

Republic of the Union of Myanmar  
Central Bank of Myanmar

# Preparatory Survey on the Project for the Development of ICT System for Central Banking

Final Report

November 2013

Japan International Cooperation Agency (JICA)

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

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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.

November, 2013

Takumi Ueshima  
Director General,  
Industrial Development and Public Governance Department  
Japan International Cooperation Agency



# Executive Summary

## 1. Overview of the Project

### 1.1 Background

Myanmar, in anticipating rapid economic growth, places importance on complying with various international standards so as to guide the growth toward catching up with the other ASEAN states. Its financial sector, however, lags behind not only on setting the regulations but also in providing appropriate infrastructure for economic activities. Delay in the development of information infrastructure for the financial sector may even become a bottleneck for the Growth of the country as the whole. The Central Bank of Myanmar (CBM), under the notion of the absence of its business ICT system, has prioritized the development of settlement system for fund and bonds transactions as well as for cheque clearing that will immediately bring about benefits to the financial institutions. It is on the ground of this urgent necessity that CBM has request to the government of Japan for the development of ICT system for central banking.

Experience of the development and introduction of modern ICT system is still limited, not only in the financial sector but as overall in Myanmar. This is why the ICT related skills and capacity are significantly lacking in the country. Development and introduction of an ICT system for central banking is likely to face considerable constraints under such circumstances. The assistance should therefore focus not only on the development of the information system but also on penetration of ICT relates knowledge and experience to the country's financial sector as a whole. Technical transfer for CBM to become capable of planning and operating of its ICT system will also be an essential element of the assistance.

This project will be conducted with the purpose of not only developing the ICT system but also to transfer knowledge and skills from Japan to CBM, by integrating soft component and also by support from the Technical Cooperation Project that will be conducted in parallel with this project.

### 1.2 Project Information

The project for the development of ICT system for Central Banking is formulated based on the requested from the Central Bank of Myanmar. The overall goal of the project is to improve the environment for the Central Bank of Myanmar to implement necessary financial policies and measures in a smooth and steady manner. The overview of the project is summarized in the following table.

**Table E1 Overview of the Project for the Development of ICT Systems for Central Banking**

Item	Description
Overall goal	To improve the environment in the CBM so that financial policies and measures may be implemented smoothly and steadily.
Project Purpose	To modernize the operation of the CBM for the advancement of financial market and monetary policy by establishing Central Bank ICT System based on the technology and experience of Japan's central bank ICT system.

Output of the Project	Develop an ICT system for CBM based on the technology and experience of Japan's central bank ICT system. Improved infrastructure and office automation (OA) environment so that the central bank system may function appropriately.
Requirement	<ul style="list-style-type: none"> <li>● Software development of the following systems based on the technology and experience of Japan's central bank ICT system <ul style="list-style-type: none"> <li>➢ Fund settlement using RTGS (current account management)</li> <li>➢ Treasury Bonds / Bills (T-bond/bill) settlement including delivery versus payment (DVP) function (registry management)<sup>1</sup></li> <li>➢ Credit and collateral management</li> <li>➢ Mechanized Clearing House</li> </ul> </li> <li>● Operation of system tests/acceptance tests, training for system users in the central bank, state owned banks and private banks, and design of technical support and system maintenance.</li> <li>● Hardware Development: Procurement of hardware, operating system, middle ware and any other equipment which are necessary for properly operating software mentioned above.</li> </ul>
Target area	Target geographical area is the entire territory of Myanmar. CBM Head Office and branches are located in the following areas. <ul style="list-style-type: none"> <li>● Nay Pyi Taw (Head Office of the CBM)</li> <li>● Yangon</li> <li>● Mandalay</li> </ul>
Relevant organizations of recipient country	Responsible Agency and Implementing Agency: CBM
Beneficiary	Direct beneficiary : CBM Indirect beneficiary : Commercial banks (State owned banks, Private banks), Banks' customer
Undertakings by the Myanmar side	Software <ul style="list-style-type: none"> <li>[a] Any change in technical specification after the definition of system requirements;</li> <li>[b] Development of systems of agencies other than CBM;</li> <li>[c] Modification of the existing systems including those outside CBM to be connected to the new system;</li> <li>[d] Transition from the legacy system to the new system, including transfer of data and information;</li> <li>[e] Any change of the system after the system transfer, due to changes of system environment such as the upgrade of OS and middle ware;</li> <li>[f] Any change (upgrade and expansion) of the software after the system transfer;</li> <li>[g] System setting changes for enhancing the system function;</li> <li>[h] Software maintenance costs which may incur after introducing the system;</li> <li>[i] Update of data such as the user list;</li> </ul>

<sup>1</sup> The category and type of securities to be settled in the future can be extended wider in variety besides the existing T-bonds/ T-bills as long as such securities can be settled in the ICT system without changes in the defined specifications.

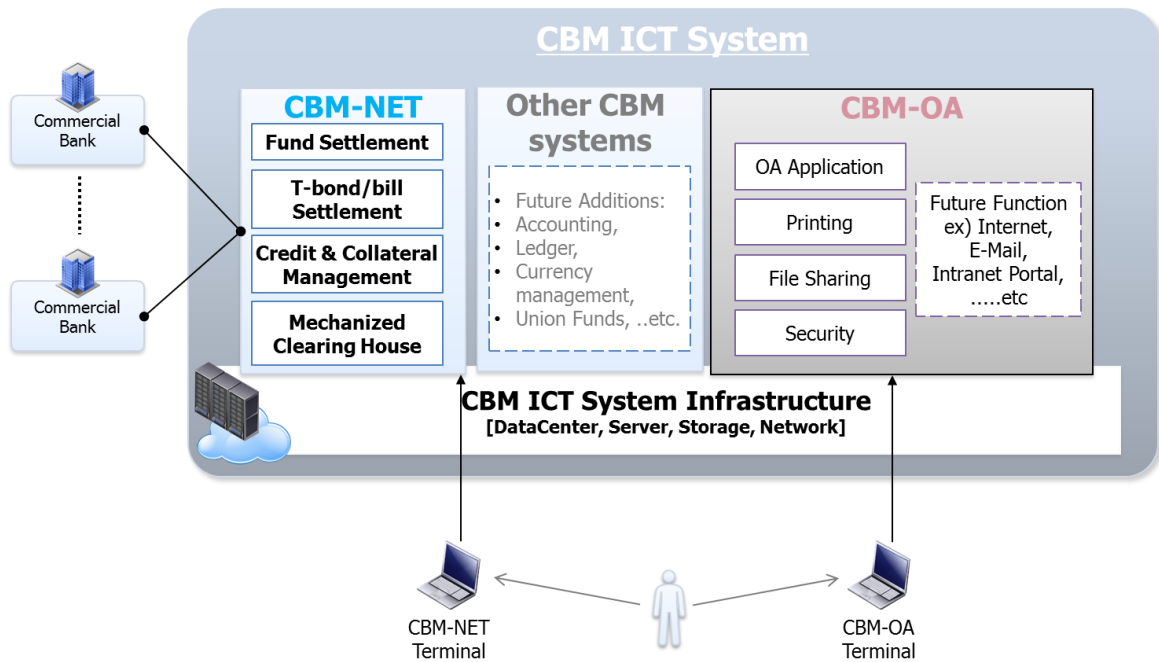
	<p>[j] Cost of process of application for use from the commercial banks;  [k] Preparation and distribution of document for the users of commercial banks and the central bank;  [l] Development of the central bank's operations manuals with regards to legal requirements.</p> <p>2) Hardware/Facilities, etc.</p> <p>[m] Construction/Upgrading of a datacenter and a backup datacenter;  [n] Necessary facilities on premises such as security against theft, fire protection, electricity supply and air conditioning;  [o] Technical design for Wide Area Network (WAN) and Local Area Network (LAN);  [p] Providing the computer terminals for any system users including system users of state owned banks and private banks;  [q] System maintenance and operation after the system transfer; (helpdesk, system monitoring staff, maintenance staff, etc.);  [r] Any replacement of the hardware after the system transfer;  [s] Changing the setting for enhancing the function of the system;  [t] Hardware maintenance after the introduction of the system;  [u] User support for state owned banks and private banks;  [v] Creating a business manual in CBM which stipulates business operation using the new system;  [w] Printing and distribution of documents for state owned banks and private banks;  [x] Connection fees of the installed communication lines;  [y] Make arrangements and agreements with financial institutions regarding implementation of ICT system in CBM (e.g. with participants of clearing house to make nationally uniform standards of cheques, etc);  [z] Providing a user training facility in CBM for operation of the new system, and;  [aa] Distributing and setting up equipment necessary for participants of Clearing House.</p>
Activities in Soft Component	<ul style="list-style-type: none"> <li>● Support for drafting of business manuals;</li> <li>● Support for user trainings;</li> <li>● Support for communications with the commercial banks, and;</li> <li>● Support for setting up of operation and maintenance structure.</li> </ul>

Source: Prepared by the Survey Team based on the Minutes of Discussion signed between CBM and JICA, September 2013

## 2. The New ICT Systems

### 2.1 System Description

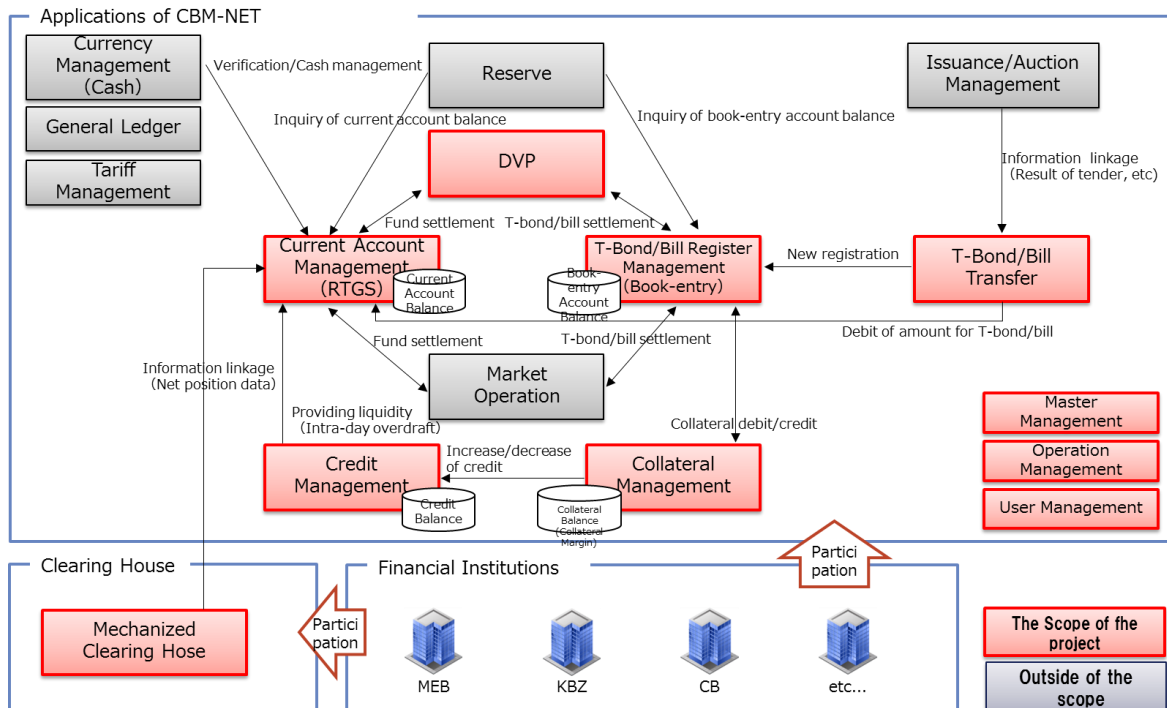
In this project, “CBM-NET (CBM Financial Network System)” and “CBM-OA (CBM Office Automation System)” will be developed to provide new functions for CBM. CBM-NET provides functions for settlement of funds, Treasury bonds (T-bonds) and Treasury bills (T-bills), credit and collateral management, and mechanized clearing house (MCH). The CBM-OA provides office automation (OA) application, printing function, file sharing service, and security mechanism. These systems will be structured on the new CBM ICT System Infrastructure. Other ICT systems may also be developed in future on this system infrastructure.



Source: Prepared by the Survey Team

**Figure E1 CBM-NET and CBM-OA**

Fund transactions in CBM-NET include cash deposit / withdrawal and fund transfer in Myanmar Kyat (MMK), US Dollar (USD), Euro (EUR), Japanese Yen (JPY) and Singapore Dollar (SGD). T-bond / T-bill transactions in the system include new issuance – tender – new registration, T-bond/bill selling, T-bond/bill transfer, T-bond/bill delivery versus payment (DVP), and interest payment / redemption.



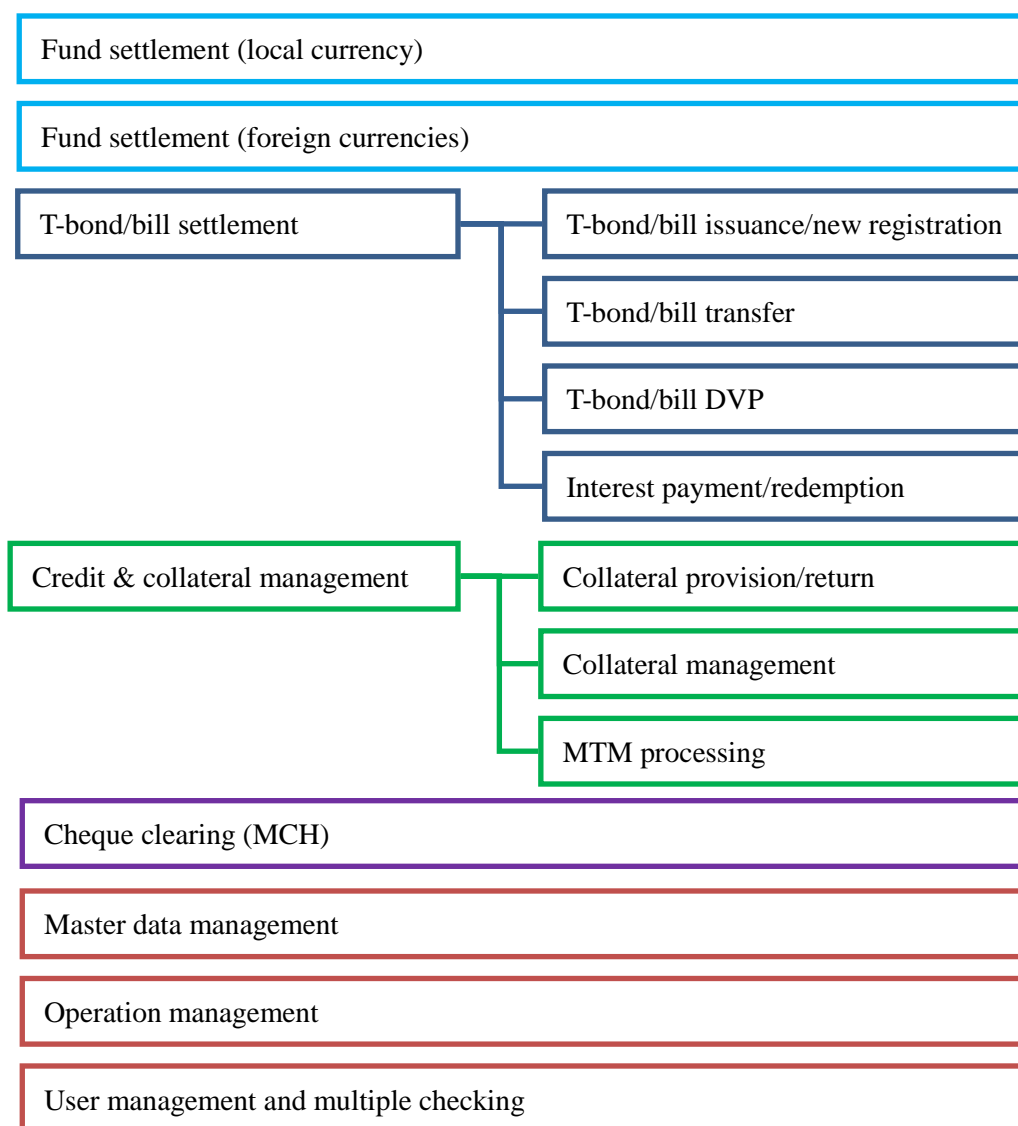
Source: Prepared by the Survey Team

**Figure E2 Coverage of CBM-NET Applications**



## 2.2 System Functions

Overview of the system functions requirement (logical configuration) of CBM-NET, based on the new business settings is as shown in the next figure. There are broadly five categories of functions, which are fund settlement, T-bond/bill settlement, credit & collateral management, cheque clearing, and system management functions.



Source: Prepared by the Survey Team

**Figure E3 Overview of CBM-NET Functions**

## 2.3 Project Timetable

The project started with the signing of the Minutes of Discussion (M/D) between CBM and JICA in March 2013. Following the M/D, the preparatory survey for defining the scope and specification of the systems to be developed is being conducted. The survey will be completed by October 2013, when the Cabinet is scheduled to approve the execution of the project.

Designing and development of the systems will commence in March 2014 and will continue until the end of 2015. After various testing and trainings, the system will be handed over to CBM by the end of year 2015.

## 3. Evaluation of the Project

### 3.1 Relevance

Japan recognizes the importance of extending economic cooperation to Myanmar from the viewpoint of contribution to the prosperity, stability and integration of ASEAN. This is done by supporting the reforms in Myanmar pursued toward democratization, reconciliation and sustainable development. In April 2012, Japan, with the intention to further encourage the reforms, widened the scope of its economic cooperation to include not only the basic human needs (BHN) but also to support (1) improvement of the living standard of the people, (2) institutional development and capacity development of human resources that would contribute to the social and economic development, and (3) development of infrastructures and systems that will enable sustainable development of the country. This Project will correspond directly to the direction mentioned in (3) by developing an ICT system, as well as consequently to (2) by contributing to institutional and capacity development at CBM, and also to (1) as the outcome. The Project therefore is of significant relevance to Japan's economic cooperation policy.

Another aspect of notable relevance is with the fact that CBM-NET will be developed based on the experiences and know-hows of designing and operation of Bank of Japan Financial Information Network (BOJ-NET), which is Japan's business ICT system for today's central banking. The feature of BOJ-NET in that fund and bond settlements are conducted in integral manner coincides well with the requirement from CBM. This is a strong rationality for CBM-NET to be developed with reference to BOJ-NET.

The Government of Myanmar already made a commitment to join the ASEAN Economic Community in 2015 and consider the development of ICT to enhance its financial system as an important issue. The necessity to modernize the financial sector was also pointed out during the IMF's Article IV Consultations wherein the introduction of systems such as the independence of CBM, and strengthening of its functions and electronic settlement are regarded as urgent task. Under such situation, the development for an ICT system for central banking is an issue of highest priority and urgency. Relevance of the project in the context of Myanmar's requirement is therefore evident in that the Project addresses directly to this priority issue.

The effect of the Project will be brought about as the direct contribution to the modernization of the financial sector as well as improvement in business and investment climates. Such effect will benefit the citizens of Myanmar as a whole in that it contributes to the economic development of the country.

### 3.2 Effectiveness

#### (1) Expected Effects

The primary effect will be based on the changes that might be occurring at CBM:

- Business operation at CBM will be relieved due to the use of CBM-NET and CBM-OA.
- Service provided to the financial institutions will be improved (wider range of services, conducted in more efficient manner).

Secondary effect may be brought about as a result of the primary effect realizing. For example, the ease of interbank transfer may contribute to the same commercial banks to become more efficient and easy. Financial institutions may also become more integrated among each other, more devoted to the customer making use of the wider variety of products and service.

## (2) Quantitative indicators

**Table E2 Quantitative Evaluation Indicators**

Indicator	Baseline (2013)	Target (2018: three years after completion)
Growth in the number of transactions to be processed (transaction/day)	500	5,000
Time saving in cheque clearing operations (second/cheque)	4.2	0.3

Source: Prepared by the Survey Team

## (3) Qualitative indicators

- ICT literacy:  
Improvement of ICT literacy at CBM (measurable for example, by the ratio of usage of PC applications within daily business).
- Knowledge and awareness on information security:  
Improvement in information security at CBM (may be measured by the ratio of unprotected PCs against the total number of PCs in CBM).



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# Location Map



Source: Base map taken from the United Nations Department of Field Support Cartographic Section





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## Acronyms

A/C	Account
ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
ATM	Automatic teller machine
BHN	Basic human needs
BIC	Bank identifier code
BIS	Bank for International Settlements
BOJ	Bank of Japan
BOJ-NET	Bank of Japan Financial Network System
CB	Commercial bank
CBM	Central Bank of Myanmar
CBM-NET	Central Bank of Myanmar Financial Network System
CBM-OA	Central Bank of Myanmar Office Automation System
CPSS	Committee on Payment and Settlement Systems
CPE	Customer premises equipment
CPU	Central processing unit
CR	Credit request
D2D	Disk to disk
DAC	Development Assistance Committee (OECD)
DC	Data center
DDG	Deputy Director-General
DG	Director General
DNS	Domain name system
DR	Debit request
DTNS	Designated-time net settlement
DVP	Delivery versus payment
EFT	Electric Funds Transfer
EMEAP	Executives' Meeting of East Asia Pacific Central Banks
E/N	Exchange of Notes
EUR	Euro (currency)
FEMD	Foreign Exchange Management Department (CBM)
FI	Financial institution
FMD	Financial Market Department (CBM)
FX	Foreign exchange
G/A	Grant Agreement
GDP	Gross Domestic Product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
HA	High availability
HDD	Hard disk drive
H/O	Head Office
HV	Hypervisor
HW	Hardware
ICAS	Imaged Cheque Clearing and Archive System
ICT	Information Communication Technology
ID	Identification
IMF	International Monetary Fund
IOSCO	International Organization of Securities Commissions
IP	Internet protocol
IPSEC	Security Architecture for Internet Protocol

JICA	Japan International Cooperation Agency
JETRO	Japan External Trade Organization
JPY	Japanese Yen (currency)
LAN	Local area network
LTV	Loan-to-value
M1	Money supply (definition M1)
MAC	Media access control
MAX	Maximum
MCH	Mechanized Clearing House
MDY	Mandalay (CBM Mandalay Branch)
M/D	Minutes of Discussion
MEB	Myanma Economic Bank
MICR	Magnetic ink character recognition
MMK	Myanmar Kyat (currency)
MOF / MOFR	Ministry of Finance / (formerly Ministry of Finance and Revenue)
MPT	Myanma Posts and Telecommunication
MPU	Myanmar Payment Union
MTM	Mark-to-market
MSEC	Myanmar Securities Exchange Centre Co., Ltd
NAS	Network attached storage
N/A	Not available
NIC	Network interface card
NPT	Nay Pyi Taw (CBM Nay Pyi Taw Head Office)
NTP	Network time protocol
NW	Network
OA	Office automation
O&M	Operation and maintenance
ODA	Official Development Assistance
OECD	Organisation for Economic Cooperation and Development
ONU	Optical network unit
OS	Operating system
OSS	Open source software
PC	Personal computer
POS	Point of sales
PSSD	Payment and Settlement System Department (CBM)
RAID	Redundant arrays of inexpensive disks
RTGS	Real-time gross settlement
SAN	Storage area network
SGD	Singapore Dollar (currency)
SNMP	Simple network management protocol
SOA	Service oriented architecture
STP	Straight through processing
SW	Software
SWIFT	Society for Worldwide Interbank Financial Telecommunication
T-bill	Treasury bill
T-Bond	Treasury bond
UPS	Uninterruptible power supply
USD	US Dollar (currency)
VDI	Virtual Desktop Infrastructure
VPN	Virtual private network
WAN	Wide area network
XML	Extensible Markup Language
YGN	Yangon (CBM Yangon Branch)

## Exchange Rates

MMK	= JPY 0.10
USD	= JPY 99.77

(Average May – July 2013)



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# 1. Background of the Project

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## 1.1 Financial Sector in Myanmar

### 1.1.1 Overview of Myanmar

The Republic of the Union of Myanmar is a country with an estimated population of 62.4 million (as of 2011) and a territory size of 680,000 km<sup>2</sup>, which is approximately 1.8 times of that of Japan. Myanmar's economic growth rate is 5.5% and per capita GDP of USD 702. The head of State is the President and the principal industry is agriculture.

Myanmar, after 25 more than years of socialist regime, followed more than 20 years of the military rule. During this period the country's economic development was only in a limited extent. Its financial sector was hence left in an under developed condition for almost half century. The new administration of Myanmar was only formed in March 2011. Soon after, its new president delivered a speech on policy reform goals on politics, economics, investment promotion and social development. In April 2012 the dual exchange rate system, which had been pending, was dissolved and the import-export system has improved. With these initial reforms, Myanmar's financial sector is steadily making up for almost half century of the time it has lost. It nevertheless has various issues to be solved to catch up with the rest of the world.

Although Myanmar is expected to make a big economic growth in the future, there are significant constraints that need to be addressed. Among all, the introduction of the Information Communication Technology (ICT) system, regarded as basic infrastructure for financial system is the requisite condition for the country's financial institutions to be linked to the global economy. The issues of supporting the undeveloped financial institutions will have to be fully addressed especially from the perspective of ICT system introduction. Nevertheless Myanmar also lacks experience in ICT system development, and its resources are deficient. Absence of skills and know-how can become a serious bottleneck for the growth of the country's financial sector.

The Government of Myanmar already made a commitment to join the ASEAN Economic Community in 2015 and consider the development of ICT to enhance its financial system as an important issue. The necessity to modernize the financial sector was also pointed out during the IMF's Article IV Consultations (May 2012) wherein the introduction of systems such as the independence of the Central Bank of Myanmar (CBM), and strengthening of its functions and electronic settlement are regarded as urgent task. As of August 2013, the Myanmar government has enacted a legal instrument that would make CBM independent from the Ministry of Finance and Revenue and therefore implements financial policies smoothly and steadily in the near future. The Ministry also changed its name to Ministry of Finance (MOF).

### 1.1.2 Financial Settlement in Myanmar

#### 1.1.2.1 Overview of the Banking Sector

The CBM is the regulatory and supervisory authority of the financial sector in Myanmar. It is responsible for the development of efficient, fast safe and reliable national payment system. Other than CBM, there are four state-owned banks and 20 private banks that comprise the

country's banking sector. Further, there are 28 foreign bank representative offices. The list of the banks is as in the following table. Majority of the banks are headquartered in Yangon while is a gradual trend to shift the head offices to Nay Pyi Taw. 17 out of 24 are the members to the Myanmar Payment Union (MPU), which is the service provider for automatic teller machines (ATM) and point of sales (POS), jointly set up by the member banks.

In 1962, under the socialist government all commercial banks in Myanmar were merged into few state-owned banks. In 1988, the Myanmar government adopted a market-oriented policy and formed the Financial Institution Law of 1990, which is the current legal instrument for the banking sector. In 1993, the Financial Institutions Law permitted the participation of the private banks.

In parallel with the Financial Institutions Law, the Central Bank of Myanmar Law 1990 was enacted to develop the country's financial system in line with the market oriented policy set by the Government, and to promote the efficiency of financial activities.

Among the 24 banks, 17 are the members to MPU which is an organization established under the joint initiatives of the commercial banks. Being a member to MPU, ATM and POS services will be offered.

**Table 1 Structure of the Banking Sector in Myanmar**

No.	Bank name	Head Office Location	MPU Membership
<b>Private Banks</b>			
1	Yoma Bank Ltd.	Yangon	-
2	Myanmar Oriental Bank Ltd.	Yangon	Yes
3	Kanbawza Bank Ltd.	Yangon	Yes
4	First Private Bank Ltd.	Yangon	-
5	Tun Foundation Bank Ltd.	Yangon	Yes
6	Asian Yangon Bank Ltd.	Yangon	-
7	Co-operative Bank Ltd.	Yangon	Yes
8	Innwa Bank Ltd.	Yangon	Yes
9	Myawaddy Bank Ltd.	Yangon	Yes
10	Small & Medium Industrial Development Bank Ltd.	Yangon	Yes
11	Myanma Livestock and Fisheries Development Bank Ltd.	Yangon	Yes
12	Myanmar Citizens Bank Ltd.	Yangon	Yes
13	Yangon City Bank Ltd.	Yangon	-
14	Rural Development Bank Ltd.	Nay Pyi Taw	Yes
15	Asia Green Development Bank Ltd.	Nay Pyi Taw	Yes
16	Myanmar Apex Bank Ltd.	Nay Pyi Taw	Yes
17	United Amara Bank Ltd.	Nay Pyi Taw	Yes
18	Ayeyarwady Bank Ltd.	Nay Pyi Taw	Yes
19	Nay Pyi Taw Sibibin Bank Ltd.	Nay Pyi Taw	-
20	Yadanabon Bank Ltd.	Mandalay	-
<b>State owned banks</b>			
1	Myanma Economic Bank	Nay Pyi Taw	Yes
2	Myanma Foreign Trade Bank	Yangon	Yes
3	Myanma Investment and Commercial Bank	Yangon	Yes
4	Myanma Agricultural Development Bank	Yangon	-



No.	Bank name
Representative offices of the foreign banks	
1	DBS Bank Ltd.
2	United Overseas Bank Ltd.
3	Oversea-Chinese Banking Corporation Ltd.
4	Malayan Banking Berhad (MAYBANK), Malaysia
5	Bangkok Bank Public Company Ltd.
6	National Bank Ltd.
7	Brunei Investment Bank (BIB)
8	First Overseas Bank Ltd.
9	First Commercial Bank, Singapore Branch
10	CIMB Bank Berhad
11	Sumitomo Mitsui Banking Corporation
12	The Bank of Tokyo-Mitsubishi UFJ, Ltd.
13	Bank for Investment and Development of Vietnam
14	AB Bank Limited
15	Industrial and Commercial Bank of China Ltd.
16	Mizuho Corporate Bank Ltd.
17	Siam Commercial Bank Public Company Ltd.
18	MARUHAN Japan Bank PLC
19	Krung Thai Bank Public Company Ltd.
20	United Bank of India
21	KASIKORNBANK Public Company Ltd.
22	AEON Credit Service Company
23	Hana Bank
24	Woori Bank
25	ANZ Bank
26	Vietin Bank
27	Korea Development Bank
28	Standard Chartered Bank

Source: Prepared by the Survey Team based on information obtained from CBM

In parallel with the Financial Institutions Law, the Central Bank of Myanmar Act came into power in 1990. Principal missions of the CBM are stipulated as: issuing of domestic currency, supervision and settlement between the financial institutions, management of foreign currency and governmental accounts.<sup>2</sup>

### 1.1.2.2 Payment Settlement methods

#### (1) Domestic Cash Payment

Myanmar's domestic payment is still dominated by cash payment, which is evident when comparing the ratio of cash in M1 (narrow money supply). The following table shows the country's heavy reliance on cash as a method of payment.

