

In this way, a new sub-system (host, network or terminal related sub-system) can be added without changing the software for the message switching system.

10-2 Preliminary Design of Software

10-2-1 Preliminary Designs of Applications Systems

10-2-1-1 Functional Requirements for Applications Systems

The preceding section discussed the overall structures of applications systems, as an extension of 9-2 "Plan on Improvement of the Computerized Network System for the Payment System." While keeping the results in mind, this section breaks down the functions that each sub-system should provide or the functions that need to be developed under Phase I and Phase II.

(1) Phase I

1) Terminal Sub-system

The Terminal Sub-system consists of (a) the dedicated transfer system, (b) the RCC data entry system, and (c) the Operation Day interface. The system functions of systems (a) and (b) are basically the same. Systems (a) and (c) are generally called the "Office System."

(a) Functions of dedicated transfer and RCC data entry systems

The dedicated transfer system would be newly implemented under the new payment system at the headquarters and branch offices of commercial banks. In response to payment orders from customers, these systems offer transfer-related services such as transfer data entry, input data verification, authorization and transmission, and receiving messages dealing with fund transfers.

The RCC data entry system is implemented at regional clearing centers and provides the services of dedicated transfer systems based on the payment order slips for those banks that cannot afford the system.

The two systems offer the following major functions:

- Entry of transfer data for customer-remittance transactions and fund transactions
- Verification, change and cancellation of input data
- Authorization of input data and transmission of transfer messages
- Printing received messages such as transfer data and responses to inquiries to message printer.
- Transmitting notifications of receipt of fund transfers to the sending bank upon reception of transfer messages
- Transmitting messages to related sub-systems (broadcast function)

(b) Functions of Operation Day interface

The Operation Day interface allows existing Operations Day (fund transfer related functions) to use the functions of the new payment system. However, since existing Operations Day vary from bank to bank, interface software must be developed for each Operation Day. Thus the scope of services that the new payment system provides will be limited to converting the transmission files so that the new payment system can accept and forward the files to the new payment system.

Banks that have Operation Day but no dedicated transfer system must either use the RCC data entry system or develop an interface between their Operation Day and the new payment system.

The Operation Day interface would have such functions as:

- Converting transmission files from the format of Operation Day to that of the new payment system
- Forwarding transmission files to the new networked payment system

2) Host Computer Sub-system

(a) Fund-Transfer Processing System

This system forms the central part of application functions of the new payment system. All the data relating to fund-transfer operations would be centrally processed in this system for both inter-bank and intra-bank settlements. This system would also be responsible for the overall operations of the new payment system such as start-up and shutdown. The (inter- and intra-bank) Fund-Transfer Processing System offers the following major functions:

a) Fund transfer common functions

- Checking the contents of messages (inter-bank and intra-bank settlement)
- Updating common files such as journals
- Requesting message transmissions such as requests for forwarding fund-transfer messages to destination bank offices
- Error handling

b) Inter-bank settlement functions

- Account management such as number and amount of inter-bank transfers and fund transactions
- Requests for transfers among NBK current deposit accounts for inter-bank fund settlements
- Transmitting notification of NBK current deposit account transfers to sending banks in the case of fund transactions.

c) Intra-bank settlement functions

- Account management such as number and amount of intra-bank transfers
- Sorting the inter-office accounts upon transmission and receipt of intra-bank fund-transfer messages

d) Inquiry-answering and document-return functions

- Inquiry on Remittance/Receipt List: Answer inquiries for outgoing and incoming transmission lists, providing detailed summaries, and the total number and total amount of fund transfers for each fund-transfer message going out of and coming into the inquiring headquarters/branch
- Inquiry on Summary of Remittance and Receipt: Answer inquiries for outgoing and incoming transmission summaries, providing the total number and total amount of fund transfers for each fund-transfer message going out of and coming into each headquarters/branch, and the total number and total amount of fund transfers for all fund-transfer messages going out of and coming into all headquarters/branches of the inquiring bank (these inquiries normally come from bank headquarters)
- Other inquiry-answering functions
- Preparing and returning fund-transfer documents in batches

e) System operation functions:

- Forward summary of Remittance and Receipt outgoing and incoming transmission summaries to each bank headquarters upon closing of on-line communication hours
- Create transmission files upon closing of on-line operation hours that are carried forward to the next operating day
- Start up and shut down the system and reject inputs of transfers
- Security management functions
- Registration management for files and databases
- Management for the Recover of failures

(b) NBK-Net System

This is the on-line system for NBK current deposit accounts and has two major functions.

- In response to instructions from the current deposit account terminals connected to NBK-Net, executes deposits, withdrawals, and transfers on funds in NBK current deposit accounts for inter-bank fund settlement
- Accept the transmission data of inter-bank fund-transfer transaction data from the Fund-Transfer Processing System and transfer funds between the NBK current deposit accounts for inter-bank settlement as immediate gross settlements with finality

The major functions of this system are as follows:

a) NBK current deposit account functions

- Provides interfaces with the current deposit account terminals and provides such features as input screens and printouts
- Provides interfaces with the Fund-Transfer Processing System such as input and output of fund-transfer transaction data
- Checks the contents of incoming transaction data such as inputs from the current deposit account terminals and fund-transfer transaction data from Fund-Transfer-Processing System
- Provides daily deficit-limit management
- Updates current deposit account balances at the time of deposit, withdrawal or transfer operation
- Error handling

b) Inquiry answering and document-return functions

- Inquiry on Post-settlement balance of current deposit account :Answers inquiries on balances after each deposit and withdrawal in the current deposit accounts (the preceding business day's balance in the NBK current deposit account, changes in the balance thereafter by transaction type, and current balance)
- Inquiry on balance of current deposit account by bank: Answers inquiries on current deposit account balances in for

each bank (the preceding business day's balance in the NBK current deposit account for a bank, changes in the balance thereafter by transaction type, and current balance)

- Answers other inquiries
- Prepares and returns transfer documents in batches

c) System operation functions

- Starts up and shuts down the system and rejects illegal inputs
- Provides registration management for files and databases
- Management for the recovery of failures

3) Automatic Payroll service (gross settlement)

This is offered as an extension of the RCC data entry service. Bank offices would collect payroll data stored on floppy discs from firms and deliver them to the nearest regional clearing center. The payroll data will be converted into transfer messages by the RCC data entry system and forwarded to the Fund-Transfer Processing System through the Network Sub-system during on-line communication hours. After the Fund-Transfer Processing System receives the messages, the payroll messages will be treated as ordinary transfer messages. Inter-bank transfers are settled using the immediate gross settlement method. Large-scale data processing such as data exchanges between bank offices within a region and netting processes will be implemented in Phase II. The following functions will be developed:

- Accept payroll data on floppy discs, and create related messages (Payroll transfer messages)
- Transmit payroll transfer messages

4) Automatic transfer service (gross settlement)

This is also offered as an extension of the RCC data entry service. Automatic transfer service is essentially fund collection when, normally, collecting banks transmit messages to the banks from which funds are to be deducted from designated accounts (so-called "backward procedure"). In Phase I, however, we would use forward procedures as in the case of

scheduled transfers currently practiced in Kyrgyz in order to conserve time spent on development work and to improve prospects for early implementation.

As in the case of automatic payroll service, banks deliver fund-transfer data on floppy discs to the nearest regional clearing centers for conversion into transfer messages and forwarding to the Fund-Transfer Processing System through the Network Sub-system during on-line communication hours. Large-scale data processing such as data exchanges between bank offices within a region and netting processes will be implemented in Phase II. The following functions will be developed to provide automatic transfer service:

- Accept transfer data on floppy discs, and create related messages (funds transfer messages)
- Transmit funds transfer messages

(2) Phase II

1) Netting system

In principle, the new payment system for Kyrgyz would immediately gross settle accounts using the NBK-Net taking into consideration such factors as assuring the finality of settlements and payment risks and the volume of transactions. In anticipation of future increases in the volume of small-lot fund transfers, however, the CD/ATM services to be developed in Phase II would incorporate a netting mechanism in the Fund-Transfer Processing System (centralized netting process).

For payroll services and automatic transfers which would be handled by the RCC data-entry service systems, Transfer messages will be exchanged between banks and the net balances will be transmitted to the Fund-Transfer Processing System as remittance messages to transfer funds between NBK current deposit accounts (local netting procedures).

2) Linking remittances and deposits

Linking remittances and deposits means that the system confirms the balance in the deposit account specified for settlement by the remitting customer and the specified amount is deducted from the customer's account only if there is sufficient balance in the account and also deposit the amount of the funds to the destination deposit account of the receiver upon receiving the transfer message.

In order to do this, the new payment system must be able to directly or indirectly access the deposit ledgers of both the sending and receiving customers. If not, for example, if branch offices maintain paper deposit ledgers or if the dedicated transfer system cannot share the deposit ledgers under the new payment system even if branch offices handle deposits under Operation Day, remittances and deposits cannot be linked in a strict sense under the above definitions. The new payment system would not support these cases except that it could output deposit and withdrawal data on paper or floppy disc or it could accept the balance of the deposit ledgers of the preceding day off-line to create the file and return the results after accounting for incoming and outgoing transfers to the banks upon closing of operations for the day although this is not synchronous with actual fund transfer.

- (a) If a bank keeps a central deposit ledger in its internal processing system, the new payment system would provide a mechanism for the bank's internal processing system to receive transfer messages.
- (b) If a bank maintains its deposit ledger under Operation Day (if the dedicated transfer system can share the Operation Day deposit ledger), the new payment system would provide a mechanism for a dedicated transfer system to confirm balances with the deposit ledger when it issues transfer messages, to handle errors when balances are not sufficient, and to update the Operation Day deposit ledger when it receives transfer messages.

3) Connecting bank computers to the network

In order to enable banks (headquarters and branches) operating under the new payment system to transfer funds to those (headquarters and branches) that rely on their own internal system for their intra-bank settlements, the system would provide a link to deliver the fund-transfer messages from the new payment system to banks' internal systems.

On the other hand, the system would also provide a link to deliver fund-transfer messages from bank headquarters and branches that rely on their own internal system for their intra-bank settlements to the new payment system to enable them to transfer funds to those (headquarters and branches) operating under the new payment system.

4) CD/ATM services under a central netting process

The new payment system's Network Sub-system would offer a link among cash dispensers and automatic teller machines to provide not only intra-office, but also intra-bank and inter-bank deposit and withdrawal services.

The CD/ATM services other than those that are confined within a branch, would use the communication function of the Network Sub-system. In settling the inter-bank debits and credits generated by inter-bank deposit and withdrawal services, the Fund-Transfer Processing System would undertake netting operation using the deposit and withdrawal messages for a day and issue a request to the NBK-Net system to transfer the balances among banks after on-line operation hours. All these deposits and withdrawals themselves would be handled by the internal processing systems or Operation Day of each bank.

5) Account information service

The new payment system's network sub-system would provide account information service in which the dedicated transfer system of a bank office could forward such account data as office balances to the internal processing system or other offices (specifically to the dedicated transfer system of the other offices) of the bank.

This service would be offered using the broadcast function of the dedicated transfer system. The system would only support a free-format screen interface because message contents and formats would vary from bank to bank. Thus, each bank would need to establish its message rules and use of the free format.

6) Transfer service for foreign exchange Som-clearing messages

The new payment system's Network Sub-system would offer a mechanism to send the messages of foreign exchange Som clearing from the dedicated transfer system to the internal processing system or other offices (specifically to the dedicated transfer system of the other offices) of the bank. This service would also support a formatted input screen and remittance processing as well as check and correct, and authorize and transmit input data as in the case of the fund-transfer Processing.

7) Extension of payroll service offered after on-line operation hours of a day

In Phase II, a large-scale system would be required to accommodate a large quantity of data. In order to meet this requirement, the payroll service developed for Phase I would be replaced with a new service that offers additional payroll processing after business hours. In order to offer this new service, the following functions need to be developed:

- Exchange data among banks in a region at both headquarters and branch offices on what customer remittance transaction transactions can be handled within the region for any payroll data that is brought to an RCC
- Calculate net positions for all payroll data that are brought in to RCCs
- Forward net position transfer messages to the Fund-Transfer Processing System to clear the netting results

For payroll data that requires inter-region transmission, fund-transfer messages would be created and forwarded to the communications center's Fund-Transfer Processing System (unlike normal fund transfers, this fund-transfer Processing does not involve immediate inter-bank settlement of debits and credits).

- 8) Extension of automatic transfer service (Additional process after business hours)

As in the case of payroll services, automatic transfer services developed for Phase I would be extended to further process fund transfers after business hours and to accommodate backward messaging to increase the capacity of this service. Specifically, such new functions as data exchange among banks in a region at both headquarters and branch office levels, backward messaging, and netting procedures, would be developed and implemented. For backward messaging and netting procedures, among others, the new system would need to develop a backward fund-transfer mechanism by calculating the net positions after data exchange in the RCC Data-Entry Service System. It would also need to consider an operating mechanism to confirm that, as a result of transmitting a fund-transfer (collection) message to the payer's bank/branch, the specified amount of funds have actually been deducted from the specified account.

10-2-1-2 Key Factors of Applications Systems

- (1) Types of system control number and numbering methods

In order to check redundancies and drop-outs from messages, assure data security, recover from failure, and facilitate message re-transmission, the following control number would be used by various sub-systems of the new payment system. Note that these number are exclusively used by the system. Optional number such as customer's transaction reference number for payment orders may be used as particular applications require.

- 1) Reference number (slip number)

The reference number is a serial number that the Terminal Sub-system would allocate to each data entry for a fund-transfer transaction for each bank office. The reference number would not be allocated to inquiry transactions or communication message transmissions. The reference number is used as one of the keys together with the bank and office codes, to refer the sub-system to a transaction.

NNNNN

(A five-digit serial number up to 99999 that re-starts at 00001 every morning.)

2) Message reception number

The message reception number is a serial number that the Fund-Transfer Processing System would allocate to every message when the system records it in the receiver's journal. This code is used by the system as a key for the file of received messages.

NNNNNN

(A six-digit serial number up to 999999 that re-starts at 000001 every morning.)

3) Current deposit account transaction number

The current deposit account transaction number is a serial number that the NBK current deposit account system would allocate to every transaction including a deposit, withdrawal or transfer transaction in an NBK current deposit account when the system receives a transaction input from the NBK current deposit account terminal or fund-transfer message for the account.

NNNNNN

(A six-digit serial number up to 999999 that re-starts at 000001 every morning.)

For the system number that the Host Computer sub-systems allocate such as the message reception number and the current deposit account transaction number, the respective sub-systems would create an index file for each number that cross-refers the reference code to either the message reception code or the current deposit account transaction code.

