

Chapter 6 Basic Strategy and Design Standards for *e*-Government

6.1 Basic Strategy for *e*-Government Platform

6.1.1 General Areas of *e*-Government Application

The Study Team carried out extensive surveys in order to identify where improvements in government operations are needed in El Salvador in terms of the use of ICT technology. Those included in this survey are the priority, but an eventual *e*-Government platform should be able to link areas such as finance and the judiciary (an ongoing World Bank project in El Salvador is working on modernization of the Judicial System and eventually it should link to the platform). It was understood from the outset that applications must be such that ordinary people can directly perceive their benefit. Only by this way, can *e*-Government have a wide acceptance and consequently a chance to become the intended engine of transformation of the Salvadorian society and economy. Various people in a variety of positions have been interviewed and the following consensus emerged:

- Citizen Identification
 - First of all, it is essential that a person who is to receive a service from the government must be identified and certified. It is guaranteed that the rights of citizenship are given when a birth certificate is issued. An identification card is physically given to a citizen of 18 years or above. The right to access the services of the government via electronic means can be provided when a citizen's identity is certified before using the system.
- Security
 - This is the most important service as a nation that defends its citizens from threats through the use of defense (military affairs), crime prevention, and protection against disasters. It is thought that the service can be improved by *e*-Government in the areas of crime prevention and disaster protection.
- Education
 - The possible uses of ICT technology in education are varied. In particular, the Internet has opened vast possibilities where the problem of accessibility was a serious hindrance in providing educational opportunities of various kinds.
- Health
 - ICT technology also provides opportunities to improve health services by the government without much cost in the provision of its management.

Some people mentioned the area of road traffic management such as road traffic information services, road traffic rule violations, ticketing and licensing. However this area was considered unsuitable for the initial implementation as it was seen as too restrictive.

6.1.2 Issues in Establishing *e*-Government

There are existing systems of the government in which citizens can directly access. Some provide information by individual ministries, and others are interactive application systems that citizens can input directly from outside of the government. A latter example is the *e*-Tax payment provided by the Ministry of Finance. In addition, *e*-Procurement systems to be applied across ministries and an online property registration system by CNR are being implemented. However, the implementation of such systems is still limited. The expansion of this field will become the main field of *e*-Government in the future.

The following issues should be taken into account in order to expand these types of application systems.

1. There are many organizations facing shortage of budget, institutional capabilities and human resources to develop necessary systems, while a few have sufficient resources. Most local governments are facing this issue. It is a difficult situation to develop many *e*-Service applications in many government institutions.

2. The network and the system's operational environment have been constructed in different ways within each ministry. This applies not only to physical configurations but contracting methods as well. Under the current conditions in which transactions are undertaken within each ministry, it is not a big issue. However, when the access by citizens outside of the ministry increases in the future, and the system that provides such services expands, the integration of networks and the system's operational environment would become crucial. Moreover, even under the current circumstances, it would cost much less if systems were integrated and structured.
3. There exists a big problem in that many application systems have been independently developed in each ministry without communicating with other ministries. This affects, for example, programming structure, definition and the structure of data. The result is low productivity in development and low reliability of data.
4. The attitude towards system continuity and stable operation is missing among ICT related personnel. Basic residential data or national map data are kept and manipulated without any appropriate back up of data or systems. For instance, there is no alternative when the entire computer, which keeps basic data on residents managed by RNP, breaks down due to a disaster although the system itself has a redundant configuration, which is contained in the same location. Moreover, because the remote backup storage of data is taken to RNP only once a week, one-week's worth of data could be lost.
5. When a system is developed by each organization, the integration of the system with others beyond the boundary of the organization rarely takes place. For instance, data concerning an individual citizen is kept and managed in various organizations in different forms. The duplicate issuance of passports to criminals could occur.
6. There are no common standards concerning the development of software programs. Consequently, systems are often incompatible and data exchange difficult. Software developed cannot be shared among different organizations and the overall cost of software development, therefore, is high. The lack of common standards in software development leads to many duplicated and wasteful development efforts in multiple ministries.

6.1.3 Requirements for *e*-Government Platform

Government services via the Internet are now expanding thanks to the efforts of each government agency. This movement must be accelerated if El Salvador desires to remain competitive in the world and move up the scale. While individual government agencies are trying to develop their own systems to provide *e*-Services, some of them do not have sufficient resources and knowledge to do so. They need assistance.

e-Government must guarantee citizens easy and secure access to government services in a comfortable environment.

It is desirable to establish a single entry point for any type of *e*-Government service for the purposes of security and efficiency. A government portal is required. This portal must have an authentication function to identify individuals. Some of the *e*-Service applications are limited only for nationals with identification while other applications may be fully open to anybody including foreigners, whether registration is not required.

Service levels must be standardized among agencies. One of the examples is operating hours. Many citizens may want to receive services after office hours or on weekends. Individual ministries may encounter difficulties in maintaining extended hours for coverage.

As in the above examples, after implementing *e*-Services through individual agencies, they can utilize common resources to save time and their own resources.

6.1.4 Concepts of *e*-Government Platform

Establishing the *e*-Government Platform can be achieved along the lines of:

1. Integration of all ministries' platforms aiming at cost reduction, secure and safe operations and productivity improvement;

2. Improving Internet connectivity for the Central Government, municipalities, schools, and rural areas; and
3. Improving Government services for citizens, making them fast and convenient at a reduced cost.

Targeted benefits are as shown below.

- In the short run:
 - The government's telecommunications cost will be reduced; and
 - Savings in computer back-up and software development costs.
- In the long run:
 - A rise in national ICT literacy;
 - Expansion in the use of the Internet and in the software industry;
 - Higher productivity; and
 - Improvement in the quality of life.

6.1.5 Contents of e-Government Platform

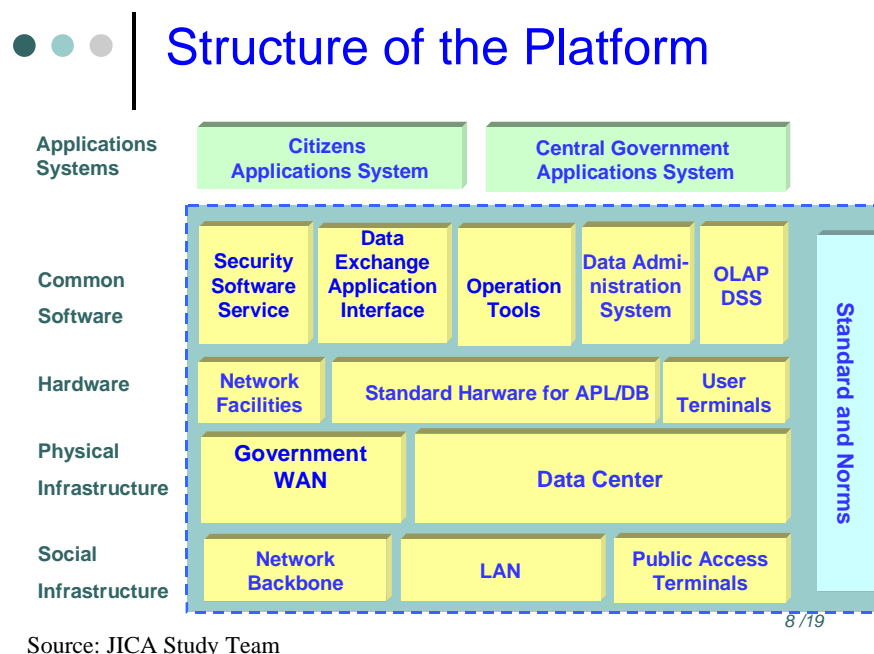
The e-Government Platform generally consists of 4 layers as shown below plus standards and norms, which define the rules to utilize its components.

1. Social Infrastructure
2. Physical Infrastructure
3. Infrastructure for Government ICT
4. Common sub-systems (hardware / software)

Various application systems are to be built on the platform.

It is necessary to define how and when to use the platform in each layer and how to maintain and operate them. Also, the interface between platforms or between components in a platform is defined by a set of established rules identified as "standards and norms". An efficient system should be developed and be operated by these rules as defined by the government. Moreover, the establishment of a set of rules encourages private IT enterprises, who maintain their own system development techniques at a constant level separate from the development projects of government systems, to standardize by imposing the technical standards to the private companies when putting a bid to tender.

The components of the platform and the relationship to application systems are shown in the Figure below.



Source: JICA Study Team

Figure 6.1 Platform and Applications

6.1.6 Criteria to Select Priority Applications and Systems

As shown in the figure above, the platform can be defined as the combination of the components shown within the broken line. In essence a platform is infrastructure for the e-Government. Unlike roads or bridges, ordinary citizens cannot see its presence unless there is an application system running on the platform that connects him or her with the platform. It is therefore quite important for the purpose of citizens' recognition that a suitable application system is chosen for the initial system. Such an initial application may be called a Trigger Application since it would trigger the development of other applications with the general development of the ICT sector to follow.

