

6.6.7 Options

(1) Do Nothing for standard and norms

- Efficient software development, stable system operation, improvement of the IT cluster will not be achieved.
- No clear criteria for a common subsystem and e-Government services.

(2) Partial Implementation

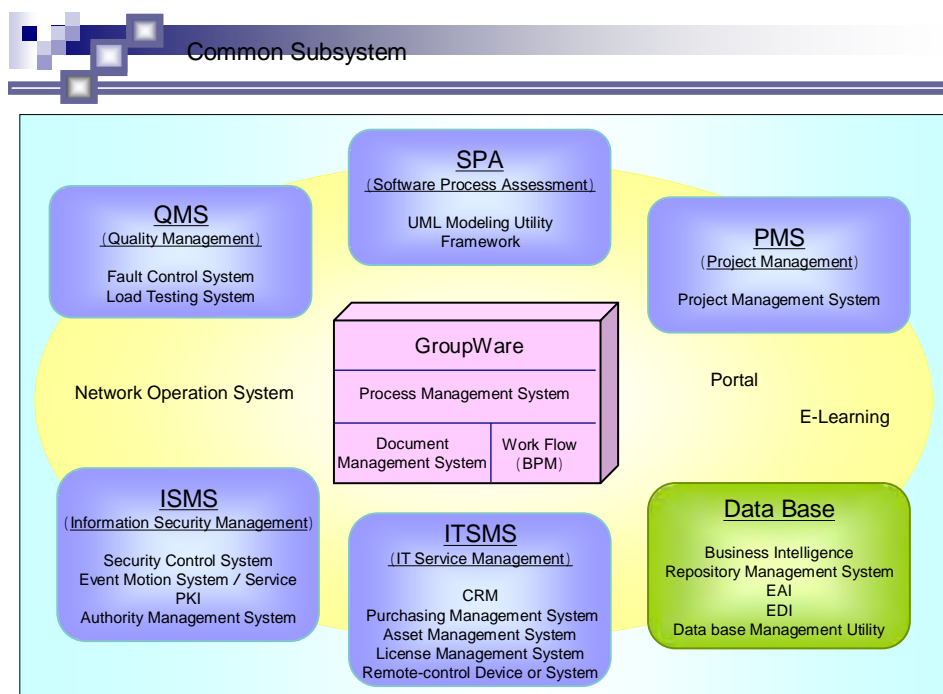
- As described, standardization tasks will continue gradually over time. So ever after a number of years pass, progress may not yet be recognizable. Currently, because business operations are not given much attention, it may be seen as lower priority. This in turn causes unstable operations and bad services to citizens.

6.7 Basic Strategy and Design for Common Subsystems

6.7.1 Issues and Concepts

At present, most of application systems in the government have been produced by each of the ministry without much consideration to other organizations, resulting in the waste of effort due to duplication and mutual incompatibility, which deprives the government of development opportunities that would arise by combining systems of different ministries and agencies.

The preceding section described necessary standards and norms to be established for the effective e-Government preparation and operation. In practical terms, common subsystems are necessary for the e-Government to operate efficiently. The following diagram illustrates the subjects to which common subsystems are desired to be established and used by system producers and operators.



Source: JICA Study Team

Figure 6.25 Composition of Common Subsystems

6.7.2 Types of Common Subsystems

Types of common subsystems that should be introduced as a part of the e-Government effort are summarized in the table below.

Table 6.9 Functions of Common Subsystems

Name of Solution		
General Functions	Specific to This Project	Priority
ITSMS (IT Service Management)		
CRM (Customer Relationship Management)		
Information system that aims at building a long-term relationship with customers. It manages the information about customers as essential information, and performing unified management of the communication with each customer including correspondence concerning inquiry on offers for commodity buying and selling, maintenance service, complaints, etc. It is often used for the purpose of improving customer's convenience and satisfaction rating by performing fine-tuned responses for customer needs.	Mainly, it will support the call center, which is a single window for the citizens to lodge claims, demands, etc. (G2C) This can also be utilize in services for government IT staff. (G2E)	
Purchasing Management System		
Information system used by procurement department to manage applications for purchase, to execute order processing and contracting, delivery acceptance, etc.	The procurement group becomes the main user. The management of purchase requests, ordering data, delivered data, etc. is to be classified into a unified database managed by this team, and one that each ministry or local government uses is to be managed independently.	
Asset Management System		
Information system to manage asset in government including IT facilities.	The procurement team will use this system to manage facilities in the e-Government center.	
License Management System		
Chiefly, information system that manages procurement of software packages and their status. It is preferable to cooperate partially with the Asset Management System.	It mainly aims at controlling the investments in package software.	
Remote-control Device or System		
A tool to operate and manage servers or specific client PCs at remote locations. One type of this tool depends on hardware, while another is realized by software.	The e-Government Center may provide remote operation service to ministries and municipal offices.	
ISMS (Information Security Management)		
Security Control System		
Integrated security system that performs intrusion detection function, anti virus function, etc. to protect system security.	In this project, it is necessary to introduce the network security system and the data security system separately. It is necessary to unite security systems in each field. It is preferable that the securing of client PCs that are operated in each ministry, agency, local government, and PAT is achieved by the security system of the server management type.	

Name of Solution		
General Functions	Specific to This Project	Priority
Authority Management System		
Information system to manage users who use two or more applications, and to manage user authentication.	Objective is the user profile management of government officials who use the government systems. Profiles includes name, position, e-mail address, telephone number, etc., and the users' authority management (folder inspection authority and application of right of use, etc.). This function links with the Intra-Government portal.	
PKI (Public Key Infrastructure)		
It is a name of the technology and the product, which uses the public key cryptosystem. Providers of digital certification services (CA) construction server etc. that issue a public key cryptosystem technologies of RSA and the Elliptic Curve Cryptosystem, etc., encryption Electronic Mails that use the Web server using SSL, the browser, S/MIME, and PGP, etc., and digital vouchers are included.	This function is to take place as a part of the Government Wan in this project.	
Database		
BI (Business Intelligence)		
Software that aims to accumulate, analyze, process data accumulated in each system, and to facilitate appropriate decision making. Not depending on specialists, managers or staff can analyze the accumulated data by themselves to use for creating management plan, business plan, and corporate strategy. It is considered that data mining is one of BI functions in addition to data warehouse (DWH), decision support system (DSS), on-line analytical processing (OLAP), Ceritsle, and reporting tools.	It aims at statistical and other analysis of databases that the government has. Because expertise is needed to keep data consistently, e-Government center should do the tuning of the system, and customizing to improve usability.	
EAI (Enterprise Application Integration)		
Information system to achieve efficient integration of multiple systems, data and processes. These systems are run on various kinds of environment, such as mainframes, UNIX, Windows, etc. EAI is a kind of middleware consisting of some functions, e.g. "Adaptor" that provides the interface to each system, "Format conversion" that converts differences in data layout or protocols of each system, "Routing" that distributes the data received from certain system to other systems on the content and "Work flow (process control)", which are combination of those functions and build the business process adaptable to actual business practices.	It is used in the Trigger Applications in this project, such as the Citizens' Master Database Systems and Disaster Information System to build integrated Database. The cooperation among related organizations becomes possible by the integration of DBs using EAI.	

Name of Solution		
General Functions	Specific to This Project	Priority
EDI (Enterprise Database Integration)		
System that aims at uniting business transactions to a standard format, and to exchange them electronically between organizations. Information is sent and received electronically through the network according to standard format provided beforehand for different organizations. The technology of Internet standards such as Web browsers and XML is taken as the Internet spreads, and the technique that uses the Internet for channel is increasingly selected in recent years.	In this project, it is not necessary. In the future, it is possible to use this also for the transactions with the organizations outside the government (suppliers and business consignments). Also government may serve private sector data exchange services to promote its business efficiency.	
Database Management Utility		
	The security team initiates and it operates it.	
SPA (Software Process Assessment)		
UML Modeling Utility		
A tool that supports design based on UML.	The development team selects the tool based on the standardization document and the manual that relates to designing.	
Framework		
It is a group of software, which performs widely, used functions to be utilized as a basis of application software. It improves development efficiency because only original functions have to be developed on top of the framework.	The development team under standardization promotion committee investigates, selects the Framework based on the standardization document and the manuals related to developing application systems. It is necessary to develop a sample source programs to use with the Framework, common components and tutorials.	
PMS (Project Management)		
Project Management System		
System that adjusts HR, budget, facilities, goods, and schedule, etc. in balance to achieve the target given to the team, and manages the entire progress. Most of them aim at managing items such as scope of the project, time, cost, quality, human resources, communication, risk, procurement, and integrated management when the project is directed in accordance with ISO and PMBOK.	The system in accordance with ISO16001 or PMBOK should be introduced. In order to execute the project management, not only implementation of systems but also capacity building of project managers, educating staff, process management as organization are necessary. The standardization promotion committee should lead developing project management plan, execute and audit it.	
System Control		
Fault Control System		
System that manages encumbrance of system. The encumbrances in the development step, the test process, the introduction step, and the operation process are managed, and factorial experiment and so forth are made.	It is not only for the improvement in the quality of deliverables of development but also for the establishment of the organization that can maintain high quality by analyzing factors of bugs and troubles. This system includes software, which automatically detects violation of coding conventions and bugs.	

Name of Solution		
General Functions	Specific to This Project	Priority
Load Testing System		
This system measures how much the developed application is able to endure the load.	The development team and the security/data team select the subject systems.	
Common		
Document Management System		
Information management system that aims at performing unified management of various electronic files, and sharing and recycling them in all organizations.	It is necessary to select a system with the retrieval function of the electronic files accumulated and the authority management function to the reference and the recycling of the electronic files. It is preferable to have cooperation function with Authority Management System and Project Management System. Moreover, because information to be managed in off-line documents is huge, it is necessary to examine the introduction of a selection or additional utility of an easy system to incorporate scanner and optical character reader software.	
Work Flow (BPM)		
Information system that aims at generating automatic operation procedure. It is implemented when an organization processes operation procedures in which basic flows do not change, or to clarify application and approval procedures.	It is necessary to introduce Work Flow because the origin of each process and the visualization of the approval points are needed when the process is managed, and to achieve systematic BPM. In the future, it is possible to use this also for the procurement processing and for the request for decision processing, etc.	
GroupWare		
Information system that aims at the efficiency improvement of intelligence sharing and communication within the organization, and supports cooperation by group. This includes the functions such as schedule management, to-do management, email, teleconference room, and bulletin board system.	For effective project management and process management, is should be implemented in the software development area. It is preferable to select the system with the Document Management function and the Work Flow function and other systems that can cooperate with each application.	
Process Management System		
Project Management System contains this.		
Others		
Portal		
It is an information system on user's PC screen that offers display, guidance, retrieval function, etc. uniformly as if it is an individual information system that exists in the organization. In general, the Web browser and network communication are used.	In this project, portal sites for the each ministry agency and the local government staff (G2G and G2E) and portal sites for the people (G2C) are necessary. In each portal, integration with functionalities such as Authority Management System is indispensable to secure security. (For portals in the government, it is necessary to examine the achievement of One-Click Login.)	

	Name of Solution		Priority
	General Functions	Specific to This Project	
	Video Conference		
	Information system to achieve communication that exchanges voice and image by using network communication.	It is necessary to select a system that operates only with software, considering the introduction and support cost. Installation on client PC must be simple.	

Source: JICA Study Team

6.7.3 Method of Establishment

Common subsystems are to be introduced in a centralized fashion rather than introduced by individual government agencies. There are six kinds of common subsystems that should be given priority and are as follows:

- CRM;
- Business Intelligence;
- EAI;
- Project Management System;
- Document Management System; and
- Work Flow (BPM).

When a standardized operation is executed, the process management, document management, application and approval management are essential. Application systems to support those operations should be implemented with high priority such as a Project Management System, Document Management System, and Work Flow, particularly, if the software development field is the first target.

The reason for choosing the above six is as follows.

The development of two trigger applications is planned to be implemented. This will be a good opportunity for the actual use of Project Management System, Document Management System and Work Flow. Business Intelligence and EAI will form the core of Citizens' Master Database System. Once these application systems begin to be used by citizens, a call center must be organized and for the call center CRM is an essential system to support its operation.

In principal, common subsystems are selected by the standardization promotion committee's initiative, and implemented at the e-Government Center. It is likely that customization is required, or the setting is so complicated that it becomes necessary to contract the implementation tasks to IT divisions in ministries or private companies.

The installation and settings may be required in clients' PCs depending on the software. In this case, factors such as the difficulty of the work and/or work places, overall responsibility (e-Government Center staff, IT staff of each ministry and local government, or private companies) and how to work (via field work or remote operations) should be clarified with the procedures clearly determined.

Introduction and operation requirements including these introduction procedures are matters that should be examined when the applications are selected.

6.7.4 Place of Installation and System Accommodation

Because these are common systems that many agencies will commonly use, the e-Government Center should own and operate, and maintain them.

6.7.5 Participating Organizations

Common Subsystems are closely related to standards and norms. The Standardization Promotion Committee should suggest implementing the necessary common subsystems upon evaluation. It may be based on the technological trend or requests from an agency or from the *e*-Government Center itself. Once decided to be implemented, the *e*-Government Center should support implementation work and provide the relevant services to agencies.

It will be necessary to decide how to charge this service to user agencies.

6.7.6 Options

1) No Common Subsystems

Each ministry will implement such subsystems on own. It will cause duplicated investment, increased use of resources and more time to implement. Especially common systems related to multiple agencies like EAI require implementation by integrated organizations.

2) Partial Implementation

Actual implementation can be done, on the actual proceedings of the standard and norms and actual requirements from agencies. Therefore, common subsystems which will be implemented in the first stage can be less than or more than those indicated in the preceding section.

6.8 Implementation Arrangements for *e*-Gov Organization

6.8.1 Issues and Necessary Functions

The *e*-Government organization will be in charge of implementing, overseeing and programming the functions of the *e*-Gov platform and its applications in El Salvador. This organization has three elements to be defined, first, the ministry or entity in charge, second, the physical infrastructure, and third, the arrangement for directors and staff. Refer to Section 6.3 for the Physical Infrastructure necessary for *e*-Gov emphasizing in the building, and to Section 6.5 for necessary conditions of the building and the functions of the *e*-Gov center.

