-Value Settlement System

Country	Large-Value Settlement System	Fees (examples)
Malaysia	RENTAS	Annual membership fee: MYR 15,000 (= USD 3,650) Interbank transfer (participating bank) MYR 2.5 (= USD 0.61) per transaction Notifications for deposits and withdrawals MYR 2.0 (= USD 0.49) per transaction
Thailand	BAHTNET	Monthly fee: THB 3,500 (= USD 107) Per transaction fee Below 10,000 THB 25 (= USD 0.77) 10,000 - 30,000 THB 35 (= USD 1.07) Bulk Payment-Credit 100,000 or less THB 12 (= USD 0.37) 100,001 - 500,000 THB 40 (= USD 1.225) 500,001 - 2,000,000 THB 100 (= USD 3.063)
Philippines	PhilPaSS	PhilPaSS fee: PHP 5 (= USD 0.099) Back-end fee: PHP 50 (= USD 0.991) by Beneficiary Bank
[Reference] Myanmar	CBM-NET	Initial Fee (one-time fee): 2,000,000 MMK Membership Fee (Annual fee): CBM-NET online: 1,000,000 MMK MCH: 500,000 MMK User fee of CBM-NET: 1,000 MMK per message

(Source: data obtained on each central bank's website by the survey team)

According to the fee policy at the central bank in each country, fees can be collected for other transactions, such as government bond settlement and bill clearing, as well. The fee collection from users will partially recover operation and maintenance expenses, which will contribute to sustainable operation and maintenance of CBM-NET.

As of October 2017, the average transaction number (calculated from January to October 2017 based on the average of 20 business days a month) of fund settlement and customer transfer of CBM-NET was 100 transactions per day, which is 59.5% higher than 2016 (62.7 transactions per day, 12 months).

For reference, the transaction in RENTAS (developed in 1999) which was increased

from approximately 7,000 transactions per day in 2003 to 9,000 transactions per day in 2006, achieved 28.6%[25] growth in 3 years. PhilPaSS (developed in 2002) which was 812 transactions per day in Dec. 2003 became 1,847 transactions[26] per day in Dec. 2006, grew up more than twice in three years (31.6% annually). Meanwhile, BAHTNET (developed in 1995) raised its total transactions 17.3% in three years from 2000 to 2003[27].

Assuming an annual growth rate of 30% according to the growth rate of PhilPaSS (which has data just after the go-live of new system), the number of transactions will be 482.7 per day and 115,849 per year in 2023. If the fee is set to 1,000 MMK per transaction, the same as the current fee, the annual fee will amount to 115.8 million MMK. With the annual fee 65.1 million MMK, annual total fee will be 177.3 million MMK. In any case, it is believed that it is difficult to cover the entire maintenance and operation expenses required for CBM from fee collection alone. Moreover, cost for the replacement of the system after the go-live should be added in calculation also.

On the other hand, Since BOJ position BOJ-NET as a public infrastructure supporting the nation's financial market, BOJ bears the costs of development and maintenance of BOJ-NET. Similar to BOJ-NET, Bangko Sentral ng Pilipinas (BSP) is setting up a low price for PhilPaSS to encourage the oversea workers (OSW) which is supporting the economy of Philippines.

Currently, CBM maintains a strong financial position, thus it is possible to set low fee rates in early stage and aim for more participation in transactions from the viewpoint of providing an environment indispensable as the public infrastructure of the settlement system rather than trying to cover the operation and maintenance costs with setting the higher fee. Then it is possible to adjust the fee setting according to the economic growth in Myanmar. However, setting the fee rate is a matter to be determined in accordance with the policy and measures of CBM.

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[25] https://www.bnm.gov.my/files/publication/fsps/en/2010/cp04.pdf (statistics since 2002)
[26] http://www.bsp.gov.ph/financial/payment_stats.asp
[27] http://www2.bot.or.th/statistics/BOTWEBSTAT.aspx?reportID=436&language=ENG (statistics since 2000)

3.5 Project Initial Cost Estimation

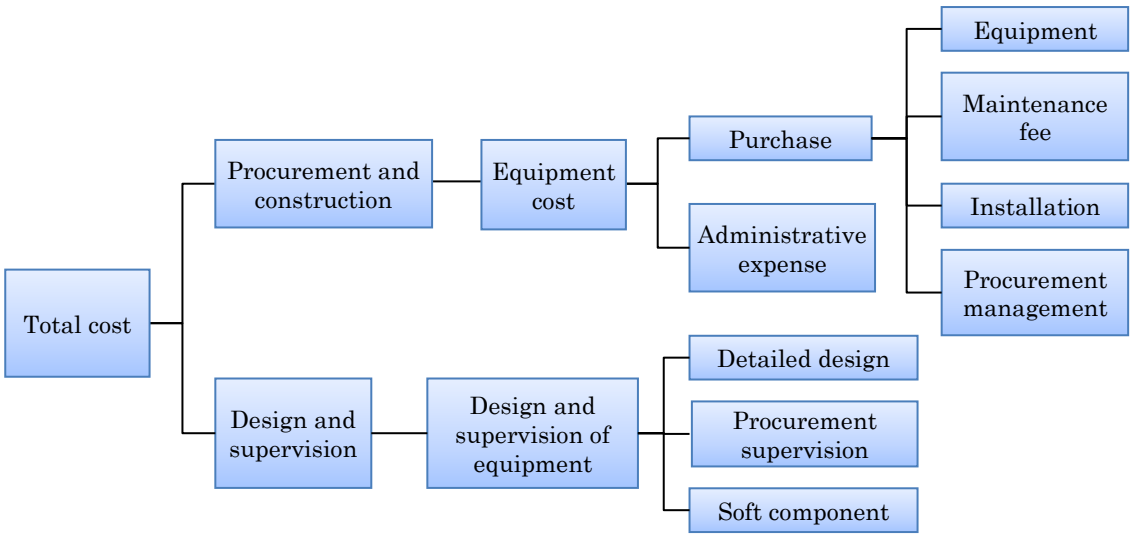
3.5.1 Initial Cost Estimation Breakdown

3.5.1.1 Policy for Cost Estimation

Cost estimations for goods and services to be procured under competitive tendering procedure batch were based on the quotations obtained from multi-potential vendors and suppliers. For goods and services planned to be procured under a single source method, the survey team examined the elements of the elaborated cost breakdown as provided by the single vendor and supplier.

3.5.1.2 Composition of the Project Cost

The project costs consist of the procurement cost and the project supervision cost. The procurement cost includes the purchase cost and indirect cost. The project supervision cost includes planning, procurement management, and soft components.



Source: Preparatory Survey Team

Figure 3-39 Composition of project cost

The total cost for the project to be borne by the Japanese ODA Grant Aid was calculated as approximately JPY 5.3 billion. The composition of the cost shows that 88% of the cost, i.e., JPY 4.67 billion, is the amount required for procurement and construction (purchase of equipment, applications, installations and other accompanying costs). The remaining 12% is the cost for design and supervision including soft components.

Any cost for the replacement of the system after the go-live will be borne by CBM.

Table 3-37 Project cost and breakdown

Item	Calculation	Amount in JPY million
TOTAL	1+2	5,279
1 Procurement and construction	(1)+(2)	4,648
(1) Purchase	(i)+(ii)+(iii)	4,648
(i) Equipment		3,373
(ii) Installation		0
(iii) Procurement management (*)		631
(2) Administrative expense (*)		381
2 Design and supervision	(3)+(4)	250
(3) Detailed design and Procurement supervision		5,279
(4) Soft component		4,648

Source: Preparatory Survey Team

(*) Procurement management and Administrative expense is included other elements of cost.

Cost structure by functions of the ICT system is as shown in the next table.

Table 3-38 Project cost breakdown by functions

Item	Amount in JPY million
TOTAL	5,279
1 Procurement and construction	4,648
CBM-NET applications	2,558
Infrastructure	2,071
Usage Charge for Container DC	19
2 Design and supervision	631

Source: Preparatory Survey Team

3.5.1.3 Cost for CBM-NET Applications Development and Relevant Equipment

3.5.1.3.1 Method for Cost Estimation

Cost for CBM-NET applications development and relevant equipment comprises three elements, which refer to equipment, maintenance fees, and installation. Although CBM-NET applications are software, these are classified as "equipment" just as with physical machines and parts.

The total cost is estimated by accumulating the required cost to develop each function of CBM-NET and other expenses relevant to system development. Installation costs include the expenses required for supporting the test done by CBM and executing migration from the current environment. Maintenance fee costs include the expenses required for getting the product support for three years after the system handing over to CBM in addition to the expense for development period.

3.5.1.3.2 Estimated Cost

Costs for CBM-NET development and relevant equipment amounts to approximately JPY 2.58 billion and are as described in the following table: Most of the cost is allocated as the equipment cost, which is the software development cost.

Table 3-39 Cost for CBM-NET development and relevant equipment

Item	Calculation	Amount in JPY million
TOTAL (procurement and construction)	(1)+(2)	2,558
(1) Purchase	(i)+(ii)+(iii)+(iv)	2,558
(i) Equipment		2,371
(ii) Installation		187
(iii) Procurement management		0
(2) Administrative expense		0

Source: Preparatory Survey Team

3.5.1.4 Cost for Infrastructure Development

3.5.1.4.1 Method for Cost Estimation

Infrastructure functions, which are mainly comprised of hardware equipment but include software for infrastructure functions, are planned to be procured under competitive tender procedures. Total costs for infrastructure function and relevant equipment include the following elements:

- Equipment
- Maintenance fees for products (including expenses for three years after handover)
- Installation
- Procurement management
- Administrative expenses

3.5.1.4.2 Estimated Costs

Total costs for infrastructure functions amount to approximately JPY 2.07 billion. One of the major costs is for HW and SW products, which are the equipment and maintenance fees. Maintenance fee includes expense for three years after project completion in addition to the development period (approximately 5 years in total). Another major cost element is for installation. This includes not only the installation of the system in the data center, but also installation of the network equipment in the offices of CBM and FIs.

Table 3-40 Cost for infrastructure development

Item	Calculation	Amount in JPY million
TOTAL (procurement and construction)	(1)+(2)	2,071
(1) Purchase	(i)+(ii)+(iii)	2,071
(i) Equipment		984
(iii) Installation		1087
(iv) Procurement management		0
(2) Administrative expense		0

Source: Preparatory Survey Team

3.5.1.5 Cost for Usage charge of Container DC

3.5.1.5.1 Method for Cost Estimation

This is the expense for using the additional three racks in the container data center for the Phase 2 development period for 20 months.

3.5.1.5.2 Estimated Costs

Total cost for container DC amounts to approximately JPY 0.02 billion.

Table 3-41 Cost for Container DC

Item	Calculation	Amount in JPY million
TOTAL (procurement and construction)	(1)+(2)	19
(1) Purchase	(i)+(ii)+(iii)	19
(i) Equipment		19
(ii) Installation		0
(iii) Procurement management		0
(2) Administrative expense		0

Source: Preparatory Survey Team

3.5.1.6 Cost for Project Supervision

3.5.1.6.1 Method for Cost Estimation

Project supervision cost includes two elements:

- Detailed design and Procurement supervision
- Soft component

Each of the elements consists of consultant remuneration and direct expenses.

The consultant remuneration is estimated for each consultant and task, which is defined by the statement of work. The project direct expense is accumulated by item of expenditures, travel, accommodations, and other expenses.

3.5.1.6.2 Estimated Cost

The estimation result of project supervision cost is shown in the following table. Total cost amounts to approximately JPY 630 million, among which detailed design and procurement supervision comprises JPY 360 million and soft component JPY 270 million.

Table 3-42 Cost for project supervision

Item	Amount in JPY million
TOTAL (project supervision)	631
(1) Detailed design and Procurement supervision	381
(i) Remuneration (including indirect cost)	277
(ii) Direct cost	104
(2) Soft Component	250
(i) Remuneration (including indirect cost)	197
(ii) Direct cost	53

Source: Preparatory Survey Team

4 Project Evaluation

4.1 Preconditions

4.1.1 Arrangement and preparation within CBM

ICT systems to be developed in this project will inevitably require CBM, as the executing agency, to make necessary arrangements within CBM to accommodate the systems. CBM will be required to make institutional arrangements for the following items:

- To make physical arrangement required to accommodate the systems
- To assign its internal institution responsible for service delivery by the system;
- To assign its internal institution responsible for operation and maintenance of the system;
- To secure budget for operation and maintenance of the system;
- To prepare necessary sets of internal rules for the operation of the systems.

4.1.2 Arrangement by CBM to mobilize the Government

An environment whereby CBM-NET can be serving the financial sector should be duly arranged through rules, new rules described in 3.3(3)(D) in particular.

4.1.3 Participation and cooperation of the FIs

FIs should be responsible for utilizing CBM-NET. The responsibilities should be exhibited by the FIs readiness to interact with CBM based on the rules set out by CBM. Examples are the requirement by CBM such as the preparation of STP connection with their CBSs or preparation for cheque truncation

.

4.2 Necessary Inputs by Recipient Country

Two major elements for this project which will be required for the Myanmar side to pursue are: (i) development of rules and regulations to enable the service provision of CBM-NET, and (ii) setting up of appropriate environment for installation of the ICT systems.
In particular, it is as descripted in 3.3.

4.3 Important Assumptions

Externalities that may seriously affect the implementation of the project lies mostly with the situation and policies of the stakeholders such as the MOF, commercial banks, state owned banks and telecommunication service providers. There is also a competition factor which should be taken into account.

- The necessary human resource for O&M will not assigned by CBM;
- Myanmar government change the basic policy related to modernization of financial sector;
- Core Banking System of FIs not implemented as expected;
- Necessary O&M cost will not be prepared by CBM;

The project should be implemented under assumptions that the above will not occur. Risks on whether such may occur should therefore be closely monitored

4.4 Project Evaluation

4.4.1 Relevance

Following the first project of CBM, the number of bank accounts grew by more than 10% per year along with economic development in Myanmar, and financial transactions are rapidly increasing and becoming more diversified, as seen in the introduction to mobile banking services, etc. Against this backdrop, the need for enhanced functionality of CBM-NET is increasing, such as improvement of

settlements by direct connections between CBM-NET and each commercial banking system, as well as the liquidity saving function, and handling point-in-time settlements to respond to the needs for small-lot transfers by mobile banking and internet banking. Also, it is necessary to promote responses to international trends in Myanmar, such as ISO 20022, the international standard for financial service transactions, and the principle for financial market infrastructure (PFMI).

With an aim to facilitate financial transactions, what the Myanmar government positions as important initiatives are to respond to increasing and diversifying financial transactions by expanding the function of the Myanmar Central Bank's funds and securities settlement system, and to comply with international standards.

In the policies for economic cooperation to Myanmar enacted in April 2012, Japan considers support for improving the capacity of human resources supporting the economy and society, and for establishing institutions as one of the priority areas. Also, in the Japan-Myanmar Cooperation Program announced in November 2016, financial system development support is listed as one of the nine pillars. This project is consistent with these policies and will contribute to the stabilization and facilitation of the financial transaction in Myanmar by expanding the settlement system of the central bank of Myanmar, and it is highly likely that the grant aid will support this project.