As shown in Section 5.2, the investigation by the Study Team resulted in the identification of the following areas for possible applications to be adopted as the initial component of the e-Government.

- a) Citizen Identification
 - a-1 Citizen Identification (Birth Certificates)

Birth certificates are necessary when applying for a new job, obtaining a visa, buying a house. The average frequency of obtaining a birth certification is once every 1 to 2 years. Currently, to obtain a birth certificate, citizens have to visit municipal offices where they are registered.
 - a-2 Passport

An online application for passports and efficient immigration operations utilizing ICT are desired.
- b) Security
 - b-1 Crime prevention

Tracing criminals and victims, such as kidnapped children, can be efficiently done using ICT with a comprehensive database.
 - b-2 Disaster prevention

Basic information on disaster-prone areas and continuous monitoring of impending disasters can be combined to provide warning and evacuation information that can be widely accessible to citizens.

c) Education

c-1 e-Learning

The use of ICT in education not only increases computer literacy but also enhances teaching materials in which manpower in quantity and quality is in short supply.

c-2 School management

Individual students as well as schools themselves can be better managed by using ICT.

d) Health

d-1 Hospital management

Hospital information and reservation systems can be provided to the citizens.

d-2 Health insurance

By linking with ISSS, health certificates can efficiently be provided. This is currently available only from overseas.

d-3 Medical records

Medical records of patients can be stored and shared among medial institutions. It will help to provide better medical care for patients.

The application systems proposed as Trigger Applications have been evaluated by the following criteria.

- It should be a system that the wide range of citizens can directly access including overseas Salvadorians. (Wide Subject)
 - Application systems must be selected from those in which users are not limited to specific groups, such as age, residence, and income group.
 - Overseas Salvadorians must be incorporated as users.
- It should be able to support services provided by the government to citizens. (G2C)
 - The major target here is the services described in Section 6.1.1. There are needs in G2B services (Government to Business). That is, it is important to support the convenience and productivity of business entities. But from the point of view mentioned previously, services geared toward the individual as in G2C types of services have priority.
- There must be an effect on PPP nations. (Effect on PPP)
 - El Salvador is in charge of the telecommunication sector as a member of PPP. So it is in a position to lead ICT projects in the region. e-Government is one of promising possibilities that can affect PPP countries directly or indirectly. For example, a disaster information system can be utilized as a region-wide system. Some other applications may be compatible in other countries as far as social systems and regulation are allowed. More practical components to be used in other countries are services in the government WAN, the e-Government Center and standards and norms. These can be exported to other countries.
- It should be the base for other application systems that will be added in the future. (Basis for Expansion)
- It should have a critical database from the viewpoint of the standardization of data. (Standardization)
 - A core database, which affects many systems, should be standardized in terms of data structure, data names, way of data transmission, etc. A Citizens' database is obviously one, which comprises the core, which can be related to many systems in many agencies. Map information, which can be used in the Disaster Information System, is also applicable to other systems and should be defined in a standardized format. The local government should be able to participate. (Local Government)
 - Municipalities must be important participants in e-Government. Themes directly related to local operations procedure or which provide useful information to municipalities have to be inclusive.
- Effect should be seen early. (Readiness)
 - When the e-Government Platform is ready, even a small portion should be seen by citizens at the early stage so that its benefits can be observed by the citizens and consequently, its use among them can grow rapidly, resulting in further benefits. This requires that the system should be started in areas where existing institutional systems are ready to be connected with the platform.

An evaluation exercise was carried out against identified areas of application shown utilizing the criteria above.

Table 6.1 Criteria for Evaluation

Criteria/Appl	Weight	a-1	a-2	b-1	b-2	c-1	c-2	d-1	d-2	d-3
1) Wide Subject	10	10	5	5	7	6	6	8	4	8
2) G2C	10	10	10	10	10	10	8	8	4	8
3) Effect on PPP	5	3	5	3	5	3	3	3	3	3
4) Basis for Exp	5	5	3	3	4	3	3	3	2	3
5) Standardization	5	5	3	3	4	3	3	3	3	3
6) Local Gov.	5	5	3	3	5	3	5	3	3	3
7) Readiness	20	15	10	5	10	5	5	5	5	3
Total	60	53	39	32	45	33	33	33	24	31

Source: JICA Study Team

The result of the exercise indicates that the area a-1 (citizen identification) and the area b-2 (disaster prevention) should be chosen for the initial stage assuming that the initial stage can accommodate the development of only two application systems.

6.1.7 Selection of Priority Components

The foregoing discussions have led to the conclusion that the following components should be adopted for the initial stage of e-Government in El Salvador.

1. Government WAN
2. e-Government Center
3. Trigger Applications
4. Standards and Norms

1) Government WAN

The establishment of a network environment suited to an integrated government has a high priority. The following should be included in this (Indication after “→” is the relationship with the target concepts.):

- Large area high-speed network connection with special lines between government ministries and agencies. → Integration (Cost, Safety);
- Network connection of local governments and government ministries and agencies →Connectivity;
- Security system that firmly defends the network of the entire government including local governments → Connectivity;
- Application services within the network system such as e-mail, file transfer, etc. → Integration (Cost, Safe, Productivity);
- Communication line setting to the Internet in regions with little ICT presence (Schools to be a target). → Connectivity; and
- Installation of public terminals in public facilities such as schools → Connectivity.

2) e-Government Center

- Organization which manages the ICT of the entire e-Government → Integration (Productivity)
- Data center protected from disasters of all kinds → Integration (Cost, Safety)
- ICT services provided by the data center and its facilities. → Integration (Cost, Productivity)
- Organization that provides standards to the entire e-Government → Integration (Cost, Productivity)
- Various services utilizing the database and equipment → Integration (Cost, Safety, productivity)

3) Standards and Norms

- Organization to develop, authorize, maintain, update and enforce standards and norms → Integration (Cost, Productivity)
- List of standards and norms → Integration (Cost, Safety, Productivity)
- Procedure for updating standards and norms → Integration (Cost, Safety, Productivity)
- Common subsystems, which guarantee the compliance with standards and norms and make the work of institutional ICT easier. → Integration (Cost, Safety, Productivity)

4) Trigger Application Systems

- Disaster Information System
Notification system for the dissemination of disaster information to public. Target terminals include PCs and mobiles. Also hazard map is to be presented online with a friendly user interface. → Services
- Citizens' Master Database System
Based on the existing RNPN database, add functions providing citizens convenience by direct access to the database from them to get documents, data integration among government agencies, process integration between RNPN and municipalities. → Services, integration (Cost, Productivity)

6.1.8 Effect on Promotion of IT Industry

Currently the IT industry in El Salvador is very small. The total size of this market has been estimated at around 5 to 10 million US dollars in annual revenue. Mini-enterprises that employ less than 10 persons each make up more than 50% of the total number of enterprises. Those with annual revenue less than US\$100K make up almost 60% of the total. It seems that the industry is in a difficult position to compete in the global market.

Private IT enterprises in El Salvador are limited to software development companies and telecommunication operators. The IT hardware manufacturing industry is almost non-existent. There are enterprises whose business are sales and/or support of hardware and software manufactured overseas including in the United States.

Many telecommunication operators appeared after this market was privatized. Because the domestic network demand is small, high-speed circuits were never laid in rural areas, and even in urban areas, the circuit quality is poor and prices are kept at very high level.

Traffic to web sites in El Salvador from within the country would increase through the provision of the Internet environment in schools in rural areas as well as through the implementation of the e-Government applications. A concerted effort by the government in association with the establishment of e-Government would increase the traffic dramatically. As a result, telecommunication operators can be expected to operate with more traffic at a lower price.

Various services provided by the Government WAN and the e-Government Center may be outsourced to private enterprises. Those companies can utilize the infrastructure and base cargo to provide new types of services as business. Some of such services do not exist in El Salvador at present, as services in the United States are being used. Opportunities for new services would open up.

Private companies can be contracted for the software development of some parts of the components of this project, making a new market. The standards and norms are to be applied to the development of this project, and the development is to be executed under the newly established standards and norms. Thus, improvement in productivity is expected, which should spread to other areas of the industry, strengthening workers of the industry in the country. The standards and norms include how to obtain industry certifications such as CMMI and ISOs. Especially for private IT enterprises, these certificates are the evidence of capability when competing in the world market.

The establishment of *e-Government* and subsequent standardization of ICT-related work within various agencies of the government will lead to redundancy in ICT personnel within the government. This is a blessing in disguise as the experienced ICT experts within the government would be available to the private sector, boosting the quality and quantity of manpower for the private sector. Instead of waiting for this to take place, the government may encourage such a move in parallel with the implementation of the *e-Government* project. The establishment of the *e-Government* Center, for example, would provide exactly such an opportunity, as its operation can be entirely done by outsourcing to the private sector.

