



**Office of Transport and Traffic Policy and Planning
Ministry of Transport**

Program Management Services : PMS



Operation Guideline Report for the Common Ticketing Office



Avantgarde Capital Co., Ltd.



Korea Smart Card Co., Ltd.



PSK Consultants Co., Ltd.

August 2014



Program Management Services (PMS)

Operation Guideline Report for the Common Ticketing Office

By

Avantgarde Capital Company Limited

Korea Smart Card Co.,Ltd.

PSK Consultants Co., Ltd.

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Chapter 1 Introduction

In this operation guideline report for the Common Ticket in company, the Program Management Services (PMS) consultant of Avantgarde Capital Co., Ltd., PSK Consultants Co., Ltd. and Korea Smart Card Co., Ltd. (the consultant) is going to present operational procedures of Common Ticketing Company (CTC). The consultant has studied, analyzed and presented an appropriate formation by taking the operational flexibility and efficiency into consideration as well as proficiency in operating and developing of common ticketing system for continuous and effective operations. The conclusion is made to establish CTC in form of a private limited company. The details of operations in this report consist of the following topics;

- (1) Background
- (2) Laws related to the Common Ticketing Company's Operations
- (3) Authority and duties of Common Ticketing Company
- (4) Operational Plan and Duration
- (5) Required Activities

According to the topics, the consultants will present details of each topic to supplement the CTC's operational procedures, starting from the establishment guideline complying with the related, rules, regulations and requirements, as well as the Common Ticketing System's development and modification to be performed over time.

Chapter 2 Background

The Ministry of Transport (MOT) by the Office of Transport and Traffic Policy and Planning (OTP) has studied Common Ticketing System developmental project to apply the common ticketing system to transit sectors in order to link all mass transit systems; mass rapid transit, train, public bus, boat and expressway including non-transit applications. The Common Ticketing System development supports the Eleventh National Economic and Social Development Plan which focuses on Thailand's global competitiveness. At the meantime, it also supports environmental sustainability and complies with the government's strategy over rail mass transit system extension in order to solve the urban traffic problem.

On May, 3rd 2011, the cabinet passed a resolution approving OTP to study and develop the Common Ticketing System, and OTP has hired the consultants as the Program Management Services (PMS) to develop the common ticketing system for the public. It facilitates transportation for the public and saves their expenses as well. The government's policy is to speed up the common ticketing system development and to establish the Central Clearing House (CCH). As a result, the cabinet's resolution approved a budget for the common ticketing system management. The Program Management Services consultants are hired under a budget of approximately 10 million U.S. dollars (approximately 300 million baht), and under a budget of approximately 13 million U.S. dollars approximately 409 million baht is provided for the establishment of Central Clearing House (CCH). Annual budget allocation of 62.15 million baht was also allocated as the common ticketing system management expenses. OTP, with the supports from the PMS consultants, hired a contractor to develop common ticketing system and establish Central Clearing House (CCH) using international bidding for the tasks to be completed within 30 months. Moreover, the consultants study also includes a study possible alternatives of the common ticketing office establishment to act at the operational level for operation and maintenance of common ticketing system. The alternatives include the government agency, State-Owned Enterprise, public organization, foundation institute limited company and public company limited and limited partnership. In addition, five international common ticketing office models are studied to analyze the establishment's advantages and limitations and different forms of operations. After the analysis is performed, the consultants group summarizes and figures out suggestions for an appropriate form of establishment which is analyzed from various factors such as the

establishment duration, operational flexibility, possibility of establishment and competence for the public sector is regulatory.

The consultant studies five international common ticketing office models as follows;

- (1) Hong Kong Special Administrative Region of the People's Republic of China as a management organization of the common ticket called "Octopus".
- (2) Republic of Korea as a management organization of the common ticket called "T-Money"
- (3) Singapore as a management organization of the common ticket called "EZ-Link"
- (4) Japan as a management organization of the common ticket called "SUICA"
- (5) United Kingdom as a management organization of the common ticket called "Oyster"

With the details as follows;

1. Hong Kong Special Administrative Region of the People's Republic of China (Hong Kong)

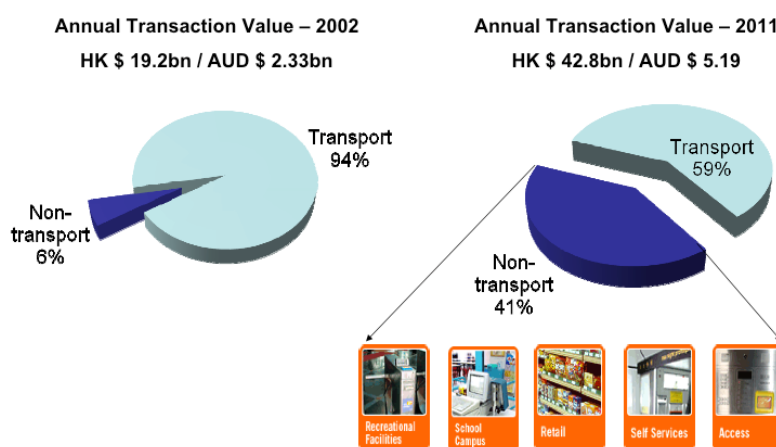
Hong Kong is the first place in the world that uses common ticketing system and smart cards. The project has been started since 1997 and took 3 years in the operation through OCTOPUS Card Limited (OCL) as the operator of the common ticketing and smart cards, which is in the Octopus Holdings Limited group.

OCL acts as the card issuer and clearing house. The ticket issued is called "Octopus" card. The cards were initially used in mass transit systems, and then in 2000 Hong Kong expanded its market to commercial applications (Non-Transit). As the result, Octopus cards can be used with different types of mass transit system, i.e., bus, mass rapid transit, tram, ferry, taxi, tour bus, including shopping and services in shopping malls, restaurants, movie theaters, hospitals, fitness centers, car parks and public services, etc.

During 2000 – 2011, there were 5,200 mass transit service providers and 12,000 shops participating in the system, so the uses of Octopus cards in transit and non-transit systems were increased from 6% in 2002 to 41% in 2011.

Figure 2-1 Proportion of Octopus usage in Hong Kong

Octopus in Transport and Other Businesses



According to statistic of the card usage in Hong Kong's mass transit systems, it is found that at the present the proportion of passengers using Octopus card in the mass transit system exceeds 90%. Whereas usage of Single Journey Ticket : (SJT), which is magnetic card, and cash in combination is lower than 10%. The fare of mass transit system is adjusted according to Fare Adjustment Mechanism (FAM) which is controlled by the government.

Moreover, Octopus was developed automatic ticketing system and automatic fare collection system for many countries e.g., Netherland, United Arab Emirates (Dubai) and New Zealand (Auckland).

According to the structure of Octopus Holding Limited, its shares are held by Hong Kong main mass transit leading operators which consist of

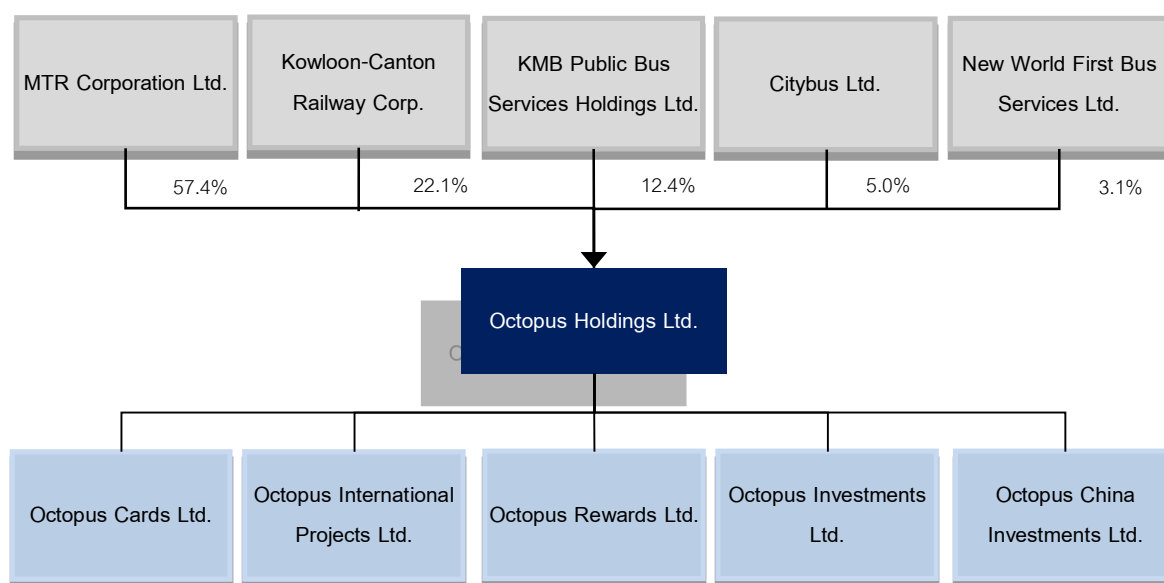
- (1) MTR Corporation Ltd. - a mass rapid transit operator MRTCL has a contract with the government to manage assets of Kowloon-Canton Railway Corp. (KCRC) for 50 years from 2007-2057.
- (2) Kowloon-Canton Railway Corp. - a construction contractor and an operator of mass rapid transit system.
- (3) KMB Public Bus Services Holdings Ltd. – an operator of public service buses in Hong Kong.
- (4) Citybus Ltd. – an operator of public service buses
- (5) New World First Bus Services Ltd. – an operator of public service buses (originally owned by Hongkong and Yaumatei Ferry)

In addition, Octopus Holdings Ltd. holds shares of the following subsidiary companies which are responsible for supporting the Octopus Holdings Ltd's operations;

- (1) Octopus Cards Ltd. – an operator of contactless smart card systems
- (2) Octopus International Projects Ltd. – an operator of automatic fare collection system both in Hong Kong and internationally
- (3) Octopus Rewards Ltd. - responsible for the development and management of the Octopus customer loyalty platform
- (4) Octopus Investments Ltd. - an investment company
- (5) Octopus China Investments Ltd. - an investment company for China-related projects

The proportion of Octopus shareholding shall be reviewed and adjusted according to the number of Octopus card usage in each type of mass transit.

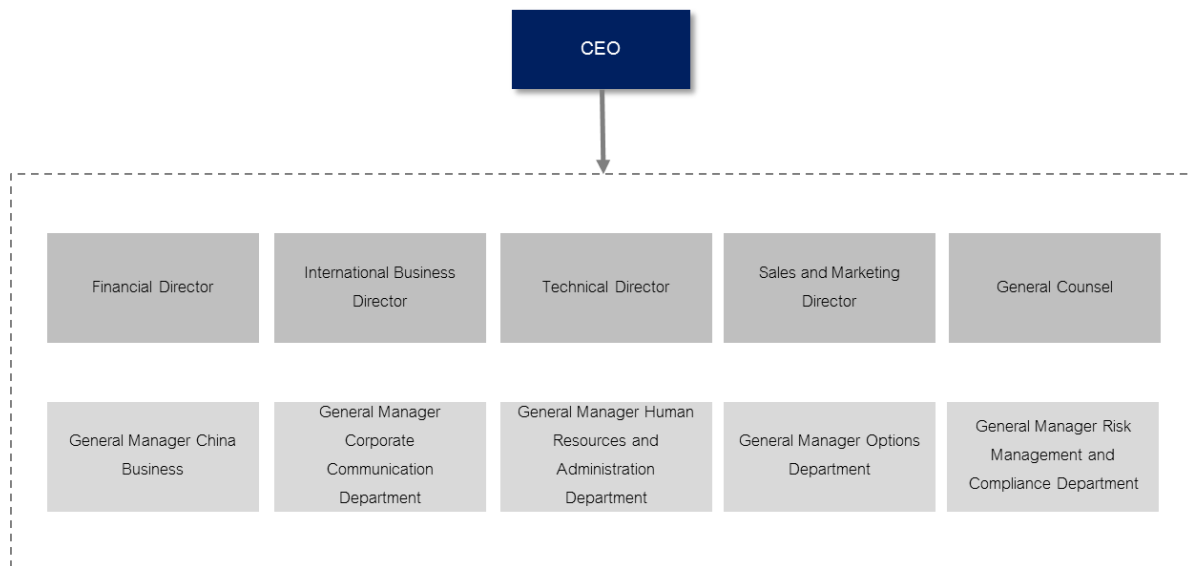
Figure 2-2 Structure of Octopus Holdings Limited



Source: Octopus Holdings Ltd.

The Octopus organization structure consists of the top executive or Chief Executive Officer (CEO) who regulates and controls the overall organization, Director who supervises finance, international business, technique, sales and marketing, General Counsel and General Manager who supervises the organizational communication, human resource management, business operation, risk management and compliance as shown in the chart.

Figure 2-3 Executive Structure



Source: Octopus Holdings Ltd.

2. The Republic of Korea (South Korea)

Common Ticketing System management started from use of Automatic Fare Collection in mass rapid transit system and public buses to solve traffic problem, and then it is extended to non-transit applications. Seoul's local government called for bidding for the common ticketing system the concession was granted to Korea Smart Card Co., Ltd. (KSCC), which is owned by LG CNS Co., Ltd., equipment manufacturer, and 13 financial institutes and it is 35% owned by the local government. KSCC modifies all existing fare collection systems to be on a par with the standard required by the government. Who shall supervise the operation of KSCC.

South Korea's common ticketing system started in 2003. Cash card and credit card service providers and banks are responsible for issuing the card and KSCC acts as medium for the customers, service providers and card issuers, known as T-Money. Initially, it was Microprocessor – based card using MIFARE Classic technology which was an Off-the-Shelf product to make sure that the common ticketing service could be operated according to its schedule. Later, its own standard was developed. At the present, the card can be used with taxi cars, public buses, including convenient stores, restaurants and movie theaters. However, both types of cards are still in use at the current of which 60% are Type A cards. Moreover, South Korea also has other clearing house such as Lotte's Cashbee, which was also originated from the MIFARE Classic but with different card data structure from the KSCC's MIFARE. Some cards which are newly launched by Cashbee use standard of KSCC version 2.0. At the present, South Korea's system supports many card standards, so its cross-system data processing might be rather slow.

Common ticketing of KSCC is a large system, which is able to support a large amount of usage and it is among the top most effective system in the world. South Korea is one of the countries that become successful in the total system reform, using the road traffic reform through re-routing public bus and express bus and providing car parks in order to solve the traffic problem. This includes the mass rapid transit network operation using new fare scheme.

T-Money usage rate by the customers is as follows; public bus 93%, subway 100% and taxis 30%. It can be used for traveling in Seoul and other cities as well such as Incheon and Busan, etc.

In Republic of Korea, the common ticketing office is Korea Smart Card Co., Ltd. which is established as a limited company jointly owned by the public and private sectors. The KSCC's

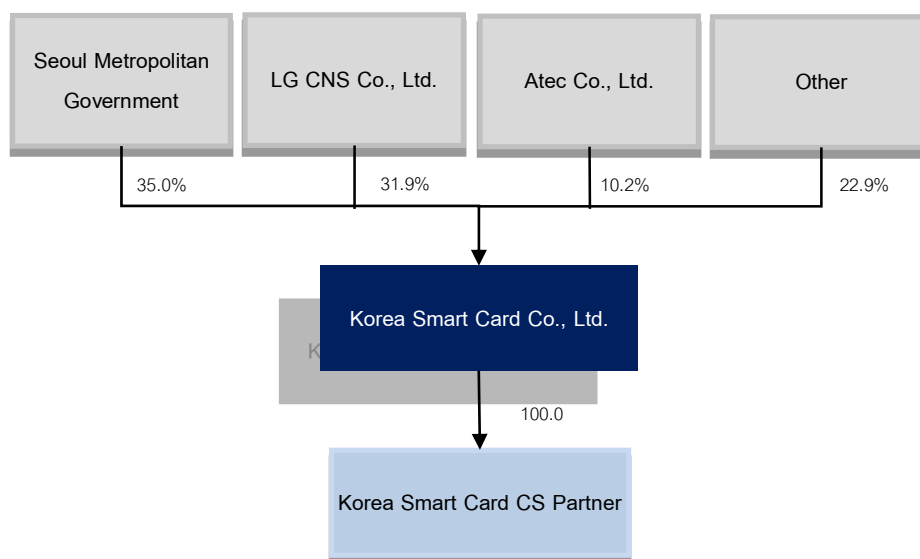
major shareholder is the public sector while the private sectors are the leaders of Information Technology.