<sup>2</sup> CBM website (<http://www.cbm.gov.mm/content/central-bank-myanmar/>, browsed 16 July 2013)

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**Table 2 Percentage of Cash in M1 (narrow money supply)**

Country (data source)	Percentage of Cash in M1 (narrow money supply)
Myanmar (Central Statistical Organization)	83%
Philippines (Bangko Sentral ng Pilipinas)	71%
Thailand (Bank of Thailand)	33%
Malaysia (Bank Negara Malaysia)	21%
Singapore (Monetary Authority of Singapore)	13%

Source: Extract from Kanbawza Bank document "Development of Payment and Settlement System in Myanmar"

## (2) Domestic Non-Cash Payment

The common means of non-cash payment in Myanmar are cheques, payment orders and card payments. Among these instruments cheques are the most widely used means of payment. Although the case, cheques are mostly used for large value payments between the corporates and / or governmental organizations. Cheques are not commonly used by the individuals in general. The absence of a penal rule for dishonored cheques is considered a major reason why cheques are unpopular among the individuals in Myanmar.<sup>3</sup>

To cope with the concerns of dishonored cheques, payment orders are commonly used for utility payment and other commercial transactions. Both cheques and payment orders are cleared at CBM's clearing house located in Nay Pyi Taw, Yangon and Mandalay under identical manners.

The only source of card payment in domestic transaction is the MPU card that was introduced in 2012. MPU is a cooperation of 3 state-owned banks and 14 private banks. MPU is supported by Union Pay China. In September 2012 these member bank each provided MPU with MMK 20 million, totaling up to MMK 340 million to establish 198 ATMs and 465 POS throughout Myanmar.<sup>4</sup> According to CBM the total number of MPU cards issued is at 180,000 as of February 2013.

### 1.1.3 Information Communication Infrastructure in Myanmar

The Central Bank of Myanmar, which plays a core role in the financial sector, only has about 150 computer units that are merely 10 percent of the total number of employees at 1,500. Operation system and local area network (LAN) are inadequate. Most of CBM's operations, including the fund settlement and account management between head office and branch office, registry management of bond, and information collection for supervision of commercial banks, are performed through manual operation causing operational inefficiency and inadequate security protection or data management. With the President's policy reforms, Myanmar will soon see increase in capital demands from domestic companies, activate foreign investment and promote use of bank by individuals. Funds and volume of data that financial institutions handle are therefore expected to increase. The ICT infrastructure of CBM along with its development of application software is an urgent issue to maintain and improve the credibility of the country's financial sector.

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<sup>3</sup> Kanbawza Bank document "Development of Payment and Settlement System in Myanmar"

<sup>4</sup> MPU press conference 23 February 2013, as per an article on Myanmar Times 25 February 2013

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## 1.2 Background of the Project

Myanmar, in anticipating rapid economic growth, places importance on complying with various international standards so as to guide the growth toward catching up with the other ASEAN states. Its financial sector, however, lags behind not only on setting the regulations but also in providing appropriate infrastructure for economic activities. Delay in the development of information infrastructure for the financial sector may even become a bottleneck for the Growth of the country as the whole. CBM, under the notion of the absence of its business ICT system, has prioritized the development of settlement system for fund and bonds transactions as well as for cheque clearing that will immediately bring about benefits to the financial institutions. It is on the ground of this urgent necessity that CBM has request to the government of Japan for the development of ICT system for central banking.

Experience of the development and introduction of modern ICT system is still limited, not only in the financial sector but as overall in Myanmar. This is why the ICT related skills and capacity are significantly lacking in the country. Development and introduction of an ICT system for central banking is likely to face considerable constraints under such circumstances. The assistance should therefore focus not only on the development of the information system but also on penetration of ICT relates knowledge and experience to the country's financial sector as a whole. Technical transfer for CBM to become capable of planning and operating of its ICT system will also be an essential element of the assistance.

This project will be conducted with the purpose of not only developing the ICT system but also to transfer knowledge and skills from Japan to CBM, by integrating soft component and also by support from the Technical Cooperation Project that will be conducted in parallel with this project.

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## 2. Contents of the Project

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### 2.1 Basic Concept of the Project

#### 2.1.1 Summary Information of the Project

The project for the development of ICT system for Central Banking is formulated based on the requested from the Central Bank of Myanmar. The overall goal of the project is to improve the environment for the Central Bank of Myanmar to implement necessary financial policies and measures in a smooth and steady manner. The overview of the project is summarized in the following table.

**Table 3 Overview of the Project for the Development of ICT Systems for Central Banking**

Item	Description
Overall goal	To improve the environment in the CBM so that financial policies and measures may be implemented smoothly and steadily.
Project Purpose	To modernize the operation of the CBM for the advancement of financial market and monetary policy by establishing Central Bank ICT System based on the technology and experience of Japan's central bank ICT system.
Output of the Project	Develop an ICT system for CBM based on the technology and experience of Japan's central bank ICT system. Improved infrastructure and OA environment so that the central bank system may function appropriately.
Requirement	<ul style="list-style-type: none"><li>● Software development of the following systems based on the technology and experience of Japan's central bank ICT system<ul style="list-style-type: none"><li>➢ Fund settlement using RTGS (current account management)</li><li>➢ Treasury Bonds / Bills (T-bond/bill) settlement including delivery versus payment (DVP) function (registry management)<sup>5</sup></li><li>➢ Credit and collateral management</li><li>➢ Mechanized Clearing House</li></ul></li><li>● Operation of system tests/acceptance tests, training for system users in the central bank, state owned banks and private banks, and design of technical support and system maintenance.</li><li>● Hardware Development: Procurement of hardware, operating system, middle ware and any other equipment which are necessary for properly operating software mentioned above.</li></ul>

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<sup>5</sup> The category and type of securities to be settled in the future can be extended wider in variety besides the existing T-bonds/ T-bills as long as such securities can be settled in the ICT system without changes in the defined specifications.

Target area	<p>Target geographical area is the entire territory of Myanmar. CBM Head Office and branches are located in the following areas.</p> <ul style="list-style-type: none"> <li>● Nay Pyi Taw (Head Office of the CBM)</li> <li>● Yangon</li> <li>● Mandalay</li> </ul>
Relevant organizations of recipient country	Responsible Agency and Implementing Agency: CBM
Beneficiary	<p>Direct beneficiary : CBM</p> <p>Indirect beneficiary : Commercial banks (State owned banks, Private banks), Banks' customer</p>
Undertakings by the Myanmar side	<p>Software</p> <ul style="list-style-type: none"> <li>[a] Any change in technical specification after the definition of system requirements;</li> <li>[b] Development of systems of agencies other than CBM;</li> <li>[c] Modification of the existing systems including those outside CBM to be connected to the new system;</li> <li>[d] Transition from the legacy system to the new system, including transfer of data and information;</li> <li>[e] Any change of the system after the system transfer, due to changes of system environment such as the upgrade of OS and middle ware;</li> <li>[f] Any change (upgrade and expansion) of the software after the system transfer;</li> <li>[g] System setting changes for enhancing the system function;</li> <li>[h] Software maintenance costs which may incur after introducing the system;</li> <li>[i] Update of data such as the user list;</li> <li>[j] Cost of process of application for use from the commercial banks;</li> <li>[k] Preparation and distribution of document for the users of commercial banks and the central bank;</li> <li>[l] Development of the central bank's operations manuals with regards to legal requirements.</li> </ul> <p>2) Hardware/Facilities, etc.</p> <ul style="list-style-type: none"> <li>[m] Construction/Upgrading of a datacenter and a backup datacenter;</li> <li>[n] Necessary facilities on premises such as security against theft, fire protection, electricity supply and air conditioning;</li> <li>[o] Technical design for WAN (Wide Area Network) and LAN (Local Area Network);</li> <li>[p] Providing the computer terminals for any system users including system users of state owned banks and private banks;</li> <li>[q] System maintenance and operation after the system transfer; (helpdesk, system monitoring staff, maintenance staff, etc.);</li> <li>[r] Any replacement of the hardware after the system transfer;</li> <li>[s] Changing the setting for enhancing the function of the system;</li> <li>[t] Hardware maintenance after the introduction of the system;</li> <li>[u] User support for state owned banks and private banks;</li> <li>[v] Creating a business manual in CBM which stipulates business</li> </ul>

	<p>operation using the new system;</p> <p>[w] Printing and distribution of documents for state owned banks and private banks;</p> <p>[x] Connection fees of the installed communication lines;</p> <p>[y] Make arrangements and agreements with financial institutions regarding implementation of ICT system in CBM (e.g. with participants of clearing house to make nationally uniform standards of cheques, etc);</p> <p>[z] Providing a user training facility in CBM for operation of the new system, and;</p> <p>[aa] Distributing and setting up equipment necessary for participants of Clearing House.</p>
Activities in Soft Component	<ul style="list-style-type: none"> <li>● Support for drafting of business manuals;</li> <li>● Support for user trainings;</li> <li>● Support for communications with the commercial banks, and;</li> <li>● Support for setting up of operation and maintenance structure.</li> </ul>
[Reference] Relevant activities in the Technical Cooperation Project which is planned to be conducted in parallel with this Project	<ul style="list-style-type: none"> <li>● Technical support to enhance capacity of CBM to enable CBM to utilize their own capacity in operating and maintaining the ICT system until the end of 2017 (the first two years after the installation), taking into account the budgetary constraints before realizing sufficient revenue from banks using the ICT system and from any other business as a central bank,</li> <li>● Purchase, installation and relevant technical support fee for introducing application software for General Ledger to enhance capacity of CBM, on condition that the regulatory framework for accounting and business flows are ensured to be in accordance with international standard, and</li> <li>● Technical support to consider appropriate measures for realizing “digital leapfrogging” toward the modernization of payment and settlement mechanism in Myanmar including feasibility assessment for introducing Automated Clearing House with truncated imaged cheques system.</li> </ul>

Source: Prepared by the Survey Team based on the Minutes of Discussion signed between CBM and JICA, September 2013

## 2.1.2 Project Timetable

The project started with the signing of the Minutes of Discussion (M/D) between CBM and JICA in March 2013. Following the M/D, the preparatory survey for defining the scope and specification of the systems to be developed is being conducted. The survey will be completed by October 2013, when the Cabinet is scheduled to approve the execution of the project.

Designing and development of the systems will commence in March 2014 and will continue until the end of 2015. After various testing and trainings, the system will be handed over to CBM by the end of year 2015.



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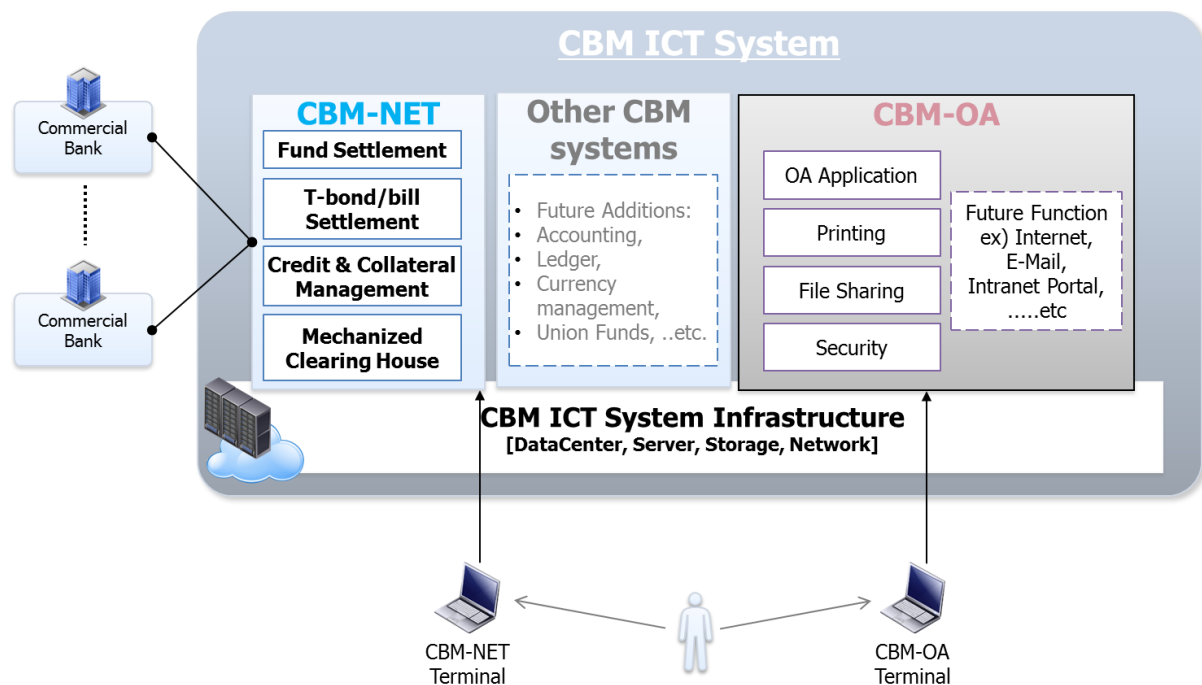
## 2.2 Outline Design of the Japanese Assistance

### 2.2.1 Overview of the New ICT System

#### 2.2.1.1 Description of the New ICT System

CBM's new ICT System consists of "CBM-NET (CBM Financial Network System)", "CBM-OA (CBM Office Automation System)", and other future and existing CBM information systems. In this project, CBM-NET and CBM-OA provide new functions on the CBM's ICT system. The new ICT System has data center, servers, storages, and network infrastructure. It works with CBM-NET terminal and CBM-OA terminal in CBM and commercial banks in Myanmar.

The CBM-NET provides functions for settlement of funds, Treasury bonds (T-bonds) and Treasury bills (T-bills), credit and collateral management, and mechanized clearing house (MCH). The CBM-OA provides office automation (OA) application, printing function, file sharing service, and security mechanism.



Source: Prepared by the Survey Team

**Figure 1 CBM-NET and CBM-OA**

#### 2.2.1.2 Purpose of Systemization

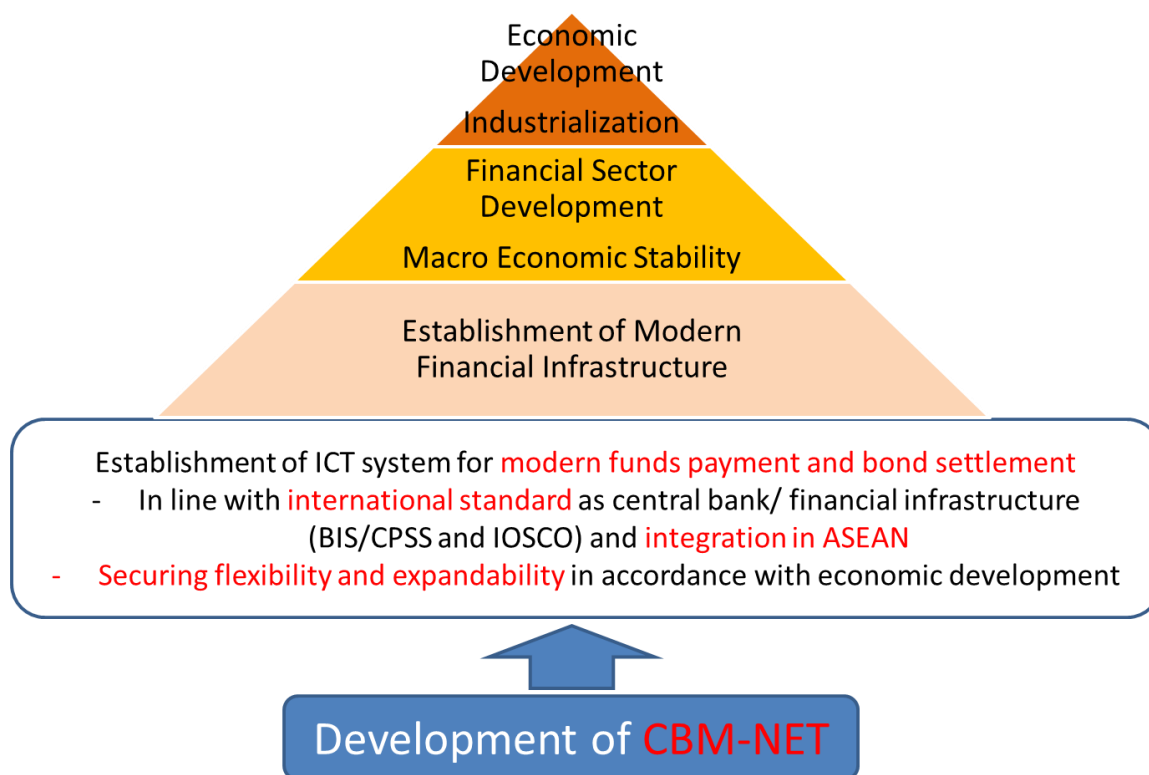
The purpose of systemization is to develop a central banking system that will contribute to further development of Myanmar's financial market, thus improving Myanmar's investment climate and promote economic development. The modernization of financial system is necessary to meet socio-economic development, increase in capital demands of domestic companies, activation of foreign investment, and increase and promotion of use of bank by individuals.



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Establishing central bank ICT system based on Japanese technology and experience will bring high efficiency to CBM. It will also improve business transaction of commercial banks handling huge volume of funds and data.



Source: Prepared by the Survey Team

**Figure 2 Purposes of Systemization**

### 2.2.1.3 Systemization Policy

The ICT System for central banking to be developed in this project will be designed based on the specification and requirements defined in this preparatory survey. The specification of the system is defined after thorough survey of the current condition of central banking operation at CBM and hence to address to the modernization of central banking operation.

A major policy for systemization of central banking in Myanmar is to introduce a system which enables fund and T-bond / T-bill management to be conducted in an integrated manner. This policy was set in light of the current function at CBM, where fund settlement and T-bond/bill management are being conducted under the same organization. A rationale for introducing an ICT system based on Bank of Japan Financial Information System (BOJ-NET) design is therefore an ideal proposal for CBM. This is because BOJ-NET is a central banking system in which fund transactions and T-bond / T-bill management are conducted in an integrated form.

CBM-NET, functioning on CBM's ICT system infrastructure, is a financial settlement system for central banking. The system must therefore be of high availability and high reliability. With the resources constraints that CBM might have, CBM-NET was designed to offer this requirement based on minimum investment and operation & maintenance (O&M) costs.

To this end, CBM-NET is designed with some latest technology features and considerations. Such will enable the system to be highly available and reliable, but with minimal O&M cost

burden for CBM. The following table lists up some of the features applied to CBM-NET.

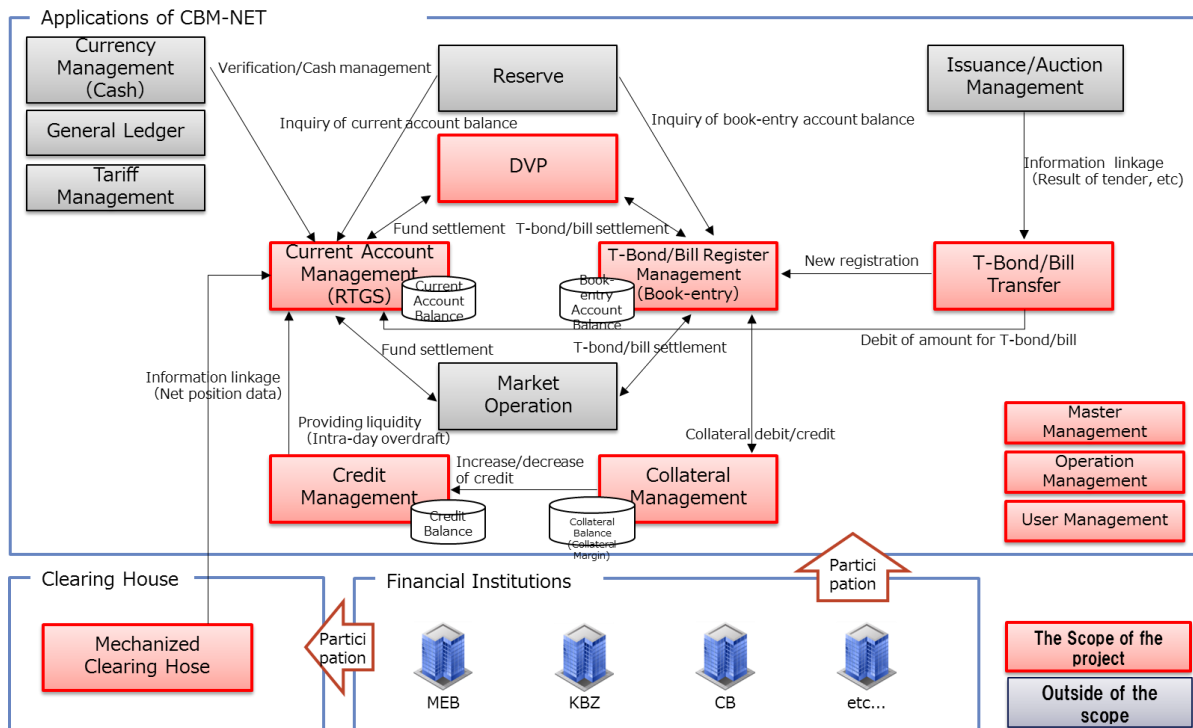
**Table 5 Main Features of CBM-NET**

Area	Features
Latest applications architecture	<p>SOA, JAVA:</p> <ul style="list-style-type: none"> <li>● The major feature of CBM-NET is in adoption of service oriented architecture (SOA) structure and JAVA for programming.</li> <li>● Technology comparable with the new BOJ-NET currently being developed is applied to CBM-NET.</li> </ul> <hr/> <p>Integrated applications:</p> <ul style="list-style-type: none"> <li>● Unlike many of the package applications, three core functions i.e. fund settlement, bond/bill settlement and credit &amp; collateral management are integrated on a single platform. This will enable three functions to be operating in a seamless manner, thus offering more convenient and high quality service for the users.</li> <li>● For example, CBM-NET will be the sole system in the world, other than BOJ-NET that can offer “auto-credit” service, which requires integral operation of these three core functions. This auto-credit service is expected to be valuable in providing liquidity for effective RTGS operation.</li> </ul>
Latest infrastructure architecture	<ul style="list-style-type: none"> <li>● Latest server hardware machine is introduced under high availability (HA) technology.</li> <li>● CBM-NET, being a settlement system for central banking, is expected to play an important role underpinning the economic activities in Myanmar. This mission-critical ICT system must be based on reliable machine structured under high availability arrangement (simple structure PCs and non-comprehensive maintenance support are not recommended).</li> </ul>
<p>Note 1: MS Windows Server based system tends to encounter non-compatibility constraints in updating occasions, and therefore is not being recommended for CBM-NET.</p>	
<p>Note 2: Linux open source software (OSS) is recommended to be utilized under maintenance contract.</p>	

Source: Prepared by the Survey Team

#### 2.2.1.4 Coverage of Systemization

The CBM-NET covers fund transaction, T-bond / T-bill transaction, credit and collateral management, mechanized clearing house, and master/operation/user management. Fund transactions in CBM-NET include cash deposit / withdrawal and fund transfer in Myanmar Kyat (MMK), US Dollar (USD), Euro (EUR), Japanese Yen (JPY) and Singapore Dollar (SGD). T-bond / T-bill transactions in the system include new issuance – tender – new registration, T-bond/bill selling, T-bond/bill transfer, T-bond/bill delivery versus payment (DVP), interest payment / redemption.



Source: Prepared by the Survey Team

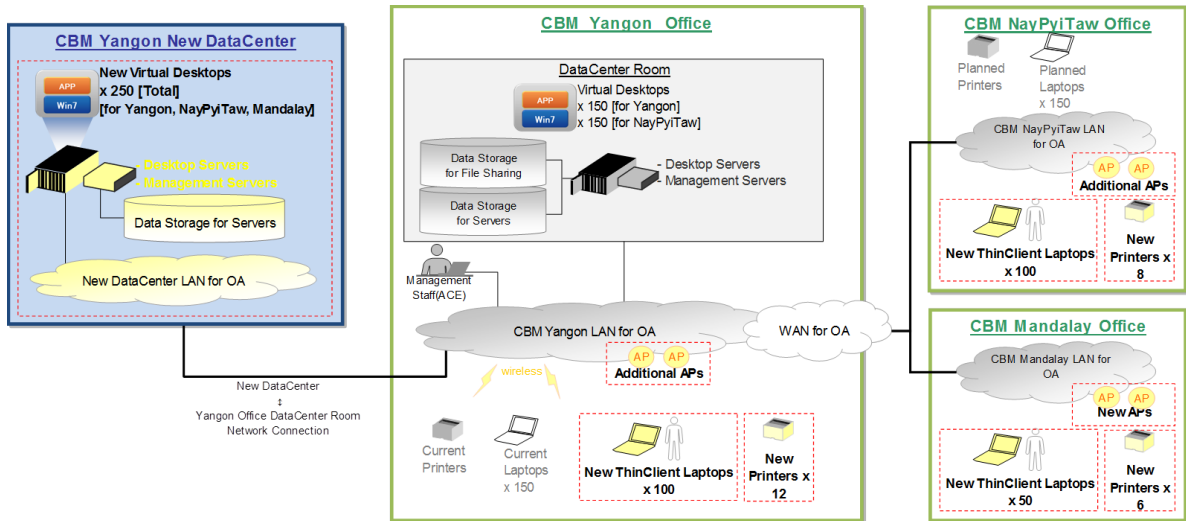
**Figure 3 Coverage of CBM-NET Applications**

The CBM Integrated Service Platform is the infrastructure of the CBM-NET. The CBM Integrated Service Platform will be launched in the new data center in Yangon and provide functions for the CBM-OA and the CBM-NET utilizing virtualization technology. The CBM Head office in Nay Pyi Taw, Yangon branch, and Mandalay branch will be connected to CBM Integrated service platform through wide area network (WAN). The CBM-NET clients in head offices of commercial banks will also be connected to the CBM Integrated Service Platform.

The CBM-NET system that covers the above-mentioned payment areas including Real time gross settlement (RTGS) and MCH should be easily upgradable at a minimum cost to a more advanced system that include, for instance, automated clearing house (ACH), MCH or Imaged Cheque Clearing System once the related infrastructures (such as telecommunication system and/or regulations related to electronic signature) are in place in the future and should also be easily expandable, at a moderate cost, to cover beyond the payment area such as accounting, dealing room, data management, human resources etc.

### 2.2.1.5 Conceptual Drawing for Systemization

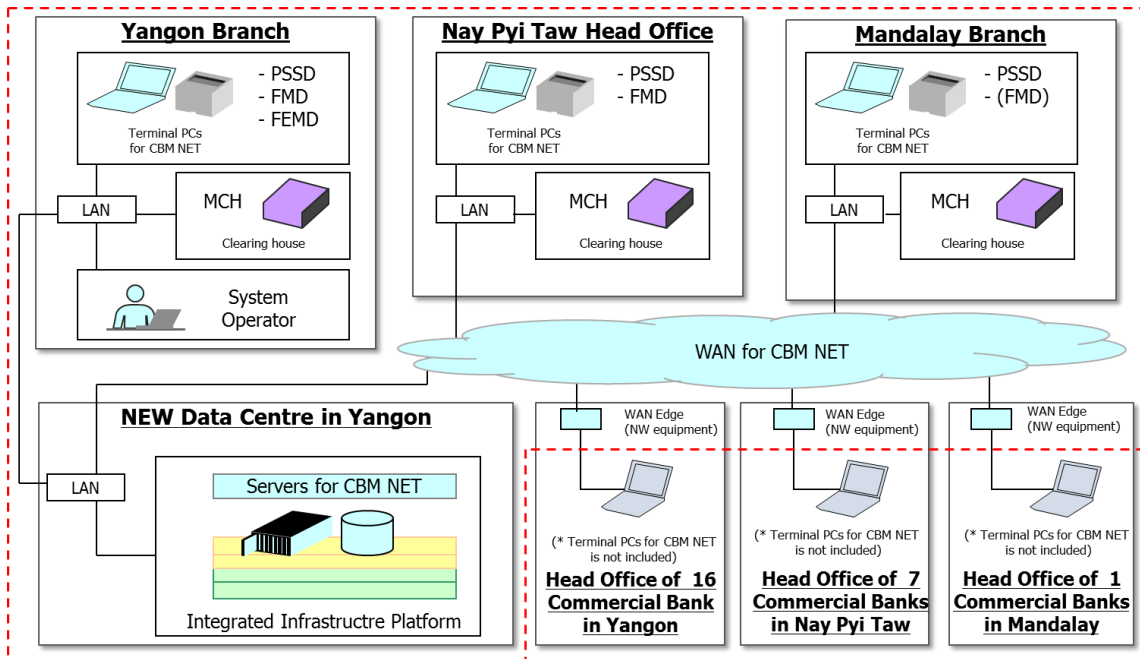
CBM-OA consists of servers, new thin client laptops, OA equipment. Servers for CBM-OA are placed in new data center in Yangon. These servers will provide virtual desktops for thin client laptops operated in offices in Nay Pyi Taw, Yangon and Mandalay.



Source: Prepared by the Survey Team

**Figure 4 CBM-OA Infrastructure Design**

CBM-NET consists of servers, terminal PCs. Servers for CBM-NET are placed in new data center in Yangon. Terminal PCs for CBM-NET are connected to data center by WAN for CBM-NET. System operators for CBM-NET servers are assumed to be stationed in Yangon



Source: Prepared by the Survey Team

**Figure 5 CBM-NET Infrastructure Design**

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## 2.2.2 Business Requirements

### 2.2.2.1 Overview of Business Operations

#### (1) Fund Settlement (Local Currency)

- Fund transactions include cash deposit / withdrawal, and transfer
- Real time gross settlement (RTGS) and intra-day overdraft will be applied.

#### (2) Fund Settlement (Foreign Currencies)

- Fund transactions include cash deposit / withdrawal, and transfer (USD, EUR, JPY and SGD).
- Foreign currency transactions will cover four currencies (USD, EUR, JPY and SGD).

#### (3) T-bond / T-bill Settlement

- Transactions for tender-based new registration and non-tender-based new registration as with CBM's current operation of T-bond/T-bill selling to banks will be implemented.
- T-bond/bill transfer and T-bond/bill DVP will be implemented.
- Interest payment/redemption amount will be calculated and automatically credited to the fund accounts.

#### (4) Credit and collateral Management

- Credit and collateral management which will enable smooth currency market operation against collateral (T-bond/bill) will be introduced.
- Credit and collateral management will cover registration of eligible T-bond/bills and market value information, provision/return of collateral, and mark- to-market processing.