4.4.2 Effectiveness

4.4.2.1 Expected Effects

The effects to be brought by the second project are as follows:

- Transactions between FIs become more active.
- CBS implementation in Myanmar FIs will increase and networking of financial systems will be promoted.

With the above effects, lending of funds to businesses and individuals by commercial banks is also promoted, contributing to the economic development in Myanmar. Indicators for measuring effectiveness are set as a means for confirming the effect of

the performance of the project. These indicators can be categorized into quantitative indicators (measurable by numerical value) and qualitative indicators (unmeasurable by numerical value).

4.4.2.2 Quantitative indicators

(1) Settlement amount on CBM-NET

The settlement amount per day processed on CBM-NET is 6,610 (hundred million MMK) at present, and is expected to grow to 12,438 (hundred million MMK) after the implementation of the second project (assumed to be three years from the completion of project in 2023).

In particular, as current Phase 1 system will be used continuously, it is deduced to increase according to the current growth rate (10.3% per year) until 2013. Meanwhile, after the go-live of CBM-NET Phase 2, by the solution of current barrier avoiding from using CBM-NET and the utilization of STP, an interbank transfer services which are covered by CBM-NET Phase 2 will be conducted on the CBM-NET. Therefore, the settlement amount on CBM-NET will increase in proportion of Myanmar's GDP growth prediction (13.95% per year[28]). In result, the average settlement amount on CBM-NET will be raise up to 12,438 (hundred million MMK) per day in 2023.

表 4-1 Growth of the settlement amount on CBM-NET

Year	2018	2019	2020	2021	2022	2023
Growth rate (per year)	10.3%	10.3%	10.9%*	13.95%	13.95%	13.95%
Settlement amount (hundred million MMK per day)	6,973	7,692	8,490	9,579	10,915	12,438

* 10.3% per year growth until the go-live of CBM-NET Phase 2 (Oct. 2020), 13.95% per year growth after the go-live.

[28] On the assumption that GDP growth based on 6 year growth average including latest GDP growth which is announced after IMF Article IV Consultation with Myanmar (Jan. 25, 2017)

(2) Number of FIs implementing STP connection

For implementing STP connection, the applicable FI needs to have a CBS prepared. Currently, major commercial banks have introduced a CBS, and according to the survey, about 1/3 of banks are developing or planning it. In particular, 13 banks out of 40 answered that the CBS is already developed and capable (and wish) to connect STP. However, 4 banks out of those 13 banks could not answer actual or too long (more than 2 years) duration for modification of CBS to connect, so that currently 9 banks are surely possible to connect via STP.
Given this situation, it is expected that about 9 banks will have STP connection by 2023.

Table 4-1 Capability for connection to CBM-NET via STP

(n=40)		Development of CBS	
		Done	Not yet
Capability to connect via STP	Capable (not actual)	13* (4)	3
	Not Capable	10	14

* 4 FIs out of 13 answered the necessary period too long (more than 2 years) or not actual.

Table 4-2 Quantitative target indicators

Indicator name	Reference value (Actual value in 2017)	Target value (2023) [Three years after project completion]
Settlement amount on CBM-NET (hundred million MMK MMK per day)	6,610	12,438
Number of FIs implementing STP connection	0	9

4.4.2.3 Qualitative indicators

The qualitative effects of CBM-NET's second project are as follows:

- Improvement of efficiency in settlement operations by the commercial banks

- Improvement in system availability
- Improvement of the implementation status of the principle of financial market infrastructure (PFMI)
- Revitalization of interbank transactions (increased transactions in the money market and the capital market)
- Stabilization of the financial system

(1) Improvement of efficiency in settlement operations by the commercial banks

At commercial banks that shifted to STP, it used to be required to enter settlement information into CBM-NET after the internal payment process. Operation efficiency improves because these tasks are automated by STP. In addition, CBM-NET also supports the international standard format, so it is easier to design procedures when processing received messages at the bank. Moreover, optimization of work (such as the efficient use of deposit by introduction of LSF, reduction of re-sending instruction by queueing function, avoiding of manual works by introduction of automatic data exchange function) will be offered to all FIs in Myanmar.

(2) Improvement in system availability

Since CBM-NET's business continuity site for disaster recovery is prepared, even if the main site in Yangon suffered damage, the data center in Nay Pyi Taw can take over the settlement processing; thus, the commercial banks can continue settlement. The development of FI's DR site will be promoted by the implementation of CBM's DR site since it will provide the direction for the development.

(3) Improvement of the implementation status of Principles for financial market infrastructures (PFMI)

CBM and some commercial banks will secure the operational safety of settlement through the development of disaster recovery sites and back-up systems. This is not just an improvement of the information system, but also a review including the system and procedure of the administrative operation. Such arrangement will lead to a reduction in settlement risk pointed out by PFMI.

(4) Revitalization of interbank transactions (increased transactions in the money market and the capital market)

The money market will be revitalized because of the progress of lending and borrowing between FIs, and so capital procurement by FIs and companies will lead to the fostering of capital markets.

(5) Stabilization of the financial system

The functions such as STP or LSF with queueing will be implemented by Phase 2. These functions will promote funds settlement between FIs., The financial system in Myanmar will be more stabilized by the improvement of transactions on stable platform provided by CBM, instead of current settlement situation which is limited to cash or transactions among few FIs.

Appendix 1

Member List of the Study Team

Appendix 1 Member List of the Study Team

1	Takashi Nakamura	Senior Consultant ICT and Media Strategy Group, Social ICT Innovation Division Mitsubishi Reserch Institute, INC.
2	Hiroshi Nishioka	Chief Consultant Regional and Public ICT Group, Social ICT Innovation Division Mitsubishi Reserch Institute, INC.
3	Akihiro Emi	Managing Diractor, Promontory Financial Group Gloval Services Japan, LLC
4	Akihito Koizumi	Senior Principal, Promontory Financial Group Gloval Services Japan, LLC
5	Keita Abe	Principal Consultant, Project Management Department OPMAC Corporation
6	Tetsujoh Awae	Senior Research Associate ICT and Media Strategy Group, Social ICT Innovation Division Mitsubishi Reserch Institute, INC.
7	Tomohiro Sawada	Senior Principal, Promontory Financial Group Gloval Services Japan, LLC
8	Ken Nishitani	Associate Certified Architect, Digital Innovation IBM Japan System Enginering Co., Ltd.
9	Kenichiro Saito	Advisory IT Specialist, Delivery #4, Networking Service, IS Delivery, GTS IBM Japan System Enginering Co., Ltd.
10	Zin Nien Oo	Advisory IT Specialist, IBM Japan System Enginering Co., Ltd.
11	Toshiyuki Imazeki	Senior Consultant Regional and Public ICT Group, Social ICT Innovation Division Mitsubishi Reserch Institute, INC.

Appendix 2

Study Schedule

Appendix 2 Study Schedule

YGN survey　NPT survey　MDY survey　Other country survey

June	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Takashi Nakamura																													
2	Hiroshi Nishioka																													
3	Akihiro Emi																													
4	Akihito Koizumi																													
5	Keita Abe																													
6	Tetsujoh Awae																													
7	Tomohiro Sawada																													
8	Ken Nishitani																													
9	Kenichiro Saito																													
10	Zin Nien Oo																													
11	Toshiyuki Imazeki																													

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September	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
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10	Zin Nien Oo																													
11	Toshiyuki Imazeki																													

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Appendix 3

List of Parties Concerned in the Recipient Country

Appendix 3 List of Parties Concerned in the Recipient Country

CBM	
Bo Bo Nge	Deputy Governor
Set Aung	Deputy Governor (former)
Than Than Swe	Director General, PSSD & FMD
Khaing Shwe War	Deputy Director General, Accounts Department

CBM (Working Group member for CBM-NET)	
Nwe Ni Tun	Direct, FMD
Kyi Moe Moe Aye	Deputy Director , PSSD
Phyu Pyar	Deputy Director , PSSD
Su Su Nwe	Deputy Director , FMD
Ko Ko Aung	Deputy Director , CMD
Kyi Kyi Oo	Assistant Director, FMD
May War Moe	Staff Officer , FMD
Myat Myat Maw	Staff Officer , PSSD
Khin Soe Myat	Staff Officer , FMD
Aye Mya Nyein	Staff Officer , FMD
Than Than Sint	Staff Officer , PSSD
San Myint Lwin	Staff Officer , CMD
Pyei Pyei Phyo Myint	Office Supertendant , PSSD
Swe Swe Win Shein	Office Supertendant , PSSD

CBM (Working Group Member for IT)	
Khin Nwet Aung	Deputy Director , AHRD
Soe Hlaing	Assistant Director , AHRD
Nilar Htwe	Assistant Director , AHRD
May Thu Win	Assistant Director , AHRD
Sabal San	Staff Officer , AHRD
Thazin Tun	Staff Officer , AHRD
Thandar Aung	Staff Officer , MDY Br.
Aye Aye Myo	Staff Officer , AHRD

Aya Bank	
Thet Su Naing	Director, Treasury Department
Minn Wint Oo	Deputy Managing Director , IT & Nanking Operations Division
Bryan Kuan	Senior General Manager
Joe Barker Bennett	Senior General Manager, Head, Channel Management
Myat Myat Moe	Senior General Manager

KBZ Bank	
Swe Swe Thin	Deputy General Manager, ICT Department

CB Bank	
Wai Phyo Aung	Chief Technical Officer
Zaw Min Thant	Deputy Head, Consumer Banking Division

YOMA Bank	
Mike Phone Myint	Head of IT
Kyi Pyar	Deputy Head, Treasury Department
Nyan Myint Aung	Deputy Head, Branch Operation Department
Ba Maung Sein	Chief Operations Officer

Yadanarbon Bank	
Moe San Oo	Assistant General Manager

Naypyitaw Sibin Bank	
Soe Htun	Deputy Managing Director, Zubuthiri Br
Moe Moe	GM, HO (Banking)
Phyo Phyo Thoe	GM, Zubuthiri Br.
May Khin Chaw	Assistant GM, HO (IT)
Lwin Lwin Aye	Manager, HO (IT)
Zin Zin Htun	Manager, HO (Banking)
Kyi Phyo Thet	Assistant Manager, HO (Banking)

Myanma Economic Bank	
Nang Hkwe Ngunt	Deputy General Manager, Research
Phyu Phyu Hlaing	Deputy General Manager, Accounts
Shin Htwe Nyan Win	Assistant General Manager, Int'l Ralations Dept.
Kay Thwe Soe	Assistant General Manager, Accounts
Moe Thi Dar	Manager, Research
Mag Zon Soe	Manager, Research
Mi Mi Khaing	Manager, Accounts
Ei Ei Thein	Assistant Manager, Accounts
Mar Mar Htay	Assistant Manager, Accounts
Su Yee Phyo	Supervisor, Accounts
Nyein Chan Wai	Deputy Supervisor, Accounts
Nehin Aung	Assistant Manager, Research

ANZ (Myanmar)	
Rajesh Ahuja	Chief Executive Officer, Myanmar Branch
Pradeep Pai Sasthan	Operations Manager, Myanmar Branch
Steve Goh	Head of Operation, Myanmar Branch
Aye Htet Htet Oo	Assistant Manager, Trade Operations

SMBC	
Toshiyuki Ataka	Joint General Manager
Tatsuro Koizumi	Head of Treasury Department

BTMU	
Yoshiki Iriyama	Deputy General Manager

Aeon Credit Service	
Mitsuru Suzuki	Chief Representative

MIZUHO	
Hiroshi Ishikawa	Head of Operations & General Affairs
Susumu Furukawa	Head of Administration & Planning Department

Bank of Papua New Guinea	
Gaona Gwaibo	Manager (Payment Systems Dept.)

ANZ (PNG)	
Venkatraman Ramamurthy	Manager, Operations

Australian Payment Network	
Paul Anguita	Manager, Member engagement
Trish Mcginness	Manager, Compliance
Lynda Gajic	Manager, Member service

New Payments Platform (Australia)	
Jason Krebs	Executive Manager, Engagement
Tina Meizer	Assistant Manager, Engagement

Wave Money	
Brad Jones	Chief Executive Officer
Justin Hadgkiss	Head of Technology & Operation
Kyaw Than Aung	Head of Government Relations & Strategic Partnership
Arvinder Singh Grewal	Head of Sales, Distribution & Customer Services

UNCDF	
Paul Luchtenburg	Country Cordinator

NETSYS	
Raymond Chuah	IT consultant
Zarni Yun	Tech Manager
Soe Myat Phoo	Sales
Chaw Su Su Thwe	Sales

NEX4	
Aung Thu Rein	Managing Director

Appendix 4

Minutes of Discussions

(Body of M/D)

Minutes of Discussions
on the Preparatory Survey for the Project for
Development of ICT System for Central Banking (Phase 2)
in Republic of the Union of Myanmar
(Explanation on Draft Preparatory Survey Report)

With reference to the minutes of discussions signed between the Central Bank of Myanmar and the Japan International Cooperation Agency (hereinafter referred to as "JICA") on July 27, 2017 and in response to the request from the Government of Republic of the Union of Myanmar (hereinafter referred to as "Myanmar") dated August 28, 2017, JICA dispatched the Preparatory Survey Team (hereinafter referred to as "the Team") for the explanation of Draft Preparatory Survey Report (hereinafter referred to as "the Draft Report") for the Project for Development of ICT System for Central Banking (Phase 2) in Republic of the Union of Myanmar (hereinafter referred to as "the Project"), headed by Mr. Kensuke Tsuji, Director, Industry Development and Public Policy Department, JICA, from December 5 to December 7, 2017.

As a result of the discussions, both sides agreed on the main items described in the attached sheets.

Nay Pyi Taw, December 8 , 2017

Mr. Kensuke Tsuji
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

U Bo Bo Nge
Deputy Governor

Central Bank of Myanmar
Republic of the Union of Myanmar

ATTACHMENT

1. Objective of the Project, Title of the Preparatory Survey, Project site, Responsible authority for the Project, Procedures and Basic Principles of Japanese Grant
   Both sides confirmed the above captioned subject unchanged from those agreed in the Minutes of Discussions signed on July 27, 2017, as attached in Annex 1.

2. Contents of the Draft Report
   After the explanation of the contents of the Draft Report as attached in Annex 2 by the Team, the Myanmar side agreed to its contents.

3. Cost estimate
   Both sides confirmed that the cost estimate described in the Draft Report is provisional and will be examined further by the Government of Japan for its approval.

4. Confidentiality of the cost estimate
   Both sides confirmed that the cost estimate in the Draft Report should never be duplicated or disclosed to any third parties until all the contracts under the Project are concluded. The Preparatory Survey Report from which project cost is excluded will be disclosed to the public after completion of the Preparatory Survey.

5. Timeline for the project implementation
   The Team explained to the Myanmar side that the expected timeline for the project implementation is as attached in Annex 3.

6. Expected outcomes and indicators
   Both sides agreed that key indicators for expected outcomes are as follows. The Myanmar side will be responsible for the achievement of agreed key indicators targeted in year 2023 and shall monitor the progress based on those indicators.