6.1.9 Effect on PPP Countries

Effect on PPP countries has also been taken into consideration in the selection of the priority components.

First, other PPP nations do not possess the Government WAN, the basis of effective *e-Government* Platform, nor any method of managing *e-Government* operations characterized by the proposed *e-Government* Center. If successful, the scheme to be implemented in El Salvador could become a model to other countries. El Salvador would become a center of training in *e-Government* among PPP countries. It is technically possible for the *e-Government* Center of El Salvador to provide services to other countries such as data back up and system back up.

The standards and norms can become a model for other countries, by which each country can develop its own with some customization.

The priority application systems have been selected with considerations towards other PPP countries. For example, the Disaster Information System can be expanded to include neighboring countries and consequently, El Salvador would become the disaster information center for the entire region of Central America.

The *e-Government* portal will have the function that authenticates users' identification by reference with the citizens' master database. This technology will have wide applicability to other countries.

6.1.10 Management of *e-Government* Platform

It is not possible, nor desirable for the government alone to construct, operate, and maintain the *e-Government* Platform components, since they are highly specialized work and removed from mainline government work. It is necessary to utilize the private sector for the majority of this work.

The private sector can secure a substantial business opportunity in undertaking the work and obtain technology and experienced personnel that can be utilized elsewhere. On the other hand, the government is freed from the burden of retaining large number of workers. Service levels can be maintained by contractual conditions between the two parties. It is best to outsource daily operations to the private sector.

At present, each government agency enters separate contract with ISP (telecommunications operator) independently from other agencies with a contract period of single fiscal year. It is certain that a large reduction in costs would result if such contract were made for combined requirements of multiple government agencies and for a longer time period. More cost reduction measures can be taken by changing the medium of exchange to an integrated high-speed line from the existing low-speed line currently utilized by individual government agencies.

It is also possible to utilize savings from such cost reduction efforts for subsidizing a non-profitable network portion such as in rural areas, where at present no services exist.

The *e-Government* Center, which is to manage the *e-Government* Platform, may well be a mixture of government and private operations. The following table indicates the possible division of responsibilities between the government and the private sector in running the *e-Government*.

Table 6.2 Possible Distribution of Responsibilities between Public and Private Sector

No	Tasks	Public	Private	Remarks
1	Policy making			
2	Planning			
3	Standards & Norms			
4	Auditing			3 rd party should do.
5	Training			
6	System development			
7	System implementation			
8	Regular operation			
9	Maintenance			
10	Performance evaluation			
11	Call center			
12	Field services			
13	Procurement			

Source: JICA Study Team

In the public sector, the cost related to the management of *e-Government* should be covered by the budget of each organization, in accordance with the cost of each service and the degree of actual use.

Government budget should also be allocated to common activities such as the standardization promotion committee.

6.2 Basic Strategy and Design for *e-Gov-WAN*

6.2.1 Issues

(1) Problems of the Internet Market in El Salvador

Internet business in El Salvador started in early 1990s, after the telecommunications industry was privatized. It should be emphasized that the Internet business began and grew without any government intervention, such as capital investment support, Internet policy announcement, supervision of service level, and so forth.

There are many problems that the Internet Market faces such as the following.

(a) Slow Internet Speed

There is general dissatisfaction among Internet users about the normal response time of web references, (taking more than 2-3 seconds after pressing Enter key). SIGET has been receiving a lot of complaints from citizens about the slow Internet, although no formal documentation is available on this matter. The current legal setting does not allow SIGET to ask ISPs to open their statistical network performance data so that bottlenecks in traffic handling can be known.

There was a serious discussion about introducing the National NAP (Network Access Point - Interconnection point for all ISPs to effectively share common backbone network) in 2004 in order to resolve the situation between the government and ISPs. However, no conclusion has been reached so far.

(b) Narrow Bandwidth and High Tariff (Service Price)

The maximum bandwidth of residential Internet service is 512kbps (44\$/month, unlimited time use, example from Telefonica), categorized as the minimum broadband bandwidth. Figure 6.4 shows examples of world Internet tariff. In comparing El Salvador's case of 6.8 USD/100kbps, the Study Team found that it is relatively expensive considering the average income of its citizens. Technically speaking, 512kbps can be easily upgraded to several mbps, if the copper wire quality is nominal. Also, the distance between the telephone exchange offices to the residence is an important factor to realize fast data transmission (ADSL).

(c) No Statistical Data for Public Internet Traffic

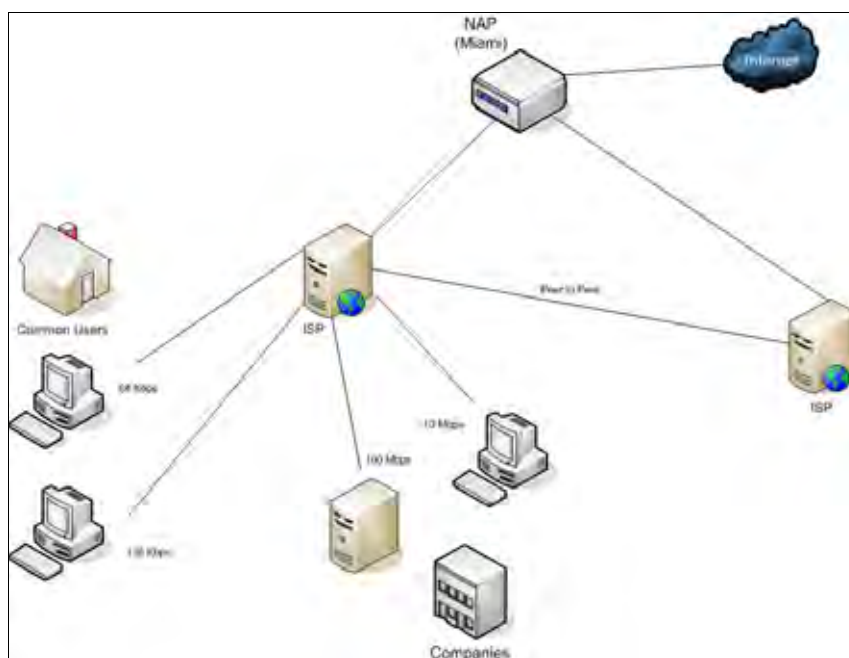
These days Internet service is considered as a part of the basic infrastructure for public. Government has the responsibility to assure the best infrastructure service quality is fairly provided to all citizens under the circumstances. Most of the countries around the world therefore have an organization to supervise private communication companies' business activities in order to avoid failure in providing good services. Therefore, it is very important for the government to periodically collect statistical network performance data.

- A recent visit to Telecom (the biggest ISP in the country) by the Study Team made it possible to acquire the latest data for the Internet's population and market share on a verbal basis.
- The number of contracts is increasing at a rate of 4,000 contracts/month. The total number of contracts at the moment is 75,000.
- Telecom's market share is 55%; 17 other telecommunications companies share the remaining 45%.
- The total Internet population is estimated about 136,000 (2% of national population).

With the following background information concerning the Internet situation of the country, it is recommended to collect statistical network data from at least major ISPs.

Bandwidth is not the only factor that affects Internet speed, although that is the one most people recognize. In government agencies, transmission of a large file is often needed, connecting to local servers that contain the information. When other users share this connection, a decrease in the transmission speed in regular transactions results and this also congests the servers, resulting in another lag in service.

Figure 6.2 shows how companies, such as Telecom, provide Internet service to residential users. They usually provide these services through dialup connections or dedicated lines; but the speeds vary (64 Kbps, 128 Kbps, 512 Kbps, etc.). They also provide high speed Internet to companies that can afford it. An example of this service is Metro Ethernet, offered by Telecom, whose speeds can reach up to 100 Mbps.



Source: JICA Study Team

Figure 6.2 Internet Services

Both of the services (residential and business) are provided by the same ISP. The ISPs connect to an international NAP in order to reach information located in servers outside the country as well as servers located in El Salvador. This kind of configuration affects the speed of the connection.

According to Telecom, the situation described above should not be the cause of low speeds when accessing services inside the country because they have peer-to-peer connections between them and are the

most important ISPs in the country. Such peer-to-peer connections would solve the issue of national connections, but not international ones, which are the most common ones in El Salvador at present. Also, direct connections to other ISPs are usually used for e-mail exchange, not to access websites located in national servers.

The speeds offered by the ISPs are the ones offered in the last minute, but the whole network configuration affects the speeds in a negative way, by slowing them down or causing interruption.