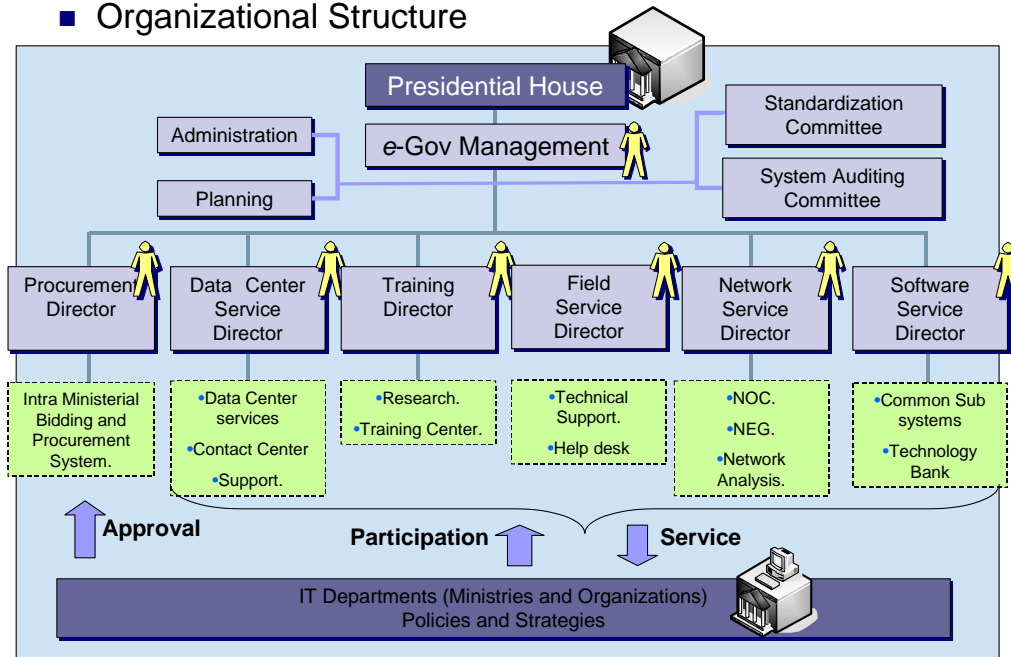
(1) The Organization in Charge

The center must be defined in logical and managerial terms. In terms of functions (See Figure 6.26) where the *e*-Gov center has several activities under its responsibility such as managing the 1) Data Center, the *e*-Gov WAN, 2) Training Center, 3) Technology Bank, 4) Standards and Norms, and others. These main roles are the minimum necessary to perform as an entity for *e*-Gov Center and need to be under a ministry with strong mandate and leadership.

The figure below shows the organizational structure of the *e*-Gov Center and a possible arrangement under the Presidential House.

e-Government Center

■ Organizational Structure



Source: JICA Study Team

Figure 6.26 Organization Structure for Functions, with Presidential House (Tentative)

This arrangement is still option since a menu of possible ministerial or vice-ministerial alternatives will be indicated in the next chapter.

In terms of the organizational arrangement for management, the *e-Gov* Center will have as minimum ten functional units in charge each one of the ten functions explained below.

1) Planning

Business planning is coordinated. This includes implementation of new services, arrangement and decision of fee-charging scheme, evaluation of services, cost calculation/evaluation, and contractual matters with sub-contractors, etc.

Estimated number of staff in this group is 3 to 5.

2) Administration

This group is responsible in all of administrative work for the *e-Government* Center.

Estimated number of staff here is 3 to 5.

3) Standardization Promotion Committee

Consists of persons from several agencies including academics, and private sector. Details are described in Section 6.6 Standards & Norms.

4) System Auditing Committee

Consists of persons from several agencies including academics, and private sector. Details are described in Section 6.6 Standards & Norms.

5) Procurement

All of facilities procured in the e-Government Center and services for the e-Government Center are handled here. Application for procurement by other agencies is reported to this unit and it approves based on the procurement rules defined in Standards & Norms.

Estimated number of staff here is 3 to 5.

6) Data Center Service

All hardware and systems in the Data Center (server room) are operated under this group. Systems in the Data Center include hosting services, housing services, back up services, and other services by common sub systems.

Operation includes regular operation, monitoring (detecting troubles, performance checking), regular maintenance, and recovery from troubles. Operation service for systems in other locations can be done as well. Any troubles should be detected before any end user's claim.

Operation management system should be installed here to support these tasks.

Operators have to be in charge beyond normal government office hours including weekend. Two shifts may be required, while three shifts may be introduced in the future. They are not necessarily government officials. They can be staff from private outsourcing companies.

The Call Center for citizens is under this group. The Call Center has to keep close communication with operators in the Data Center to know the status of the system running, and with agencies which provide e-Government application systems linked with the e-Government portal.

Estimated number of internal staff here is 3 to 5. Actual operation may be outsourced to private sector. Call Center staff will increase starting from 5 to 10 people as the number of users increases.

7) Training

Training is provided mainly for ICT staff in the government.

Researching on technology trends should be made. General training is made by private organizations such as Oracle, MS, Cisco, etc. There are trainings specifically for e-Government such as Standard & Norms definition and design, common subsystems ready to be used, common components, which are for, web applications, usable software developed in some agencies, and so forth.

Training programs are developed here. In the future, e-Learning will be facilitated for the users outside of San Salvador.

Close communication with Standardization Promotion Committee, Technology Bank and other e-Government Center organizations are important. Estimated number of internal staff here is 2 to 3, who are dedicated in planning and arrangement. Actual instructors are called in from other organizations including private sector.

8) Field Service

Services to government agencies are provided. Call Center for government users (helpdesk) receives requirements from them. If necessary, staff may visit users' offices to satisfy users' requirements.

Estimated number of internal staff here is 2 to 3, who are managers and operators.

9) Network Services

Located in the Network Operation Center, where the government WAN is monitored and managed. Details are described in Section 6.1.1.

10) Software Services

Its major role is developing common programs, which can be used for any application programs in any agencies. Customization and implementation support of Common Sub System and Technology Bank under this group store such software to notify to all agencies.

Software developed by any agency or municipality should be informed to this group. These software are for use by other agencies after customization if necessary. These may be uploaded on hosting servers for multiple agencies to use them without installation in each agency as ASP service.

Estimated number of internal staff here is 3 to 5, who have software development project management experience. Actual development is outsourced to private sector.

(2) Organizations for e-Gov Center

Considering the legal framework and its implications, there are three main ministries which can be responsible for the e-Gov Center: 1) The Technical Secretariat under the Presidential House, 2) the Vice-Ministry under the Ministry of Gobernacion, 3) the Vice-Ministry under the Ministry of Finance. In addition, two more are also in the list: the e-Pais Initiative, and the Vice-Ministry of Technology at the Ministry of Education.

Each of them complies with the requirement that the organization needs a strong mandate and capacity to enforce policies. Some pros and cons are indicated in the table below.

Table 6.10 Organization for e-Gov Center

Possible organizations to lead the e-Gov Center	Pros	Cons
Presidential House, Technical Secretariat, e-Gov Center Department (tbc)*	<ul style="list-style-type: none"> Strong mandate comes directly from the President and the Presidential minister. Capacity to enforce over interministerial powers 	<ul style="list-style-type: none"> Creation is by Executive Presidential order, and does not require approval by congress.
Presidential House, Technical Secretariat, e-Pais Initiative	<ul style="list-style-type: none"> Strong mandate comes directly from the President and the Presidential minister. 	<ul style="list-style-type: none"> Creation is by Executive Presidential order, and does not require approval by congress. Does not yet have capacity to enforce over interministerial powers
Ministry of Gobernacion, Vice-Ministry of Technology for e-Gov (tbc)*	<ul style="list-style-type: none"> Strong ministry Capacity to enforce through interministerial powers Creation possible by presidential orders 	<ul style="list-style-type: none"> Creation does not require approval by congress, but the loan for funding approval is required by the Congress. Already responsible for too many functions ranging from Civil Protection, police, to national security.
Ministry of Finance Vice-Ministry of Technology for e-Gov (tbc)*	<ul style="list-style-type: none"> Strong ministry, which already has relatively well-trained and experienced staff. Capacity to enforce through interministerial powers Creation possible by presidential orders 	<ul style="list-style-type: none"> Creation does not require approval by congress, but the loan for funding approval is required by the Congress.
Ministry of Education Vice-Ministry of Technology	<ul style="list-style-type: none"> Already in place with strong leadership 	<ul style="list-style-type: none"> Still needs Vice-ministerial capacity to enforce. It is not clear if it can be directly in charge of the e-Gov center - subject to the umbrella of the Ministry of education.

* (tbc): To be created.

Source: JICA Study Team

The Presidential House: An e-Gov Center Department

The initiative and counterpart of the current study is under the e-Pais initiative of the Presidential House. Any project or initiative under the Technical Secretariat has a strong mandate because of its direct link with the President and presidential initiatives (See Box 6.1). Currently the e-Pais Project aims to develop IT related projects to all El Salvador with broad tasks to support the economic development agenda on technology and science issues, from which the e-Government initiative is one of the components.

Box 6.1 Internal Legal Law for the Executive Branch

TECHNICAL SECRETARIAT OF THE PRESIDENCY

(16) Art. 53-D.-“ The Technical Secretariat of the Presidency will be in charge of a Secretary whose attributions will be:

- 1) Advise the President of the Republic in the making of strategic decisions;
- 2) Attend the secretariat of the Management Committees conformed for the execution of the governmental agenda; convoke its members in an ordinary and extraordinary manner, register and follow up on the agreements made;
- 3) Follow up on the agreements emitted by the Ministry Cabinet;
- 4) Establish the necessary relationships between the agendas of the different committees to propitiate an integrated and effective management of the Executive Organ;
- 5) Facilitate an effective flow of information for the development of the meetings and the decisions of the Management Committees;
- 6) Propose the modernization policies of the public sector;
- 7) Facilitate and support the institutions of the public sector in the development of their modernization programs; and
- 8) Evaluate, along with the Minister of the corresponding Branch, the investment priorities and formulate in coordination with the office in charge of the Government’s budget, the annual and multi-annual investment program, in order to submit it to the approval of the Ministry Cabinet...”

The Ministry of Gobernacion: A Vice-Ministry of Technology for e-Gov

The Ministry of Gobernacion is a very strong entity responsible for several areas, such as justice, public security, and public and interministerial powers in case of disasters and national emergencies (See Box 6.2). A Vice-Ministry of Technology could comply with the need to have the necessary enforcing powers if there is an appropriate legal framework approved and supported by legislation.

Box 6.2 Internal Legal Law for the Executive Branch

MINISTRY OF GOBERNACIÓN

(19) “Art. 34.- The Ministry of Gobernación is responsible for the areas of justice, public safety and other internal matters, such as:

- 1) Protect and watch over all that is related to the political and administrative organization of the Republic;
- 2) Advise the President of the Republic and the Ministers of State, regarding law projects or their reforms, that are submitted for their consideration;
- 3) Serve as a means of communication and coordination between the Executive Organ and the Supreme Court of Justice, the Public Ministry and the National Judicature Council;
- 4) Emit opinions regarding the convenience of subscribing or ratifying International Agreements related to the areas of competence of the Ministry and certify, before the applying Institutions, the legality of the obligations contracted by the Government and its institutions;
- 5) Exercise, in representation of the President of the Republic, the conduction of the Civil National Police and the National Academy of Public Safety;
- 6) Coordinate the national efforts against organized crime, money laundering and corruption, as well as support the integral prevention of the inadequate consumption and use of drugs, its control and supervision and the treatment and rehabilitation of addicts as well as comply with the international commitment acquired in this matter; and
- 7) Coordinate, when it is necessary and legally proceeding, the public safety actions with the Ministry of National Defense and with the Intelligence Organism of the State; ...”

From previous chapters regarding the technical and managerial capacity of the Ministry of Gobernacion, it is evident that several services are already in place and though not strongly advocating a national plan for science and technology, this ministry containing strong leadership could be in charge of the e-Gov Center.

The Ministry of Gobernacion currently has two vice-ministries: the Vice-Ministry of Gobernacion and Justice and the Vice-Ministry of Citizens Security. The Vice-Ministry of Gobernacion oversees multiple tasks, which range from Firemen Unit to Radio and TV, media, postal services and emergencies. The Vice-Ministry of Citizens' Security oversees immigration, national police, antidrug units, and civil protection. One of the disadvantages is the wide nature of the vice-ministries, where activities such as fire protection and postal systems are joined and without a clear logic. An e-Gov center could therefore suffer from multiplicity and lack of ministerial support.

Ministry of Finance (Hacienda): A Vice-Ministry of e-Government

The Ministry of Finance (Hacienda) is a powerful ministry responsible for budget, internal and external debt, and taxes (See Box 6.3).

In contrast to the Ministry of Gobernacion, this ministry is highly centralized with a Vice-Ministry under which there are different directions, such as customs, public investment and credit, budget, taxes as well as three organizations, 1) the national lottery, 2) the Salvadorian fund for pre-investment studies, and 3) the National Institute of Pension Funds for National employees.

The Ministry of Finance possesses accumulated experience in IT applications and some activities, such as procurement and taxes, are in part progressing toward on-line applications - though still in an incipient state.

Box 6.3 Internal Legal Law for the Executive Branch

MINISTRY OF FINANCE

Art. 36.- “ It is the competency of the Ministry of Finance to:

- 1) Direct the public finances; as well as redefine and orient the financial policy of the State;
- 2) Harmonize, direct and execute the tributary policy and propose to the Executive Organ, previous initiative of the President of the Republic, the dispositions that affect the tributary system;
- 3) Participate in the formulation of the public expense policy, proposing the actions or measures that it considers convenient to make the best use of the funds assigned to the different programs and projects of the public sector entities;
- 4) Present to the Ministry Cabinet, by means of the President of the Republic, the proposed law projects and their respective salary laws, as well as their reforms;
- 5) Propose to the President of the Republic for the consideration of the Legislative Organ the decree projects of the emission or contracting of government loans for the public sector, and administer the public debt service;
- 6) Harmonize and orient the fiscal policy with the monetary policy of the country;
- 7) Participate in the formulation of the polities that foment productive activities and in the administration of incentives granted for these purposes; and
- 8) Prevent and persecute contraband in all of its forms with the help of all the authorities; ”

Other Entities for e-Gov Center

The Vice-Ministry of Technology is already functioning under the Ministry of Education. This is overseeing and implementing educational projects in the country, expanding the use of Internet and IT in schools, and has strong leadership in the area of connectivity. It still requires a legal framework to support a stronger mandate in the case of including the e-Gov Center under its responsibilities.

The e-Pais initiative under the Technical Secretariat is another strong candidate because it has already been created and has a mandate from the Presidential House to advance the on-line policy for everybody and everywhere.