#### (5) Mechanized Clearing House

- Participating branches encode the amount on cheques using the encoders before bringing them to the clearing house.
- Clearing house aggregates and calculates net position automatically using reader/sorter.
- Net position data will be transferred to CBM-NET electronically.

#### (6) Master management

- Master operation manages the information such as financial institution (FI) information and FI branch information, etc.

#### (7) Operation management

- Input operation hours for transactions and calendar information will be managed.
- Raw data for calculating the usage fee will be generated. Fee calculation will NOT be processed.
- Raw data for accounting and preparing the ledger will be generated. Accounting and ledger systems will NOT be covered in this project.

#### (8) User Management and Multiple Checking

- CBM-NET will conduct user management and password management.
- CBM-NET will realize double check system for transaction input.

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## 2.2.2.2 New Business Functions

### (1) Fund Settlement (Local Currency)

#### 1) Current deposit account

Set a current deposit account designed to manage the balance of current deposits by counterparty financial institution (“counterparty”). Individual counterparties are allowed to perform transactions for their own account and make inquiries on it. Current deposit accounts are distinguished by FI code assigned according to Bank identifier code (BIC) (ISO9362).<sup>6</sup>

Current deposit account will be set for one counterparty per a bank. However, for the time being, current deposit accounts can be set for up to three counterparties per a bank (one counterparty per head office / branch of CBM).

#### 2) Date of transaction conducted

The date of transaction, the credit or debit is carried out, is limited within the day only.

#### 3) Real-time processing, intra-day overdraft

Processing is immediately done after the inputting transaction, resulting in an updated counterparty current deposit balance. For debiting, however, intra-day overdraft is performed within the collateral margin if the current deposit balance is not enough for the amount to be debited. Even though the intra-day overdraft is performed, the debiting transaction will cause error in case of collateral margin shortage. Collateral margin set for FI is based on the amount of T-bond/bill pledged as preliminary collateral. Each FI is allowed to have only one current deposit account with an overdraft facility.

Repayment must be made in full for intra-day overdraft within the day the operation is conducted. “List of outstanding for overdraft” is output to a CBM-NET terminal at CBM head office / branch after closing counterparty’s input. If repayment is not made, then it will be treated as arrear, but system will not cover the response of arrear (collection of interest in arrear).

#### 4) Input operation hours

A transaction or inquiry is allowed during hours specified by “Registration of input operation hours”.

#### 5) Customer Transfer

This transaction is used for cases where customers request their banks to make credit transfers to or debit transfers from other banks’ customers.

Online FI (which has a CBM-NET terminal) can conduct Customer Transfer simultaneously by inputting “Customer Credit Transfer” and “Customer Debit Transfer”.

Credit transfer: an interbank transfer by input from a debit bank (Sender)

Debit transfer: an interbank transfer by input from a credit bank (Receiver)<sup>7</sup>

<p>Points to note:</p>
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<p>i) Applications do not cover revocation or correction of each transaction input. In the event of an input error being detected, reverse entry (opposite transaction) and/or re-entry shall be made to address the situation.</p>
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<sup>6</sup> Bank code (four digits) + country code (two digits) + area code (two digits) + branch code (three digits)

<sup>7</sup> In the case of debit transfer, it is assumed that the transaction has been verified by means other than via the CBM-NET (a debit transfer notice sent by Receiver to Sender, and approval given by Sender to Receiver for the debit transaction).

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ii) Processing results for each transaction will be stored in the CBM-NET for the day and can be checked on screen or printed out. In the case where counterparty is offline, CBM H/O or branch will obtain the result and hand it over to the counterparty after printing it out.

iii) Automatic processing is not available in the event of a merger or discontinuance of business. Therefore, if such an event occurs, it is necessary to perform operations by means of “debit” or “transfer” to reduce the fund account balance to zero by the business day immediately preceding the applicable date.

## (2) Fund Settlement (Foreign Currencies)

### 1) Covered currencies

Four currencies which are USD, EUR, SGD and JPY will be covered. Transaction and inquiry screens shall be set on a currency-by-currency basis.

### 2) Foreign exchange (FX) current deposit account

Set a current deposit account designed to be used to manage the balance of FX current deposits held by the counterparty. Individual counterparties are allowed to perform transaction for their own account and make inquiry on it. FX current deposit accounts are set in different currencies, and are distinguished by FI code. FI code is assigned according to BIC code (ISO9362).<sup>8</sup>

FX current deposit account will be set for only one counterparty per bank which conducts FX transactions.

### 3) Date of transaction conducted

The date of transaction, the credit or debit is carried out, is limited to only a day.

### 4) Real-time processing, intra-day overdraft

Processing is immediately done after inputting transaction, resulting in an updated counterparty current deposit balance. Debiting, however, is performed only after it is confirmed that the deposit balance is sufficient. A deposit funds shortage will result in error. Collateral margin will not be set (account for intra-day overdraft will not be made) for FX current deposit account.

### 5) Input operation hours

A transaction or inquiry is allowed during hours specified by “Registration of input operation hours”.

#### Points to note:

i) Applications do not cover revocation or correction of each transaction input. In the event of an input error being detected, reverse entry (opposite transaction) and/or re-entry shall be made to address the situation.

ii) Processing results for each transaction will be stored in the CBM-NET for the day and can be checked on screen or printed out. In the case where counterparty is off-line, the CBM H/O or branch will obtain the result and hand it over to the counterparty after printing it.

iii) CBM-NET does not convert MMK to foreign currency (convert by manual operation).

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<sup>8</sup> Bank code (four digits) + country code (two digits) + area code (two digits) + branch code (three digits)

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CBM-NET does not cover PVP (Payment Versus Payment).

iv) Automatic processing is not available in the event of a merger or discontinuance of business. Therefore, if such an event occurs, it is necessary to perform operations by means of “debit (foreign currency)” or “transfer (foreign currency)” to reduce the fund account balance to zero by the business day immediately preceding the applicable date.

### (3) T-Bond / T-Bill Settlement

#### 1) T-bond/bill account

CBM-NET implements the book entry system for T-bond/bill settlement. CBM-NET sets a T-bond/bill account designed to manage the balance of T-bonds/bill (total face amount by different T-bond/bill issues) held by the participant FIs. FIs are allowed to perform transaction for their own account and make inquiry on it. T-bond/bill accounts are distinguished by FI code (four digits), T-bond/bill code (12 digits), account type code (two digits), and account category code (two digits).

Account type code “no type name” will be set while account category code “own account” for managing the balance of T-bonds/bill held by FI, and “customer’s account” for managing the balance of T-bonds/bill held by the FI’s customer will be set.

#### 2) T-bond/bill issuance, auction, and new registration

In the event of a new T-bond/bill being issued, information such as T-bond/bill code, T-bond/bill name, issuing date, interest payment date, redemption date and interest rate shall be input by “T-bond/bill information registration/change/deletion”, and the information on the T-bond/bill concerned shall be managed.

Although tender-based new registration is not currently conducted, transactions such as “Preliminary registration information registration/change”, “Preliminary registration information change”, “Preliminary detailed registration/change” and “New registration/payment execution” are available in preparation for the potential implementation sometime in the future.

After a successful bidder is determined as a result of a tender, the total face amount of T-bond/bill sold and the amount of funds to be paid are initially registered for each successful bidder by inputting “Preliminary registration information/change” and the total face amount of those T-bonds/bills is preliminarily allocated to the participant account held by each successful bidder by inputting “Preliminary detailed registration/changes”. Then, the predetermined fund accounts of the successful bidders are debited and registrations are made for the T-bond/bill accounts of the successful bidders by inputting “New registration/payment execution” (Tender-related operations are not covered by the CBM-NET).

In the case of non-tender-based T-bond/bill issuance, which is currently conducted, new registrations are made by inputting “T-bond/bill receipt”. Note that all T-bills are bought by CBM at the time of issuance. Thus, when T-bills are sold by CBM to a FI, T-bond/bill transfer is conducted after the FI’s fund account is debited.

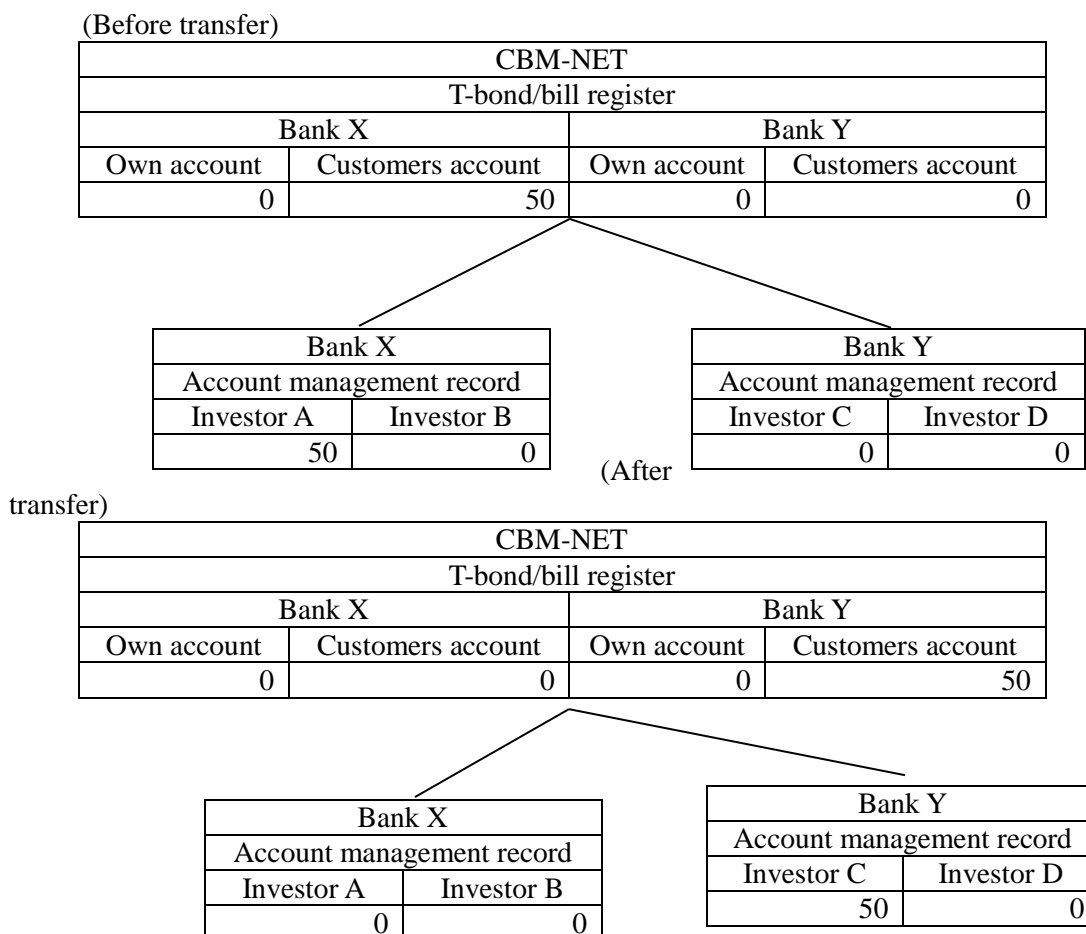
In the case where a FI buys some T-bills from CBM, discounted interest rate is applied for the T-bills. On the day of interest payment, while original (not-discounted) interest will be automatically credited to the FI’ account, the amount of difference (original interest - discounted interest) should be debited from the FI’ account by CBM.



### 3) T-bond/bill transfer

Although T-bond/bill transfer transaction between different T-bond/bill accounts is not a type of transaction currently conducted, we have made available “T-bond/bill transfer” in preparation for T-bond/bill trading potentially starting to be done in the market sometime in future.

Suppose, for instance, that investor A (Bank X’s customer) sells a T-bond/bill to investor C (Bank Y’s customer). In such a case, Bank X transfers the T-bond/bill from the bank X’s “customer’s account” to Bank Y’s “customer’s account” by “T-bond/bill transfer”.



Source: Prepared by the Survey Team

**Figure 6 Conceptual Diagram for T-Bond/Bill Transfer**

### 4) T-bond/bill DVP

Online FI (which has a CBM-NET terminal) can conduct T-bond/bill transfer and fund transfer simultaneously by inputting “T-bond/bill DVP request” and “Fund DVP request”. For example, in the case where online FI A sells T-bond/bill to online FI B and conducts T-bond/bill transfer and fund transfer simultaneously, the following procedure shall be taken:

- i) Agreement is made between FI A and FI B
- ii) FI A inputs the contents of transfer application and fund delivery by “T-bond/bill DVP request”
- iii) FI A informs FI B about the content of fund delivery requested
- iv) FI B inputs “Fund DVP request”
- v) CBM-NET executes fund transfer as well as T-bond/bill transfer between FI A and FI B

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FI A can cancel “T-bond/bill DVP request” by “T-bond/bill DVP request cancellation” until FI B inputs “Fund DVP request”. Also, FI A can designate other branch’s current deposit account as a fund credit account. FI B can designate other branch’s account as a fund debit account.

In the case where a transaction is left unexecuted as “Fund DVP request” was not input following “T-bond/bill DVP request” input, the “T-bond/bill DVP request” will be automatically cancelled after closing transaction input.

5) Date of transaction conducted

The date of transaction is limited to only one day. Processing is performed without delay after an input transaction, resulting in the T-bond/bill account balance being updated each time. Debiting, however, is performed only after it is confirmed that the T-bond/bill balance is sufficient for debiting the relevant amount. Inputting such transaction as causes a T-bond/bill balance shortage will result in the error.

6) Input operation hours

A transaction or inquiry is allowed to be input during the input operation hours specified by “Registration of Input operation hours”.

7) Interest payment, redemption and debit for tax payment

On the business day immediately preceding an interest payment date, interest payment amounts are calculated for each subject T-bond/bill and for each participant account by using information such as interest rates and T-bond/bill balances, and the amounts are credited to the fund accounts of the payees. At the same time, a list of credit payment details about all interest payments is output for CBM’s head office.

On an interest payment date for a T-bond/bill pledged as collateral, the fund account related to the collateral provider will be credited.

Debit for tax payment is not conducted. On the business day immediately preceding a redemption date, redemption amounts are calculated for each subject T-bond/bill and for each participant account by using information such as interest rates and T-bond/bill balances, and the amounts are credited to the fund accounts of the payees. At the same time, a list of credit payment details about all redemption payments is output for CBM’s head office.

Debit for tax payment is not conducted.

If an interest payment date or a redemption date for a T-bond/bill falls on a non-business day of CBM, the following will be conducted: for example, in the case of 18th as Friday, 19th as Saturday, 20th as Sunday, and 21st as Monday, if 19th is the interest payment/redemption date, the amount of interest payment/redemption for T-bonds will be calculated for the period until 19th, and will be paid on 21st (Monday). The amount of interest payment/redemption for T-bills will be calculated for the period until the preceding day (18th) to the interest payment/redemption date (19th) and will be paid on 18th.

8) T-bill renewal

In the case where CBM wishes to postpone the redemption date of T-bills held by CBM or FIs, CBM changes the redemption date from the original one to a new one on “T-bond/bill information” before the original redemption date. In the case where some banks request to redeem their portion of the T-bill which is to be renewed, CBM buys them back (so that all subject T-bills should be renewed).

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Points to note:

i) Applications do not cover revocation or correction of each transaction input. In the event of an input error being detected after a given transaction is input, reverse entry and/or re-entry shall be made to address the situation.

ii) Processing results for each transaction will be stored in the CBM-NET for the day and can be checked on screen or printed out. In the case where counterparty is off-line, CBM H/O or branch will obtain the result and hand to the counterparty after printing it out.

iii) Fund accounts for: payers whose funds are debited at the time of new registration/payment execution; payees whose accounts are credited on interest payment dates and redemption dates shall be the fund accounts (FI branches) for T-bonds/bills related to the FIs that are set by inputting "Registration/change/deletion of FI branch's authorization information".

iv) Automatic processing is not available in the event of a merger or discontinuance of business. Therefore, if such an event occurs, it is necessary to perform operations by means of "T-bond/bill transfer" or "T-bond/bill delivery" to reduce the T-bond/bill account balance to zero by the business day immediately preceding the applicable date.

v) Additional issuance with the same T-bond/bill code shall not be made. When additional funds need to be raised, a different code shall be used for the issuance.

vi) Irrelevant of the actual T-bond/bill holding period, interest shall be calculated on the next interest payment date on the assumption that the T-bond/bill has been held since the last interest payment date or the initial issuance date. (Accrued interest is not included in the assumption.)

vii) If any account becomes unable to be made settlement due to its insufficient balance after inputting "New registration/payment execution", it will result in error. "New registration/payment execution" shall be re-entered after resolving the insufficient balance.

viii) CBM is to consider whether it is possible to streamline the different treatments between T-bill and T-bond for redemption/coupon payment on holidays

ix) The procedure to renew T-bill should be altered to redemption and re-issuance if T-bills are to be traded under market value.

x) Scrip less system for T-bond/bill settlement should be realized when introducing the book-entry system. This should be done simultaneously with the commencement of CBM-NET operation.

#### (4) Credit and Collateral Management

##### 1) Collateral account

The followings will be made available: the balance management (collateral) for managing the balance of collateral (total face amount of T-bonds/bills and total collateral amount for each T-bond/bill, type code, and account category code) that an FI ("collateral provider") has provided to CBM; the balance management (credit/collateral) for managing total collateral amount; and the management of collateral balance breakdown for managing a collateral amount for each collateral type. Each collateral provider can make transactions or inquiries about their own collateral balances.

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The balance management (collateral) is distinguished by bank codes (four digits), T-bond/bill codes (12 digits), type codes (two digits) and account category codes (two digits). The balance management (credit/collateral) is distinguished by bank codes (four digits), and The management of collateral balance breakdown is by bank codes (four digits) and collateral type classification codes (four digits).

The type codes used shall be the T-bond/bill account type codes managed in T-bond/bill settlement operations, and the account category codes used shall be the T-bond/bill account category codes for the balance of T-bonds/bills held by collateral providers.

## 2) Registration of eligible T-bonds/bills

For T-bonds/bills selected as collateral, information on the T-bonds/bills is managed by writing information, such as T-bond/bill code, T-bond/bill name, name of securities management institution (CBM) and collateral type classification code, etc., with “Registration/change/deletion of information on eligible T-bonds/bills”.

## 3) Provision of collateral and return of collateral

If a T-bond/bill balance managed through T-bond/bill settlement is provided as collateral, the balance shall be transferred from the T-bond/bill settlement participant account to the pledge account at the collateral management institution (CBM), and the collateral amount at the collateral provider shall be increased.

If the collateral balance at a collateral provider is returned, the balance shall be transferred from the pledge account at the collateral management institution to the participant account managed through T-bond/bill settlement. The collateral amount at the collateral provider shall be reduced.

In the case of collateral that is not managed through T-bond/bill settlement, the collateral amount at the collateral provider shall be increased or decreased through “Collateral amount increase/decrease” transactions.

If there are changes to the collateral amount as a result of the “provision of collateral”, “return of collateral”, or “collateral amount increase/decrease” mentioned above, the collateral margin (\*) shall be recalculated and changed.<sup>9</sup>

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<sup>9</sup> (\*) Collateral margin = Total collateral amount – (Total credit amount + Total overdraft amount)

(Before provision of collateral)

CBM-NET			
T-bond/bill register		Balance management (credit/collateral)	
Bank X		CBM	Bank X
Own account	Customers account	Pledge account	500
150	0	300	

(After provision of collateral)

CBM-NET			
T-bond/bill register		Balance management (credit/collateral)	
Bank X		CBM	Bank X
Own account	Customers account	Pledge account	500
150⇒100	0	300⇒350	⇒545
			[*]

[\*] The collateral amount shall be calculated based on a market price and a loan-to-value ratio and added. The total face amount of T-bonds/bills pledged as collateral shall be managed for each collateral provider (FI) and for each T-bond/bill, using separate tables (balance management (credit/collateral), and balance management (collateral)).

Source: Prepared by the Survey Team

### Figure 7 Conceptual Diagram for Provision of Collateral

For instance, Bank X pledges 50 from T-bonds/bills it holds on the CBM-NET to CBM. The T-bonds/bills (50) held by Bank X are transferred from Bank X's transfer settlement balance (own account) to CBM's transfer settlement balance (pledge account). At the same time, the collateral amount (45) equivalent to the face amount (50) of the T-bonds/bills is calculated, and that collateral amount 45 is added to Bank X's total collateral amount.

#### 4) Registration of market value information and loan-to-value (LTV) ratios

Market value shall be registered for each T-bond/bill code in "Registration/change of market value information" as necessary.

Loan-to-value ratios shall be registered directly for each LTV classification code by using a utility program as necessary.

#### 5) Mark-to-market processing

Mark-to-market (MTM) processing is performed after collateral operations are finished on the business day immediately preceding the MTM applicable date. A collateral amount for the collateral balance at the collateral provider is calculated based on market value and LTV ratios as of the applicable date, and the collateral amount at the collateral provider is increased or decreased, and the MTM results are given. Note that the collateral amount will not change from that on the preceding business day if there is no change in the market value and LTV ratios applied on the applicable date.

In order to advise FIs of the fact that their collateral margins will go negative on the applicable date in the future, temporary MTM processing is performed after the collateral operations are finished on the date for setting base values for market value and LTV ratios. With this processing, a collateral amount is calculated for the collateral balance at the collateral provider as of the applicable date, and the temporary MTM results are output for FIs whose collateral margins will go negative.

In order to change an MTM plan, the MTM frequency and the number of days remaining before the applicable date (the number of business days from the base value setting date to the

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applicable date) are input to set and change the MTM schedule.

6) Return of collateral at maturity

Collateral pledged by a collateral provider will be automatically returned to the collateral provider on a given business day before the redemption date of the eligible T-bonds/bills pledged as the collateral. Also, a list of T-bond/bill transfer results (details) is output.

7) Output of List of Fund Balances and List of Overdraft Outstanding (MMK)

A list is output indicating FIs that did not repay overdrafts within the day. Also, a list is output at the CBM's head office indicating the balances in the fund accounts with all the FIs (the final balances as of the business day).

8) T-bond loan

Intra-day overdraft can substitute for the function of T-bond loan. Therefore CBM-NET will not cover T-bond loan.

Points to note:

i) Automatic processing will not be available in the event of mergers or discontinuance of FIs. If any such event occurs, it is necessary to perform operations to reduce the collateral amount to zero by means of "Return of collateral" or "Collateral amount increase/decrease" by the business day immediately preceding the applicable date.

ii) Automatic processing will not be available when collateral is disposed of as a result of the failure of FI. If such an event occurs, it is necessary to perform operations to reduce the collateral amount at the collateral provider to zero through "Collateral amount increase/decrease" transactions. Note that in such a case, the balance management (collateral) remains and thus the unnecessary account must be terminated in a timely manner.

iii) With respect to collateral pledged by a collateral provider, interest payments are credited to the funds account associated with the collateral provider on the date of interest payment for the eligible T-bonds/bills pledged as the collateral

## (5) Mechanized Clearing House Functions

1) Clearing house participant

FI can only have one participant per clearing house. FI issues a standardized cheque. The standardized cheque will contain the magnetic ink character recognition (MICR) for clearing (bank code and branch code of issuing branch, cheque number).

Before FIs can conduct credit exchange at clearing house, cheques must be sorted by the clearing house. Participants use the MICR Encoder placed at their branch to print data prescribed for clearing on cheques issued by other bank. The prescribed data printed on the cheques is amount, and data printed on the attached slips are bank code and branch code which conducts credit exchange, code of the branch which collected cheques, and total number and amount of credit exchange cheques, etc.). The attached slips have to be prepared both by the participant and collecting branches including non-participant branches. A participant visits clearing house and submits the cheque for credit exchange and attached slip.

2) Clearing house

Using the MICR reader/sorter, the clearing house reads the data encoded on a cheque and

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attached slip for credit exchange, and sorts individual cheques for accepting participant FIs. The MICR reader/sorter processes counting of credit and debit-exchange cheques. It also calculates clearing balance for different participant FIs and includes the result in a slip, printing it out as “clearing house abstract” and “aggregation of cheques brought in/taken back”. The MICR reader/sorter will also record the clearing balance data in a designated storage space used to connect to CBM-NET, while changing it into a slip and printing it out as “clearing settlement with other banks”.

Codes for clearing are used at clearing houses, but they are converted to BIC codes when a connection is made to the CBM-NET terminal, so that data on clearing balances are linked.

After checking the result of the clearing balance calculation, the clearing house establishes a connection to the CBM-NET terminal. CBM conducts settlement of clearing balance by inputting “settlement for MCH” with CBM-NET terminal. CBM-NET in turn credit to and debit from participant FI accounts. The CBM-NET makes settlements using linked data for each clearing house.

An error will result if any account cannot provide settlement due to insufficient balance after inputting “settlement for MCH”. “Settlement for MCH” shall be re-entered after resolving the insufficient balance.

Note that data shall be transferred using a medium storage if data cannot be linked to the CBM-NET terminal because of a network failure or any other problem.

### 3) Clearing house participant

Clearing house participants are branches of FIs. After having a clearing process completed, each participant leaves the clearing house, carrying the debit-exchange cheques as well as the printed out “clearing house abstract” and “aggregation of cheques brought in/taken back”.

## (6) Master data management

### 1) Master information

CBM-NET manages the following types of master information and covers registration, change, and deletion as well as inquiry.

#### FI information

- FI name and business category are managed

#### FI’s authorization information

- The authorization management code stipulating the scope of operation that FI is authorized to conduct is managed

#### FI branch information

- The FI branch name and address as well as head office / branch classification, etc. are managed

#### FI branch’s authorization information

- The authorization management code stipulating the scope of operation that FI branch is authorized to conduct is managed.

Master Information shall be registered, changed or deleted, when FI will be CBM new counterparty or will be merged in other FI.

### 2) Master information registration procedure

“Applicable date”, “setting type (registration, change or deletion)” and the information for registration (in cases of registration or change) must be inputted in advance for registering, changing, or deleting Master information (FI information, FI’s authorization information, FI

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branch information or FI branch's authorization information). The information input will be reflected on the applicable date.

### 3) Input operation hours

A transaction or inquiry is allowed to be input during the input operation hours specified according to "Registration of Input operation hours".

Points to note:

i) Processing results for each transaction will be stored in the CBM-NET for the day and can be checked on screen or printed out.

## (7) Operation management

### 1) Input operation hour registration

Input operation hours for transactions and inquiries shall be determined according to the input operation hours for "input operation hours group" set or changed by "Registration of input operation hours". Such setting and change by "Registration of input operation hours" are reflected immediately after the inputting.

The linkage between input operation hours group and transaction/inquiry is determined at the timing of system architecture and changes afterwards are not assumed. If, in any case, it becomes necessary to extend the input operation hours due to transaction input's delay, etc., it shall be extended before input operation closing hour in the "Registration of input operation hours".

### 2) Registration of calendar information

A registration of whether a given day is an operating day or non-operating day shall be made in advance by designating a specific date in the "Registration of calendar information."

### 3) Extraction of charging data

Extract original data for calculating amount of charge. Fee charge calculation processing will not be covered.

### 4) Extraction of ledger data

Extract original data for preparing ledger. No interlocking with ledger system.

### 5) Input operation hours

A transaction or inquiry is allowed to be input during the input operation hours as specified in the "Registration of Input operation hours".

Points to note:

i) Processing results for each transaction will be stored in the CBM-NET for the day and can be checked on screen or printed out.

## (8) User Management and Multiple Checking

### 1) User management

CBM-NET users will be classified into "supervisor" and "staff" and will be preliminarily registered before running system to realize double check system for transaction input.



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User can register, change, and delete their own or other user's information through the "User information registration" and "User information change/deletion". However, "User information registration" and "User information change/deletion" are transactions subject to double check and thus it requires the approval from the "supervisor".

CBM-NET users include CBM User and FI user. CBM user can register, delete and change all the users (CBM user and FI user). FI user can register, delete and change all the users of his/her branch. Transactions which can be conducted by CBM user and FI user differ.

## 2) Double check

Transaction input requires two personnel to log-in and they can be the "supervisor" and "staff". Either "Supervisor" or "staff" registers a transaction contents and the transaction will be executed upon the approval by the "supervisor". In the case where the "supervisor" conducts a registration, approval by his/her own will be impossible, thus approval by other "supervisor" will be necessary.

The double check methodology for all the transactions to which double check is applied will be the same. Also the double check methodology will be the same in both CBM and FI. Inquiry can be conducted through login in by either the "supervisor" or "staff".

## 3) Password management.

User can change password as time preferred through "Password change". The user who erroneously entered a password for five consecutive times will be locked out, and log-in will be impossible. In such a case, other "staff" and "supervisor" can release lock-out by "user information change/deletion" to enable re-login. Password section is masked in order to prevent other "staff" and "supervisor" from seeing the password of the "staff".

In the case where a user forgot his/her password, other "staff" and "supervisor" reset the password by "User information change/deletion" and then the user change the password by "Password change".

Changing password does not need double check (can be conducted by the user alone). However releasing lock-out and resetting password need double check (need the approval from "supervisor").