(2) Message types and formats

1) Message types

The types of messages exchanged by various sub-systems of the new payment system include:

- Fund transfer messages
 - Customer remittance transactions (urgent and ordinary)
 - Fund transactions (urgent only)
- Inquiry messages
- Inquiry response messages (in print-out format)
- General communication messages
- Broadcast messages
- Error-notification messages

(a) Fund transfer messages for customer remittance transaction transactions and fund transactions

Fund transfer messages would be input from the Terminal Sub-systems in bank offices or regional clearing centers according to payment orders. The input data would then be verified, authorized, and forwarded to the Fund-Transfer Processing System through the Network Sub-system. The Fund-Transfer Processing System would receive fund-transfer messages one by one from the Network Sub-system and process them internally one by one after converting the messages in a format that the applications system can handle easily. The Fund-Transfer Processing System would transmit the fund-transfer message through the network sub-system to the receiving bank office when the process terminates normally.

For inter-bank customer-remittance transactions and fund transactions, the Fund-Transfer Processing System would request the NBK-Net System to transfer funds between the current deposit accounts in the NBK. The interface for such direct data exchanges between sub-systems that do not go through the Network Sub-system would

forward the fund-transfer transaction data that have been converted from fund-transfer messages.

(b) Inquiry messages

When a user enters inquiry transactions for Remittance/Receipts list, post settlement balance of current deposit account etc. in the Terminal Sub-system of a bank office or an RCC, the system would forward an inquiry message to the Fund-Transfer Processing System through the Network Sub-system.

Inquiry messages may require the Fund-Transfer Processing System to further forward the messages on to other sub-systems such as the NBK-Net System depending on the nature of the inquiries. For these inquiry messages, the Fund-Transfer Processing System would expand and convert the original inquiry message because the data contents and sizes used by the system would be different from those of the original messages.

(c) Inquiry response messages (in print out format)

In response to the above inquiries, the Fund-Transfer Processing System would collect and edit the requested data in the specified print-out formats, and return them as inquiry response messages to the Terminal Sub-system from which the inquiries have been submitted. At the end of daily operations, the Fund-Transfer Processing System would forward summary of remittance and receipt to the dedicated transfer system of all bank's head offices without an explicit request from them. These one-way messages are also a kind of inquiry response message.

Inquiry response messages would be temporally stored in the file of received messages of the Terminal Sub-system and then edited and printed out by the Terminal Sub-system's print task which intermittently monitors the file.

The system would allow users to review messages in the file of received messages on the monitors of the Terminal Sub-system if the messages have not been output to the message printer.

Note: "Print-out formats" are data streams that include the following function symbols so that the data items are printed in the desired format.

SI (shift in)
SO (shift out)
CR (carriage return)
LF or NL (line feed or new line)
FF (form feed)
SP (space)
HT (horizontal tabulation)
etc.

(d) General communication messages

The general communication message service would allow a terminal of any sub-system (the terminal, host computer or Network Sub-system) to send messages in a free format with a certain limitation of message length to one, several or all other sub-systems. Receiver sub-systems would output messages to their monitors or message printers.

As an extension to the general communication message service, the system would offer a transmission service for account data such as daily trial balances by defining a new message type by specifying the use of free format messages among related sub-systems.

(e) Broadcasting messages

The Fund-Transfer Processing System would generate a message such as operation start, operation end, failure and recovery notices as the need arises and forward the message simultaneously to multiple office systems.

(f) Error-notification messages

If the Fund-Transfer Processing System finds an error while it verifies a fund-transfer message or finds it impossible to continue a process because of insufficient funds in a current deposit account, the system would forward a message to the respective office system to provide notification of the error. The network sub-system would give a higher priority to error-notification messages.

2) Message format

(a) Basic message structure

The message data stream used by the interface between sub-systems would basically comply with the SWIFT II format of SWIFT (the Society for Worldwide Interbank Financial Telecommunications). All messages would have the following essential components:

a) Message header block

The message header would carry such basic data items as message ID, receiver information and sender information.

b) Text block (message body)

The message body, mainly used by the Terminal Subsystem and applications systems (the Host Computer Subsystem) such as the Fund-Transfer Processing System and the NBK-Net System, would have variable contents and formats depending on message types and application. Applications systems would normally use the transaction data which is made up of the data items of the message body in combination with the basic data items of the header block (i.e. by converting the message into a transaction data).

c) Trailer block

The message trailer, mainly used by the network sub-system, would carry such items as a security check code and end mark code. (See Figure 10-2.)

(Figure 10-2)

Basic message structure

Header block (fixed length)	Text block (message body) (variable length) The format and contents vary depending on the message and application types.	Trailer block (fixed length)
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Note: Although the length of the Text block would be variable, its maximum length could be limited by communication software or hardware. In such a case, one logical message would have to be divided into two or more physical messages. This factor will be taken into account in designing the details of messages.

(b) Contents of text block and transaction data

– Text block

Since the text block would have variable contents and formats depending on message types and application, the details of specific message bodies would eventually be determined when we design individual applications systems. However, the data stream of text blocks would comply with the SWIFT II format which specifies that:

- The data stream is comprised of a mandatory field that is required of any message type, and an optional field that depends on the transaction type.
- Fields are divided by specific delimiters.
- Each field is identified by tags which are either two numbers or a combination of two numbers and one letter.
- One field may have one or more subfields, etc.

[An example of a simple fund-transfer message]

See Table 10-1.

(Table 10-1)

[An example of a simple fund transfer message]

M/O*	Tag	Description	Format
Header block			
M	—	Sending bank	OELBATWW
M	—	Message ID	100
M	—	Receiving bank	ABNANL2A
Text block			
M	20	Transaction number	:20:494931/DEV
M	32A	Value date/currency/amount	:32A:910527NLG1958,47
M	59	Customer	:59:H.F. JANSSEN LEDEBOERSTRAAT 27 AMSTERDAM
Trailer block			

Note: "M" stands for "mandatory" and "O" for "optional."

- Transaction data

As already mentioned, messages would be converted into transaction data in applications systems to improve efficiency. The transaction data for fund-transfer messages would use a fixed, common format that would contain the maximum conceivable number of data items including a data transfer area.

Table 10-2 shows the mandatory data items for fund-transfer transaction data (customer-remittance transactions and fund transaction) which are most important in the new payment system.

(Table 10-2)

Data Items of Fund Transfer Transaction Data

for customer transfers and fund transactions

Item	Attribute (digits)	Remarks
Message ID	N (3)	Identification of a message
Message length	H (2)	Length of the text block
ID of the transmission authorizer	X (4)	Identification of the personnel who authorized to transmit this message
Password	X (6)	Password attached to the transmission authorizer
Transmission time	N (4)	Time in HHMM format when the Terminal Subsystem forwarded this message
Current date	N (6)	Current date in YYMMDD format
Value date	N (6)	Value date in YYMMDD format
Transaction reference number	X (16)	Administrative number used by the customer who submitted the order
Service type	N (2)	Service type such as "urgent" or "ordinary"
Amount transferred	N (15)	Total amount transferred with the lowest two digits indicating decimal position
Ordering bank/branch	X (7)	The codes of ordering bank (A (4)) and branch (X (3))
Ordering client's account number	X (10)	Account type (X (1)) + account number (X (9))
Ordering client's information	X (35)	Name, address, telephone number of ordering client
Sending bank/branch	X (7)	The codes of bank/branch or the RCC transmitting this message for another
Bank/branch with beneficiary's account	X (7)	The codes of bank (X (3)) and branch (X (3)) with beneficiary's account
Beneficiary's account number	X (10)	Account type (X (1)) and account number (X (9))
Beneficiary	X (35)	Name, address, telephone number of the receiver
Receiving bank/branch	X (7)	The bank/branch receiving this message for another
Remarks	X (70)	Free format communication message
System reference number (slip number)	N (5)	Serial system number that the Terminal Subsystem allocates
Check code	H (4)	Check code used to assure security
Time processed	N (4)	Time (HHMM) when the Fund Transfer Operation System received this message
Balance in current deposit account (1)	N (18)	Balance after transfer in the NBK current deposit account of transmitting bank
Balance in current deposit account (2)	N (18)	Balance after transfer in the NBK current deposit account of receiving bank
Process result	N (3)	Error code detected (blank if normally executed)

Note: Although the message ID and current date are also header data items, applications systems would also use this data.

Remarks: The letters and the numbers in parentheses in the column under Attributes indicate the following data attributes and the number of digits, respectively.

- N: numbers
- A: letters
- X: alpha-numerics
- H: hexa-decimal numbers
- b: blank

(3) Use of data codes

There are two major reasons for using data codes. One is to "maintain uniqueness." Some of the data used by the new payment system would become confusing if they were described in natural language. For example, we can refer to the same entity in various ways such as abbreviations, initials, nicknames and aliases. By contrast, data codes unambiguously identify objects.

The other objective is to "facilitate data entry." Data codes can greatly alleviate the burden of entering extremely long names.

In addition to the above two major objectives, data codes can "encrypt data" or convert plain text into unintelligible form, "facilitate sorting" by linking a data code to an attribute of the object, and "compress data."

For the above reasons the new payment system for Kyrgyz should make full use of data codes. In this section, we would like to comment on representative data items that best conform to data codes and on questionable data codes that the current Kyrgyzstani system uses.

1) Bank code

The current Kyrgyzi payment system employs a 9-digit "bank code" based on the former Soviet Union's banking system. However, the code is not a bank code in a strict sense because the compound code is designed essentially to identify branches and cannot identify banks under the new regime after independence. Because of this inability, Chui temporarily replaced the two digits for the NBK branch code with a bank code.

XX XX XX X XX

(A nine-digit serial number)

1. Republic code (33 for Kyrgyz)
2. Area code (01 for Chui)
3. NBK branch code (Chui used this as a bank code)
4. Check digit

5. Branch code

On the other hand, the SWIFT address (SWIFT BIC) of an international SWIFT system was developed taking the advice of a variety of international organizations such as the International Organization for Standardization (ISO) and the International Chamber of Commerce (ICC) and the structure is as follows:

XXXX XX XX XXX

(X (11))

1. Bank code
2. Country code
3. Area code
4. Branch code

The computer centers and Rashotonaya Parata currently use a three-digit code to identify banks as a temporary measure and the code size seems to be sufficient to cover new bank openings in Kyrgyz.

But, the new payment system for Kyrgyz is a completely new system and the code system it would use should comply with international standards, if any, and if possible for future expandability. We recommend using the ISO bank code because, as far as the bank code is concerned, there seems to be no constraints over its use.

X X X X

(A four-letter code)

2) Branch code

Under the current payment system, the above "bank code" serves as a branch code. However, as mentioned above, the current "bank code" system does not meet the needs of the new situation after independence. Although, as a basic principle, a branch code should be designed to give banks freedom to adapt it to their internal systems, it also needs to be consistent throughout all banks under the new payment system which would be shared by all banks.

Some computer centers and Rashotonaya Parata are temporarily using a two-digit code to identify branches but the code size does not appear to be sufficient to accommodate new branches and savings banks that are expected to emerge in Kyrgyz. Thus, a three-digit code system should be established as a bank code and we recommend the ISO branch code system.

X X X

(Three alphanumerics)

3) Account number

As a basic principle, an account code should also be designed to provide flexibility to banks that use it. The current payment system uses a nine-digit account number which appears adequate for the new payment system.

4) Other codes

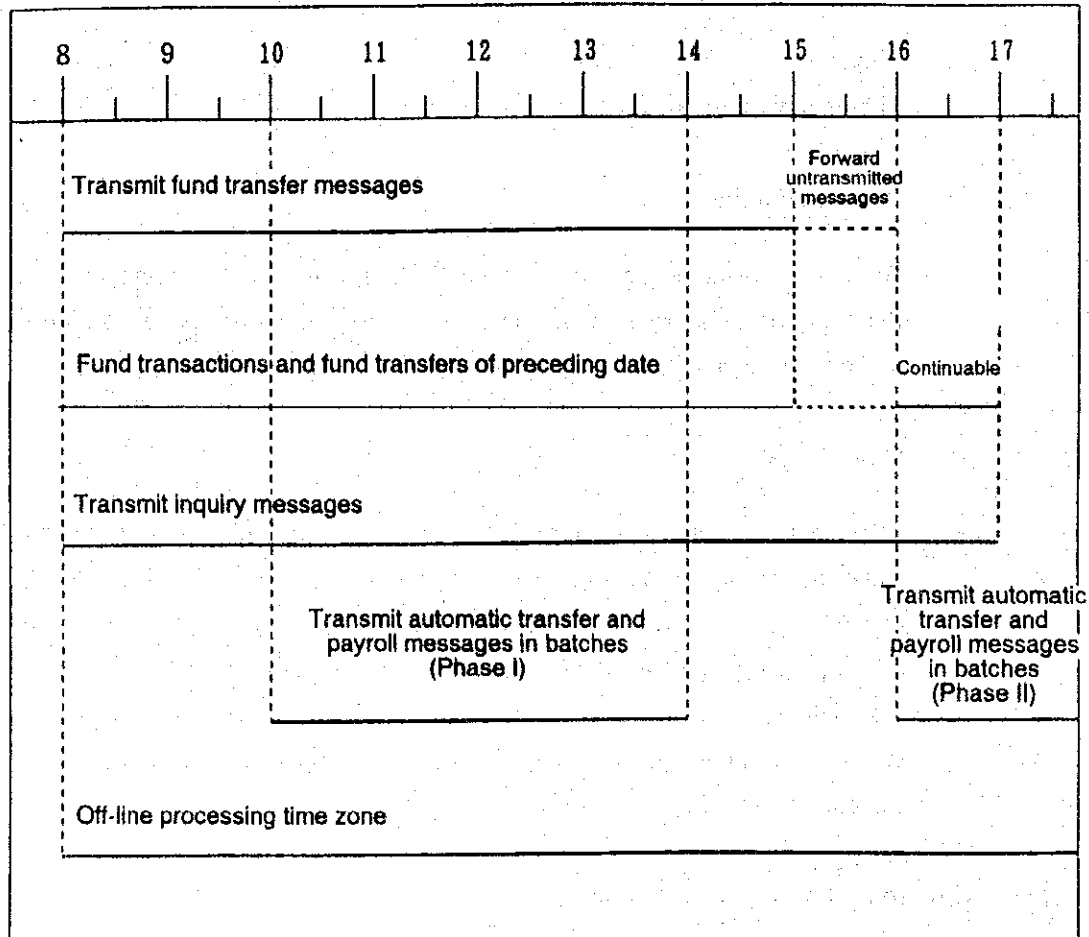
There may be other data items that should be codified. We would like to leave the specific designs of these data codes up to the subsequent work on this project. The work should take into account the objectives for using code system we discussed in the introductory paragraphs of this section. We would like to recommend that for future expandability, the new payment system should incorporate such established international codes as the currency and country codes if possible.