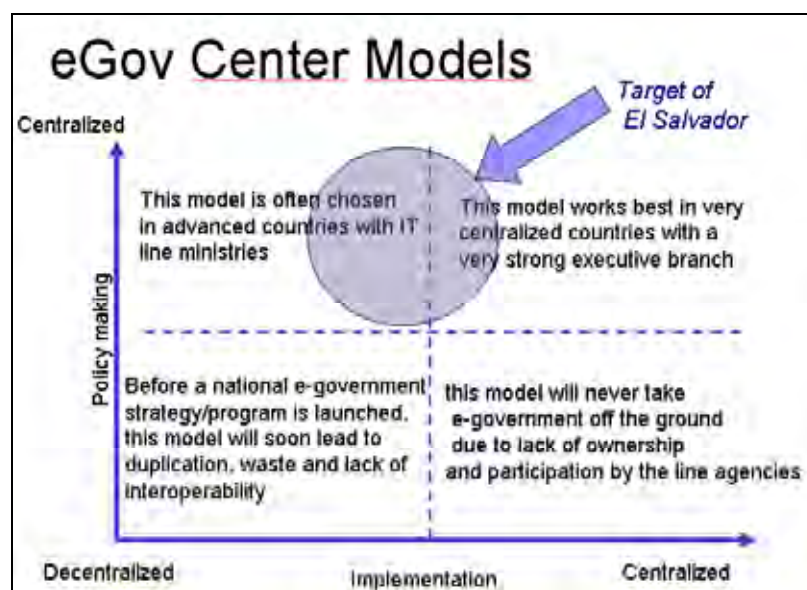
(3) Method of Establishment and Legal Aspects

The organization responsible for the e-Gov center must consider the following features in order to succeed in its mandate. A clear authority with the appropriate leadership will ensure operations over a time frame beyond political changes through presidential administrations. In the case of existing organizations or vice-ministries, it can be created by presidential decree. But in order to operate budget is necessary, so unless this new office has funding available its existence can be precarious and weak. Also to be effective an appropriate legal framework is needed which give strength to the agency, and the Congress must sanction the law.

For an e-Gov Center some of the basic conditions are:

- Strong **political support** from the highest government;
- Strong central **coordination and enforcement** of S&N;
- Strong **linkage with administrative reforms** and other reforms;
- Strong **focus on e-Government** within broader e-development agenda and institutions;
- Strong linkages between **national** and **subnational** programs;
- Strong **multi-stakeholder** participation: private sector (e.g. via PPPs), civil society and academia; and
- If a line Ministry/agency is empowered to play a central role, **strong support from the PM/President office** will be required to make this model effective.

In addition, the country must decide the nature of the e-Gov center. Figure 6.27 shows a proposal for a suitable model for El Salvador. The scheme considers four kinds of e-Gov Centers worldwide. Centralized policy-making combined with an intermediate decentralized/centralized feature for implementation will ensure better management and efficient progress.



Source: First concept adapted from materials gathered on “e-Gov Practice” World Bank Conference organized by the Global Development Learning Network. Kazakhstan, USA, Korea, Estonia, Sri Lanka, January 2006.

Figure 6.27 e-Gov Models and Place of El Salvador

In terms of the law for creation of organizations in El Salvador, the Presidential House can create vice-ministries and give them a mandate and a budget without Congressional approval. The Internal Law for the Executive Branch authorizes the Cabinet for the creation of new vice-ministries, organizations and units according to needs if the President proposes. Article 31 states: “The Cabinet can create by decree proposed by the President of the Republic, new vice-ministries, units or organizations, when the management of public entities is required”.

It will be important that the profile of the organization is described in detail if it is going to be approved by Presidential decree.

(4) Data Structure and Data Exchange Methods (As Part of Standard and Norms)

Standard and Norms is a critical component of the e-Gov center authority, and needs a complete description of functions and roles - as described in a separate chapter in this report (refer to Section 6.6 on Standard and Norms).

(5) Place of Installation and System Accommodation (Building)

A logical organization for an e-Gov center is necessary, but also a physical place within El Salvador is required, as concluded from the consultants' first phase of research with the study counterparts and components teams. The logical management structure is indicated in Figure 6.29 below with the e-Gov center offering services in hosting, back up systems, data exchange, operation services, and sharing of common systems, as well as Standards and Norms. Standards for physical infrastructure must contain the following elements for Installation and Environment.

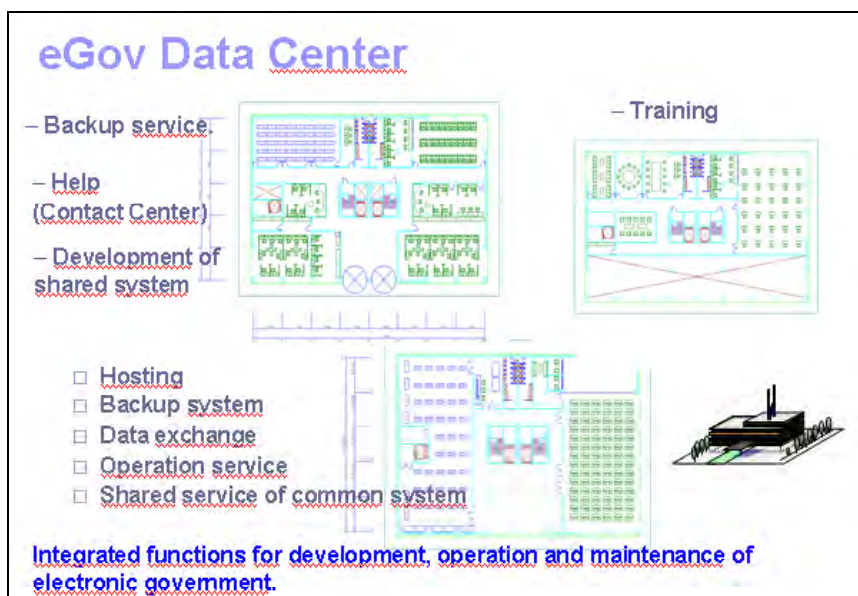
Installation	Environment
Operation & Management	Electric facilities
	Air conditioned facilities
	Monitoring facilities
	Anti-earthquake measures

Source: JICA Study Team

Figure 6.28 The Logical Management Structure

As indicated in Section 6.8, these requirements are non-existent in El Salvador. Therefore, a building is necessary to house all services provided by the e-Gov organization as well as equipment and communication infrastructure.

The team also considered the need for a physical building to host the e-Gov center considering the recurrence of disaster from earthquakes, floods, volcanoes and hurricanes. A building able to resist such disaster is necessary to protect the highly sensitive and important data. Functions and services to be handled by the e-Government Data Center are illustrated in the following figure.



Source: JICA Study Team

Figure 6.29 Functions and Services of e-Government Data Center

Natural disasters affect El Salvador in a recurrent way. Although earthquakes are the most common, the country is vulnerable to floods, landslides and torrential rains, as well as hurricanes and volcanic eruptions. The probability that a great earthquake will affect the country is once in every 15 years. Between 1576 and 1965, the capital of San Salvador was seriously damaged by at least 11 earthquakes.

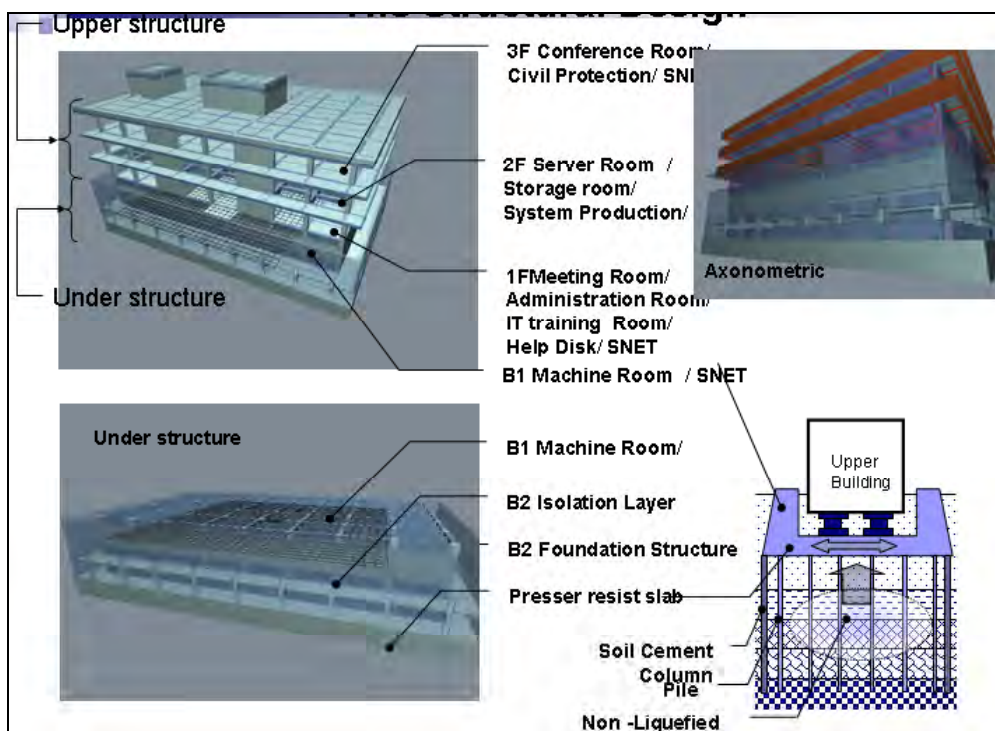
In more recent years, in October of 1986, an earthquake killed 1,200 people and affected 520,000 causing financial losses of US\$1,352 million. Later in January and February of 2001, another earthquake caused 1,250 deaths and affected 252,600 people, causing US\$1,600 million in losses.

Furthermore, in 1998 Hurricane Mitch killed 260 people and affected 84,300 people, and tropical storm Stan, from October 1st to October 6th, combined with the eruption of the Ilamatepec Volcano in October of 2005 affected 70,000 and cost the country a further US\$355 million dollars.

Field research has identified three potential locations in San Salvador for an e-Gov center:

- Finca El Espino (first option);
- Santa Elena; and
- San Benito.

Other places can be considered based on land availability, costs and location. If the government owns land that can be easily transferred to this project, then options must be studied and adapted to include it.



Source: JICA Study Team

Figure 6.30 Structural Designs (Example)

(6) Hardware and Software

In the Data Center, many hardware and software will be accommodated. They are:

- Network equipment, network application hardware and software;
- Hardware and software for e-Government services including Common Subsystems;
- Hardware and software for trigger applications (Citizens' Master Database, Disaster Information Systems); and
- Hardware and software for building tenants (SNET, Civil Protection).

(7) Legal Framework for *e-Gov* center

The *e-Gov* center needs a strong commitment from the high senior authorities of the government. Since the organization has to decide on interministerial IT issues including procurement, staff, equipment and policies, it needs a clear mandate first indicating by law its character “with capacity to enforce”. Also legislation indicating the authority to regulate and apply joint norms should be established.

The rules governing SIGET, the telecom regulator body in El Salvador can be a first reference to prepare the norms of the *e-Gov* Center.

(8) Participating Organizations and Expansion

It is extremely important to have a ‘building block’ approach and use what is already in place. The *e-Pais* initiative is part of the National Commission for Science and Technology created in 2000 by the Technical Secretariat.

First Building Block

The National Information Committee (CNI - Spanish acronym) instituted by the National Council of Science and Technology, CONACYT (Spanish acronym), launched a National Information Policy proposal in July of 2000 with the objective of having it serve as a strategic horizon for the country in the ICT area and sector. The CNI had the representation and participation of twenty-eight entities from the public, private, academic and professional sectors, and culminated its work with the approval from the Board of Directors of CONACYT, from the mentioned National Information Policy.

This is a broad multibody structure, which has helped to support IT and the *e-Gov* platform initiative in different instances. The proposal for the National Information Policy was presented based on six main subjects: I. Management and administration of the information; II. Education and formation of human resources; III. Information applications; IV. Infrastructure, interconnectivity and data networks; V. National information industry; VI. Positioning of the information technology sector in the economic and social development of the country.

Second Building Block

The *e-Pais* initiative, also under Presidential House was created in 2005 with the objective of promoting IT for education, science and competitiveness, by optimizing and expanding connectivity to all the country. This was the first counterpart of this feasibility study and its progress must be taken into account.

Third Building Block

Several efforts by both the private sector and public sector on connectivity and IT Technologies are currently in place. At present, some regional groups of private companies have strong intranetworks to support regional operations. The same is true for some ministries, such as Finance and Gobernacion, as well as the Centro Nacional de Registros. All these examples of progress must be incorporated in the *e-Gov* agenda.

Chapter 7 Overall Picture of the Project Needs and Effects

7.1 Project Needs, the Project, and Effects

The aforementioned arguments have identified the project's strategic elements such as the project's inputs, outputs, outcomes, and impact. This section intends to formulate them into a logical framework (hereinafter termed as "Logframe") to see the causality in the achieved goals and outcomes, and also the underlying project risks associated with externalities. In addition, the project's indicators (both operational and effects) that facilitate *e*-Government policy-makers to review and monitor project performance throughout the project cycle are formulated.

Aided by the Project's logical framework presented here, the planners and decision makers will be able to **track down causality** between **project activities** (engineering services, systems installation, operation and maintenance), , and **expected outputs** (government procurement of goods and services), assuming that **preconditions** (El Salvador Government's commitments) are satisfied; and also **causality** between **outputs**, and resultant **project goals** (Government transparency and efficiency, and improved government services for citizens), again provided that **assumptions** (Project budget and personnel are secured by the El Salvador government) are satisfied. Achievement of **project goals**, with the assumptions satisfied, will then turn into achievement of **overall goals**. The above exercises also facilitate decision makers in identifying bottlenecks and obstacles in achieving the project's objectives, goals and outcomes.

Summarized below are the project's strategic elements identified so far.

(1) Objectives of *e*-Government

The project objectives are; to provide El Salvador citizens with improved and efficient government services, and to promote El Salvador ICT industries. It will be realized through establishing network "connectivity" among El Salvador Central Government bodies enabled by an *e*-Government Platform. It will eventually contribute to improving citizens' quality of life. The three objectives are:

- Improve government's services to the El Salvador citizens;
- Improve efficiency in government's provision of services; and
- Promote ICT industries.

(2) Project Goals

El Salvador government will achieve such goals through establishment of *e*-Government Platform as:

- Improved transparency and efficiency in public administrative process and procedures; and
- Improved the administrative serviceability to El Salvador citizens.

(3) Outcomes

- Improved Government Services (ex. Reduced time to response)
- Improved Government Efficiency (ex. Reduced government expenditure in telecommunications)
- Enhanced pervasiveness in compliance with international standards in ICT
- Reduced disaster damages (ex. Damages from earthquakes, floods, and volcanic eruptions)

(4) Outputs (Goods purchased, *e*-Gov platforms installed and operated)

- Government WAN (Underground optical fiber cable (2km), 37 units of server, Switch and firewall, Software, 500 stations for wireless router interconnecting with locals, 4 units of public access terminal at 100 locations)
- *e*-Government Center (150 units of server rack, 180 units of UPS, 31 units of Server, 4 units of storage, 90 units of PC, 40 units of telephone receivers and software)

- Citizens Master Database (Applications development, 20 units of server, 4 units of storage, and 550 units of fingerprint reader and cardreader)
- Disaster Information Systems (Applications development, 20 units of server, 2 units of storage)
- Common Subsystems (34 units of server, 4 units of storage)

(5) Inputs

Project Implementation

Foreign Loan	US\$ 46.41 million
(Possible Foreign Grant)	US\$ 10.64 million

Project Operation (El Salvador Own Fund)

Total O&M (2010)	US\$ 6.60 million
Total Renewal	US\$ 15.65 million
Additional Equipment	US\$ 13.57 million

(6) Activities

- Project Implementation (September, 2007 to August, 2011)
- Technical Advisory Services (November, 2007 to June, 2010)
- Procurement Assistance, Assistance of Bid Document Preparation, Assistance of Bid Evaluation
- Engineering Supervisory Service (January, 2009 to August, 2011)
 - Supervision and technical advisory of Installation, launching and Operation of *e-Gov* Platform
 - Technical Advisory on Introducing International ICT Standards and Norms
- El Salvador's own implementation (Beyond August, 2011)

(7) Risks and Assumptions

Overall Goals will be realized through **achieved project goals**, unless such incidences occurred:

- Political Incidence : Deflated project priority due to administration reshuffle
- Economic Incidence : Project funds unavailable, due to worsened government financial situation, economic downturn

Project Goals will be realized through **achieved outputs**, provided following conditions are met:

- Technical Secretariat of the Presidential House sustains promoting implementation of *e-Government* Platform;
- El Salvador Government maintains budget for operation, maintain, and training for the *e-Government*; and
- Officers trained with the *e-Government* operation maintain their positions.