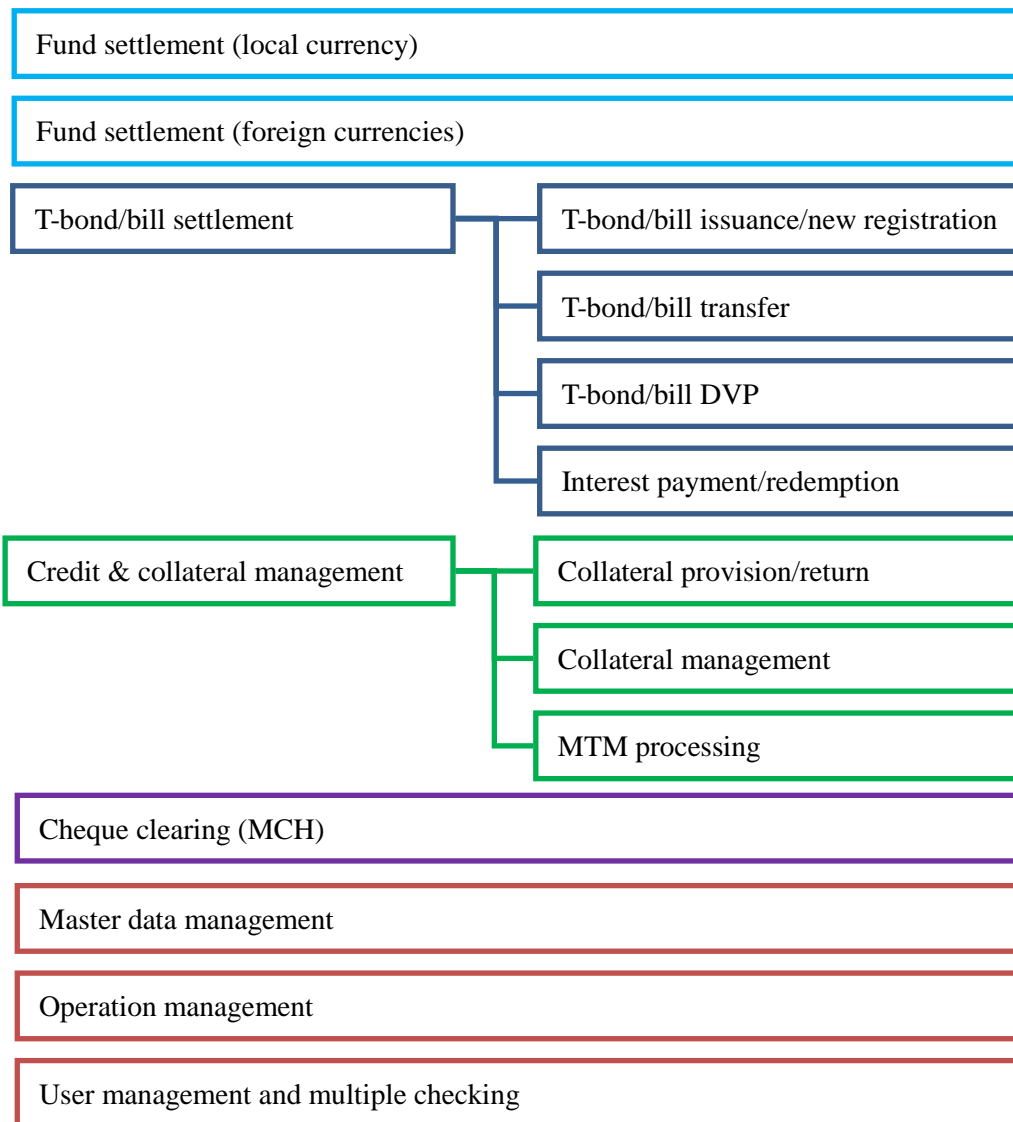
### 2.2.2.3 New Business Flow

With reference to the new business requirement explained in the previous sub-section, a set of new flows for each business are prepared. These are as shown in Attachment 7 of this report.

## 2.2.3 System Functions Requirement (Logical Configuration)

### 2.2.3.1 System Structure Diagram (Overall System)

Overview of the system functions requirement (logical configuration) of CBM-NET, based on the new business settings mentioned in the previous section, is as shown in the next figure. There are broadly five categories of functions, which are fund settlement, T-bond/bill settlement, credit & collateral management, cheque clearing, and system management functions.



Source: Prepared by the Survey Team

**Figure 8 Overview of System Functions**

### 2.2.3.2 System Function List / Description

System function list and description are as shown in the table in Attachment 8 of this report. The table lists up the business process for which CBM-NET Application will be designed.

### 2.2.3.3 External Interface

CBM-NET will not interlock with other systems. In developing CBM-NET, interlocking with other systems will not be considered. However, it will extract and record original data for calculating the charge amount and preparing ledgers. Usage fee charging system or central accounting system (out of CBM-NET scope) will be able to access these data and conduct charging or booking ledgers.

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## 2.2.4 System Configuration Requirement (Physical Configuration)

### 2.2.4.1 System Configuration Policy

#### (1) Basic Policy

##### [Use Policy]

As a basic policy, the system infrastructure shall be configured as integrated IT infrastructure used for IT system implementation, which CBM needs. Moreover the centralized management shall be carried out. A separate application shall be constructed in CBN-NET and CBM-OA based on this integrated infrastructure.

Furthermore, a system construction for different application can be carried out in this integrated infrastructure in the future.

##### [Technology Policy]

This policy realizes the centralized management and application-oriented assignment of system resources by adopting the virtualization technology. However, depending on the application, physical servers can also be the available configuration.

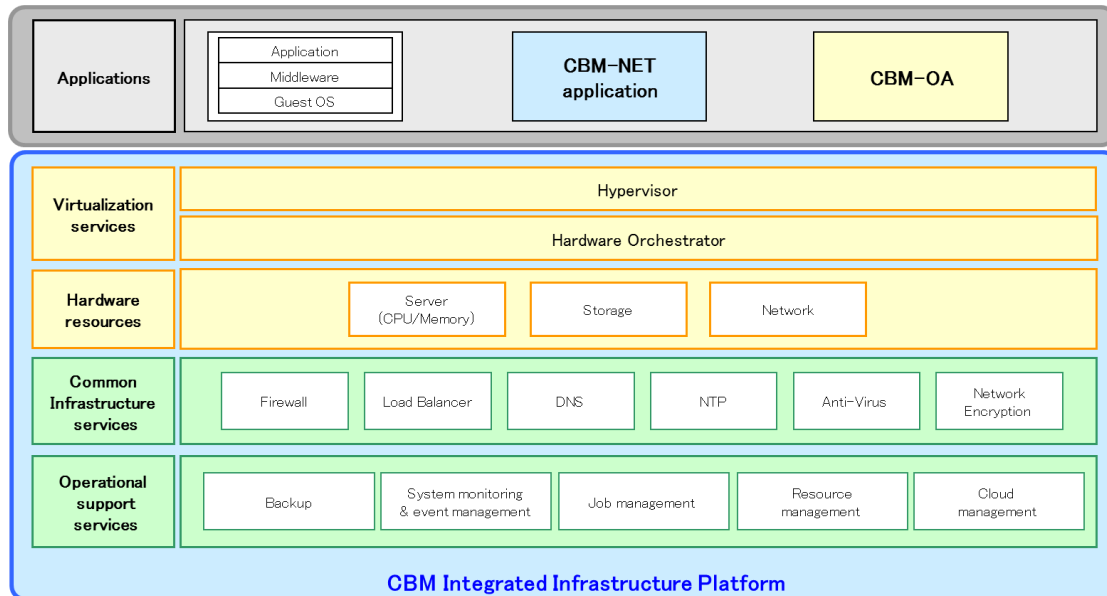
In addition, the configuration is conducted to centrally manage the entire IT infrastructure by operation personnel and there are necessary standardized operation functions for IT infrastructure. Moreover, labor-saving of configuration changes in the event of a failure, and configuration management of server and storage equipment can both be achieved through software that manages the system configuration. Planned operational functions provided as integrated infrastructure are shown in the following:

**Table 6 Operational Functions of the Integrated Infrastructure**

Category	Function	Overview
Virtualization Services	Hypervisor	It creates the virtualization layer on physical hardware and provides logical partitions for servers.
	Hardware Orchestrator	It refers to the layer of abstraction between the server hardware and its connectivity to the data center infrastructure and the OS/HV layer, providing maximum flexibility and portability.
Hardware Resources	Server (CPU/Memory) Storage Network	This is the physical resource layer. Physical resources are managed as the resource pool, and the amount needed are assigned to logical partitions. It can also provide a physical server without hypervisor.
Common Infrastructure services	Firewall	It would be placed between external networks and CBM internal network, and provided the function of blocking un-approved network traffic for securing the CBM inside network.
	Load Balancer	Load Balancer distributes network or application traffic across a number of servers. It is used to increase capacity (concurrent users) and reliability of applications.

	DNS	It provides the function that resolves the host name to its IP address by looking at its DNS table
	NTP	It provides the standard time in the CBM system, and is synchronized by every server on the integrated infrastructure.
	Anti-Virus	It provides the anti-virus pattern to guest OS on this platform. (The guest OS, which can use this function, should be supported by the anti-virus software.)
	Network Encryption	It provides data encryption and decryption function for network traffic on WAN.
Operational Support Services	Backup	Data backup functions for recovery are provided. <ul style="list-style-type: none"> <li>- Disk to disk backup</li> <li>- Tape backup service for off-site storage</li> </ul> Backup function for system image is also provided.
	System Monitoring & Event Management	System monitoring informs infrastructure component failures while event management console manages events of failure centrally. <ul style="list-style-type: none"> <li>- alive monitoring (ping)</li> <li>- SNMP trap</li> <li>- log monitoring (virtualization layer and OS)</li> <li>- process monitoring</li> </ul>
	Resource Management	Hardware resources are monitored to manage utilization <ul style="list-style-type: none"> <li>- CPU/Memory/Disk utilization monitoring</li> </ul>
	Job Management	For running the scheduled job automatically, job management functions are provided.
	Configuration Management	It manages and controls hardware resource pools. It also creates a logical partition and assigns hardware resources to a logical partition are operated via this function. Highly available functions (for logical partition, physical server) are also provided.

Source: Prepared by the Survey Team



Source: Prepared by the Survey Team

**Figure 9 CBM Integrated IT Infrastructure Platform**

## (2) CBM-NET Infrastructure Environment System Configuration Policy

The application server infrastructure that constitutes the CBM-NET will be configured by using some application-specific physical servers and virtualization resources of integration infrastructure. The continuity will be ensured by the concomitant use of the redundant function of virtualization infrastructure and the redundant function introduced on the application.

Normal PCs are used as terminals for accessing CBM-NET, and these are connected to the CBM-NET dedicated network by wire. Although there is no specific limit to the number of client PCs which can be connected to CBM-NET, up to 100 client PCs are assumed to be accommodated. In addition, for the PC of CBM-NET terminals placed in the offices of CBM and commercial banks, the connection to the network of illegal terminal shall be prevented by carrying out terminal authentication when accessing network.

The server infrastructure are physically separated and built through production application servers and operational management servers to minimize the effects of changes in the usage of one another. The development environment of applications can also be provided by the same integrated infrastructure. Furthermore, server resources are provided to support both virtualization servers and physical servers.

Storage infrastructure consists of two types of storage. One is fiber channel storage with storage area network (SAN) connections, the other is network attached storage (NAS) with IP connections. Fiber Channel storage is used for each application server, while NAS storage is used for storing various types of backup data. In addition, tape media is used for off-site storage of backup data.

WAN and LAN network is newly installed for CBM-NET only. At that time, separate the path by the connection from CBM office and the commercial banks to separate the security zone. As for the connections from commercial banks, security will be ensured via Firewall. Moreover, the server load balancing and redundancy accessed from CBM-NET terminal are carried out by using a load balancer.

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### (3) CBM-OA Environment System Configuration Policy

Following the OA system environment of Yangon branch that are currently in use, the OA system environment will be a thin client environment with the same architecture as current OA system. This way, the risk of delaying the project and work load for CBM can be reduced.

Based on the configuration policy of CBM-OA, the servers are classified into two types: "management server" and "virtual desktop server" and are arranged to avoid mutual influence on performance and failure response.

In addition, at the aim is to unify user environment by aligning virtual desktop environment for each user to the OS and application environment the same as those of the existing OA environment. And resource amount assigned to the user are communalized to current OA environment.

Storage is configured by Fiber Channel storage and NAS storage, which is the same as the CBM-NET. Connect the current OA system with the network, so that files can be shared with the current OA environment users. Besides, as the policy, the wireless LAN environment in the building as a supplement to the network of the current OA environment can reinforce the insufficient network equipment resource.

Developing some new fundamental infrastructure environments, for example Active Directory domain controller server and DNS server for user management, will result in double management and raise the operation load for CMB. Because of that, some of the management servers are shared with the current OA. Among operation functions including system monitoring, those can be shared with CBM-NET infrastructure will be shared for the unification of operation management methods.

### (4) Network Environment Policy

The environmental policy of CBM-NET and the CBM-OA network is as follows:

#### [Common Policy]

- Built CBM-OA network and CBM-NET networks separately.
- Aggregate the WAN network equipment in the datacenter or machine rooms.
- Encrypt the WAN in order to ensure the confidentiality of communication in the external connection lines.
- Prevent the unauthorized network connection of terminals, conduct authentication of terminals connected to the network.

#### [WAN lines Procurement Policy]

- Network construction of WAN will be conducted by local carrier.
- This construction work will be procured as part of the tender for infrastructure.

#### [CBM-NET network environment policy]

—WAN: City network (head office and branches of CBM)

- Connect CBM Yangon branch with head offices of commercial banks (16 banks).
- Connect CBM Nay Pyi Taw branch with head offices of commercial banks (7 banks).
- Connect CBM Mandalay branch with head offices of commercial banks (1 bank).

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- WAN network equipment is established in the data center for CBM Yangon branch, and is established in machine room for Nay Pyi Taw head office and Mandalay branch of CBM.
  - Build a site-to-site VPN by IPSEC on the WAN connection router of CBM and commercial banks.

—WAN: City network (commercial banks)

- Installations are ranging from WAN connection router to WAN connection L2 switch.
- Build a site-to-site VPN by IPSEC on the WAN connection router of CBM and commercial banks.
- Perform the terminal authentication by MAC address at WAN connection L2 switch.

—WAN: Network among bases (head office and branches of CBM )

- Connect the datacenter with Nay Pyi Taw head office of CBM, and with Mandalay branch of CBM.
- Establish the WAN network equipment in the data center for Yangon branch of CBM, and in the machine room for Nay Pyi Taw head office and Mandalay branch of CBM. (The data center will be discussed below.)
- Build a site-to-site VPN by IPSEC on the WAN connection router of CBM and commercial banks.

—LAN: Network within the Bank (head office and branch of CBM)

- Construct the network for CBM-NET in the CBM
- Cables shall be used for all the wiring.
- Network for development environment of CBM-NET system is also constructed or Yangon branch office of CBM.
- Construct the network connecting clearing house.
- In addition to internal network, network between the machine room and data center shall also be constructed in Yangon.
- Wiring between floors shall be basically optical fiber.
- Wiring within the floors shall be basically metal cable, however, when the wiring distance is over 100m, it will be conducted with optical fiber.
- Conduct the terminal authentication by MAC address with switch that accommodates terminals (Island L2 switch and clearing house island switch)

—LAN: Network in Data Center

- Construct the network of production environment and development environment for CBM-NET system.
- Construct network for connecting machine rooms in Yangon Branch of CBM. Wiring will be conducted with optical fiber.

[Environment Policy of CBM-OA Network]

—WAN: Network among Sites (head office and branch of central bank)

- Connect data center of central bank with Nay Pyi Taw head office and with Mandalay branch office.
- WAN network equipment is established in the data center of Yangon branch bank, and established in the machine room of Nay Pyi Taw head office of central bank and Mandalay branch office. (Data center will be discussed below.)
- Establish VPN between sites in IPSEC through a WAN connection router.

—LAN: Network within the Bank (head office and branch of central bank)

- Construct network for CBM-OA in central bank.
- Connect the current OA system with the network, so that files can be shared with the

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- 
- current OA environment users.
  - In addition to internal network, network between the machine room and data center shall also be constructed in Yangon.
  - Cables should be used for wiring between network equipment.
  - The terminal of CBM-OA and printers are connected by wireless LAN.
  - Wiring between floors shall be basically optical fiber.
  - Wiring between floors is basically metal cable, however, when the wiring distance is over 100m, it will be conducted with optical fiber.
  - Terminal authentication by MAC address is conducted during the network connection.
- LAN: Network in Data Center
- Construct network for CBM-OA system
  - Construct network for connecting with machine room in Yangon branch office of central bank. Wiring will be conducted with optical fiber.

## (5) Facility Environment Policy

The facility environment policy was decided to the following 2 items.

- 1) The facilities of the Central Bank of Myanmar's head office and branch offices (including preparation of data center and data center room): prepared by the Central Bank of Myanmar.
- 2) The IT related facilities (racks, uninterruptible power supply (UPS), etc.) installed in the Central Bank of Myanmar: to be installed in this project.

Item 1) mentioned above was requested to Central Bank of Myanmar.

For item 2), Decision was made on the specification and the design was based on the improvements of facility system of item 1).

The environment policy is described as the following:

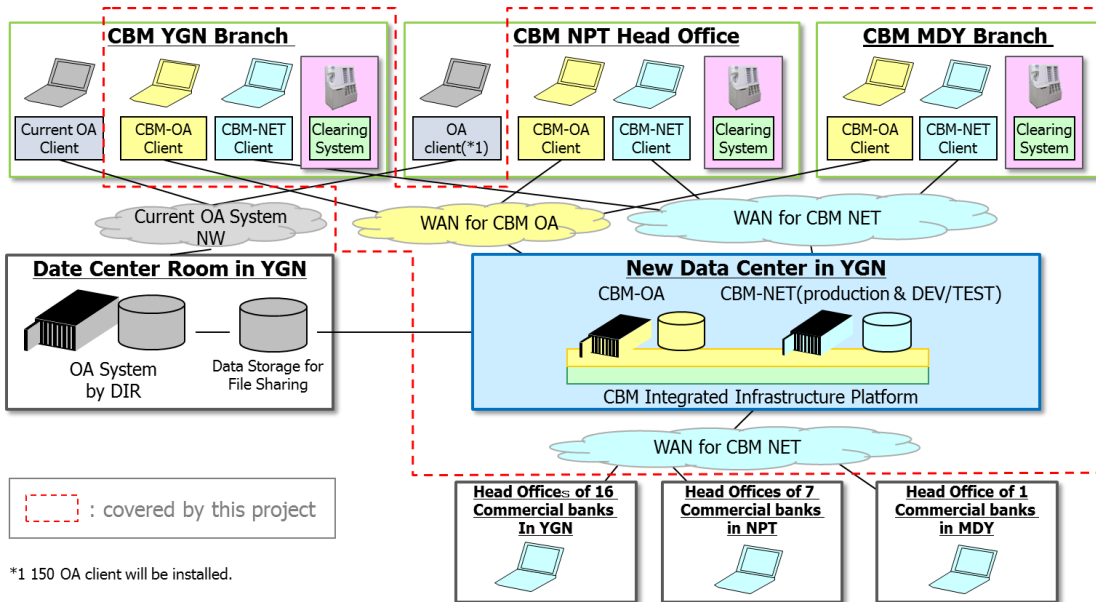
- [1] Considering the power condition in which power failure occurs frequently, we will build an uninterruptible environment for the newly installed IT equipment by UPS before a self-generator operating at the time of power failure.
- [2] Considering the earthquake in Myanmar, we will introduce earthquake countermeasure feature to IT rack.
- [3] In order to respond to physical security of the data center room and the IT equipment in each floor of CBM, the rack locking management feature will be installed.

### 2.2.4.2 System Block Diagram

#### (1) System Overview

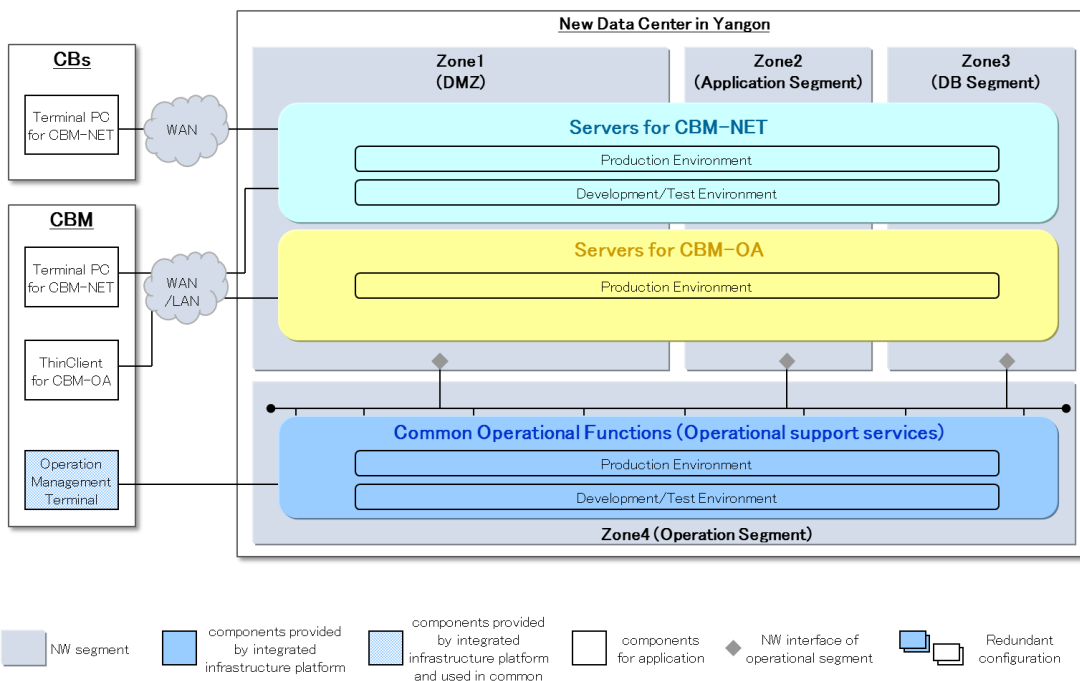
Following is the system overview of CBM integrated IT infrastructure platform:





Source: Prepared by the Survey Team

**Figure 10 System Overview**

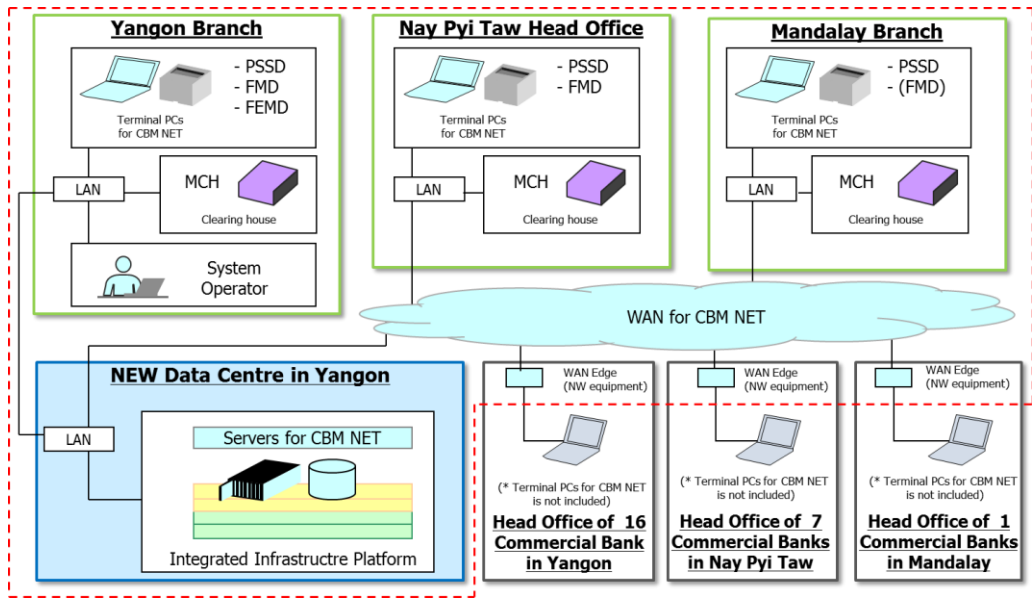


Source: Prepared by the Survey Team

**Figure 11 Infrastructure Overview**

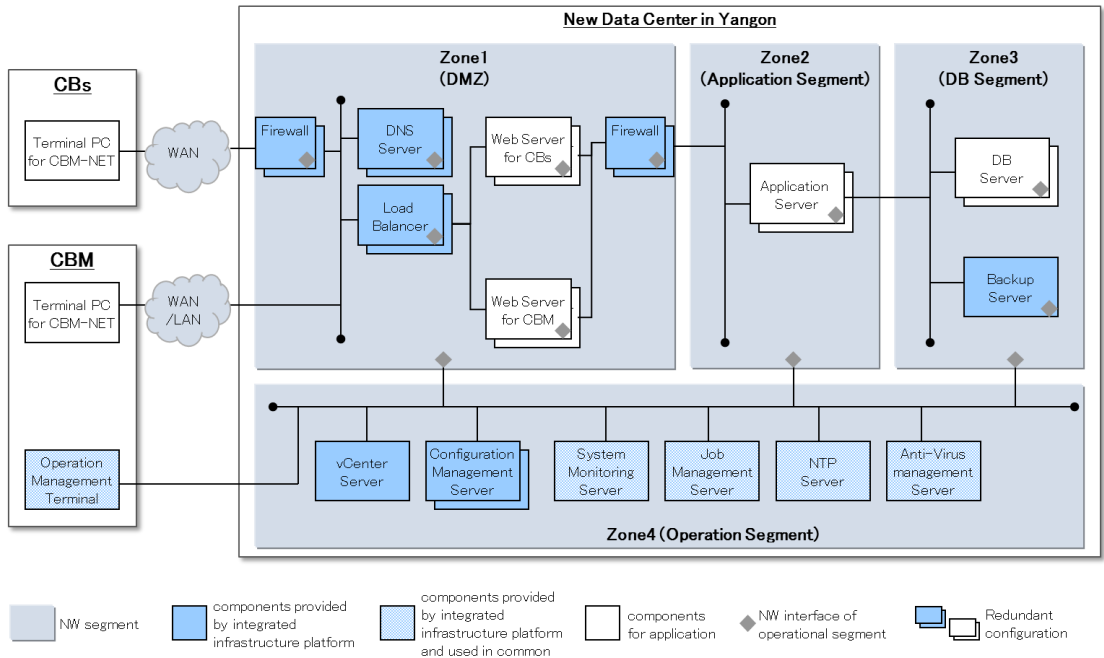
**(2) CBM-NET Infrastructure Environment Structure**

The block diagram of CBM-OA environment is as shown in the following figure:



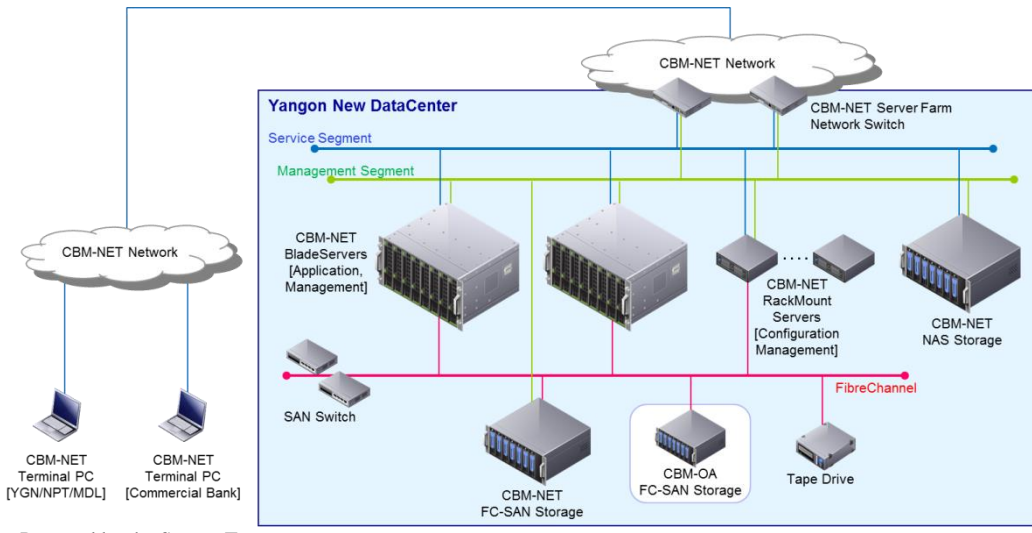
Source: Prepared by the Survey Team

**Figure 12 CBM-NET Architecture Overview**



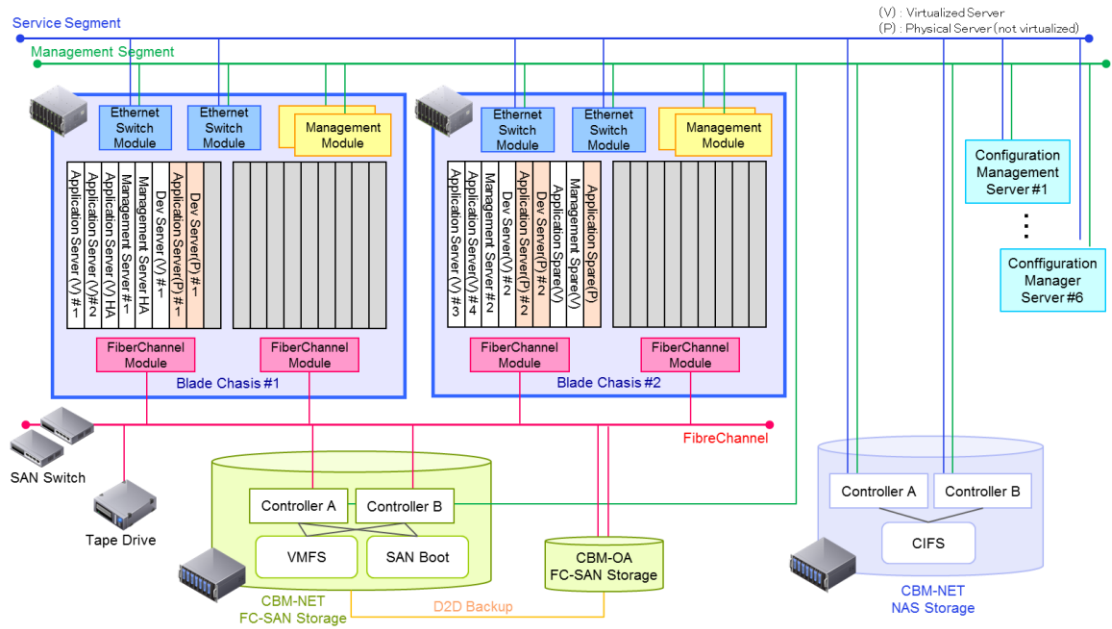
Source: Prepared by the Survey Team

**Figure 13 CBM-NET Logical Component**



Source: Prepared by the Survey Team

**Figure 14 CBM-NET Physical Component**



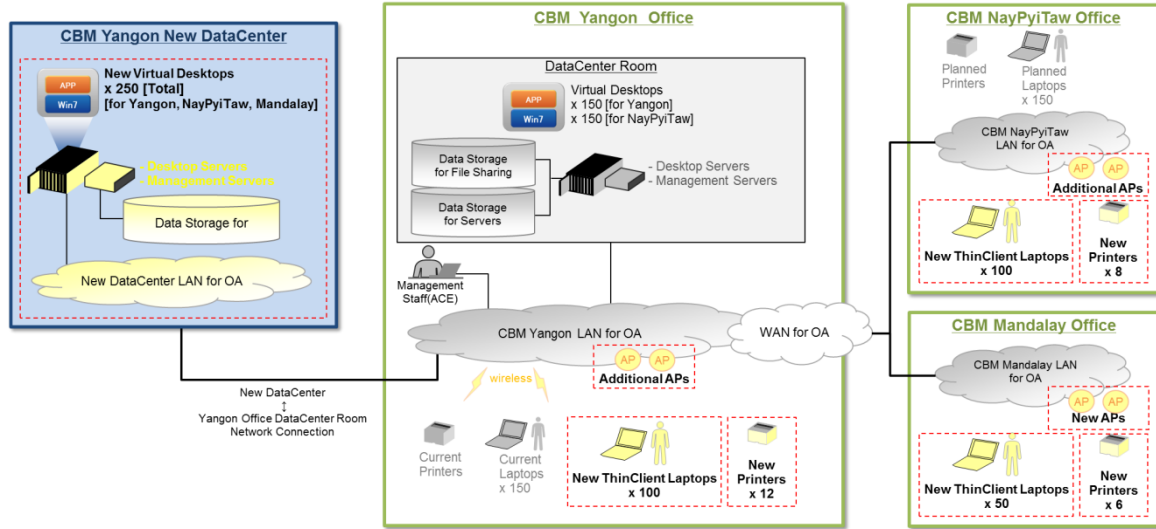
Source: Prepared by the Survey Team

**Figure 15 CBM-NET Server Farm Details**

### (3) CBM-OA Infrastructure Environment Structure

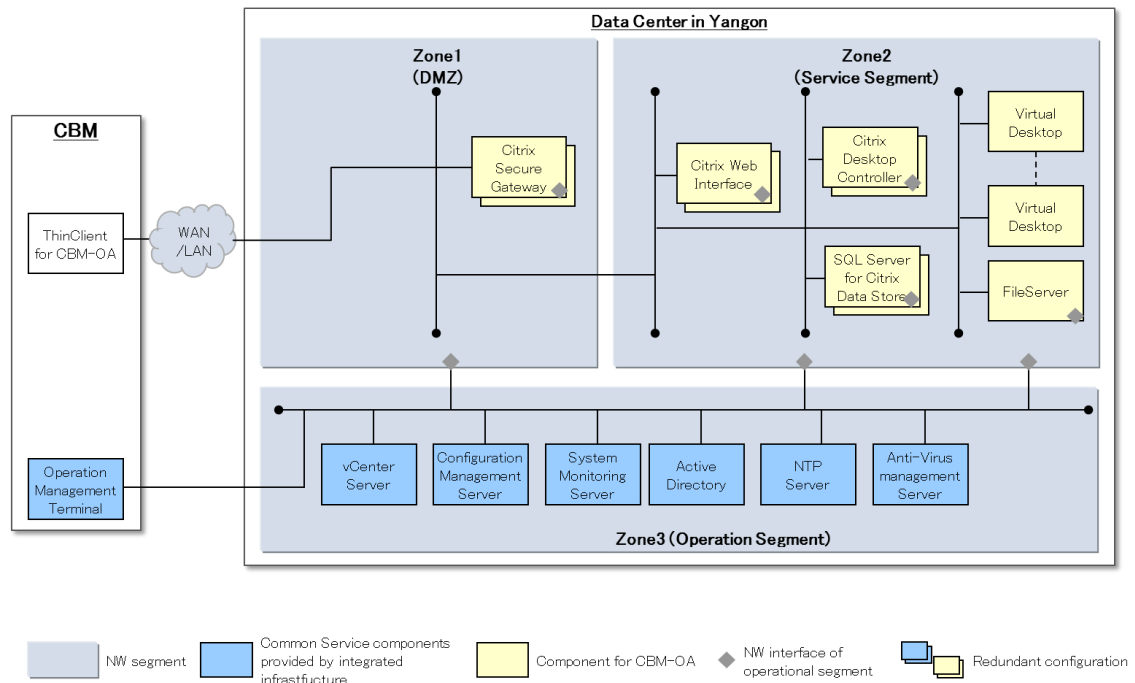
The block diagram of CBM-OA environment is showed as below.