KSCC is established through cooperation between the public and private sectors. Its major shareholders are as follows;

- (1) Seoul Metropolitan Government is responsible for Seoul's mass transit system management, determination of the mass transit fare rates and routing.
- (2) LG CNS Co., Ltd. operates Information Technology related services.
- (3) Atec Co., Ltd provides Information Technology related services for the transit card business, displays and systems.

The KSCC issues the cards and provides clearing services (Clearing House).

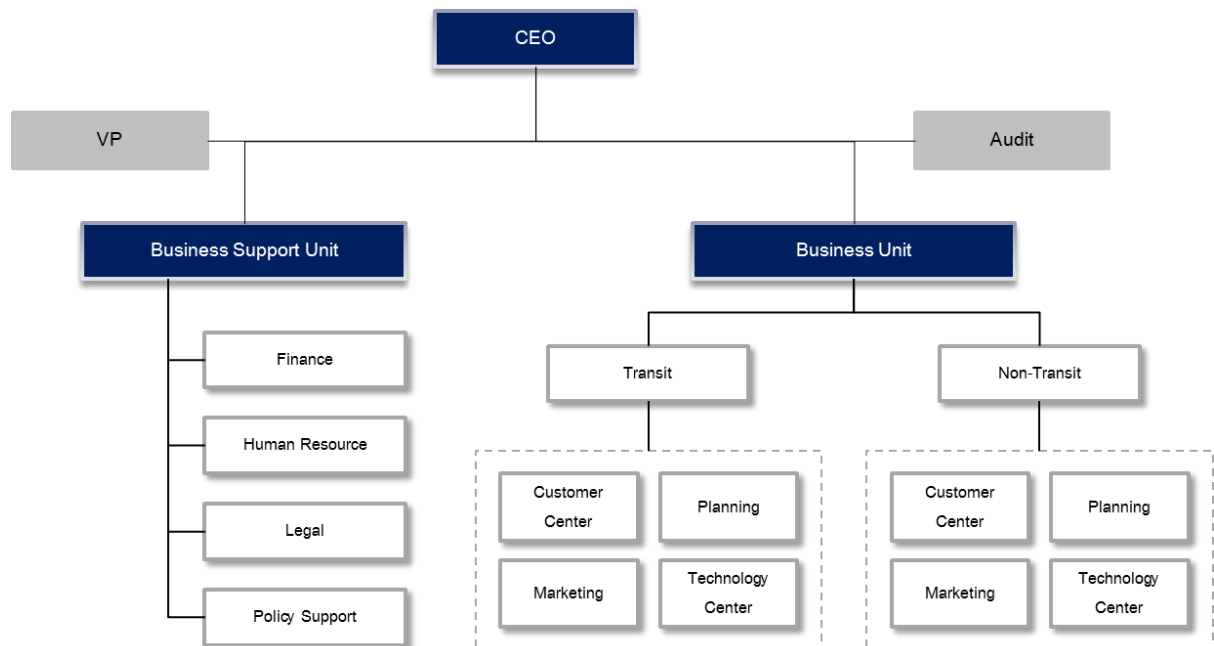
Figure 2-4 Structure of Korea Smart Card Co., Ltd.



Source: Korea Smart Card Co., Ltd.

KSCC's structure is divided into 2 parts; 1) business operation supports consisting of finance department, human resource department, legal department and policy support, and 2) business components divided into 2 parts, i.e., transit section and non-transit section, each section consists of customer service, planning and marketing departments, and technology center as shown in the chart below.

Figure 2-5 KSCC Organization Structure



Source: Korea Smart Card Co., Ltd.

3. Singapore

Singapore's common ticketing system is operated by TransitLink Pte Ltd., which is government. In 1990, through the government's financial support, the company launched Transit Link card which was still a magnetic card. The public bus fare is set in steps, while the mass rapid transit charges its fare according to distance-based.

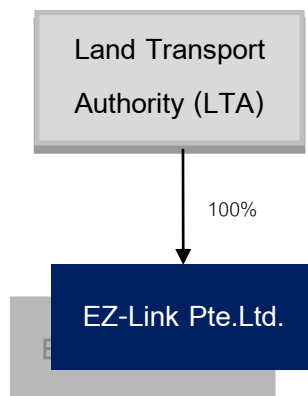
Later in 2002, Singapore's Land Transport Authority (LTA) formed a private company, EZ Link, to operate the issuance of smart card common ticket, called EZ-Link to be used in the mass rapid transit and public bus using the same fare rates. The use is then expanded to non-transit applications.

EZ-Link is wholly owned by LTA with registered capital of 14.54 million Singapore Dollar or 340 million baht. EZ-Link is responsible for the sale and management of EZ-Link cards (Singapore's common ticket), as well as management of central clearing house for the transit and non-transit operators. Introduced in April 2002, EZ-Link is regulated by the Monetary Authority of Singapore and the Public Transport Council sell.

The EZ-Link cards are used to pay for public bus, Light Rail Transit fare (LRT), Mass Rapid Transit (MRT) and taxi fares, including payments for goods and services in shopping malls, restaurants, school's canteens and public services. Moreover, the EZ-Link card is further developed to substitute as an Identification Card, student card, or soldier ID cards for male juveniles conscripted for army service.

From 2002 – 2008, EZ-Link has issued for more than 10 million EZ-Link cards (achieving the highest share in the pre-paid cash card market in Singapore), and in December 2008, EZ-Link launched new EZ-Link cards, CEPAS cards (Contactless e-Purse Application, Prepaid Card) and Symphony for ePayment (SeP) system as Clearing House. It took two years for the design and it can be used more extensively and broadly such as all types of public service charge payments through electronic system, etc. To date, the number of EZ-Link cards in the system is in total of 12 million.

Figure 2-6 Structure of EZ-Link Pte.



Source: EZ-Link Pte. Ltd.

4. Japan

Japan's common ticketing system consists of many types of cards. Each type of card is used for transportation in specific zone in Japan. The major types of cards are as follows;

Table 2-1 Types of Common Tickets in Japan

Card Types	Operated by	Main Service Area	Sample of Card
SUICA	JR East	Greater Tokyo Area, Sendai and Niigata	
Toica	JR Central	Greater Nagoya and Shizuoka Prefecture	
Icoca	JR West	Greater Osaka, Okayama and Hiroshima Prefectures	
Kitaca	JR Hokkaido	Sapporo	
Sugoca	JR Kyushu	Fukuoka Prefecture	
Pasmo	Pasmo Corporation	Greater Tokyo Area	
Manaca	Nagoya City Transportation Bureau	Nagoya	
Pitapa	Surutto Kansai Association	Greater Osaka, Okayama and Shizuoka	

However, at the present, the common ticket which covers the largest area and has the highest number of users is SUICA card, operated by JR East Company, which has 40.74 million cards¹ in the system. SUICA card is the most developed one. As the result, it can be used with mass transit system in many areas in Japan and it can replace almost all types of transit cards.

JR EAST Company introduced SUICA card in 2001. It is Microprocessor card based on RFID technology which is developed by Sony known as FeliCa technology. It was first used in the mass rapid transit system and then expanded to the public bus and taxi. In 2004, its use was expanded to non-transit applications such as convenient stores and restaurants. SUICA card provides service to 12 mass transit systems covering Kanto, Sendai and Niigata.

Then, JR Group made an agreement to create the card's interoperability, since all systems in Japan already use FeliCa technology but their data structure standards are different. The improving plan for the cards to use the same data structure standard for the interoperability is performed based on SUICA and PASMO existing data structure standard in order to minimize effects caused to the passengers.

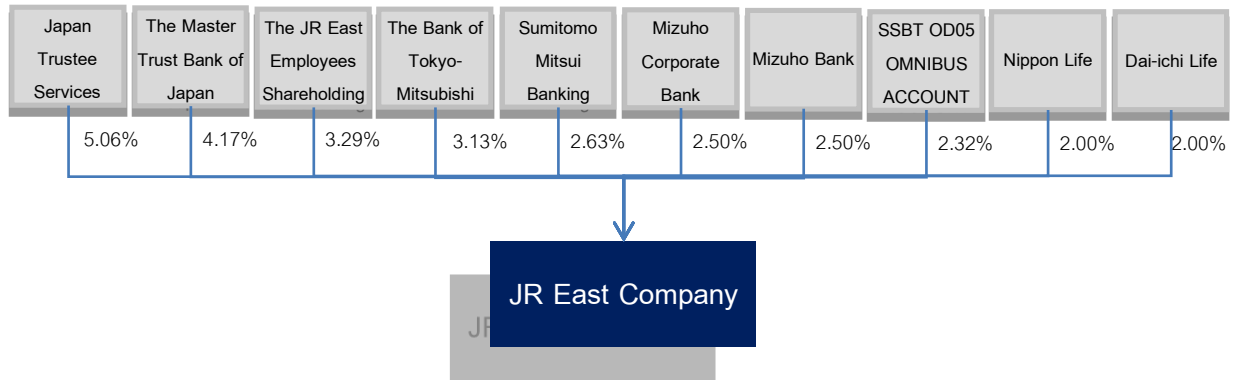
In 2008, the company cooperated with the Central Japan Railway to enable interoperability with TOICA card, so that its service area would be extended to cover Tokai, Kinki, Okayama, and Hiroshima. Moreover, it also cooperated with the Hokkaido Railway Company to enable interoperability with Kitaca card in 2009. It cooperated with the Kyushu Railway Company and the Nishi-Nippon Railroad to enable interoperability with SUGOCA and Nimoca card in 2010, and the Fukuoka Transportation Bureau in 2011 to enable interoperability with HAYAKAKEN card. For the two remaining cards, it was planned to be completed in 2013. Consequently, SUICA and all cards in the project can be used with other common ticketing systems covering almost all the areas.

In the past, the East Japan Railway was only a part of the Japanese National Railways wholly owned by the Japanese government. Then in 1987, the government privatized it to become 7 private companies which are divided according to each zones. The East Japan Railway manages the mass transit system in Eastern Honshu which is located by many major cities such as Tokyo, Yokohama, Nagoya, Kyoto and Osaka.

¹Source: FY2012.3 Financial Results Presentation, https://www.jreast.co.jp/e/investor/pdf/2012_presentation.pdf

Later in 2012, the East Japan Railway has successfully listed in the Tokyo Stock Exchange. At the present, the top ten shareholders are as follows;

Figure 2-7 Structure of JR East Company

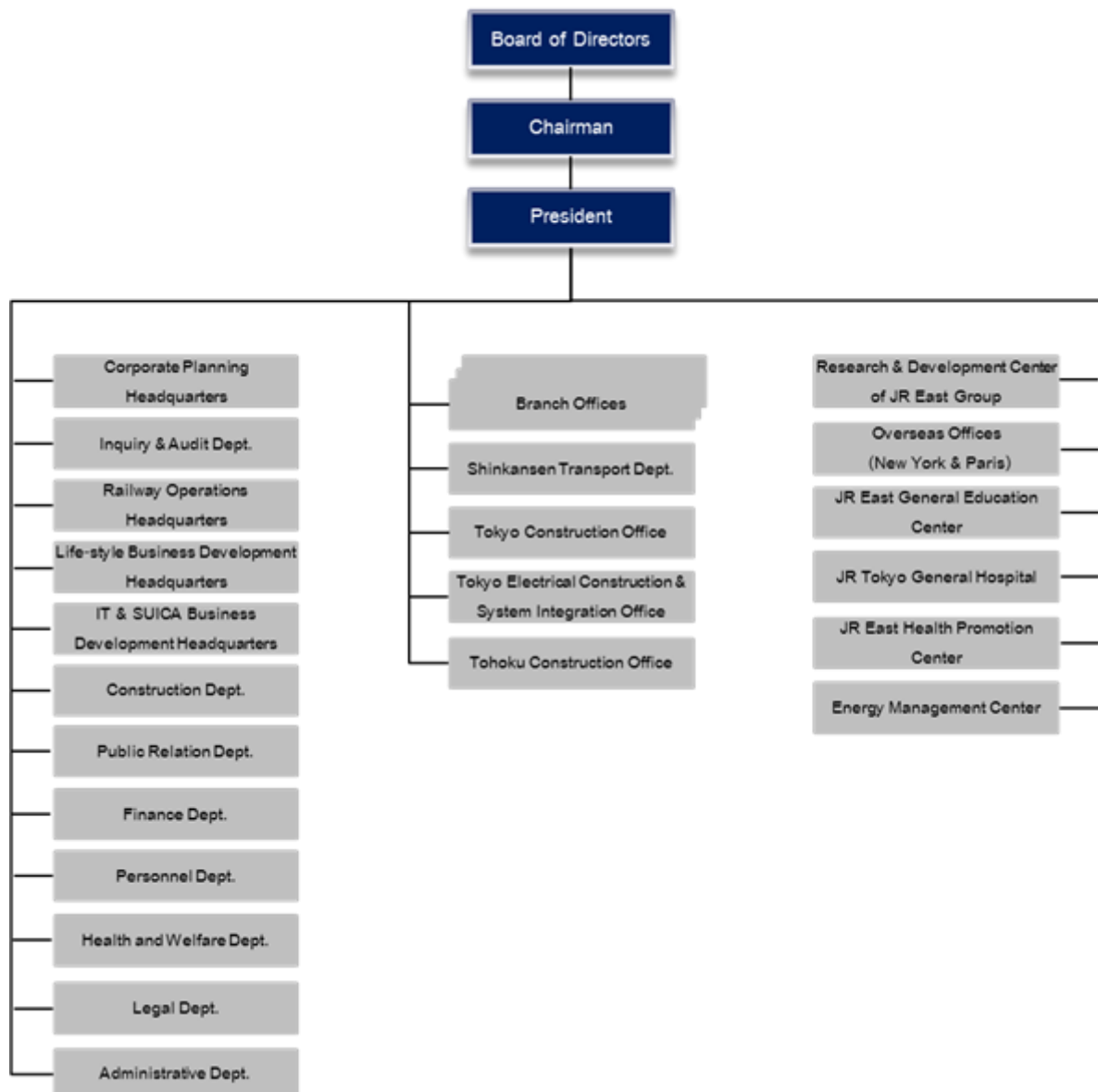


Source: JR East Company

JR East has a large organizational structure. Since it is a large public limited company, it consists of many departments and regulating bodies, namely the Board of Directors, the Chairman and the President as the top management, as well as other departments and branch offices² as shown in the chart.