[Quantitative indicators]

Indicator	Baseline (2017)	Target (2023)
Settlement amount by CBM-NET (billion MMK/day)	570*	1,090*
Financial Institutions with STP** connection	0	9

*The amount is subject to change when the annual transaction results of 2017 are confirmed.

**STP represents Straight Through Processing.

[Qualitative indicators]

- promoting efficient settlement business of Financial Institutions
- improving operability of ICT systems for settlement
- establishing settlement system in accordance with Principles for Financial Market Infrastructures (PFMI)
- enhancing banking business (e.g. increasing transactions in money and capital markets)
- stabilizing financial system in Myanmar

7. Undertakings of the Project

Both sides confirmed the undertakings of the Project as described in Annex 4. With regard to exemption of customs duties, internal taxes and other fiscal levies as stipulated in 1.(2)5 of Annex 4, both sides confirmed that such customs duties, internal taxes and other fiscal levies include VAT, commercial tax, income tax and corporate tax, which shall be clarified in the bid documents by the Central Bank of Myanmar (hereinafter referred to as "Executing Agency") during the implementation stage of the Project. For smooth implementation of the Project and proper use and maintenance of the facilities constructed and equipment provided under the Grant Aid after the Project, the Executing Agency shall take the necessary measures stipulated in Annex 4.

The Myanmar side assured to take the necessary measures and coordination including allocation of the necessary budget which are preconditions of implementation of the Project. It is further agreed that the costs are indicative, i.e. at Outline Design level. More accurate costs will be calculated at the Detailed Design stage.

Both sides also confirmed that the Annex 4 will be used as an attachment of G/A.

8. Monitoring during the implementation

The Project will be monitored by the Executing Agency and reported to JICA by using the form of Project Monitoring Report (PMR) attached as Annex 5. The timing of submission of the PMR is described in Annex 4.

9. Project completion

Both sides confirmed that the project completes when all the equipment and services under the Grant Aid are in operation. The completion of the Project will be reported to JICA promptly, but in any event not later than six months after completion of the Project.

10. Ex-Post Evaluation

JICA will conduct ex-post evaluation after three (3) years from the project completion, in principle, with respect to five evaluation criteria (Relevance, Effectiveness, Efficiency, Impact, Sustainability). The result of the evaluation will be publicized. The Myanmar side is required to provide necessary support for the data collection.

11. Other Important Issues

Both sides confirmed the items and measures to be considered for the smooth implementation of the Project as follows:

- The Executing Agency will arrange and coordinate internally and externally for making decisions in a timely manner.
- The Executing Agency will estimate expenses and secure budget for items listed in Annex 4 such as securing space and facilities necessary for installing equipment for the disaster recovery system and in the container data center. Preparation schedule for the items will be planned in reference to instruction stipulated in Annex 2. Estimated cost for installing facilities for disaster recovery center and for establishing WAN connections will be shared with JICA by mid February, 2018.
- The Executing Agency will determine whether to use current container data center and will update JICA about the results before notice of the bidding documents.
- The Executing Agency will bear any cost for expansion, upgrade or replacement of both the facilities constructed and equipment provided under

the Grant Aid and the systems outside the scope of the Project such as CBM-OA, MCH, and Accounting System.

Annex 1 Minutes of Discussions (signed on July 27, 2017)
Annex 2 Draft Summary of the Outline Design Report
Annex 3 Project Implementation Schedule
Annex 4 Major Undertakings to be taken by the Government of Myanmar
Annex 5 Project Monitoring Report (template)

Appendix 5

Soft Component Plan

Appendix 5 Soft Component Plan

Republic of the Union of Myanmar
Central Bank of Myanmar

Preparatory Survey for the Project for Development of ICT system for Central Banking (Phase 2)

Soft Component Plan

November 2017

Mitsubishi Research Institute, Inc.
Promontory Financial Group Global Services Japan, LLC

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2. **Objective of Soft Component** **2**
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Prerequisite

Central Bank of Myanmar is expected to establish the new guide line, and relevant rule in accordance with the Myanmar low, regarding cheque truncation. This Soft Component (Management Guidance) plan is based on the assumption that CBM provides all the necessary institutional design and rule to operate cheque truncation, asking for support from Technical Cooperation Team of JICA if necessary.

1. Background of the Soft Component Plan

1.1 Outline of the ICT System Development Project

The settlement system of Central Bank of Myanmar (hereinafter "CBM-NET") has been commenced since January 2016 and resulted in the activity of "The Project for the Development of ICT System for Central Banking Phase 1 (hereinafter "The 1st. Development").
While CBM-NET is operated smoothly, additional requirement to improve the functions such as adoption of international standards, STP (Straight Trough Processing), and measures for disaster recovery. Thus, JICA had decided to start "Preparatory Survey on the Project for the Development of ICT System for Central Banking Phase 2" to find the necessary system functions. In accordance with the survey results, JICA has a plan to organize "The Project for the Development of ICT System for Central Banking Phase 2" (hereinafter "The 2nd. Development") in 2018, and additional system functions will be implemented in accordance with the requirement definition agreed by Myanmar side and Japanese side.

The project aims to modernise the business operations at the Central Bank of Myanmar (hereinafter CBM). To complete the objective, in addition to the system development administration, it is required to prepare the business manuals, conduct training for both CBM and financial institutions (FIs), and support the contract between CBM and operation & maintenance providers. The soft component program will cover those activities.

1.2 Necessity of executing soft component

The 2nd Development covers adaptation of ISO20022, STP, cheque truncation, and measures for disaster recovery. These upgrades of CBM-NET will not only cover computer system modifications, but entire business process which consists of business flow, rules, and modification among the FIs including CBM. For example, FIs will deal with business transactions by their own core system and interface the data to CBM-NET automatically, throughout the business, the procedure of the settlement will be entirely changed.

As same as the 1st. Development, this project focuses on fund settlement, securities settlement, therefore these all occupy crucial positions regarding 1) accuracy 2) sustainability, and 3) universality. Any error or outage of these functions will immediately affect the Myanmar economy.
To achieve these crucial businesses modification, it is essential to explain the business and system modification background, support for manuals preparation, and training to CBM and FIs.

2. Objective of Soft Component

Merely constructing, supplying, and showing how to operate an ICT system does not ensure its continuous usage. The first objective of the Soft Component is to ensure a smooth start-up of the system by CBM, into an autonomous and sustainable utilization and operation status.

The immediate objective is to ensure operational, technical, and stable start-up of the system which will be launched in April 2020, by 1) preparing the manuals, 2) conducting trainings, 3) conducting explanations and trainings for commercial banks who are the actual users of the system, and 4) supporting the setup of a sustainable operation and maintenance of the system even after the completion of the grant aid assistance, i.e. after the entry into service of the system.

Business changes rapidly depending on the new legislatures, the status of the economy etc. And also, as the system must evolve in response to any additional business demands and technology progress, etc. the Soft Component will also aim to create an environment where the initial basic structure of the ICT system at the entry into service will be sustainably maintained.

3. Soft Component Deliverables

Smooth start-up of CBM-NET will be ensured by conducting the Soft Component in response to the 2nd Development. In light of the objectives mentioned above, concrete deliverables from the Soft Component will be as follows:

1) Preparing the manuals
   Based on laws and regulations and the institution of CBM, a detailed business plan is required to enable precise and efficient business operations.
   The assured quality and quantity of the manuals makes for appropriate usage and operation of the CBM-NET in response to the 2nd Development.
2) Training (tutorial / user education)
   Officers of CBM are provided with training of sufficient quality and quantity to become capable to conduct the business utilizing the system appropriately;
3) Commercial bank support
   Users at the commercial banks are provided with training of sufficient quality and quantity to become capable of conducting the business utilizing the system appropriately.
4) Maintenance & operation support
   Operational plans for the running of the system after start-up are developed and utilized.

4. Evaluation of deliverable completion

Soft Component deliverables are broadly divided into quantitative and qualitative as follows:

4.1 Quantitative effect

(1) Smooth start-up of the System

Following indicators will be measured during the running test period: The aim will be to improve the indicator values compared with the start and the end. Target of the indicator values will be set in consultation with the stakeholders, at the start of running test period, aiming at a level where business can be achieved without difficulty (CBM-NET).

- Reduction of the number of business operation errors (which are the number of incorrect data inputs that are corrected by reverse transaction inputs; overall business mistakes, which are found and adjusted by multiple checking procedures are not counted.)
- Reduction of the number of system operation mistakes

(2) System continuity

The status of manual preparation and training delivery are measured as indicators. The manuals are expected to be prepared prior to the entry into service of the ICT system. However, even in the case where some part of the manuals is not prepared in time, entry into service may be deemed appropriate under condition that the consultant determines that this incompletion is already being addressed (e.g. documentation is delayed but running test results confirm that operation can be conducted without any concerns for utilization). In such cases, the unachieved issues will be addressed as part of CBM's autonomous program of continuous technical improvement.

- Status of manual preparation
  Target: In order to run CBM-NET daily operation continuously, the minimum set of manuals (NB1) is specified, and the preparation status of the necessary manuals is reported.
  (NB 1): status that manuals for cheque truncation, fund management (MMK), fund management (foreign currency), credit and collateral management, bond management, bond transfer, common business operations for CBM, and disaster recovery

  Indicator: Manual preparation status = number of prepared manuals / total number of manuals to be prepared

- Status of training
  Target: Adequate trainings and briefings are conducted for the bank officers identified in CBM and in commercial banks as the users of the ICT system. At CBM this means at least 2 officers from each branch or HQ where there is a department that either operates or uses the system for business. In the case of the commercial banks, this means at least 2 officers from each branch using CBM-NET.
  Indicator: Status of training = number of officers trained / total number of officers to be trained.

- Understanding of the training
  Target: officers of CBM and the commercial banks properly understand the training and briefing they have been given. Responses to the CBM-NET basic outline's 5 stage evaluation (1. Completely understood; 2. Mostly understood; 3. Basically understood; 4. Some parts not understood; 5. Not understood) (NB 2) must be 3 or above.
  (NB2) Questionnaire evaluation items and evaluation parameters are to be reappraised during the period of operation
  Indicator: Check understanding by questionnaire.

4.2 qualitative effect

(1) Establishment of a business operating system

CBM's establishment of business operating system (organisational structure, segregation of duties, definition of authority, adequate staff retention, etc) related to CBM-NET and MCH is confirmed by organisational chart and on-site verification.

Compared with the 1st. Development, it is not required to change the existing organizational structure for the business and system operation of the 2nd Development, but required to establish additional business and system organizational functions. For example, followings are expected to be arranged, for more, detail will be discussed in the business planning.

- Organizational structure for cheque truncation operation. (for the time being, it is required to operate cheque truncation and Mechanical Clearing House (hereinafter "MCH") in parallel.

- Organizational structure for disaster recovery. (Set up the Head office for the disaster recovery, establishment of the alternative organizational structure, business flow, and rule when all the business function of Yangon branch has suspended, and etc.)

- Establish organizational structure and functions in accordance with the additional system functions such as Straight Though Processing (hereinafter "STP"), Liquidity saving features (hereinafter "LSF"), and Automated Clearing House (hereinafter "ACH").

- Establish business flow, monitoring organization, and responsibility of the relevant organization for alert and dash-board system functions.

- Establish organizational structure in accordance with the enhancement of operation hours for transaction data input.

The establishment of the organization will be confirmed though the running tests of the system which will be conducted in the actual organization.

(2) Establishment of a system maintenance management structure

Confirm the construction of a system maintenance structure (made up of system-related department within CBM and of outsourced system-related contractors) shall be emphasized in the 2nd Development.

First, as for disaster recovery, it is necessary to confirm the followings by reviewing the organization chart in the operation manuals as an output of manual preparation, and observing the actual assignment of the staffs in the running test.

- Establishment of the organizational structure of CBM for disaster recovery site.

- Establish the judgment for the recovery site, authority, and approval process.

- Establish the system evacuation process to the recovery site.

- Establish the communication process and rue with FIs.

- Plan the regular evacuation drill.

Sustainable operation structure of CBM will be confirmed as follows. As for (a), it will be confirmed by the description of the operation manuals. As for (b) and (c), it will be confirmed by observing the application maintenance structure of CBM if the ratios of outsourcers are decreased.

(a) The work flow definition for the incident which is in-house oriented.

(b) Assist for the demarcation of CBM and system developer for the regular system operation work.

(c) Support CBM to define the role and responsibility of the system, to maintain by its own staffs, using master table administration and programs equipped with selective parameter.

The demarcation of the consultant and system developer will be defined as followings.

Consultant;

- System Design Phase; Guide CBM to define the work scope of CBM for system operation work.

- System design confirmation; Confirm it is equipped with the system maintenance function so as to maintain by CBM.

- Support to define organisational structure, segregation of duties, definition of authority, definition of insource / outsource.

The system developer;

- Prepare the system operation manuals which describe operation of the facility, explain the system console operation, show measures against alerts, and etc.

The activities mentioned above focus on the scope of the 2nd Development. In the case of the facility which is handed over from the 1st Development and use for the 2nd Development are in the scope. MCH and CBM-OA are excluded.

5. Soft Component activity (input plan)

5.1 Executing structure

The executing structure is illustrated as below. Total of 11 members headed by the Operation Support Leader are planned to be assigned. Of all these, 6 officers are to be business and application-related.

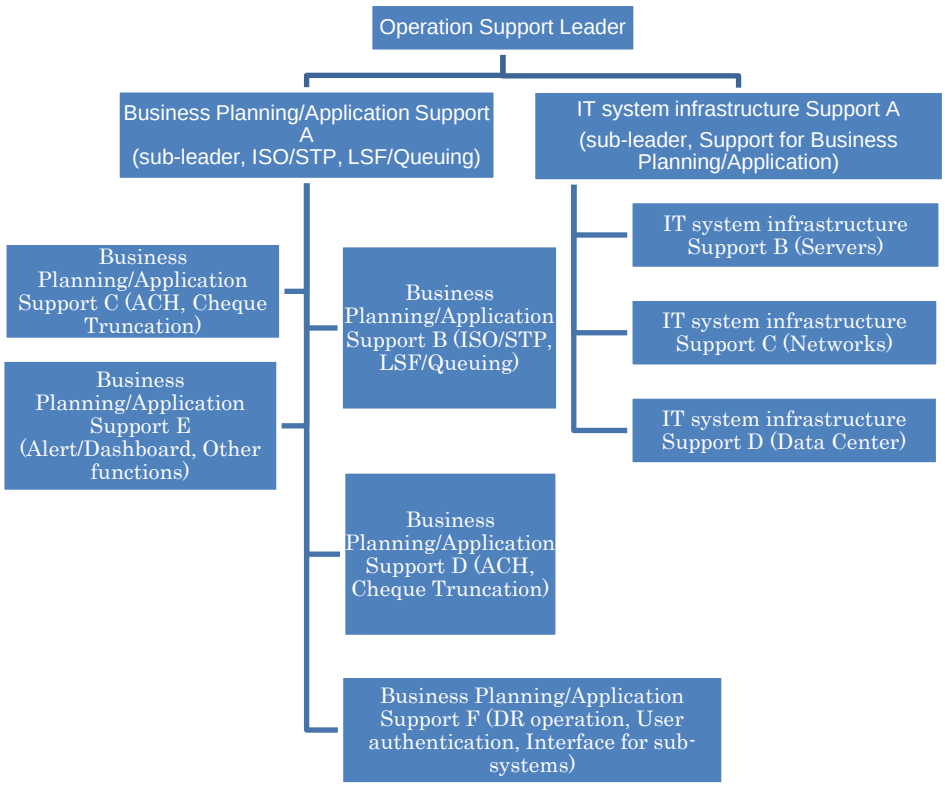

Figure 5-1 Execution Structure

The role of Business Planning/Application member is to ensure that the CBM-NET functions implemented in Phase2 can be utilized by all users concerned, including those at the commercial banks, under the recipient country's rules and regulations, and to advise on the corrections as necessary. The task will also include support and giving advice, related to any system alterations deemed necessary to be instigated by the CBM. As this responsibility requires extremely specialized knowledge of financial and settlement systems and the scope of Phase2 covers a broad range of topics, ISO/STP, LSF/Queuing, ACH, cheque truncation, alert/dashboard, DR operation, user authentication, interface for sub-systems, 6 persons shall be assigned.