[Architecture Overview]



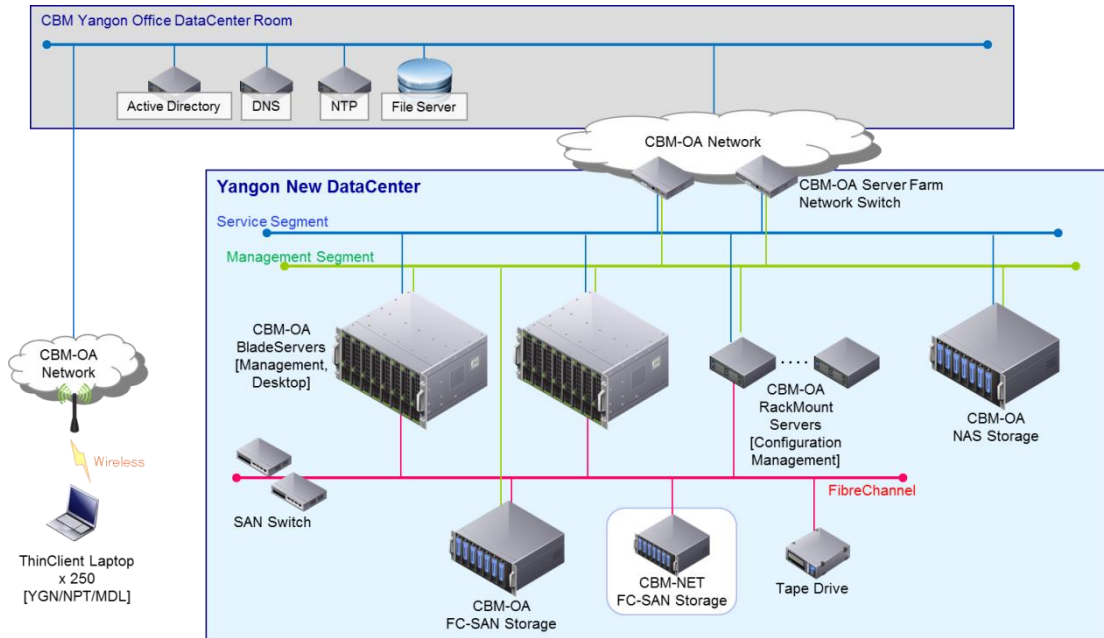
Source: Prepared by the Survey Team

**Figure 16 CBM-OA Architecture Overview**



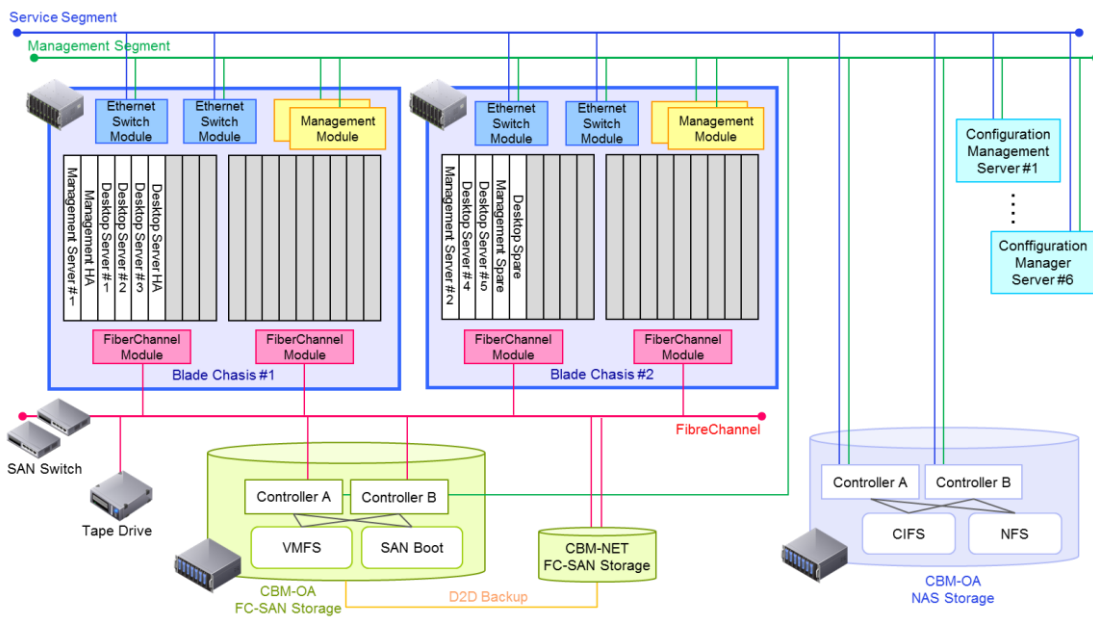
Source: Prepared by the Survey Team

**Figure 17 CBM-OA Logical Component**



Source: Prepared by the Survey Team

**Figure 18 CBM-OA Physical Component**



Source: Prepared by the Survey Team

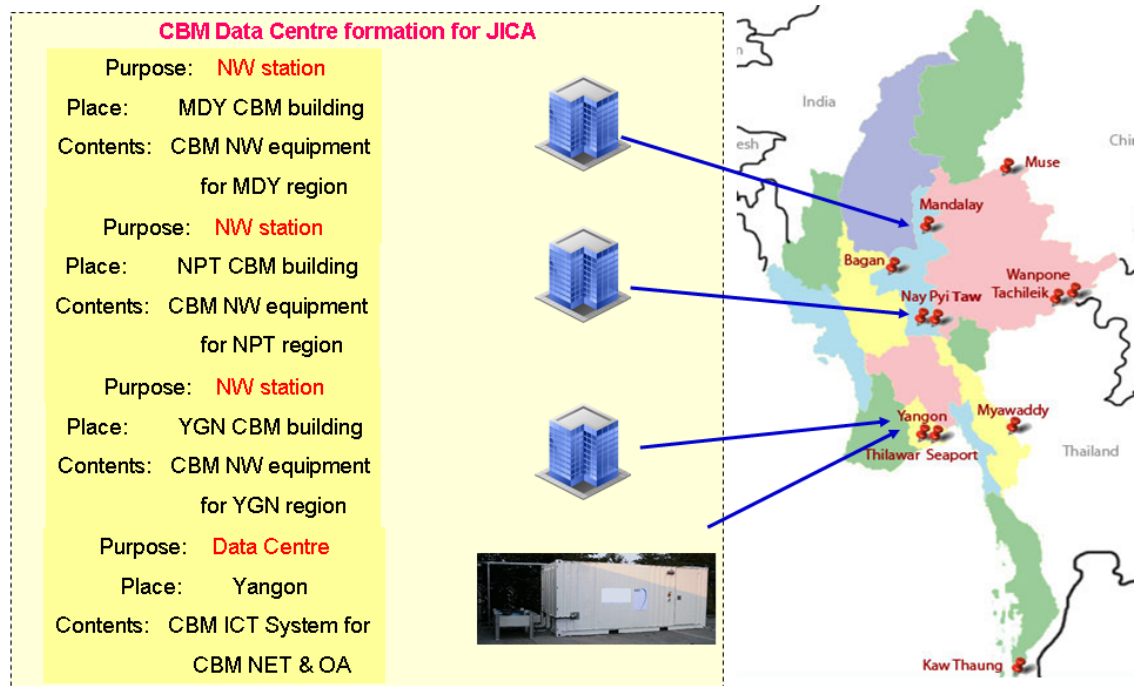
**Figure 19 CBM-OA Server Farm Details**

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#### (4) Facility Environment

Set up the integrated infrastructure in data center of Yangon, and arrange network machines in three places in the Central Bank of Myanmar's head offices, branch offices, and each commercial bank head office.



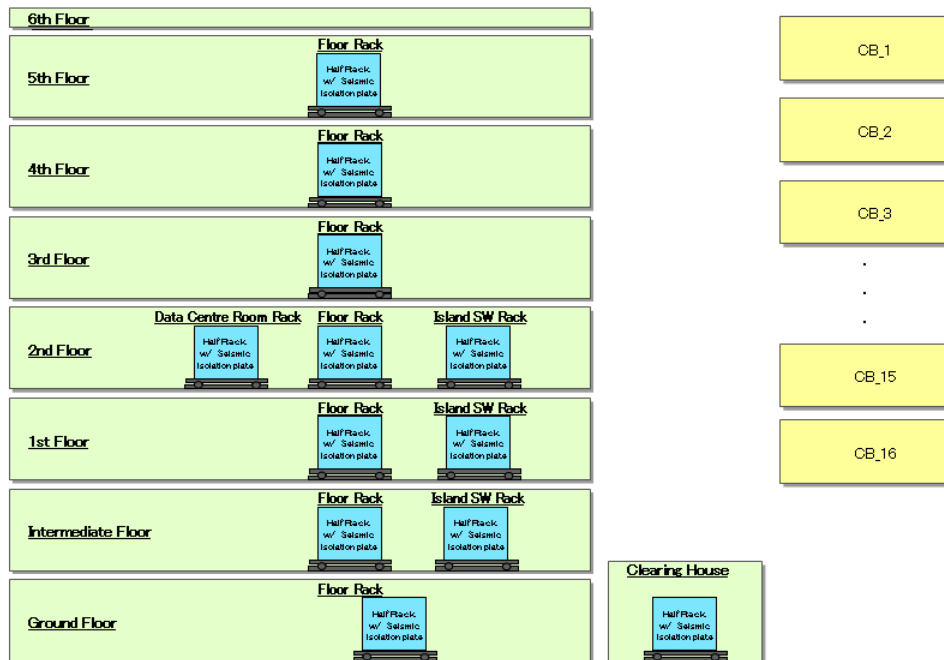
Source: Prepared by the Survey Team

**Figure 20 Data Center Assignment for CBM ICT System**

The arrangement of IT racks in data center and three places in the Central Bank of Myanmar head office and branch offices are as shown below:

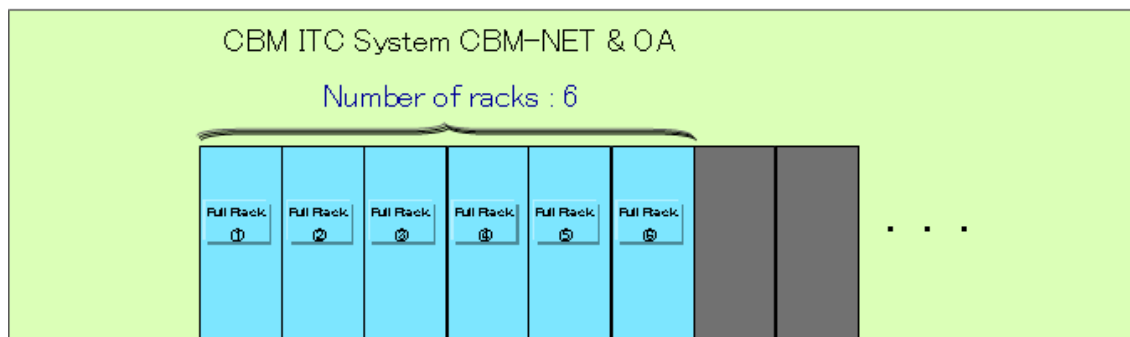
## Facility Layout in Yangon area

### Yangon CBM Office



Source: Prepared by the Survey Team

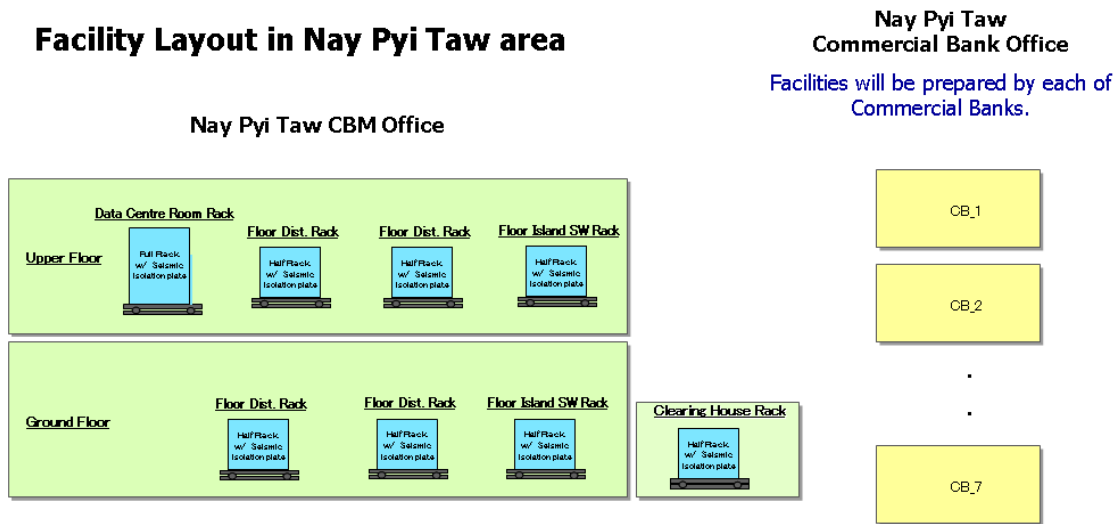
Figure 21 Facility Layout in Yangon Area



Source: Prepared by the Survey Team

Figure 22 Facility Layout of Data Center

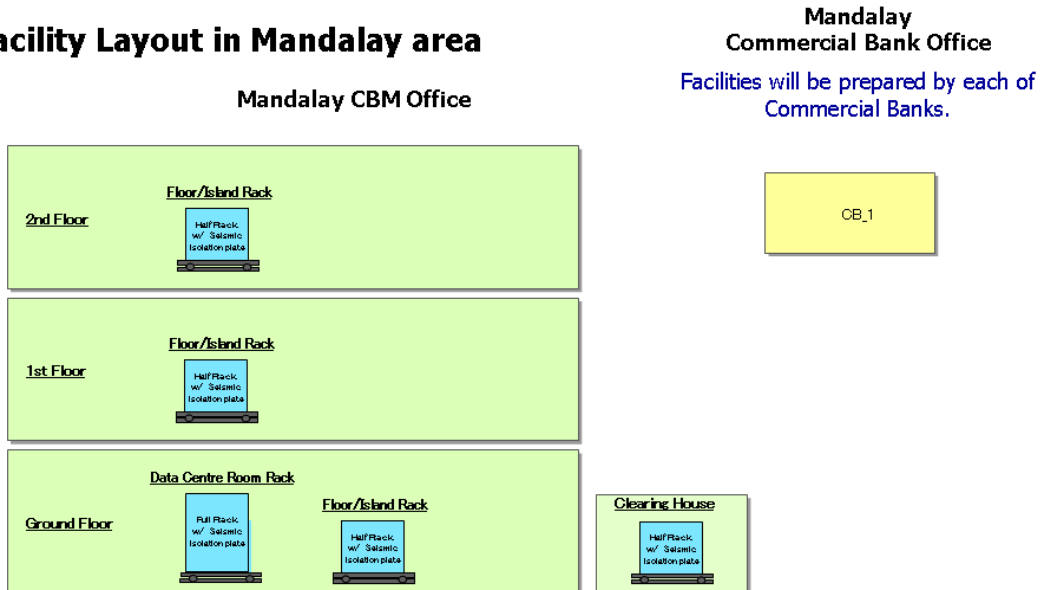
## Facility Layout in Nay Pyi Taw area



Source: Prepared by the Survey Team

**Figure 23 Facility Layout in Nay Pyi Taw Area**

## Facility Layout in Mandalay area



Source: Prepared by the Survey Team

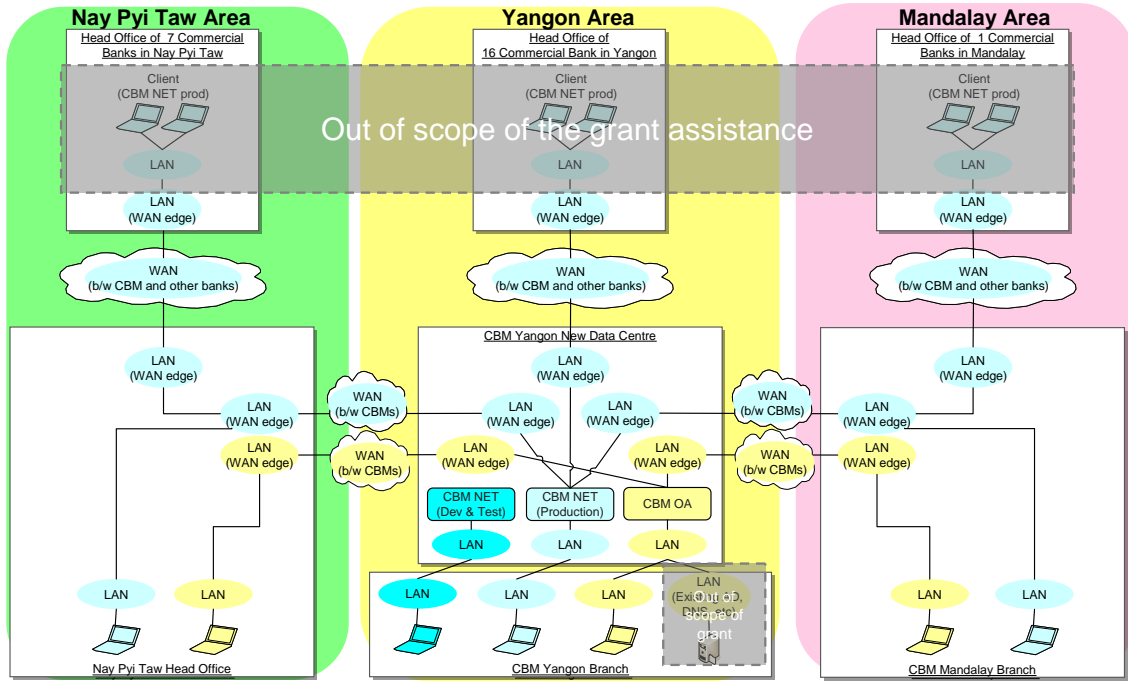
**Figure 24 Facility Layout in Mandalay Area**

### 2.2.4.3 Network Block Diagram

#### (1) WAN Configuration

WAN will be constructed by local carrier in this project. The configuration of city network and the network between branches is as shown below:





Source: Prepared by the Survey Team

**Figure 25 Network Configuration**

**(2) LAN Configuration**

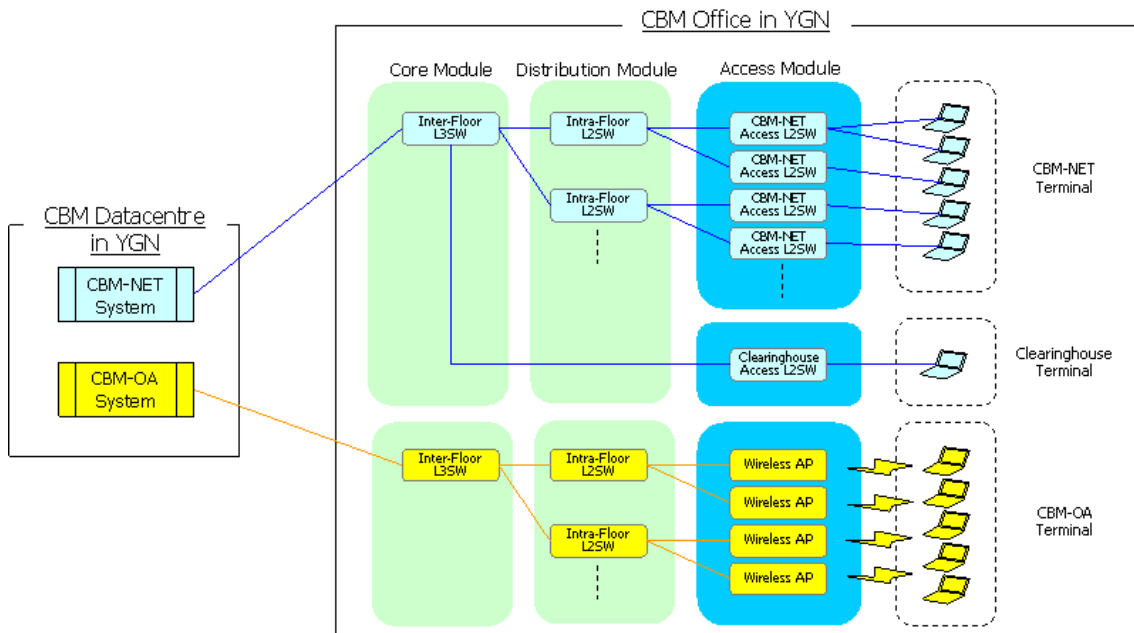
Modularize network in data center and in bank of each branch by each network function and requirement, and build a network that can address the extension and reinforcement of the system flexibly. The function of each module is described as follows.

**Table 7 Function of Network Modules**

	Module	Main Function
Office Network	Border Module	Connects the Central Bank Office with Outside (commercial bank and Central Bank data Center)
	Core Module	Aggregates network between floors and provide routing/access-control function in the office network
	Distribution Module	Aggregates network on the same floor and provide connection to core module
	Client Access Module	Connect network client such as PC and printer in each bank
Data Center Network	Border Module	Connects data center to the external (commercial banks and Central Bank offices)
	Distribution Module	Aggregates the external connection of data center
	Core Module	Aggregates network and provide routing /access-control function in data center
	Server Access Module	Connects the servers and storages in the data center
	Firewall Module	Provides the firewall function
	Load Balancer Module	Provides the load balancer function for server
	Radius Module	Provides the Radius function for terminal authentication

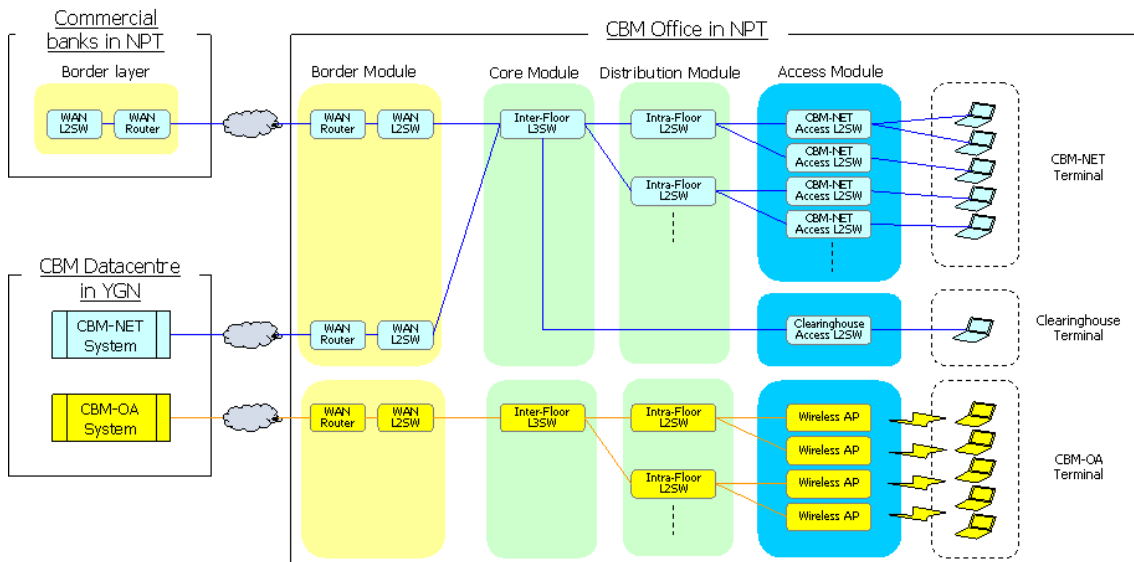
Source: Prepared by the Survey Team

The network configuration of each branch is as shown below:



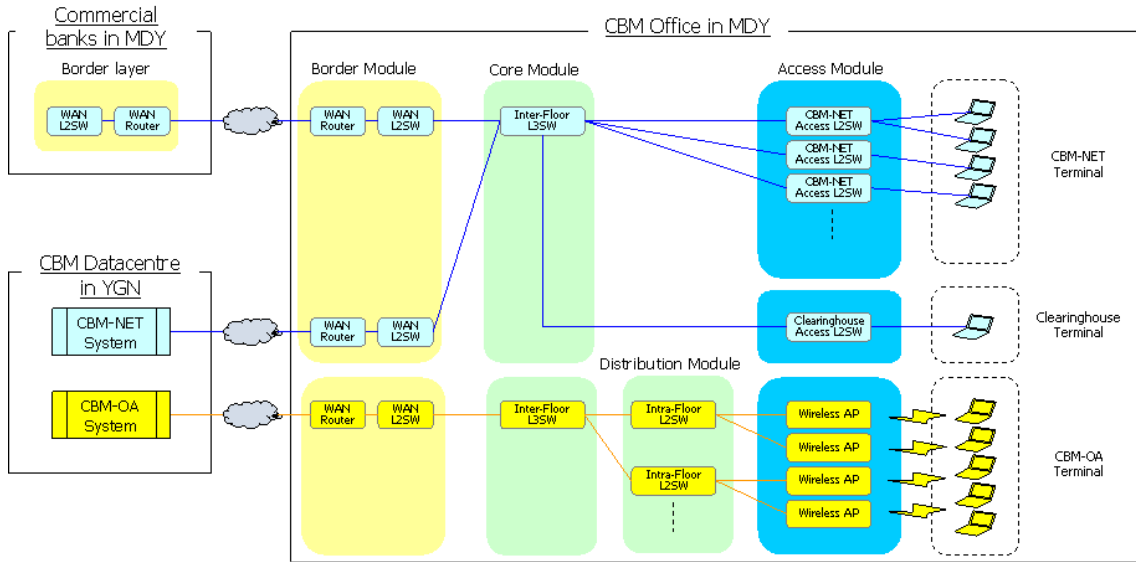
Source: Prepared by the Survey Team

**Figure 26 LAN Network within CBM Yangon Branch**



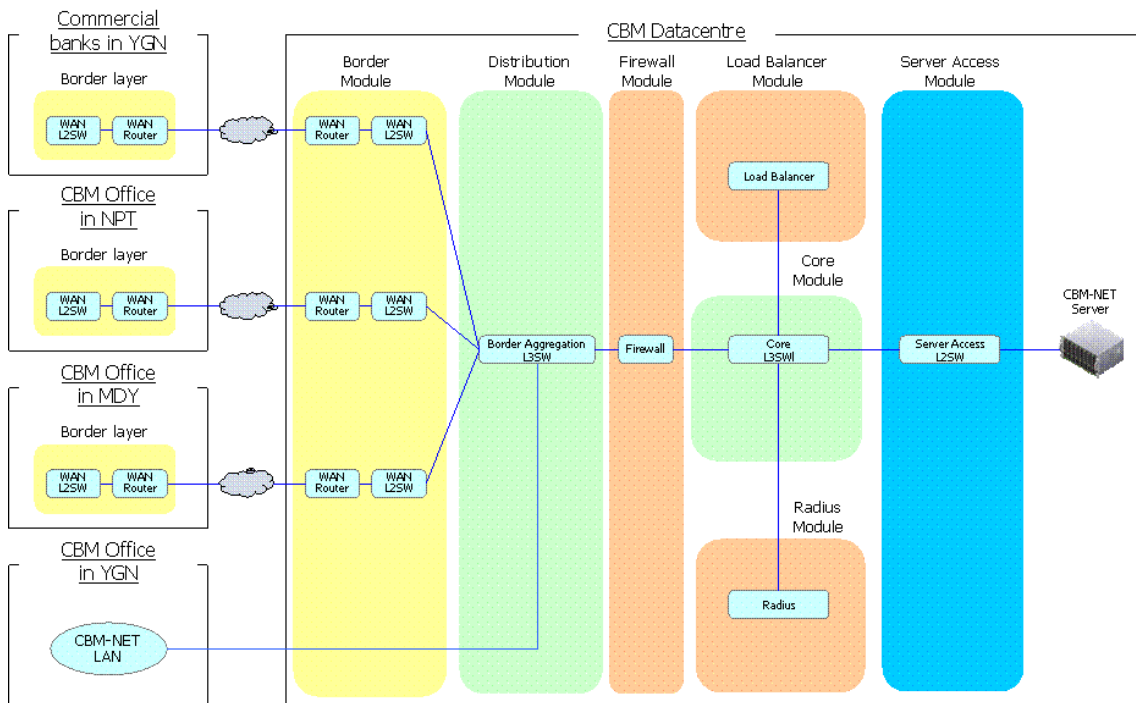
Source: Prepared by the Survey Team

**Figure 27 LAN Network within CBM Nay Pyi Taw Head Office**



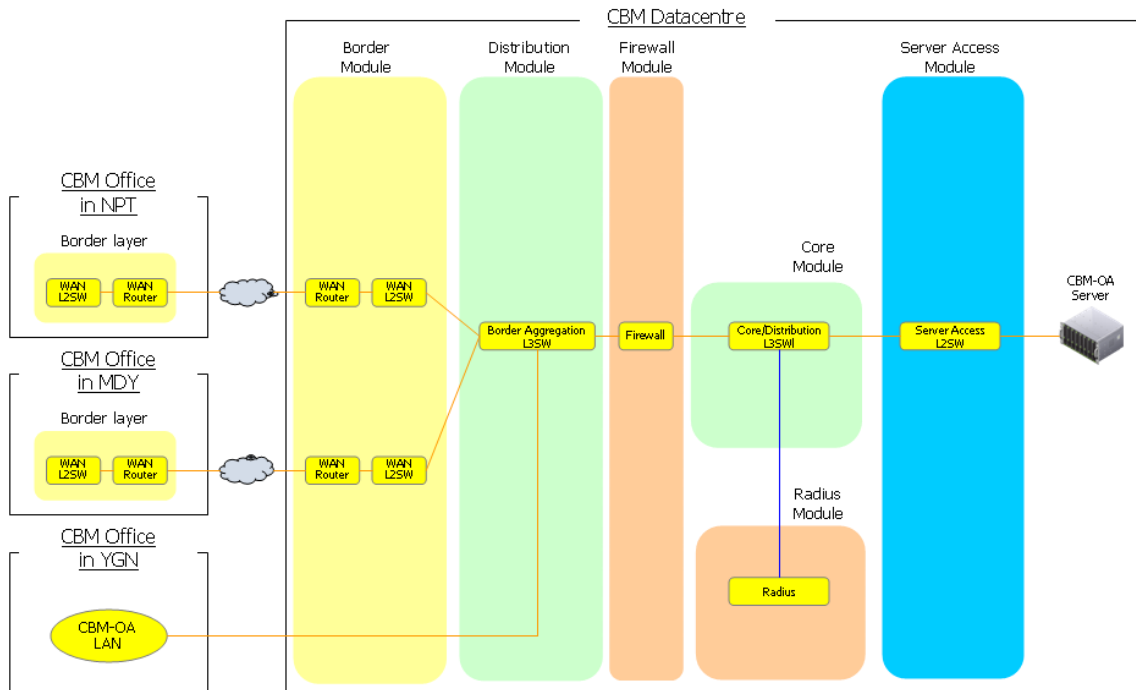
Source: Prepared by the Survey Team

**Figure 28 LAN Network within CBM Mandalay Branch**



Source: Prepared by the Survey Team

**Figure 29 LAN Network in Data Center (CBM-NET)**



Source: Prepared by the Survey Team

**Figure 30 LAN Network in Data Center (CBM-OA)**

Detailed network diagrams are in Attachment 9 of this report.  
WAN assumptions are in Attachment 10 of this report.