Expected outputs will be realized through **activities done**, provided following conditions are met:

- Departments and sections of respective central and local governments held responsible for *e-Government* operation are named and assigned;
- Budgets of the departments and sections responsible for *e-Government* are appropriated; and
- Officers assigned for *e-Government* are made available of their working hours for installation, operation and maintenance.

Activities will be done, provided the following **preconditions** are met:

- El Salvador Government commits in the establishment and provision of organizational units, personnel, and the budget allocated for installation, maintenance and operation of e-Government Platform.

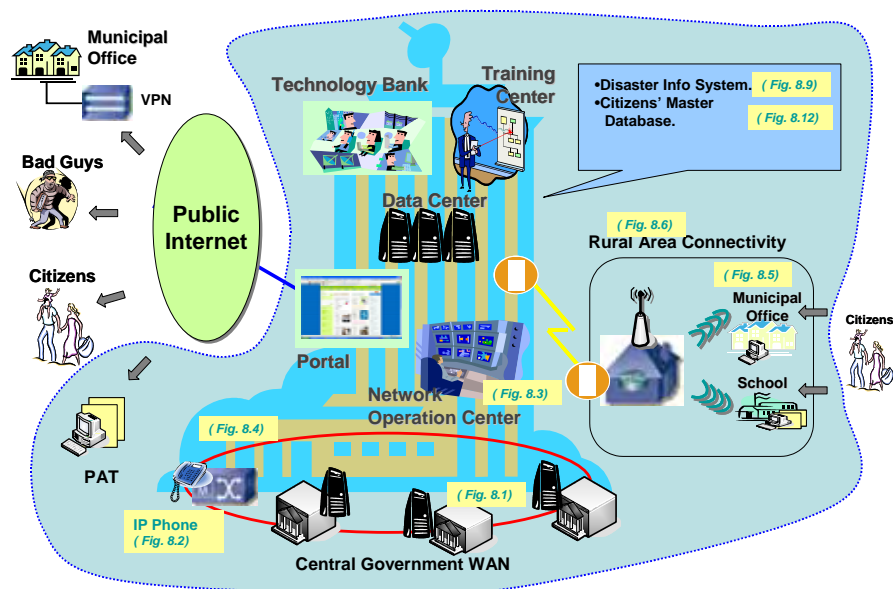
The above reasoning resulted in the project profile in a log framework as illustrated in the next section.

7.2 Project Logical Framework

The logical framework of the project is summarized in Table 7.1.

7.3 Overall Project Structure

The overall structure of the entire project and the boundaries of the current project is illustrated in Figure 7.1.



Note: Dotted line indicates project boundary.
Source: JICA Study Team

Figure 7.1 Overall Project Structure

Table 7.1 Establishment of e-Government Platform for El Salvador

Project Period: September, 2007 - August, 2011 (48 Months)

Target Area: Entire Country of El Salvador

Target Beneficiary Groups: All El Salvador People, Technical Secretariate of Presidential House, Central Government Bodies, Municipalities, Telecommunications Providers

Project Summary	Objectively Verifiable Indicators	Means of Verification	Assumptions
<p>Overall Goal El Salvador assumes a leading role in promoting ICT infrastructure among the Puebla Panama Plan (PPP) countries. JBIC assisted El Salvador in formulating "IT Master Plan". Also an e-Government initiative represents a centerpiece in the e-Government National Strategy", issued in the year 2004. National Center for Information Society (NCIS) is drafting e-Pais" that dictates essential components to establish an e-Government. The project intends to facilitate network connectivity (e-Government Platform) among the Central Government bodies that provide Salvador citizens with enhanced administrative services and to improve efficiency of the government. All those will contribute to enhanced standard of living of Salvador people.</p>	<p>Impact Indicators 1. Alleviation of Digital Divide - Citizens' Exposures to Web-based Environment Number of towns and villages without means of internet access Number of population without internet access Number of citizens equipped with network access, Number of ISPs Citizen's net access frequency and time consumed with web exposure 2. Enhanced Government Administrative Services for Citizens Number and types of government administrative services available via web-based transactions 3. Growth of Information and Communications Industry Number of ICT enterprise registered Revenue and the number of employees of ICT Sector</p>	<p>Collection of Data from Government Statistics - Relevant data from - IT literacy rate, Amount of household expenditure Questionnaire/Interview Survey - Frequency and time consumed by citizens' access to internet - Number of ICT enterprise registered - Revenue and the number of employees of ICT Sector</p>	<p>- Political Incidence: Deflated project priority due to administration reshuffle - Economic Incidence: Project funds unavailable, due to worsened government financial situation, economic downturn</p>
<p>Project Goals e-Government Platform with priority application systems is installed and operated at central and local governments. El Salvador citizens, central and local government bodies, and enterprise are benefited from; 1) Improved administrative services for citizens, 2) Improved efficiency of government bodies, 3) Promoting ICT industries, and 4) Reduced natural disaster losses and damages.</p>	<p>Outcome Indicators Priority systems and applications are installed and are in operation in central as well as local governments. Citizens, government and enterprises benefit from: 1. Improved administrative services; Citizens' time saved for application and registration for administrative services 2. Improved efficiency among government bodies; Savings in government communication expenditures 3. Reduced disaster damages; and Reduction in citizen's disaster damage cost 4. Protection from data loss and damage by natural disaster on the part of the government agencies (RNPN, SNET and so on).</p>	<p>Conduct Questionnaire/Interview Surveys with Citizens, Government Officers and People Working for Enterprise Subjects of Inquiry: 1. Citizens' perception on time consumed for application and registration for administrative services 2. Government officers' perception on time saved in processing administration tasks pertinent to government bodies 3. Number of ICT systems in compliance with the international standards 4. Accounts on incidences of disaster damages</p>	<p>- Technical Secretariate of the Presidential House sustain promoting implementation of e-Government Platform - El Salvador Government maintain budget for operation, maintain, and training for the e-Government. - Officers trained with the e-Government operation maintain their positions</p>
<p>Output Procurement by the Government 1. Government WAN (Underground optical fiber cable (2km), 37 units of server, Switch and firewall, Software, 500 stations for wireless router interconnecting with locals, 4 units of public access terminal at 100 locations). 2. e-Government Center (150 units of server rack, 180 units of UPS, 31 units of Server, 4 units of storage, 90 units of PC, 40 units of telephone receivers and software) 3. Citizens Master Database (Applications development, 20 units of server, 4 units of storage, and 550 units of fingerprint reader and cardreader) 4. Disaster Information Systems (Applications development, 20 units of server, 2 units of storage) 5. Common Subsystems (34 units of server, 4 units of storage)</p>	<p>Components Installation and Operation Indicators Measured are Progress in Components Installation and Operation, by respective number of system units and associated application software installed and operated. 1. Government WAN 2. e-Government Center 3. Citizens Master Database 4. Disaster Information Systems 5. Common Subsystems Stages of Engineering Service Delivered 1. Detail Design, 2. Procurement Tender Assistance, 3. Construction Supervision, 4. Development of Standards and Norm</p>	<p>Conduct Questionnaire/Interview Surveys with Citizens, Government Officers and People Working for Enterprise Subjects of Inquiry: 1. Addressed to the government officers responsible for e-Government installation and operation - Number of Units installed and operated - Types of Application Systems installed and operating 2. Addressed to Beneficiaries - Citizens and Enterprise - Frequency and Types of Applications Accessed and Used</p>	<p>- Departments and sections of respective central and local governments held responsible for e-Government operation are named and assigned - Budgets of the departments and sections responsible for e-Government are appropriated - Officers assigned for E-Government are made available of their working hours for installation, operation and maintenance</p>
<p>Activities</p>	<p>Inputs</p>		
<p>Project Implementation (September, 2007 - August, 2011) Technical Advisory Services (November, 2007 - June, 2010) Procurement Assistance, Assistance of Bid Document Preparation, Assistance of Bid Evaluation Engineering Supervisory Service (January, 2009 - August, 2011) - Supervision and technical advisory of installation, Launching and operation of e-Gov Platform - Technical advisory on introducing international ICT standards and norms El Salvador's own Implementation (Beyond August, 2011)</p>	<p>Japan Side Technical Assistance and Engineering Service US\$ 10.64 Million Project Implementation US\$ 35.77 Million Yen Credit Amount US\$ 35.77 Million 1. Government WAN (US\$ 18.76 M) 2. e-Government Center (US\$ 3.76 M) 3. Citizens Master Database (US\$ 4.10 M) 4. Disaster Information Systems (US\$ 3.87 M) 5. Common Subsystems (US\$ 5.28 M) Grant 1. Building a house for an e-Gov Center (US\$ 8.98 M) 2. Development of International ICT Standards and Norms (US\$ 1.66 M)</p>	<p>El Salvador Side Annual O&M US\$ 6.60 M <Case of Y2010> Government WAN US\$ 2.90 M e-Gov Center Service US\$ 2.15 M Applications US\$ 0.72 M Common Subsystems US\$ 0.83 M Hardware Renewal US\$ 15.7 M <in Y2014> Possible additional investment in e-Government Center Services US\$ 3.77 M Laying Out a Wireless Network outside the 500 sites initially targeted US\$ 5 M <Assuming that 700sites will be added> Installing PCs outside the 100 sites initially targeted US\$ 4.8 M <Assuming that 400sites will be added></p>	<p>Prerequisites El Salvador Government commits organizational units, personnel, and the budget allocated for installation, maintenance and operation of e-Government Platform.</p>

Source: JICA Study Team

Chapter 8 Preliminary Design and Specifications

8.1 e-Government WAN

8.1.1 System Configuration and Components

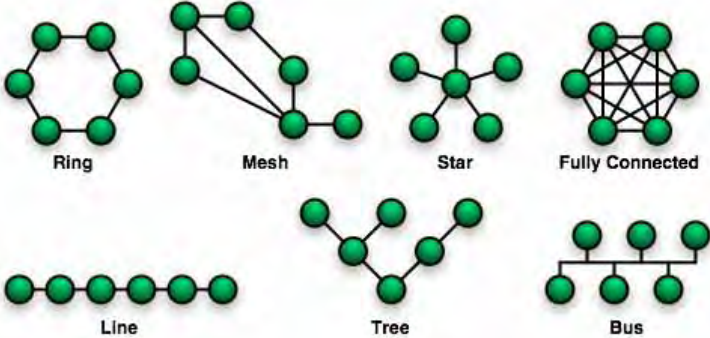
The e-Government WAN consists of seven components.

- 1) Optical Fiber Links and Switches (Figure 8.1)
- 2) Voice IP (VoIP) network (Figure 8.2)
- 3) Network Operation Center (NOC) system (Figure 8.3)
- 4) Network Application Servers (Figure 8.4)
- 5) Municipal Connectivity (Figure 8.5)
- 6) Rural Wireless WAN (Figure 8.6)
- 7) Public Access Terminal (PAT) network (Figure 8.7)

Each component has to be defined in terms of both the technical requirements and scope of user characteristics in order to prepare a general system description with consistent system specifications. The system specification items are listed in the following table.

Table 8.1 Specification Items

System Specification Item	Definition
System Sizing	System sizing is the process of determining the capacity requirements of a system in order to meet a given workload and service level requirement. This includes processing capacity, amount of memory and I/O capacity for servers and the network bandwidth and network hardware for network infrastructure. For any service, system availability, throughput and response time criteria determine the client facing service level. System sizing is a critical step in ensuring that service levels are met.
System Capacity and Scalability	A capacity planning work is a fundamental activity to predict the ICT capacity requirements over the government (user) network planning horizon. The following items are included in the process of capacity planning. <ul style="list-style-type: none"> • Defining the boundaries of the system under examination • Defining the workload of the system through workload characterization • Identifying the business drivers of the system • Business forecasting • Workload modeling • Capacity forecasting • Writing the capacity plan • Regular tracking of the capacity plan and updates to the model
Performance	The System Performance Analysis work provides the following capacity and performance management tasks. <ul style="list-style-type: none"> • Establishing a performance baseline of a system • Assessing the performance impact of infrastructure changes, application changes, business initiatives, and performance tuning changes • Troubleshooting performance problems
Configuration	Using results of both capacity planning and system sizing work, system/network configuration can be designed. The output of this work is a configuration diagram.

System Specification Item	Definition
Reliability and Fault Tolerance	<p>Reliability requirements analysis is implemented in the following three steps.</p> <ul style="list-style-type: none"> • Determine customer needs <ul style="list-style-type: none"> - Find how severe it is if network services are stopped. - Percent of network availability needed. - Amount of money for network support that can be afforded. • Convert needs to reliability requirements <ul style="list-style-type: none"> - Resilience arrangement (Duplicated system, so on) - Fault tolerance - Life cycle planning (End of life expectation) • Convert requirements to network configuration and sizing
Network Topology	<p>A network topology is the pattern of links connecting pairs of <u>nodes</u> of a <u>network</u>. It's the shape of a <u>LAN</u> or other communications system. A given node has one or more links to others, and the links can appear in a variety of different shapes. Network topology is determined only by the configuration of connections between nodes. Distances between nodes, physical interconnections, <u>transmission</u> rates, and/or <u>signal</u> types are not a matter of network topology, although they may be affected by it in an actual physical network.</p>  <p>The diagram shows seven network topologies: Ring (a closed loop of 6 nodes), Mesh (a 3x3 grid of 9 nodes), Star (a central node connected to 5 peripheral nodes), Fully Connected (6 nodes, each connected to every other node), Line (5 nodes in a straight line), Tree (a root node connected to 3 child nodes, which are further connected to 5 leaf nodes), and Bus (5 nodes connected to a single central horizontal line).</p>
Hardware/Software	Define all necessary software and hardware.
Network Management	<p>The ISO Network Management Model is the primary means for understanding the major functions of network management systems. This model consists of four conceptual areas, as shown below.</p> <ul style="list-style-type: none"> • Performance Management • Configuration Management • Fault Management • Security Management
Security	<p>Prevent attacks from hackers Virus/Spam mail protection Data encryption/PKI File access control</p>
Scope of User Criteria	Who uses? How many users? Light or heavy?