The assignments of each member are as follow.

- Business Planning/Application Support A: Sub-leader, ISO/STP, LSF/Queuing
- Business Planning/Application Support B: ISO/STP, LSF/Queuing
- Business Planning/Application Support C: ACH, Cheque Truncation
- Business Planning/Application Support D: ACH, Cheque Truncation
- Business Planning/Application Support E: Alert/Dashboard, Other functions
- Business Planning/Application Support F: DR operation, User authentication, Interface for sub-systems

.

Furthermore, 4 persons are assigned to IT system infrastructure support. Due to the divergence and sophistication of the ICT systems, the specific tasks of each field require a high degree of expertise with the consultants. The 4 fields of sub-leader and support for business planning/application, servers, networks, and data centre, each need their own personnel.

5.2 Execution process and task definition

The design and supervision (detailed design, procurement supervision) and Soft Component tasks are carried out as in the table below. The Soft Component are the tasks numbered from 12 through to 15 (four tasks namely 12.1, 14.5, 15.2, and 15.3 are design and supervision tasks). And, the task numbered 11 is excluded from the scope of soft component, because this is executed in the scope of technical cooperation project,

Table 5-1 List of Tasks

Detailed design Procurement Supervision	1. Final approval for plan contents 2. Bidding support 3. Contract support 4. Logistics 5. Confirmation of specifications 6. Judgment of PT completion 7. Running test support 8. Support for decision to commence service 9. Rehearsal 10. Development supervision
	11. regulations/rules 11.1 Support for settlement systems policy development 11.2 Support for promotion to use CBM-NET 11.3 Support for BCP policy development 11.4 System security policy development 11.5 Operation rules for the data center 11.6 Support for renewal of the rules for oversight of commercial banks 11.7 Regulations, rules and operation policy for cheque truncation 11.8 Support for consideration in the CBM for DR site development 11.9 Support for consideration in the CBM for WAN development
Soft Component	12. Manuals 12.1 Operation manual review 12.2 Business plan / manual review and support for creation 12.3 System operation manual review and support for creation 12.4 DR operation manual review and support for creation 13. Training / user education 13.1 Training plan production 13.2 Training materials preparation 13.3 Training-related logistics support 13.4 Providing the training programs 14. Commercial banks support 14.1 Drafting of briefing plan 14.2 Briefing materials preparation 14.3 Support for briefing meetings 14.4 Support for testing with FIs 14.5 Support for equipment installation 15. Maintenance /operation support 15.1 Maintenance / operation plan 15.2 Scrutiny of the contract contents 15.3 Contract support 15.4 Maintenance / operation follow-up

5.2.1 Execution process

This work schedule shows the execution process for the project.
And the project execution schedule chart that shows the detail schedule of tasks in Japan and in Myanmar is attached as Attachment 1.

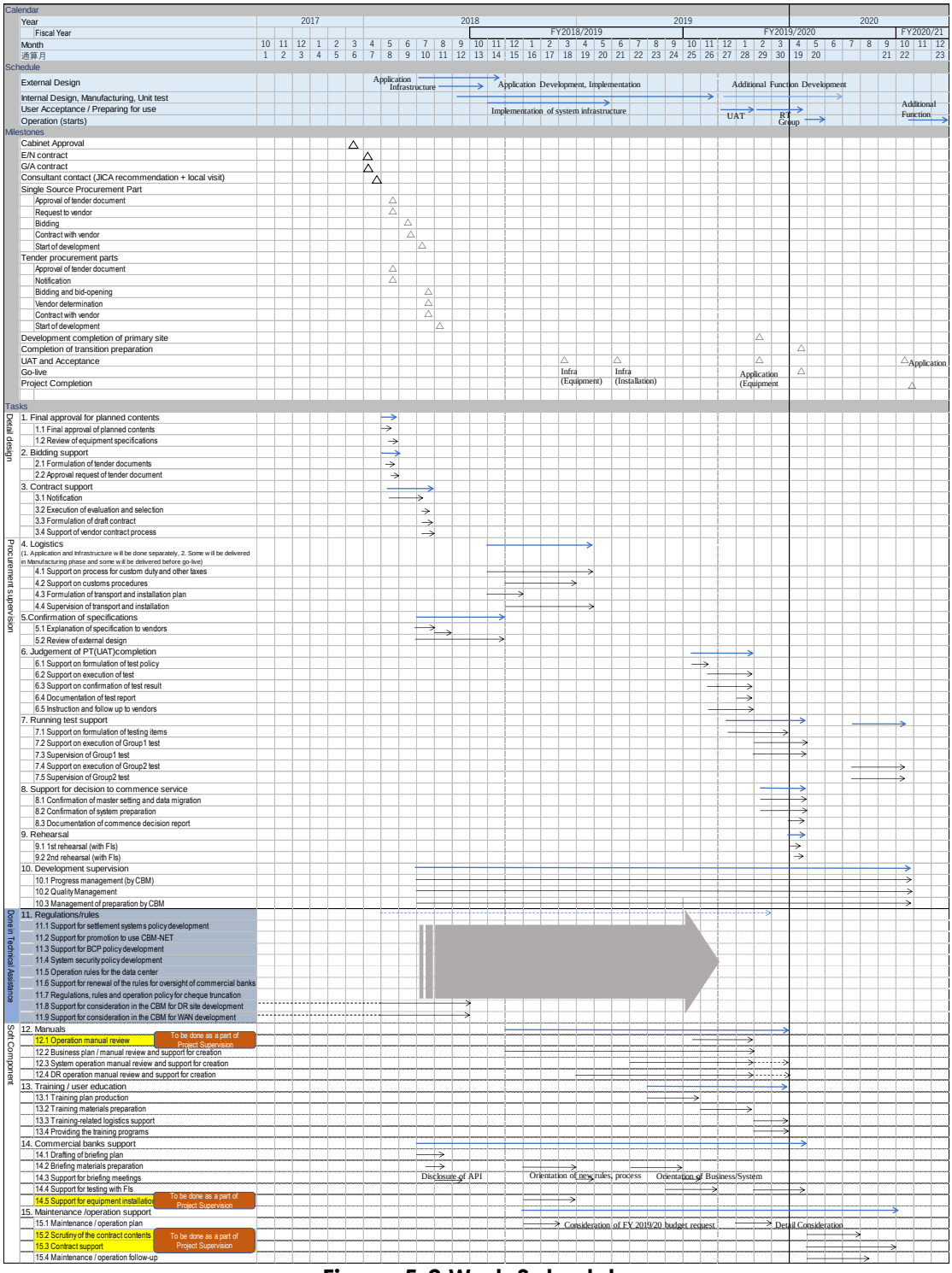

Figure 5-2 Work Schedule

5.2.2 Task definition

The work contents of the Soft Component are explained below

Numbers are aligned with the '**List of Tasks**' above.

Task 12. Manuals

12.2 Business plan / business manual review and support for creation

The business plan is the work of planning and considering about contents which should be described in the business manual in advance of the creation of the business manual. There is a wide range of topics in the business plan, organization structure and responsibility for business, creation of the rules for business operation, definition of the scope that rules are applied in (defining the irregular cases), defining the detail of business functions, creation of the detail business flow including related business operations that are not covered in the CBM-NET itself, and etc.

The business manuals codify the business procedure laid down by CBM, legislature, regulations, etc. These are deliverables that the user could not have produced without related knowledge. The change of business procedure by Phase2 will be revised and added on the business manuals that have been created in Phase1.

Creation of the business plan and the business manuals is done by CBM itself is desirable. However, CBM do not have enough knowledge of business related with the scope of Phase2 and also do not have enough staffs in PSSD and FMD as same as Phase1. Therefore, consultants will draft the business plan and the business manuals and CBM will review and comment on them with the consultants, and then the consultant will revise them based on the result of reviews.

Table 5-2 Workload for Business plan/manual review and support for creation

Tasks/Business manuals	For CBM/ for FIs	Pages (newly created or revised)	Business Plan (MM)			Business Manuals (MM)			Total (MM)
			Draft	Review	Total	Draft	Review	Total	
Management work			0.35	0.2	0.55	0.35	0.2	0.55	1.10
Cheque Truncation (new)	CBM	80	1.51	0.85	2.36	1.51	0.85	2.36	4.72
	FIs	40	0.75	0.42	1.17	0.75	0.42	1.17	2.34
Fund settlement (MMK) (revise)	CBM	50	0.94	0.53	1.47	0.94	0.53	1.47	2.94
	FIs	40	0.75	0.42	1.17	0.75	0.42	1.17	2.34
Fund settlement (foreign currency) (revise)	CBM	0	0	0	0	0	0	0	0.00
	FIs	0	0	0	0	0	0	0	0.00
Collateral management (revise)	CBM	30	0.56	0.32	0.88	0.56	0.32	0.88	1.76
	FIs	20	0.38	0.21	0.59	0.38	0.21	0.59	1.18
Bond settlement (revise)	CBM	50	0.94	0.53	1.47	0.94	0.53	1.47	2.94
	FIs	30	0.56	0.32	0.88	0.56	0.32	0.88	1.76
Common business (revise)	CBM	110	2.02	1.11	3.13	2.02	1.11	3.13	6.26
	FIs	50	0.71	0.51	1.22	0.72	0.52	1.23	2.46
Total		500	9.47	5.42	14.89	9.48	5.43	14.91	29.8

Table 5-3 Relation between business manuals and functions in Phase2

Business manuals	Related functions developed in Phase2
Cheque Truncation (new)	Cheque truncation
Fund Settlement (MMK) (revise)	ISO/STP, LSF/Queuing, ACH, Forward date transaction
Fund Settlement (Foreign Currency)	N/A
Collateral Management (revise)	ISO/STP, LSF, ACH
Bond Settlement (revise)	ISO/STP, Forward date transaction
Common Business (revise)	STP, User Authentication, Interface for sub-systems, Alert/dashboard, Extending time for input, DR operation

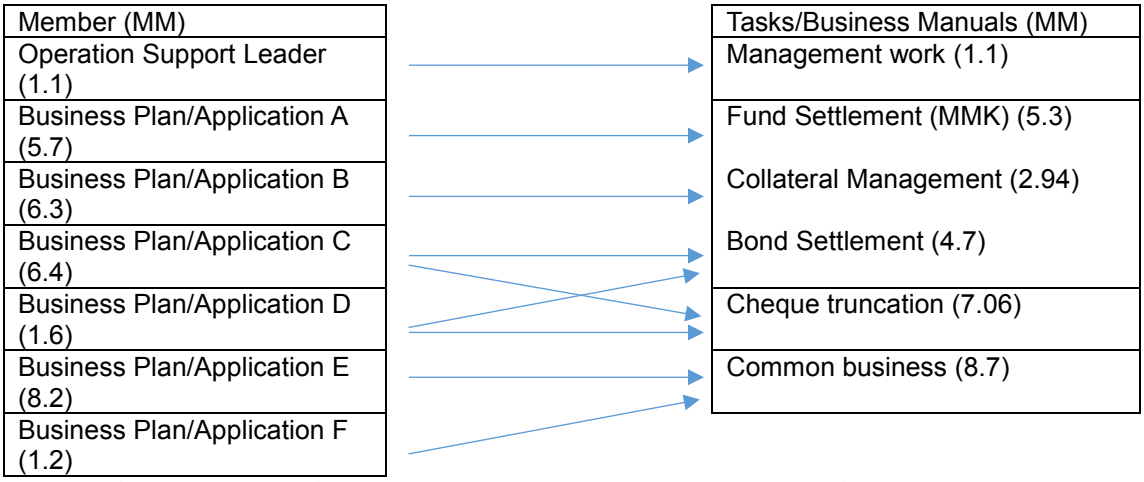

Figure 5-3 relation between members and tasks/business manuals

12.3 System operation manual review and support for creation

The system operation manuals related to the system control only are provided by the installing vendor or equipment maker. The manual mostly consists of general-use contents. From the viewpoint of the user, the staffs of Administration and Human Resource Department (hereinafter "AHRD"), depending on his environment and skill level, he may need to revise and add to it. In Phase2 the system operation manual which is created in Phase1 will be revised or renewed because of the change of system operation in Phase2. The number of member of AHRD is increased comparing with Phase1, therefore, drafting of the manuals will be basically done by CBM with support and instruction from consultants, and consultant will review, advice and support to finalize it.

12.4 DR operation manual review and support for creation

In Phase2, Disaster Recovery (hereinafter "DR") environment of the CBM-NET system will be installed. Therefore, the creation of DR operation manual is needed.
The topics like, the structure and procedure for decision making in disaster situation, business operation and system operation in disaster situation, operational organization structure and operation procedure for DR environment and etc. are necessary to be described in the DR operation manual. Consultant will draft DR operation manual, and review and finalize with CBM, because CBM is not familiar with DR operation.

Table 5-4 DR manuals

DR manuals	Contents
DR manuals (Basic)	Basic information for DR operation - Disasters which are assumed - Decision making process for applying DR manuals - Organization structure and rolls of the disaster countermeasures office - Formation in disaster situation - etc.
DR manual (Business operation)	Describing business operations in each disaster situations
DR manual (System operation)	Describing system operations in each disaster situations
DR manual (For FIs)	Describing operations done by FIs in each disaster situations

Table 5-5 Assumed workload for creation of DR manuals

Tasks/DR manuals	Pages	Workload (MM)
Management work	N/A	0.5
DR manual (Basic)	20	1.1
DR manual (Business operation)	30	2.1
DR manual (System operation)	30	2.1
DR manual (For FIs)	20	0.9
Total	100	6.7

Task 13. Training / user education

13.1 Training plan production

The production of a plan for training and user education should be carried out mainly by the staff of CBM, but CBM staffs are still not accustomed to business planning. Therefore, the consultants' support is necessary. Support consists of (1) The consultants producing a draft of training plan (2) CBM officers reviewing it and consultants reflecting comments from the review on it.
In phase1, initially it was assumed that CBM staffs understood the system specification of CBM-NET and business operation through engaging to review work for the detail design document, business plan and business manuals. However, level of understanding did not achieve to enough level for the business operation of production environment, although the sufficient proficiency level of CBM staffs about business operation with CBM-NET was necessary until the beginning of the running test with FIs. As a result, more training time and programs were necessary comparing with the initial plan of trainings. After revising the plan

of trainings, hands-on operation training using CBM-NET terminals and business flows for real business operation were provided to CBM staffs instead of lecture programs by a trainer. In phase2, the same kind of training programs are assumed to provide to CBM staffs.