(4) Time zones for system operation

Based on the Fund-Transfer Processing System, the standard operating hours of the new payment system are shown in Figure 10-3 of the next page. The NBK-Net and Terminal Sub-systems would be operated during the same hours as the Fund-Transfer Processing System except that these sub-systems must be operative before the operation start message is broadcast.

(Figure 10-3)

Time Zones of System Operation



Operation start and operation end would be advanced or postponed by the system operator.

(5) Failure management

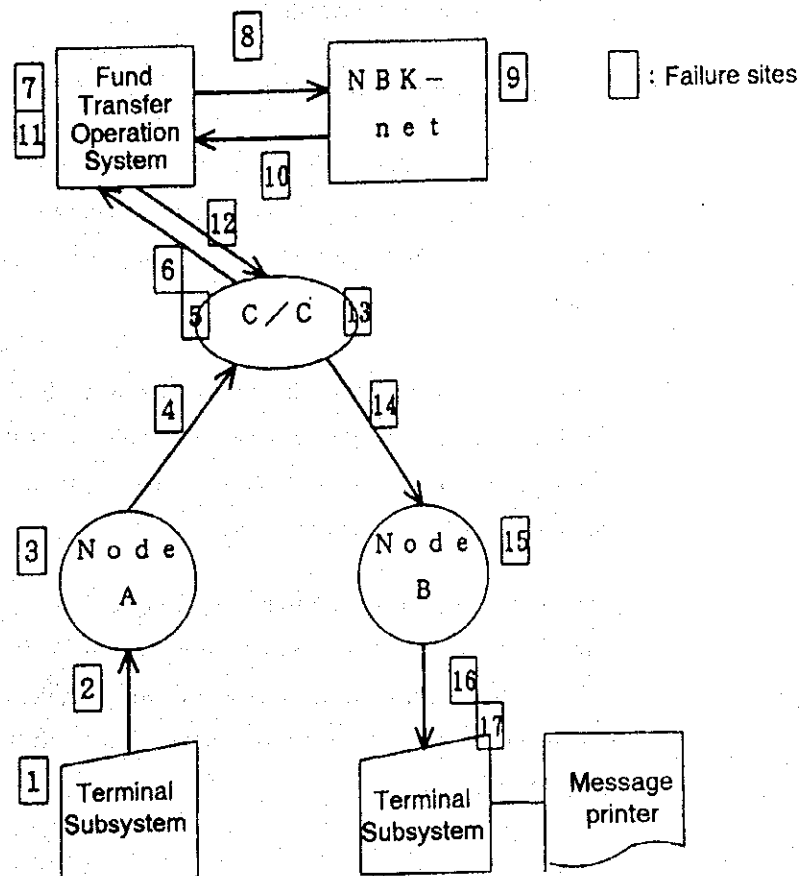
In principle, even if there is a failure, the new payment system must guarantee the completion of transactions updating the database files in the Host Computer Sub-

systems (the Fund-Transfer Processing System, the NBK-Net System and the internal systems of individual banks) which are entered into the Terminal Sub-systems and transmitted to the network system. In the worst case, if some transactions are incomplete, the system should be able to identify them and prompt the Terminal Sub-system operators to re-enter the data.

In order to do so, the system must be able to identify the transaction process in which a sub-system failed, remove the cause of failure, and recover anomalies in the system resources including database files.

There are many points in the process flow for general fund transfers at which failures can occur as shown in Figure 10-4. The following discussion provides conventional knowledge about the scope within which applications systems such as the Terminal Sub-system, the Fund-Transfer Processing System and the NBK-Net System, guarantee complete transactions or recovery.

(Figure 10-4)



1) Recording messages in on-line journal files

In order to guarantee the completion of transactions by applications systems such as the Terminal Sub-system, the Fund-Transfer Processing System and the NBK-Net System, the sub-systems involved must at least keep records of messages they receive. Each sub-system has on-line journal files to keep records of incoming and outgoing messages to determine whether or not to undertake recovery procedures.

The basic approaches toward diagnosing the transaction process status and recovering from failure in each sub-system would be as follows:

(a) Timing for recording messages in on-line journal files

- Incoming messages would be recorded in an incoming journal file once they are verified
- Outgoing messages would be recorded in an outgoing journal file just before they are forwarded

(b) Diagnosing the transaction process status

The transaction process status in the relevant sub-system would be diagnosed using the records in its on-line journal file. When there is a failure, incoming and outgoing messages will be handled in the following way:

- Messages not recorded in the incoming journal of the on-line journal file during a failure, would be diagnosed as "transmission failed" requiring either re-entry of the message or re-transmission of the message from the preceding sub-system.
- Messages recorded in the incoming journal but not in the outgoing journal of the on-line journal file during a failure, would be diagnosed as "transaction in process" and recovery procedures (re-activation of the same transaction) would be triggered by the incoming journal.

- Messages recorded in the outgoing journal of the on-line journal file during a failure, would be diagnosed as "transmission complete." The system should be able to re-transmit such messages when subsequent sub-systems demand them.

2) Updating system resources upon commitment (completion of a transaction)

When there is a failure and a message has been recorded in the incoming journal but not in the outgoing journal of the on-line journal file, the transaction is in process and may have produced anomalies in system resources such as database files.

One way to minimize anomalies in the system resources, is to update system resources upon commitment (completion of a transaction). That is, whereas a logical demand to update system resources is issued by each sub-system along the transaction process stream, system resources are physically updated only after completion of a transaction. This assures transaction consistency. Today, such a function is often offered by the database management function of the operating system software. In selecting operating system software, this function should be taken into account as an important criteria, in addition to basic functions such as backward and forward recovery functions.

3) Confirmation of the process statuses of individual transactions from applications systems

In principle, completion of transactions entered from Terminal Sub-systems should be guaranteed even if there is a failure in the Host computer sub-system or network systems. There are limitations, however, depending on the nature of the failure.

Also the new payment system would consist of several independent sub-systems and the network system would have a queueing function which would allocate different priorities depending on message types. Thus, transactions may not be processed in the order of entry which makes it extremely difficult for system users to know the process statuses of individual transactions in sub-systems.

Thus, if a failure occurs in the Host computer sub-system, applications systems would need to issue an "inquiry on Remittance/Receipt List" or an "inquiry on Summary of Remittance and Receipt" to cross-check the data input at a branch and process status at the center after the system has recovered from failure and entered stable operation.

(6) Concept of Security Management

1) Scope and level of security measures

The new payments system in Kyrgyz is a shared computer system with external connection, which requires the assurance of computer security in terms of operational safety to address various hazards in data input/output and transmission, including unauthorized access to the system, the browsing of transmitted or received data, incorrect data input, and data falsification.

Notably, the new payments system consists of various individual systems. In particular, the fund transfer operation system that handle data processing related to transfer of funds through the new payments system, and the NBK-Net system to manage current deposit accounts at the central bank play an essential role in serving public interests. The interruption of their services due to system failure would affect operation of the system seriously. Thus, these systems must be guarded by reinforced security measures, including the recovery function (software and systems operation) for improved reliability, and a variety of backup measures including the duplexing of system components such as communication lines, CPUs, and peripherals.

It is important to determine a proper level of actual security measures to be implemented for the entire system. Given the current size of payment transactions in Kyrgyz (in terms of amount and the number of transactions) and its economic and social situations, the SWIFT level of security measures is apparently overlaid from the standpoint of cost impacts. The realistic solution is, however, to obtain its creditability to the electronic payment system in Kyrgyz to maintain the minimum-required level of security for sound operation of the new payment system.

Note: The concept of safety to be maintained by security measures contains three elements, a) confidentiality, b) integrity, and c) availability. (Please refer to "Security Management

in Annex 12.) Key security measures to be implemented for the new payments system in Kyrgyz can be classified into these elements, as shown below. Note that the items in "availability" are described in "(5) Failure Management", and "Preliminary Design of Network," and "Preliminary Design of Hardware."

- a) Confidentiality
 - Unauthorized access to the system
 - Confiscation of transmitted and received data
- b) Integrity
 - Unauthorized access to the system
 - Falsification of data
 - Incorrect data entry
- c) Availability
 - Improvement of the recovery function
 - Backup measures including the duplexing of individual systems and equipment

2) Contents of security measures

- (a) Maintenance of confidentiality on network (Encryption of data transmitted on communication lines)

To prevent confiscation of data transmitted or received, encryption of data transmitted on communication lines within the network subsystems is widely adopted measures.

Encryption technology has been a subject of research and development from military and national security interests from early days, regarded as effective measures for "data protection."

"Data protection" consists of two elements, "protection of confidentiality" and "protection of integrity." Encryption technology can serve the both purposes by allowing identification of a person who can operate conversion procedures between encrypted data and plain data, thereby to allowing identification of who has transmitted the encrypted data, thus warranting integrity of data.

Generally speaking, there are two methods for encryption. The first method is to use a cipher system that is connected to each terminal for data encryption and decryption. This obviously requires the purchase

of additional equipment to result in increase hardware costs. Another method is to create an encryption/decryption program and bundle it with other applications running on the system. The second method has an advantage in allowing the development cost for type encryption program to be absorbed in the entire software development process. Thus, the report assumes that the two approaches will be evaluated at the product implementation stage by estimating initial and running costs on the basis further defined system designs.

(b) Verification of data integrity

a) Prevention of unauthorized use of terminal equipment

The most commonly adopted method for preservation of integrity of data entry is to restrict terminal operation to an authorized person.

The simplest way to achieve it physically is to make a protection key, without which a terminal cannot be turned on. However, it presents various problems related to physical control of the key, including uncertainty and complexity. Instead, a more system-oriented solution, i.e., registration of operator's ID and a password assigned to him on the system (terminal subsystem) side, which must be checked at each sign-on entry, is considered to be more reliable and thus desirable.

In the terminal subsystem, 3 steps of operation take place before a fund transfer message is transmitted to the host computer subsystem, namely data entry (input), checking of entered data (verification), and approval of data transmission (authorization). From the viewpoint of prevention of unauthorized use of the terminal, therefore, it is important to clearly define the type of operation authorized to each operator and ID, in particular assigning different operators for input/verification and authorization.

b) **Verification of authority of person transmitting data**

Another effective way to secure integrity of data entry is to check if a fund transfer message is transmitted to the host computer subsystem upon verification of data integrity by an authorized person. Under this procedure, the terminal operator's ID and password of a person who has effectuated authorization (transmission) are inserted into the transfer message on the terminal subsystem side, which is transmitted to the host computer subsystem (the fund transfer operation system). The fund transfer operation system collates the authorized person's ID and password registered by each bank against those contained in the message to check integrity of entered data. Note that the procedure can be combined with "Verification of Data Credibility by Authentication Means" discussed below to provide more reliable verification as to whether particular data of accurate contents are sent by an authorized person.

c) **Prevention of Incorrect Data Entry**

As discussed earlier, the terminal subsystem executes the three-step operations consisting of input of fund transfer data, verification of data contents, and authorization of data transmission. The system design giving two verification opportunities (at least by a different person for authorization), rather than input and transmission, can reduce incorrect data entry and transmission.

d) **Verification of Data Credibility by Authentication Means**

Data credibility can be checked by verification procedures called "message authentication." The message authentication process represents a series of operations executed by a message recipient under a security agreement with a message sender to check integrity of the received message.

More precisely, by using a constant agreed by the transmitter and the recipient (authenticator key) and a message, the

authentication means (authenticator result) is calculated according to a predetermined specific algorithm. The recipient collates the authenticator result against the result of calculation from the authenticator key and the received message, using the same algorithm. If they are matched, the received data are deemed not to contain falsified or unintelligible data. If not, the received data lack integrity.

As discussed earlier, the new payments system does not require the SWIFT-level security function. Nevertheless, by incorporating a more simplified and similar function into the terminal subsystem and the fund transfer system, data credibility can be verified at application levels.

Note: Adoption of message authentication code (MAC) as the authentication means.

MAC can be used in place of the authenticator result. It consists of a compressed and encrypted statement (code) attached to an un-encrypted message to assure integrity of the message.

As mentioned in "Encryption of Data Transmitted on Line," encryption serves two purposes, "protection of confidentiality" and "protection of integrity." For the purpose of "protection of integrity," the encrypted statement (code) is not given in full text, and it can be "compressed" by an appropriate method. A primary example of "compression" is to divide the encrypted text into certain length and determine exclusive-OR for all the blocks. In this case, the encrypted statement ceases to be meaningless after "compression" and is treated as a simple "code."

Note that, while MAC is a simple code, it is essentially different from "password or ID No." in the sense that it is created by compressing a plain statement. Thus MAC is considered to offer a relatively high capability to "protect data integrity." Standard procedures for creation of MAC are set forth by International Standardization Organization (ISO).

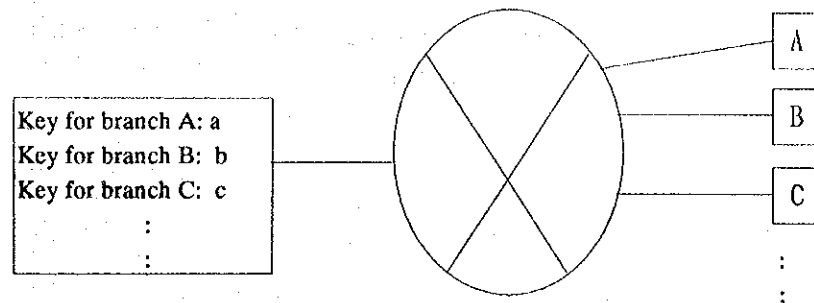
(c) Creation and Control of the Key by Using A Security System

Under the security measures using encryption technology, the identical "crypt-key" data, kept secret, must be shared by the sender and the recipient. Since the new payments system is considered as a N-to-N network system operated through the fund transfer operation system,

the following issues must be addressed: 1) where the key should be created; 2) how the created key should be made known to the recipient; and 3) how secrecy of the key data should be preserved and maintained. At the same time, the issue of where and how the creation of encrypted statement and MAC and message authentication should be made needs to be addressed as determinant factors for the above three issues, from the viewpoint of CPU load, although decisions on the three issues would lead to solution of the latter. In this connection, the following two alternatives are proposed.

(Alternative 1) The fund transfer operation system maintains and controls the key for each bank and branch. Under this arrangement, the fund transfer operation system holds the key for each bank's branch, which in turn maintains only one key to the fund transfer operation system, thus offering ease of maintenance. On the other hand, the fund transfer operation system must bear higher workload as it has to recreate encrypted statement and MAC for each branch that receives funds after message authentication.