² Tokyo branch, Yokohama branch, Omiya branch, Hachioji branch, Takasaki branch, Mito branch, Chiba branch, Sendai branch, Morioka branch, Akita branch, Niigata branch and Nagano branch

Figure 2-8 Structure of JR East Company



Source: JR East Company

5. United Kingdom (London)

London's common ticket was introduced in 2003 by the Transport for London (TfL) operating under the Mayor of London, which manages and monitors the mass transit system in London according to London Mayor's policy. It includes London buses, London Underground, Docklands Light Railway (DLR), London Overground, Tramlink, London River Services and Victoria Coach Station. London's common ticket is called "Oyster" card which can be used with different mass transit systems; rail, water, land and air transit.

At the early stage, Oyster card was managed by a Consortium called TranSys, consisting of Cubic Transportation System, Inc. HP Enterprise Services Fujitsu Ltd. and WS Atkins PLC. The company made a contract with TfL in order to develop, install, manage and maintain the automatic fare collection system, including the Oyster card. The contract's term was 17 years, starting from 1998. However, in 2008 TfL terminated the contract with TranSys and made a new contract with Cubic Transportation System, Inc. in 2010.

The Oyster card management model by London's local government is a good example, since it focuses on the mass transit system management and takes long-term changes into consideration. For a short operational plan, TfL chooses to adopt Mifare DESFire EV1, which is currently available as Off-the-shelf product, instead of determining the card's own central standard. In the long run, it is planned that bank will be designated to issue the card using EMV (Europay, Master and Visa) standard, which is credit card standard. Therefore, TfL does not necessarily use its resources for the technology and standard development, but it focuses on providing services and reducing cost. In addition to the use of EMV, the system is to be changed to Open Loop Account Base System. However, such change requires good infrastructure and stable communication system, so TfL has studied and planned for this in the future.

In 2014, TfL planned to start using the EMV standard, but processing speed was still be a problem. At the present, the processing speed reaches 500msec/transaction, which needs to be improved in order to start using the EMV standard. Regarding (Near Field Communication (NFC), it is currently under an operational test, and TfL will gather all transit information, and hire a private company to form the Automatic Fare Collection (AFC) System and the Central Clearing House (CCH). Vision 2030 policy has been launched. London is going to develop Bus Rapid Transit

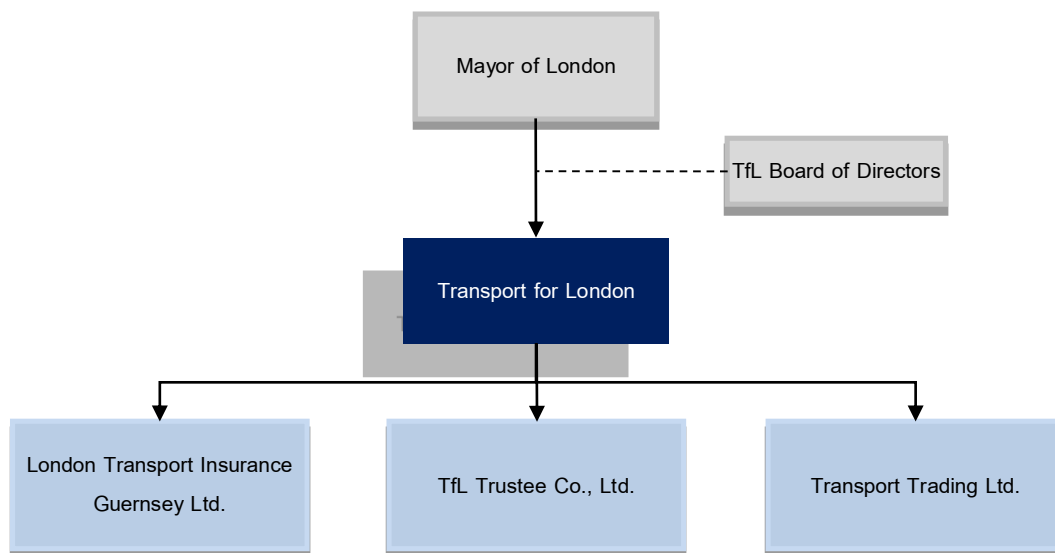
(BRT) system and bike lanes, including additional footpaths in order to support the inevitable expansion of passenger transportation.

As a government organization, TfL is responsible for transportation and communication in the capital. It operates according to the Mayor's transportation strategic policy and manages the urban transportation services under the Mayor's responsibilities. In addition to the mass transit system managements, including issuing Oyster card as common ticket for the mass transit systems, TfL is also responsible for Collection of Congestion Charge, maintenance of 580-kilometer main road and all traffic lights in London, taxi regulations and controls, and supporting footpath and bike lane construction.

Moreover, TfL owns shares of three companies as follows;

- (1) London Transport Insurance Guernsey Ltd. which is established in order to support the insurance of London Regional Transport and its subsidiary companies
- (2) TfL Trustee Co., Ltd. operates as TfL Pension Fund's trustee
- (3) Transport Trading Ltd. is responsible for investments and trades for the mass transit service companies under TfL

Figure 2-9 Structure of Transport for London



Source: Transport for London

Table 2-2 Summary of Nature of Common Ticketing Offices in Foreign Countries

Country	Hong Kong Special Administrative Region	Republic of Korea	Singapore	Japan	United Kingdom
Service Provider	Octopus Holdings Ltd.	Korea Smart Card Co., Ltd.	EZ-Link	JR East Company	Land Transport Authority
Card Name	Octopus	T-Money	EZ-Link	SUICA	Oyster
Year of Establishment	2004	2003	2002	2002	2003
Type of Company	Limited Company	Limited Company	State Enterprise	Public Limited Company	Government body
Share Holding Structure	Held by Mass Transit Service Operators with MTR as major shareholder that holds 57.4% of shares	Held by government sector that develops systems and other private companies. Major shareholders are Seoul Metropolitan Government that holds 35% and LG CNS that holds 31.9% of shares.	100% owned by government sector; Land Transport Authority.	Top ten major shareholders are financial institutes and insurance companies	Operates as government body under the Mayor of London
Authorized Capital	n.a.	61,654.79 million won or 1,850 million baht	14.54 million Singapore dollars or 340 million baht	n.a.	n.a.
Number of Staff	n.a.	150	n.a.	59,130	n.a.
Number of Issued Cards	22 million	45 million	12 million	60 million	43 million
Number of Transactions per day	12 million	35 million	20 million	70 million	6 million
Transaction Proportion (Transit : Non-Transit)	59 : 41	n.a.	n.a.	50: 50	n.a.

Chapter 3 Laws Related to the Common Ticketing Office Operations

1. Laws and Procedures related to Formation of Limited Company

1.1 Laws related to Limited Company Formation

(1) Civil and Commercial Code

Limited company formation is required to be performed according to the Civil and Commercial Code Chapter 4, Part 1, Nature and Formation of Limited Companies.

1.2 Procedures of Limited Company Formation

Limited company formation procedures as stipulated in the Civil and Commercial Code are as follows;

- (1) A minimum of three promoters who are ordinary persons are required to subscribe their names to the memorandum of association. Every promoter is required to hold at least one share.³
- (2) The promoters have to manage for the reservation of the whole number of shares with which the company proposes to be registered.
- (3) When all the shares are reserved, the promoters must arrange invitation letters for general meeting of subscribers in order to hold the statutory meeting. The invitation for the meeting must be issued at least 7 days in advance of the meeting date.⁴
- (4) The general meeting of subscribers must be attended by the subscribers or their proxy not less than half of the total number of subscribers. After counting, the total number of shares must not be less than half of the total numbers of shares. The agenda to be considered at the meeting are as follows; draft of company regulation, ratification of any

³Civil and Commercial Code

Section 1097 Any three or more persons may, by subscribing their names to a memorandum and otherwise complying with the provision of this Code, promote and form a limited company

⁴Section 1107 When all shares to be paid in money have been subscribed, the promoter must without delay hold a general meeting of subscribers which shall be called the statutory meeting

The promoters shall, at least seven days before the day on which the meeting is to be held, forward to every subscriber a statutory report, duly certified by them, containing the particulars of the business to be transacted at the statutory meeting under the following section

contracts entered into and any expenses incurred by the promoters in promoting the company, appointment of the company's directors and auditors, etc.⁵

(5) After the statutory meeting, the promoters shall hand over all the business to the company's directors.

(6) The directors are responsible for managing the promoters and subscribers to pay not less than twenty-five percent of the share value which shall be used for the company's registration.⁶

(7) The formation of limited company according to the above procedures can be completed within the same day

Nevertheless, since the government stipulates that the Ministry of Finance holds shares of every company in which the government invests, the Ministry of Transport Communications or OTP is required to ask for specific permission from the cabinet in order to hold the newly formed company's shares. The cabinet might designate the Ministry of Finance as the shareholder and OTP as an authorized body to only regulate the common ticketing system. To buy the recently formed company's shares, OTP is required to follow the regulations as stipulated in the Ministry of Finance Regulations on Offering and Purchase of Shares by the Government Agencies B.E. 2535. The purchase of shares must be approved by the Finance Minister, and Deputy Permanent Secretary of the Ministry of Finance and Director-General of State Enterprise Policy Office shall sign the purchase order.

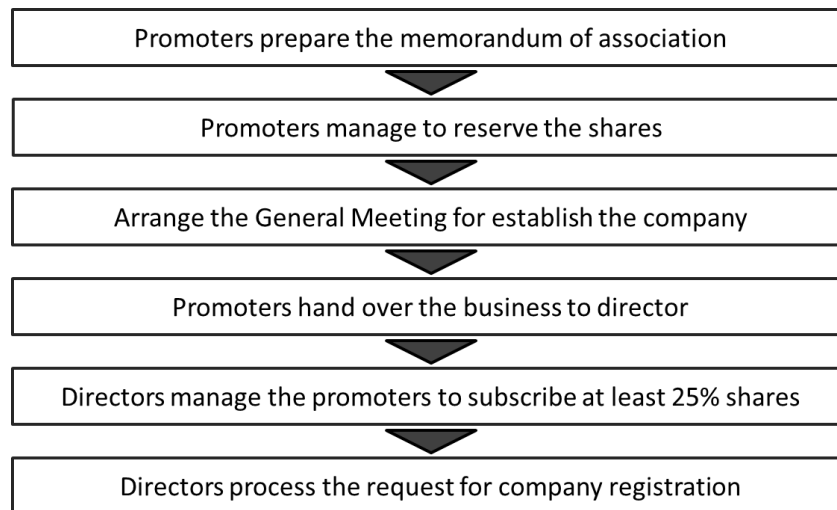
⁵Section 1108 The business to be transacted at the statutory meeting are as follows;

- (1) The adoption of the regulations of the company
- (2) Ratification of any contracts entered into and any expenses incurred by the promoters in promoting the company
- (3) The fixing of the amount, if any, to be paid to the promoters
- (4) The fixing of the number of preference shares, if any, to be issued, and the nature and extent of the preferential rights accruing to them
- (5) The fixing of the number of ordinary shares or preference shares to be allotted as fully or partly paid-up otherwise than in money, if any, and the amount up to which they shall be considered as paid-up. The description of the service or property in return for which such ordinary shares or preference shares shall be allotted as paid-up shall be expressly laid down before the meeting.
- (6) The appointment of the first directors and auditors and the fixing of their respective powers.

⁶Section 1110 After the statutory meeting is held, the promoters shall hand over the business to the directors.

The directors shall thereupon cause the promoters and subscribers to pay forthwith upon each share payable in money such amount, not less than twenty-five percent as provided by the prospectus, notice, advertisement or invitation.

Figure 3-1 Procedures of Limited Company Formation



2. Laws related to the Common Ticketing Office Operations

2.1 Laws related to e-Money Card Service Operations and Electronic Transactions

2.2 Notification of the Revolutionary Council No. 58 B.E. 2515 (1972)

The notification's objective is to control any financial business that has broad impact on the public security and well-being. Various laws are amended and combined into one. It stipulates that the following businesses require permission from the Ministry of Finance;

- (1) Insurance
- (2) Warehouse
- (3) Bank
- (4) Saving Service
- (5) Credit Foncier
- (6) Guarantee or Bill Purchase
- (7) Acquisition of capital fund and lending the money to other persons, or using that money for purchase or discount of bill of change, negotiable instrument or credit Instrument

Purchase, sale or exchange of assets or debt instruments such as bond, stock, debenture or commercial paper; operating as an agent, broker, manager or advisor for any investments in those instruments; providing a market or trading center for purchase, sale or exchange of those instruments.

2.3 Electronic Transactions Act B.E. 2544 (2001)

This act shall apply to all civil and commercial transactions performed by using electronic data, except the transactions prescribed by a Royal Decree to be wholly or partly excluded from this Act. The service providers related to electronic transactions shall notify, apply for registration or permission as prescribed in the Royal Decree.

2.4 Notification of the Ministry of Finance on Business that Requires a Permit According to Section 5 of the Notification of the Revolutionary Council No. 58 (Business of Electronic Money Card) B.E. 2547 (2004)

The Notification prescribes that issuance of e-Money by non-financial institutions, similar to commercial banks, or any businesses that issue e-Money as their own businesses for consumers for goods and service or other payments, are required to obtain permission.

2.5 Notification of the Bank of Thailand No. Sor Nor Sor 1/2550 on Determination of Rules, Procedures and Conditions of Electronic Money Card Business

The notification prescribes the rules, procedures and conditions of electronic money card business as follows; currency, prohibitions in the business, provision of saving account, operational regulations such as operating system, report delivery, etc.

2.6 Royal Decree Regulating Electronic Payment Service Business B.E. 2551 (2008)

The Royal Decree regulates the electronic payment service businesses that require notification (Category A), registration (Category B), or license (Category C) from the Bank of Thailand. Rules and qualifications of three categories are specified.

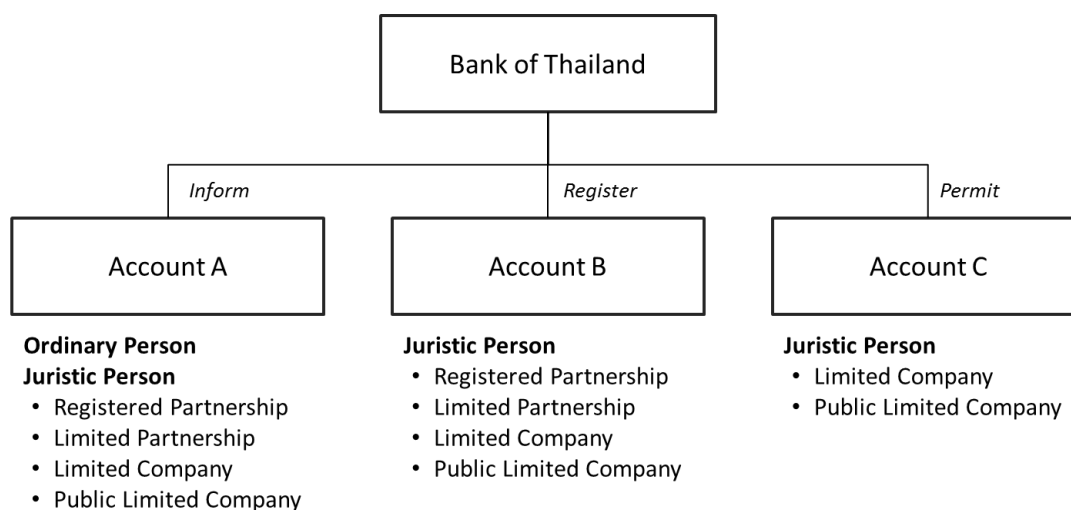
The common ticketing office operation is stated under the Category C consisting of;

- (1) Clearing Service
- (2) Settlement Service
- (3) Electronic Payment Service through any device or network
- (4) Transaction Switching Service for multi-system payments
- (5) Payment Service Provider, and

- (6) Electronic money service for goods payment, or a certain service according to a predetermined list from many service providers, without restrictions on location or being under the same distribution system and service

In addition, the Royal Decree prescribes that the service providers under the Category C shall be legal person; a limited company or public limited company. The service providers under Category A can be an ordinary person or legal person, while the service providers under Category B shall be legal person such as registered partnership, limited partnership or public limited company.