13.2 Training materials preparation

Consultants will support the preparation of materials for the trainings which are planned in 13.1. Basically, drafting the documents is assumed to be done by the consultants because of the small number of CBM staff, although this work is assumed to be done with CBM.
On the other hand, it is very important for the CBM staffs to engage this work as much as possible because of improvement of maturity for the business operation. Therefore, CBM staffs are assumed to review the documents which are drafted by consultants.

Table 5-6 Materials for Training

Materials	Pages	Workloads (MM)
Training Scenario, Data	300 (*estimated based on the reference in Phase1.)	6.9

13.3 Training-related logistics support

Joint training is planned for either Bank HQ at Nay Pyi Taw, or at the more accessible Yangon. Moreover, as it would be difficult for serving bank officers at manager level to take leave of absence for some days, some follow-up at branch level will be needed. Selection for training, contents of training, preparing the venue, preparing the trainer etc. should be the task of CBM, but the consultants must confirm whether the preparations are complete and issue preparation instructions to CBM. The consultants also undertake to support the request by the developer to prepare access to the system (test environment) from the training venue.

13.4 Providing the training programs

Training is delivered to the user departments of CBM; Payment & Settlement Department (hereinafter "PSSD"), Currency Management Department (hereinafter "CMD"), Foreign Currency Management Department (hereinafter "FMD"), and Administration and Human Resource Development Department (hereinafter "AHRD") which is the department of system management, etc.
Training uses the materials produced at 13.2, but briefings require knowledge of CBM's business systems, related financial business, and the specifications of this system. Duties at CBM are carried out horizontally, and often the officer only knows his own business area, so the trainer's instructions may fall on stony ground. Therefore, the consultants need the support of CBM officers in finding suitable training staff who can communicate effectively with the training participants. Also, onsite support at each branch, while vital, needs the active participation of all related parties to follow through.

Task 14. Commercial banks support

14.1 Drafting of briefing plan

Training is supplied to commercial banks participating in CBM-NET.
It is planned to conduct briefings at CBM facilities, to be carried out either at Bank HQ in Naypyidaw, or at the more accessible Yangon. Basic logistics, however, also suggest that all three Nay Pyi Taw, Yangon, and Mandalay hubs may conduct briefings.
As with CBM internal training plan provision (13.1), the consultants will involve bank staff in planning briefings to the commercial banks.

14.2 Briefing materials preparation

Briefing materials are planned the same as for CBM users (13.2). The consultants and CBM are to cooperate on this. The consultants will provide the draft of documents, the bank staff will review it, and finally the consultants will reflect review comments on it and finalize it.

14.3 Support for briefing meetings

Briefing meetings, for the same reason as bank internal briefings, shall be given by the consultants. To aid communication with the participants, support from senior officers of CBM is envisaged. Also from development vendors as necessary to construct the demo environment (preparation of system partition used in the commercial banks briefings, data sets etc)

14.4 Support for testing with FIs

The following support work is assumed, when the connection test with FIs and the running test that FIs will participate in.
STP function will be launched in Phase2, therefore the STP connection test via network will be executed between systems in FIs and CBM-NET. This test is organized by CBM; however, consultant will support CBM on the briefing to FIs, some arranges related the test and etc. And, the running test that FIs will also participate in will be supported by consultant as same as the connection test.

Task 15. Maintenance / operation support

15.1 Maintenance / operation plan

CBM has the basic manuals for system operation and maintenance for operating current system environment. These manuals are prepared in Phase1 under the supports of the consultants. AHRD which has the responsibility of IT system operation has enhanced the organization and members after Phase1, however, they are still on the way to acquire the knowledge for system operation and management, and new staffs are not having enough experience on IT system operation and management. As same as Phase1, CBM must create the plan for post start-up (1) maintenance items; (2) maintenance structure, (3) service contents, (4) division of roles, and (5) contracts with contractors. As noted previously, the AHRD of CBM still does not have enough capacity to prepare these items for service. The consultants will therefore prepare the necessary items, and advance the plan while taking appropriate advice.

15.4 Maintenance / operation follow-up

The maintenance contractor will deal with problems with the installed system and mechanical breakdowns. As same as 15.1, AHRD staffs mainly manage the system operation. Also, consultants watch over the status of system operation and support and advice to AHRD staffs at least for three months after the system is launched.

5.3 Tasking and role definition

The planned staffing levels necessary for the Soft Component are explained below

Numbers are aligned with the '**List of Tasks'** above.

Task 12. Manuals

12.2 Business plan / manual review and support for creation

Below are the consulting business contents related to business plan / manual review and support for creation.

1) Consulting support contents

The business support contents of the consultants are laid out below. Those that take time are where the consultants have to research the contents of the business plan and create a draft of business manuals. Especially, the work would be heavier, if the additional survey work is necessary.

Table 5-7 Support Items

(1) Drafting the business plan (NB1) • Selecting items which are studied and described as part of the business plan document • Researching and acquiring information for the business plan document • Creating a draft of the business plan document
(2) Reviewing the business plan • Reviewing the document (by both of CBM and consultants) • Executing additional study based on review results • Revising the business plan document for reflecting review results
(3) Drafting the business manuals (NB2) • Studying current business manuals and identifying sections which are needed to revise • Creating and revising the business manuals
(4) Reviewing the business manuals • Reviewing the document (by both of CBM and consultants) • Revising the business manuals based on the results of review

(NB1) Content related to legislation and institutions, etc. are the tasks of the Technical Cooperation Project
(NB2) IT systems developed by FIs in FIs are not in the scope of manuals.

2) Expected work

Manuals which are expected to create newly or to revise on Phase1 are as follow.
As manuals which are expected to revise, there are fund settlement of MMK for CBM, fund settlement of foreign currency, collateral management, bond settlement and common business (terminal management, master information management, business operation, user management etc.). As manuals which are expected to create newly, there are cheque truncation operations for CBM and for FIs.

3) Expected schedule of work and executing plan

The work will be started around the time when the detail design phase is completed, and will be finished until the preparation for running test will be started. It is estimated about 14 months, and 30.5 MM workload.
This work is mainly done by 6 members (business planning/application support A – F).
Average workload of each member will be 0.36MM per month.
The work of each business category will be done with following order,
1) Drafting the business plan, 2) Reviewing the business plan, 3) Drafting the business manuals, and 4) Reviewing the business manuals.
Input for the above will require the following person months:

Person month plan (unit: person months)

Operation Support Leader		Application A		Application B		Application C		Application D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0.3	0.8	4.4	1.1	4.4	1.9	4.3	1.9	0	1.6

Application E		Application F		Infra A		Infra B		Infra C		Infra D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
5.2	3.0	0.4	0.8	0	0	0	0	0	0	0	0

- Operation Support Leader: Management of the work
- Business planning and application support A (Application A)
  : business planning and manual creation support for ISO/STP and LSF/Queuing
- Business planning and application support B (Application B)
  : business planning and manual creation support for ISO/STP and LSF/Queuing
- Business planning and application support C (Application C)
  : business planning and manual creation support for ACH and cheque truncation
- Business planning and application support D (Application D)
  : business planning and manual creation support for ACH and cheque truncation
- Business planning and application support E (Application E)
  : business planning and manual creation support for Alert/Dashboard and other functions
- Business planning and application support F (Application F)
  : business planning and manual creation support for DR operation, user authentication and interface of sub systems

12.3 System operation manual review and support for creation

It is envisaged that the system operation manual is written by CBM after receiving guidance based on our Japan-related experience, which is then reviewed by the consultants.

Person month plan (unit: person months)

Operation Support Leader		Application A		Application B		Application C		Application D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0.1	0.4	0	0	0	0	0	0	0	0

Application E		Application F		Infra A		Infra B		Infra C		Infra D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0	0	0.2	0.4	0.2	0.5	0.2	0.5	0.8	1.0	0	0

- Operation Support Leader: Management of the work
- Business planning and application support F (Application F)
  : supporting manual creation from the view of business planning and application
- IT system infrastructure support A (Infra A)
  : consideration is given to whether vital work items have been missed out, or whether there are any special Myanmar conditions (irregular power cuts, monsoon) to be taken into consideration.
- IT system infrastructure support B (Infra B)
  : Same as Infra A. Covers CBM-NET server environment
- IT system infrastructure support C (Infra C)
  : Same as Infra A. Covers networks such as long-distance, metropolitan, and building LAN

12.4 DR operation manual review and support for creation

It is envisaged that the DR operation manual is written by consultants, and then reviewed by CBM and the consultants, and finally revised by the consultants based on the result of review.

Person month plan (unit: person months)

Operation Support Leader		Application A		Application B		Application C		Application D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0.1	0.4	0.2	0.5	0.5	0.5	0	0	0	0.8

Application E		Application F		Infra A		Infra B		Infra C		Infra D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0	0.5	0	0	0.2	0.5	0.2	0.5	0	0	0.8	1.0

- Operation Support Leader: Management of the work
- Business planning and application support A (Application A)
  : supporting manual creation from the view of business operation
- Business planning and application support B (Application B)
  : Same as Application A. supporting the work of Application A
- Business planning and application support E (Application E)
  : Same as Application A. supporting the work of Application A

- IT system infrastructure support A (Infra A)
  : supporting manual creation from the view of system operation
- IT system infrastructure support B (Infra B)
  : Same as Infra A. supporting the work of Infra A
- IT system infrastructure support D (Infra D)
  : Same as Infra A. supporting the work of Infra A

Task 13. Training / user education

13.1 Training plan production

The members of business planning and application support will work in Myanmar for discussing what kind of contents should be included in the training. Other consultants prepare the plan in Japan

Person month plan (unit: person months)

Operation Support Leader		Application A		Application B		Application C		Application D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0.1	0.2	0.4	0.2	0	0	0.2	0.2	0	0

Application E		Application F		Infra A		Infra B		Infra C		Infra D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0	0	0	0	0.2	0	0.1	0	0	0	0	0

- Operation Support Leader: Management of the work
- Business planning and application support A (Application A)
  : Planning agenda of training. Having discussions with CBM staffs for selecting appropriate contents
- Business planning and application support C (Application C)
  : Same as Application A. supporting the work of Application A
- IT system infrastructure support A (Infra A)
  : supporting to plan agenda of training from the view of system operation
- IT system infrastructure support B (Infra B)
  : Same as Infra A. supporting the work of Infra A

13.2 Training materials preparation

Training materials to be produced in Japan and CBM to review and approve the contents.

Person month plan (unit: person months)

Operation Support Leader		Application A		Application B		Application C		Application D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0.2	0.2	0.4	0.2	0.4	0	0.4	0.2	0.4	0.8

Application E		Application F		Infra A		Infra B		Infra C		Infra D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0.4	0	0.4	0	0	0.5	0.1	0	0.8	0.4	0.8	0.4

- Operation Support Leader: Management of the work
- Business planning and application support A (Application A)
  : Supporting to create training materials related to ISO/STP and LSF/Queuing
- Business planning and application support B (Application B)
  : Same as Application A
- Business planning and application support C (Application C)
  : Supporting to create training materials related to ACH and cheque truncation
- Business planning and application support D (Application D)
  : Same as Application C.
- Business planning and application support E (Application E)
  : Supporting to create training materials related to Alert/Dashboard and other functions
- Business planning and application support F (Application F)
  : Supporting to create training materials related to DR operation, user authentication and interface with sub-systems
- IT system infrastructure support A (Infra A)
  : supporting to create materials while discussing with AHRD members. confirming the contents of training with Application A
- IT system infrastructure support B (Infra B)
  : Same as Infra A. Covers related servers
- IT system infrastructure support C (Infra C)
  : Same as Infra A. Covers related networks
- IT system infrastructure support D (Infra D)
  : Same as Infra A. Covers related data center

13.3 training-related logistics support

Training-related logistics are to be mainly handed by CBM. However, the consultants are to oversee and make arrangement where necessary.

Person month plan (unit: person months)

Operation Support Leader		Application A		Application B		Application C		Application D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0	0	0	0.2	0	0.2	0	0.2	0	0.2

Application E		Application F		Infra A		Infra B		Infra C		Infra D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0	0	0	0	0	0.5	0	0.4	0	0	0	0

- Business planning and application support A (Application A)
  : Supporting to make arrangement for training-related logistics which is handed by CBM, mainly PSSD, CMD, FMD, and etc.

- Business planning and application support B (Application B)
  : Same as Application A
- Business planning and application support C (Application C)
  : Same as Application A
- Business planning and application support D (Application D)
  : Same as Application A
- IT system infrastructure support A (Infra A)
  : Supporting to make arrangement for training-related logistics, especially infrastructure-related one, which is handed by CBM, mainly AHRD
- IT system infrastructure support B (Infra B)
  : Same as Infra A

13.4 Providing the training programs

The consultants would not only attend trainings, but also work as a lecturer of training sessions, and oversee the effectiveness of sessions.
The training sessions which follows about 60 patterns of business flow are expected to run for a period of 2 months.

Person month plan (unit: person months)

Operation Support Leader		Application A		Application B		Application C		Application D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0.2	0.2	0	0	0	0.8	0	0	0	0.8

Application E		Application F		Infra A		Infra B		Infra C		Infra D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0	0.8	0.2	0.8	0	0.3	0	0.4	0	0	0	0

- Operation Support Leader: Management of the work
- Business planning and application support B (Application B)
  : Supporting to run training sessions related to ISO/STP and LSF/Queuing
- Business planning and application support D (Application D)
  : Supporting to run training sessions related to ACH and cheque truncation
- Business planning and application support E (Application E)
  : Supporting to run training sessions related to Alert/Dashboard and other functions
- Business planning and application support F (Application F)
  : Supporting to run training sessions related to DR operation, user authentication and interface with sub-systems
- IT system infrastructure support A (Infra A)
  : supporting to run training sessions related to infrastructure topics
- IT system infrastructure support B (Infra B)
  : Same as Infra A.

Task 14. Commercial banks support

14.1 Drafting of briefing plan

Briefings are planned for the FIs, especially commercial banks, as one of the users of CBM-NET system. Contents, timing, and agenda of the plan are to reflect the requirements as an aid recipient country. 3 briefings are envisaged for the commercial banks; the first briefing (expected on June 2018 or later (TBD)) will introduce the API for STP connections from FIs; the second briefing (expected on January 2019 or later (TBD)) will cover new business procedure on CBM-NET; the third briefing (expected on August 2019 or later (TBD)) will explain new CBM-NET functions after Phase2 system launch.