#### 2.2.4.4 Hardware List

##### (1) Hardware of MCH

The Hardware of the MCH is described as follows:

**Table 8 Hardware List (MCH)**

No	Name	Main Specifications and Components	Qty
1	MICR Reader/Sorter	<ul style="list-style-type: none"> <li>● The machine which constitutes hardware for clearing houses.</li> <li>● To read MICR (Magnetic ink character recognition) letter and transmit the MICR information to a Reader/Sorter control terminal.</li> <li>● To sort cheques based on the sort pattern.</li> <li>● The MICR reading speed requires "300 pieces/m or more"</li> </ul>	6
2	Reader/Sorter control terminal	<ul style="list-style-type: none"> <li>● The machine that constitutes hardware for clearing houses.</li> <li>● The PC that operates MCH software.</li> <li>● To make and save MICR information transmitted by MICR Reader/Sorter.</li> <li>● To generate some data of output slips according to process data.</li> </ul>	6

No	Name	Main Specifications and Components	Qty
3	Input Terminal	<ul style="list-style-type: none"> <li>● The machine that constitutes hardware for clearing houses.</li> <li>● The PC which operates MCH software.</li> <li>● To assist a Reader/Sorter control terminal.</li> </ul>	3
4	Printer	<ul style="list-style-type: none"> <li>● The machine that constitutes hardware for clearing houses.</li> <li>● To print out some of the outputting slips with operation in the MCH software.</li> </ul>	6
5	Clearing house server	<ul style="list-style-type: none"> <li>● The machine that constitutes hardware for clearing houses.</li> <li>● The PC that saves data generated with a Reader/Sorter control terminal and various setting information</li> <li>● For data preservation use, hard disk drive of this machine should be dualization.</li> </ul>	6
6	UPS	<ul style="list-style-type: none"> <li>● The machine that constitutes hardware for clearing houses.</li> <li>● It should be prepared for each terminal.</li> <li>● It is necessary to support the voltage provided in Myanmar.</li> </ul>	15
7	MICR encoder	<ul style="list-style-type: none"> <li>● The machine that is deployed in each clearing house and Financial Institutions.</li> <li>● To encode the MICR printing to the cheques.</li> </ul>	100

Source: Prepared by the Survey Team

## (2) Infrastructure Hardware

The list of infrastructure hardware is as in the Attachment 11 of this report.

### 2.2.4.5 Software List

#### (1) Applications Software List

The Software of the application is described as follows:

**Table 9 Software List (Applications)**

No	Name	Main Specifications and Components
1	CBM-NET software	<p>The software which has a function as follows:</p> <ul style="list-style-type: none"> <li>● Fund settlement</li> <li>● T-bond/bill settlement</li> <li>● Collateral Management</li> <li>● Master Management</li> <li>● Operation Management</li> <li>● User Management, double check</li> </ul>

No	Name	Main Specifications and Components
2	Middleware, OS	<p>The software which has a function as follows.</p> <ul style="list-style-type: none"> <li>● Relational database management systemOS</li> <li>● Frame Work</li> <li>● Web server software</li> <li>● Application server software</li> <li>● Business form design/operation software</li> </ul>
3	MCH software	<p>The software which has a function as follows.</p> <ul style="list-style-type: none"> <li>● Read Cheques</li> <li>● Sort Cheques</li> <li>● Make and Output slips</li> <li>● Calculate the result of clearing</li> <li>● Master Management</li> </ul>

Source: Prepared by the Survey Team

## (2) Infrastructure Software List

The list of infrastructure software is as in the Attachment 12 of this report.

## 2.2.5 Non-functional Requirements

### 2.2.5.1 Availability Requirements

Among the ICT systems to be developed, CBM-NET as the financial settlement system for central banking will have to ensure high availability. Focusing on the hardware, operation system (OS) and middleware, the grade of availability can be defined by multiplication of the reliability of the hardware configuration and O&M service level. The minimum required availability grade for a financial settlement ICT system is being taken into account. This is the specification whereby: (i) Linux Server Active – Active configuration is structured (with some Active – Hot Stand-by exceptions), and (ii) working hours’ on-site operator and call center support together with update patch provision is guaranteed.

Minimum requirement for the computing machine was identified to be Linux Server, with considerations for the stability, track record and scalability. Requirement for high availability (HA) redundancy configuration, with regards to the criticality of the system was identified as Active – Active structure with some exceptional Active – Hot Stand-by settings. Hardware reliability grade requirement for CBM-NET is therefore 20.

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**Table 10 Hardware Reliability Grade**

Hardware Reliability Grade	Remarks
0 – 8	Non-HA or HA by PC and Windows
8 – 24 (20)*	HA by Server, Linux and Middle Ware (Active – Active & Active – Hot Standby combined)
24 over	HA by Mainframe

\*: Requirement identified for CBM-NET  
Source: Prepared by the Survey Team

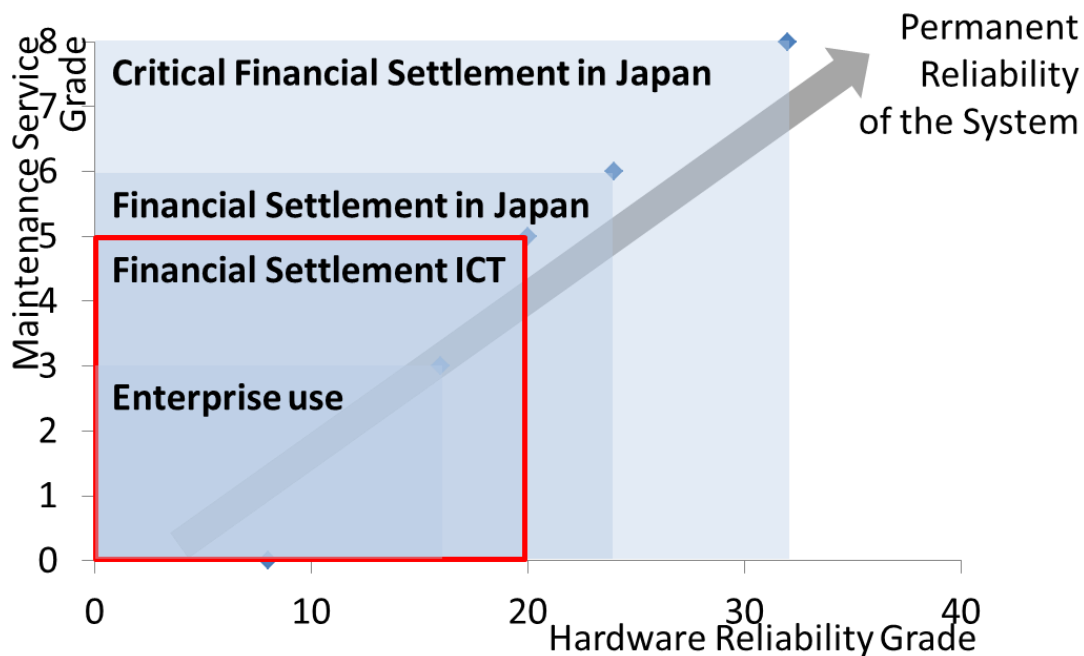
Another factor that comprises the availability is the maintenance service level. The availability grade is deemed to be the sum of three elements, i.e., (i) provision of update patch, (ii) call center opening time, (iii) on-site operator duty hours. With consideration for the criticality of CBM-NET as the financial settlement for central banking which is operating during the daytime on weekdays (requirement for the time being), the required service level was identified to be: 9 to 5 call center and on-site operator, plus full provision of update patch. Maintenance service grade, with the above three factors for CBM-NET, within the scale of 0 to 8, was identified as 5.

**Table 11 Maintenance Service Grade**

Maintenance Service Grade	Level of service
2	Patch provided 9-17 weekdays Call center
5*	Patch provided 9-17 weekdays Call center and 9-17 weekdays Operation support
6 over	Patch provided 24/365 Call center 24/365 Operation support and more

\*: Requirement identified for CBM-NET  
Source: Prepared by the Survey Team

Availability grade, being calculated as the multiplication of hardware reliability grade and maintenance service grade, required availability grade for CBM-NET, was identified. This availability grade is the requirement that can be described as the minimum requirement for financial settlement ICT system. Considering the possible resources constraints that CBM may face, the requirement is set also with the aim to minimize the burden on the O&M cost of the system, which CBM will have to bear.



Source: Prepared by the Survey Team

**Figure 31 Availability Grade for CBM-NET**

By mentioning that the grade identified for CBM-NET is the minimum requirement for financial settlement ICT system, it can also be said that any ICT system of availability grade below that of CBM-NET may not comply with the internationally required standards, as stipulated, for example, by CPSS. With regards to the possible consequence, an ICT system which has a likelihood of being in a status of non-recovery will not be tolerated as a financial ICT system. The following figure shows that the availability requirement for financial settlement ICT system, in some countries such as Japan, is often of higher grade compared with what has been identified as minimal requirement for CBM-NET.

It should also be noted that CBM-OA, with regard to its purpose, requires the same level of availability grade as CBM-NET. It will be under the discretion of CBM to decide on the appropriate availability grade of CBM-OA, in relation to the required O&M cost.

## 2.2.5.2 Security Requirements

### (1) User Management

[User of CBM-NET]

User management of CBM-NET is as explained in item 2.2.2.1 Overview of Business Operations (8) User Management and Multiple Checking.

[User of CBM-OA]

User authentication when using a thin client environment will be conducted by user ID and password, and the user account will be managed in Active Directory.

[System Administrators]

System administrator's ID and password should strictly control in the operations team. The Usage of system administrator's ID is recorded and managed with a list or application form etc. In addition, it is considered that administrator's IDs are separated in each operational functions



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and middlewares, and each ID is managed that it is possible to access the functions which are required only (it is recommended to keep the administrator's ID privilege to a minimum).

## (2) Network Security

Following is the security requirements of CBM-NET and CBM-OA network:

### [Access Control]

Through access control of the firewall and the L3 device, unauthorized access to system is prevented. Furthermore, system logs should be saved for a certain period for the investigation in case of security incidents.

### [Encryption]

- WAN is encrypted to ensure the confidentiality of communication among the external connected lines.
- Configure VPN among sites by IPSEC in WAN router of each branch.

### [Terminal Authentication]

- When connecting the network, authorize the terminal through MAC address to prevent the network being connected with unauthorized terminal.
- MAC address of terminal is centralized managed by RADIUS.

## (3) Physical Security

In order to ensure the physical security environment, it is expected that system racks which can be locked by a key are used for the place to install IT equipment. In addition, it is assumed that the spaces for install system racks are the data center room or data center which are considered physical security management. These spaces are to be prepared by CBM.

### 2.2.5.3 Reliability Requirements

#### (1) Backup and recovery

Two types of backup (System Backup and Data Backup) of each server are obtained. Moreover, two methods (D2D Backup between storage enclosures, Backup to tape drive) are provided. Data backup shall be obtained daily. System backup shall be obtained when the change to the system is applied.

The recovery of restoring from the daily backup data shall be the data of the previous business day. In addition, as a system recovery at the time of data center disaster, the backup data obtained by tape shall be stored in remote locations.

#### (2) Redundant Configuration

##### [Basic Policy]

Configure for continuous use even during hardware failures (double failure is excluded). Configure for automatic switch to standby system during hardware failures.

##### [CBM-NET Server]

Use the High Availability function (e.g.: VMware HA.etc.) of virtualization software as redundant servers. Configure the HA cluster with multiple servers to realize the restart during server failures. HA cluster is classified, according to the uses, into business servers, production servers. etc. In addition, physical servers without the introduction of virtualization software will implement redundancy mechanism in the application. Perform the redundancy and distribution destination switching by Load Balancer for some servers.

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In addition, spare servers will be deployed to enable the disconnection of failed servers and switching to the spare servers by the function of configuration management software.

[CBM-OA Server]

Management server and virtual desktop server use the HA functions of virtualization software, which is described above. HA cluster is divided into management server and virtual desktop server.

In addition, some thin client management servers are implemented by using the redundancy function of the management software itself. Spare servers are deployed in a way the same as that of CBM-NET to realize the disconnection of failed servers and switching to spare servers during failure.

[Storage]

There are two redundant storage controllers for each storage case, which comprise redundant configuration, enabling continuous operation even if either of the controllers fails. Moreover, HDD is provided with redundancy by the function equivalent to RAID, which enables continuous operation without data loss even when one HDD fails. The failed HDD will be exchanged and the redundancy can be recovered through re-configuration.

Connection paths among each server and storage controller perform redundancy through multi-pass connection.

[Network]

From servers to upper layer switches, redundancy is performed by NIC teaming. In the internal network, redundancy is performed by duplex path. Multiple units will be installed physically in network equipment considering physical node redundancy. In the case of failure, network equipment can continue to provide the service by switching to another node manually or automatically.

## 2.2.5.4 Scalability Requirement

### (1) CBM-NET

Adding server resources of virtualization infrastructure, and adding to virtualization resource pool shall be carried out through the assignment process.

The adding of disk space shall be carried out according to the HDD adding to storage, or adding of extended disk enclosure of storage.

The adding of disk performance shall be carried out according to the HDD adding to storage, adding of extended disk enclosure of storage, or the scale up of storage controller.

### (2) CBM-OA

With remaining server resource, adding process of virtual desktop is implementable. If it is insufficient, adding the server and adding it to resource pool of virtualization servers, and carry out the adding progress of virtual desktop.

Add the disk space based on the HDD adding to storage, or the adding of extended disk enclosure of storage.

Add the disk performance according to the HDD adding to storage, adding of extended disk enclosure of storage, or the scale up of storage controller.

### (3) Network

Regarding the expansion of environmental changes, business functions and the number of users, etc. after operation, the expansion shall be agile and inexpensive, without large-scale changes of

equipment as well.

For the scale of expansion, according to dynamic configuration changes and the adding of suitable resources, capacity shall be extended linearly without degrading the performance.

### 2.2.5.5 Scale / Performance Requirement

#### (1) Volume of Current Business

Current business volume at CBM, focusing on fund transfer and T-bond / T-bill transfer is as shown in the next table. It shows that the business volume at Yangon Branch exceeds those of other two hubs. It also shows that most of the transaction is cheque clearing.

**Table 12 Transaction Conducted and Volume at CBM Head Office / Branches**

Transaction	Nay Pyi Taw						Yangon						Mandalay					
	Yes or No	Daily		Monthly		Annual	Yes or No	Daily		Monthly		Annual	Yes or No	Daily		Monthly		Annual
		Ave.	Max	Ave	Max			Ave	Max	Ave	Max			Ave	Max	Ave	Max	
Clearing*1	Y	60	100		1315		Y	2550	6000		56110		Y	35	100		763	
Cash deposit	Y		10				Y		20				Y		10			
Cash withdraw	Y		15				Y		30				Y		15			
Fund transfer	Y		20				Y		40				Y		20			
Deposit auction*2	N						Y		19	38	76		N					
Cash deposit (FX)	Y		2				Y		10				N					
Cash withdraw(FX)	Y		2				Y		10				N					
Fund transfer(FX)	Y		2				Y		20				N					
FX auction*2	N						Y	4	9	48	108	2300	N					
Foreign currency buy/selling	Y		1				Y		4				N					
T-bill selling from Government to CBM	Y		1				N						N					
T-bond selling from CBM to bank*3	Y		1	1	1	12	Y		1	15	20	240	N					
T-bond selling from MEB/MSEC to others*3	Y		1	1	2	24	Y		1	3	4	48	Y		1	1	1	12
T-bill selling from CBM to bank*3	Y		1	1	1	12	Y		2	2	2	24	N					
T-bill renewed	Y		1	4	6	72	N						N					

\*1 Number of transaction means the number of cheques

\*2 Number of transaction means the number of banks which participate in the auction

\*3 Number of transaction means the number of banks (average number of T-bond/bill issues is 2 per a bank)

Source: CBM

Indicators other than the business volume that are also relevant to designing the CBM-NET is as shown in the following table.

**Table 13 Number of Related Items at Each CBM Head Office / Branch**

	Nay Pyi Taw	Yangon	Mandalay
Number of member branch at clearing house	20	79	26
Number of Head Office *1	15 (7)	8 (16)	1 (1)
Number of Head Office and branch of each financial institution	20	105	26
Number of bank which use EFT	0	19	1
Number of Head Office and branch which participate in deposit auction	0	19	0
Number of direct participant bank in T-bond/bill registry	1	21	0
Number of Head Office and branch which use foreign currency account	1	22	0
Number of Head Office and branch which participate in FX auction	0	16	0
Number of personnel at PSSD	32	43	13
Number of personnel at FMD	15	35	0

\*1 (number in bracket) is the number of head office or branch which has an actual H/O function.

Source: CBM

## (2) Volume of Data

### [Hypothesis]

- Estimate number/volume of transactions during the first 5 years after the system starts operation in 2015 based on the current business volume.
- Assume the current business volume at its peak time (hourly) during a day consists 35% of all the daily transaction number/volume (70% of transactions concentrate from 14:00 - 16:30 based on comments from PSSD).
- Annual growth rate of daily business volume is assumed to be 50 %, with reference to the growth rate of inter-bank settlement in Vietnam (2006 - 2010, State Bank of Vietnam Annual Report 2010).<sup>10</sup>
- Annual growth rate for clearing assumed to be 20% with reference to the growth rate of clearing in Vietnam (2006 - 2010, State Bank of Vietnam Annual Report 2010).<sup>11</sup>

**Table 14 Current business volume**

Yangon	Current daily business volume (MAX)	300
	Business volume at its peak time (hourly, MAX)	105
	Clearing	6,000
Nay Pyi Taw	Current daily business volume (MAX)	100
	Business volume at its peak time (hourly, MAX)	35
	Clearing	100
Mandalay	Current daily business volume (MAX)	100
	Business volume at its peak time (hourly, MAX)	35
	Clearing	100
Total	Current daily business volume (MAX)	500
	Business volume at its peak time (hourly, MAX)	175

Unit: number of transactions  
Source: CBM

**Table 15 Projection of Business Volume**

### Yangon

Business volume	Annual growth rate	2013	2014	2015	2016	2017	2018	2019	2020
Daily business volume (MAX)	50%	300	450	675	1,013	1,519	2,278	3,417	5,126
Business volume at its peak time (hourly, MAX)	50%	105	158	236	354	532	797	1,196	1,794
Clearing (# of cheques )	Average (20%)	2,550	3,060	3,672	4,406	5,288	6,345	7,614	9,137
	MAX (20%)	6,000	7,200	8,640	10,368	12,442	14,930	17,916	21,499

### Nay Pyi Taw

Business volume	Annual growth rate	2013	2014	2015	2016	2017	2018	2019	2020
Daily business volume (MAX)	50%	100	150	225	338	506	759	1,139	1,709
Business volume at its peak time (hourly, MAX)	50%	35	53	79	118	177	266	399	598
Clearing (# of cheques )	Average (20%)	60	72	86	104	124	149	179	215
	MAX (20%)	100	120	144	173	207	249	299	358

<sup>10</sup> The inter-bank settlement in Vietnam grew 3 times from 2006 to 2010 with average growth rate of 37%

<sup>11</sup> The clearing in Vietnam grew 2 times from 2006 to 2010 with average growth rate of 20%

## Mandalay

Business volume	Annual growth rate	2013	2014	2015	2016	2017	2018	2019	2020
Daily business volume (MAX)	50%	100	150	225	338	506	759	1,139	1,709
Business volume at its peak time (hourly, MAX)	50%	35	53	79	118	177	266	399	598
Clearing (# of cheques )	Average (20%)	60	72	86	104	124	149	179	215
	MAX (20%)	100	120	144	173	207	249	299	358

## Total

Business volume	Annual growth rate	2013	2014	2015	2016	2017	2018	2019	2020
Daily business volume (MAX)	50%	500	750	1,125	1,688	2,531	3,797	5,695	8,543
Business volume at its peak time (hourly, MAX)	50%	175	263	394	591	886	1,329	1,993	2,990

Source: Prepared by the Survey Team based on current data obtained from CBM

## 2.2.5.6 Operational Requirement

### (1) Service Hours

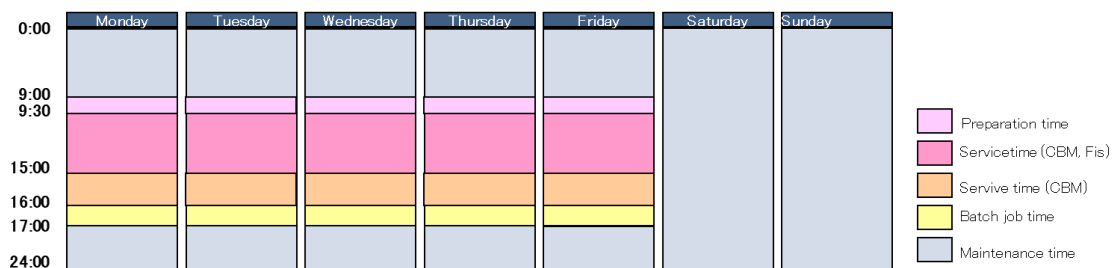
In the following section, it shows the plan of service hour for CBM-NET and CBM-OA.

For realizing this plan, power backup for all of the equipment from the private power generators will be required with anticipation for power failure all the time, including holiday and night time. Details of system maintenance time will be fixed in the system development phase by CBM and the project team.

[CBM-NET]

The plan of CBM-NET service hours is as shown in the figures below.

No	Name of time	Day	Hours	Description
1	Preparation time	Mon.-Fri.	09:00-09:30	The hours for CBM to prepare to start online service.
2	Service time	Mon.-Fri.	09:30-15:00(FIs)	The hours for providing the online service. Financial institutions can input transactions until 15:00 and CBM can extend the hours by max. 30min*. CBM can input transactions until 16:00 and CBM can extend the hours by max. 30min*. * If CBM wants to extend operation hours, CBM can change the closing time by inputting "Registration of input operation hours"
			09:30-16:00(CBM)	
3	Batch job time	Mon.-Fri.	16:00-17:00	The hours for running the batch job for application. When CBM extends the online service hours by 30min, The batch job starts at 16:30.
4	Maintenance time	Mon.-Fri.	17:30-08:00	It is included followings in this hours. - daily scheduled job for operation (data backup, etc.) - system reboot - HW maintenance (replace the failure unit, etc.) - SW maintenance (apply new module for fixing a problem, etc.)
		Sat.-Sun.	All day	
		Holiday	All day	



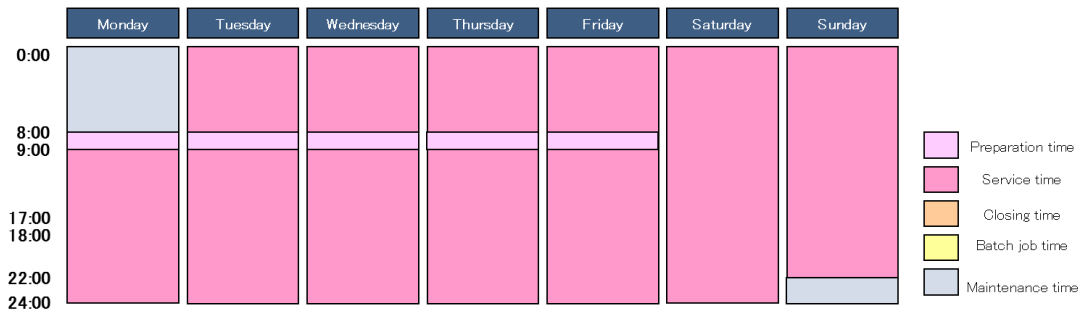
Source: Prepared by the Survey Team

**Figure 32 CBM-NET Service Provision Hours**

[CBM-OA]

Following is the plan of CBM-OA service providing time:

	Name of time	Day	Time	Description
1	Preparation time	Mon.-Fri.	08:00-09:00	The time for the preparation to start online service. It is checked the system status whether is no issue to start the service.
2	Service time	Mon.-Fri.	09:00-08:00	The time for providing the online service. The users are possible to use OA clients. * Sat., Sun. and holidays might be out of service because of the special maintenance requirement.
		Sat.	08:00-08:00	
		Sun.	08:00-22:00	
3	Maintenance time	Sun.	22:00-08:00	It is included followings in this time. - weekly data backup (daily backup runs back ground) - system reboot - HW maintenance (replace the failure unit, etc.) - SW maintenance (apply new module for fixing a problem, etc.)



Source: Prepared by the Survey Team

**Figure 33 CBM-OA Service Provision Hours**

## (2) Operation Item

Following is the operational functions those will be provided by CBM Integrated Infrastructure:

- System Monitoring
- Backup and recovery
- Job management

The details of each function are explained in the sections below.

## (3) System Monitoring Operation

The system monitoring function as below will be provided.

- 1) Gathering monitoring data from target machines (by monitoring agent, or agentless)
- 2) Judging monitoring data by monitoring manager (Judging will be done with monitoring templates those describes monitoring conditions).
- 3) Report to operation staff.

The detailed list of monitoring target will be decided in micro design phase.

## (4) Backup and Recovery Operation

The backup and recovery function as below will be provided.

- 1) System Backup  
System image backup will be done when system has changed.
- 2) Data Backup (Disk to Disk)  
Disk to Disk backup function will be provided for daily data backup. This can be done at both online and offline conditions.
- 3) Data Backup (Tape)  
Tape backup function will be provided for data backup and storing tape media in remote

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place. This is the function for disaster recovery. The backup tape can be moved from tape drive to other places.

#### **(5) Job Management**

The job management functions as below will be provided.

- 1) Job manager will add jobs to job agent based on the information from job net. (Job agent is installed in each server).
- 2) Servers will do jobs added by job manager.
- 3) Report the result of job from job agent to job manager.

#### **(6) Institutional Arrangement for Operation**

Operation staff for integrated infrastructure will be assigned and they will do system operational work. Other operational work specified for CBM-NET or CBM-OA will be done by operation staff for each system.

### **2.2.5.7 Transition Requirement**

#### **(1) CBM-NET**

As CBM-NET is a new one, and the deployment to users is also new, transition work from the existing environment will not occur.