Figure 3-2 Electronic Payment Service Provider Formation



2.7 Notification of the Bank of Thailand No. Sor Ror Khor 2/2552 on Rules, Procedures and Conditions Regulating Electronic Payment Service

The notification prescribes responsibilities of various service providers such as electronic money service, settlement service, and electronic payment service through any device or network, and payment service provider.

2.8 Notification of the Bank of Thailand No. Sor Ror Khor 3/2552 on Information Security Policy and Measures for Business Operation of Electronic Payment Services Business Operator

The notification prescribes the information security policy and measures for business operation of electronic payment services business operator which cover the following matters;

- (1) Access control and authentication

(2) Information privacy and information technology reliability

(3) Service Availability

(4) Inspection of Information Security

2.9 Notification of the Electronic Transaction Commission on Rules, Procedures, and Conditions regulating Electronic Payment Service Business Operation B.E. 2552 (2009)

The notification prescribes qualifications of service providers under three categories. It also prescribes the amount of additional registered capital for the service provider under the Category C as follows;

(1) Clearing service - not less than 50 million baht

(2) Settlement service - not less than 200 million baht

(3) Electronic Payment Service through any device or network - not less than 5 million baht

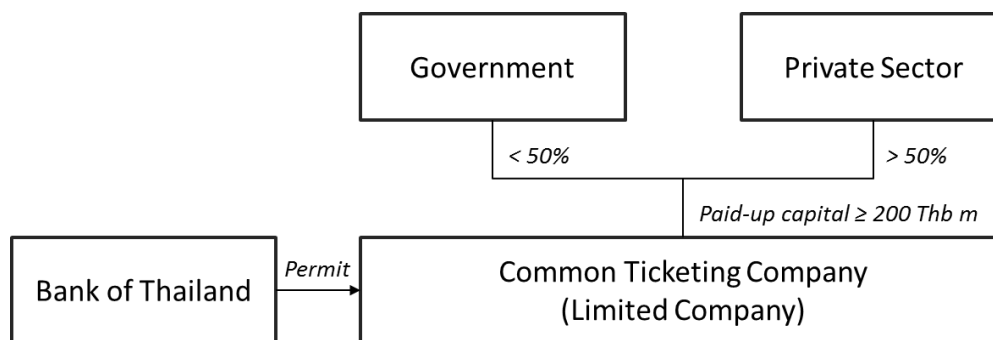
(4) Transaction Switching Service for multi-system payment - not less than 50 million baht

(5) Payment Service Provider – not less than 5 million baht

(6) Electronic money service for goods payments, or a certain service according to a predetermined list from many service providers, without restrictions on location or being under the same distribution system and service – not less than 200 million baht

If the service providers wish to provide more than one type of service, the registered capital amount not less than registered capital already paid for the business type which is set at the maximum, is required. Moreover, the notification prescribes procedures for each type of electronic payment service operation and documents and information required for the permit application.

Figure 3-3 Structure of Common Ticketing Office



2.10 Royal Decree on Security Procedures for Electronic Transactions B.E. 2553 (2010)

The Royal Decree prescribes that the electronic transactions (including electronic payment service) requires minimum security procedures specified by the Electronic Transactions Commission. The security procedures are divided into 3 levels; strict, medium and standard levels. The security procedures applies to the electronic transactions that affect national security, public order, or the general public and that of an agency or an organization which deems to be the country's critical infrastructure.

2.11 Notification of the Electronic Transactions Commission on Information Security Standards in accordance with the Security Procedures B.E. 2555 (2012)

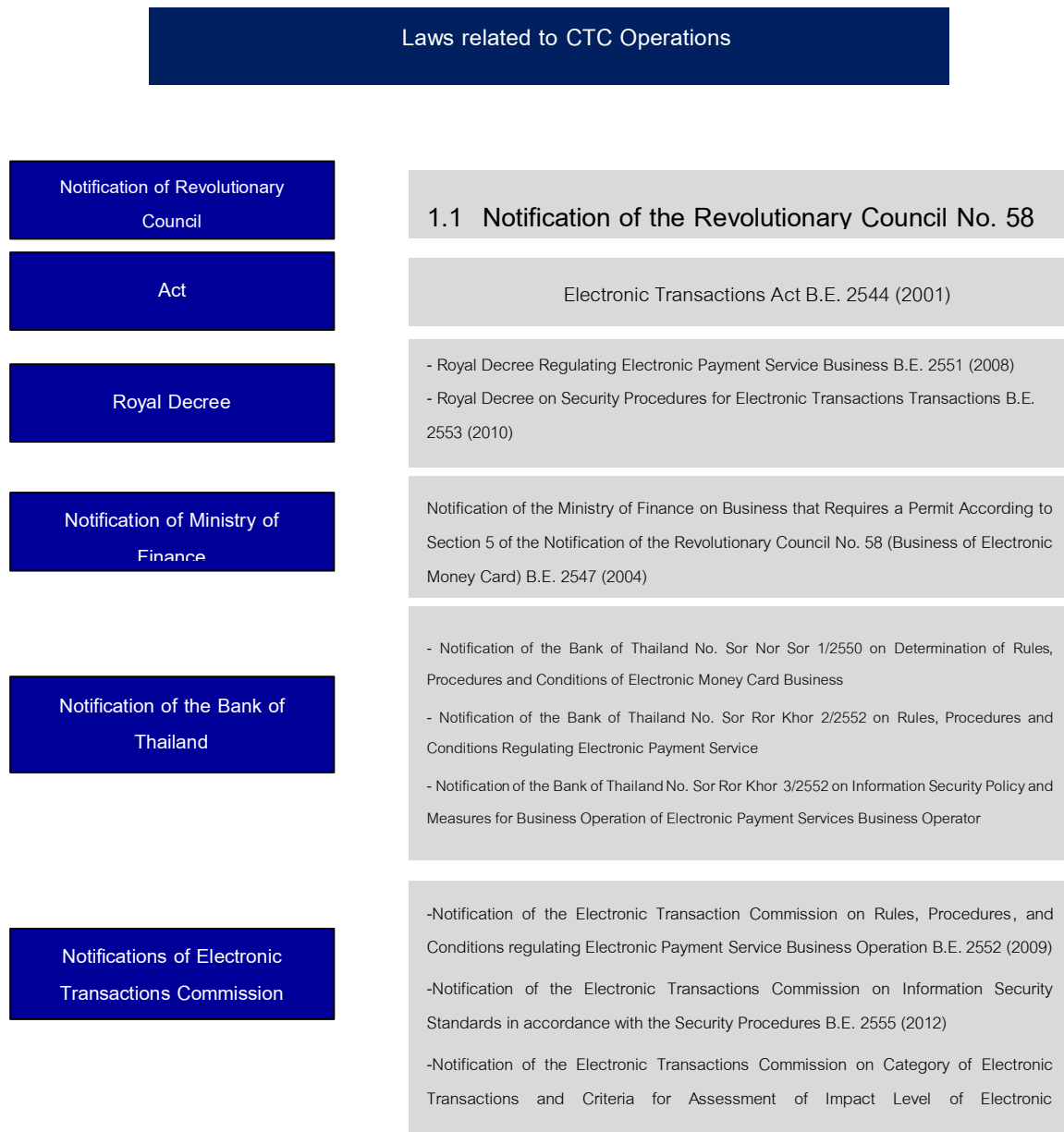
The notification on Information Security Standards in accordance with the three level Security Procedures as controlling standard for information security which covers confidentiality, integrity, and availability of the information system and its information. It has to follow the related standard in accordance with assessed risk level.

2.12 Notification of the Electronic Transactions Commission on Category of Electronic Transactions and Criteria for Assessment of Impact Level of Electronic Transactions Pursuant to Security Procedure B.E. 2555 (2012)

The notification specifies the categories of electronic transactions and criteria for avaluation of impact level of the electronic transactions pursuant to the security procedures, which prescribe that electronic transaction, i.e. electronic payment according to the Royal Decree regulating electronic payment service business B.E. 2551 (2008), and electronic transactions for public utility

and public services which require continuous operations, must apply the strict level of security procedures and perform impact assessment in many aspects.

Figure 3-4 Summary of an Overview of Laws Related to the Electronic Payment Business Regulations



3. Operating Reports

As an electronic money service provider, CTC is required to make a report as stipulated by the Bank of Thailand, and send the report to that Bank of Thailand every month. The reports shall be in Excel format and sent through DMS Internet. The reports will be sent within 30 days starting from the end date of each month. It contains the following information;

3.1 Report Format according to the BOT Circular Notice For Nor Chor. (10) Wor. 289/ 2557

Consisting of

Table 1.1	Electronic-Money (e-Money) Service
Table 1.2	Electronic Money Payment classified into amount
Table 2	Credit Card Network Service
Table 3	EDC Network Service
Table 4	Switching Service
Table 5.1	Clearing Service
Table 5.2	Clearing Service (In case of a problem)
Table 6.1	Settlement Service
Table 6.2	Settlement Service divided by members
Table 6.3	Settlement Service (In case of a problem)
Table 7.1	Electronic Payment Service through any device or network (Global Transfer)
Table 7.2	Electronic Payment Service through any device or network
Table 7.3	Number of EFTPOS Terminals for goods and service payments at point of sale
Table 7.4	Frauds caused from payment transaction classified into various payment channels

Table 7.5 Transactions through bank counters and automatic banking machines divided into provinces

Table 8 Payment Service Provider

3.2 Report Format according to the BOT Circular Notice For Nor Chor. (10) Wor. 290/ 2557

Consisting of electronic money service operations

3.3 Report Format according to the BOT Circular Notice For Nor Chor. (10) Wor. 291/ 2557

Consisting of

Table 1 Quantity and Amount of Intrabank Cheque

Table 2 Quantity and Amount of Intrabank Cheque divided into amount

3.4 Report Format according to the BOT Circular Notice For Nor Chor. (10) Wor. 292/ 2557

Consisting of

Table 1 Quantity and Amount of Intrabank Cheque

Table 2 Quantity and Amount of Intrabank Cheque divided into amount

Table 3 Number of EFTPOS Terminals for Goods and Service Payments at point of sale

Table 4 Frauds caused from payment transaction classified into various payment channels

Table 5 Payment Service Provider

Table 6 Electronic Money Service (e-Money)

Table 7 Electronic Money Payment (e-Money) divided into amount

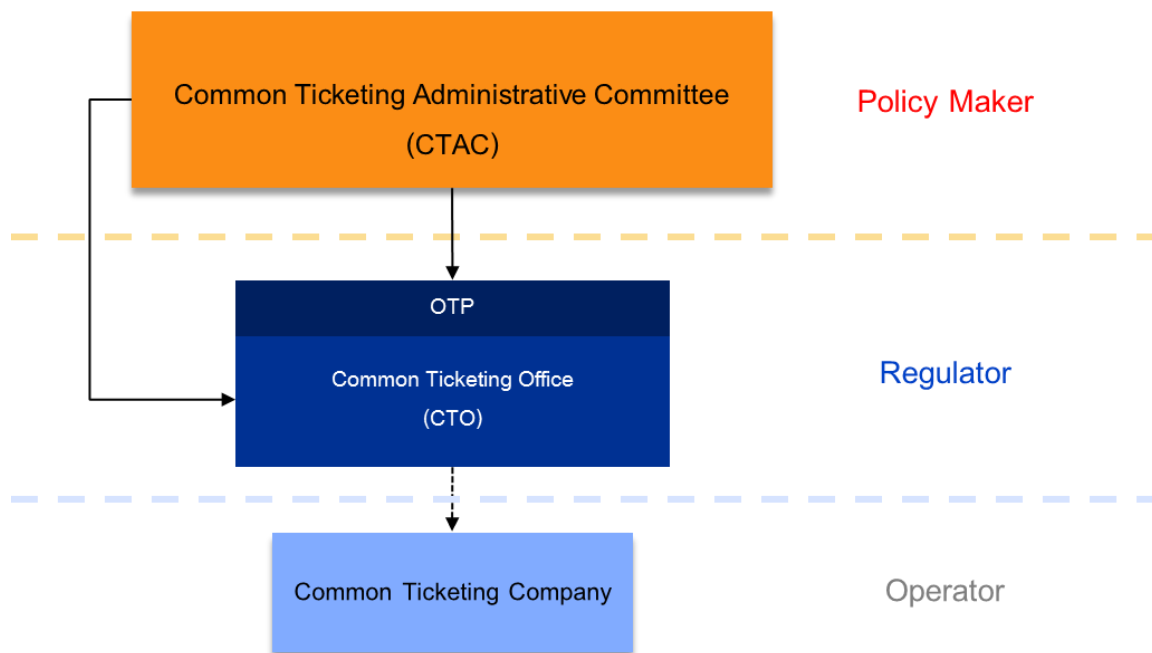
Table 8 Transactions through Bank Counters and Automatic Banking Machine divided into provinces

Chapter 4 Authorities and Responsibilities of the Common Ticketing Office

1. Authorities and Duties of the Related Person in Development-related Staff

The operation of common ticketing system consists of related organizations which can be divided according to their relative roles and responsibilities into 3 levels; policy maker, regulator, and operator as follows;

Figure 4-1 Overall Structure of Common Ticketing System



1.1 Policy Level

1.1.1 Common Ticketing Administrative Committee (CTAC)

The Common Ticketing Administrative Committee (CTAC) is established according to the Ministry of Transport Ministerial Decree No. 335/ 2554 for the following functions;

- (1) Devise pattern, regulations and common ticketing administrative guideline for the efficiency and maximum benefits for the public, i.e.,
 - (A) Determine form and direction for the Establishment of Common Ticketing Company
 - (B) Determine framework for the common ticketing system operation, and the Central Clearing House (CCH).
 - (C) Determine an effective framework on a par with the common operational standard for the operation of common ticketing system
 - (D) Determine system integration format between existing and new operators

- (E) Consider fare structure and common ticketing system for intersystem integration
 - (F) Determine pattern and directions for the operation for integration between existing and potential operators in order to connect the systems effectively, harmoniously and fairly
- (2) Assign the sub-committee, working group or individual to assist the Committee performing tasks assigned as appropriate
 - (3) The Committee is authorized to invite government officials, project-related organizations or individual, and the private sectors to or provide information as necessary
 - (4) Operate other related functions as assigned

However, stipulating common ticketing policy for its operation might exceed the administrative committee's authority, so its authorities and duties should be extended to cover policies and standards setting. The Transport Minister can amend the Ministerial Decree that appoints the Committee, and the Transport Minister can be appointed as the Chairman so that the Committee's authority extension is under the Transport Minister's authority.