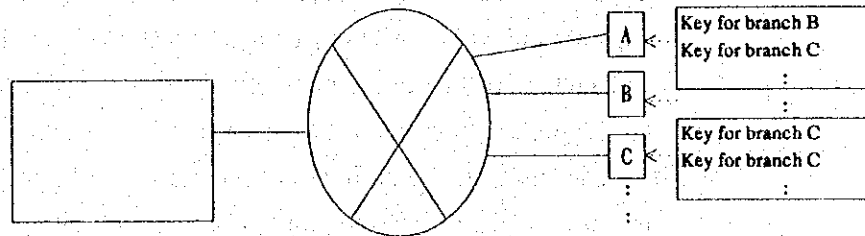
Fund Transfer Operation System



(Alternative 2) Each branch controls the key

While this arrangement has advantages in diversion of workload from the fund transfer operation system and processing efficiency since each branch holds different keys for all the branches it transacts with, it presents uncertainties in terms of maintenance and safety when branches grow in number.

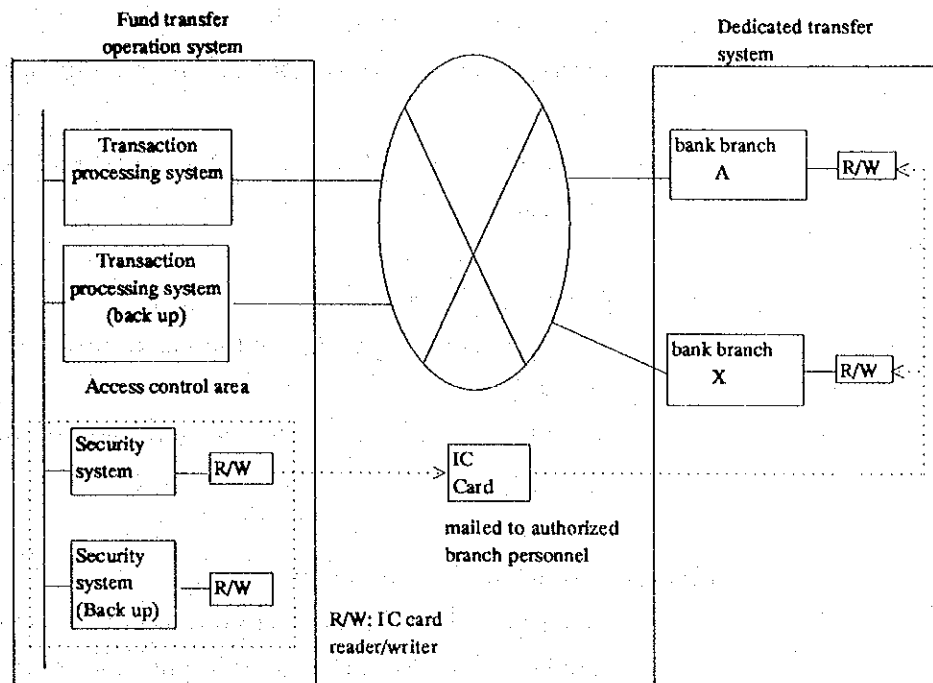
Fund Transfer Operation System



The two alternatives have different advantages and disadvantages. In light of current situation in Kyrgyz, the system to control the keys at one place seems to offer ease of operation. Thus, the fund transfer operation system for the new payments system should be designed on the basis of Alternative 1, with a security system being added in consideration to minimization of workload on the fund transfer operation system and ease of maintaining the key's secrecy. The key created by the security system is notified to each branch by using an IC card that has excellent confidentiality.

(Conceptual image)

The above discussions and results are summarized into the following conceptual diagram.



(Principal Functions of Major Systems)

a) Security System

- Creation of the crypt-key and writing to the IC card
- Message authentication and decryption of encrypted code (upon reception of fund transfer message)
- Creation of encrypted code and MAC (upon transfer of fund transfer message)

b) Dedicated Transfer System

- Reading the crypt-key from the IC card (deleted when power is turned off; not readable without the operator's ID)
- Creation of encrypted code and MAC (upon transmission of fund transfer message)
- Message authentication and decryption of encrypted code (upon reception of fund transfer message)

c) Message Switching System

- Decryption of encrypted code (upon reception of fund transfer message)
- Creation of encrypted code (upon transfer of fund transfer message)

d) Regional Node System

- Decryption of encrypted code (upon reception of fund transfer message)
- Creation of encrypted code (upon transfer of fund transfer message)

(Operation of the key's secrecy control)

- The access control area where the security system is installed should be located in a separate room from other systems for ease of strict control access.
- The IC card should be strictly controlled by authorized personnel at each branch.

10-2-1-3 Outline of Functions Offered by Individual Systems in Phase I

This section will describe the function offered by individual systems to be developed in Phase I in terms of the process, important I/O screens and documents, as well as the contents of major files.

(1) Terminal Sub-system

1) Dedicated fund-transfer system and RCC data-entry service system

(a) Process outline of main functions

[Processes from entry of fund-transfer data up to transmission of fund-transfer message]

a) Entering fund-transfer data including customer-remittance transactions and fund transactions

[1] Receive data entered on the basis of a payment order

[2] Check each input item for its format and consistency

(If an error is found in any item, it would be highlighted to prompt re-entry.)

[3] Allocate the system reference number

[4] Record the journal information in the (on-line and off-line) incoming journal files

[5] Record the input data (fund-transfer message) in the entry Q

[6] Record the journal information in the (on-line and off-line) outgoing journal files

[7] Print out the backup copy of input fund-transfer data (a hard copy of the input screen)

b) Checking, changing and cancelling (verifying) input data

[1] Display input data from the entry Q on the screen

[2] Check the input data on the screen and make changes and cancellations if necessary

[3] When making changes, check the changed item for format and consistency with other input data

[4] Record the journal information in the (on-line and off-line) incoming journal files

[5] Replace the input data in the entry Q with changed data, or add a cancellation flag to the respective input data in the entry Q

[6] Record the journal information in the (on-line and off-line) outgoing journal files

[7] Print out the backup copy of fund-transfer data change or cancellation (a hard copy of the input screen)

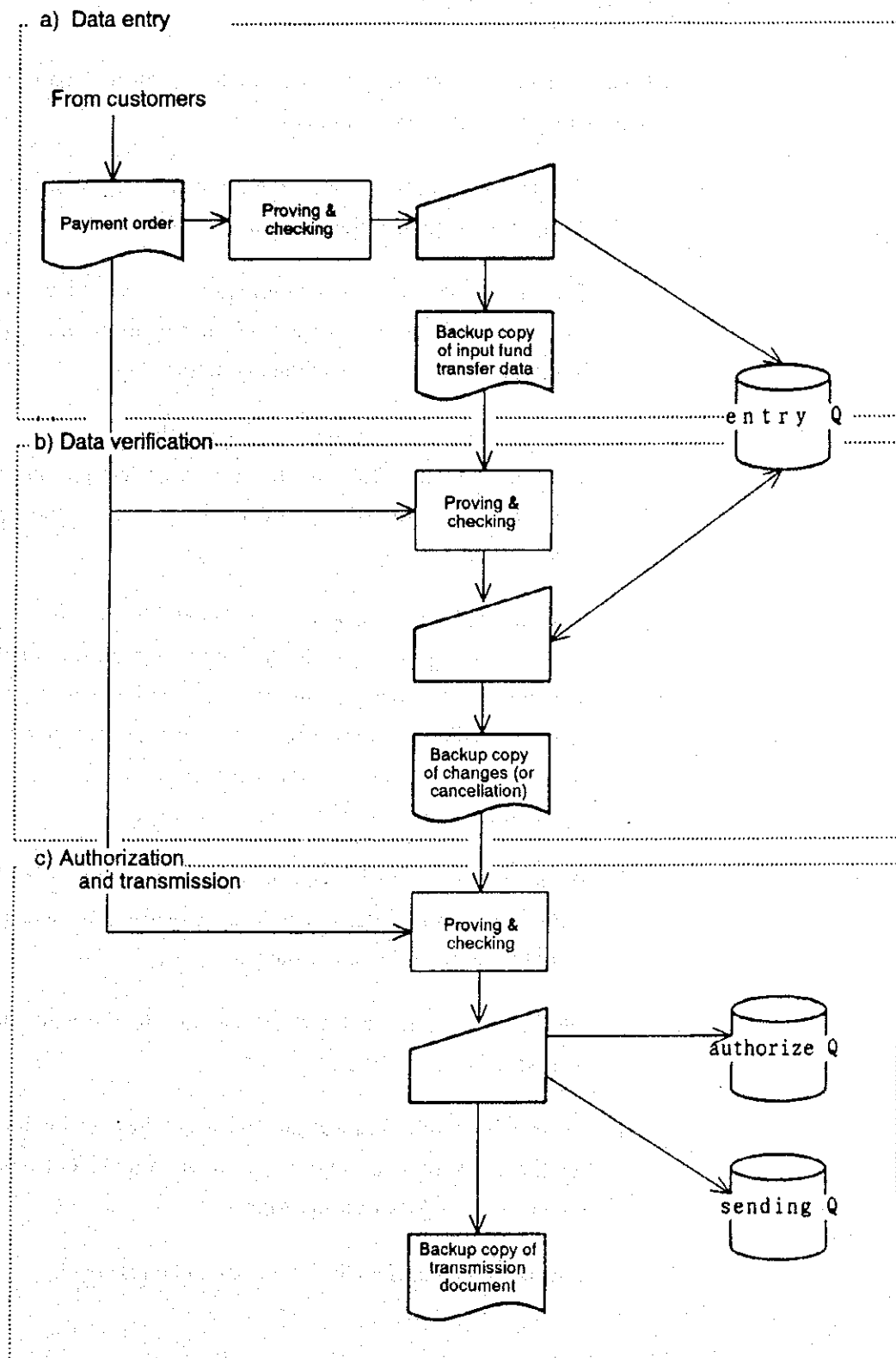
c) Authorizing input data and transmitting the data as a fund-transfer message

- [1] Display input data from the entry Q on the screen**
- [2] Record the journal information in the (on-line and off-line) incoming journal files if the input data is authorized and approved for transmission (if not, cancel the transaction)**
- [3] Record the fund-transfer message in the transmission message file and update the transmission management file**
- [4] Record the input data (fund-transfer message) in the authorize Q and transmit the fund-transfer message to the Network Sub-system**
- [5] Record the fund-transfer message in the sending Q when the Network Sub-system provides notification that it received the message**
- [6] Record the journal information in the (on-line and off-line) outgoing journal files**
- [7] Print out the backup copy of transmission document (a hard copy of the input screen)**

(See Figure 10-5.)

(Figure 10-5)

Flow of main processes for transfer operation



Note: The above processes are for serial authorization/transmission procedures at every input data. The authorization/transmission procedures with the designation of the reference number range would also be developed.

[Output incoming messages such as fund-transfer data and inquiry responses to the message printer]

- [1] The message-receiver task receives a message coming in through the Network Sub-system
- [2] The message-receiver task determines the type of incoming message, updates the reception management file, and stores the message in the incoming message file.
- [3] The printer task which intermittently monitors the incoming message file, activates after a certain period and read the reception management file and the incoming message file.
- [4] If the printer task finds a new unprinted incoming message in the incoming message file, it would edit and output the message to the message printer, and add a flag to the message in the file to indicate that the message has already been printed, and repeats this process until there are no unprinted messages in the incoming message file.
- [5] When the printer task finds no unprinted message in the incoming message file, it would specify the time when it would re-activate and enter the wait mode.

[Transmitting a reception-notification message to the bank that has transmitted a fund-transfer message]

- [1] Receive reception-notification data which has been entered on the basis of a backup copy to be printed out upon receiving a fund-transfer message
- [2] Check each input item for its format and consistency

(If an error is found in any item, it would be highlighted to prompt re-entry.)

- [3] Record the journal information in the (on-line and off-line) incoming journal files
- [4] Record the input data (reception-notification message) in the transmission message file and update the transmission management file
- [5] Transmit the reception-notification message to the Network Sub-system
- [6] Record the journal information in the (on-line and off-line) outgoing journal files
- [7] Print the backup copy of transmission document (a hard copy of the input screen)

[Transmitting optional communication messages to all sub-systems (broadcasting function)]

Apart from providing a screen that accepts any communication message, the processes of the broadcasting function are the same as those of "Transmitting a reception-notification message to the bank that has transmitted a fund-transfer message."

(b) Important input/output screens and documents

Important input/output screens and documents for the dedicated fund-transfer system and RCC data entry service system are as follows:

- a) Screen for entering transmission data (or backup copy of the screen) -- a case of inter-bank customer remittance transaction (See Figure 10-6).

(Figure 10-6)

Screen for Entering Transmission Data			
		Current date ⁽¹⁾	_____
		Bank/branch ⁽²⁾	_____
	Receiving bank/branch ⁽³⁾	_____	
	Service type ⁽⁴⁾	_____	
20 :	Transaction reference number	_____	
32 :	Value date ⁽⁵⁾	(Currency code _____)	Amount _____
50 :	Ordering client	_____	Account number ⁽⁶⁾ _____
52 :	Ordering bank/branch ⁽⁷⁾	_____	
57 :	Bank/branch with beneficiary's account ⁽⁸⁾	_____	
59 :	Beneficiary	_____	Account number ⁽⁶⁾ _____
72 :	Remarks	_____	
	Reference number ⁽⁹⁾	Time processed ⁽⁹⁾	Operator ⁽⁹⁾
	_____	_____	_____

Note 1: The system would automatically display the current date.

Note 2: The system would automatically display the names of the bank and branch.

Note 3: Input name of receiving banks and branches of which transmission data on the network.

Th system automatically displays bank and branch names in receiving memoes.

Note 4: The service type such as urgent transfer would be entered in a code.

Note 5: Input only case of previous day transaction reference are handled. If no entry, the system would automatically display the date which is the same as the transaction processed.

Note 6: Account type is entered in a code followed by the account number.

Note 7: Input code only case of input reception service is to be done.

Note 8: Not necessary to input in case of input reception service

Note 9: Data items for which the system would automatically display the information.

- b) Screen for checking, changing and cancelling input data (or backup copy of the screen)
- c) Screen for authorizing input data and transmitting fund-transfer message for serial processing

The above two screens are not shown because these screens are essentially the same as the "screen for entering transmission data" except for the screen titles.

- d) Backup document for incoming message -- a case of inter-bank customer remittance transaction transaction transaction

This is automatically output to the message printer:

- keep it as a backup for incoming fund-transfer data, and
- use it as a payment instruction.

(See Figure 10-7.)