Another important issue is that most of the information is requested to servers outside the country, mostly in the United States. The lines that connect the local networks to the U.S. do not have a high capacity. For example, the Telecom IP network link to the U.S. network is only 10 STM-1 (10 × 155 Mbps). Each telecommunication company has a different line for their network. Therefore, this is an important factor causing slow speeds in Internet connections because most of the Internet traffic requested by the users comes from outside the country.

(2) Problems in Governmental Policies for Communication Procurement

It is obvious that the high price of Internet service in El Salvador prevents the rapid growth of Internet usage that many advanced countries experienced. In the government procurement rules for Internet service, there is an unsuitable contract condition. The government establishes that the tender process must be done every single year in order to give an equal business opportunity to all private companies. This results in a higher communication price due to the higher business risk for private companies. If a long-term as well as a high volume contract is available, it can decrease communication cost by at least 20%.

(3) Internet Use in Ministries

As it happens to most governments in the world, each ministry has its own network for both data and voice communication. For data communication, when direct data exchange between two ministries is needed, the link is leased to a telephone company and paid by one of the ministries. This arrangement results in having many thin lines among ministries. From a procurement point of view, it is a waste because it excludes the chance for volume discount.

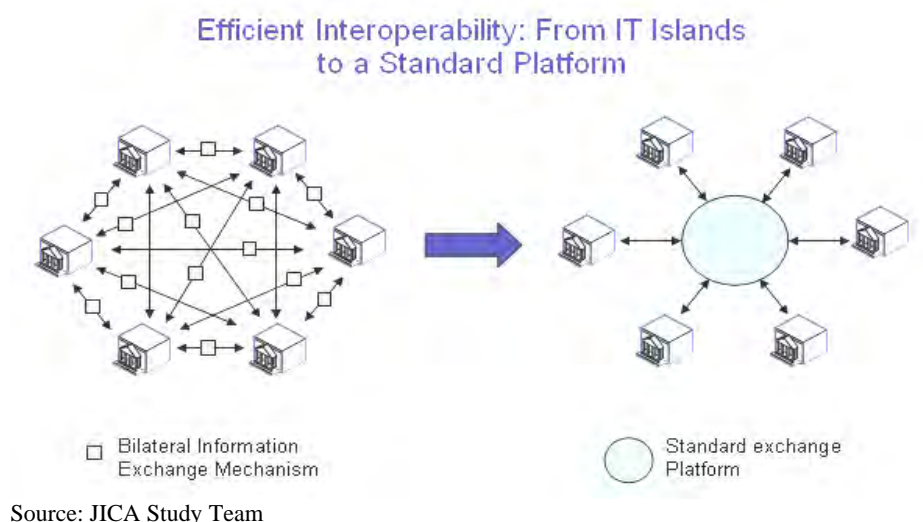


Figure 6.3 Efficient Interoperability

(4) Network Operations and Maintenance (O&M)

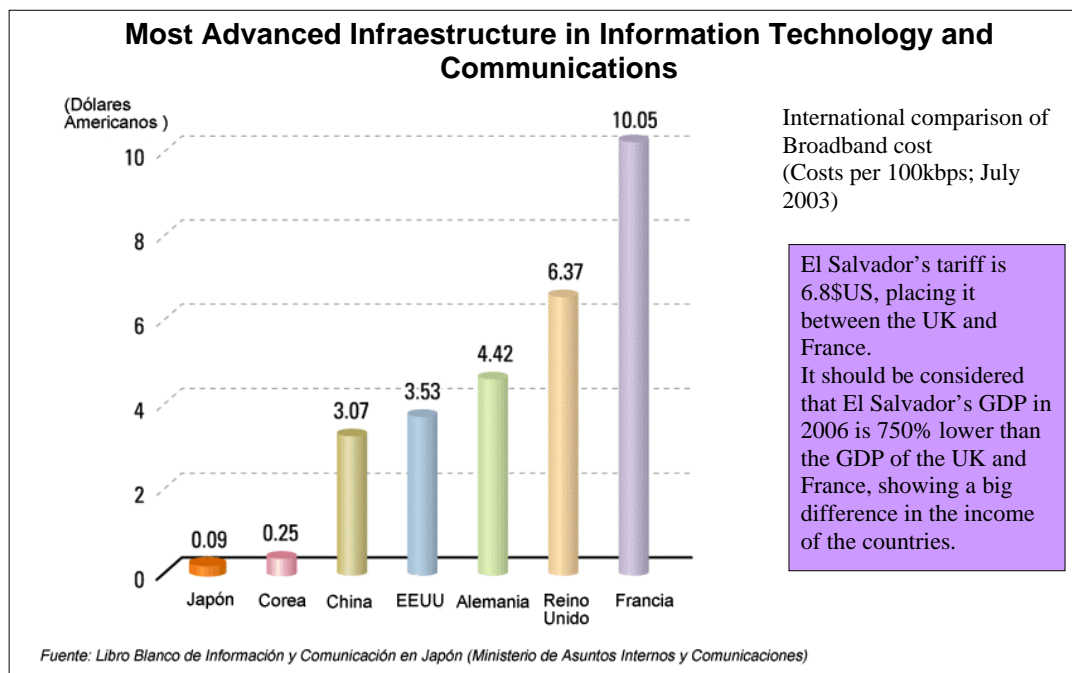
It seems there is no O&M work concept in the government. Reasons for this lack of recognition may include the following:

- No proprietary organization or team is assigned for O&M work;
- O&M work is required to provide service for 24 hours, 7 days a week;
- Programmers and systems analysts do operations and trouble-shooting by themselves; and
- System faults are reported mostly by users. (There is no critical business system)

(5) Conditions to be Considered

The following conditions and questions should be considered in designing the Government WAN.

- The scope of privatization should be clarified. The question of ownership of the networking equipment is an important issue.
- No O&M experience in the government.
- How to manage network infrastructure in order to provide good service to all citizens.
- Communication experts in the government should be developed.



Source: Ministry of Internal Affairs and Communications, Japan, White Book on Information and Communication

Figure 6.4 Communication Costs

6.2.2 Network Design Concept

(1) Design Concept

Network design aims for the following effects in general:

- Communication lines integration reduces communication costs dramatically;
- Expanding backbone bandwidth improves transaction handling speeds and business efficiency;
- Latest network O&M system introduction using latest technology and well designed O&M organizational roles improves service levels and minimizes downtime; and

- Not only transmission and its control functions (normal network functions) are supported, but the new network also includes network application functions, such as e-mail, web security controls, and file controls within a common platform.

The most important purpose of the Gov-WAN would be the integration of all ministries' networks into one. This design approach is considered to be a rare case in the world since ministries tend not to help each other in most of the countries due to bureaucratic rivalry and the inertia of their vast organization. Thorough integration, therefore, has been successful in smaller countries such as Singapore and Estonia, where e-Government has significantly enhanced their standing in terms of international competitiveness.

In order to integrate all ministries' networks by the use of a Government WAN, three design goals need to be fulfilled.

- Provide easy and secure access to a variety of e-Government services offered to citizens.
- Stimulate the expansion of the Internet population and the Internet industry in El Salvador.
- Achieve a 30% - 50% reduction in the Government's communication expenses.

A well conceived network design concept is crucial in the Government WAN implementation. This is due to the fact that the infrastructure is expected to function for an extended period of time, and also because Government applications and the applications used by the citizens depend on the quality of the network services.

The following effects are expected from the Gov-WAN:

Sharing Information: Integration of all ministries makes it possible to share all ministries information between each other (through application programs), so that it will accomplish the provision of better national services (e-Gov service) to citizens.

Exchanging information: Exchanging data among municipality offices and government ministries improves fast and secure national data updates and references.

Sharing network resources: Sharing network application resources, such as a web server, file exchange and transfer utilities, security functions, will offer a better Internet application development environment to ministries that lack sufficient ICT resources.

The design of e-Gov-WAN should be based on the design targets described above. In El Salvador, all telecommunication businesses were privatized in 1996, and the government has refrained from government intervention (not defined in communication law though). Since then, no telecommunications technocrat is needed in the government organizations. Network function has been assumed as a small part of the ICT system in the government. Large vendors such as Cisco and IBM do all network design work. Therefore, the government has no appropriate staff to design a large-scale data and voice network.

(2) Government WAN Connectivity

The following design specifications should be implemented according to the design concept.

- Performance - Gbps class backbone network bandwidth.
- Reliability - No single failure of equipment has consequences over the entire network service.
- O&M:
 - Fault detection and control;
 - Capacity control and planning;
 - Fault operation and recovery;
 - Configuration change;

- Statistical data collection and analysis;
- Enhance planning; and
- Call Center operation.
- Security Control:
 - Preventing internal data flow out;
 - Preventing attack by hackers;
 - Preventing computer virus; and
 - Preventing spam e-mail circulation.

(3) Local Connectivity

There are two types of local connectivity.