1.2 Regulator Level

1.2.1 Office of Transport and Traffic Policy and Planning (OTP) by the Common Ticketing Office (CTO)

On May 3rd 2011, the cabinet had a resolution approving OTP to conduct Program Management Service (PMS) and establish the Common Ticketing Office (CTO) subjected to OTP, in order to develop the project. According to the Ministerial Regulation on the Organization of the OTP, B.E. 2558 (2015). CTO is the office under OTP and has the responsibilities are determined as follows;

- (1) Studying and analyzing data related to the common ticketing system development and the common fare rate
- (2) Detailing the common ticketing system's policy setting plan and standards
- (3) Supporting the operation and coordinating with the related government and private organizations in order to achieve the common ticketing system's objectives and targets effectively
- (4) Cooperating with other related or assigned organizations, or supporting their operations
- (5) Making framework and standards related to the common ticketing operation, including each operator's intersystem connecting format
- (6) Detailing the format, regulations, and the common ticketing administrative model for an effective service

1.3 Operation Level

1.3.1 System Operation and Maintenance Contractor have main duties as follows;

- (1) Supervising and modifying all common ticketing devices' standards and details such as the national standard, card structure, standards of reader, station computer, central computer and interface protocol, etc.
- (2) Managing the maintenance and controlling the common ticketing system operation and the Central Clearing House (CCH)
- (3) Inspecting device's standards of other common card issuers and distributors such as ticket's standards, reader, selling or top-up equipment other card issuers and distributors have to be verified and approved for the distribution and device installation prior to their operations to ensure that all the tickets are based on the same standard; hence interoperability.
- (4) Modifying front-end system of transit service providers who participate in the project, to comply with the fare scheme specified by the government sector
- (5) Issuing and distributing the common tickets to be on a par with the standard set by the government sector

- (6) Gathering transaction data of the mass transit system, and processing the data to make reports, so that the government sector is able to study and use them for the planning and policy making

2. Other Organizations Related to the CTC's Common Ticketing System Operation

The common ticketing system consists of the following related agencies;

- (1) Central Clearing House (CCH)
- (2) Transit Services Providers (Transit SPs)
- (3) Non-transit Services Providers (Non-transit SPs)
- (4) Ticket Issuers
- (5) Top-up Agents
- (6) Settlement Banks

Duties and responsibilities of each sector can be summarized as follows;

2.1 Central Clearing House (CCH)

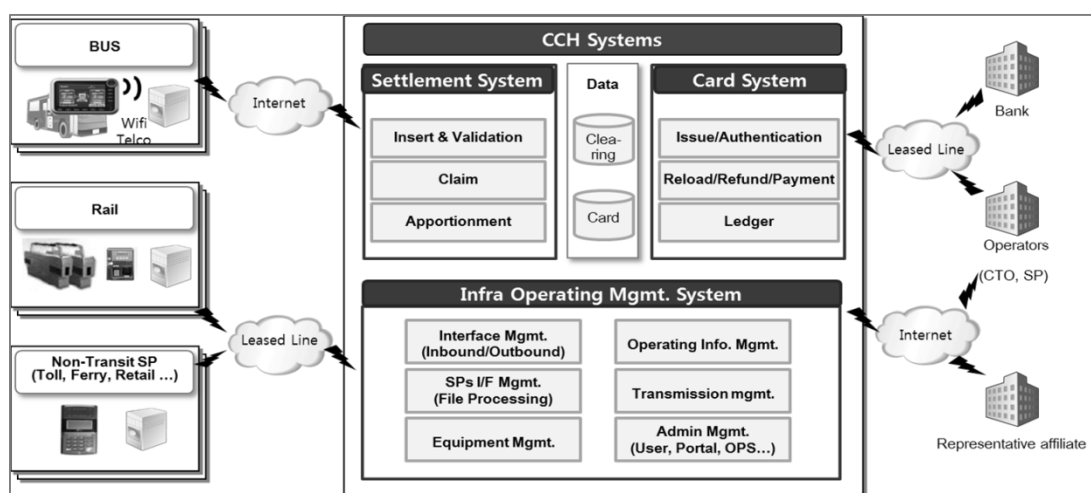
Central Clearing House (CCH) is another important element for the common ticketing system. It is responsible for gathering transaction data made through the common ticketing system, including common ticket use the fare payment in the mass transit systems participating, or other goods and service payment. CCH is responsible for data processing in order to calculate revenue apportionment according to the calculation criteria. After the data processing, CCH will deliver the data to Settlement Bank for updating indebtedness. CCH's responsibilities are as follows;

- (1) Gathering transaction data such as fare payment, goods and service payments, etc. In the data gathering process, CCH is responsible for extraction of common ticket usage data (Data reception) from the transaction data stored by Front-end equipment. The extracting methods depend on each type of equipment and operations. During the data gathering process, CCH is responsible for data verification to ensure that the data obtained is accurate, complete and without redundancy. After the data is completely collected, CCH is responsible for arrangement and updating of the transaction data (Data transformation) to ensure that it is in correct and suitable format as specified, e.g. storing in database, forwarding the data to the government sector for traffic planning, etc. In case

of incorrect data, CCH is responsible to correct the mistake and identifying its cause. Moreover, CCH is responsible for management of other common ticket-related activity's data such as common ticket issuance and distribution, card top-up verification, etc.

- (2) Storing and managing common ticket data usage. CCH is responsible for control and update of the produced and distributed ticket (common ticket) database. The database update includes the update for the following cases; ticket distribution, top-up, lost or stolen tickets. In addition, the common ticketing management system is responsible for the system update according to common ticketing system policies such as determining maximum value to be stored in the common ticket, the ticket's usage life or money return policy for the cardholder in case of lost or stolen ticket.
- (3) Revenue apportionment and then delivering the calculation result to the Settlement bank. CCH is responsible for the processing collected data process and apportioning the revenue according to the determined criteria. The revenue apportionment and settlement are performed daily, and completed on the schedule. Initially, it is expected to be completed daily from 03.00 to 04.00 a.m. during when the minimum transaction quantity is expected. After the process is completed, the calculation data for revenue apportionment will be delivered to related staff for the verification before forwarding it the Settlement Bank.

Figure 4-2 Sample Structure of Central Clearing House System



2.2 Transit Service Providers: Transit SPs

Transit Service Providers refer to the mass transit service operators dividing into 4 mass transit systems; rail, bus, expressway, and water transportation. The transit service providers are responsible for collecting the passengers use data and forwarding it to the Central Clearing House (CCH) based on the standard set by the government sector. Regarding such operations, the service providers who currently use the Automatic Fare Collection (AFC) equipment or system are required to modify the Front-end equipment to ensure that they are compatible with the common ticketing system. If the service providers have not yet developed the AFC system, they are required to invest and install the equipment such as card readers and station computer, to ensure that the AFC system is on a par with the standard and interoperable with other systems. According to such development, CTC is responsible for providing advices related to the system development and system test participation. Initial guideline for the front-end equipment modification can be summarized as follows;

- (1) Guideline for front-end system modification for rail transit system includes the modification of reader at each gate to support new card standard. This includes station and central computer modification as well as system interfacing with the Central Clearing House. Interm of rail transit system under development such as Purple Line of MRTA, Red Line suburb rail system or other potential projects, the AFC system development must be considered under the central standard specified by the Common Ticketing Office.
- (2) Since to date the public bus has not yet developed the automatic fare collection, in order to participate in the common ticketing system it is required to invest on and install all new equipment and tools. Because of the difference of the public bus and the rail transit operations, the common ticketing system participation guidelines are also different. The readers have to be installed on the bus to facilitate the passengers' convenience during getting on and off and relieve the bus stop congestion. The reader's data will be recorded by the Bus Driver Console (BDC) during the service, and the data will be forwarded to the computer devices when the bus stops at the bus station.
- (3) Development of expressway fare collection system is performed through installation of Tab & Go system at the existing cash collection booths.

The overall benefits of mass transit service provider in participating common ticket system are as follows; it does not necessarily manage its own front-end system, since CTC will operate the whole system for them. It is expected that this will be able to reduce its operational costs such as coin management, ticket distributing machine installation, and fare collection staff.

2.3 Ticket Issuers

Ticket issuers and distributors are important elements which connect the common ticketing system to the public. They act as medium for the issuance and distribution for the customers. The details over the issuance system, top-up or the card's usage limits, including the mass transit systems participated in the program, goods and service payments, will be publicized by the ticket issuers and distributors to the customers. Their responsibilities in details are as follows;

- (1) The ticket issuers and distributors are responsible for bank card related transactions. They are authorized to give a permission to any application-related operations; loading, installation, deletion, extradition and personalization, as well as to terminate any third party's operations such as the Application Providers through SSD Manager Command.
- (2) The ticket issuers and distributors issue card to the cardholder, and they are also responsible for the whole security system starting from pre-issuance production processes to card preparation, and from post-issuance processes to the final decommissioning.
- (3) The ticket issuers specify the application's performance for the card supporting data, including managing to approve the card's application.

2.4 Top - up Agents

Top-up agents act as agents for the common ticket's top-up for the customers, as well as trips top-up for a certain type of cards. The top-up agent might be established by the Common Ticketing Company or other private sector participated in the program such as 7-11 or Family Mart, or other counter services. The top-up agent's details are as follows;

- (1) Top – up Agents operate as a medium of the card top-up using application and/or Personalization/Customization Data according to the application provider's instructions,

security policies and the ticket issuer's instructions. Moreover, the final security domain keys might be provided on the card.

- (2) Top-up Agents provide equipment capable to top-up money for the common card holder – in general it is top-up for stored value portion (such as e-wallet)
- (3) In addition, the Top-up Agents must be able to add number of trips, e.g., monthly pass and round-trip ticket, according to the specification and the customers' requirements. The cardholders do not need to do anything else than contacting the Card Scheme Operator (CSO)

For the top-up channels, the consultant decides that different top-up channels should be developed to cover all customer groups for convenience. It is expected that the customers can be classified into 3 groups consisting of high income (Group A, B), middle income (Group B, C) and low income (Group C, D). Since the customers use different services, the top-up channel design has to be suitably performed for each service type.

Regarding the top-up channel development for the customer group A, B, the consultant has expected that internet top-up is the most suitable one of all channels. Such channel might consist of internet banking, auto-debit or automatic credit card payment, since the customers in this group need convenient top-up methods and they are familiar to such business transactions. Customers Group B, C who are mostly company's employees or government employees, and their lifestyles are suitable for a certain top-up channel, i.e., top-up vending machine at mass rapid transit stations and ATMs. Last group of customers (Group C, D), the consultant expects that the suitable top-up channel is through convenience stores such as 7-11, Family Mart, or MaxValue, since they are frequent customers and familiar with such convenience stores.

The consultant realizes that the top-up agent is one of the important components to successfully develop the common ticketing system, so incentive measures should be provided in order to encourage the customers. According to the review of common ticketing system operation in foreign countries, it is found that one successful method is to give the Top-up Agent some top-up fee every time of the service. The top-up fee is calculated based on each top-up amount, e.g.,

a top-up agent receives fee of 0.2%⁷ of each top-up amount. Alternatively, it might be calculated based on the number of services, e.g. the agent receives fee of 2 baht⁸ for each top-up service. The fee calculation policy is currently considered by the consultant which studies each method's advantages and disadvantages in order to determine the most suitable calculation method.

2.5 Settlement Bank

The Settlement Bank refers to payment service providers for related parties such as mass transit operators, the common ticket program participating stores, etc. An example of settlement bank might be a bank. The settlement bank's details are as follows;

- (1) The settlement bank is responsible for money transfer for updating indebtedness in a transparent, safe and reliable manner within the predetermined schedule. The settlement system including the service providers have to be legally approved and all related permits for the operation must be obtained. The settlement bank is required to clearly identify and present the operation rules, regulations, conditions and steps, as well as clarifying and explaining all risks caused by the participation in the payment system, to all related parties.
- (2) The settlement bank is responsible for determining risk management measures and clarifying it for all related parties, including managing the risk which is under its authority.
- (3) The settlement bank has to be able to complete its duty for updating indebtedness within the same day transaction occurs. This also depends on mutual agreement in the future.
- (4) The settlement bank is required to issue letters or reports showing each settlement details to raise reliability and confidence for participation in the settlement system.
- (5) The settlement bank is required to have a reliable settlement system as well as an information security system. It also requires a transparent and acceptable payment system for all related parties.

⁷Assumed rate for the purpose of example

⁸Assumed rate for the purpose of example

2.6 Summary of Roles and Responsibilities

Table 4-1 Summary of Roles and Responsibilities

Office/Sector	Responsibilities
Common Ticket Operator (CTC)	– Manage, supervise and control the Central Clearing House's operation – Verify and approve card issuance of other card issuers and distributors to ensure that all cards are on par with the same standard – Modify Front-end system to conform to the fare rate stipulated by the government sector – Issue and distribute common ticket
Central Clearing House (CCH)	– Apportion revenue of service providers and related sectors – Collect and manage data of transaction performed through common tickets, as well as making card usage reports – Supervise and manage the common ticketing system – Establish and regulate various operational systems
Transit/Non-transit Services Providers (SPs)	– Provide transit services – Provide non-transit services
Top-up agents	– Provide top-up service; both an amount of money and a number of trips – Transfer money received from top-up service to the card issuers and ticket distributors
Ticket Issuers	– Operate as a ticket issuer as assigned – Responsible for transferring money to the settlement bank on schedule

3. Nature of Common Ticketing Company Operations

To enable the Common Ticketing Company to run on its own without obligation to the government's budget, the consultant has considered the CTC business's nature and methods so that it is able to create its own sufficient income to cover expenss payment, and make it financially viable the budget invested in the system.

However, since the CTC is established for services and benefits for the public (Public mind), rather than business benefits (Business mind), the determination of business operation policy has to focus on fairness for all parties. The following principles are also taken into consideration;

- (1) The common ticket management including the related policy making have to be fair for all the parties without trade barrier or acting in favor of any particular party's benefits

(2) Calculated service fee shall not be too high and become the operator's financial burden.

(3) The Common Ticketing Company's Operation is mainly based on the public benefits.

(4) The Common Ticketing Company's earning has to be sufficient to cover for expenses occurred by the operation, and it shall not seek for the maximum profits.

Details and Natures of the Common Ticketing Office Operation can be summarized as follows;

3.1 Source of Revenue from the Common Ticketing Company Operation

(1) Revenue from clearing fee or transaction fee

Income from the settlement fee is obtained from CTC's transaction data gathering both from transit service providers and non-transit service providers, and revenue apportionment calculation. Regarding this income calculation, the consultant has an opinion that it should be calculated based on percent of all transaction value obtained from the services performed by service providers. The fee rate determination mainly takes fairness and transaction value size into the consideration. Moreover, the fee rate will not be too high that it becomes financial burden for service providers or passengers. Such fee will be collected from service providers or card issuers according to the CTC's operation methods which are currently under a study and discussion with all related parties.

(2) Revenue from Card Test and Certification Fee

Apart from revenue apportionment and clearing service, CTC is also responsible for testing qualifications and technical specification of tickets issued by other agencies or private companies to ensure that the tickets and cards are on par with the central standard and able to use in the common ticketing system. Such responsibilities certainly cause costs and expenses in the operations such as test staff costs, investment cost for related tools and equipment, etc. As the result, CTC is required to charge the card test and certification fee. It might be either one-time fee or annual fee. The calculation methods are currently under consideration and discussion with the related parties.

(3) Revenue from Co-branded Card Issuance Fee

In order to provide all sector an opportunity to participate in the common ticketing system and increase the number of common tickets in the system, the consultant suggests that a policy should be provided to other operators, especially ones that are inexperienced in using smart card instead

of cash for transaction, to ensure that they are able to issue cards to support their main business as their marketing tools and sale promotion activities. Therefore, the CTC encourages those business operators to participate in the project as ticket issuers. In doing so, the CTC shall act as the out source to issues common tickets for those operators, and the tickets' privilege and details depend on such issuers to provide such service, CTC might charge royalty fee which is calculated based on a proportion of all transaction value or the number of co-branded cards.

(4) Revenue from Common Ticket Distribution

Aside from revenue from the service fee, CTC might create some income from the common ticket distribution for new customers. However, according to the CTC's objective which focuses on the public mind rather than the business one, the consultant suggests that the pricing only be equivalent to its procurement cost; approximately 31 – 33 baht/card at the present. Nevertheless, the consultant has considered that the government may provide free cards to support certain people, namely disabled people, elderly persons, students, university students or low-income people.