(Figure 10-7)

Backup document for an Incoming Message			
Current date _____	Bank/branch ⁽¹⁾ _____		
Value date _____	Service type _____	Amount _____	Transaction reference number _____
Bank/branch with beneficiary's account _____		Account number _____	
Beneficiary _____			
Ordering bank/branch _____		Account number _____	
Ordering client _____			
Sending bank/branch _____			
Remarks _____			
Reference number _____		Time processed _____	

Note 1: The names of the bank and branch that actually received the message (for another bank/branch) under the data item "Bank/branch"

- e) Screen for transmitting reception notification message (or backup copy of the screen)

This screen is not shown because it is essentially the same as the "backup document for incoming message" except for the screen/document titles.

- f) Screen for entering communication message

(Please refer to Figure 10-8.)

(Figure 10-8)

Screen for Entering Communication Message	
Current date ⁽¹⁾ _____	Sender ⁽²⁾ _____
Destinations ⁽³⁾ _____	
Communication message _____	

Time processed ⁽⁴⁾ _____	Operator ⁽⁵⁾ _____

Note 1: The system would automatically display the current date.

Note 2: The system would automatically display the names of the bank and branch transmitting the data, or the name of the sub-system in which the message is being entered.

Note 3: An operator can specify up to five destinations by entering the bank code followed by one space and the branch code. If the destination is a sub-system, enter the identity of the sub-system. If the message is being transmitted to all sub-systems, enter "ALL."

Note 4: In a free format, enter character strings that the system can handle.

Note 5: Data items for which the system would automatically display the information.

(c) Description of major files

Major files used in the dedicated fund-transfer system and RCC data entry service system are as follows:

(See Table 10-3.)

(Table 10-3)

Major files used in the dedicated transfer system and the RCC data entry service system

File names	Description	Applications
Entry Q	A file used to store entered fund transfer data. Created by entering fund transfer data and used by such functions as verification, authorization and transmission.	Fund transfer (data entry and transmission)
AuthorizationQ	A file used to store fund transfer data which have been verified and authorized for transmission. The data in this file would be transmitted within a day.	ibid
Sending Q	A file used to store fund transfer data which have been transmitted and confirmed as received by the Network Subsystem.	ibid
Outgoing message file	A file used to store the details of all messages (e.g. fund transfer, inquiry and communication) that the Terminal Subsystem has transmitted.	Common
Transmission management file (counter)	A file used to store necessary management data items (number and amount) by message type and by destination and for the total of all messages transmitted from the Terminal Subsystem.	ibid
Incoming message file	A file used to store the details of all messages (e.g. fund transfer, inquiry and communication) that the Terminal Subsystem has received.	ibid
Reception management file (counter)	A file used to store necessary management data items (number and amount) by message type and by originator and for the total of all messages received by the Terminal Subsystem.	ibid
Bank/branch information file	A file used to store data on banks and branches. This is a master file used in checking the destination banks and branches and origin banks and branches, and in converting bank and branch codes into bank and branch names.	ibid
Calender file	A file that maintains business days and other important dates.	ibid
On-line journal file	A file that maintains data such as incoming and outgoing messages and file update information which is used in recovering system failures.	ibid
Off-line journal file	A file used to store data for each transaction to create a variety of return management documents.	ibid

2) Operation Day interfaces for fund-transfer applications

(a) Process outline of major functions

[Creating outgoing message file and transmitting message to the Network Sub-systems]

- [1] Read the fund-transfer message file of Operation Day, convert each message into the format of the new payment system, and group multiple messages into an Operation Day interface file for batch processing

Note: The format of the Operation Day interface file is as follows:

a) Header record

Each Operation Day interface file has one header record which holds control data such as the number of message records in the file necessary to forward the file.

b) Message records

Each Operation Day interface file has more than one message records. The format of one message record is the same as that of the fund-transfer message for the new payment system.

c) Trailer record

Each Operation Day interface file has one trailer record indicating the end of the file. The trailer record also has a check code for security management and a control data needed to forward the file.

- [2] Activate the file transfer function between the terminal and Network Sub-systems and forward the fund-transfer messages as an Operation Day interface file to the Network Sub-system in batches

Note: Even if an existing package software should be used to forward the file, we would offer an exit routine for security checking.

(b) Contents of major files

The major file used by the Operation Day interface function is as follows:
(See Table 10-4.)

(Table 10-4)

Major files used by the Operation D interface function

File names	Description	Applications
Operation Day interface file	A file used by the Operation Day interface to forward a batch file. The interface converts Operation Day messages into the New Payment System messages, group multiple messages in a batch file to forward it to the network subsystem.	Operation Day Interface

(2) Host Computer Sub-systems

1) Fund-Transfer Processing System

(a) Process outline of major functions

[Fund transfer common functions]

The fund-transfer common functions and their process outlines are as follows:

- a) Check the contents of inter-bank and intra-bank messages
- b) Update common files such as journals
- c) Demand transmission of outgoing messages such as fund-transfer messages to receiving bank branches
- d) Error handling

[1] Receive a message from the Network Sub-system

[2] Check the data items of the message for format and consistencies

Note 1: When the Fund-Transfer Processing System finds the first error in a message, it would immediately abort checking and forward an error notification message to the originating bank/branch through the Network Sub-system.

Note 2: Major check items include:

- System reference number

The Fund-Transfer Processing System would check each message for duplications in the number for each headquarters/branch (The order of reception may not agree with that of transmission from a Terminal Sub-system.)

- Format

The system would check each message for its compliance with the specified format.

- Contents

The system would check each message for mandatory data items, format, registration of the bank/branch in the bank/branch file.

- [3] Allocate serial message reception number
- [4] Record the journal information in the (on-line and off-line) incoming journal files
- [5] Record the received data in the reception message file and update the reception management file
- [6] Request processing by the inter-bank settlement function, intra-bank settlement function or inquiry function depending on the message type
- [7] Upon completion of processing by other functions, the fund-transfer Processing function regains the control over the message.
- [8] If there is any transmission message (e.g., inter-office transmission of the fund-transfer message within the receiving bank, inquiry response and error notification), the system would record it in the

transmission message file, update the transmission management file, and request the Network Sub-system to transmit the message.

- [9] Record the journal information in the (on-line and off-line) outgoing journal files

[Inter-bank settlement function]

The inter-bank settlement functions and their process outlines are as follows:

- a) Manage accounting (the number and amount) for inter-bank fund transfers including fund transactions
 - b) Request transfer between the NBK current deposit accounts for inter-bank fund settlement
 - c) Transmit notification of a transfer between the NBK current deposit accounts to settle a fund transaction
- [1] Receive control from the fund-transfer Processing function
 - [2] Request a fund transfer between the NBK current deposit accounts for inter-bank fund settlement due to fund transfer or fund transaction to the NBK-Net System depending on the contents of the fund-transfer message

Note: The settlement function would transmit unchanged inter-bank transfer transaction data to the NBK-Net System, and receive inter-bank transfer transaction data to which the NBK-Net System would add information such as the results of fund-transfer and any errors.

- [3] If the NBK-Net System successfully executes its processes, the inter-bank settlement function would calculate the accounts (number and amount) at every combination of sending bank/branch and receiving bank/branch for the inter-bank transfers including fund transaction, and record the results in the inter-bank settlement management file.

Note: The calculation would be conducted in the following manner (an example of the amounts for three banks; this also applies to the number of messages)

(See Table 10-5.)

(Table 10-5)

Reception Transmission	A	... A₄ ...	B	... B₂ ... B₅ ...	C	... C₂ ...	Total transmission
A	—		10		20		30
A₁ ⋮				5 5		20	30
B	30		—		10		40
⋮ B₃ ⋮		30				10	40
C	20		40		—		60
C₁ ⋮		10		10 7			27
C₃ ⋮		10		8 15			33
Total reception	50	50	50	23 27	30	30	130
Net position	20		10		-30		

Note: Larger upper-case letters indicate banks and subscript numbers indicate branches of the respective banks.

- [4] If the NBK-Net System process in the case of fund transaction, completes normally, the inter-bank settlement function would generate and forward a message to the bank/branch that transmitted the fund-transfer message through the Network Sub-system to inform that the fund has successfully been transferred between NBK current deposit accounts.
- [5] If the NBK-Net System process completes abnormally, the inter-bank settlement function would forward, according to the error notification code set in the process results, an error notification message to the bank/branch that transmitted the fund-transfer message through the Network Sub-system.
- [6] Return control to the fund-transfer common function

[Intra-bank settlement function]

The intra-bank settlement functions and their process outlines would be as follows:

- a) Manage accounting (the number and amount) for intra-bank fund transfers
- b) Add up all the intra-bank fund transfers in the inter-office accounts

- [1] Receive control from the fund-transfer common function
- [2] The intra-bank settlement function would calculate the accounts (number and amount) for the intra-bank transfers for each combination of transmitting and receiving headquarter/branches, and record the results in the intra-bank settlement management file.

Note: The calculation would be conducted in the following manner (an example of the amounts for four branches; this also applies to the number of messages)

(See Table 10-6.)

(Table 10-6)

Reception Transmission	A ₁	A ₂	A ₃	A ₄	Total transmission
A ₁	—	5	4	7	16
A ₂	4	—	2	2	8
A ₃	3	6	—	2	11
A ₄	6	1	8	—	15
Total reception	13	12	14	11	50
Inter-branch position	-3	4	3	-4	

Note: Upper-case letters with subscript numbers indicate branches of a bank.

[3] Return control to the fund-transfer common function

Note: Urgent and ordinary customer remittance transaction services and urgent fund transaction services which would be offered under the new payment system, require the following functions:

1. Customer remittance transactions

- Urgent services
 - * Allocate higher priority to transfer messages (the network sub-system detects the message types and allocated the priority)
 - Notify transmitting banks that the terminals of receiving banks have received their transfer messages (upon receiving acknowledgements of message reception from the terminals of receiving banks, the Network Sub-system returns unchanged transfer messages to the sending banks)
 - Notify transmitting banks that the funds have been deposited in the destination accounts (receiving banks input the message that they received the funds)
- Ordinary services
 - Allocate lower priority to transfer messages (message types are detected in the Network Sub-system)

2. Fund transactions (urgent service only)

- Allocate higher priority to transfer messages (message types are detected in the Network Sub-system)
- Notify sending banks that the funds were transferred between NBK current deposit accounts (Fund-Transfer Processing System generates message informing the sending bank that the transfer has been completed)
- Notify transmitting banks that the terminals of receiving banks have received their transfer messages (upon receiving acknowledgements of message reception from the terminals of receiving banks, the Network Sub-system returns unchanged fund-transfer messages to the sending banks)

[Inquiry-answering and document-return functions]

The inquiry-answering and document-return functions would offer the following functions. Because individual processes vary greatly among different functions, they are not outlined here. The formats of major documents are given, however, under (b) "Formats of important input/output screens and documents" below.

- a) Answer inquiries (which are divided into inter-and intra-bank settlements) for Remittance/Receipt List, providing the summary details, and the total number and total amount of fund transfers for

each fund-transfer message going out of and coming into the inquiring headquarters/branch

- b) Answer inquiries (divided into inter-and intra-bank settlements) for Summary of Remittance and Receipt, providing the total number and amount of fund transfers for each fund-transfer message going out of and coming into each headquarters/branch, and the total number and amount of fund transfers for all fund-transfer messages going out of and coming into all headquarters/branches of the inquiring bank (these inquiries normally come from bank headquarters)
- c) Other inquiry-answering functions

Other inquiry-answering functions would provide:

- Fund transfer details (The details of a fund-transfer message inquired of by specifying the system reference number for the message)
- Fund transfer process status (The process status of a fund-transfer message)
- Bank/branch information (Registered information about other banks/branches)

- d) Prepare and send back documents in batches

Documents to be returned should include:

- Lists of outgoing and incoming fund transfers by destination/origin (the daily and monthly lists of the total number and amount of both outgoing and incoming fund transfers for each major service type)
- Lists of fund transfers by service type (for each bank, the daily and monthly lists of the total number, amount and charge for both outgoing and incoming fund transfers for each major service type, and the growth over previous year for each item)
- Transmission error status list (a monthly list of transmission error status by causes for each bank)

- **Carry-over list (a daily list of fund-transfer details carried over to the next operating day)**
- **List of cost assignment by bank (monthly and annual lists of cost assignments to participating banks under the new payment system)**

[System operation functions]

The system operation function would provide the following functions. Because we have already described the approaches concerning items a), c), d), e), and f), we are only describing the process for item b).

- a) Forward Summary of Remittance and Receipt to each bank headquarters upon closing of on-line communication hours
- b) Create transmission files upon closing of on-line operation hours that are carried over to the next operating day
- c) Start up and shut down the system and reject illegal inputs
- d) Security management functions
- e) Registration management for files and databases
- f) Failure management such as recovery

Process outline for creating transmission files upon closing of on-line operation hours that are carried over to the next operating day

- [1] For the fund-transfer messages that are left untransmitted in the Fund-Transfer Processing System after on-line communication hours for some reason, move them from the incoming message file to the carry-over Q file
- [2] Create a carry-over transmission file after on-line communication hours of a day, sorting and editing the carry-over Q file by receiving bank/branch on a batch basis
- [3] Forward, at the start of operation on the next operating day, the fund-transfer messages carried over from the previous operating day stored in the carry-over transmission file

(b) Formats of important I/O screens and documents

The formats of important I/O screens and documents are as follows:

- a) Hard copy response to inter-bank fund-transfer inquiries for Remittance/Receipt List inquiries would be entered at branch offices.
- This service would print out the outgoing and incoming transmission lists as of the day and time of inquiry for the inquiring branch.
 - For both outgoing and incoming transmissions, this service would provide a one-line summary of each transmission by inter-bank fund transfer (and fund transaction) and add up the number and amount of fund transfers.
 - The response to inquiries for Remittance/Rceipt List would be printed out at the end of operation for a day. They would then be compared with the number and amount of payment orders, the result of which would be reported to the headquarters.

(See Figure 10-9.)

(Figure 10-9)

**Inquiry on Remittance/Receipt List
(inter-bank fund transfer)**

Current date⁽²⁾ _____ Bank/branch⁽³⁾ _____

List of Outgoing Messages

Value date _____

Time	Service type	Bank with bene- ficiary's account ⁽⁴⁾	Branch ⁽⁵⁾	Amount	Reference number
------	--------------	---	-----------------------	--------	------------------

_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Number of outgoing messages _____ Amount _____

Total by value date Number of outgoing messages _____ Amount _____

Value date _____

Total by value date Number of outgoing messages _____ Amount _____

Total number of outgoing messages _____ Amount _____

List of Incoming Messages

Value date _____

Time	Service type	Ordering bank ⁽⁶⁾	Branch	Amount	Reference number
------	--------------	------------------------------	--------	--------	------------------

_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Number of incoming messages _____ Amount _____

Total by value date Number of incoming messages _____ Amount _____

Value date _____

Total by value date Number of incoming messages _____ Amount _____

Total number of incoming messages _____ Amount _____

Time processed _____ Operator _____

Note 1: This figure shows a standard format in which fund transfers are printed in the order of processing. As an option, they could be sorted by service type and by sending/receiving bank/branch.