Person month plan (unit: person months)

Operation Support Leader		Application A		Application B		Application C		Application D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0.1	0	0.2	0.2	0.2	0	0.2	0	0.2	0

Application E		Application F		Infra A		Infra B		Infra C		Infra D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0.2	0	0	0	0.2	0	0.1	0	0	0	0	0

- Operation Support Leader: Management of the work
- Business planning and application support A (Application A)
  : Cooperating with CBM, banking association etc. and gathering information (system preparedness, literacy at each FIs) for planning of trainings. Covers ISO/STP and LSF/Queuing.
- Business planning and application support B (Application B)
  : Supporting to Application A, covers ISO/STP and LSF/Queuing.
- Business planning and application support C (Application C)
  : Supporting to Application A, covers ACH and cheque truncation.
- Business planning and application support D (Application D)
  : Supporting to Application A, covers ACH and cheque truncation.
- Business planning and application support E (Application E)
  : Supporting to Application A, covers Alert/Dashboard and other functions
- IT system infrastructure support A (Infra A)
  : Planning training menu related infrastructure topics
- IT system infrastructure support B (Infra B)
  : Same as Infra A.

14.2 Briefing materials preparation

Preparation of the briefing materials in line with the plan. Materials are produced with building a consensus of the CBM members and the commercial banks members.

Person month plan (unit: person months)

Operation Support Leader		Application A		Application B		Application C		Application D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0.2	0	0.2	0	0.2	0	0.2	0	0.2	0

Application E		Application F		Infra A		Infra B		Infra C		Infra D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0.2	0	0	0	0.2	0	0.1	0	0	0	0	0

- Operation Support Leader: Management of the work
- Business planning and application support A (Application A)
  : Producing materials in line with the plan created in 14.1. Covers ISO/STP and LSF/Queuing.
- Business planning and application support B (Application B)
  : Same as Application A, covers ISO/STP and LSF/Queuing.
- Business planning and application support C (Application C)
  : Same as Application A, covers ACH and cheque truncation.
- Business planning and application support D (Application D)
  : Same as Application A, covers ACH and cheque truncation.
- Business planning and application support E (Application E)
  : Same as Application A, covers Alert/Dashboard and other functions
- IT system infrastructure support A (Infra A)
  : Producing materials related infrastructure topics
- IT system infrastructure support B (Infra B)
  : Same as Infra A.

14.3 Support for briefing meetings

Both the consultants and CBM lecturer arrange briefing meetings. Bidirectional delivery is also planned. Basically, in order to deliver correct information, the most knowledgeable consultant will deliver the entire content. The CBM lecturer mainly supports communication with participants from FIs.

Person month plan (unit: person months)

Operation Support Leader		Application A		Application B		Application C		Application D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0	0.2	0	0.4	0	0.4	0	0.4	0	0.4

Application E		Application F		Infra A		Infra B		Infra C		Infra D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0	0	0	0	0	0.4	0	0.4	0	0	0	0

- Operation Support Leader: Management of the work
- Business planning and application support A (Application A)
  : Lecturer in charge.
- Business planning and application support B (Application B)
  : Q&A in the area of expertise. Where simultaneous operation over multiple locations are necessary, the lecturer shall be in charge.
- Business planning and application support C (Application C)
  : Same as Application B

- Business planning and application support D (Application D)
  : Same as Application B
- IT system infrastructure support A (Infra A)
  : Lecturer in charge.
- IT system infrastructure support B (Infra B)
  : Same as Infra A. Q&A in the area of expertise.

14.4 Support for testing with FIs

Consultants support for CBM to do explanation to FIs, administrative arrangements and etc. in the phase of connection test with FIs and running test.

Person month plan (unit: person months)

Operation Support Leader		Application A		Application B		Application C		Application D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0	0.2	0	0	0	0.4	0	0.4	0	0.4

Application E		Application F		Infra A		Infra B		Infra C		Infra D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0	0	0	0	0	0.4	0	0.4	0	0	0	0

- Operation Support Leader: Management of the work
- Business planning and application support B (Application B)
  : Explaining about the business and applications to FIs. also supporting administrative arrangement.
- Business planning and application support C (Application C)
  : Same as Application B
- Business planning and application support D (Application D)
  : Same as Application B
- IT system infrastructure support A (Infra A)
  : Explaining about related infrastructure topics, also supporting administrative arrangement.
- IT system infrastructure support B (Infra B)
  : Same as Infra A.

Task 15. Maintenance / operation support

15.1 Maintenance / operation plan

Consultants prepare the basic ideas of drawing up the plan for maintenance & operation after the system launch in Japan, then instruct new creation or revising of materials for system operations after discussion with AHRD members in Myanmar.

Person month plan (unit: person months)

Operation Support Leader		Application A		Application B		Application C		Application D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0	0	0	0	0	0	0	0	0	0

Application E		Application F		Infra A		Infra B		Infra C		Infra D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0.2	0	0	0	0	0	0.3	0	0	0	0	0

- Business planning and application support E (Application E)
  : Studying and finding considerations for the operation and maintenance phase from the view of business and applications, and sharing with Infra B
- IT system infrastructure support B (Infra B)
  : Listing up the requirement related infrastructure for operation and maintenance phase.

15.4 Maintenance / operation follow-up

Disruption is a possibility in the immediate aftermath of system launch (April 2020 or later (TBD)), so support will be on-site.

Person month plan (unit: person months)

Operation Support Leader		Application A		Application B		Application C		Application D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0	0.5	0	0	0	0	0	0	0	0

Application E		Application F		Infra A		Infra B		Infra C		Infra D	
JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR	JPN	MMR
0	0	0	0.5	0	0	0	0.5	0	0	0	0

- Operation Support Leader: Over sighting the system stability and operational capacity of AHRD, and having communication with managements of AHRD.
- Business planning and application support E (Application E)
  : Over sighting the system stability from the view of business operation and applications, and advising CBM staffs.
- IT system infrastructure support B (Infra B)
  : Over sighting the system stability from the view of infrastructure, and advising CBM staffs.

6. Business travel plan

Plan for travel to Myanmar is specified below. As specified in the practical task list, Soft Component is conducted in parallel with procurement supervision, and there may be some overlapping of members. Travel costs are accounted under Soft Component from December 2018 to September 2019.

Table 6-1 Business Travel Plan

Person in charge	Travel dates *	Tasks	Abstract of works
Operation Support Leader	16 to 27 Dec. 2018 (12days)	Manuals	Discussion for the plan of manuals preparation
	13 to 24 Jan. 2019 (12days)	Manuals	Confirming the plan for manuals preparation
	21 to 29 Apr. 2019 (9days)	Commercial banks support	Support for briefing meetings with FIs
	14 to 28 Jul. 2019 (15days)	Manuals	Progress and document review of preparation of manuals
	17 Aug. to 21 Sep. 2019 (36days)	Manuals, Training / user education	Progress and document review of preparation of manuals Support for planning of training and user education
	13 to 21 Oct. 2019 (9days)	Commercial banks support	Support for briefing meetings
	17 to 28 Nov. 2019 (12days)	Training / user education	Materials preparation support for training and user education
	11 Jan. to 12 Feb. 2020 (33days)	Manuals, Training / user education	Review of business manual, system operation manual and DR operation manual Support for providing the training programs
	15 to 26 Mar. 2020 (12days)	Training / user education	Support for providing the training programs
	10 Apr. to 15 May. 2020 (36days)	Commercial banks support, Maintenance /operation support	Support for testing with FIs Maintenance / operation follow-up
	14 to 25 Jun. 2020 (12days)	Maintenance /operation support	Maintenance / operation follow-up
	12 to 23 Jul. 2020 (12days)	Maintenance /operation support	Maintenance / operation follow-up
	9 to 23 Aug. 2020 (15days)	Maintenance /operation support	Maintenance / operation follow-up
Application A	19 to 24 Aug. 2018 (6days)	Commercial banks support	Drafting of briefing plan for the support for FIs
	21 to 29 Apr. 2019 (9days)	Commercial banks support	Support for briefing meetings with FIs
	18 to 29 Aug. 2019 (12days)	Manuals, Training / user education	Progress review for the preparation of business plan and business manuals Training plan production
	13 Sep. to 15 Oct. 2019 (33days)	Manuals, Training / user education, Commercial banks support	Progress review for the preparation of business plan and business manuals Review and creation of DR operation manuals Training plan production Support for briefing meetings with FIs

Person in charge	Travel dates *	Tasks	Abstract of works
	16 Nov. to 9 Dec. 2019 (24days)	Manuals, Training / user education	Progress review for the preparation of business plan and business manuals Review and creation of DR operation manuals Training materials preparation
	6 to 23 Feb. 2020 (18days)	Manuals, Training / user education,	DR operation manual review and support for creation Training-related logistics support
	8 to 19 Mar. 2020 (12days)	Manuals, Training / user education,	DR operation manual review and support for creation Training-related logistics support
Application B	9 to 20 Sep. 2018 (12days)	Commercial banks support	Support for briefing meetings with FIs
	12 to 23 May. 2019 (12days)	Manuals	Business plan / manual review and support for creation
	23 to 28 Jun. 2019 (6days)	Manuals	Support for review and creation of manuals
	26 Jul. to 18 Aug. 2019 (24days)	Manuals	Support for review and creation of manuals
	13 Sep. to 18 Oct. 2019 (36days)	Manuals, Commercial banks support	Support for review and creation of manuals Support for briefing meetings with FIs Support for testing with FIs
	10 Nov. to 15 Dec. 2019 (36days)	Manuals, Training / user education	DR operation manual review and support for creation Support for training materials preparation
	11 Jan. to 21 Feb. 2020 (42days)	Training / user education	Training-related logistics support Support for providing the training programs
	5 Mar. to 18 Apr. 2020 (45days)	Training / user education, Commercial banks support	Training-related logistics support Support for testing with FIs
Application C	26 Mar. to 9 Apr. 2019 (15days)	Manuals, Commercial banks support	Business plan / manual review and support for creation Support for briefing meetings with FIs
	19 to 27 May. 2019 (9days)	Manuals	Business plan / manual review and support for creation
	22 Jun. to 9 Jul. 2019 (18days)	Manuals	Business plan / manual review and support for creation
	23 Aug. to 15 Sep. 2019 (24days)	Manuals, Training / user education, Commercial banks support	Business plan / manual review and support for creation Training plan production Support for testing with FIs
	20 to 25 Oct. 2019 (6days)	Manuals, Commercial banks support	Business plan / manual review and support for creation Support for testing with FIs
	19 Nov. to 12 Dec. 2019 (24days)	Manuals, Training / user education	Business plan / manual review and support for creation Training materials preparation
	23 Jan. to 15 Feb. 2020 (24days)	Manuals, Training / user education	Business plan / manual review and support for creation Training-related logistics support
	14 Mar. to 15 Apr. 2020 (33days)	Commercial banks support, Training / user education	Support for testing with FIs Training-related logistics support
Application D	9 to 20 Dec. 2018 (12days)	Manuals	Business plan / manual review and support for creation

Person in charge	Travel dates *	Tasks	Abstract of works
	14 Jan. to 18 Feb. 2019 (36days)	Manuals	Business plan / manual review and support for creation
	17 Mar. to 21 Apr. 2019 (36days)	Manuals, Commercial banks support	Business plan / manual review and support for creation Support for briefing meetings
	20 May. to 12 Jun. 2019 (24days)	Manuals, Commercial banks support	Business plan / manual review and support for creation
	11 Jul. to 15 Aug. 2019 (36days)	Manuals	Business plan / manual review and support for creation DR operation manual review and support for creation
	13 Sep. to 18 Oct. 2019 (36days)	Manuals, Commercial banks support	DR operation manual review and support for creation Support for briefing meetings
	10 Nov. to 21 Dec. 2019 (42days)	Training / user education	Training materials preparation
	8 Jan. to 24 Feb. 2020 (48days)	Training / user education, Commercial banks support	Training materials preparation Training-related logistics support Providing the training programs Support for testing with FIs
	8 Mar. to 30 Apr. 2020 (54days)	Training / user education, Commercial banks support	Support for training materials preparation and providing the training programs Support for testing with FIs
Application E	17 May. to 15 Jun. 2019 (30days)	Manuals	Business plan / manual review and support for creation
	17 Jul. to 15 Aug. 2019 (30days)	Manuals	Business plan / manual review and support for creation DR operation manual review and support for creation
	10 Sep. to 12 Oct. 2019 (33days)	Manuals	Business plan / manual review and support for creation DR operation manual review and support for creation
	7 Nov. to 18 Dec. 2019 (42days)	Manuals	Business plan / manual review and support for creation
	6 Feb. to 24 Mar. 2020 (48days)	Training / user education	Providing the training programs
Application F	13 Sep. to 12 Oct. 2019 (30days)	Manuals	Business plan / manual review and support for creation System operation manual review and support for creation
	13 Nov. to 18 Dec. 2019 (36 days)	Manuals	Business plan / manual review and support for creation
	5 Jan. to 24 Feb. 2020 (51days)	Training / user education	Support for providing the training programs
	11 Mar. to 24 Apr. 2020 (45days)	Training / user education	Support for providing the training programs
	22 Jun. to 9 Jul. 2020 (18days)	Maintenance / operational support	Maintenance / operation follow-up
Infrastructure A	26 Jul. to 12 Aug. 2018 (18days)	Commercial banks support	Support for briefing meetings with FIs
	19 Sep. to 9 Oct. 2018 (21days)	Commercial banks support	Support for briefing meetings with FIs

Person in charge	Travel dates *	Tasks	Abstract of works
	20 Aug. to 15 Sep. 2019 (27days)	Manuals, Commercial banks support	System operation manual review and support for creation DR operation manual review and support for creation Support for testing with FIs
	14 Oct. to 27 Nov. 2019 (45days)	Manuals, Commercial banks support, Training / user education	System operation manual review and support for creation DR operation manual review and support for creation Support for testing with FIs Training materials preparation
	14 Dec. to 24 Jan. 2019 (42days)	Manuals, Training / user education	System operation manual review and support for creation DR operation manual review and support for creation Training materials preparation
	9 Feb. to 24 Mar. 2020 (45days)	Training / user education	Training-related logistics support Providing the training programs
	4 to 30 Apr. 2020 (27days)	Training / user education	Providing the training programs
Infrastructure B	19 to 24 Aug. 2018 (6days)	Commercial banks support	Support for briefing meeting with FIs
	19 Sep. to 12 Oct. 2019 (24days)	Manuals, Commercial banks support	System operation manual review and support for creation Support for briefing meetings Support for testing with FIs
	4 Nov. to 18 Dec. 2019 (45days)	Manuals	System operation manual review and support for creation DR operation manual review and support for creation
	17 Jan. to 12 Feb. 2020 (27days)	Manuals, Training / user education	DR operation manual review and support for creation Support for training-related logistics and providing the training programs
	17 Mar. to 9 Apr. 2020 (24days)	Training / user education, Commercial banks support	Support for training-related logistics and providing the training programs Support for testing with FIs
	23 May. to 6 Jun. 2020 (15days)	Maintenance / Operational support	Maintenance / operation follow-up
Infrastructure C	26 Jul. to 6 Aug. 2019 (12days)	Manuals	System operation manual review and support for creation
	25 Sep. to 12 Oct. 2019 (18days)	Manuals	System operation manual review and support for creation
	13 Nov. to 15 Dec. 2029 (33days)	Training / user education	Training materials preparation
	8 Jan. to 24 Feb. 2020 (48days)	Training / user education	Training materials preparation
Infrastructure D	26 Jul. to 6 Aug. 2019 (12days)	Manuals	DR operation manual review and support for creation
	25 Sep. to 12 Oct. 2019 (18days)	Manuals	DR operation manual review and support for creation
	13 Nov. to 15 Dec. 2029 (33days)	Training / user education	Training materials preparation
	11 Jan. to 18 Feb. 2020 (39days)	Training / user education	Training materials preparation

* "Travel dates" includes work day for the procurement supervision.