- Municipal office or a local office of the Central Government.
- School connectivity:
 - VPN service should be used in order to provide secure data communication. More network applications will be added;
 - School connectivity will be a brand new service, which will be provided to schools in rural areas where no ISP dares to invest Internet facilities. The following design concepts are considered at this stage;
 - Internet facility is shared by nearby public offices, such as police stations, health offices, hospitals, etc. Nearby residents can share the service as well;
 - Inexpensive equipment and facilities should be used at minimum to medium bandwidth;
 - Wireless LAN or Power Line Communication (PLC) is preferable;
 - World standard technology should be selected to minimize PC card cost;
 - More than 1,000 schools will be equipped; and
 - Private companies will basically operate this service, while the government will do investment.

(4) PAT (Public Access Terminal) Accommodation

PAT accommodation can be similar to the Infocentro business arrangement. PCs equipped with ID card readers and finger print readers will be installed in certain public facilities, such as municipal offices or schools. Citizens will visit and use PAT to access to birth certificate printout application or some other *e-Gov* services.

(5) O&M Scheme

O&M efforts are a vital part of the project and should be well organized in accordance with the expansion of *e-Government* and with the growth of the Internet population. It is also necessary to establish a good planning scheme to guarantee endurance throughout the years.

An efficient O&M organization within the Government WAN project will help avoid the following problems.

- Slow Internet, which would cause an inefficient service provision.
- Broadcast storms, which would cause a failure of service continuation in the network.
- Internet crime, resulting in economic loss and loss of the citizens' confidence in the *e-Government* platform and in the Government itself.

To guarantee the success and efficiency in terms of O&M, efforts in planning and analysis should have the following characteristics:

- Maintenance by networking professionals;
- Independent of private Internet service providers; and
- Capabilities for network management.

Organizing network professionals is very important in order to achieve the Government WAN goals. Network technicians, network analysts and network planning staff will be required to run the O&M scheme.

(6) Conditions to be Considered:

- Ownership of Gov-WAN equipment and facilities as well as school connectivity facility;
- Slow procedures may cause a severe failure of *e-Gov* service as the environment changes;
- It is recommended that a one-year contract should be changed to a longer term. According to people in the Telecom sales department, a three-year contract will decrease annual price at least 10%; and
- The Procurement system is known to take a long time to be implemented.

6.2.3 Network Design Outline

(1) Technology for Governmental Institutions Connectivity

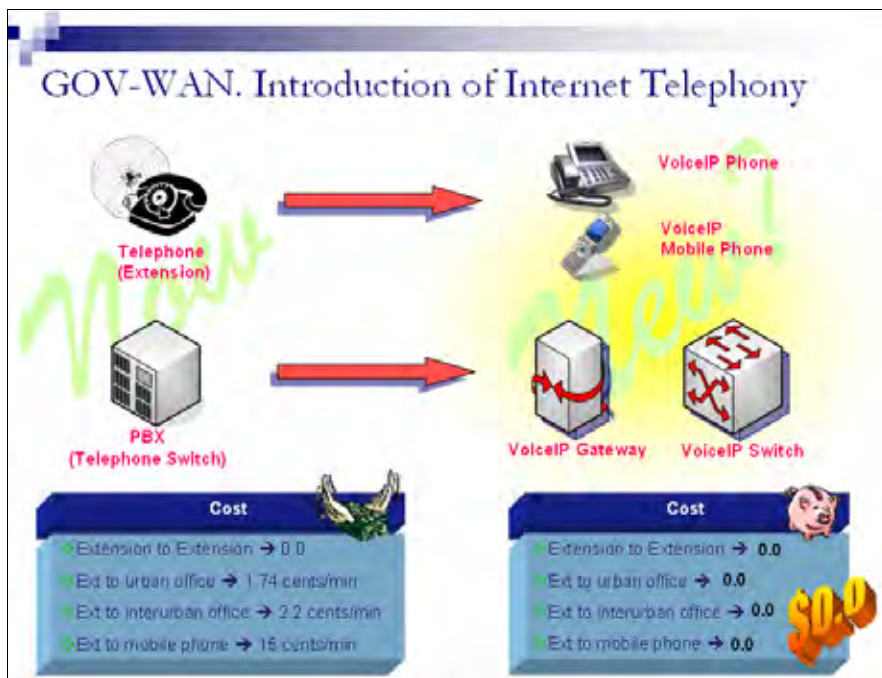
- Performance
 - Gbps class bandwidth capacity is required as a backbone in order to accommodate several hundreds of thousand citizens' *e-Gov* service access.
 - In addition to the above, the following data traffic is transmitted along the backbone. The total amount of traffic volume can be assumed to be larger and more accurate since voice communication data is included.
 - Inter-ministerial data communication / Inter-ministerial voice communication (VOIP)/ ministries' – local office data/voice communication.
 - Load balancing mechanisms should be included to control the anticipated large volume access to Portal Web.
 - The required routers, switches, and intelligence hubs should be installed.
- Reliability
 - At least two Gbps class trunk lines should be connected to different ISPs in order to share the traffic load and to provide mutual back-ups.
 - Major equipment is also duplicated (load sharing) to avoid a complete failure of network services by single equipment fault.
- O&M
 - O&M work is considered to be divided into two categories, i.e.
 - Monitoring the network 24 hours per day / 7 days and weekend fault operation & recovery
 - Analysis / enhancement planning
 - The first work category should be outsourced to a private company
 - New government department staff should do the second work category.
- Network functions
 - Described in (4) as Gov-WAN. Required number of servers shall be installed.
- Securities
 - Required software and firewall shall be installed.

(2) Technology for Local Connectivity

- Wi-Fi (IEEE 802.11) is the current standard wireless LAN solution. Bandwidth is only up to 2.4Mbps, enough for rural application, but short range.
- Wi-MAX is a brand new technology, offering fast and long-range services. However a complete product needs 2-3 more years to be available on the market.

(3) IP Telephony Introduction

Voice IP technology is now a common technology available in the market. Up to 80% of telephone cost reduction has been reported in other countries. The decrease in costs varies depending upon number of outgoing calls. Since changing all telephone equipment is a big project, a phased approach should be taken.



Source: JICA Study Team

Figure 6.5 Internet Telephony

(4) Network Functions

It is recommended that LINUX should be used as a standard Operating System for servers instead of Windows because the second one would cost far more than the first, especially since licenses of the product need to be purchased at a high price. A sufficient training of O&M personnel in LINUX should be done at the outset.

The Gov-WAN's main objective is to provide fast and reliable connectivity among ministries and local offices. But in order to accomplish this and go even further to provide services to different users, the network should have a set of functions.

1) E-Mail System

In order to increase the use and productivity of the Electronic Mail System (e-mail) as a communication channel between different government agencies and between government agencies and their citizens, the Gov-WAN will provide the following services.

Naming Conventions for e-mail Addresses

E-mail 'address' should be considered as distinct from an e-mail 'account' (or inbox). E-mail sent to an address is delivered to an account. An account may have one or more addresses (often called "aliases"). An account may also forward e-mail to another address (often called a 'forward' or 'redirect').

Government employees can have a single e-mail account, but two different e-mail addresses:

- Personal address, which would be used to assign an individual's name to an account;
- Positional address, which would be used to assign an individual's position (e.g. Minister of Finance or IT Director of the Ministry of Health) to an account; and

- Some other options can be considered, however, multiplicity of e-mail addresses can generate an unnecessary extra workload. For senior government officials, one personal account is necessary as well as a second, which is scanned by their assistants and secretaries.

Standardized naming convention should be applied to both types of addresses. Those standards may define aspects such as:

- Maximum number of characters before the @;
- Format of the institution names after the @;
- Names to use;
- Valid characters;
- Special names' cases;
- Abbreviations for the different institutions and positions; and
- Others.

Additional points to be considered are procedures to follow in the event of crashes and requests for e-mail address change.

If all these measures were to be applied, communication between the Government officials would be more efficient. It would also provide an easy way for citizens to contact the Government officials and the different departments of institutions. And if standards are used, the process of naming e-mail addresses could be done automatically.

Yellow Pages

The Yellow Pages refers to a telephone directory for businesses, organized by the category of product or service. With the arrival of the Internet, the term "Yellow Pages" became applied to online directories of businesses. In this case, the term is applied to an online directory of Governmental e-mail addresses.

All Government employees' e-mail addresses would be stored in a database, which would make the information easily available for all of them by the implementation of an online directory.

Virus Detection

The advent of the Internet and electronic mail technology brought a new type of crime to the world. An e-mail virus is defined as computer code sent to a person in the form of an e-mail attachment, which, if activated, will cause some unexpected and usually harmful effect, such as destroying certain files on the hard disk and causing the attachment to be forwarded to everyone in the address book.