Note 2: The system would automatically print the current date.

Note 3: The system would automatically print the names of the bank and branch entering the data.

Note 4: The system would use abbreviations for sending/receiving banks.

Note 5: The system would print branch codes.

b) Hard copy response to inter-bank fund-transfer inquiries for Summary of Remittance and Receipt as a principle, inquiries would be entered at headquarters.

- This service would print the subtotals of the number amount for fund transfer for each branch of the inquiring bank by outgoing or incoming transfer and by inter-bank transfers (and fund transactions) and add up the number and amount of fund transfers as of the day and time of inquiry for the inquiring branch.

- The response to inquiries for Summary of Remittance and Receipt would be printed out at the end of operation for a day. They would then be compared with the total number and amount of transfers reported by branch.

(See Figure 10-10.)

(Figure 10-10)

Inquiry on Summary of Remittances and Receipts (inter-bank fund transfer)				
Current date ⁽¹⁾ _____		Bank/branch ⁽²⁾ _____		
Value date _____				
Branch ⁽³⁾	Number of outgoing messages	Amount of outgoing fund	Number of incoming messages	Amount of incoming fund
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
Total	_____	_____	_____	_____
Total by value date	_____	_____	_____	_____
Value date _____				
Total by value date	_____	_____	_____	_____
Total	_____	_____	_____	_____
Time processed _____	Operator _____			

Note 1: The system would automatically print the current date.

Note 2: The system would automatically print the names of the bank and branch entering the data.

Note 3: The system would use the branch code and abbreviations for sending/receiving banks.

Note 4: the format for Summary of Remittance and Receipt which would be transmitted by the Fund-Transfer Processing System to bank headquarters at the end of operation (after on-line communication hours) for a day, is the same as this one.

c) **Hard copy response to intra-bank fund-transfer inquiries for Remittance/Receipt List inquiries would be entered at branch offices.**

- This service would print out the outgoing and incoming transmission lists as of the day and time of inquiry for the inquiring branch.
- For both outgoing and incoming transmissions, this service would provide a one-line summary of each transmission by intra-bank fund transfer and add up the number and amount of fund transfers.
- The response to inquiries for Remittance/Receipt List would be printed out at the end of operation for a day. They would then be compared with the number and amount of payment orders, the result of which would be reported to the headquarters.

(See Figure 10-11.)

(Figure 10-11)

**Inquiry on Remittance/Receipt List
(intra-bank fund transfer)**

Current date⁽²⁾ _____ Bank/branch⁽³⁾ _____

List of Outgoing Messages

Value date _____

Time	Service type	Receiving branch ⁽⁴⁾	Amount	Reference number
------	--------------	---------------------------------	--------	------------------

_____	_____	_____	_____	_____
-------	-------	-------	-------	-------

_____	_____	_____	_____	_____
-------	-------	-------	-------	-------

		Number of outgoing messages _____	Amount _____
--	--	-----------------------------------	--------------

Total by value date		Number of outgoing messages _____	Amount _____
---------------------	--	-----------------------------------	--------------

Value date _____

_____	_____	_____	_____	_____
-------	-------	-------	-------	-------

Total by value date		Number of outgoing messages _____	Amount _____
---------------------	--	-----------------------------------	--------------

		Total number of outgoing messages _____	Amount _____
--	--	---	--------------

List of Incoming Messages

Value date _____

Time	Service type	Sending branch ⁽⁴⁾	Amount	Reference number
------	--------------	-------------------------------	--------	------------------

_____	_____	_____	_____	_____
-------	-------	-------	-------	-------

_____	_____	_____	_____	_____
-------	-------	-------	-------	-------

		Number of incoming messages _____	Amount _____
--	--	-----------------------------------	--------------

Total by value date		Number of incoming messages _____	Amount _____
---------------------	--	-----------------------------------	--------------

Value date _____

_____	_____	_____	_____	_____
-------	-------	-------	-------	-------

Total by value date		Number of incoming messages _____	Amount _____
---------------------	--	-----------------------------------	--------------

		Total number of incoming messages _____	Amount _____
--	--	---	--------------

Time processed _____ Operator _____

Note 1: This figure shows a standard format in which fund transfers are printed in the order of processing. As an option, they could be sorted by service type and by sending/receiving bank/branch.

Note 2: The system would automatically print the current date.

Note 3: The system would automatically print the names of the bank and branch entering the data.

Note 4: The system would print both branch codes and names.

d) Hard copy response to intra-bank fund-transfer inquiries for Summary of Remittance and Receipt as a principle, inquiries would be entered at headquarters.

- This service would print the subtotals of the number amount for fund transfer for each branch of the inquiring bank by outgoing or incoming transfer and by intra-bank transfers (and fund transactions) and add up the number and amount of fund transfers as of the day and time of inquiry for the inquiring branch.
- The response to inquiries for Remittance/Receipt List would be printed out at the end of operation for a day. They would then be compared with the total number and amount of transfers reported by branch.

(See Figure 10-12.)

(Figure 10-12)

Inquiry on Summary of Remittances and Receipts (intra-bank fund transfer)				
Current date ⁽¹⁾ _____		Bank/branch ⁽²⁾ _____		
Value date _____				
Branch ⁽³⁾	Number of outgoing messages	Amount of outgoing fund	Number of incoming messages	Amount of incoming fund
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
Total	_____	_____	_____	_____
Total by value date	_____	_____	_____	_____
Value date _____				

Total by value date	_____	_____	_____	_____
Total	_____	_____	_____	_____
Time processed _____		Operator _____		

Note 1: The system would automatically print the current date.

Note 2: The system would automatically print the names of the bank and branch entering the data.

Note 3: The system would print both branch codes and names.

Note 4: The format for Summary of Remittance and Receipt which would be transmitted by the Fund-Transfer Processing System to bank headquarters at the end of operation (after on-line communication hours) for a day, is the same as this one.

For the formats of the following documents are not shown because they seem to be self-evident:

- c) Notification of NBK current deposit account transfers
- d) Fund transfer details

- (c) Contents of major files

Major files used in the Fund-Transfer Processing System are as follows:
(See Table 10-7.)

(Table 10-7)

Major files used in the Fund-Transfer Operation System

File names	Description	Applications
Incoming message file	A file used to store the details of all messages (e.g., fund-transfers, inquiries and communications) that the Fund-Transfer Operation System receives.	Common
Incoming message management file (counter)	A file used to store necessary management data items (e.g., number of messages) for all messages that the Fund-Transfer Operation System receives by message type and by origin as well as total counts.	ibid
Outgoing message file	A file used to store the details of all messages (e.g., fund-transfers, reception-notification, inquiries and communications) that the Fund-Transfer Operation System transmits.	ibid
Outgoing message management file (counter)	A file used to store necessary management data items (e.g., the number of messages) for all messages that the Fund-Transfer Operation System transmits by message type and by origin as well as total counts.	ibid
Inter-bank settlement management file	A file used to store the counts (e.g., number of messages and amounts) for inter-bank fund transfers by combination of the sending and receiving banks/branches.	Fund transactions and other inter-bank transfers
Intra-bank settlement management file	A file used to store the counts (e.g., number of messages and amounts) for intra-bank fund transfers by combination of the sending and receiving head-quarters/branches.	Intra-bank fund transfers
Carry-over Q file	A file used to store the fund-transfer messages that have not been transmitted during the on-line operating hours of a day that the system extracts from the incoming message file.	Fund transfers
Carry-over transmission files	Files used to store fund-transfer messages from the carry-over Q file grouped by receiving bank/branch on a batch basis. These files would be used as on-line inputs for the next operating day.	Fund transfers
Serial number index file	A file used to store data which cross-refer the reference numbers and the message reception numbers, as well as record addresses of incoming messages.	Fund transfers
Bank/branch information file	A file used to store data on banks and branches. This is a master file used in checking the destination banks and branches and origin banks and branches, and in converting bank and branch codes into bank and branch names.	Common

Continued . . .

(Table 10-7)

File names	Description	Applications
Calender file	A file that maintains business days and other important dates.	Common
On-line journal file	A file that maintains data such as incoming and outgoing messages and file-update information which is used in recovering system failures.	ibid
Off-line journal file	A file used to store data for each transaction to create a variety of return management documents.	ibid

2) NBK-Net System

(a) Process outlines of major functions

[NBK current deposit account functions]

NBK current deposit account functions and their process outlines as follows:

- a) Interface with current deposit account terminals (input screens and output documents)
- b) Interface with the Fund-Transfer Processing System (fund-transfer transaction data input and output)
- c) Check the contents of messages (inputs from current deposit account terminals and incoming fund-transfer transaction data)
- d) Daily deficit limit management
- e) Update the balances in current deposit accounts (upon transfers, deposits and withdrawals)
- f) Error handling

Note: For items a), b), and c), common process would be fully exploited by use of common work areas because the data items are basically the same for current deposit account transfers, deposits and withdrawals regardless the inputs are from current deposit account terminals or the Fund-Transfer Processing System.

- [1] Receive one message (or transaction data) from a current deposit account terminal or from the Fund-Transfer Processing System

- [2] Check the data items in the message (or transaction data) for their formats and consistencies

Note: When the NBK-Net System finds the first error in a message, it would immediately abort checking. If the input is from a current deposit account terminal, the system would then highlight the erroneous data item on the input screen or display an error message to the terminal to prompt re-entry. If the input is from the Fund-Transfer Processing System, the NBK-Net System would set an error code in the process results for the transaction data return them to the Fund-Transfer Processing System.

- [3] If the message (or transaction data) requests a transfer or a withdrawal from a current deposit account, the system would read the current deposit account balance management file, calculate the balance after withdrawal from the current deposit account, and check it with the warning and limit levels in the daily deficit limit table.

Note: If the deficit exceeds the warning level but not the limit level, the system would continue the process. If the deficit exceeds the limit, the system would abort the process. In either cases, the system would take the following actions to inform the fact to the user.

- a) If the input is from a current deposit account terminal:

The system would print a warning on the current deposit account payment or transfer slip which would be printed out upon completion of the process.

- b) If the input is from the Fund-Transfer Processing System:

The system would insert the over-limit code in the results for the transaction data and return them upon completion of the process.

- [4] Allocate the serial current deposit account transaction number to the current deposit account in which a fund is deposited or from which a fund is withdrawn (both accounts in the case of a transfer)

- [5] Record the journal information in the (on-line and off-line) incoming journal files

- [6] Update the balance of the current deposit account in the current deposit account balance management file, and add the transaction record to the current deposit account transaction file
- [7] Record the journal information in the (on-line and off-line) outgoing journal files
- [8] Print out the current deposit account payment or transfer slip if the input is from a current deposit account terminal, or add necessary information to the transaction data and return it if the input is from the Fund-Transfer Processing System

[Inquiry-answering and document send-back functions]

The inquiry-answering and document send-back functions provide the following functions. The process outlines are not described here. The formats of major documents are given, however, under (b) "Formats of important input/output screens and documents" below.

- a) Answering inquiries on the balances after each deposit and withdrawal in current deposit accounts
- b) Answering inquiries on the balances in current deposit accounts for individual banks
- c) Other inquiries

Other inquiry-answering functions would provide:

- Answering inquiries on current deposit account information (The information about individual accounts such as the balance and reserve is given by specifying the account number.)
- Answering inquiries on daily deficit limit status (The information about the daily deficit limit status for individual accounts is given by specifying the account number.)
- Answering inquiries on required reserves (Given by specifying the account number)

d) Prepare and send back documents in batches

Returned documents should include:

- List of daily deficit status (a monthly list of daily deficit status for individual current deposit accounts)
- List of allocated daily deficit limits (a monthly list that shows the warning and freezing levels for permissible daily deficits for individual current deposit accounts)

[System Processing functions]

The system operation function would provide the following functions. The process outlines are not shown here.

- a) Start up and shut down the system and reject illegal inputs
 - b) Registration management for files and databases
 - c) Failure management such as recovery
- (b) Formats of important input/output screens and documents

The formats of important input/output screens and documents for the NBK-Net System are as follows:

- a) Input screen format for current deposit account transfers (entered from the NBK current deposit account terminals)

(See Figure 10-13.)

(Figure 10-13)

Screen for Entering NBK Current Deposit Account Transfer Data		
Current date ⁽¹⁾ _____	Section ⁽²⁾ _____	Terminal number ⁽³⁾ _____
Value date ⁽⁴⁾ _____	Amount _____	Transaction type ⁽⁵⁾ _____
Bank requesting the fund transfer ⁽⁶⁾ _____		

Bank receiving the transferred fund ⁽⁶⁾ _____		

Remarks _____		

Time processed ⁽⁸⁾ _____	Operator ⁽⁹⁾ _____	

- b) Print-out format for current deposit account transfers (printed out by the NBK current deposit account printers)

(See Figure 10-14.)

(Figure 10-14)

NBK Current Deposit Account Transfer Slip		
Current date _____	Section _____	Terminal number _____
Value date _____	Amount _____	Transaction type ⁽⁹⁾ _____
Bank requesting the fund transfer _____		
Current deposit account transaction number ⁽¹⁰⁾ _____	Account No. ⁽¹¹⁾ _____	Balance after transfer ⁽¹²⁾ _____

Current deposit account transaction number ⁽¹⁰⁾ _____	Account No. ⁽¹¹⁾ _____	Balance after transfer ⁽¹²⁾ _____
Remarks _____		
Time processed _____	Operator _____	

Note 1: The system would automatically print the current date

Note 2: the name of the section entering the data

Note 3: the number of the terminal entering the data and

Note 4: The value date is entered only when the fund transfer is reserved for a future date. If there is no entry, the system would automatically print the current date as the value date.

Note 5: The transaction type (the purpose of the transfer transaction) would be entered in a code.

Note 6: The transferring and receiving banks/branches would be entered using the NBK user (bank/branch) registration codes.

Note 7: The attributes of transferring and receiving banks/branches could be entered in a free format.

Note 8: Data items for which the system would automatically print the information.

Note 9: Transaction type would be entered using a code and the system would print the registered code name.

Note 10: The system would automatically allocate serial current deposit account transaction numbers for both depositing and withdrawing accounts.

Note 11: The number of the current deposit accounts maintained by banks in the NBK.

Note 12: The balances in the depositing and withdrawing accounts after transfer.