Source: JICA Study Team

(1) Optical Fiber Links and Switches Component

The OFLS component is a backbone communication link for all members of the government. The OFLS has the following characteristics.

- Various data communication traffic is transmitted on OFLS, such as:
 - Internet (Web) access for both directions (government/citizens);
 - All e-mails (intra/extra communication);

- All kinds of data (file) transfer; and
- Telephone calls for both incoming/outgoing from/to Government.
- Bandwidth of OFLS backbone network will be decided according to a network capacity planning analysis in the future. However, it is easily anticipated to provide Gbps class bandwidth facilities, since data traffic will grow rapidly. Another good reason is that the cost of expanding Mbps class switches to Gbps is much more expensive than installing Gbps switches from the beginning.
- Optical fiber cable lasts more than 50 years. For security reason, it is recommended to lay the cables under the ground. Therefore, it is also recommended that at least 100 optical fiber cables should be installed and wrapped with special underground shell for future use.

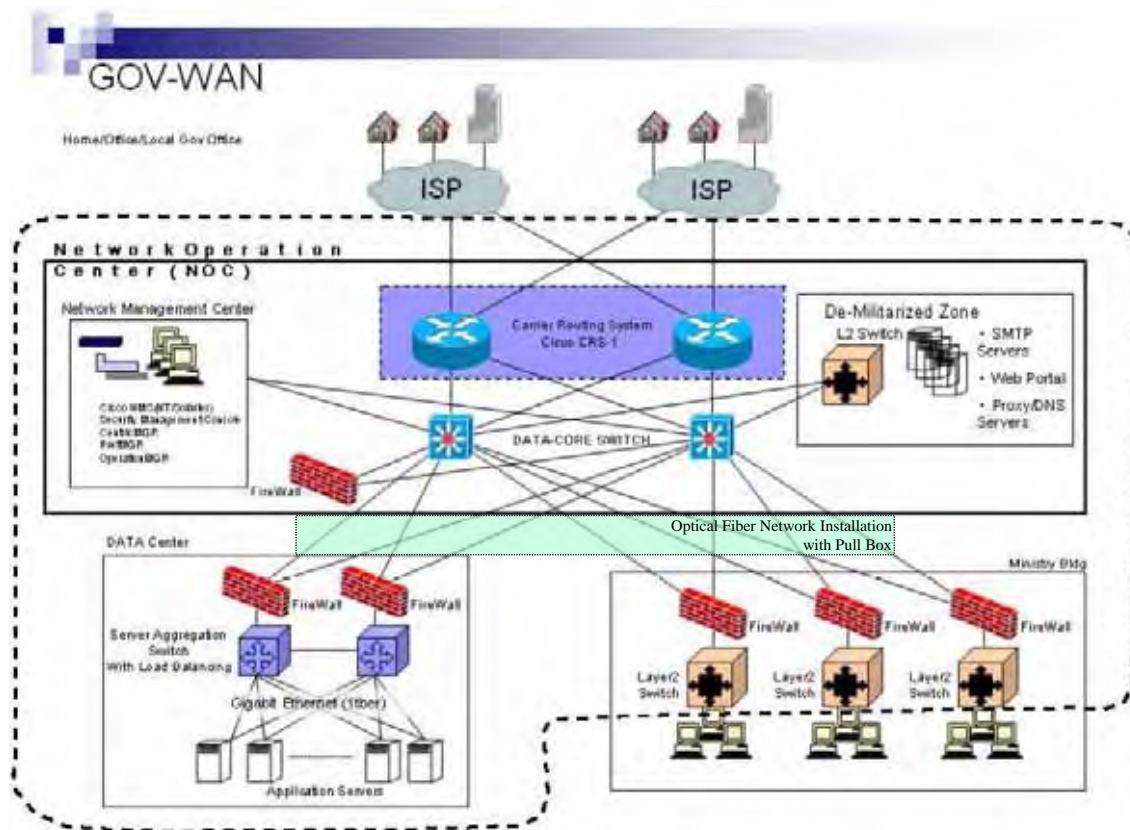
It is recommended to use the Multi Protocol Label Switching (MPLS) as a carrying mechanism for the data traveling in the Government WAN. MPLS improves and simplifies packet exchange in a network, because it links information such as bandwidth, latency and utilization (Layer 2 of the OSI model) with IP information (Layer 3), which is in charge of routing the packages through the network; this means that the people in charge of the network can divert and route traffic more efficiently, avoiding link failures, congestion and bottlenecks. MPLS can be used to carry different kinds of traffic, including IP packets, as well as native ATM, and Ethernet frames.

Requirements for network specifications are described in the following table.

Table 8.2 System Requirements

System Specification Item	Requirements
System Sizing	Gbps class switches and other equipments are required due to accommodate various media (data, mails, VoIP , web) traffic for entire government users.
System Capacity and Scalability	All internet link bandwidth for each ministry is known, but amount of traffic and growth ratio are not known. Make big one.
Performance	Unknown
Configuration	See Figure 8.1
Reliability and Fault Tolerance	A 20 minutes suspension of the network service will cause a big problem within the government. Avoid long time (5 minutes) network service suspension any time. A single equipment or communication link should not cause a whole network service suspension.
Network Topology	Ring type is the most popular topology for governmental infrastructure.
Hardware/Software	Cisco
Network Management	SNMP (Simple Network Management Protocol)
Security	Not required at this level
Scope of User Criteria	All government staff, Citizens, municipal office staff, Local government office staff

Source: JICA Study Team



Note: Components circled by the dotted line are those included in the Project.
Source: JICA Study Team

Figure 8.1 Optical Fiber Links and Switches

(2) Voice IP (VoIP) Network Component

Voice IP (VoIP) network component has the following functions:

- All connections among government PBX and outside connections are converted to IP data and transmitted via OFLS component. This is the first step to reduce telecommunication cost drastically; and
- The second step is to remove all PBX and telephones in order to replace them with IP phone. PBX is replaced with Call Manager (Software Switch).

In order to establish Internet telephone calls between Ministries in the Government WAN, the Session Initiation Protocol (SIP) will be used. SIP is an application-layer control (signaling) protocol that creates, modifies and terminates sessions with one or more participants. This protocol can also be used to perform multimedia distribution, and multimedia conferences. SIP provides functions such as user authentication, redirect and registration services, and also, a SIP Server supports features such as personal mobility, and call forwarding based on the geographical location of the person being called.

Table 8.3 VoIP Requirements

System Specification Item	Requirements
System Sizing	All incoming and outgoing telephone lines connected to each PBX facility within the central government premises will alter its connection to a Media Gateway shown in Figure 8.2. Therefore, the number of Media Gateways is the same as the number of PBX + 1.
System Capacity and Scalability	The OFLS backbone network should have enough capacity to carry VoIP traffic. Size of Media Gateways and Call Manager will be determined according to a result of capacity planning analysis for each PBX.
Performance	Unknown
Configuration	See Figure 8.2
Reliability and Fault Tolerance	Similar to PBX reliability requirements.
Network Topology	Not Available
Hardware/Software	Cisco or similar product.
Network Management	SNMP (Simple Network Management Protocol)
Security	Not required at this level
Scope of User Criteria	All government staff, citizens, municipal office staff, local government office staff

Source: JICA Study Team

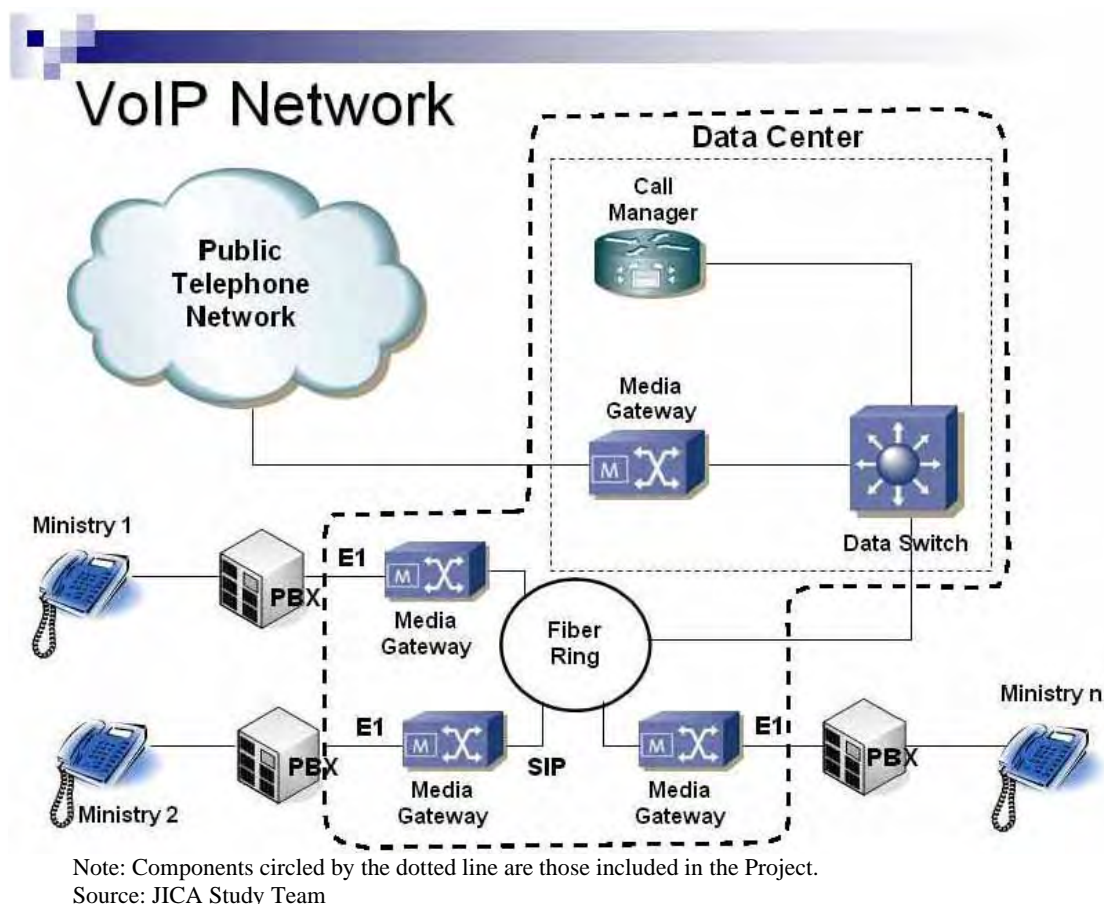


Figure 8.2 Voice IP (VoIP) Network

(3) Network Operation Center (NOC) System Component

The Network Operation Center (NOC) is a 24 hours, 7 days/week operation. It monitors and controls network operation status. The NOC is equipped with a sophisticated and integrated monitoring and management system, such as Tivoli Monitoring or Openview product.

The monitoring system can detect and report various kind of event, such as:

- Network equipment failure (hardware, communication link);
- Network application server failure (hardware/software);
- Application Server failure;
- Data Base failure;
- Operating system failure; and
- Local wireless WAN Base Station failure.

All those events are monitored and reported to an integrated monitor, so that an NOC technician (an employee of an outsourcing company) has to isolate the problem in order to find out if it is needed to escalate it to an appropriate professional assistance, such as a network professional, a server professional, a data base professional, so on.

The Gov-WAN is consisted of a large variety of different network equipments. As seen in Figure 8.3, each one of the network equipment is connected to a monitor unit to show current status and failure messages. Therefore, NOC staffs, trained network specialist, will be able to detect any situation that doesn't comply with the conditions in which the network should be running. They will also be able to monitor that the SLA (Service Level Agreement) held with the outsourcing companies is being fulfill, ensuring quality of service (QoS) throughout the Government WAN.

Employing NOC staffs has contradictive requirements:

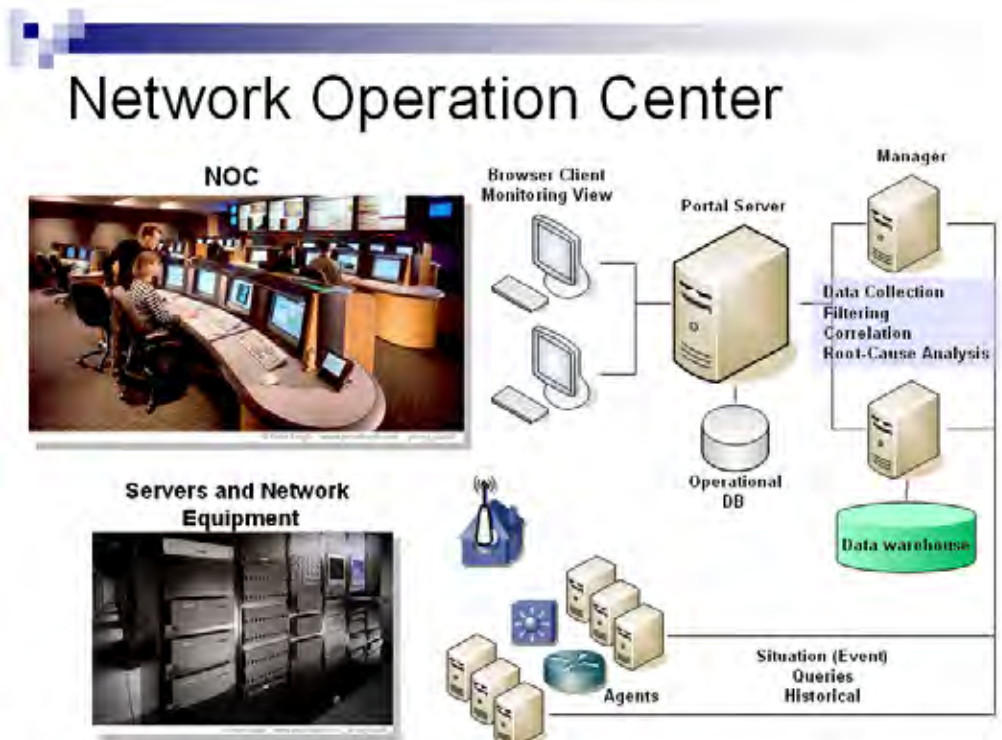
- Basic network technology background is required; and
- 24 hours operation. Lower wage.

Telecom companies have a training program to educate staffs, so it is inevitable to outsource the NOC operation.

Table 8.4 NOC Requirements

System Specification Item	Requirements
System Sizing	Full set of OPENVIEW or similar product. Standard configuration.
System Capacity and Scalability	Standard product configuration.
Performance	Unknown
Configuration	See Figure 8.3
Reliability and Fault Tolerance	Standard product configuration.
Network Topology	Not Available.
Hardware/Software	HP OPENVIEW or similar product.
Network Management	SNMP (Simple Network Management Protocol), among others.
Security	Product standard.
Scope of User Criteria	NOC staff and e-Gov Management Organization staffs.