It is obvious that this kind of attack could bring several bad consequences for a Government agency, such as monetary loss and waste of time. With the implementation of the Gov-WAN, more measures against viruses should be considered, because if all institutions are connected, one single attack could spread easily throughout the network.

In order to prevent these kinds of attacks, a good virus detection system should be installed, with constant updates and monitoring procedures.

Spam e-mail

Spamming is the abuse of electronic messaging systems to send unsolicited, bulk messages. If the e-Gov-WAN is saturated with Spam e-mail, it could cause problems, such as the slowdown of the network and saturated storage capacity. Additionally, it could affect government institutions and employees by causing productivity loss and even fraud.

To prevent this from happening, a good Anti-Spamming system must be implemented, using an efficient filtering package and applying security policies that would block unwanted e-mail messages.

It is also important to develop users' guides, to educate the government employees in the use of e-mail, in order to prevent Spam and viruses.

2) Network Security (PKI/Encryption)

If a large amount of information is going to be exchanged between ministries and if the citizens are going to be able to perform transactions from remote terminals, the security of the network is a vital issue in order to provide good service.

If the system doesn't provide a secure environment for its clients and their operations, it would be ineffective because people will not use it, resulting in severe consequences, such as the waste of money and lack of trust in the Government.

PKI (Public Key Infrastructure)

Public Key Infrastructure (PKI) is an arrangement that provides for trusted third party vetting of, and vouching for, user identities. It also allows binding of public keys to users. This is usually carried out by software at a central location together with other coordinated software at distributed locations. To provide public keys, a certification authority is needed.

The PKI must be developed in El Salvador, so citizens can perform online government transactions, guaranteeing to eliminate the threat of fraud and improving the provision of services to the population.

Encryption

This technique is required for information exchange among government agencies and also to transfer confidential information via citizens' transactions.

Encryption uses the cipher of messages, to ensure that only the person that is intended to read the message can decipher it using a secret key (PKI). This ensures security, by preventing information to fall into the wrong hands, even if intruders manage to intercept the transmitted packages.

3) Web Services

Web Portal

The Gov-WAN will provide access to government services through a single web portal for all government agencies. This portal must provide easy navigation for citizens, so they can find the information and the services they are looking for quickly and efficiently.

It is also important to provide guidelines and templates to build the governments' websites, so there is a common form throughout the whole portal, making it easy to navigate. This would also make the website design easier for people without specialized technical skills.

Web Hosting

The Gov-WAN will provide website hosting to all government institutions, including municipalities, lifting the cost from their budget. This would guarantee the provision of useful information for all citizens that live in anywhere in the country.

4) Search Function

Since all the ministries are going to share a single entrance for the citizens to access their information and services, the installation of a search engine is a vital part of the Gov-WAN.

The Gov-Search Engine would find information located inside the Gov-WAN, so citizens can find the information that they are looking for easily and efficiently. The Search Engine has to be capable of finding information in a large database in a precise manner, without providing meaningless and useless results to citizens.

The Gov-Search Engines would have to be updated regularly and automatically, to make sure that users can find new information that is being added on a daily basis.

5) File Transfer

To provide the file transfer function, the new network will use FTP (File Transfer Protocol). This is a common function that many ministries already have.

FTP is a commonly used protocol for exchanging files over any network that supports the TCP/IP protocol (such as the Internet or an intranet). This protocol involves two components, a client and a server, connected to each other. The client usually makes requests to the server in order to upload, download, rename, or delete files. The new network would provide connectivity between both parts (client and server), making file transfer fast and reliable.

6) File Exchange

Exchanging files in a secure way using the new network would increase the productivity of the government operations and services.

The file exchange function requires high security, such as encryption and PKI, because the information that is going to be handled by the network is critical and must remain confidential.

7) DNS (Domain Name System)

The Domain Name System function that the new network would provide will relate IP addresses to names, in order to easily identify and access the network; providing a better address organization and creation of hierarchy in the address assignment.

The DNS is related to Access Control, because the Active Directory can be supported by DNS.

8) Access Control (Active Directory)

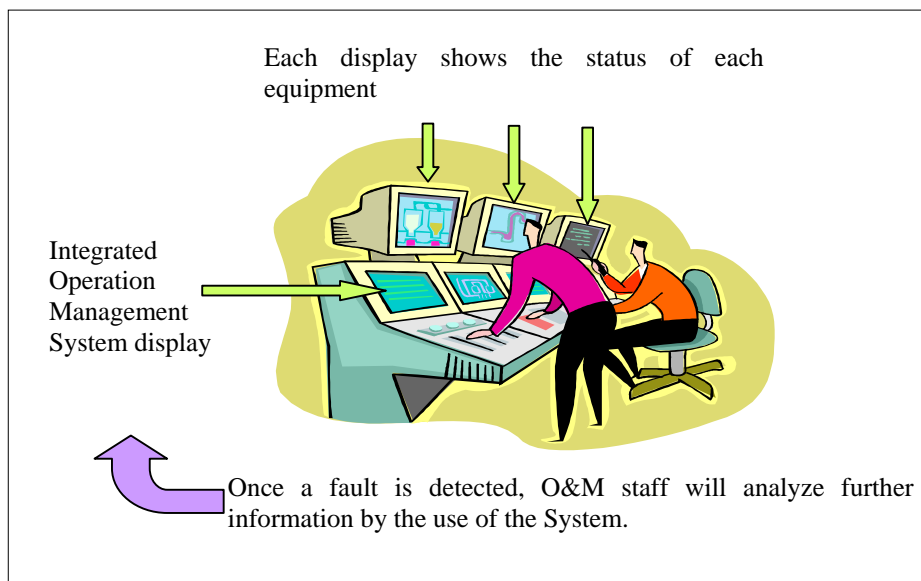
Access control can be used to manage user access to shared resources in the Gov-WAN for security purposes. In the Active Directory, access control is administered by setting different levels of access, or permissions, such as Full Control, Write, Read, or No Access. User authentication is required in order to use the different resources that the network provides.

This kind of security control guarantees that critical governmental information handled by the Gov-WAN is kept inside the government and prevents it from ending up in the wrong hands. It also ensures that intruders do not occupy shared resources, even from inside the government by establishing hierarchy levels in the different institutions and in the government in general.

(5) O&M System

The NOC (Network Operation Center) will have specialized equipment, software and O&M staff to make sure that the new network functions properly.

The O&M system has the purpose of providing information about the status of telecommunication lines, equipment and servers of the Government WAN.



Source: JICA Study Team

Figure 6.6 Operations and Maintenance

The Integrated O&M System includes the following functions.

Job Scheduling

This part of the software is responsible for managing automated items such as tasks and processes. Time requests are handled to maintain the ordering of different tasks and to keep the network running properly and up to date.

Service Level Management

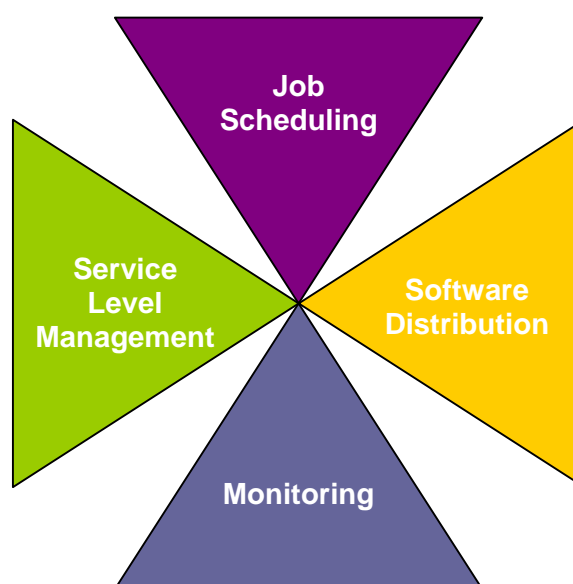
This stores and displays chronographically collected data, showing the status and trends of the network's performance at all times. This information is required for analyzing the network in order to know when it is time to make changes and continual enhancements in the infrastructure as time goes by.

Software Distribution

This component distributes the different applications that the network needs in order to maintain a high level of performance.

Monitoring

This involves agent software installed in each server in order to constantly monitoring the network's status. If a problem is detected, a signal is displayed (in form of audible signals, lights, change of color), along with a message describing the problem in an understandable way.