3.2 Costs and Expenses related to the Operation (Variable Costs)

(1) Procurement and Distribution Costs (Common Ticket)

Procurement and distribution costs are occurred in each distribution. Such costs include card purchase from manufacturers, operating system and card data development for the same standard operation, card printing cost, including various card distribution-related expenses such as card delivery cost, rental area for or building distributing booth, inventory management expenses, etc. the costs mentioned above are direct costs which are variable according to the number of cards distributed.

(2) Settlement Costs

According to the common ticket administrative policy, the consultant has an opinion that CTC should assign settlement duties to Settlement banks for higher efficiency. Such operation requires some costs related to outsourcing the bank for the settlement. The settlement costs are directly variable with the transaction value size that is settled each time. The service charge rate depends on business negotiation with the settlement banks.

(3) Top-up Service Costs

In order to facilitate the top-up, the common ticketing system development policy is to extend the top-up service points as many as possible to cover many different channels suitable for each customer group. The top-up channels might include convenient stores, internet transactions or ATMs. To employ those top-up agents, it requires service fee. Initially, it is expected that the fee calculation is based on the proportion of each top-up value, or it might be a fixed price per one top-up. The top-up expenses are paid by the ticket issuer to the top-up agent)

3.3 Related Operation Cost and Expenses (Fixed Cost)

(1) Labor and general management costs

The Common Ticketing Company consists of different operating departments divided into Executives, Supporting, Technology, Marketing and Customer Service and Business Development. Initially, the consultant expects that the Common Ticketing Company should have approximately 45 – 50 staffs, including senior personnel and operators. However, the number of staff might be changed according to CTC's business expansion. Such costs include labor cost, staff's welfare and benefits, etc.

(2) System Maintenance Cost

The Common Ticketing Office's operation consists of complicated systems and equipment, including card management system, top-up system, clearing and settlement systems. These systems require regular maintenance and upgrade by a specialist. In addition, the back-up system management and data back-up costs are also required, so that the systems and data will be promptly restored if the systems become defective.

(3) Telecommunication Network Rental Cost

The common ticketing system requires a lot of connections and data transmission such as customer card issuance data daily, card usage in various places, top-up data and revenue apportionment data for the service providers. As the result, the telecommunication network or cable system rental is necessary for fast, effective and safe from important data loss or stealing.

(4) Office Rent

The Common Ticketing Company requires Head Quarter office as the operation and coordination place for different departments such as Executive, Supporting, Technology, Marketing and Customer Service and Business Development, for harmonious operation and effective coordination, so the Head Quarter office rent is required.

(5) Other expenses

Other operating expenses can consist of tools and equipment and office supply costs, depreciation, public utility charges or travelling expenses as well as miscellaneous expenses, etc.

Chapter 5 Operating Plans and Duration

The CTC's establishment is performed according to Private Investments in State Undertakings Act, B.E. 2556 (2013); its establishment principle must be approved by the Transport Minister. The related government departments that wish to invest in the CTC's shares must be subjected to each department's approval process. Therefore, the CTC's establishment can begin only after it is approved by the related departments.

However, the CTC establishment requires plan and duration which are in accordance with the Common Ticketing System and Central Clearing House's establishment, because various technologies have to be transferred from the consultant (Program Management Services: PMS), and the Central Clearing House system developers (BSV Group) to the CTC in order to operate the common ticket and the Central Clearing House. Regarding the duration, CTC establishment has to be completed at least within during of ontegration with service providers' system, which requires the Automatic Fare Collection modification and lead to the system maintenance duration according to the Common Ticketing System and Central Clearing House Project's Agreement.

Chapter 6 Required Activities

1. Company Registration

The Common Ticketing Company establishment starts from the company registration process according to the steps stipulated in the Civil and Commercial Code. The consultant explains the limited company registration steps in Chapter 3, Topic 1. CTC is required to follow the specific laws as described in Chapter 3, Topic 2 as well.

2. Office Setup

2.1 Office Usable Area

In order to facilitate the common ticketing system management, CTC office may require some useable area for the following purposes;

Table 6-1 Total Usable Area of System Management and Maintenance Offices

List	Square meter
CCH server room*	150
Card Issuance and verification center	100
Card warehouse	130
Test lab	120
Admin Office	200
Total	700

Note: * In case of renting a server room

3. Personnel Recruitment

The operation requires capable personnel and technical specialists, since the common ticketing and CCH systems need continuous development to ensure that the systems are stable, sustainable and able to provide services effectively. As the result, the personnel and staff are required to have the experience and proficiency in the common ticketing system management. Moreover, since this system shall be used for the first time in Thailand, the public understanding and knowledge become very important for the project's success. Consequently, the system operation should contain the common card marketing and promotion department. The Consultant then determines an organizational structure necessary for the system operation. The details are as follows;

CTC's structure consists of four main departments as follows;

- (1) Supporting Department is responsible for administration and supporting the regulation, management and various operations such as administration, policy, finance and accounting, law, the common ticket and settlement system management, and human resource management.
- (2) Marketing and Customer Service Department is responsible for business development of marketing and customer relation in order to communicate with the customers and shareholders for understanding, and providing the customers services including advertisement and public relations to attract the target and promulgate news to related parties, namely government sector, private companies, technocrats and the public.
- (3) Business Development Department is responsible for system planning, designing, test and business development to ensure that the common ticketing system is able to operate effectively.
- (4) Technology Department is responsible for technical supports such as card issuance and test, AFC and settlement.

3.1 Primary Manpower Structure

3.1.1 Primary Stage: Year 1

At the early stage of the operation (primary), the system operator might determine a small number of manpower approximately 5 people, and suitable personnel might be recruited within 6 months starting from signing of the CTC's joint venture agreement. Initially, the main duties are technical works, since the business operation at the early stage is to study the common ticket and its standard development, as well as the CCH system (collectively called "the common ticketing system"). This includes the ticketing system design acceptance. The system operator should emphasize on participation in the study, plan and business development directions at the early stage. As the result, personnel selected to business planning should be recruited as well.

Table 6-2 Manpower for the Primary Stage (Year 1)

Position	Job Description	Qualifications	Manpower	Salary (Baht-Person-Month)
Director-General	General management in the organization	- At least a master's degree in related field - Experience in managing organization related to transportation, ticket system or other card types, both in management and technique	1	[250,000]
Technical Director	Technical Management	- At least a master's degree in related field - Technical experience in common ticketing system management	1	[200,000]
Ticketing System Engineer	Design, develop and/or update ticket's software	At least a bachelor's degree in related field	1	[30,000]

Position	Job Description	Qualifications	Manpower	Salary (Baht-Person-Month)
		Technical experience in ticket or other related types of ticket		
Computer System Engineer	- Supervise computer systems - Test developed or updated computer system operations	- At least a bachelor's degree in related field - Technical experience in computer systems	1	[30,000]
Business Planning Manager	Plan business operation strategies	- At least a bachelor's degree in related field - Experience in business planning related to computer system and transportation management	1	[70,000]

3.1.2 Secondary Stage: Year 2

Later, in the second year of operation; a period for the common ticketing system's acceptance inspection and all related technology transfer before commercial service will be started; the manpower might be increasingly required from 10 to 15 persons for the second year. In the secondary stage, the system management should emphasize on recruitment of additional technical staff, since this stage requires system acceptance inspection and technology transfer, and marketing and public relation staff in order to publicize the public over the common ticket details. The organizational structure for the second year is basically designed as follows;

Table 6-3 Additional Manpower needed for the Secondary Stage (Year 2)

Position	Job Description	Qualifications	Manpower	Salary (Baht-Person-Month)
Sales and Marketing Manager	● Devise marketing and public relations strategies ● Plan to promote marketing and public relations activities ● Coordinate with persons who are interested to participate in the project	● At least a master's degree in related field ● Experience in marketing and public relations in order to broadly publicize information to the public	1	[65,000]
Technical Planner	● Plan and devise a guidance for system development and maintenance	● At least a bachelor's degree in related field	2	[30,000]

Position	Job Description	Qualifications	Manpower	Salary (Baht-Person-Month)
System Integration Manager	Supervise system integration within the CCH and integration from the CCH to other systems	- At least a bachelor's degree in related field - Technical experience in system integration management for CCH	2	[70,000]
Ticket Standard Certification Manager	Verify and certify card issuance according to standard	- At least a bachelor's degree in related field - Technical experience in ticketing system or other related ticket types	1	[70,000]
Finance and Accounting Manager	Manage finance and accounting	At least a bachelor's degree in accounting, finance or other related fields	1	[65,000]

Position	Job Description	Qualifications	Manpower	Salary (Baht-Person-Month)
		Experience in finance and/or accounting in an organization or a company related to transport systems or issuing various card types		
Common Ticketing and Settlement System Management Staff	- Check and report the revenue apportionment results - Transfer revenue to operators - Calculate and collect related fees	At least a bachelor's degree in related field	3	[35,000]

Moreover, the system operator might consider outsourcing staff to provide payment services for the common ticketing program's participants, as well as data center and Near Field Communication (NFC) system formation at the early stage of this service.

3.1.3 Tertiary Stage: Full-service Provision (Year 3)

At this full-service provision stage, it is expected that the number of customers will be increased so additional system management staff is needed. Initially, it is expected that additional 35 staff are needed, so the organization size will consist of 50 staff. In the third year, the additional personnel will mainly consist of the ticketing and computer engineers and supporting staffs. However, the system manager might consider increasing the number of staffs in the organization or outsourcing other specialists in other fields such as public relations and information propagation, customer service center, system maintenance, etc. This outsourcing protects the organization from a risk of labor cost and increases its managing flexibility.

Table 6-4 Additional Manpower needed for the Tertiary Stage (Year 3)

Position	Job Description	Qualification	Manpower	Salary
Finance Director	General finance and accounting management	- At least a master's degree in related field - Experience in finance and accounting management in computer system management-related organization	1	[200,000]
Sales and Marketing Staff	- Devise marketing and public relation activities in accordance with predetermined strategies - Coordinate with interested persons and the participants - Prepare marketing data	At least a bachelor's degree in related field	3	[25,000]

Position	Job Description	Qualification	Manpower	Salary
External Coordination Manager	- Determine strategies/plans for managing external agencies - Contact and coordinate with related external agencies	- At least a master's degree in related field - Experience in management and coordination with external agencies or persons such as Investor Relations	1	[65,000]
External Coordination Staff	Contact and coordinate with related external agencies	At least a bachelor's degree in related field	2	[25,000]
Business Planning Staff	- Gather information related to transport in common ticketing system, industrial transport data, transport techniques and statistics, and other related data - Analyze basic data for business planning	- At least a bachelor's degree in related field - Experience in business planning related to computer system and communication management	1	[30,000]
Business Development Staff	Develop business according to the predetermined plan	At least a bachelor's degree in related field	3	[30,000]
Senior Engineer	- Design, develop and update transit ticket software - Test the developed or updated software	At least a bachelor's degree in related field	2	[70,000]

Position	Job Description	Qualification	Manpower	Salary
		Technical experience in transit ticket management		
Ticket System Engineer	Design, develop and update the ticket software	- At least a bachelor's degree in related field - Technical Experience in ticket management	2	[30,000]
Ticket Issuance Staff	Issue ticket	Graduate with a diploma	4	[25,000]
Computer System Engineer	- Control computer system - Test the developed or updated computer system	- At least a bachelor's degree in related field - Technical experience in computer system	4	[30,000]
Ticket Standard Certification Manager	Verify and certify card issuance according to standard	- At least a bachelor's degree in related field - Experience in ticketing system management and ticket standard development	1	[70,000]
Finance and Accounting Staff	Develop finance/accounting data, payments and other related duties	At least a bachelor's degree in related field	1	[25,000]

Position	Job Description	Qualification	Manpower	Salary
Human Resource Manager	Develop human resource development plan, manpower and organizational structure	- At least a bachelor's degree in related field - Experience in human resource management	1	[65,000]
Human Resource Staff	- Create data of personnel and staff - Provide in-house personnel training - Recruit qualified and suitable staff for the operation - Contact and coordinate with labor-related agencies	At least a bachelor's degree in related field	1	[25,000]
Senior Lawyer	- Provide advice on legal matters - Handle legal disputes - Draft and check agreements and contracts - Manage legal matters	- At least a bachelor's degree in related field - Legal experience related to transport business and commercial business	1	[65,000]
Lawyer		At least a bachelor's degree in related field	2	[25,000]
Policy Support Staff	Gather and analyze information and give	At least a bachelor's degree in related field	1	[25,000]

Position	Job Description	Qualification	Manpower	Salary
	useful advice for policy planning	Experience related to government policy support		
Common Ticketing and Settlement System Management Staff	- Verify and report revenue apportionment results - Deliver revenue to operators - Calculate and collect related fees	At least a bachelor's degree in related field	4	[35,000]

Table 6-5 Summary of Additional Required Manpower Each Year

Department	Position	Additional Manpower (Persons)			Total Manpower (Persons)
		Year 1	Year 2	Year 3	
Director-General		1	-	-	1
Finance					
Finance	Director	-	-	1	1
Finance and Accounting	Manager	-	1		1
	Staff	-	-	1	1
Human Resources	Manager	-	-	1	1
	Staff	-	-	1	1
Legal	Senior Lawyer	-	-	1	1
	Lawyer	-	-	2	2
Policy Supporting	Staff	-	-	1	1
Common Ticketing and Settlement System Management	Staff	-	3	4	7

Department	Position	Additional Manpower (Persons)			Total Manpower (Persons)
		Year 1	Year 2	Year 3	
Marketing and Public Relations					
Sales and Marketing	Manager	-	1	-	1
	Staff	-	-	3	3
External Coordination	Manager	-	-	1	1
	Staff	-	-	2	2
Business Development					
Business Planning	Manager	1	-	-	1
	Staff	-	-	1	1
Business Development	Staff	-	-	3	3
Technical					
Technical	Director	1	-	-	1
Ticket and Computer Engineering	Senior Engineer	-	-	2	2
	Ticket System Engineer	1	-	2	3
	Ticket Issuer	-	-	4	4
	System Engineer	1	-	4	5
Technical Planning	Staff	-	2	-	2
Ticket Standard Certification	Manager	-	1	1	2
System Connection	Senior Engineer	-	2	-	2
Total		5	10	35	50

4. Potential Development Training by CCH, CTC Operator

To ensure that CTC is able to perform the system management and maintenance effectively, CTC requires training programs related to common ticketing and CCH system operation, and system maintenance in order to create understanding of responsibilities and all related scopes. CTC's personnel evaluation standard is also needed.