Source: JICA Study Team



Source: JICA Study Team

Figure 8.3 Network Operation Center (NOC) System

(4) Network Application Server Component

Communication related to common application services are categorized as part of the network application server component. It may be a unique arrangement in which all network application servers should be installed at a special zone called DeMilitarized Zone (DMZ). In computer security, a DMZ is a network area that sits between the government’s internal and external network. The DMZ is typically used for connecting servers that need to be accessible from the outside world, such as e-mail, web and DNS servers. Detailed explanation of all network application candidates are described in Section 8.1.4, Requirements for Applications.

Currently, each Ministry has their own DNS and e-mail system. Integrating to one common system shall provide the following advantages:

- Achieving cost reduction;
- Standardize e-mail naming rules; and
- Providing more security (spam, virus protection).

A secured File Exchange service will provide a mean of transferring digitalized data files among ministries and local municipality offices. It will not only speed up their report work, and also enhance digitalized documentation usage.

Table 8.5 NOC Server Requirements

System Specification Item	Requirements
System Sizing	According to a capacity planning analysis, servers can be shared among applications.
System capacity and scalability	A study of all ministry message traffic is required.
Performance	N.A.
Configuration	See Figure 8.4
Reliability and Fault Tolerance	Adherence to a product standard
Network Topology	Not Available.
Hardware/Software	See standard product configuration.
Network Management	SNMP (Simple Network Management Protocol) and other industry standards.
Security	Adherence to a product standard
Scope of User Criteria	All government staff, citizens, municipal office staff, Local government office staff

Source: JICA Study Team

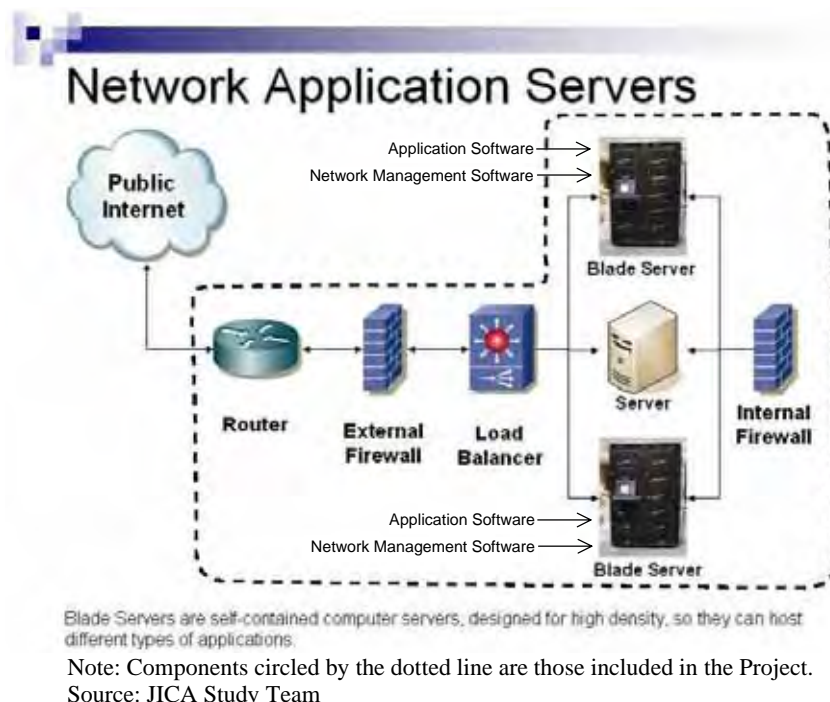


Figure 8.4 Network Application Servers

(5) Municipal Connectivity Component

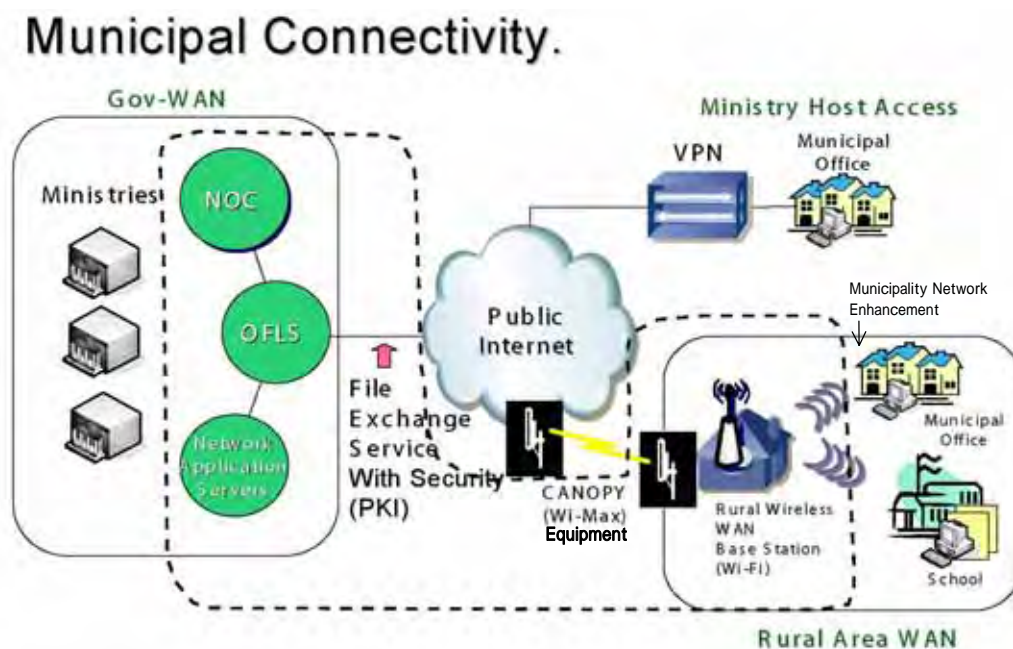
Basically Municipality connectivity uses an existing public network. For security purposes, VPN service may be used. For a municipal office in rural areas where internet service is not provided by an Internet Service Provider (ISP) company, a Rural Wireless WAN component will provide internet connectivity.

Currently some municipality offices send their accounting data and citizen’s data changes by normal mail with CD or paper media. This work can be replaced by utilizing a secured file exchange service.

Table 8.6 Municipal Connectivity Component Requirements

System Specification Item	Requirements
System Sizing	Not Available
System capacity and Scalability	Not Available
Performance	Unknown
Configuration	See Figure 8.5
Reliability and Fault Tolerance	Not Available
Network Topology	Not Available
Hardware/Software	-
Network Management	Not Available
Security	Least security is protected by VPN. PKI is used for file transfer.
Scope of User Criteria	Municipal office staffs, Local government office staffs

Source: JICA Study Team



Note: 1) Components circled by the dotted line are those included in the Project.

2) CANOPY is a wireless data communication equipment.

Source: JICA Study Team

Figure 8.5 Municipal Connectivity

(6) Rural Wireless WAN Component

For schools or municipal offices in rural areas where internet service is not available, a Rural Wireless WAN component will provide internet connectivity.

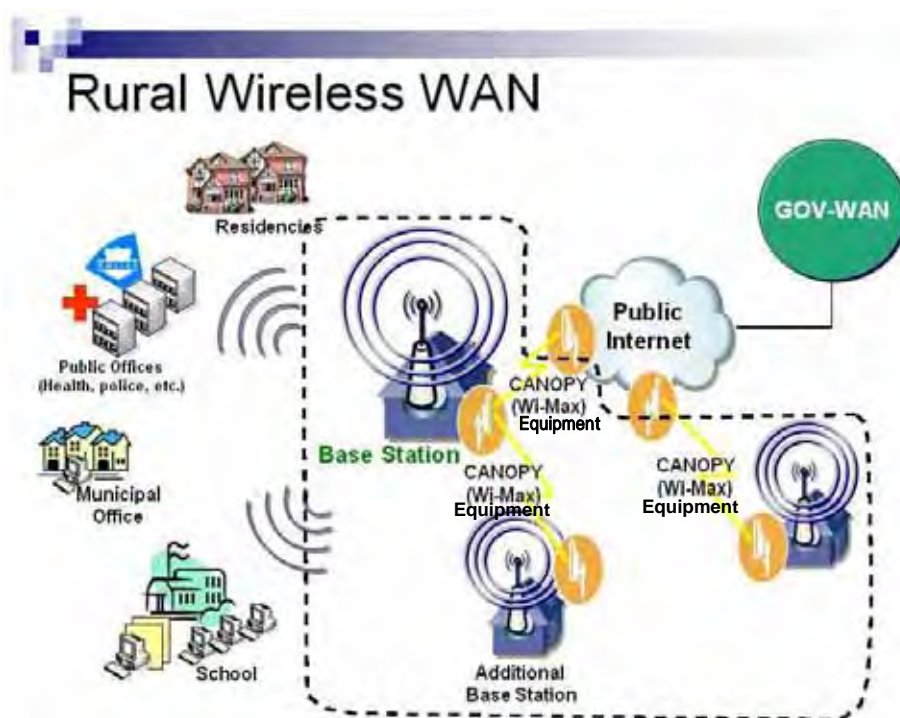
In most cases, isolated towns or villages are far away from cities with internet facilities. The Internet Service Provider would not provide service due to a lack of enough customers to make profit. Therefore, the government will provide internet connectivity.

The most difficult part to provide internet service in rural area is to run a cable from a city to a destination town as a backhaul communication line. Wireless backhaul links makes it possible to provide inexpensive long range (35 miles) and fast (10Mbps) backhaul link.

Table 8.7 Rural Wireless WAN Component Requirements

System Specification Item	Requirements
System Sizing	Depending on the site.
System Capacity and Scalability	Not Available.
Performance	Not Available.
Configuration	See Figure 8.6
Reliability and Fault Tolerance	A 20 minutes suspension of the network service will cause a big problem within the government. Avoid long time (5 minutes) network service suspension any time. A single equipment or communication link should not cause a whole network service suspension.
Network Topology	Ring type is the most popular topology for governmental infrastructure.
Hardware/Software	Cisco
Network Management	SNMP (Simple Network Management Protocol)
Security	PKI for file transfer process to the central government offices.
Scope of User Criteria	Educational purpose, Citizens, Municipal office staffs, Local government office staffs

Source: JICA Study Team



Note: Components circled by the dotted line are those included in the Project.

Source: JICA Study Team

Figure 8.6 Rural Wireless WAN

(7) Public Access Terminal (PAT) network component

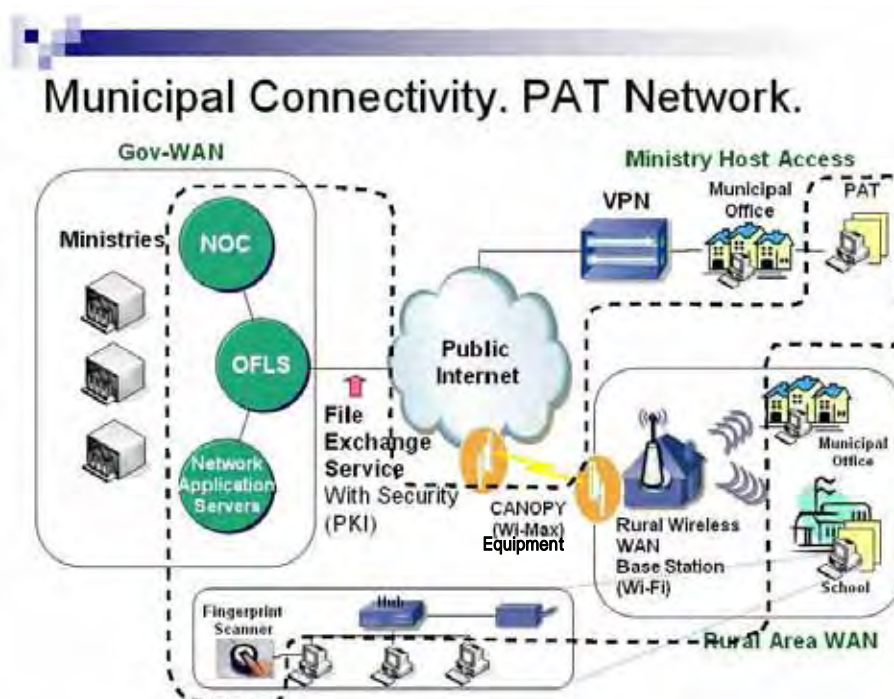
The Public Access Terminal Network consists in several PCs and a printer, as well as in a finger print scanner, in order to any citizen utilizing an e-Government application service, such as a birth certification service. A difference of PAT to Infocentro is that the PAT utilization is basically focused on specific services. The PAT network shall be installed within either municipality office or school at rural area where internet service is not easily available.

The Project will select up to 500 sites in poorly served areas and will install the network over a three year period. No such definite selection of the sites has been made.

Table 8.8 PAT Requirements

System Specification Item	Requirements
System Sizing	1000 PCs at initial stage.
System Capacity and Scalability	Not Available.
Performance	Not Available.
Configuration	See Figure 8.7
Reliability and Fault Tolerance	No special function is provided.
Network Topology	Not Available.
Hardware/Software	Not Available.
Network Management	SNMP (Simple Network Management Protocol)
Security	No special function is provided.
Scope of User Criteria	Citizens

Source: JICA Study Team



Note: Components circled by the dotted line are those included in the Project.

Source: JICA Study Team

Figure 8.7 Public Access Terminal (PAT) Network

8.1.2 Interface and Data Exchange

All components have standard but many special interfaces or protocols. All log messages from either network equipment or computer are sent to centralized system/network management system at NOC.

8.1.3 Hardware and Software, Renewal

Network technology advances rapidly, so that the existing product may not be supplied after only 2 - 3 years, much faster than PC and Server technology. This means that all network equipments should be fully replaced within 5 years at the most. Even if all equipments are replaced, invested cost may be recovered within 1 - 2 years, since new equipments are designed to increase efficiency and to reduce communication cost.