7. Soft Component installation resources procurement

The resources to be installed are expected to be direct-input type depending on ordering consultant. This project is based on technical experience of the Bank of Japan business and system, so consultants with that technology and experience are appointed for this project.

8. Soft Component business installation chart

For this project, the Soft Component installation process chart, including server installation, is seen in Appendix 1

9. Soft Component deliverables

Soft Component deliverables are as follows

- Soft Component completion report
- Training program
- Training materials (joint production by developer and CBM)
- Business manuals (joint production with CBM)
- Commercial banks briefing materials (joint production with CBM)
- System operation manuals (joint production by developer and CBM)
- DR operation manuals (joint production with CBM)
- Maintenance and operation plan (joint production with CBM)

10. Soft Component approximate costing

Approximate business costs are broken down in Appendix ‘Soft Component summary table’

11. Arrangement by the Recipient Country

- Contribution to adjustment items
  CBM have to carry responsibility for instruction, contact and arrangement items within CBM and commercial banks etc. For example, notice of workshop and arrangement of MCH machine delivery.

- Building the system
  The necessary legislation and regulation to run this project to be carried out beforehand by CBM, in order to prevent hindrance to this project.

- Building the organisation
  Appointing sufficient number and capable CBM staff to complete the organisational structure which is required to carry a new business and system operation.

Appendix 6

Reference

- 6-1 Summary of Banks in Myanmar
- 6-2. Internet & Mobile Banking in Myanmar

6-1 Summary of Banks in Myanmar (as of Aug. 2017)

No.	English bank name	MPU deta				CBM-NET		Branches Office				
		MPU member	E-commerce	ATM	POS	Network bandwidth	terminals	Total	YGN	NPT	MDY	Etc.
1	Myanma Agriculture and Development Bank	No				4Mbps	3	4	3	1	0	
2	Myanma Economic Bank (Mandalay)	Yes		Yes	No	2Mbps	1	41	34	2	5	
	Myanma Economic Bank (Nay Pyi Taw)					2Mbps	3					
	Myanma Economic Bank (Yangon)					4Mbps	1					
3	Myanmar Foreign Trade Bank	Yes		Yes	No	4Mbps	4	1	1	0	0	
4	Myanma Investment and Commercial Bank	No				4Mbps	5	1	1	0	0	
5	Ayeyarwady Farmers Development Bank Limited					2Mbps	1	4	1	0	0	Ayarwaddy -3
6	Asia Green Development Bank Ltd	Yes	Yes	Yes	Yes	4Mbps	3	51	11	0	11	Ayarwaddy - 2 Bago - 8 Kachin - 2 Kayar - 1 Magway - 7 Mon - 1 Sagaing - 2 Shan - 5 Tanintharyi - 1
7	Ayeyarwady Bank	Yes		Yes	Yes	4Mbps	3	220	100	11	36	Ayeyarwaddy – 15 Bago – 10 Kachin – 4 Kayin - 2 Magway – 6 Mon – 8 Rakine – 4 Sagaing – 8 Shan – 12 Tanintharyi - 4
8	Asia Yangon Bank Ltd	No				4Mbps	4	10	2	0	2	Ayeyarwaddy -1 Bago - 2 Magway - 2 Sagaing -1
9	Co-operative Bank Ltd.	Yes		Yes	Yes	4Mbps	5	190	68	7	29	Ayeyarwaddy - 15 Bago - 13 Chin - 1 Kachin - 2 Kayin - 3 Magway - 10 Mon - 7 Rakhine - 5 Sagiang - 8 Shan - 14 Tanintharyi - 8
10	Construction and Housing Development Bank Limited	Yes		Yes	Yes	4Mbps	3	9	4	1	1	Ayeyarwaddy - 1 Magway - 1 Mon - 1
11	First Private Bank Ltd	No		No	No	4Mbps	3	31	7	1	3	Ayeyarwaddy -2 Bago - 1 Kayah -1 Kayin -1 Magway 4 Mon -1 Sagaing - 5 Shan - 1 Tanintharyi - 4
12	Global Treasure Bank Ltd	Yes		Yes	No	4Mbps	4	124	25	4	10	Ayeyarwaddy - 13 Bago-12 Kayah-1 Kayin-4 Magway-11 Mon -14 Rakhine-10 Sagaing-10 Shan-5 Tanintharyi-5

6-1 Summary of Banks in Myanmar (as of Aug. 2017)

No.	English bank name	MPU deta				CBM-NET		Branches Office				
		MPU member	E-commerce	ATM	POS	Network bandwidth	terminals	Total	YGN	NPT	MDY	Etc.
13	Innwa Bank Ltd	Yes				4Mbps	5	34	4	1	5	Ayeyarwaddy - 1 Bago - 2 Kachin-3 Kayah-1 Kayin-1 Magway-3 Mon-1 Rakhine - 3 Sagaing-2 Shan -5 Tanintharyi-2
14	Kanbawza Bank Ltd(Kyuntawlan Branch)	Yes	No	Yes	Yes	4Mbps	3	391	127	12	84	Ayeyarwaddy - 17 Bago - 25 Chin - 1 Kachin - 8 Kayin - 9 Magway - 11 Mon 17 Rakhine - 8 Sagaing - 20 Shan - 43 Tanintharyi - 9
	Kanbawza Bank Ltd(Merchant Road)					2Mbps	2					
15	Myanmar Apex Bank	Yes		Yes	Yes	4Mbps	3	90	25	2	18	Ayeyarwaddy - 4 Bago - 7 Kachin - 2 Kayar - 1 Kayin - 1 Magway - 7 Mon - 2 Rakhine - 4 Sagaing - 7 Shan- 7 Tanintharyi - 3
16	Myanmar Citizens Bank Ltd	Yes		Yes	Yes	4Mbps	3	15	6	1	3	Magway-1 Sagaing-2 Shan-2
17	Myanmar Microfinance Bank Limited	Yes		No	No	4Mbps	3	3	3	0	0	
18	The Myanmar Oriental Bank Ltd.	Yes		Yes	Yes	4Mbps	6	26	8	1	5	Ayeyarwaddy-3 Bago-2 Magway-2 Mon-1 Rakine-1 Sagaing-1 Tanintharyi-2
19	Myawaddy Bank Ltd	Yes		Yes	Yes	4Mbps	10	50	13	2	10	Ayeyarwaddy-2 Bago-7 Kachin-1 Kayin -2 Magway-1 Mon-1 Rakhine -1 Sagaing-1 Shan-7 Tanintharyi-2
20	Naypyitaw Sibin Bank Limited	No				2Mbps	3	7	0	7	0	
21	Rural Development Bank Ltd	Yes		Yes	No	4Mbps	2	2	1	0	1	
22	Small & Medium Industrial Development Bank Ltd	Yes		No	Yes	4Mbps	3	17	6	1	5	Magway-1 Sagaing-2 Shan-2
23	Shwe Rural and Urban Development Bank Limited	Yes		No	No	4Mbps	3	1	1	0	0	
24	Tun Foundation Bank	Yes		Yes	No	4Mbps	3	31	8	1	3	Ayeyarwaddy - 3 Bago - 1 Magway - 4 Sagaing - 11

6-1 Summary of Banks in Myanmar (as of Aug. 2017)

No.	English bank name	MPU deta				CBM-NET		Branches Office				
		MPU member	E-commerce	ATM	POS	Network bandwidth	terminals	Total	YGN	NPT	MDY	Etc.
25	United Amara Bank Ltd	Yes		Yes	Yes	4Mbps	3	74	42	2	21	Ayeyarwaddy - 1 Bago -2 Magway - 2 Shan - 4
26	Yangon City Bank Ltd	Yes		No	No	4Mbps	3	3	3	0	0	
27	Yadanabon Bank Ltd	No				2Mbps	3	2	0	0	2	
28	Yoma Bank Ltd	Yes		No	Yes	2Mbps	3	73	27	1	13	Ayarwaddy - 3 Bago - 6 Kachin - 1 Kayin - 2 Magway -5 Mon - 2 Rakine - 1 Sagaing - 4 Shan - 7 Tanintharyi - 1
29	Australia and New Zeland Banking Group Limited	No				4Mbps	2	1	1	0	0	
30	The Joint Stock Commercial Bank for Investment and Development of Vietnam	No				2Mbps	2	1	1	0	0	
31	Bangkok Bank Public Company Limited	No				4Mbps	3	1	1	0	0	
32	The Bank of Tokyo-Mitsubishi UFJ, Ltd	No				4Mbps	2	1	1	0	0	
33	E.Sun Commercial Bank Limited	No				2Mbps	1	1	1	0	0	
34	Industrial and Commercial Bank of China	No				4Mbps	2	1	1	0	0	
35	Malayan Banking Berhad	No				4Mbps	2	1	1	0	0	
36	Mizuho Bank Limited	No				4Mbps	3	1	1	0	0	
37	Oversea-Chinese Banking Corporation Ltd	No				4Mbps	5	1	1	0	0	
38	State Bank of India	No				2Mbps	1	1	1	0	0	
39	Shinhan Bank	No				2Mbps	1	1	1	0	0	
40	Sumitomo Mitsui Banking Corporation	No				4Mbps	3	1	1	0	0	
41	United Overseas Bank Limited	No				4Mbps	2	1	1	0	0	

6-1 Summary of Banks in Myanmar (as of Aug. 2017)

No.	English bank name	Core Banking System			ATM	Retail payment	Internal Communication	Number of accounts			
		Core banking Software	Data center	DR Data center				Savings accounts		Current accounts	
								2016	Increase	2016	Increase
1	Myanma Agriculture and Development Bank	Nothing	N/A	N/A	No	N/A	Manual	860	(2)	94	(-8)
2	Myanma Economic Bank (Mandalay) Myanma Economic Bank (Nay Pyi Taw) Myanma Economic Bank (Yangon)	(Planning)	(NPT)	(YGN)	Yes	CBM-NET LBA	Manual	873,709	(37,826)	179,018	(19,778)
3	Myanmar Foreign Trade Bank	(Planning)	N/A	N/A	Yes	CBM-NET	N/A		( )	104,561	(331)
4	Myanma Investment and Commercial Bank	(Flexcube)	N/A	N/A		CBM-NET LBA	Manual	6,527	(-252)	1,034	(-497)
5	Ayeyarwady Farmers Development Bank Limited	ACE	Pathein	Nothing		N/A	N/A	3,261	(2,873)	828	(798)
6	Asia Green Development Bank Ltd	Finack	NPT	Nothing	Yes	CBM-NET LBA	N/A	115,217	(15,425)	150,570	(33,466)
7	Ayeyarwady Bank	Optimal 9(JITS) (Change to Misys)	YGN	YGN	Yes	CBM-NET LBA	Online	837,023	(379,818)	207,322	(30,116)
8	Asia Yangon Bank Ltd	(Planning)	N/A	N/A	NO	CBM-NET LBA	Manual	2,039	(607)	1,761	(137)
9	Co-operative Bank Ltd.	Temenos T24	YGN	YGN (Planning NPT)	Yes	Manual LBA	Online	107,729	(15,068)	929,286	(230,388)
10	Construction and Housing Development Bank Limited	(Planning)	(Planning YGN)	(Planning)	Yes	CBM-NET LBA	Manual	8,404	(4,444)	2,091	(1,122)
11	First Private Bank Ltd	Nothing	N/A	N/A	No	LBA	N/A	44,582	(1,888)	7,508	(175)
12	Global Treasure Bank Ltd	(Planning)	N/A	(Planning)	Yes			146,821	(9,436)	21,994	(-3,640)

6-1 Summary of Banks in Myanmar (as of Aug. 2017)

No.	English bank name	Core Banking System			ATM	Retail payment	Internal Communication	Number of accounts			
		Core banking Software	Data center	DR Data center				Savings accounts		Current accounts	
								2016	Increase	2016	Increase
13	Innwa Bank Ltd	local system	YGN	(Planning)		CBM-NET	Online	112,637	(8,214)	54,081	(1,195)
14	Kanbawza Bank Ltd(Kyuntawlan Branch) Kanbawza Bank Ltd(Merchant Road)	Flexcube	YGN	YGN (Planning NPT)	Yes	LBA	Online	3,036,525	(849,429)	205,176	(25,260)
15	Myanmar Apex Bank	Flexcube	NPT	YGN	Yes	CBM-NET LBA	Online	141,186	(14,626)	111,561	(-480,580)
16	Myanmar Citizens Bank Ltd	(Planning)	(Planning)	N/A	Yes	LBA	Manual	27,657	(2,655)	43,190	(4,980)
17	Myanmar Microfinance Bank Limited	Temenos T24	YGN	Nothing	No	CBM-NET LBA	Online	6,527	(-252)	850	(-184)
18	The Myanmar Oriental Bank Ltd.	Tenemos T24	YGN	(Planning)	Yes	CBM-NET LBA	Manual	58,789	(9,641)	44,267	(5,987)
19	Myawaddy Bank Ltd	MIT Pte,LTD (Semi online) (Change to Infosys Ltd.)	YGN	Nothing	Yes	LBA	Online &Manual	133,485	(32,293)	9,070	(-80)
20	Naypyitaw Sibin Bank Limited	ICBS	NPT	(Planning)	No	CBM-NET LBA	Online	2,465	(0)	774	(228)
21	Rural Development Bank Ltd	(Planning)	N/A	(Planning)	Yes	CBM-NET LBA	Manual	3,131	(-331)	2,360	(476)
22	Small & Medium Industrial Development Bank Ltd	(ACE)	YGN	Nothing	Yes	CBM-NET LBA	Manual	15,761	(986)	6,818	(546)
23	Shwe Rural and Urban Development Bank Limited	Flexcube	YGN	YGN	Yes	CBM-NET LBA	Online	5,770	(0)	617	(0)
24	Tun Foundation Bank	Flexcube	YGN	Kyackkada	Yes	CBM-NET	Online	53,944	(3,857)	6,341	(422)

6-1 Summary of Banks in Myanmar (as of Aug. 2017)