#### **(2) OA**

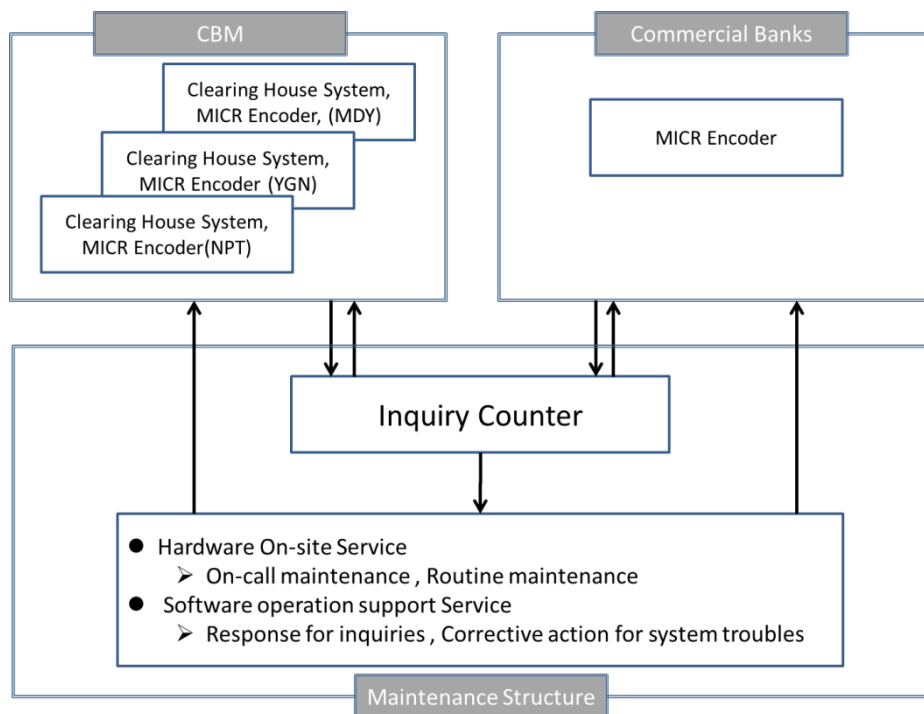
As the adopted infrastructure is a new one, and the deployment to users is also new, transition work from the existing environment will not occur.

### **2.2.5.8 Maintenance Requirement**

#### **(1) Maintenance Requirement for Applications**

As for CBM-NET, IT vendor should decide on the Maintenance Structure. As for MCH, the Maintenance requirement is that IT vendor has inquiry counter and maintains Hardware and Software. And also it is desirable that IT vendor has on-site maintenance service.

The example of Maintenance structure and Maintenance service which IT vendor has is described as follows:



Source: Prepared by the Survey Team

**Figure 34 Example of Maintenance Structure and Maintenance Service**

## (2) Maintenance Requirement for Infrastructure

Periodic maintenance will not be conducted as well as current OA system. Any maintenance will be covered by regular maintenance. Replacement of faulty parts will be done by equipment vendors as well as current OA system.

## (3) Institutional Arrangement for Maintenance (Infrastructure)

Specific institutional arrangement for maintenance of the system as well as current OA system will not be made. Any maintenance work will be done in each of the cases.

## 2.2.6 Design / Installation Plan

### 2.2.6.1 Purpose and Scope

This plan aims to make clear management work to be necessary in carrying out business (system development). This plan is intended for all procurement units and it clarifies a development and management method, schedule, and cost.

### 2.2.6.2 Use of Management Consultants

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. As such procedure requires specialized skills CBM will be requested from JICA to hire management consultant(s) who will support CBM in detailed designs and development supervision.

The following are the tasks assumed to be pursued by the management consultant(s):

#### (1) Detailed Design:

- Support for Confirmation of the development plan



- Support for Procurement of suppliers / vendors

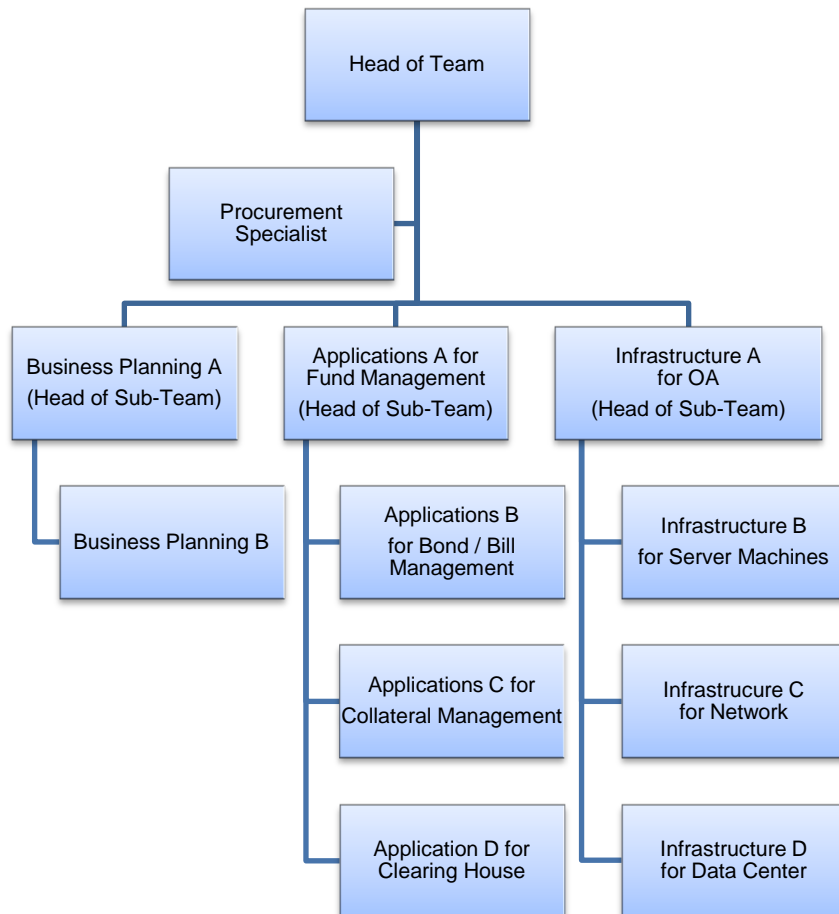
(2) Supervision of Development:

- Support for logistics;
- Support for confirmation of specification;
- Support for running test;
- Support for system development process management;
- Support for acceptance;
- Support for operation rehearsal;
- Support for decision making on service commencement;

(3) Supervision of Development (Soft Component):

- Support for drafting of business manuals;
- Support for user trainings;
- Support for communications with the commercial banks;
- Support for setting up of operation and maintenance structure.

The consultants will be supporting CBM on the items mentioned above throughout the procurement and development period of the systems. Such tasks will be conducted by a team of twelve members as illustrated in the following execution structure.



Source: Prepared by the Survey Team

**Figure 35 Team Structure of Management Consultants**

As will be mentioned in the following procurement batches and methodologies section, the management consultants will be appointed by CBM based on the JICA recommendation. This is

the standard procedure for JICA Grant Aid. Contract between CBM and the management consultants will be concluded by means of a standard contract format offered by JICA.

JICA expects CBM to appoint and hire the management consultant(s) by December 2013, so that procurement and detailed design procedures can be started in a smooth manner. The consultants, on the other hand, are expected to start negotiating the contract with CBM soon after the conclusion of Gran Agreement.

### 2.2.6.3 Project Management

IT vendors have to make project management plan. It is needed to carry out to exemplify items in the following Table.

**Table 16 Item example of project management**

Item	Detail
Progress Management	<ul style="list-style-type: none"> <li>● The progress management is carried out to visualize progress of developing system.</li> <li>● To hold a progress meeting regularly to share progress with the Central Bank of Myanmar and stakeholder. To report any problem, risks, etc., in progress meeting.</li> <li>● Issues and risks, among other topics will be reported in the progress meeting.</li> </ul>
Problem Management	<ul style="list-style-type: none"> <li>● The purpose of the problem management is to classify problems and to deal with them effectively.</li> <li>● The things to recognize as a problem by a project intends for the item which inhibits development work and promotion work to achieve below. <ul style="list-style-type: none"> <li>➢ Estrangement from the plan of the schedule</li> <li>➢ overs and shorts of the resource</li> <li>➢ To need to make adjustment with Central Bank of Myanmar and other stakeholders</li> <li>➢ The risk that were actualized</li> </ul> </li> </ul>
Risk Management	<ul style="list-style-type: none"> <li>● The purpose of the Risk Management is that prevent the outbreak of the problem by identifying and by managing the risk.</li> <li>● The risk identified performs an appropriate review depending on the situation of the project and acts so that a risk is not actualized by the evaluation of the risk, the enforcement of the reduction plan.</li> <li>● On the other hand, to make the preparation for an emergency countermeasure to solve a problem immediately when a risk is actualized.</li> <li>● To manage the risk by a handling problem management process as "a problem" when a risk is actualized</li> </ul>
Quality Management	<ul style="list-style-type: none"> <li>● The Quality management is that raise the quality of the system.</li> <li>● To carry out the quality control by a review and a test for the entire period of the project.</li> <li>● To set an achievement of quality measurement item and quality standard and perform quality control.</li> </ul>

Change request Management	<ul style="list-style-type: none"> <li>● The change management defines the addition of specifications change, requirements, and the correspondence procedure at the time of the modified outbreak of the defect.</li> <li>● The purpose of the change management is to promote the progress of this project smoothly by planning the certain transmission to the precise grasp of the influence range and the stakeholder and Central Bank of Myanmar.</li> </ul>
Other Management	<ul style="list-style-type: none"> <li>● Configuration Management</li> <li>● Communication Management</li> <li>● Release Management</li> </ul>

Source: Prepared by the Survey Team

## 2.2.6.4 Procurement Plan

### (1) Procurement Policy of the Government and CBM

The general rules for tender of government organizations have been established by the President's Office, The title of the document is the "Tender Rules issued for government departments and enterprises to follow in facilitating investments and businesses" (original document in Myanmar language), dated 05/Apr/2013. However the specific rules for procurement under grant assistance from foreign countries are established neither at CBM nor at other government organizations.

This project, which includes CBM-NET, MCH, System Infrastructure and OA, is a Japanese Government grant. Therefore the procurement policy of this project will follow the rule for Japanese government organizations, and it is also necessary to take the rule of the Myanmar government into account. The rule for procurement is basically competitive bidding.

### (2) Necessity of Single Source Procurement

However, there is one exception, and that is when the procurement is single source procurement. CBM-NET applications will have to be procured under single source procurement (not competitive bidding) due to the following reasons:

- Based on the request from CBM, the development of CBM-NET is being required to incorporate equivalent level of efficiency and stability by referring to the designing documents and other features of BOJ-NET including its function to conduct fund and bond settlement in an integrated manner;
- CBM-NET will have to enter into service by the end of 2015, so as to respond to Myanmar's policy requirement. If any vendor, other than the one who has actually developed BOJ-NET, is to develop the system, it will inevitably take extra timespan for acquiring necessary knowledge on business process and technologies, hence the assistance for the development of CBM-NET may not be able to meet Myanmar's policy requirement.

In the light of the President's Office instruction on rules for tender of government organizations (dated 05/Apr/2013), following approvals may be required for single source procurement.

- Internal approval at CBM
- Approval from the Minister
- Approval from the President's Office

### (3) Policy for Customs Clearance and Transportation of Equipment

There is no rule that all customs and other duties are waived from import by CBM. But this

project is Government to Government grant, so all customs and other duties have to be waived. So it is necessary for CBM to apply for tax exemption at the MOF.

#### (4) Policy for After-Sales Service

O&M (Operation and Maintenance) cost will be undertaken by CBM. Therefore this procurement will have to follow the “Tender Rules” issued by the President’s Office.

#### (5) Policy for Defining Procurement Batches

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

**Table 17 Approach to Procurement for CBM-NET and CBM-OA**

No	Aim	Approach
1	Competitive pricing	Separate procurement items into small components for tender
2	Ensure reliability of the integrated systems	Bundle procurement items which have integral relations
3	Minimize the total cost of ownership (by considering both initial procurement and system operation costs)	Procure the system including operation and maintenance services

Source: Prepared by the Survey Team

#### (6) Procurement Batches

Procurement will be conducted in four batches. Among these four batches, procurement for CBM-NET Applications should be conducted under the “single source procurement method” whereby a vendor is nominated by CBM. This is due to the highly-specialized nature of the CBM-NET Applications, not applied elsewhere but to central banking ICT system. BOJ-NET is an ICT system which is an ideal model for CBM-NET Applications, with an integrated functions serving both fund transfer and bond management. Only an application vendor who has experience in developing a comprehensive central banking ICT system such as the BOJ-NET would be capable of offering the solution, based on well-proven architecture. Moreover, under the constraint to have CBM-NET Applications in operational by the end of 2015, time available for the development of the system is extremely limited. This is another reason why CBM-NET Applications vendor must have a track record of development of a comprehensive ICT system for central banking. Under these conditions, the applications will have to be procured from a single vendor with experience of the development of BOJ-NET.

To achieve consistency and continuity, the management consultants for detailed designing and development supervision need to 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, also through single source method.

On the other hand, system infrastructure and mechanized clearing house are procured by

competitive tendering. This is because the equipment to be supplied from these two batches is mostly comprised of “off-the-shelf” products. The equipment therefore may be procured from number of suppliers. It is for this reason that these two batches are procured under the competitive tendering procedure.

procurement Items Function	Software		Hardware	
	Custom-made software	Commercial Product	specialized equipment	General equipment
CBM-NET	(1) CBM-NET Applications	(2)	(6)	(3) System Infrastructure
(Mechanized Clearing House)	(4) Mechanized Clearing House	(5)		(7)
CBM-OA		(8)		(9)
Development Supervision	(10) Development Supervision			

Source: Prepared by the Survey Team

**Figure 36 Procurement Batches and procurement methods**

### (7) Source of Procurement

Almost all of the equipment required under this project will have to be procured from out of Myanmar. These equipment will have to be sourced from Japan or any third countries. Manufactures that may provide sufficient support in Myanmar, in case of failure, repair or supply are currently limited. Nevertheless, with the aim to promote competition in bidding, source of equipment will also be sought from the ASEAN as well as Europe and US.

### 2.2.6.5 Test Policy

Test policy is necessary to secure the quality of deliverables. The purpose of test policy is to minimize the system failure after starting the system operation. According to the Test policy, the IT vendors carry out the test in each phase of the development and also test the performance of the system maintenance at the same time.

IT vendors decide the test schedule and test process in the following Table. IT vendors should report the test result to the Central bank of Myanmar at each phase of the development.

**Table 18 Test Process**

Item	Detail
Unit Test/Integration Test	<ul style="list-style-type: none"> <li>To confirm whether a program works at each module unit and plural module units of system.</li> <li>To carry it out in the Software vendor.</li> </ul>
Product Test	<ul style="list-style-type: none"> <li>Infrastructure vendor carry out communication confirmation test between the base of CBM-NET infrastructure, operation</li> </ul>

	<p>test, infrastructure test and Batch job test</p> <ul style="list-style-type: none"> <li>● Application vendor confirms through the test whether the system can work according to the required specification or whether the system performance is enough.</li> </ul>
Connection Test.	<ul style="list-style-type: none"> <li>● To confirm the performance of integrated operation connecting central bank of Myanmar and Financial Institution through online network.</li> <li>● Application vendor carries out the Connection test.</li> </ul>
Running Test	<ul style="list-style-type: none"> <li>● To check whether the system performs as expected during operation and to rehearse.</li> <li>● The Central bank of Myanmar carries out Comprehensive test.</li> </ul>

Source: Prepared by the Survey Team

### 2.2.6.6 Soft Component

Other than the trainings that the applications and equipment suppliers will provide, technical support for ensuring smooth operation of CBM-NET will be required. Soft component of the project will therefore be included in the terms of reference for the project management consultants. The four topics of technical supports are:

- Support for drafting of business manuals;
- Support for user trainings;
- Support for communications with the commercial banks, and;
- Support for setting up of operation and maintenance structure.

### 2.2.6.7 Technical Cooperation Project

Technical Cooperation Project will be implemented in parallel with the development and initial years of operation of CBM-NET/OA system. The duration of the Technical Cooperation Project is expected to be approximately 3 to 5 years. Technical Cooperation Project is a form of technical transfer activity commonly conducted by JICA, with the main activities being: Co-working on policy development / trainings (both inland and overseas).

The overall goal of the Technical Cooperation Project is to modernize the financial market in Myanmar. To this end, the purpose is set as to establish a necessary environment for operating and maintaining ICT system for central banking.

Outputs from the Technical Cooperation Project are assumed to be as follows:

- Necessary laws, regulations and circulars corresponding to introduction and operation of the ICT system for central banking are developed;
- The capacity to plan, operate, maintain and manage the new system properly is enhanced;
- Users of the new system both in CBM and the commercial banks acquire necessary knowledge and skills in accordance with modernization of financial sector.

Capacity development of CBM to develop and to utilize the ICT system will be one of the main activities of this Technical Cooperation Project. The following issues will be included in the technical cooperation project:

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(1) Capacity development to enable CBM to maintain and utilize their own ICT system

Technical support to enhance capacity of CBM to enable CBM to utilize their own capacity in operating and maintaining the ICT system will be included in the Technical Cooperation Project until the end of 2017 (the first two years after the installation). This takes into account the budgetary constraints before realizing sufficient revenue from banks using the ICT system and from any other business as a central bank.

**Table 19 Capacity Development Cost to be borne by JICA under Technical Cooperation Project**

Cost item	Capacity development aspects to be taken care of by the Technical Cooperation Project
Software maintenance	The Project will support CBM to become capable to operate the ICT system. Necessary knowledge on Software maintenance will be transferred in the component of the Technical Cooperation Project and the relevant cost will be borne by the Project.
Operation	Cost for operation of the ICT system is a requisite for acquiring knowledge and skills on: (i) routine monitoring, (ii) problem analysis, (iii) recovery actions and (iv) negotiations with the vendors, among others. The above cost in the context of capacity development therefore will be borne within the Technical Cooperation Project.
Applications maintenance	Necessary knowledge and skills for Applications maintenance will be transferred in the component of the Technical Cooperation Project and the relevant cost will be borne by the Project.

Source: Prepared by the Survey Team

These items contribute to enhancing capacity of CBM to utilize the ICT system during operation and maintenance – to be supported by the planned Technical Cooperation Project funded by JICA until 2017.

In addition, the Technical Cooperation Project will also provide necessary technical support on appropriate tariff policy on the usage of the ICT system and any other central banking operations so that CBM can enhance their capacity to afford to maintain the ICT system sustainably.

(2) Support for the Introduction of New international accounting system

Purchase, installation and relevant technical support fee for introducing application software for General Ledger to enhance capacity of CBM, on condition that the regulatory framework for accounting and business flows are ensured to be in accordance with international standard will be featured in the Technical Cooperation Project.

(3) Digital leapfrogging towards the modernization of payment and settlement mechanism

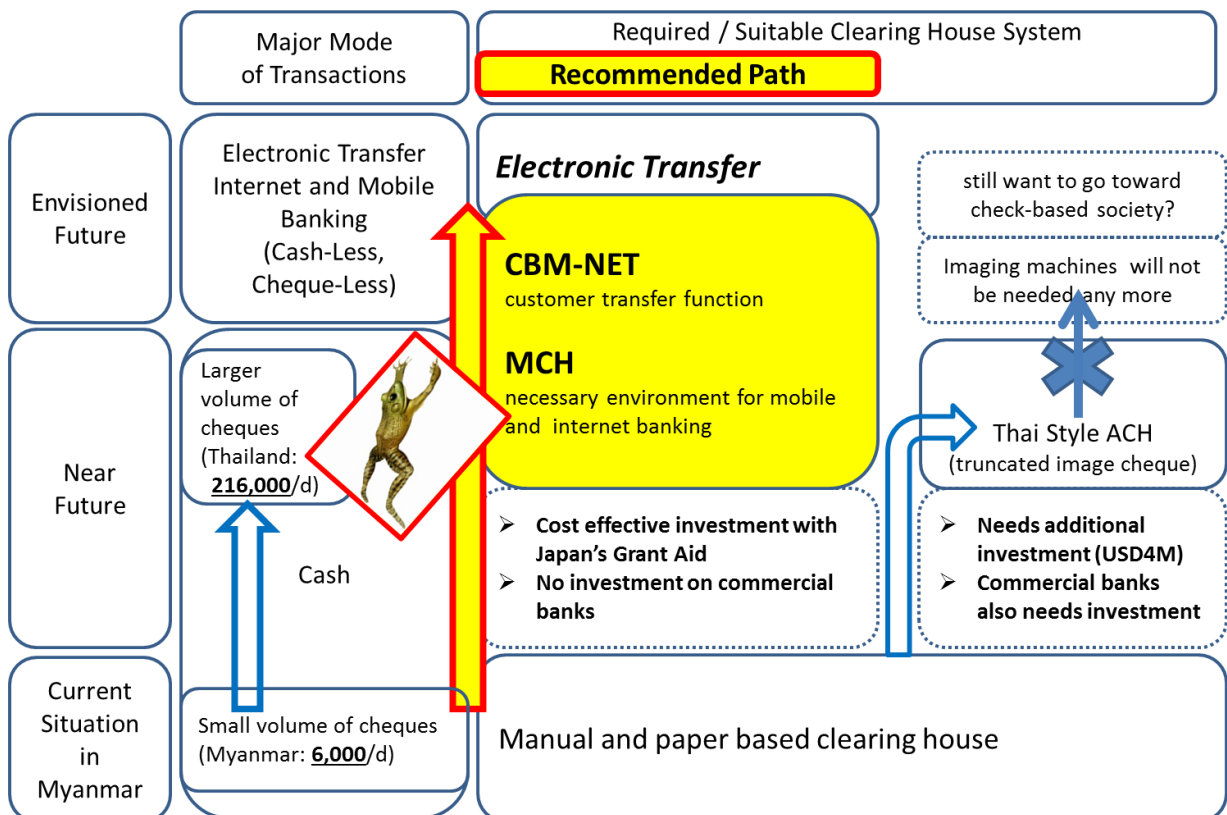
Technical support to consider appropriate measures for realizing “digital leapfrogging” toward the modernization of payment and settlement mechanism in Myanmar will be conducted within

the Technical Cooperation Project. This will also include feasibility assessment for introducing Automated Clearing House with truncated imaged cheques system.

Assessment and policy making for realizing the “digital leapfrogging” should be conducted by looking both at good practices as well as the characteristics of the financial market in Myanmar. One hypothesis is to introduce the state of art cheque clearing system as with the case of Imaged Cheque Clearing and Archive System (ICAS) of Thailand (which is an image based cheque truncation system). In considering the application of best practices in other countries, rationality, applicability and effectiveness should be carefully considered.

ICAS of Thailand, for example, may be an optimal cheque clearing system only in an environment where cheque has already penetrated as one of the most common way of transaction settlement. This is backed by Thailand’s legal system in which issuing a cheque resulting in being dishonored is a serious criminal offence. Cheque therefore has already been regarded as a reliable and convenient means of settlement in Thailand. If such were to be introduced in Myanmar, a similar legal system will have to be developed, followed by familiarization of cheques and necessary investments for establishing proper infrastructure. Following such path may not be the most recommendable way if ultimate direction were to be the electronic transfer society in which mobile and internet banking can be popularly utilized instead of cheques as many other countries moving ahead.

CBM-NET, contrary to the image based cheque truncation system, is in line with the path towards the electronic transfer society. The customer transfer function of CBM-NET is the basic fund transfer mechanism that can be enhanced and applied to mobile and internet banking systems.



Source: Prepared by the Survey Team

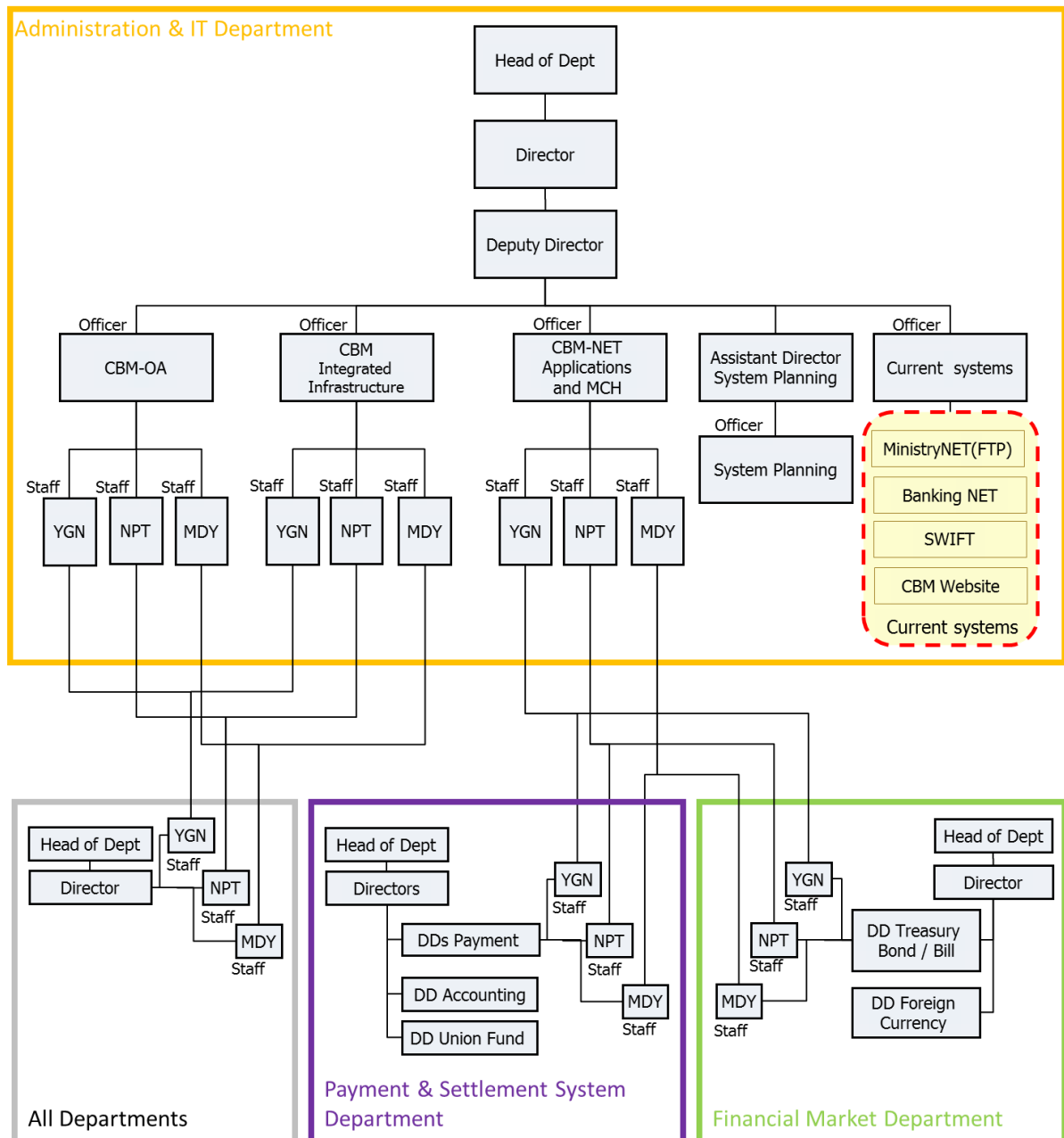
**Figure 37 Recommendable Digital Leapfrogging Path**



### 2.2.6.8 Institutional Arrangement for Operation of the System

All departments will utilize CBM-OA for daily business operations. Staffs under the Directors assigned as the caretaker of the ICT system will be posted at each hubs of CBM. Further, PSSD and FMD will become the major users of CBM-NET. These departments will facilitate the use of the CBM-NET by assigning dedicated staffs for the system.

An example of institutional arrangement for the operation of the ICT system is shown in the following figure.



Source: Prepared by the Survey Team

**Figure 38 Proposed institutional Arrangement for the Operation of ICT System**

ICT department will be considerably strengthened so as to become capable of operating and

maintaining CBM-NET and CBM-OA. The mission of the new ICT department will be:

- To make available optimal ICT environment for CBM staffs;
- To introduce updated ICT technologies to CBM in timely manner, and;
- To ensure that CBM stays connected to Myanmar and the international community, online.

## 2.3 Obligations of Recipient Country

Further to the undertakings mentioned in Section 1.1 of this report, CBM is requested to make arrangements on the following points. All of the items listed below are based on the undertakings initially listed in the Minutes of Discussion signed in March 2013.

### 2.3.1 Establishment of Necessary Rules

CBM is requested to establish necessary rules (laws, regulations, circulars, guidelines, clarifications, etc.) both for its internal operation and also for business operations in relation with the financial institutions that will make use of the ICT systems. Following is the list of rules that will have to be established prior to the commencement of the ICT system operation:

- Current account needs to be coded according to the BIC code structure of SWIFT.
- The number of CBM-NET online accounts will be limited to one account per bank (tentatively one account with one CBM branch <=3 accounts>).
- Scrip less system for T-bond/bill settlement should be realized when introducing the book-entry system. This should be done simultaneously with the commencement of CBM-NET operation.
- Intra-day overdraft agreements with the CBM-NET account holders are to be introduced.
- Cheque format needs to be standardized utilizing MICR.
- The number of clearing house participating branch is to be limited to one per clearing house (The case of Myanmar Economic Bank (MEB) will be considered separately).
- CBM should negotiate and arrange with the commercial banks to prepare an appropriate environment for installing communication equipment, CBM-NET client PC, cheque encoder, and for the operation of the ICT system introduced under this project.

### 2.3.2 Physical and institutional preparations within CBM

Many of the physical preparation will incur expenses. CBM is therefore requested to secure budget for the costs mentioned below. Budgetary measure will be necessary from FY 2014.