Source: JICA Study Team

Figure 6.7 Operation Functions

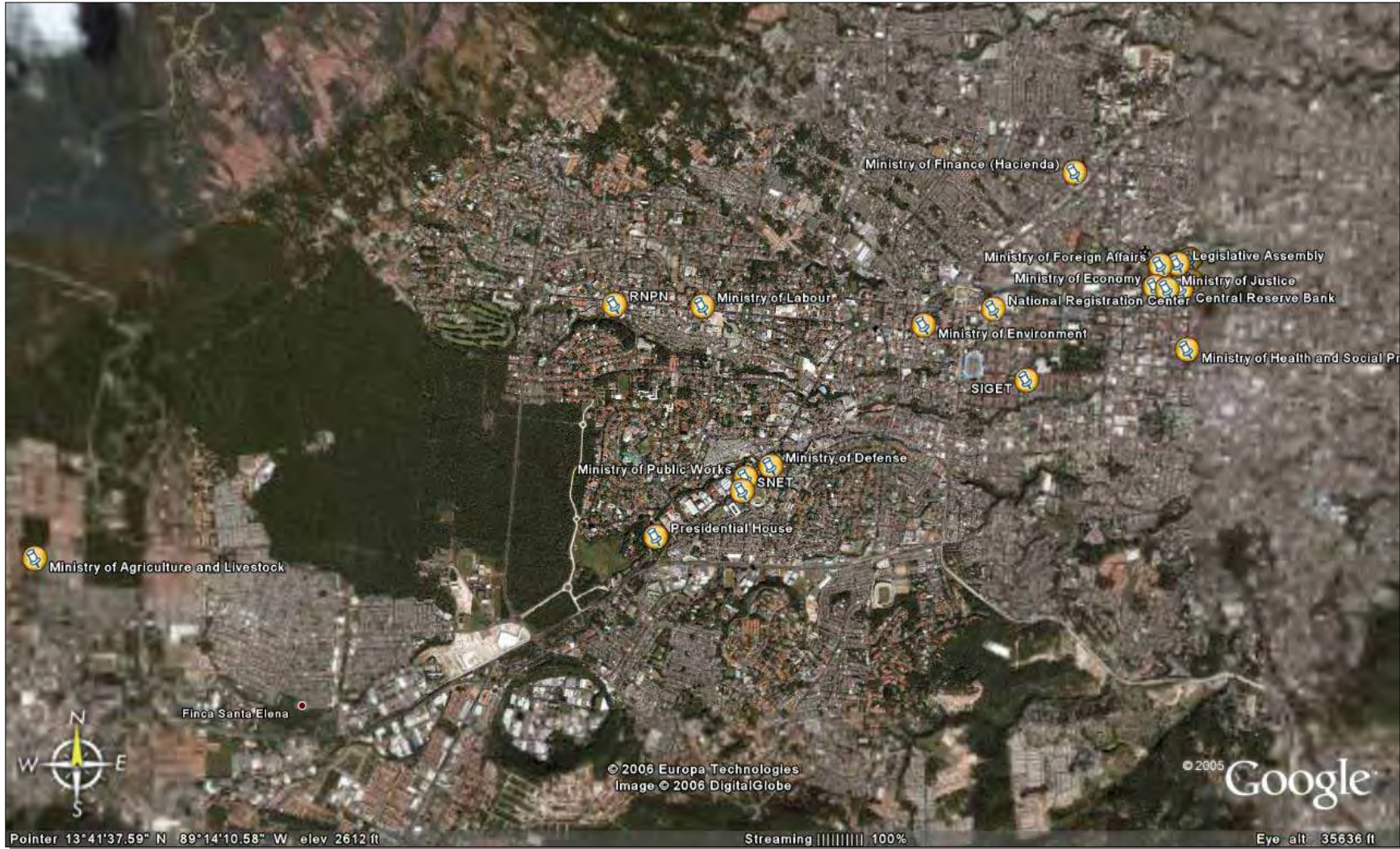
(6) Installation Environment

**Table 6.3 Gov-WAN
Shortest Distance Between the Different Salvadoran Government Agencies
and the Centro de Gobierno**

Government Agency	Distance (Km)
Ministry of Justice	0.10
Ministry of Economy	0.19
Ministry of Education	0.14
Legislative Assembly	0.14
Ministry of Internal Affairs	0.12
Central Reserve Bank	0.08
Supreme Court of Justice	0.21
SIGET	1.52
Ministry of Agriculture and Livestock	9.76
Ministry of Environment and Natural Resources	2.17
Ministry of Finance	1.24
Ministry of Foreign Affairs	0.14
Ministry of Labor	4.00
Ministry of National Defense	3.76
Ministry of Public Health and Social Assistance	0.52
Ministry of Public Works	4.00
National Registration Center	1.57
SNET	3.91
RNPN	4.70
Presidential House	5.00

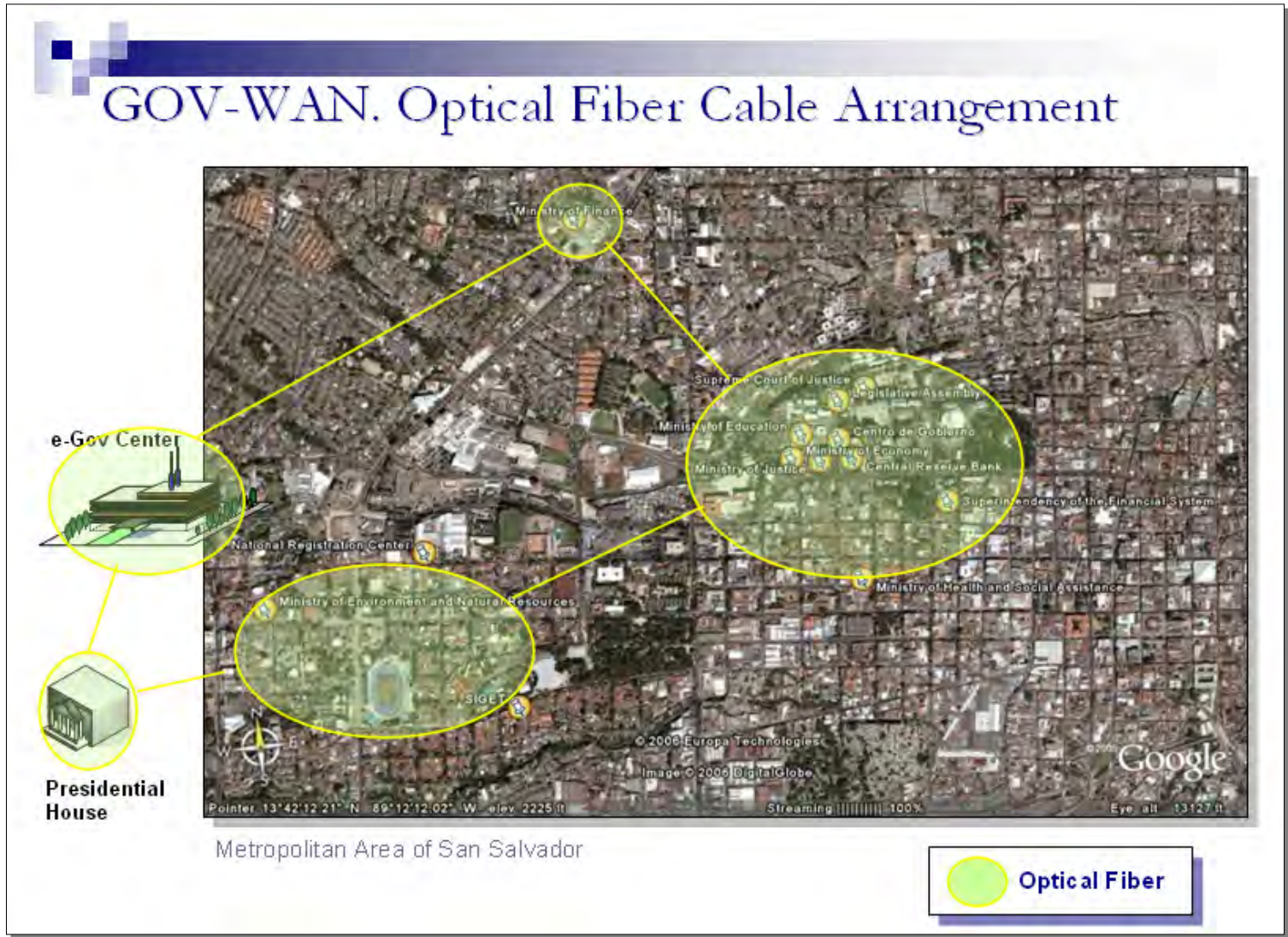
Note: Information obtained by using Google Earth.