The formats for items c), d), e), and f) below are not given because they are the same as either the input screen format for current deposit account transfers (screen) or the print-out format for current deposit account transfers (print-out):

- c) Input screen format for current deposit account deposits (screen)
- d) Print-out format for current deposit account deposit slips (print-out)
- e) Input screen format for current deposit account withdrawals (screen)
- f) Print-out format for current deposit account withdrawal slips (print-out)

Also, for the input screens and documents used to cancel and correct the entry for the transfers, deposits and withdrawals, the same format of either the input screen format for current deposit account transfers or the print-out format for current deposit account transfers is used.

Note: Users cannot cancel or correct the transactions that have already been transferred, deposited or withdrawn. Cancellation and correction are possible only with reserved transactions which are not updated although users can cancel or correct executed transactions by making a reverse transaction.

- g) Answering inquiries on the balances in current deposit accounts for individual banks
 - As a principle, inquiries would be entered at NBK headquarters and branches .
 - This service would print the preceding day's balance in the current deposit account of a bank, and the changes thereafter and current balance by transaction type in the account due to transactions during the period.(See Figure 10-15.)

(Figure 10-15)

Inquiry on the Balance of Current Deposit Accounts by Bank				
Current date _____		Section _____		Terminal number _____
Bank _____	Account No. _____		Balance at the end of the preceding day _____	
Transaction type	Number of withdrawals	Amounts of withdrawals	Number of deposits	Amounts of deposits
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
Total for the bank _____		_____	_____	_____
			Current balance _____	
Bank _____		Account No. _____		Balance at the end of the preceding day _____
Transaction type	Number of withdrawals	Amounts of withdrawals	Number of deposits	Amounts of deposits
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
Total for the bank _____		_____	_____	_____
			Current balance _____	
Total _____		_____	_____	_____
Time processed _____		Operator _____		

h) Answering inquiries on the balances after each deposit and withdrawal in current deposit accounts (document)

- In principle, inquiries are entered at the headquarters of commercial banks.
- This function would print out the preceding day's balance in the current deposit account of a bank in the NBK and the changes thereafter as well as the current balance by transaction type.

(See Figure 10-16.)

(Figure 10-16)

Inquiry on Post-Settlement Balance of a Current Deposit Account				
Current date ⁽¹⁾ _____		Bank/branch ⁽²⁾ _____		
Account No. _____		Balance at the end of the preceding day _____		
Transaction type _____				
Correspondent bank ⁽³⁾	Number of withdrawals	Amounts of withdrawals	Number of deposits	Amounts of deposits
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
Total	_____	_____	_____	_____
Transaction type _____				
Correspondent bank ⁽³⁾	Number of withdrawals	Amounts of withdrawals	Number of deposits	Amounts of deposits
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
Total	_____	_____	_____	_____
Current balance _____				
Time processed _____		Operator _____		

Note 1: The system would automatically print the current date.

Note 2: The system would automatically print the names of the bank/branch entering the data.

Note 3: The system would use both the bank code and name.

(c) Contents of major files

The major files that the NBK-Net System would use are as follows:
(See Table 10-8.)

(Table 10-8)

Major files used by the NBK-Net System

File names	Description	Applications
Current deposit account balance management file	A file used to store management data items such as the balance at the end of the preceding day, and the numbers and amounts of deposits and withdrawals, by current deposit account and by date.	Current deposit account
Current deposit account transaction detail files	A file used to store the details of transactions in current deposit accounts by date.	ibid
Daily deficit limit management file	A file used to store the daily deficit warning levels and limits allocated to the current deposit accounts of individual banks. The system would read this file at the start of operation and keeps the data in its main memory during operation as a daily deficit limit table to look up.	ibid
Serial number index file	A file used to store data which cross-refer the reference numbers and the current deposit account transaction number, as well as record addresses of checking account transaction detail files.	Fund transfers
Bank/branch information file	A file used to store data on banks and branches. This is a master file used in checking the destination banks and branches and origin banks and branches, and in converting bank and branch codes into bank and branch names.	Common
Calendar file	A file that maintains business days and other important dates.	ibid
On-line journal file	A file that maintains data such as incoming and outgoing messages and file-update information which is used in recovering system failures.	ibid
Off-line journal file	A file used to store data for each transaction to create a variety of return management documents.	ibid

(2) Other functions to be developed

1) Payroll service function (gross settlement)

(a) Process outline of major functions

The payroll service (gross settlement) would be offered as an extension of the RCC data entry service system and the outline of the processes undertaken at regional clearing centers are as follows:

- a) Read payroll data stored in floppy discs and create fund-transfer (payroll) messages
- b) Transmit fund-transfer (payroll) messages
- [1] Receive payroll data stored in floppy discs from corporate customers through commercial banks/branches
- [2] Read in payroll data from floppy discs, convert them into fund-transfer (payroll) messages, and create payroll distribution files in a batch process
- [3] The RCC data entry service system which would be connected on-line to the new payment system would read the payroll distribution files and forward them through the Network Sub-system to the Fund-Transfer Processing System during on-line operation hours
- [4] The subsequent processes would be the same as those for normal fund-transfer messages (immediate gross settlement for inter-bank settlements)

(b) Contents of major files

The major file used by the payroll service function would be:
(See Table 10-9.)

(Table 10-9)

Major file used by the payroll service function

File names	Description	Applications
Payroll data distribution files	Files used by the payroll service function to store the fund-transfer messages converted from the payroll data collected from business and other organizations. The RCC Entry Service Systems of regional clearing centers would read the file and forward the fund-transfer (payroll) messages to the Fund-Transfer Operation System.	Payroll service

2) Automatic transfer service functions (gross settlement)

(a) Process outline of major functions

As in the case of payroll service functions, the automatic transfer service would be offered as an extension of the RCC data entry service system. The process outline is not given here because Phase I would not offer backward processing and the processes undertaken at regional clearing centers would be the same as the payroll service functions.

- a) Read automatic transfer data stored in floppy discs and create fund-transfer (automatic transfer) messages
- b) Transmit fund-transfer (automatic transfer) messages

(b) Contents of major files

The automatic transfer service would use the following file:
(See Table 10-10.)

(Table 10-10)

Major file used by the automatic transfer function

File names	Description	Applications
Automatic transfer data distribution files	Files used by the automatic transfer function to store the fund-transfer messages converted from the automatic transfer data collected from business and other organizations. The RCC Entry Service Systems of regional clearing centers would read the file and forward the fund-transfer (automatic transfer) messages to the Fund-Transfer Operation System.	Automatic transfer

10-2-1-4 Outlines of Functions to Be Developed in Phase II

Almost all basic function used in the new payment system would have been developed in Phase I and all new functions to be developed in Phase II are expansions of those developed in Phase I. This section will review the outline of newly added functions in Phase II without mentioning the processes of individual functions.

(1) Linking Remittances and Deposits

1) Linking remittances and deposits means that:

- a) the system confirms the balance in the deposit account specified for payment by the remitting customer and the specified amount is deducted from the customer's account only if there is sufficient balance in the account, and
- b) deposit the amount of the funds to the destination deposit account of the receiver upon receiving the transfer message.

2) Outline of developments

New developments needed to provide these functions are as follows:

(a) If a bank keeps a central deposit ledger in its internal system:

- a) the new payment system would transmit fund-transfer messages to banks' internal systems to have them check the balance in the

specified accounts and withdraw specified amount of funds from the accounts

- b) the system would transmit fund-transfer messages to banks' internal systems to have them deposit the specified amount of funds in the specified accounts

The above two functions are offered by the Network Sub-systems by registering message routes to pass the fund-transfer messages to banks' internal systems.

- (b) If a bank maintains deposit operations on Operation Day (i.e. if the dedicated fund-transfer system can share the bank's deposit ledger):
 - a) The dedicated transfer system would share the Operation Day deposit ledger to confirm balances with the deposit ledger when it issues transfer messages (if the balance is insufficient to execute the transfer, the system would abort the process and conduct error processing), and
 - b) In a similar manner, the system would update the Operation Day deposit ledger when it receives transfer messages.

(2) Connecting Bank Computers to the Network

1) Outline of functions

In order to cross transfer funds between banks that operate on their own internal system (self-sufficient for intra-bank settlements) and those that rely on the new payment system, the new system would connect bank computers to the network using the following two processes:

- a) When banks that rely on the new payment system transfer funds to those that rely on their own systems, this function would transmit fund-transfer messages to those using internal systems.
- b) When banks that rely on their own systems transfer funds to those that rely on the new payment system, this function would pass the fund-

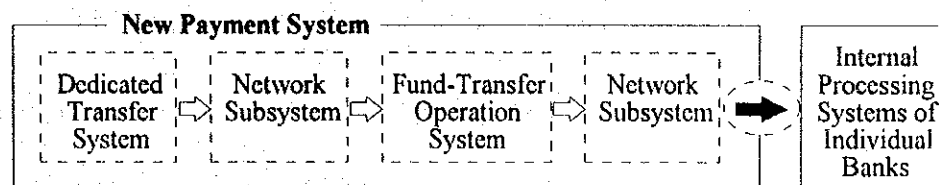
transfer messages from those using internal systems to the new payment system.

2) Outline of developments

- a) Setting up (registering) routes to pass fund-transfer messages to internal systems of banks (offered by the Network Sub-systems)

(See Figure 10-17.)

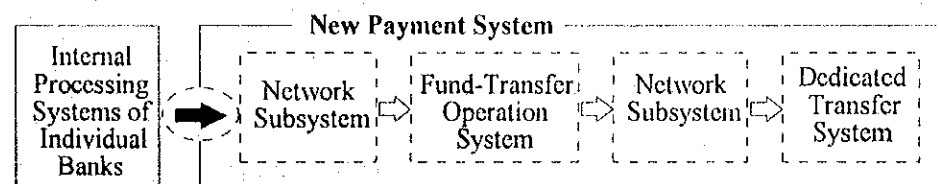
(Figure 10-17)



- b) Setting up (registering) routes to receive fund-transfer messages from internal systems of banks (offered by the Network Sub-systems)

(See Figure 10-18.)

(Figure 10-18)



(3) CD/ATM Services (Central Netting Process)

1) Outline of functions

CD/ATM services would provide the following functions:

- a) Intra-office, intra-bank and inter-bank deposit and withdrawal services from any CD/ATM in any branch
- b) Inter-bank debits and credits produced by CD/ATM services would be settled by transferring the total balance through the Fund-Transfer

Processing System between the current deposit accounts maintained by the relevant banks in the NBK after calculating the net positions among banks after on-line operation hours of the day.

2) Outline of developments

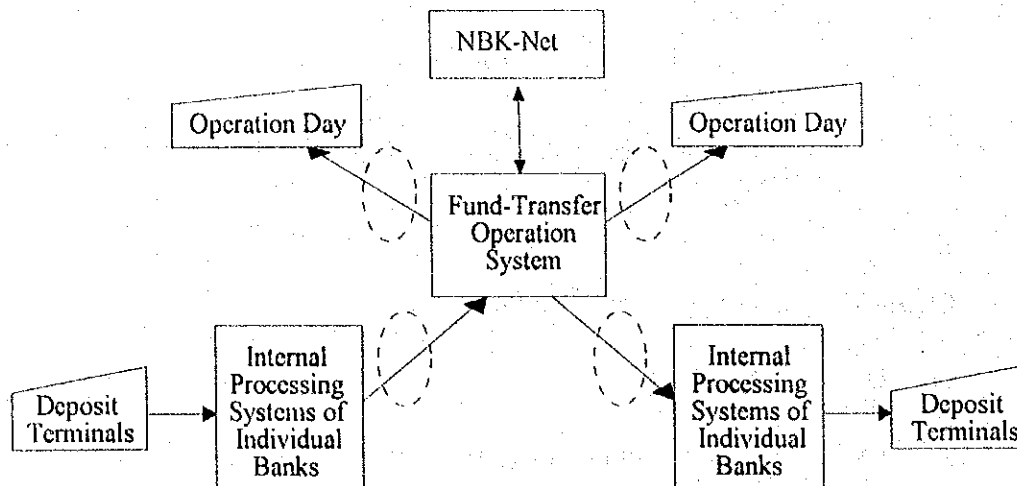
Apart from intra-office deposits and withdrawals, these functions are offered through the Network Sub-system.

Especially for inter-bank transfers, the Network Sub-system would need to offer the following functions depending on the nature of their banking systems (i.e. banks' own internal systems or the Operation Day system):

- a) Ability of the Network Sub-system to access the computers of banks
- b) Setting up (registering) routes to pass fund-transfer messages to the Fund-Transfer Processing System, banks' internal systems, and Terminal Sub-systems.

(See Figure 10-19.)

(Figure 10-19)



For both functions, deposit and withdrawal services will be provided by banks' own internal systems or Operation Day.

The following is an outline of applications systems to be developed:

(a) Functional expansion of the Fund-Transfer Processing System

- a) Calculating net positions of debits and credits among banks by the type of deposit/withdrawal messages for inter-bank deposits and withdrawals
- b) Requesting fund transfers among the NBK current deposit accounts according to the total balance of the net positions after on-line communications of the day
- c) Calculating the number and amounts of inter-office and inter-bank deposits and withdrawals
- d) Create and return documents (account data) in batches

(b) Functional expansion of the NBK-Net System

- a) Transferring the funds between NBK current deposit accounts according to the total balance of inter-bank net positions in response to a request from the Fund-Transfer Processing System
- b) Create and return documents (account data) in batches

(4) Account Information Service

1) Outline of functions

The new payment system's network system would provide account information service in which the dedicated transfer system of a bank office could forward such account data as office balances to the internal system or other offices (specifically to the dedicated transfer system of the other offices) of the bank.

2) Outline of developments

This service would be offered using the broadcast function of the dedicated transfer system. The Network Sub-system would need new message routes to pass transmission messages such as account information to the Fund-Transfer Processing System and banks' internal systems.

The following is an outline of applications systems to be developed:

(a) Functional expansion of the dedicated fund-transfer system

a) Provide screen interface for entering account and other data

The system would provide a screen interface for entering data in a free format because the contents and formats of messages that users need to transmit vary greatly among different banks (individual banks must establish their own rules on the contents of messages and use of formats)

b) Functional expansion of the Fund-Transfer Processing System

- Typing fund-transfer messages such as account information

(5) Transfer Service for Foreign Exchange Som-Clearing Messages

1) Outline of functions

Message transmission service to settle soms in foreign exchange is a service offered by the Network Sub-system of the new payment system to transmit foreign exchange settlement messages from the dedicated fund-transfer systems to their internal systems or to the dedicated fund-transfer systems of other banks/branches.

This service would also support a formatted input screen and remittance processing as well as check, correct, authorize and transmit input data.