8.1.4 Requirements for Applications

Table 8.9 Requirements for Applications

Function	How to Use It	Users	Example	OS	Price
E-mail System					
E-Mail Application (Client)					
Send and receive email messages. Filter junk mail. Support diverse protocols. Provide a series of functions and a friendly user's interface to make email exchange easy and reliable.	The user has to create an account to register its email address. After that, the user can use the different options to send and receive mail, attach files, and manage it's email account as desired.	Central Government and Municipalities.	Mozilla Thunderbird	Windows, Linux, Mac	Free
Yellow Pages (E-directory)					
The e-directory works as an online contact book. It's a centralized, web based directory that can be used to store any amount of details about organizations, organizational units and people.	The information has to be added to the directory, which works as a database to perform quick searches for contact and organizational information. This can be linked to the IP-Phone.	Central Government and Municipalities.	NEC e-directory	Server: Windows 2000 or 2003 Server: Client: Any operative System.	N.A.
Virus Detection and Anti-Spam					
Capture and eliminate virus threats in the network.	The antivirus should cover the whole network and be managed in a centralized way, by ensuring proper updates, scanning regularly for viruses, email protection, among other tasks.	Central Government and Municipalities.	McKafee	Windows, Linux.	N.A.
Network Security (PKI/Encryption)					
Permit users to be authenticated to each other, and to use the information in identity certificates to encrypt and decrypt messages travelling to and from.	Review requests for certificates, approve or reject requests, renew certificates. Also, encrypt messages, authenticate requests, and transfer certificates to intended recipients.	Central Government, Municipalities and Citizens.	NEC Carassuit	Windows	\$200,000 (500 to 1,000 users)
Web Services					
Web Portal					
Provide a single entry for all government agencies' information and services to citizens.	Design a website with links to all of the government agencies own websites, all of them with a common form and easy navigation formats, providing information, e-services, participation channels, etc.	Citizens.	http://www.korea.go.kr/eng/index_portal.html		-----

Function	How to Use It	Users	Example	OS	Price
Web Hosting					
Provide online systems for storing information, images, video, or other content accessible via the World Wide Web.	Government agencies and the Central government will store the information that they want to provide through their web portal and individual websites.	Central Government and Municipalities.	The information can be stored in government's own server.	Depends on implementation.	N.A.
Search Function					
Allow easy and quick access to required information.	Build an "index" (database) of information to make available for searching in the government web portal.	Central Government, Municipalities and Citizens.	ASTAware SearchKey PRO	Windows	N.A.
File Transfer					
Transfer Files between computers over the Internet.	FTP is most commonly used to download a file from a server using the Internet or to upload a file to a server.	Central Government, Municipalities and Citizens.	FileZilla	Windows NT4, 2000 and XP.	Free
File Exchange					
Distribute files and data between all servers across the network.	Define a transfer policy across the network.	Central Government and Municipalities.	NEC ESMPRO File Transfer	Windows	Application comes with NEC Server.
Domain Name System					
Stores and associates many types of information with domain names and it translates domain names (computer hostnames) to IP addresses.	Install a Domain Name Server that translates domain names to IP addresses.	Central Government, Municipalities and Citizens.	Implemented in own server.	Depends on implementation.	N.A.
Access Control (Active Directory)					
Manage the identities and relationships that make up network environments	An administrator assigns policies, deploys programs to many computers and applies critical updates to the entire Gov-WAN or to part of it.	Central Government and Municipalities.	Windows Server 2003 Active Directory	Windows	N.A.

Source: JICA Study Team

8.1.5 Operation and Maintenance

Performance Management

The goal of performance management is to measure and make available various aspects of network performance so that inter-network performance can be maintained at an acceptable level. Examples of performance variables that might be provided include network throughput, user response times, and line utilization.

Configuration Management

The goal of configuration management is to monitor network and system configuration information so that the effects on network operation of various versions of hardware and software elements can be tracked and managed.

Fault Management

The goal of fault management is to detect, log, notify users of, and (to the extent possible) automatically fix network problems to keep the network running effectively. Because faults can cause downtime or unacceptable network degradation, fault management is perhaps the most widely implemented of the ISO network management elements.

Security Management

The goal of security management is to control access to network resources according to local guidelines so that the network cannot be sabotaged (intentionally or unintentionally) and sensitive information cannot be accessed by those without appropriate authorization. A security management subsystem, for example, can monitor users logging on to a network resource and can refuse access to those who enter inappropriate access codes.

8.1.6 Cost Estimates: Facilities, O&M, and Renewal

Table 8.10 shows cost estimates of initial network equipment. Since it is not available to calculate an existing data and voice traffic within the government, a maximum size of data switch and routers are selected. Cost is a list price. Therefore, a total price may go down when traffic conditions becomes clear. Large size network design installation and test may require network integrator assistance. Therefore, 20% additional cost of all network equipments is added.

Network technology advances faster than computers. Therefore, the life of network equipment can be considered in 5 years, at the most. After 5 years, most network equipment will be replaced. However, new investment cost can be recovered within 1-2 years, since new equipments will be designed to reduce communication cost.

O&M cost is briefly explained in Section 8.1.7.

Table 8.10 Cost Estimates: Facilities, O&M, and Renewal

No.	Item	Vol.	Remarks	Unit Cost (US\$ Million)	Subtotal (US\$ Million)
1	Carrier Routing System	2	Cisco CRS-1. A distributed routing system that enables service providers to deliver a suite of data, voice and video services over Next Generation IP network. This system may be too big for El Salvador gov.	1.8	3.6
2	Data Core Switch	2	Cisco Catalyst 6500. A medium to large size LAN switch. A second layer of switch which accommodate ministry network and other services.	0.24	0.48
3	Firewall	15+1	A firewall works to provide controlled connectivity between zones of differing trust levels through the enforcement of a security policy.	0.12	1.92
4	Local Data Core Switch (L2)	15	Cisco Catalyst 6500. Each switch accommodates each ministry's network traffic.	0.12	1.8
5	Application Servers	N.A.	This item includes servers, firewalls, load balancers. Servers may be consisted of large performance LINUX server or blade servers which can accommodate several applications. The cost covers 4 servers plus engineering 20%.	0.72	0.72
6	Application Software	N.A.	Various network application software which are explained in Section 8.1.4 will be used as network infrastructure. The cost covers Carassuit equivalent US \$ 200,000 plus others US \$ 100,000 plus engineering 20%.	0.36	0.36

No.	Item	Vol.	Remarks	Unit Cost (US\$ Million)	Subtotal (US\$ Million)
7	Network Management Software	1	Openview or similar product. Application server system management is implemented in e-Gov center. The cost covers overview equivalent US \$ 100,000 plus engineering.	0.12	0.12
8	Optical Fiber Network Installation	2km	It is recommended that cables are buried several meters underground for security reasons. A construction cost is about 800 USD/m. This may be much less in El Salvador. Optical fiber cable specification is 100 cables wrapped by strong coated metal shell. Cost is \$80/m.	0.96	1.92
9	Pull Box	15+1	Optical cable connection box	0.018	0.29
10	Rural Wireless WAN	500	A backhaul link (WiMAX) + several Tropos wireless equipment (2k/\$6k/unit) An implementation cost may vary depending on the condition of each site.	0.0072	3.6
11	VoIP Equipment	1	One Call Manager (@0.3) + 16 Media Gateway (Cantata IMG1010 @0.03)	0.94	0.94
12	PAT	100	4 PC + Printer + Finger printer/ID card scanner	0.012	1.2
13	Municipality Network Enhancement	262	1 Router + Hub + α	0.0024	0.63
Total					17.6

Source: JICA Study Team

<Summary of the Cost>

Table 8.11 Summary of Cost Estimates for Facilities, O&M, and Renewal

	Item	Description	Cost (US\$ Million)	Renewal cost (US\$ Million)
Government WAN	Detailed Design	Consulting Work	0.703	
	Cabling	Table 8.10 No. 8 & 9	2.21	
	Hardware (Network)	Table 8.10 No.1 & 2 & 3 & 4 & 11	8.74	8.74
	Hardware (Appl.)	Table 8.10 No.5	0.72	0.72
	Software	Table 8.10 No.6 & 7	0.48	
	Connection with Municipality	Y2010-12 Table 8.10 No.13	0.629	
	PCs in PAT	Y2010-12 Table 8.10 No.12	1.2	
	Local Wireless Network	Y2010-12 Table 8.10 No.10	3.6	
	PMC	Consulting Work	0.477	
	Total		18.759	

	Item	Annual Operation cost (US\$ Million)									
		09	10	11	12	13	14	15	16	17	
Government WAN	Hardware /Software maintenance fee	0.3	1	1	1	1	1	1	1	1	
	Outsourcing fee	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
	Total	2.2	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	

Source: JICA Study Team

8.1.7 Implementation Scheme

(1) Detailed Design

Required time frame: 6 months
Required staff: Two Project Manager + One local staff + One assistant
Cost: US\$ 703K

Procedures for Detailed Design

- All of the components' specifications are defined in Table 8.1 through 8.8.
- Several items, such as capacity planning, sizing and performance, are required to investigate in order to get current numbers and future expansion trend as well.
- The investigation may be implemented by referring and collecting various statistical information, verifying invoices of telecommunication company, counting actual equipment configuration, and so on.
- After fulfilling all required specifications, those tables can be used as good material in order to write a Request For Proposal (RFP).

(2) Installation and Test

Required time frame: 9 months
Required staff: Two Japanese engineers + One local Eng. + One assist.
Cost: US\$ 477K

(3) Operation and Maintenance

1M\$ for Gov-WAN O&M outsource fee + Rural Wireless LAN O&M fee
This cost estimation has not been proved by vendor verifications.

In addition to outsourcing fee, the following fee should be considered:

- Hardware and software annual maintenance fee is 20% of the initial cost at the most;
- Rough estimation of maintenance cost is about US\$ 1 million per year; and
- ISP connection contract should be renewed. Combining extension of contract year discount and one integrated government contract will make it possible to reduce annual communication fee to 60-70%. Combining all ministries' lines to one big line will also reduce cost.

8.2 e-Government Center

8.2.1 Building Design

(1) Structure

Isolation System

There are many types of such systems. The typical characteristic of earthquakes in El Salvador is sudden short but big vacillation. We will introduce an isolation system against earthquake under the foundation.

Resistant Slab

San Salvador is on a volcanic plateau. There are thick layers of ash and sand on top of the hard rock. The ash and sand layers retain much water within. When an earthquake hits, the ash and sand layers become having properties of liquid, called the liquefied layer. When this happens, whole building can be

lifted up by upward pressure due to the liquefied layer condition. Thick and heavy concrete slab, called resistant slab is to be placed under the bottom of building. In order to defend the building from being lifted up, the consecutive wall made from sand piles is set up under the resistant slab.

Structural Conditions

The structure of the building is primarily of reinforced concrete. Standard column size is 55cm × 60cm, and standard span length is 600cm. Standard beam size is 60cm × 45cm. However, a part of long length span under the roof top is of pre-cast concrete or pre-stressed concrete beam. The shear wall is 18cm thick and other walls will be 10cm thick.

Building Size

The building is composed 5stories, one basement floor and three upper floors including a pent house. The building is made of 8 × 5 standard spans, the long side is 48m and short side 30m. One span decided with sprinkler cover area is 6m. One floor space is 1,440m², the total floor space is 5,805m².

The first floor height is 5m, the second floor is 4m, and the third floor is 5 m, so that height of the building from ground level is 14 m. Height of basement is 5m. As for the height of the ceiling from the floor, the first floor is 3.5m, the second floor is 3m and the third floor is 3.5m. In addition, a dry area is placed around the basement floor so as to make the delivery of heavy equipment easy.

Common Matters

Heavy machines are placed in underground. Space without windows to give efficiency is in an air conditioning. In addition, we arrange a dry area to carry in a machine in underground about. The basement floor is for machine room and server room. The first floor is for Administration of the building, a SNET office, a call center, an IT training center, and a utility room. The second floor is for SNET and Utility. Third floor is for the Civil Protection Center, an information center, a chamber room, a conference hall, and utility.

There is an atrium of two levels of colonnades in the first floor. The corridor takes a width of three meters so that big machine can pass through. An elevator is to have a capacity of 32-passenger so that big machine can also be lifted. An emergency elevator can be used by VIP in case of emergency.

The outer wall adopts tiling to protect the wall surface from strong sunlight and heavy rain. Interior wall finish is done by plastic cloth so as to make cleaning easy. The finish of the floor is of a tile carpet on raised floor. Smoked glasses are used for windows to mitigate strong sunlight.

Floor

The server room is equipped with 18-inch raised floors. All electrical outlets are located under the raised floor. The network connection cables are settled up in overhead cable trays and are never run under the floor. The distributed weight limit is rated at 1,200 pounds per square foot.

Power Supply

The server room power is designed with full, “Necessary+1” (N+1) redundancy. At any time each component is connected with multiple power and networking connections. The server room power design is based on multiple and fully divergent power grids and substations, N+1 uninterruptible power supply (UPS), N+1 generator backup, and N+1 generator feeds to the building. The server room has a highly available electrical infrastructure. The electrical system is built on a tiered electrical system.

Cooling System

The server room cooling system is of a closed-loop. Cold water (approximately 43 degrees Fahrenheit) circulates through a heat exchange unit, moving cold air under the server room floor.

Fire Protection and Suppression

A fire protection system is in place in the building. This system monitors all the smoke detectors throughout the building. If a smoke detector is activated, the specific location of the incident is displayed on unit monitors located within the command center, network operations center and administration office. There are multiple fire extinguishers mounted throughout the building.

Network Environment

The network environment for the building is a fault tolerant network, which provides divergent routes and multiple connections in networking cable. All network devices are, at a minimum, N + 1 redundant that are secure, highly reliable and have virtually limitless scalability condition.

(2) Sample Design

Sample design drawings for the e-Government Center Building are shown in Appendix 1.

8.2.2 e-Government Center Design

The e-Government Center is a part of the building of e-Government Center. The center accommodates the data center space, hardware and software within the data center, other related facilities such as call center and, training center, and development center, all of which are managed by an organization with staff working under this organization. The Data Center has a space of 710 m² in the building with raised floor to make cabling easy. It is estimated that 150 server-racks are installed to accommodate servers and storages which are for e-Government services or for users’ (government agencies) activities. One hundred and fifty server-racks can accommodate 1,000 to 1,500 servers e-Government services are executed mainly by this Data Center.

<e-Government Center Services>

In the Data center and other related facilities, e-Government Center services are provided to primarily government agencies. Some of the services can be provided to private companies.

Details of services are described in Section 6.3.3. The table below shows kinds of services and their possible charging schemes to users (agencies). Priority is also defined. Priority 1 means high priority, which are recommended to be implemented at the start of e-Government Center. Priority 2 means “better to have”, but they can be added after the start of initial services.

Each service should be charged to users (agencies) on its usage in accordance with its charging scheme. For example, an agency that will use the web hosting service should ask the e-Government Center to install its web site.

Table 8.12 Services and Possible Charging Schemes to users

Category	Services	Charging Scheme	Implementation Method
Network	Web Hosting Service	Fixed monthly charge within a limited storage. Additional charge for additional storage and additional requirements	To prepare minimum resources. Add facilities along with increasing users.
System Operation	Housing Services	Fixed monthly charger per sub-rack used.	Only racks are pre installed when e-Government will start.
	Online Data Back Up Service	Charged by data volume backed up a day	Standard configuration (ie LINUX+Oracle, Windows+SQL server) will be ready at the starting. It must be expanded by increasing demand. Special configuration may be added depend on requirement with another charge.