Training programs to be discussed in this section are provided by CCH system developer with an emphasis on system operation and maintenance. The training topics can be divided into 4 sections of system operation training and 2 sections of system maintenance, as follows;

4.1 System Management Training

4.1.1 Basic Knowledge on Central Clearing House

Assigned staff who are qualified and suitable with knowledge on the subsystems, technical equipment, CCH system specification, functions and interfaces provided. The trainings cover the following topics;

Table 6-6 Details of Basic Training Programs related to the Central Clearing House

Training Topic	Training Details
CCH and Subsystems	Description: Overview of CCH system and its subsystems; basic and intensive levels Objectives: To gain basic and intensive understanding of CCH system overview, specific commands and functions
CCH Technical Equipment & System Components	Description: Describe technical architecture characteristics and equipment Objectives: To enhance understanding of CCH's technical architecture
CCH End-User Features and Functions and Interfaces	Description: Describe CCH's characteristics and functions including the interfaces Objectives: To understand CCH's major characteristics and functions including the interfaces

4.1.2 CCH System Management

Training programs for the CCH system management, which are related to CCH system equipment, interfaces and software applications, cover the following topics;

Table 6-7 Details of CCH System Management Training Programs

Training Topics	Training Details	
CCH Operating Procedures, Principles and Applications	Description	Overview of significance of CCH operation procedures, principles and applications
	Objectives:	To gain understanding of the procedures and application's operation supporting methods
CCH System Monitoring and Administration	Description:	Clarify monitoring and administration systems established by CCH
	Objectives:	To gain understanding of CCH's monitoring and administrating systems
CCH Software Process Monitoring and Management and System Recovery from Minor Faults	Description	Clarify software process monitoring and management, including system recovery from damages
	Objectives:	To gain understanding of the software process monitoring and management, including system recovery process
CCH Software Release and Configuration Management	Description:	Explain about new released software related to the process and configuration management
	Objectives:	To gain understanding of new software related to the process and configuration management

4.1.3 Operations and Maintenance Manuals

This training section is about use of operation and maintenance manual which covers the following topics;

Table 6-8 Details of Operations and Maintenance Manuals Training Program

Training Topics	Training Details
CCH Operations and Maintenance Manuals	Description: Overview of Significance of components and use of CCH operation and maintenance manuals Objectives: To gain understanding of CCH operations and maintenance manuals

4.1.4 Operating Software Training

It is recommended that specialists certified by the facility training program perform the operating software training with the details as follows;

Table 6-9 Details of Operating Software Training Program

Training Topics	Training Details
Operating Software Training	Description: Provide details about installation, setting and management trainings Objectives: To gain understanding of details of operating software

4.2 System Maintenance Training

4.2.1 Components and Maintenance Concepts

This training section involves components and maintenance concepts of CCH facilities, software and applications.

Table 6-10 Details of Component and Maintenance Concept Training Programs

Training Topics	Training Details
CCH System and Subsystems Overview	Description: Introduce basic and intensive overview of CCH system and subsystem solutions Objectives: To gain understanding of overall and intensive overview of CCH solutions, vocabularies and functions
CCH Operating Procedures, Principles and Applications	Description: Overview of significance of CCH Operating procedures, principles and applications Objectives: To gain understanding of procedures and application operating methods to support the operations
CCH Technical Equipment & System Components	Description: Explain about technical architecture and equipment Objectives: To gain understanding of CCH technical architecture details
CCH Installation, Testing and Commissioning Overview	Description: Overview of CCH installation, testing and commissioning Objectives: To gain basic and intensive understanding of CCH installation, testing and commissioning procedures
Test Equipment and Special Tools	Description: Overview of equipment and special tools' test Objectives: To be familiar with the test of equipment and special tools
System Monitoring and interpretation of alarm indications, messages and print-outs	Description: Continuity of system monitoring with additional details on alarm indications, messages and print-outs Objectives: To be able to monitor and understand alarms, messages and print-outs
Preventative Maintenance Procedures	Description: To understand CCH preventive maintenance procedures entirely Objectives:

Training Topics	Training Details
	To be able to understand CCH preventive maintenance procedures
Fault Diagnosis, Troubleshooting, and Corrective Maintenance	Description: Overview of fault diagnosis, troubleshooting, and corrective maintenance Objectives: To gain understanding of procedures for fault diagnosis, troubleshooting, and corrective maintenance
Fallback Procedures	Description: Overview of fallback procedures in a case that normal procedures cannot be executed. Objectives: To be able to understand fallback procedures in a case that normal procedures cannot be executed.
Methods and procedures to provide new system expansion and enhancements	Description: Overview for system expansion and enhancements Objectives: To be able to understand system expansion and enhancement procedures for new system
Data, software backup and loading	Description: Overview for software backup and data loading Objectives: To be able to understand procedures for software backup provisions and data loading
Use of software such as peripheral control and configuration, utility, database structure, generation and modification	Description: Overview of peripheral device software Objectives: To be able to understand peripheral device software
Use of Equipment manuals, operating and maintenance manuals	Description: Overview of equipment, operating and maintenance manual Objectives: To be able to understand the manuals and operations

4.2.2 Preventive Maintenance and Correction

Training programs for preventive maintenance and corrections regarding CCH equipment, software and applications cover the following topics;

Table 6-11 Details of Preventive Maintenance and Correction Training Programs

Training Topics	Training Details
Hands-On Use of Test Equipment and Special Tools	Description: Hand-on training for use of test equipment and special tools Objectives: To gain understanding of equipment and special tool tests
Preventative Maintenance	Description: Hand-on training regarding a certain step of preventive maintenance Objectives: To gain hand-on understanding of preventive maintenance
Hands-On CCH Fault Diagnosis and Troubleshooting Example	Description: To provide hand-on training regarding a certain step of preventive maintenance Objectives: To gain hand-on training for fault diagnosis and troubleshooting
Hands-On CCH Back-up and restore procedures	Description: To provide hand-on training regarding CCH back-up and restore procedures Objectives: To gain experience in data back-up and restore

5. System Integration between Central Clearing House and related Agencies

5.1 Integrating System to Service Providers

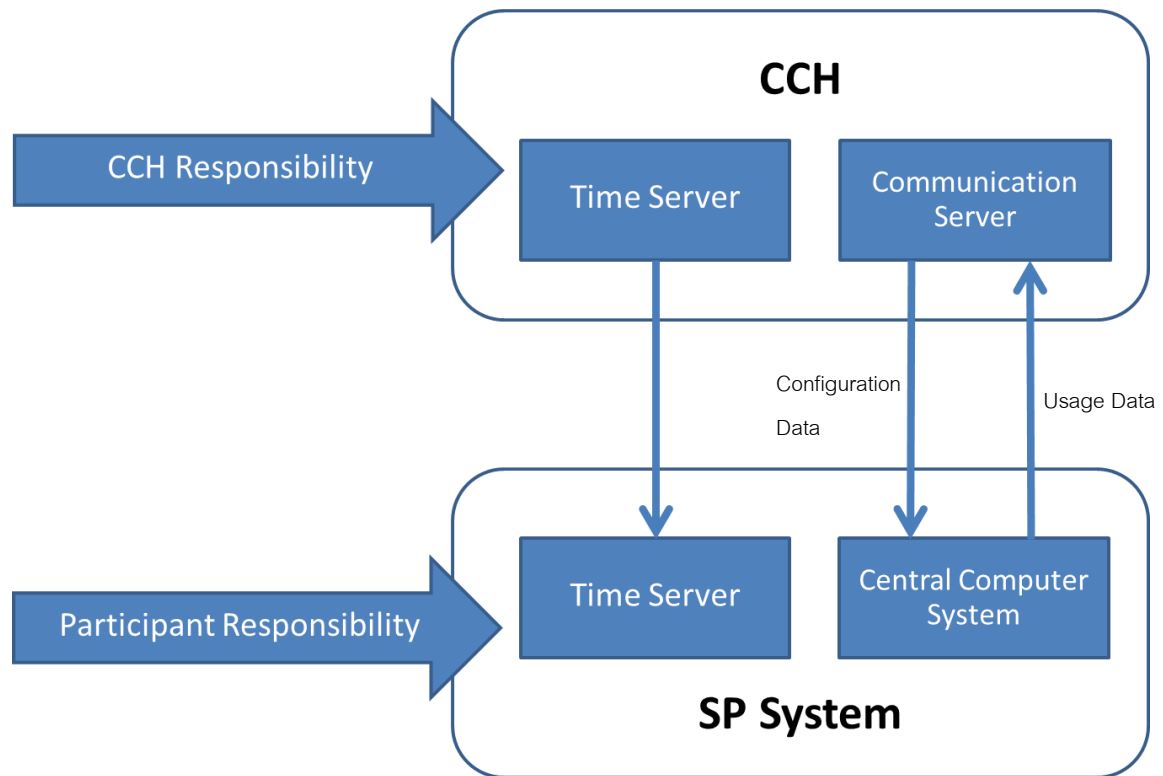
The main objectives of connection between the service providers' central computer system and the Central Clearing House System are to exchange 1) Usage Data such as transactions and events, etc., 2) Keys, and 3) Configuration Data such as various parameters and blacklists, etc.

5.1.1 Overview

Data exchange can be divided into one part sending to the central computer system by the Central Clearing House, and another part sending to the Central Clearing House by the central computer system. The details are as follows;

1. The Central Clearing House is responsible for;
 - Receiving usage data file sent from the Central Computer System
 - Sending configuration data file to the Central Computer System
 - Setting the server's time through time synchronization based on Timer Server Stratum-2
 - Sending a set of keys for SAM installed in the device
 - Preparing a report (including reconciliation and financial reports)
2. The Central Computer System is responsible for;
 - Sending usage data file sent from the Central Computer System
 - Receiving configuration data file for the Central Computer System
 - Setting the server's time using a connection to request for time synchronization from the Central Clearing House's server

Figure 6-1 Responsible Agencies for infrastructure Integration



5.1.2 Receiving-Sending Data in the Integration

1. Data sent from the Central Computer System to the Central Clearing House

Data	Description
1. Usage Data from CIPD	Data of events caused by using CIPD
2. Usage Data from Service Provider	Details of equipment usage data sent through the Central Computer System to the Central Clearing House consisting of; • Card issuance data • Card usage data • Top-up data • Card clearing data • Value return and card replacement data • Lucky draw/reward redeem data • Automatic top-up data • Reversal data • Payment data

Data	Description
3. Audit Register Data	• Data of automatic gate operation • Data of payment machine/card distributing machine operation • CIPS operation data
4. Version Information Data	Data of application versions and system configuration data. The device creates this version information data when it collects transaction data in order to send to the Central Clearing House. This version information data will be sent together with the set of transaction data.
5. Event Data	CIPD/top-up and value return device create the event data which identifies various events occurred. The event data is considered a type of usage data.

2. Data sent from the Central Clearing House to the Central Computer System

Data	Description
1. Parameters Data File	• Station Topology Refers to the station equipment and its arrangement data • Fare Parameter Refers to data used for the mass transit system fare calculation such as transit fare and fine • Add Value Quota Refers to a type of value adding device. Such device must be registered in the Add Value Quota in the system. • Card Sale Parameter Identifies details of card issuance and sale -related business parameters • Card product scheme Identifies business parameter details of each common card type
2. Card Blacklist	• Full Blacklist The system creates blacklist, determined by the card number or its number interval, daily • Partial Blacklist

Data	Description
	The system creates blacklist as requested or on predetermined schedule. When the next full blacklist schedule is due, the full blacklist will also include the partial blacklist created during that day.
3. Card Whitelist	• Full Whitelist List of all cards approved for the usage • Partial Whitelist Additional approved card list which is sent to the central computer system as requested or on predetermined schedule. When the next full whitelist schedule is due, the full whitelist sent will also include the partial whitelist.
4. CTC Equipment ID Blacklist)	List of CTC equipment ID number in the blacklist. The system creates this equipment ID blacklist daily.

5.2 Integration with Banks

The Central Clearing House must be connected and exchange data with banks to selected by the CTC as the settlement banks. The exchange of data files aims to ensure that financial operations between CTC and the service providers are complete. The processes between the Central Clearing House and banks are as follows;

- Sending settlement order between the Central Clearing House and banks
- Settlement order confirmation from the banks to the Central Clearing House
- Receiving reply from the settlement order

Then, the system will exchange the "Settlement List" file in order to complete the process.

In addition to financial data files, the banks also send other data to the CCH using for the management as follows;

- Blacklist
- Card Personalization
- Registrations
- Cancellations

6. Automatic Fare Collection System Update

There are possible channels for using the common ticket in the existing mass transit systems. In details, related parties have to modify the systems to ensure that they are able to operate effectively according to the specifications without negative effects to the existing systems.

Currently, the Automatic Fare Collection systems which require modification by the CTC are as follows;

- BTS – Sukhumvit and Silom Lines as well as all extensions
- MRTA – Blue Line
- ARL – Suvarnabhumi Airport Rail Link

Other mass transit service providers that have not yet used the AFC system, the common ticketing system has to support Single Journey Ticket (SJT) purchase. If the AFC systems do not support the SJT (although SJT is not included in the common ticketing system), for public bus ticket, it can be purchased from the bus depot's computer system. The SJT sales data is collected so that the data will be forwarded to the Central Clearing House for an analysis in the future.

6.1 Guideline for Automatic Fare Collection Modification

The modification Automatic Fare Collection shall require examination of existing systems based on selected the card's architecture. Possible guidelines for the Automatic Fare Collection modification are as follows;

- A. For the automatic fare collection modification, current ICT system must be applicable without any modification, except that a number of nodes in router is insufficient, the router might be changed or added as necessary.
- B. Existing Automatic Gate and reader devices will not be changed, except that developers and suppliers of the system do not allow the modification according to the system integration requirements, or usage of necessary Application Programming Interface (API).
- C. In a case that the automatic gate's main control program has to be changed or developed, so that the equipment is able to operate according to the Business Application and connect to the reader and gate system control, the automatic gate's main control that is changed or developed has to support a single pass and other existing ticket types.

- D. The common ticket vending machine must be provided. An area in ticket booth has to be provided for this common ticket vending machine installation.
- E. Ticket Vending Machine is not necessary for the common ticket issuance.
- F. Card top-up machine must be provided for top-up value for e-wallet and common ticket distribution or change. The service providers are able to add special functions to the machine in order to support their cards at their own expenses.
- G. The station computer system is required to update the software to be able to send the common ticket's transaction data. It also needs to modify the hardware to support increasing workload.
- H. The station computer system is required to update the software in order to receive the common ticket's configuration data. The hardware might need to be modified to support increasing workload as well.
- I. The Central Computer System has to adjust its software in order to send the common ticket and SJT's transaction data to the Central Clearing House. Additional servers probably are needed to support increasing workload.
- J. The Central Computer System has to adjust its software in order to process and collect the common ticket's configuration data received and the service providers' configuration data, before forwarding it to the station computer system. Additional servers probably are needed to support increasing workload.

6.2 System Efficiency

To minimize any negative effects caused to existing passengers from the AFC modification, the modified system should have at least the following capabilities;

- Each transaction at the automatic gate (starting from touching the card at the reader until the gate opens) for all card types must not exceed 500 milliseconds.
- Walk through rate decline at the modified automatic gate in 1 minute must not exceed 5% of the walk through rate prior to the modification.