2) Outline of developments

(a) Functional expansion of the dedicated fund-transfer system

- a) Enter data for foreign exchange settlement of soms
- b) Check, change and cancel input data
- c) Authorize input data and transmit them in the form of messages

- (b) Functional expansion of the Fund-Transfer Processing System
 - a) Request fund transfers among the NBK current deposit accounts by typing the Som settlement messages
 - b) Create and return documents (account data) in batches
- (c) Functional expansion of the NBK-Net System
 - a) Execute fund transfers among the NBK current deposit accounts by typing the Som settlement messages
 - b) Create and return documents (account data) in batches

In addition, this service would require that routes be set up (registered) to pass foreign exchange settlement messages to the Fund-Transfer Processing System, banks' internal systems.

(6) Functional Expansion of Payroll Service (process after on-line operation hours of a day)

1) Outline of functions

In Phase II, a full scale service would be needed to accommodate a large quantity of data for payroll service. The following service will replace the one offered in Phase I.

- a) Exchange data among banks/branches in a region at the regional clearing center level if possible.
- b) Calculate the net positions by bank for all payroll data brought into the RCC
- c) Forward fund-transfer messages to the Fund-Transfer Processing System at the communication center for inter-regional fund transfers (unlike normal bank-transfer operations, immediate gross settlement will not be used. The system only transmits fund-transfer messages.)
- d) Transmit fund-transfer messages to the Fund-Transfer Processing System to transfer net positions and settle the results of netting

2) Outline of developments

(a) Functional expansion of the RCC data entry service system

- a) Floppy disc exchange function**
- b) Calculate the inter-bank net positions among banks by value date (for all payroll data)**
- c) Transmit fund-transfer messages to the Fund-Transfer Processing System to transfer net positions**
- d) Forward inter-regional fund-transfer data to the Fund-Transfer Processing System**
- e) Prepare and return documents in batches**

(b) Functional expansion of the Fund-Transfer Processing System

- a) Add fund-transfer messages to carry-over Q file for processing after on-line operation hours**
- b) Prepare and return documents in batches**

In addition to the above, the network sub-system would need to set up (register) a message route to transfer to receiving banks a new type of fund-transfer message that transfers messages but does not perform immediate gross settlement.

(7) Expanding Automatic Transfer Service (processing after on-line operation hours and backward processing)

1) Outline of functions

As in the case of payroll service, a full scale service would be offered in Phase II. The specific services are as follows:

- a) Exchange automatic transfer data brought into the RCC if they are exchangeable within a region.**

- b) Calculate net positions by bank for all automatic transfer data brought into the RCC (netting service)
- c) Forward automatic transfer data to the Fund-Transfer Processing System at the communication center after creating backward fund-transfer messages for inter-region transfers. (This is a backward transfer service for inter-regional fund-transfer data. This represents a new message type which transmits fund-transfer messages to receiving banks but does not use immediate gross settlement.)
- d) Forward fund-transfer messages to the Fund-Transfer Processing System to transfer net positions and settle the results of netting.

2) Outline of developments

- (a) Functional expansion of the RCC data entry service
 - a) Floppy disc exchange function
 - b) Calculate net positions among banks by value date (for all automatic transfer data)
 - c) Transmit fund-transfer messages to the Fund-Transfer Processing System to transfer net positions
 - d) Forward inter-regional fund-transfer data to the Fund-Transfer Processing System
 - e) Prepare and return documents in batches
- (b) Functional expansion of the Fund-Transfer Processing System
 - a) Add fund-transfer messages to carry-over Q file for processing after on-line operation hours
 - b) Prepare and return documents in batches

In addition to the above, the network sub-system would need to set up (register) a message route to transfer to receiving banks a new type of the fund-transfer message that transfers messages but does not perform immediate gross settlement.

10-2-2 Preliminary Design of the Network System

In the present chapter we shall examine the overall functions of the network systems which are to make up the electronic payment system.

10-2-2-1 Functions of the Network System

The systems of the overall network which are concerned here are the regional node systems to be introduced in each of the regional areas concerned together with the message switching system which is to be set up at the center of the system. The basic functions of these systems are as follows;

- the provision of communication channels linking the systems of the settlement center and the head branches of the commercial banks.
- reception of messages from the sub-systems of the network
- inspection of messages (principally of the header sections)
- cumulative exchange (switching) of the messages received
- status control of messages being exchanged
- response to inquiries and request for information

In order to permit the operation of the basic functions outlined above to be implemented the following auxiliary functions will be needed;

- approval and supervision of terminals and user access
- management of messages according to category
- coding of the messages being transmitted
- supervision of systems and devices which are linked to the network

10-2-2-2 Data Handled by the Network System

(1) Categories of Data being handled

The data being handled by the sub-systems of the network are the messages which originate and are transmitted within the subsystems of the network. The messages can be divided into administrative messages originating in the application systems and instructional operative messages originating from outside of the application system.

The administrative messages are defined by the application system itself and these are omitted here. In the following we have listed the varieties of instructional operative messages which will arise.

- messages of irregular data (the message header section)
- messages regarding the state of systems operations
- messages between operators
- messages in connection with notification of a malfunctioning of a device or a systems disorder
- command messages between systems sent due to operation commands received from an operator at a distance

(2) Data Formats

(A) Message Formats

Please refer to 10-2-1-2.

(B) File Format

It will probably prove difficult for many regional branches to be permanently on line with the settlement network system because of limits in terms of equipment and the situation for communications channels. Therefore the regional branches will need to temporarily store data in their terminal systems and send or receive messages in blocks. Transmission of such blocked data will use the file as the basic transfer unit so that forwarding methods will be called file forwarding.

For such files it will be possible to insert several messages in the body section and this will be enveloped by the file header and file trailer sections. The following diagram illustrates a file format.

File header (one per file)	Start marker	Sender	Terminal ID	Security code
	Date created	Time created	File length	No of messages
File body	(Message records)			
(plural bodies acceptable)	Message header	Message body	Message trailer	
File trailer (one per file)	Authentication code	End marker		

10-2-2-3 Outline of Individual Functions

(1) Provision of Transmission Routes between the Terminal Subsystem points and the Host Subsystems

During operational hours the network systems will normally be linked with each other (please refer to the section on network topology). The regional node system will be responsible for messages with the terminal subsystems while the message switching system (hereafter referred to as MSS) will be in charge of messages with the host subsystems.

The transmission routes between the individual subsystems will be as follows;

Regional node subsystem	Dedicated terminal subsystems Operation day interface subsystems RCC substitution input subsystems	Public or telegraph lines (ditto) LAN
Message switching System (MSS)	Regional node systems other than Bishkek Regional node systems in Bishkek	Leased line or long distance transmission service LAN bridge
Message switching system (MSS)	Fund-transfer processing system Host system of commercial banks	LAN bridge Leased lines

The RCC substitution input system is a client system of the Regional node systems and will be installed in the same building.

The MSS and the Bishkek regional node system are to be installed in the same building in Bishkek.

The linking of the MSS and commercial bank host system is to be a CPU link in response to requests made by the commercial banks themselves.

(2) Receipt of Messages from the Sub-systems

The subsystems of the network will receive messages from the other subsystems to which they have been linked. However in the case of the regional node subsystems which carry out file forwarding operations with terminal subsystems the body of the received file will be broken down into its individual component messages. The received messages will immediately be stored into the log file of the system in the form of transmission records. The messages will then be placed in order of receipt and held on waiting for processing in accordance with the steps outlined below.

(3) Message Validation

In order to circumvent any problems such as falsification/alteration, incorrect network connections, message deformation during transfer, etc. in the case of the MSS and regional node systems it is essential to carry out an inspection of the validity of the messages received. The following inspection items are to be implemented principally with regard to the header section of the message.

- Terminal inspection to confirm that the registered terminal is concerned
- Serial number at the terminal to ensure that the figure is larger than the last serial figure of the previous day
- Message identification to confirm that the recorded message category corresponds
- Message priority to ensure that tolerated parameters are observed
- Message length to confirm that the message matches actual message length
- Addressee to confirm that the sender is the registered body or user
- Originator to confirm that the originator is the registered body or user to ensure that the originator has the right to use the terminal concerned.
- Date of creation at the terminal to ensure that this is prior to the present day of inspection

If any irregularity is found among the above items then the handling subsystem will produce notification of irregular data and send this to the originator. However in the case of identification of irregularity of an originator or identification of a security risk then the notification of irregularity will be sent to the MSS operator.

(4) 'Store and Forward' Received Messages

In general terms, this sort of network is risky in comparison to a computer system. It is possible that a computer system will not be able to send out the messages which are produced one after another. Also in cases where the speed of message dispatch differs from the speed with which messages are received there may arise a situation where messages cannot be sent as fast as they are received. In such cases the line of messages waiting to be dispatched will lengthen and this can be a hindrance to system operating. However with the system concerned here messages waiting for dispatch are placed on a waiting list according to precedence and are recorded in the auxiliary

back up memory so that the system is unburdened and the danger of the subsystems and network falling into a state of data lock is circumvented.

Further, even if the forwarding function is temporarily lost or impaired the data awaiting transmission would be stored in the system and once transmission functions were made operational again then forwarding would proceed from the next message in the waiting line.

(5) Status Control of Messages being Exchanged

The status of messages being exchanged is recorded on the MSS or the regional node system. In particular, attention is given to recording of status control in the case of messages treating settlement processing in the remittance systems, and messages sent out from the MSS to the branches after settlement processing is completed. These records are stored in the log file with the following details.

- Application identification	'Inter-bank payment' 'Intra-bank payment' etc.
- Terminal identification	(As received)
- Serial number at the terminal	(As received)
- Message identification	(As received)
- Message length	(As received)
- Addressee	(As received)
- Originator	(As received)
- Date of creation (at the terminal)	(As received)
- Status of message	'Waiting for transmission' 'Transmitted to MSS' 'Under settlement' 'Delivered to Regional Node System' 'Delivered to the addressee'
- 'Received-from' terminal/system	Device at where the message was received
- Date of logging	System date
- Time of logging	System time
- 'Sent-to' terminal/system	Device to where the message was sent

This log book data together with the terminal ID and its serial number is used as a unique key for message tracing when there are network malfunctionings or for reference purposes.

(6) Reply to inquiries

In the network system postulated here the regional node system receives the message reference with the terminal identification and serial number of the terminal from which it originates as determined in the network. This message is then broadcast within the network to either the MSS or to the regional node system.

The system which receives the reference message requires the message to show its status credentials which are compared with the data contained in the log of the receiving system. The details of status credential display are as follows;

(Figure 10-20)

- Message header	To be determined in later stage
- Message id. of inquiry	As received
- Terminal identification	As received
- Serial number at the terminal	As received
- Indication of reply	(To indicate the start of reply)
- Message identification	As on the log
- Message length	As on the log
- Addressee	As on the log
- Originator	As on the log
- Date of creation	As on the log
- Status of message	As on the log
- 'Received-from' terminal/system	As on the log
- Date of logging	As on the log
- Time of logging	As on the log
- 'Sent-to' terminal/system	As on the log
- Message trailer	To be determined in later stage

The party carrying out the inquiry will make an overall evaluation of the above inquiry items which will enable the party to postulate the present state of the message being considered. It is possible for terminal systems to be equipped so as to enable these to carry out automatic evaluation of the immediate situation but it will need to be decided at a later stage whether such programming provisions are necessary or not.

(7) Approval and Supervision of Terminal and User Access

For security purposes it will be necessary to register and supervise the terminal points to be linked to the systems of the network. The users of these terminals will also need to be registered and supervised for the same reasons (please refer to the later section on data structures).

- A unique ID is to be accorded to each terminal and this must be indicated when editing the message header
- The branches of the commercial banks which are the main users will also be given unique branch ID numbers which must be indicated when editing the message header
- Each individual branch ID must indicate the terminal IDs which can be used under its authority
- the network systems will carry out a check on the above points when it receives a message in order to confirm the acceptability of messages
- If the above confirmation inspection reveals any irregularity or inconsistency the message concerned will be treated as an error and a notification of irregularity (error) be sent either to the system operator or to the MSS operator. No notification of error will be sent to the originator of the message.

(8) Supervision of Transmitted Messages by Category

As with the terminals and users the messages themselves will need to be managed and supervised according to their category and status. The main reasons for such supervision are as follows;

- to stop the infiltration or entry of unauthorized messages
- to clarify systems operations and render these open to scrutiny by recording data on the handling of messages
- to make it easier to add to a message or change the handling operations for a given message type
- since processing methods will result in the storage of data and not of programs the maintenance burden on the system can be reduced.

The supervision to be carried are as follows;

- subsystems authorized to originate messages
- subsystems in charge of final processing of the transaction data on the messages (the message body)
- checking whether there are any notifications or messages from the data processing systems
- methods of producing and transmitting notification
- the addressees of produced messages
- whether there is a message confirming receipt from the receiver
- whether reporting of completion of transmission is necessary

(9) Encoding/Decoding of Transmitted Messages

This is discussed in the section 10-2-1.

(10) Monitoring subsystems and equipment connected to the Network

The smooth and safe operation of its computer network is an absolutely essential condition for the running of an electronic payment system. It is therefore necessary to supervise the operating condition of the lines serving the network subsystems and the equipment of individual component systems. The following outlines the main supervising functions concerned;

1. The introduction of supervising software (for example SNMP products) to the MSS and regional node systems
2. The establishment of management functions in charge of the network supervisory software of the MSS and the establishment of supervising and reporting functions for the regional node systems.
3. Establishment for a system of notification to the MSS of the important aspects of network activity of the regional node systems.
4. Functions in the MSS for examining the network structure and network activity data (3 above) and for judging whether any action is necessary in relation to these.
5. An alarm system to indicate on MSS screens when response or action is judged necessary.

When operator intervention or response is required then the impedimental actions taken will be recorded within the MSS. In order to permit a fast restoration of normal

channels and services it is advisable to consider establishing network supervisory systems which include impediment management functions such as automatic retesting and guidance, restoration management control, etc.

(11) The output of network system

The output from the network related subsystems can be determined as follows.

1) List of network definitions

This type of listing is to ensure the users and terminals which are authorized to use the computer network of the payment system. Included are:

List of authorized users	List of banks and their head and branch offices which are authorized to send and receive messages through network. These banks and offices are shown with the authorized terminals for their use
List of authorized terminals	List of terminals which are authorized to connect to, to send messages to, and to receive messages from the computer network. (Actual connection being made to the Regional node subsystem)

2) Summary of transmission in a day

A few types of summary reports are recommended to confirm the latest situation of traffic on the network.

Summary of messages by bank & branch	To see the data volume generated and transmitted from each offices of user banks to others
Summary of traffic by addressee node	To see the load of communication lines between Regional node subsystems and Message switching subsystem

3) List of unusual cases

This type of listings is to see unusual occurrence or exceptional situation on the network.