Category	Services	Charging Scheme	Implementation Method
	Data Replication Service	By storage size	Facilities will be ready at the beginning.
	System Stand by Service	Fixed monthly price which is defined by size of users' system and operation requirement.	Racks are preliminary ready
	Data Exchange Services	One time charge per type of data transmission and monthly charge per transaction.	Ready at the starting
Monitoring	Virus Protection	Anti virus software is installed in the e-Government applications must use this function by the Norm. So no charge is applicable.	This must be ready at the start.
	Access Log Management Services	Per number of required database	Priority 2
	Client Management	When applicable, no charge.	Priority 2
Security	Authentication service	e-Government applications must use this function by the Norm. So no charge is applicable.	This must be ready at the start.
	Access Control Services	e-Government applications must use this function by the Norm. So no charge is applicable.	Priority 2
	PKI	No charge. This will be mandatory for required applications.	This must be ready at the start.
Operation	Technical Services	T&M basis	Staff will be ready at the start.
	Network Engineering Services	T&M basis	Staff will be ready at the starting.
	Operation Services	Monthly fix cost defined by number of systems to operate.	Operation organization will be ready at the start.
Application	Intra - Gov. Portal	No charge	Priority 2
	e-Government Portal	No charge. All of agencies are to use.	Hardware will be added on increasing users.
	Open Document	Per number of users who use application during the month.	Priority 2
	Payment Gateway	Transaction fee..	This must be ready at the start.
	Video Conference	Charge daily or hourly per room.	Priority 2
Others	Technology Bank	For direct requirement from users, they are charged by T&M basis.	Staff for implementing services must be ready during project period. Increasing requirement, the number will increase.
	Training Center	Curriculums will include fee per head.	Facilities will be ready from the beginning. Curriculums will continue to develop
	Help Desk.	T&M basis	Priority 2
	Call Center	Monthly fixed recurring charge considering the number of application and types of applications.	At the start minimum (around 10 persons) will be assigned by 2 shift. Increasing the number by expansion of applications and end users, also expanding to coverage of 24 hours and 365 days.

Source: JICA Study Team

8.2.3 Hardware and Software

Hardware and Software, which are required to be implemented in e-Government center, are estimated based on the assumptions seen in below table.

Table 8.13 Assumptions for Hardware and Software

	Services	Hardware and Software	Resource requirement precondition
1	Web Hosting Service	Servers*5, Storage	Enough even when all municipalities will host their web.
2	Housing Services		Only racks are ready.
3	Online Data Backup Service	Server *10, Backup tool, Storage	For most critical 10 application systems can be backed up online.
4	Data Replication Service	Server *2, Backup tool, Storage	100 systems (or organizations) can be backed up into 100 TB storage.
5	System Stand by Service		Users have to procure hardware and software to install into racks
6	Data Exchange Services	<Common subsystem> Servers*2, Storage*2	Enough for the use for Citizens master database application.
7	Virus Protection	<Network>	
8	Authentication Service	<Common subsystem>	8mil users are managed. In average, all of citizens will use once a week.
9	PKI	<Network>	
10	Technical Services		
11	Operation	<Network>	
12	e -Government Portal	<Common subsystem> Servers*6	In average, all of citizens will use once a week
13	Payment Gateway	<Common subsystem> Servers*6	Every 1of 10 accesses will related to bank payment.
14	Technology Bank	Servers for development*10, tools	
15	Training Center	AV, Server * 2, PC*50	
16	Network Engineering Services		
17	Call Center	PCPhone*40 (Servers in Common sub-system) Servers*4, 40users software	Facilities for 40 operators
Total			

Source: JICA Study Team

8.2.4 Operation and Maintenance of the Building

Operation and maintenance of the building is assumed to be done by Ministry of Internal Affairs. It is practical to outsource all of building management work to a private company. These work include:

- Security management (HR assignment);
- Building and facilities cleaning; and
- Facilities maintenance • • • regular inspection, maintenance and repair for elevators, air conditioners, security gates, security systems, electric facilities, water supply, plumbing, roof equipment, lightning protection, fire alarm, halogens, sprinklers, etc.

Only the Data Center, equipment in the Data Center and Call Center, Training Center, and Development Rooms are managed by the management of the e-Government Center. Proposed organization is shown in

Section 6.3.3. Total government staff may be between 20 and 30 while many contractors will be working there.

Contents of operation & management of e-Government Center depend on the group of the Center that is also described in Section 6.3.3.

8.2.5 Cost Estimates

<Building Construction Cost>

Cost of building construction and general facilities, facilities for SNET and Civil Protection, which will be the tenants of the building, are estimated as below.

Table 8.14 e-Government Center Cost Estimates

ITEM	AMOUNT	UNIT	COST
Construction costs	5,760	600	3,456,000
Building facilities electricity cost of construction (13% of a building cost)	13%		449,280
Building facilities plumbing costs (7% of a construction cost)	7%		241,920
subtotal			4,147,200
Network construction (A server floor to remove)	5%		172,800
PC	300	Lump sum	432,000
Server		Lump sum	480,000
Disk	250	480	120,000
A conference table(include a chair)		Lump sum	120,000
Household articles / equipment / OA machine parts			1,324,800
subtotal			
Special structure construction to adopt Isolation system costs		Lump sum	620,000
Isolation system Cost		Lump sum	700,000
Building Management system	5%		172,800
Outdoor institution	5%		172,800
Others(Pile, Temporary construction etc.)	7%		290,304
Subtotal			1,955,904
Local consultant expense		Lump sum	288,000
A building design / construction control		Lump sum	1,259,138
Consultation Subtotal			1,547,138
Total Cost			8,975,042

Source: JICA Study Team

<e-Government Center Investment Cost>

Estimated costs for e-Government services are shown below.

Trigger Application systems will be run in the e-Government Center. Cost of development and O&M of these systems are calculated in Sections 8.3 & 8.4. Common subsystems to be developed will be handed over to e-Government Center when completed, and be operated there. The initial investment cost and a part of OM cost (i.e., hardware & software annual maintenance fee) are considered a part of the Common Subsystems component (Section 8.6), though HR cost or space cost, etc are part of this e-Government Center cost.

Investment for some of the services will be made over 3 years. This means that additional investment will be necessary when the number of users, applications, and transactions are substantially increased. Hardware may be renewed every 5 years.

Cost of Priority-I Services (In some items, costs are included under other components)

Table 8.15 Cost of e-Government Center Services

	Services	Unit price (in mil \$)	0.030		0.100		0.010		0.010		Total (mil US\$)
			Server		Storage		Software License		Others		
			Initial Investment	Unit	Total	Unit	Total	Unit	Total	Unit	
1	Web Hosting Service	Servers*5, Storage	5	0.15	1.0	0.10		0.00		0.00	0.250
2	Housing Services			0.00		0.00		0.00		0.00	0.000
3	Online Data Backup Service	Server *10, Backup tool, Strage	10	0.30	2.0	0.20		0.00		0.00	0.500
4	Data Replication Service	Server *2, Backup tool, Strage	2	0.06	1.0	0.10		0.00		0.00	0.160
5	System Stand by Service			0.00		0.00		0.00		0.00	0.000
6	Data Exchange Services	<Common subsystem>		0.00		0.00		0.00		0.00	0.000
7	Virus Protection	<Network>		0.00		0.00		0.00		0.00	0.000
8	Authentication Service	<Common subsystem>		0.00		0.00		0.00		0.00	0.000
9	PKI	<Network>		0.00		0.00		0.00		0.00	0.000
10	Technical Services			0.00		0.00		0.00		0.00	0.000
11	Operation	<Network>	2	0.06		0.00	30	0.30		0.00	0.360
12	e-Government Portal	<Common subsystem>	2	0.06		0.00		0.00	3	0.03	0.090
13	Payment Gateway	<Common subsystem>	2	0.06		0.00		0.00	3	0.03	0.090
14	Technology Bank	Servers for development*10, tools	10	0.30		0.00	10	0.10		0.00	0.400
15	Training Center	AV, Server * 2, PC*50	2	0.06		0.00		0.00	50	0.50	0.560
16	Network Engineering Services			0.00		0.00		0.00		0.00	0.000
17	Call Center	PCPhone*40 (Servers in Common sub-system)		0.00		0.00		0.00	16	0.16	0.160
Total				1.05		0.40		0.40		0.72	2.570

Source: JICA Study Team

In addition to hardware and software shown above, some of the costs for data center infrastructure are necessary.

Table 8.16 Cost of Data Center Infrastructure

No	Item	Unit price (K US\$)	Number	Amount (K US\$)
1	Server Racks	1.0	150	150
2	UPS	3.0	180	540
3	HVAC	50	1	50
Total				740

Source: JICA Study Team

The above investment can be divided into several packages. It is assumed that HVAC and half of server racks and UPSs are to be installed before the services start, and the rest of them will be added 2 years later along with increasing number of users.

Also costs of Detailed Design and project management are to be added:

Detail Design Consultant US\$169K (1 international consultant and a secretary)
 Project Management Consultant US\$282K (1 international consultant and a secretary)

Investment schedule by year including renewal is as shown below.

Table 8.17 Investment Schedule

		(US\$ Million)							
Services	2009	2010	2011	2012	2013	2014	2015	2016	
1 Web Hosting Service	0.16	0.06	0.03			0.16	0.06	0.03	
2 Housing Services									
3 Online Data Back Up Service	0.22	0.06	0.22			0.22	0.06	0.22	
4 Data Replication Service	0.16					0.16			
5 System Stand by Service									
6 Data Exchange Services									
7 Virus protection									
8 Authentication Service	0.00					0.00			
9 PKI									
10 Technical Services									
11 Operation Services	0.36					0.36			
12 e-Government Portal	0.00	0.06	0.03			0.06	0.06	0.03	
13 Payment Gateway	0.00	0.06	0.03			0.06	0.06	0.03	
14 Technology Bank	0.40					0.40			
15 Training Center	0.56					0.56			
16 Network Engineering services									
17 Call center	0.16					0.16			
Total	2.02	0.24	0.31	0.00	0.00	2.14	0.24	0.31	

Source: JICA Study Team

Although priority is not considered high, other functions should be considered for the next stage. This cost is estimated as below.

Table 8.18 Cost of Additional Elements

Services	Unit price (US\$)	0.030		0.100		0.010		0.010		Total (US\$ Million)
		Server		Storage		Software License		Others		
		Unit	Total	Unit	Total	Unit	Total	Unit	Total	
18 Access log Management Services	Servers*2, Access monitoring Tools	2	0.06		0.00	50	0.50		0.00	0.560
19 Client Management	Servers*5, Event monitoring Tools(10,000users)	5	0.15		0.00	80	0.80		0.00	0.950
20 Authentication Service	Servers*5, Development	5	0.15		0.00		0.00		0.00	0.150
21 Access Control Services	Servers*5, SSO Tools(10,000users)	5	0.15		0.00	100	1.00		0.00	1.150
22 Intra - Gov. Porta	Servers*10, Development	10	0.30		0.00		0.00		0.00	0.300
23 Open Document	Servers*5,	5	0.15		0.00		0.00		0.00	0.150
24 Video	Servers*5, Tools	5	0.15		0.00	20	0.20		0.00	0.350
25 Help Desk	PCPhone*40 (Servers in Common)		0.00		0.00		0.00	16	0.16	0.160
Total			1.11		0.00		2.50		0.16	3.770

Source: JICA Study Team

<Building O&M Cost>

Building operation and maintenance cost consists of salaries for SNET and Civil Protection personnel, energy expenses and outsourcing fees for building and facility maintenance fees. Summary of annual O&M cost is shown in the table below.

Table 8.19 Annual Building O&M Cost

Item	Amount	Expenses per year
SALARY		
Part time employees (With and Incremental)	120	\$588,000.00
Subtotal	120	\$588,000.00
ENERGY		
Electricity		\$169,111.80
Water		\$39,529.50
Subtotal		\$208,641.30
SUBTOTAL		\$796,641.30
Other (miscellaneous, etc.)	10%	\$23,899.24
Building Maintenance (3% of the initial cost)		\$269,251.25
TOTAL		\$1,089,791.79

Source: JICA Study Team

<e-Government Center O&M Cost>

e-Government O&M costs include hardware maintenance and support fees, software license maintenance fees and HR costs.

Hardware maintenance and support annual fee is calculated at 30% of the initial investment, and software annual maintenance fee at 20% of the initial investment.

Number of personnel increases from the minimum number to a larger number in accordance with the increase in users and services by year.

Table 8.20 e-Government Center O&M Cost by Year

(US\$ Million)

	Services		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	Web Hosting Service	Only maintenance fee	0.048	0.066	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075
2	Housing Services											
3	Online Data Back Up Service	Only maintenance fee	0.066	0.084	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
4	Data Replication Service	Only maintenance fee	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048
5	System Stand by service											
6	Data Exchange Services											
7	Virus Protection											
8	Authentication Service	Only maintenance fee	0	0	0	0	0	0	0	0	0	0
9	PKI											
10	Technical Services	5 contractors	0.06	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
11	Operation services	Maintenance fee. 10 contractors.	0.168	0.228	0.228	0.228	0.228	0.228	0.228	0.228	0.228	0.228
12	e -Government Portal	Only maintenance fee	0.018	0.036	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
13	Payment Gateway	Only maintenance fee	0.018	0.036	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
14	Technology Bank	10 to 25 SE/PGs	0.29	0.65	0.83	1.01	1.01	1.01	1.01	1.01	1.01	1.01
15	Training Center	Only maintenance fee	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
16	Network Engineering Services	5 to 15 SE/PGs	0.09	0.36	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
17	Call Center	Maintenance fee. 10 to 30 operators.	0.108	0.228	0.288	0.312	0.312	0.36	0.384	0.408	0.408	0.408
TOTAL			0.932	1.874	2.387	2.591	2.591	2.639	2.663	2.687	2.687	2.687

Source: JICA Study Team

Salary expense of e-Government Center is estimated as below.

Table 8.21 Salary Expense of e-Government Center

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
No. of staff	20	25	30	35	35	35	35	35	35	35
Annual Salary (US\$K)	229	286	343	400	400	400	400	400	400	400

Source: JICA Study Team

<SUMMARY OF INVESTMENT COST>

Table 8.22 Investment Cost of e-Government Center

	Item	Description	Cost (US\$ Million)	Renewal Cost (US\$ Million)
Building	Detailed Design	Consulting Work	0.924	
	Construction		7.391	
	PMC	Consulting Work	0.660	
	Total		8.975	
e-Government Center	Detailed Design	Consulting Work	0.169	
	Data Center Facility		0.74	
	Hardware		2.17	1.62
	Software		0.4	
	PMC	Consulting Work	0.282	
	Total		3.761	

Source: JICA Study Team

<Summary of Annual OM Fee>

Table 8.23 Annual OM Fee of e-Government Center

	Item	Annual Operation Cost (US\$ Million)								
		09	10	11	12	13	14	15	16	17
Building	Utility	0.209	0.209	0.209	0.209	0.209	0.209	0.209	0.209	0.209
	Building Maintenance etc	0.303	0.303	0.303	0.303	0.303	0.303	0.303	0.303	0.303
	Outsourcing HR Fees	0.588	0.588	0.588	0.588	0.588	0.588	0.588	0.588	0.588
	Total	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100
e-Government Center	Hardware /Software maintenance fee	0.479	0.551	0.644	0.644	0.644	0.644	0.644	0.644	0.644
	Outsourcing HR Fees	0.453	1.323	1.743	1.947	1.947	1.995	2.019	2.043	2.043
	Government Staff Salary	0.112	0.268	0.336	0.380	0.380	0.380	0.380	0.380	0.380
	Total	1.044	2.142	2.723	2.971	2.971	3.019	3.044	3.067	3.067

Source: JICA Study Team