6.3 Functional Requirements

- A. The existing functions will be wholly preserved without reducing its capabilities, capacity or operating expansion. The equipment management for SJT consists of report preparation and facility inspection.
- B. The modified system must be able to use the card according to the common ticket's business rules. Its functional framework consists of;
- Able to use the e-wallet value for mass transit fare payment
 - Support at least one type of either common day pass or common trip pass operated by transit service providers participating in the program.
 - Able to top-up to the e-wallet or add product at the ticket vending machine and automatic vending machine.
 - Able to manage the system transition and entrance fee (Primary stage)
 - Able to calculate fare from origin to destination (point-to-point) (Final stage)
 - Able to collect and deliver the usage data to the Central Clearing House
 - Able to receive the configuration data sent from the Central Clearing House
 - Able to use blacklist data received from the Central Clearing House

Table 6-12 Functions Required from the Update of Automatic Fare Collection Equipment

Equipment	Equipment Functional Requirements
Reader	In a case that the reader is needed to be changed. The reader must acquire the following qualification; • Support a number of SAM as many as the former reader does, and be able to operate the same functions • The new reader must be in compliance with EMV standard and certified by a related agency in Thailand
Automatic Gate	• Automatic gate's hardware must not be changed except its control (computer), and if the reader is not effective enough, it must be changed as well.
Ticket Vending Machine	• The ticket vending machine must be able to issue ticket, read data, calculate additional fare, update ticket's status for use, cancel ticket and issue substituted ticket for all types of common tickets. • For all types of common ticket, the ticket vending machine must be able to issue stored value card, top-up, read data, issue the ticket and debit penalty fee from all common card type. • The ticket vending machine must be able to issue ticket, extend trips and update its status to be ready for Day-Pass product. • The ticket vending machine must be able to issue ticket, add number of trips as determined, and update the ticket's status to be ready for use. • The ticket vending machine must be able to top-up automatically as specified in the business rules. • The ticket vending machine must be able to operate different functions prescribed above for a single common ticket as stated in the business rules. • The ticket vending machine must deny any transaction until the former transaction is completed, and close the transaction screen when it expires, except the new transaction is occurred before it expires. • The ticket vending machine must be able to connect to the credit/debit and EMV card readers, and issue and top-up the card through a credit card payment. • The ticket vending machine must be able to give a receipt for the most recent transaction as requested by the ticket holder.
Automatic Ticket Vending Machine	• In a case that the service provider's automatic ticket vending machine can supports contactless smart card services, all existing functions must be extended to support the common tickets. • If the automatic ticket vending machine does not support contactless smart card services, the equipment is not required the update.

Equipment	Equipment Functional Requirements
Station Computer System	- After the modification, the station computer system must be able to send the common ticket usage data to the Center Computer System. - The report has to be expanded to cover the common ticket transactions using the same format and topics as in the current station reports for SJT, contactless smart card and other types of cards currently in use. - The station computer system must be able to send/distribute the configuration data to different equipment in the station.
Central Computer System	- After the modification, the Central Computer System must be able to send the common ticket usage data to the Central Clearing House (the data can be sent through the card agent or not through it). The usage data sent might cover SJT usage and special products of the service providers for making reports. - The report has to cover the common ticket transactions using the same format and topics used in the current reports for SJT, contactless smart card and other card types currently in use. - The station computer system must be able to collect the configuration data received from the Central Clearing House with the one sent to the station computer system.
Card Agent Computer System (If any)	- After the modification, the card agent's computer system must be able to send the common card usage data to the Central Clearing House (the data can be sent through the card agent or not through it). The usage data might cover the service providers' SJT and special products for making reports. - The report has to cover the common ticket transactions using the same format and topics used in the current reports for SJT, contactless smart card and other card types currently in use. - The card agent's system must be able to send the configuration data to the Central Computer System.

6.4 System Integration

6.4.1 System Compatibility

Modified system must be backward compatible with the existing system completely. Tickets currently in use such as a single pass and day pass must be able to function normally without a need for new tickets using the newer technology.

6.4.2 Integrating to Central Clearing House

Operator who is going to modify the AFC must follow the system integration requirements designed by the CCH developers so that the service provider's central computer systems are able to connect and work with the CCH system completely.

6.4.3 Safety Concept

The modified AFC system's data storage safety must be maintained. It includes safety level expansion to cover common ticket data. The AFC modification must follow the safety requirements for data transmission between the service provider's central computer system and the Central Clearing House designed by the CCH developer.

7. Negotiation with Common Ticket Operator

7.1 Business Rule

In common ticket operation, the participating operators have to follow the business rules specified by the common ticketing system operator as an operating guideline. Therefore, the common ticketing system operator is responsible for negotiating with the Transit and Non-transit operators to make them accept the conditions and sign the agreements. If there is any change of business rules, the system operator will have to inform the operators about the change within a specified period. In addition, if such change contradicts with the agreement between the system operator and the service providers, the agreement will be predominant. The business rule prescribed by the system operator is as follows;

7.1.1 Accepting Co-Branded and Co-Issued Common Ticket Usage

- (1) The service provider shall accept the use of all types of common ticket consisting of Co-Branded card, Co-Issued card, as well as NFC or other systems certified by the system operator for goods and service payments.
- (2) If the common ticketing system operator or service providers employ top-up agents, they will be responsible for ensuring that an amount of money paid by customer is equal to top-up value.
- (3) Increased or reduced value caused by any transactions cannot be refunded, so the service providers should provide the common ticket's refund manuals for their customers or passengers.

7.1.2 Reader Location and Perception

- (1) The service providers have to install the readers in a noticeable location. The passengers or customers must be able to see the card's increased or reduced values and remaining amount on the readers clearly. If the reader does not have a screen, the operators should provide other screen to show the information mentioned above.
- (2) The common ticketing system operator will give advices to the service providers on inspection and test before actual use. The service providers have to follow the instructions and procedures recommended by the common ticketing system operator.

7.1.3 Permit the Operators to Use the Common Ticket Trademark

- (1) The service providers have to maintain the common ticket trademark shown at the reader to be visible and in good condition.
- (2) The use of trademark at all times has to be approved by the common ticketing system operator.
- (3) The common ticketing system operator will provide the trademark use permit application manual to the service providers, and they can contact the system operator's Sales and Marketing Department to apply for the permit.

7.1.4 Information Privacy

- (1) The service providers, no matter what purpose, cannot reveal any information in the common ticket unless they are approved by the common ticketing system operator.
- (2) The service providers cannot disclose any customer-related transaction data without permission from the common ticketing system operator.

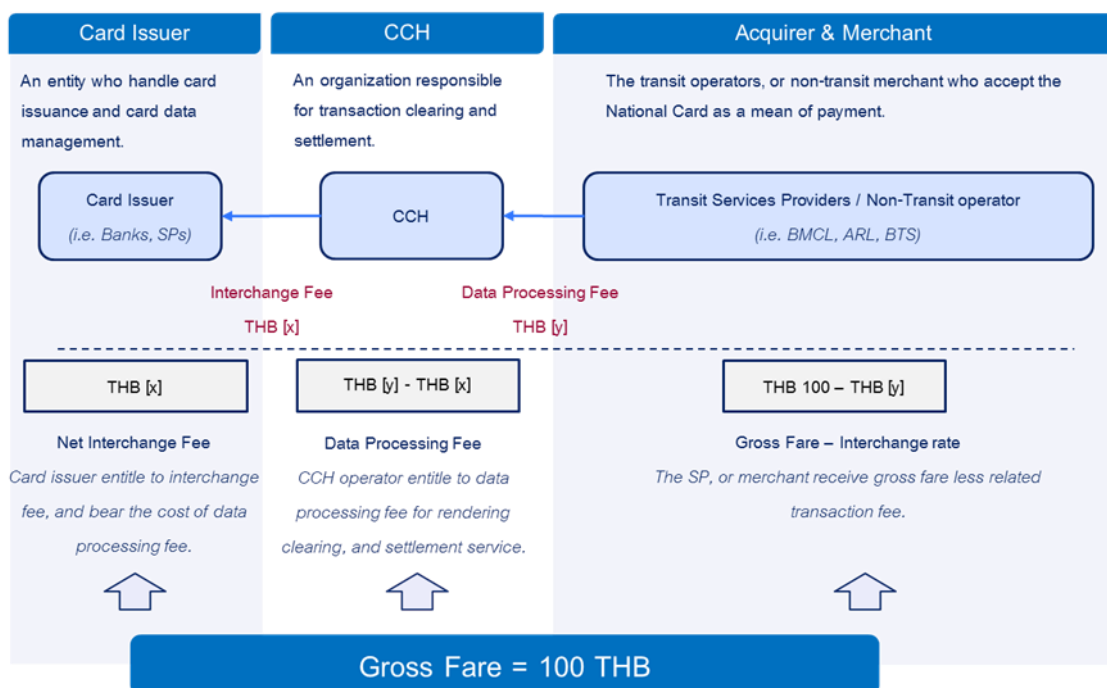
7.1.5 Cardholder Inquiries

- (1) The service providers will have to show passengers or customers the instructions, if the common tickets are not usable.
- (2) The service providers should suggest passengers or customers to contact the system manager's Customer Service Department.
- (3) The service providers will have to inform the system operator immediately, if there is any problem in the system usage.

However, the business rule prescribed by the consultant is only an operating guideline. In the system operation, the system operator can modify the business rule as appropriate for the operation.

7.2 Transaction Fee

The common ticketing system operator is responsible for negotiating for shares of the transaction fee with related parties, which is under the framework agreed by the common ticket administrative committee according to the administrative policy. The transaction fee can be divided into 2 types as shown in the chart below.



(1) Data processing fee

The data processing fee is paid by the Service Provider (SP) to the system operation and maintenance operators (CTC) as the one who process the usage data for transactions from the SPs, before it is apportioned to the card issuers based on the revenue apportionment criteria to be devised.

The data processing fee is determined as an income for CTC to repay investment and expenses caused by CTC as the common ticketing system operation. The fee rate might be set rather high at the primary stage, and then it will be lowered in accordance with increasing number of common ticket users.

(2) Interchange fee

CTC shall apportion the interchange fee to card issuers when the cards are used with any system to the service providers. For example, a common ticket issued by card issuer A is used for making a payment to operator B, in such a case CTC, as the data processors, will apportion the interchange fee to the card issuer A, based on calculating a proportion per transaction value.

To determine such interchange fee, it is expected that the fee can persuade and attract more card issuers leading to competition among the card issuers, hence benefits for the card users.

8. Operation and Maintenance

8.1 Operation during the Days

The system operation duties have to cover the following operations;

1. Operating Procedure Determination

CTC has to execute according to the System Operation Procedure details specified from the determination of system operating procedures. In the operation, at least following details are required;

- 1) System details
- 2) Glossary
- 3) Service quality requirements
- 4) Management plan consisting of
 - 4.1) Business operating plan
 - 4.2) Business rule
 - 4.3) Operational control plan
 - 4.4) Operating plan in an usual situation
 - 4.5) Operating Plan in an unusual situation
 - 4.6) Safety management plan
 - 4.7) Security management plan
 - 4.8) System maintenance plan
 - 4.9) Emergency response plan

Normally, CTC operation is divided into three main sections with duties and responsibilities shown in the Table 6-12.

Table 6-13 Duties and Responsibilities of each CTC Department

Department	Responsibilities	Functions
1. Card Center	Managing cards and supporting any card-related services for card distributing agents. Card service providers must be able to provide card as required by the system and deliver the ready cards to the card distributing agents according to the agreement. Supporting services for the card holders such as card registration and card value return, etc.	● Providing cards ● Reserving cards ● Preparing card data/issuing cards ● Registering cards ● Delivering cards ● Returning card value
2. Hotline	Hotline service is provided as a medium for contact and providing assistance to related parties and the card holders at least 17 hours a day.	● Information inquiries ● Providing information ● Accepting complaints
3. Service Provider Support	Providing a medium for contact to related parties in order to support any CCH and system network-related operations. Inspecting and performing any appropriate actions to ensure that the system operates effectively.	● Continuous coordination ● Solving problems at hand ● Providing support ● Guaranteeing performance

2. Equipment Control and Inspection

The responsible personnel operators are responsible for inspecting the equipment regularly in order to test and check each function.

3. Network Management

Network connection requires regular maintenance to ensure that the data is successfully sent and received in order to prevent instability which will affect the network quality and

equipment. The inspection can be performed by monitoring the data transmission rate, and regulating Network Bandwidth on schedule to enhance the data transmission efficiency.

4. Transactions Clearing

After any transactions are completed each day, the system will process all the transactions in order to perform the clearing according to agreement made with the service providers.

After the clearing process is completed, the system records the clearing data in the database.

5. Financial Report

In the clearing process, the system performs data processing and calculation as negotiated with each service provider. After the clearing process is completed, the system will make a financial report such as clearing report, fare calculation report according to royalty, fee calculation report, commission fee calculation report, etc. the CTC is responsible for reconciliation as well.

6. Report and Settlement Verification

After the settlement and reconciliation reports are completed, CTC will send them to the service providers for verification and confirmation. After the reports are verified, CTC's authorized person will send settlement order to the settlement banks for transferring the money to various service providers according to the settlement report. The money will be transferred to their accounts within the same day of settlement report issuance.

7. Data Backup

CTC has to perform the data backup at least once a week. The data backup should be performed regularly to protect the data in an event that the data restore become impossible.

8. Parameter Maintenance

In an event of service requirement change, the system must be able to send the parameter data for the altered requirement to the equipment before start using this new service requirement.

9. System Maintenance

The system maintenance is controlled and managed by the system engineer. Details of maintenance program and various maintenance prescriptions can be modified according to situations.

10. Database Maintenance

Apart from the database maintenance, it is specified that the data must be stored online for 6 months and offline for 5 years according to the Central Clearing House's requirement, to guarantee the effective operation and complete and thorough database.

11. Unusual Information Management

Because the transaction data is sent to the clearing system continuously, unusual information format might be created, leading to error in the clearing process. As the result, the system maintenance operators are required to monitor the data transmission and solve any error caused by the data processing.

12. Computer Center Environment Maintenance

Computer center's environment should be maintained to ensure that its humidity and temperature are kept normal, as well as preparing fire prevention tools to prevent fire. Security guards have to guard the access points to prevent information leakage.

8.2 System Maintenance

Both preventive and corrective maintenance are performed for the Central Clearing House and Automatic Fare Collection system to ensure that the systems are able to operate effectively according to the efficiency requirements.

8.2.1 Preventive Maintenance

In this part, the maintenance of systems, sub-systems, and equipment or facilities will be performed according to its schedule. It consists of service test and check, assembly of maintenance and repairing kits, operational system function test and check.

Scope of the CCH Preventive Maintenance is as follows;

(1) Daily CCH Preventive Maintenance which consists of;

- Online Server Health Check and Monitoring
- Online Server Application Check and Monitoring
- Communications Server Check and Monitoring
- Service Provider Data Check and Monitoring

- Application Server Check and Monitoring
- Offline Server Health Check and Monitoring
- Offline Server Database Check and Monitoring
- File System Back-Up Check and Monitoring
- Database Back-Up Check and Monitoring
- Virtual Server Cluster Check and Monitoring
- End of Day Check and Monitoring;
 - 1. Back Office Interface
 - 2. Financial Management
 - 3. Reporting

(2) Monthly CCH Preventative Maintenance

The monthly CCH preventive maintenance consists of the following tasks;

- Infrastructure maintenance and tuning which include data storage, various servers as well as Hardware Security Module
- Operating system maintenance and tuning such as Window Operating system, use of visual systems, CPU, data storage, data processing, etc
- Visual server maintenance and log file analysis
- Automatic Fare Collection (AFC) application maintenance & tuning such as capacity check, tuning of different servers, data settings and default configuration, etc
- Database maintenance and tuning
- Network maintenance and tuning

(3) Preventive maintenance for general hardwares and network as scheduled (twice a year)

- Manage and prepare advices for operations related to data backup
- Data restoration check
- Issues logging and tracking
- Issues management

- Providing advice for operations related to the issues (Issues Resolution Advisory)
- Disaster recovery system readiness check

8.2.2 Corrective Maintenance

This type of maintenance is performed during an inevitable and unpredictable incident such as inability to perform an action, accidents, damages, or natural disasters which negatively affect the equipment, sub-systems and facilities leading to the need of maintenance in order to bring them back to their normal status.

Scope of CCH Corrective Maintenance should contain at least the following tasks;

- Unscheduled Monitoring
- Fault Diagnosis
- Offsite troubleshooting
- Onsite troubleshooting
- Unscheduled system recovery
- Management of any issues occurred such as in management, tracking, and solution recommendation (Issues logging and tracking)
- Issues logging and tracking
- Issues Management
- Issues Resolution Advisory