No.	English bank name	Core Banking System			ATM	Retail payment	Internal Communication	Number of accounts			
		Core banking Software	Data center	DR Data center				Savings accounts		Current accounts	
								2016	Increase	2016	Increase
25	United Amara Bank Ltd	Pumori Plus Ⅳ	YGN	YGN(8miles)	Yes	CBM-NET LBA	Online	234,739	(65,457)	53,039	(3,914)
26	Yangon City Bank Ltd	Nothing	N/A	N/A	No	CBM-NET LBA	Manual	17,873	(285)	1,606	(54)
27	Yadanabon Bank Ltd	(Offline Distibuted computer systen)	N/A	N/A	No	CBM-NET LBA	Manual	4,523	(301)	2,983	(779)
28	Yoma Bank Ltd	Misys	YGN	YGN	No	LBA	Online	169,909	(39,560)	122,241	(49,371)
29	Australia and New Zeland Banking Group Limited	Midanz	Melbourne, Australia	Melbourne, Australia		CBM-NET LBA	N/A		( )		( )
30	The Joint Stock Commercial Bank for Investment and Development of Vietnam	Intellect	YGN	Nothing		CBM-NET LBA	N/A	0	(0)	45	(45)
31	Bangkok Bank Public Company Limited	Systematics	Bankok,Thal land	Bankok,Thal land		SWIFT	N/A	37	(18)	68	(33)
32	The Bank of Tokyo-Mitsubishi UFJ, Ltd	Tenemos T24	YGN	Singapore		CBM-NET	N/A	203	(87)	248	(103)
33	E.Sun Commercial Bank Limited	Tenemos T24	Taipei	Taipei		CBM-NET	N/A	N/A	( )	17	(17)
34	Industrial and Commercial Bank of China	FOVA(Oneself)	Shanhai	Shanhai		N/A	N/A	N/A	(N/A)	N/A	(N/A)
35	Malayan Banking Berhad	ICBA	YGN	Kuala Lumpur, Malaysia		CBM-NET	N/A	N/A	(N/A)	79	(53)
36	Mizuho Bank Limited	Nothing	N/A	N/A		CBM-NET	N/A	121	(79)	292	(182)
37	Oversea-Chinese Banking Corporation Ltd	Misys,Midas Plus	Singapore	Malaysia		CBM-NET	N/A	0	(0)	119	(-7)
38	State Bank of India								( )		( )
39	Shinhan Bank	Aither	Korea	YGN		CBM-NET	N/A	N/A	(N/A)	46	(46)
40	Sumitomo Mitsui Banking Corporation	Tenemos T24	Yamato,Jap an	Unagitani,Ja pan		LBA	N/A	67	(-12)	176	(-30)
41	United Overseas Bank Limited	IBM AS400	Singapore	Singapore		CBM-NET	N/A	132	(48)	0	(0)

6-1 Summary of Banks in Myanmar (as of Aug. 2017)

No.	English bank name	Settlement(/Day)		Settlement(/Day)		Settlement(/Day)				Settlement(/Day)			
		Large-value	Interbank	Intrabank	Etc.	Large-value	Interbank	Intrabank	Etc.	Large-value	Interbank	Intrabank	Etc.
		2016		2016		2015				2014			
1	Myanma Agriculture and Development Bank	13	0	0	0	12	0	0	0	10	0	0	0
2	Myanma Economic Bank (Mandalay)												
	Myanma Economic Bank (Nay Pyi Taw)												
	Myanma Economic Bank (Yangon)												
3	Myanmar Foreign Trade Bank	0	66	0	0	0	0	0	0	0	0	0	0
4	Myanma Investment and Commercial Bank	16	12	2	0	14	14	2	0	5	17	2	0
5	Ayeyarwady Farmers Development Bank Limited	0	0	0	0	0	0	0	0	0	0	0	0
6	Asia Green Development Bank Ltd	0	11,693	47,706	74,194	0	7,675	51,726	127,540	0	20,098	56,330	69,556
7	Ayeyarwady Bank	0	478	0	8,973	0	496	0	4,016	0	493	0	2,442
8	Asia Yangon Bank Ltd	0	214	43	0	0	205	34	0	0	225	26	0
9	Co-operative Bank Ltd.	0	10,462	1,312	9	0	9,469	741	0	0	8,516	772	0
10	Construction and Housing Development Bank Limited	0	0	0	0	0	0	0	0	0	0	0	0
11	First Private Bank Ltd		0	0	0								
12	Global Treasure Bank Ltd												

6-1 Summary of Banks in Myanmar (as of Aug. 2017)

No.	English bank name	Settlement(/Day)		Settlement(/Day)		Settlement(/Day)				Settlement(/Day)			
		Large-value	Interbank	Intrabank	Etc.	Large-value	Interbank	Intrabank	Etc.	Large-value	Interbank	Intrabank	Etc.
		2016		2016		2015				2014			
13	Innwa Bank Ltd	23	177	198	47	0	223	165	58	0	223	596	73
14	Kanbawza Bank Ltd(Kyuntawlan Branch)												
	Kanbawza Bank Ltd(Merchant Road)												
15	Myanmar Apex Bank	315	401	926	20	205	306	613	19	107	240	362	15
16	Myanmar Citizens Bank Ltd												
17	Myanmar Microfinance Bank Limited	0	4	0	0	0	4	0	0	0	1	0	0
18	The Myanmar Oriental Bank Ltd.	504	148	712	2,727	629	133	684	1,975	346	147	635	1,507
19	Myawaddy Bank Ltd	5	109	1,973	16,604	15	2,006	1,691	10,964	15	1,900	1,445	10,443
20	Naypyitaw Sibin Bank Limited	0	0	0	0	0	0	0	0	0	0	0	0
21	Rural Development Bank Ltd	4	29	3	0	6	24	2	0	6	31	2	0
22	Small & Medium Industrial Development Bank Ltd	1	0	0	0	0	0	0	0	0	0	0	0
23	Shwe Rural and Urban Development Bank Limited	30	0	0	0	0	0	0	0	0	0	0	0
24	Tun Foundation Bank	0	0	0	0	0	0	0	0	0	0	0	0

6-1 Summary of Banks in Myanmar (as of Aug. 2017)

No.	English bank name	Settlement(/Day)		Settlement(/Day)		Settlement(/Day)				Settlement(/Day)			
		Large-value	Interbank	Intrabank	Etc.	Large-value	Interbank	Intrabank	Etc.	Large-value	Interbank	Intrabank	Etc.
		2016		2016		2015				2014			
25	United Amara Bank Ltd	2	0	724	887	4	0	469	949	3	0	297	771
26	Yangon City Bank Ltd		71				98				80		
27	Yadanabon Bank Ltd	0	1,213	42	0	0	1,021	36	0	0	845	20	0
28	Yoma Bank Ltd	2	695	6,808	6,740	1	1,380	6,723	7,809	1	0	0	10,082
29	Australia and New Zeland Banking Group Limited												
30	The Joint Stock Commercial Bank for Investment and Development of Vietnam												
31	Bangkok Bank Public Company Limited												
32	The Bank of Tokyo-Mitsubishi UFJ, Ltd												
33	E.Sun Commercial Bank Limited												
34	Industrial and Commercial Bank of China												
35	Malayan Banking Berhad												
36	Mizuho Bank Limited												
37	Oversea-Chinese Banking Corporation Ltd												
38	State Bank of India												
39	Shinhan Bank												
40	Sumitomo Mitsui Banking Corporation												
41	United Overseas Bank Limited												

N/A

6-1 Summary of Banks in Myanmar (as of Aug. 2017)

No.	English bank name	Internet Banking		Mobile Banking	
		for Personal	for Corporate	Y/N Mobile servicer Authorization date	Transaction (/Day)
1	Myanma Agriculture and Development Bank	No	No		
2	Myanma Economic Bank (Mandalay) Myanma Economic Bank (Nay Pyi Taw) Myanma Economic Bank (Yangon)	No	No		
3	Myanmar Foreign Trade Bank	No	No		
4	Myanma Investment and Commercial Bank	No	No		
5	Ayeyarwady Farmers Development Bank Limited	No	No		
6	Asia Green Development Bank Ltd	Yes	Yes	Yes AGD Pay Nov-2015	2.84
7	Ayeyarwady Bank	Yes	No		
8	Asia Yangon Bank Ltd	No	No		
9	Co-operative Bank Ltd.	Yes	Yes	Yes Easi Mobile Jun-2014	18,055.61
10	Construction and Housing Development Bank Limited	No	No		
11	First Private Bank Ltd	No	No	Yes myKyat Jun-2014	42.55
12	Global Treasure Bank Ltd	No	No		

6-1 Summary of Banks in Myanmar (as of Aug. 2017)

No.	English bank name	Internet Banking		Mobile Banking	
		for Personal	for Corporate	Y/N Mobile servicer Authorization date	Transaction (/Day)
13	Innwa Bank Ltd	Yes	No	Yes Myanmar Mobile Money Dec-2013	66.52
14	Kanbawza Bank Ltd(Kyuntawlan Branch)	Yes	Yes		
	Kanbawza Bank Ltd(Merchant Road)				
15	Myanmar Apex Bank	No	No	Yes MAB mobile Apr-2015	327.68
16	Myanmar Citizens Bank Ltd	No	No	Yes 663 Mobile money services May-2015	0.58
17	Myanmar Microfinance Bank Limited	No	No		
18	The Myanmar Oriental Bank Ltd.	No	No		
19	Myawaddy Bank Ltd	Yes	No	Yes mBanking Myawaddy Feb-2014	16.52
20	Naypyitaw Sibin Bank Limited	No	No		
21	Rural Development Bank Ltd	No	No		
22	Small & Medium Industrial Development Bank Ltd	No	No		
23	Shwe Rural and Urban Development Bank Limited	No	No	Yes - -	0.00
24	Tun Foundation Bank	Yes	Yes		

6-1 Summary of Banks in Myanmar (as of Aug. 2017)

No.	English bank name	Internet Banking		Mobile Banking	
		for Personal	for Corporate	Y/N Mobile servicer Authorization date	Transaction (/Day)
25	United Amara Bank Ltd	Yes	No		
26	Yangon City Bank Ltd	No	No		
27	Yadanabon Bank Ltd	No	No		
28	Yoma Bank Ltd	Yes	No	Yes Wave Money Oct-2016	0.00
29	Australia and New Zeland Banking Group Limited				
30	The Joint Stock Commercial Bank for Investment and Development of Vietnam				
31	Bangkok Bank Public Company Limited				
32	The Bank of Tokyo-Mitsubishi UFJ, Ltd				
33	E.Sun Commercial Bank Limited				
34	Industrial and Commercial Bank of China				
35	Malayan Banking Berhad				
36	Mizuho Bank Limited				
37	Oversea-Chinese Banking Corporation Ltd				
38	State Bank of India				
39	Shinhan Bank				
40	Sumitomo Mitsui Banking Corporation				
41	United Overseas Bank Limited				

N/A

6-2. Internet & Mobile Banking in Myanmar (as of Aug. 2017)

No.	Banks	ATM Services				Internet Banking for Corporate	Internet Banking for Personal	Mobile Banking	International Fund Transfer	Credit Card Issuing	Tax Payment Reception
		Withdraw	Deposit	Remittance	Bill Payment						
1	**CB Bank**	Yes	Yes	Yes	N/A	Account Enquiries Payment Stadning Orders Loans and fixed deposit Enquiries Payroll Cash Sweeping Oversea Fund Transfer Domestic Fund Transfer Alerts Account Statements	Checking balance View Account History Loan Schedule Future Date Enquiries Fund Transfer Own Account Manage Beneficiary Funds Trnasfer Beneficiary Payment Payment Stop Cheque Details Cheque Book Request Standing Orders CB Bank Easi Travel VISA/MasterCard Tou Up eTop Up Making Purchase Bill Payment	View Location of ATMs Checking Balance View Exchange Rates Enquires Posted Payment Fund transfer to own account Beneficiary Registration Funds transfer to beneficiary payment Top Up for CB Easi Travel Master Card/VISA Card/CUP Card Top up for CB Bank MPU Card Top-up Payment STop Cheque Details Cheque Book Request Standing Orders	Yes [SWIFT]	Yes	N/A
2	**KBZ Bank**	Yes	Yes	Yes	Yes	Account Enquiries Collection Services[Liquidity Management] Business Payment Solutions KBZ Quick Pay E-Commerce Escrow Account	Account Enquiries Debit Card International Card Acceptance Prepaid Card Teens Card KBZ UnionPay Credit Card KBA Visa Credit Card Bank Certificate Currency Exchange E-commerce KBZ Quick Pay Payment Order Safe Deposit Box International Remittance Local Remittance Hire Purchase Loans Overdraft Loans	Check balance and view account statement Fund transfer(KBZ Accounts) Multiple accounts fund transfer Set-up scheduled payments Cheque Status Stop or unblock cheque Cheque Book Request Pay bill (Electricity Bill) Mobile Top-up DirectPay to pay for onlice purchases Foreign Exchange Calculator Secured Mailbox	Yes [SWIFT]	Yes	Only Corporate Tax Payment
3	**AYA Bank**	Yes	Yes	N/A	Yes	N/A	Account Enquires Fund Transfers E-Top-Up Bill Payment for Utility Cost	Check balance and Accounts Statement Fund Transfer Pay Bill (Electricity Bill) Mobile Top-Up Locations of ATM SMS Syntax Foreign Exchange Rates Faculty Calculator Products and Services	Yes [SWIFT]	Yes	N/A
4	**YOMA Bank**	N/A	N/A	N/A	N/A	N/A	Bill Pay Transfers Alert Paperless Statement Access to Account Balance Overdraft Requests Direct Debits/Regular Payment Credit Card Management Track Loans/Mortgage Account 24/7 Management of Accounts	Bill Pay Transfers Alert Paperless Statement Access to Account Balance Overdraft Requests Direct Debits/Regular Payment Credit Card Management Track Loans/Mortgage Account 24/7 Management of Accounts	Yes [Western Union]	N/A	N/A
5	**MEB Bank**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes
6	**UAB**	Yes	Yes	N/A	Yes	N/A	UAB Deposits UAB Foreign Current Account UAB Foreign Exchange Services UAB Hire Purchase Facility UAB Giro Payment Western Union Money Transferx ATM with MPU, VISA and MasterCard	N/A	Yes [SWIFT]	N/A	N/A
7	**MWB**	Yes	Yes	N/A	N/A	N/A	Balance Check Bank Statement Check Account Summary Check Cheque Check ATMs Locators POS and branch Locators Mobile Payment for Near Filed Communication Services	Balance Check Bank Statement Check Account Summary Check Cheque Check ATMs Locators POS and branch Locators Mobile Payment for Near Filed Communication Services	N/A	N/A	N/A
8	**AGD Bank**	Yes	Yes	N/A	N/A	Company's Current, Saving and Other Accounts Loans and Lending Services Cards Services Payment and Cash Management Service Loal Remittance	Personal Accounts (Current, Saving, Fixed and Foreign Currency) Cards (MPU,MPU-UnionPay, VISA, MasterCard Loans and Lending Services Local Remittance	Remittance Check Account Balance Transaction History Online Payment Enquiry Mini Statement Transfer Funds Pay Bills Mobile Top-Up ATM/Exchange Locator Interest/Remittance/Exchange Calculation Exchange Reate Updates Language: Myanmar/English	Yes [Money Gram] With other partnered foreign banks	N/A	N/A
9	**Innwa Bank**	N/A	N/A	N/A	N/A	N/A	Access to Account Check Accounts Balances	N/A	N/A	N/A	N/A
10	**MOB**	Yes	Yes	N/A	N/A	N/A	N/A	N/A	Yes [Western Union]	N/A	N/A