**Table 20 Physical and institutional preparations and direct expenses**

Arrangement	Direct expense	Timing for disbursement
<ul style="list-style-type: none"> <li>● Take responsibility for system operation and management by making institutional arrangements (staff assignment) for system operation of CBM- NET and CBM-OA.</li> </ul>	Hire staffs for ICT system.	By April 2015

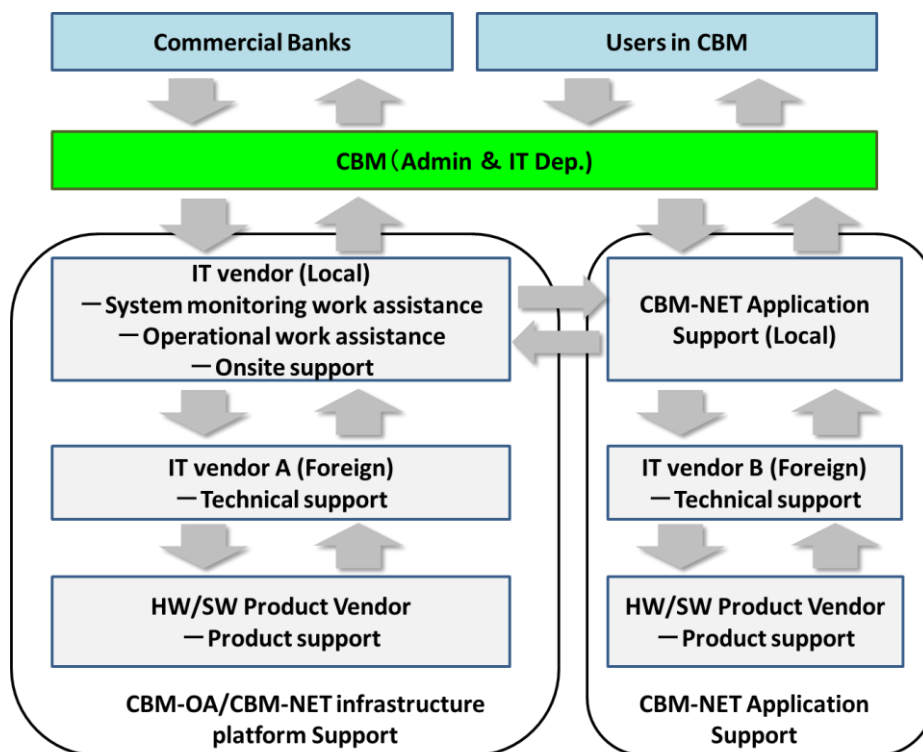
<ul style="list-style-type: none"> <li>Budget for the maintenance cost of CBM-NET and CBM-OA shall be secured and borne by CBM, including hardware / software maintenance cost, application maintenance cost, operational cost, network usage costs.</li> </ul>	Approximately MMK 4 billion per year (as mentioned in sub section 2.4.2 of this report).	From Dec 2015 onwards
<ul style="list-style-type: none"> <li>Enhance CBM's accounting and ledger information systems by adding data import functions</li> </ul>	Outsourcing of estimated cost of MMK 30 - 70 million will incur.	To be completed before the commencement of operation (Jan-Nov 2015)
<ul style="list-style-type: none"> <li>Secure spaces for the racks, which will be installed for this system <ul style="list-style-type: none"> <li>- The rack space in the new data center</li> <li>- The rack space in the data center room in CBM building</li> <li>- The rack space on each floors of CBM building</li> </ul> </li> </ul>	To be paid as the data center usage cost. The amount is to be negotiated with the owner of the center.	—
<ul style="list-style-type: none"> <li>An air conditioned and access restricted reader/sorter machine room should be prepared in each clearing house building.</li> </ul>	Approximately MMK 20 million per site: MMK 60 million for three sites.	Apr-Dec 2014 for Yangon, Nay Pyi Taw, late 2015 for Mandalay
<ul style="list-style-type: none"> <li>Provide appropriate power source and air condition. (in data center, CBM building and also in clearing house machine room).</li> </ul>	MMK 80 million for power generator installation at Yangon. MMK 5 million for new air conditioning equipment at Yangon machine room.	To be settled Apr-Dec 2014
<ul style="list-style-type: none"> <li>Bear the cost of telecommunication services from prior to the handover of the ICT systems.</li> </ul>	MMK 10 million	The cost will incur during Apr-Nov 2015
<ul style="list-style-type: none"> <li>Make necessary arrangement to transport backup tapes for disaster recovery to remote location to be stored.</li> </ul>	Service is yet to be identified	The cost will incur from December 2015
<ul style="list-style-type: none"> <li>Secure a space for reserve stocks of equipment.</li> </ul>	Cost for securing an indoor storage space.	—

## 2.4 Project Operation Plan

### 2.4.1 Operation and Maintenance Structure

The Central Bank of Myanmar outsources operation and maintenance of IT infrastructure and support of its software. Local and foreign IT hardware vendors provide CBM-OA /CBM-NET infrastructure platform. Furthermore, local and foreign IT software vendors provide

development of CBM-NET application and their support.



Source: Prepared by the Survey Team

**Figure 39 Operation and Maintenance Structure**

## 2.4.2 Operation and Maintenance Cost

Cost for operation and maintenance of the ICT system will incur from the time of handing over of the system to CBM. Under the current timetable, operation and maintenance cost will be payable from December 2015, i.e., from fiscal year 2015.

The operation and maintenance cost consists of five categories. They are operation fee for IT vendors, application maintenance fee for technical support, software maintenance fee for software vendors, hardware maintenance fee for products vendors, and network usage fees for Myanmar Posts and Telecommunications (MPT).

There is a strong concern in Myanmar related to the operation and maintenance costs to be borne, hence, the system will have to be designed and developed so as to ensure that the operation and maintenance costs shall be kept at minimum required level

**Table 21 Categories of Operation and Maintenance Cost**

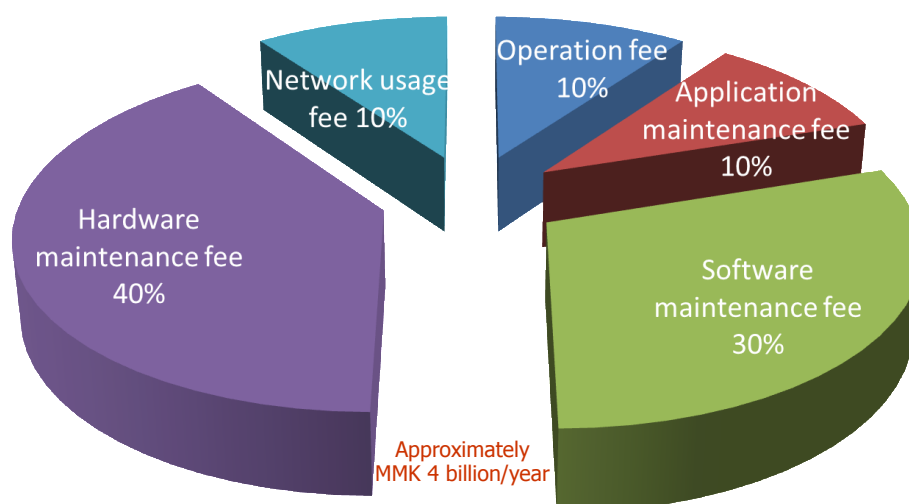
	Category	Description
1	Operation fee	<ul style="list-style-type: none"> <li>● Cost for the operational work as provided by local IT Vendor.</li> <li>● Engineers from local IT vendor support and help system operation and conduct maintenance work of CBM staff.</li> <li>● Foreign IT vendors may support the local IT vendors when required.</li> <li>● Work includes: system monitoring work, supporting fixed problems operation on the system, supporting to run scheduled operational works, etc.</li> </ul>

2	Applications maintenance fee	<ul style="list-style-type: none"> <li>● Cost for the application technical support and solution work provided by local IT vendor.</li> </ul>
3	Software (OS, framework, middleware) maintenance fee	<ul style="list-style-type: none"> <li>● Fee for obtaining maintenance support for software product (OS, framework and middleware) provided by software vendors.</li> <li>● Service includes providing fixed module and update module, using call center support, etc.</li> <li>● Some software may not be used without paying an annual fee.</li> <li>● The fee includes authorization for use.</li> <li>● Products include: OS, Virtualization SW, middleware, framework.</li> </ul>
4	Hardware maintenance fee	<ul style="list-style-type: none"> <li>● Fee for maintenance support from hardware product vendors.</li> <li>● Service includes providing parts, using call center support, etc.</li> <li>● Hardware include: Servers, Storages, Network equipment, Thin Client PCs, MCH reader/sorter, MCH encoder</li> </ul>
5	Network usage cost (to be paid to MPT)	<ul style="list-style-type: none"> <li>● Usage fees for WAN as provided by MPT.</li> <li>● Cost includes: <ul style="list-style-type: none"> <li>- Usage fees for Long distance NW (between CBM offices)</li> <li>- Usage fees for Short distance NW (between CBM and Commercial Banks)</li> </ul> </li> </ul>

Source: Prepared by the Survey Team

The hardware maintenance comprises approximately 40% of the total O&M cost, while software maintenance approximately 30%. These cost elements are the costs to ensure the high availability and reliability of CBM-NET as mentioned in section 3.4 of this report. These hardware and software maintenance costs are essential for the system to be functioning and also to be capable of recovering from failures in a limited time.

In order to secure appropriate reliability of the system as the financial settlement system for central banking, O&M cost for hardware / network / software (OS and middleware) will not differ regardless of the application the system will have.



Source: Prepared by the Survey Team

**Figure 40 Composition of the O&M cost for CBM-NET and CBM-OA**

Prior to the selection of the actual vendors, the estimation for the operation and maintenance cost will have to be based broadly on the percentage of initial investment cost. The breakdown of the O&M cost for CBM-NET and CBM-OA by cost elements was calculated. In total, 70% of the total O&M cost can be attributed to CBM-NET, including MCH. While hardware

maintenance, software maintenance, operation fees are mostly proportional to their investment figures, cost elements such as network usage and applications maintenance fee are almost totally attributable to CBM-NET function.

**Table 22 Composition of Operation and Maintenance Cost by Functions**

Items	% of O&M Cost	CBM-NET (including MCH) (%)	CBM-OA (%)
Hardware maintenance fee	40	25	15
Software maintenance fee	30	19	11
Network usage	10	9	1
Operation fee	10	7	3
Applications maintenance fee	10	10	0
Total	100	70	30

Source: Prepared by the Survey Team

To ensure that the maintenance, license, etc., of software (e.g. OS, framework, and middleware, etc.), shall not be higher than what is commonly expected, O&M cost should also be quoted in the tendering process. The vendor selection should take into account the quoted O&M costs. Also, to reduce the operation fees and a portion of application maintenance, CBM should consider making use of its in-house employees and to select local IT service providers who will render operation and maintenance services at the lowest possible fees.

### 2.4.3 O&M Cost Comparison with Package Applications

As already demonstrated in the previous sub-section, applications maintenance cost comprises merely 10% of the total O&M cost. Nevertheless, saving should be considered by selecting the applications that will be available at lower O&M cost. Here, O&M cost is compared between CBM-NET as the custom-designed ICT system and some of the package solutions.

CBM-NET will be developed in line with “Principles for financial market infrastructures” by Bank for International Settlements Committee on Payment and Settlement Systems (BIS/CPSS) and International Organization of Securities Commissions (IOSCO) which defines the requirements funds payment and securities settlement system should be furnished. In addition, CBM-NET needs to secure appropriate flexibility and expandability for stable and sustainable operation of the financial infrastructure in accordance with the growth and modernization of financial sector in this country.

Possibility of improving the efficiency of the project by making use of “off the shelf” package solutions was considered. As there is no package software currently available that provides all necessary functions the CBM-NET contains, the comparative option was to utilize the package software with necessary customization.

There are numerous choices of package applications for accounting and resource management functions. These applications are not necessarily developed for central banking. On the other hand, system application for payment and settlement in central banking are strikingly different from those commonly utilized in commercial banking, and therefore are exclusively for central banking. Products from internationally recognized vendors such as CMA Small System, Logica

(CGI), Montran and SIA Perago are utilized by many central banks.<sup>12</sup>

In general terms, the strength of custom developed system such as CBM-NET, in comparison with the package applications can be pointed out as follows:

- Can easily be tailored to the need of the users
- Size can be enhanced in phased manner
- User customization is possible
- Technical transfer can be achieved.

Major package applications brands are mostly offering full sets of products that cover RTGS, bond settlement and collateral management functions. It should however be noted that these individual package products are not designed to be linked automatically with each other. Users often pick up certain product for individual purposes as opposed to custom developed integrated system such as CBM-NET. For such reason, these package applications need to be heavily customized to be integrated into one comprehensive system that covers RTGS, bond settlement and collateral management functions.

**Table 23 Major Package Applications for Central Banking**

Brands	Country of origin	Products			RTGS examples in Asia Pacific
		RTGS	Bond settlement	Collateral management	
CMA Small System	Sweden	RTS/X	DEPO/X	DEPO/X	Brunei, Cambodia, Indonesia, Lao PDR, Mongolia
Logica (CGI)	UK	CAS	CSS	CSS	Sri Lanka, Philippines, Fiji
Montran	USA	RTGS/GPS	CSD	RTGS	Kyrgyz
SIA Perago	Italy	RTGS	CSD	CSD	N/A

Note: Packages, even if selected from the same brand, will not have automatic linkage function. For example, CMA's RTS/X has limited automatic linkage with DEPO/X collateral management. Similarly, Montran's CSD has dedicated interface with its RTGS to support the settlement for the cash-leg of securities transaction, but without any automatic linkage between securities management and RTGS collateral management.

Source: Prepared by the Survey Team

The applications operation and maintenance cost often turns out to be more expensive with the package applications due to heavy customization. This is especially the case with the application maintenance cost as the possibility to localize the maintenance is usually limited. Other items in the O&M costs would inevitably incur at the same level as the custom developed applications regardless of selection of the solutions (installing off the shelf packages or customizations).

There is also a risk in package applications when these products are revised / updated. Once such updates occur, the customization process will have to be repeated, resulting in unexpected amount of re-development cost incurring.

Moreover, transfer of knowledge may be limited due to the closed characteristics of the package solutions. CBM-NET, on the other hand, can provide more opportunity for localization of operation and maintenance as well as for customization. JICA is therefore expected to conduct technical cooperation activities so as to transfer the knowledge of system operation and maintenance through technical cooperation project.

<sup>12</sup> Revised information based on Morten Bech, Bart Hobijn, " Technology Diffusion within Central Banking: The Case of Real-Time Gross Settlement", Staff Report nj. 260, Federal Reserve Bank of New York, Working Paper, September 2006

**Table 24 Comparison of CBM-NET and Package Solutions**

Description of Cost structure	“Off the shelf” package solutions	CBM-NET based on JICA proposal
<b>1. Development Costs</b>		
1.1. Cost of the hardware/ network infrastructure development	<i>Almost same regardless of the solution</i>	
1.2. Cost of the application development	<i>Cheaper</i>	<i>More expensive</i>
<b>Total development costs (1.1+1.2)</b>	<b><i>Cheaper</i></b>	<b><i>More expensive, but all borne by JICA grant.</i></b>
<b>2. Operation &amp; Maintenance Costs (% of the total O&amp;M cost &lt;approx. 4mil. US\$&gt;)</b>		
2.1. Hardware maintenance fee	Theoretically same (40%), but more expensive with the package if locked-in by the dedicated vendor.	40%
2.2. Network usage fee	<i>Same (10%), regardless of the solution.</i>	
2.3. Operation fee	<i>more expensive, if the cost of staff training, on-demand help/support is charged by the dedicated vendor.</i>	<i>10%, operated by CBM proprietary staff trained in the soft component (see below)</i>
2.4. Application maintenance fee	<i>Much more expensive (10%+ 10%or more=minimum 20%), as the application should be customized remotely by vendors abroad. Very limited room to customize (almost “black box”)</i>	<i>10%, as customized by domestically hired vendors &amp;/or CBM proprietary system engineers</i>
2.5. Software (O/S, middle ware such as DBMS, VM, etc.) maintenance fee including license fee	Theoretically same (30%), but more expensive if locked-in by the dedicated vendor.	30%
<b>Total operation &amp; maintenance costs (2.1~2.5)</b>	<b><i>More expensive (minimum 110%)</i></b>	<b><i>Cheaper (total 100%)</i></b>

Source: Prepared by the Survey Team

#### 2.4.4 Possible Scenario for Mitigating the Operation and Maintenance Cost Impact

Annual O&M cost, including all of the categories above mentioned, is expected to reach total



MMK 2.9 billion as downside, and MMK 4 billion as upside scenarios.<sup>13</sup>

JICA understands that CBM needs to find appropriate measures to minimize the operation and maintenance cost especially in the initial period, which may at least range from 1 to 5 years, in order to afford full costs of operation and maintenance. Against this background, options for reducing the O&M cost, although with increase in risks, as a downside scenario, may be proposed.

**Table 25 O&M Cost Saving Options**

Cost element	Cost to be saved	Saving option	Risk factor
Operation (10%) MMK 0.4 billion	-MMK 0.2 billion (-5%)	No outsourcing of operation service (by utilizing CBM proprietary system engineers)	<ul style="list-style-type: none"> <li>Limited capacity and competence may take longer time for system recovery.</li> <li>Thorough and intensive training will be required.</li> </ul>
Applications maintenance fee (10%) MMK 0.4 billion	N/A	N/A	<ul style="list-style-type: none"> <li>Applications will require continuous updates and troubleshooting services to ensure sustainable operation of the ICT system.</li> </ul>
Software maintenance fee (30%) MMK 1.2 billion	N/A	N/A	<ul style="list-style-type: none"> <li>O/S, middleware (which would be provided by global brands like IBM, Microsoft, Oracle, VM Ware, etc.) needs to be licensed for usage and continued maintenance. Software maintenance contract should not be omitted.</li> </ul>
Hardware maintenance fee (40%) MMK 1.6 billion	-MMK 0.6 billion (-15%)	No service agreement on CBM-OA equipment	<ul style="list-style-type: none"> <li>Cause for failure should be identified by CBM;</li> <li>Fixing of failures may take longer time. Daily operation might be seriously affected.</li> <li>Availability of spare parts will not be ensured.</li> <li>Examples of additional costs that may incur:</li> </ul> <p>Cost that may incur in case of failure:</p> <p>1) HDD: MMK 02 million for new HDD MMK 06 million for travel expense MMK 03 million logistics (incl. send back fee)</p> <p>2) Blade server: MMK 12 million for new blade server MMK 06 million for travel expense MMK 03 million logistics (incl. send back fee)</p>

<sup>13</sup> O&M cost of MMK 4 billion accounts for approximately 10% of the initial investment, which will be the necessary cost for securing stable financial infrastructure environment of CBM-NET. The ratio of O&M cost against the initial investment amount is commonly between 10 – 20% and therefore the anticipated O&M cost for CBM ICT system can be said to be appropriate.

	-MMK 0.1 billion (-2.5%)	Sharing MCH encoder maintenance cost with commercial banks	<ul style="list-style-type: none"> <li>● Commercial banks will have to be bearing the cost burden.</li> </ul>
Network usage fee (10%) MMK 0.4 billion	-MMK 0.17 billion (-4.3%)	Sharing the network bandwidth with other mission-critical financial infrastructures such as planned Myanmar Stock Exchange, etc. who has wider bandwidth than CBM-NET and peak transaction volume in the different time slot.	<ul style="list-style-type: none"> <li>● Coincidental overlap of traffic peak may result in transaction delay.</li> <li>● No redundancy arrangement.</li> </ul>

Source: Prepared by the Survey Team

In assuming the downside scenario, core CBM-NET functions were excluded from the subject of O&M cost reduction with regards to its mission criticality.

If all of the cost reducing options were to be applied as the extreme downside scenario, the total O&M cost will become approximately MMK 2.9 billion. It should, however, be noted that this scenario will entail significant risks in operation of the systems.

JICA will also assist CBM to find effective ways to mitigate the operation and maintenance costs by offsetting with fees and charges that may include:

- **charging participant banks with usage fees** to cover a part of operation and maintenance cost through structuring the reasonable tariff to make CBM-NET economically sustainable in the long timeframe. (note: The tariff strategy could be advised in the activities of planned Technical Cooperation Project. According to our rough scenario analysis, the volume of transactions in 2020 will reach 8,600 per day, which will bring CBM the fees enough to cover the entire annual operation and maintenance cost.)
- **promoting usage of customer payments among corporate sectors** instead of delivery of bank notes which would also contribute to expand the source of revenues of CBM-NET in addition to the interbank payments. (note: The tariff strategy for customer payments could be advised in the activities of planned Technical Cooperation Project.);
- **facilitating with more DVP transactions** on the CBM-NET via; **promoting T-bond market** through establishment of wider range of CBM monetary policy operations as well as building more sophisticated function of treasury and debt management in the MOF which will bring the more traffic into DVP on the CBM-NET,
- **expanding the asset classes such as corporate bonds, CPs, etc. to be settled on the CBM-NET** in addition to T-bonds/ bills, which will also help reduce the systemic risks in the financial market through the better use of central bank money.

CBM nonetheless may encounter difficulty in securing and managing the budget for O&M of CBM-NET from the first year of its operation. With regards to enabling gradual start-up of its own ICT system operation and management, JICA will execute a technical cooperation project in parallel to CBM-NET development up to the initial two years of its operation. Necessary technical transfer to enable CBM to utilize and manage the ICT system eventually will be provided, and which will contribute to reducing the burden of CBM on the required O&M costs during the first and second years of CBM-NET operation.<sup>14</sup>

<sup>14</sup> Resources for capacity development activities are explained in 2.2.6.7 Technical Cooperation Project of this report.

## 2.4.5 Financial Sustainability of the Project

The initial cost for this project on the development of the ICT system for central banking will be borne by JICA's grant aid. Financial sustainability therefore is dependent on how operation and maintenance expenditure can be managed. An option to secure sustainability is to have CBM seeking for its own source of income from the usage of the ICT system that it will avail to the financial institutions.

The following table shows some of the examples of fees collected by the high value payment system operators. It shows that the structure and the level of levy differ from country to country. Representative patterns are: fixes charge, charge per transaction and charge per value. In most of the cases these patterns are applied in plural. Fee per transaction may also vary from USD 0.22 to 6.00.

**Table 26 Fee Structure for High Value Payment Systems**

Country	High value payment system	Fee (example)
Malaysia	RENTAS	Annual membership: MYR 5,000 (=USD 1,500) MYR 2.5 (=USD 0.75) per transaction
Thailand	BAHTNET	Monthly: THB 3,500 (=USD 105) Per transaction (after 16:00) THB 200 (=USD 6)
Philippines	PhilPaSS	Minimum: PHP 10 (=USD 0.22) Large value= Value x 0.001%

Source: EMEAP

According to the preceding tariff strategies with the central banks in various countries, fee may be charged also for other transactions such as bond settlements and cheque clearing which may also contribute to sustainably managing CBM-NET by recovering certain portion of its O&M cost from the users.

An appropriate tariff strategy will not only partially contribute to the financial sustainability of the ICT system but should also encourage the shift from manual, paper based transactions to electronic automated transactions. JICA technical cooperation project may address to the issue of the development of such tariff strategy at CBM.

A simple simulation to calculate an average charge on a transaction that will diminish budgetary support for the O&M of the CBM-NET applications down to MMK 1 million by 2020 was calculated to be approximately MMK 774 per transaction.

**Table 27 Simulation of Usage Fee Revenue against O&M Cost**

	2016	2017	2018	2019	2020
1. Operation and maintenance cost					
Upside Scenario	4	4	4	4	4
Downside scenario	2.9	2.9	2.9	2.9	2.9
2. Operation and Maintenance Cost for CBM-NET					
Upside Scenario [A]	2.2	2.2	2.2	2.2	2.2
Downside scenario [B]	2.0	2.0	2.0	2.0	2.0
3. Usage fee income [C]	0.2	0.3	0.5	0.7	1.0
4. Balance (to be covered by budgetary subsidy)					
Upside scenario [C-A]	2.0	1.9	1.7	1.5	1.2
Downside scenario [C-B]	1.8	1.7	1.5	1.3	1.0

Note: (Assumptions)

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(1) Subscription fee = MMK 2 million / year  
(2) Fee per transaction to be charged with participant banks: MMK 774.  
Source: Prepared by the Survey Team

User fee charging policy may be formulated with the aim of covering the O&M cost of CBM-NET. The fee charging structure, however, should be designed based on the policy to promote the utilization of CBM-NET to encourage manual transactions to shift to electronic transfer. Fee charging policy should therefore be considered with a wider scope to include manual transactions.

## 2.5 Project Cost Estimation

Cost to be borne by the Myanmar side

Approximately MMK 225 million

Data center environment preparation	MMK 85 million
Clearing house environment preparation	MMK 60 million
Reinforcement of accounting and ledger system	MMK 70 million
Telecommunications cost during development	MMK 10 million

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## 3. Project Evaluation

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### 3.1 Preconditions

#### 3.1.1 Arrangement 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, e.g. creating an physically-appropriate environment for placing the equipment;
- To prepare its internal institution responsible for service delivery by the system;
- To prepare its internal institution responsible for operation and maintenance of the system;
- To secure budget for operation and maintenance of the project;
- To prepare necessary sets of internal rules for the operation of the systems.

#### 3.1.2 Arrangement by CBM to mobilize the Government

An environment whereby CBM-NET can be serving the financial sector should be duly arranged through rules and regulations. These rules and regulations may be developed with the initiatives of the other governmental functions such as the MOF. Followings are some of the necessary arrangement which should be made by the other governmental organizations under support from CBM:

- To have the MOF set rules on the utilization of cheques, transfer of funds, T-bond / T-bill transactions;
- To have MPT offering the means to connect the CBM hubs and the commercial banks in safe and reliable communication infrastructure;

#### 3.1.3 Participation and cooperation of the commercial banks

Commercial banks should not only be willing but also be responsible for utilizing CBM-NET for their interbank fund transfers, cheque clearing and T-bond / T-bill transactions. Responsibilities should be exhibited by the commercial banks readiness to interact with CBM based on the rules set out by CBM and any other governmental organizations. Examples are the requirement by CBM such as the standardization of cheque format, limited representation at cheque clearing houses overdraft facility operations.

### 3.2 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.

First, the rules and regulations for enabling the use of MCH for cheque clearing (standardization of cheques) as well as rules for fund transfer, bond transactions should be in place. These tasks

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will require cooperation between CBM and MOF. Second, the setting up of appropriate environment will include the following points:

- MPT will furnish CBM with secure and reliable telecommunication facility so as to link the three hubs of CBM with the head offices of the commercial banks;
- CBM will arrange for appropriate utility, communication and security environment for data centers and cheque clearing houses, and;
- CBM will reinforce their existing accounting and ledger system.

Further, CBM, after the start of operation of CBM-NET, will also be required to establish a system where its own financial resource is secured through the collection of usage fees from the financial institutions. This will be essential for CBM to become capable of operating and maintaining CBM-NET in sustainable manner.

### 3.3 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.

- MOF may promote other fund transfer systems
- Commercial banks may prefer to use their own system developed with their partner banks;
- Telecommunication service may become unreliable;
- CBM may choose to introduce other banking system;

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

### 3.4 Project Evaluation

#### 3.4.1 Relevance

Japan recognizes the importance of extending economic cooperation to Myanmar from the viewpoint of contribution to the prosperity, stability and integration of ASEAN. This is done by supporting the reforms in Myanmar pursued toward democratization, reconciliation and sustainable development. In April 2012, Japan, with the intention to further encourage the reforms, widened the scope of its economic cooperation to include not only the basic human needs (BHN) but also to support (1) improvement of the living standard of the people, (2) institutional development and capacity development of human resources that would contribute to the social and economic development, and (3) development of infrastructures and systems that will enable sustainable development of the country. This Project will correspond directly to the direction mentioned in (3) by developing an ICT system, as well as consequently to (2) by contributing to institutional and capacity development at CBM, and also to (1) as the outcome. The Project therefore is of significant relevance to Japan's economic cooperation policy.

Another aspect of notable relevance is with the fact that CBM-NET will be developed based on the experiences and know-hows of designing and operation of BOJ-NET, which is Japan's business ICT system for today's central banking. The feature of BOJ-NET in that fund and bond settlements are conducted in integral manner coincides well with the requirement from CBM.

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This is a strong rationality for CBM-NET to be developed with reference to BOJ-NET.

The Government of Myanmar already made a commitment to join the ASEAN Economic Community in 2015 and consider the development of ICT to enhance its financial system as an important issue. The necessity to modernize the financial sector was also pointed out during the IMF's Article IV Consultations wherein the introduction of systems such as the independence of CBM, and strengthening of its functions and electronic settlement are regarded as urgent task. Under such situation, the development for an ICT system for central banking is an issue of highest priority and urgency. Relevance of the project in the context of Myanmar's requirement is therefore evident in that the Project addresses directly to this priority issue.

The effect of the Project will be brought about as the direct contribution to the modernization of the financial sector as well as improvement in business and investment climates. Such effect will benefit the citizens of Myanmar as a whole in that it contributes to the economic development of the country.

## 3.4.2 Effectiveness

### 3.4.2.1 Expected Effects

The primary effect will be based on the changes that might be occurring at CBM:

- Business operation at CBM will be relieved due to the use of CBM-NET and CBM-OA.
- Service provided to the financial institutions will be improved (wider range of services, conducted in more efficient manner).

Secondary effect may be brought about as a result of the primary effect realizing. For example, the ease of interbank transfer may contribute to the same commercial banks to become more efficient and easy. Financial institutions may also become more integrated among each other, more devoted to the customer making use of the wider variety of products and service.

Indicators can be set as the way to verify the effects due to the implementation of the project. These indicators may be either quantitative (measurable in numeric manner) or qualitative (measurable in non-numeric manner).

### 3.4.2.2 Quantitative indicators

- Growth in the number of transactions to be processed:  
Baseline: current number of interbank transactions at peak level is 300 (Yangon), 100 (Nay Pyi Taw) and 100 (Mandalay), which totals to maximum of 500 transactions per day.  
Productivity is measured at approximate average of 30 minutes per current manual transaction procedure. Assuming that the number of staffs involved in these transactions is approximately 50, the maximum number of the transaction is also 500 (under assumption that a staff works 5 hours per day). The baseline therefore is set at 500.  
With the introduction of ICT system, one transaction can be processed in 3 minutes (i.e. productivity becomes 10 times of the current level). Target at three years after the completion of the system (end of year 2018): 5,000 transactions per day at peak level.  
Data will be measured and verified by actually observing the business operations at CBM offices.
- Time saving in cheque clearing operations:  
Baseline: current number of cheques being processed is 2,550 (Yangon), 60 (Nay Pyi Taw) and 60 (Mandalay). In Yangon time duration for processing is approximately 3 hours per day. Average clearing time duration for one cheque therefore can be calculated as 4 seconds

per cheque (figure will become 3 seconds per cheque in Nay Pyi Taw and Mandalay).  
 Target: maximum of 20 to 30 minutes for all cheque clearing at all three locations (YGN, NPY and MDY), as with the specification of the MCH reader / sorter. Number of cheques to be processed is assumed to grow by 20% per year to reach 6,350 per day. This can be calculated as 0.3 second per cheque. Time duration for cheque clearing therefore is expected to be 1/10 of the current situation by 2018.

Data will be measured from system log of MCH and manual measurement of business transactions.

**Table 28 Quantitative Evaluation Indicators**

Indicator	Baseline (2013)	Target (2018: three years after completion)
Growth in the number of transactions to be processed (transaction/day)	500	5,000
Time saving in cheque clearing operations (second/cheque)	4.2	0.3

Source: Prepared by the Survey Team

#### 3.4.2.3 Qualitative indicators

- **ICT literacy:**  
 Improvement of ICT literacy at CBM (measurable for example, by the ratio of usage of PC applications within daily business).
  
- **Knowledge and awareness on information security:**  
 Improvement in information security at CBM (may be measured by the ratio of unprotected PCs against the total number of PCs in CBM).



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