Source: JICA Study Team



Source: JICA Study Team

Figure 6.8 Subject Area



Source: JICA Study Team

Figure 6.9 Optical Fiber Cable Arrangement

6.2.4 O&M Management Scheme (NOC Operation)

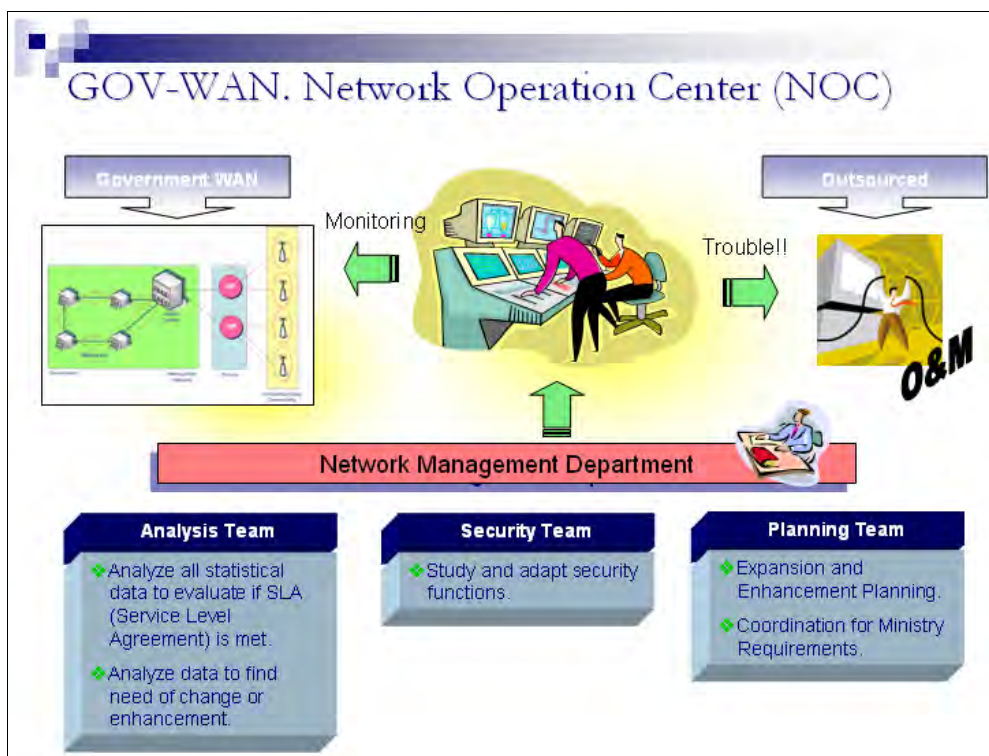
(1) Management Items

The new network will require the outsourcing of O&M to a private company. In order to ensure the quality of the service, SLAs (Service Level Agreements) must be established between both parties. SLAs are contracts between service providers and customers that define the services provided, the metrics associated with these services, acceptable and unacceptable service levels, liabilities on the part of the service provider and the customer, and actions to be taken in specific circumstances. Service-level management is the set of people and systems that allow the organization to ensure that SLAs are being met and that the necessary resources are being provided efficiently. All of these components are to be under the NOC of the Government WAN.

(2) Organization and Work Procedure

In order for the NOC to fulfill its purposes, specialized staff must be hired. There should be a Network Management Department with capable engineers that handle issues in the areas of planning, analysis and network security. A large number of personnel are not necessary as long as they have enough knowledge and training in the areas that they oversee.

The following figure shows the organization and work procedure of the NOC.

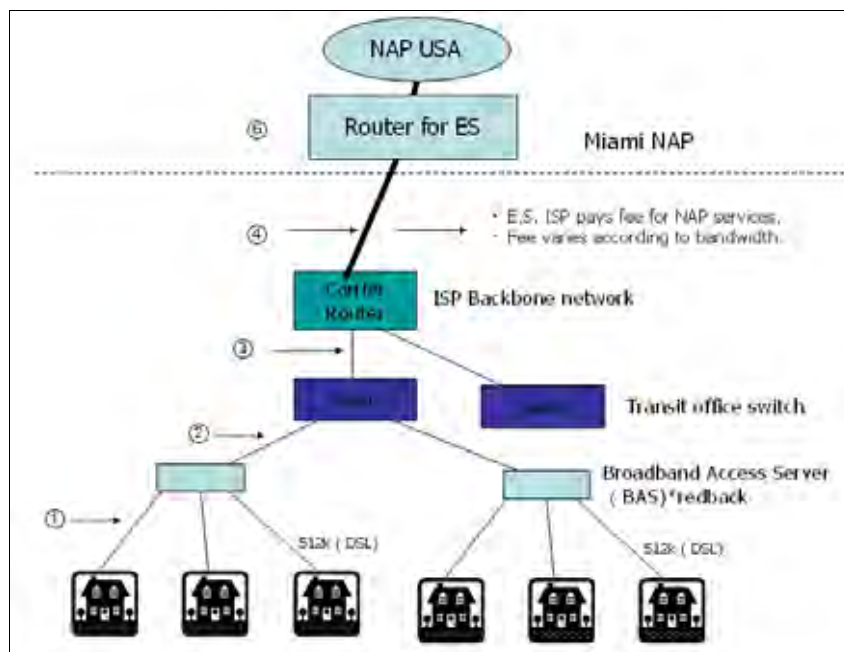


Source: JICA Study Team

Figure 6.10 Operation Center

(3) Internet Service Monitoring

The following image and associated descriptions show the possible causes of a slowdown in Internet service. The description describes the way of analyzing the data collected by the monitoring system in the NOC.



Source: JICA Study Team

Figure 6.11 Causes of Slowdown

- ① DSL transmission quality may be poor due to analogue line (telephone line) quality, old copper lines or longer-than-average distances from a Telephone Office.
 - Analyze BAS statistical monitoring data to find the average transmission quality.
- ② Transmission bandwidth may be insufficient for the expected traffic volume (during the busiest time).
 - Digital trunk line bandwidth between the BAS office and the Transit office is determined according to the busiest time efficiency of aggregated BAS traffic. If it is busy, traffic congestion occurs, resulting in the slowdown of Internet responses.
 - Analyze BAS and Transit Switch statistical monitoring data to find out where congestion is occurring.
- ③ Similarly, transmission bandwidth between Transit office and Highest-level office may not be enough.
 - Same analysis method as ②.
- ④ Transmission bandwidth to U.S. NAP is insufficient.
 - Analyze highest-level route statistical monitoring data. A MRTG (Multi Router Traffic Grapher) is a common tool among ISPs for analyzing timeline traffic graphs.
- ⑤ Not enough performance at U.S. NAP
 - If ① - ④ are OK, U.S. NAP performance may not be adequate.
 - U.S. NAP provides Gbps class router to accept higher bandwidth requirement.
 - It may be common that the lower ISP pays less due to expensive bandwidth fee.

6.2.5 Proposals for Changes in Government Communication Rules

In 1996, telecommunications services in El Salvador were privatized. This measure was supposed to encourage competition in order to expand and innovate the market and provide better services to the citizens.

The policy followed by the government was one of complete liberalization. The successful transformation from a monopolized market to a competitive one requires regulatory intervention; this was applied in El Salvador. The Telecommunications Law contemplates some aspects of basic services to citizens. It gives regulatory power to SIGET, but in a very limited manner. Since those days, the telecommunications sector has experienced several changes. Technology is advancing, data traffic is

overtaking voice traffic in many countries, mobile phone use is growing rapidly and the Internet is making the world smaller.

Regulatory intervention is required for various reasons and it is needed in El Salvador. Three major companies control the sector in an inefficient way causing the market to go from a monopoly to an oligopoly, where competition is not always beneficial and the customer is not usually the main concern.

1) Role of the Regulatory Organization

The role of a regulatory telecommunications organization in El Salvador would be to maintain a regulatory environment that would contribute to the efficient supply of telecommunications services to the public, and among its objectives being to:

- Promote universal access to telecommunications services;
- Promote and control competitive markets in order to achieve the efficient supply of quality telecommunications services, advanced services and efficient prices;
- Prevent abuses of market power by dominant firms;
- Ensure transparency in the regulation process and in the telecommunications service;
- Protect consumer rights;
- Promote increased telecommunications connectivity for all users through efficient interconnection arrangements; and
- Optimize use of scarce resources, such as radio spectrum, numbers and rights of way.

2) Regulations

The telecommunications regulations in El Salvador must be updated. A regulatory organization should be in charge of that task by proposing and implementing new policies in the telecommunications arena. The policies must be flexible and able to evolve because the telecommunications market is one that moves quickly and changes at the same pace as technology does.

The areas that should be regulated are:

- Licensing and permission;
- Interconnection;
- Competition policy;
- Universal service; and
- Consumer protection.

3) General Considerations

- Facility sharing can be of benefit to town planning, public health and environmental reasons, and should be encouraged by regulatory authorities on the basis of voluntary agreements. In cases where undertakings are deprived of access to viable alternatives, compulsory facilities or property sharing may be appropriate.
- Information exchange between the regulator and the telecommunications providers should be ensured, in order to guarantee efficient supply, quality of service and good prices for the users. It would also help to promote innovation and good service management.
- To ensure good integration between technologies owned by different companies, government authorization should be required to make changes or modifications in their infrastructure.
- Promote investment in rural areas.

4) Organization

The organization in charge of regulating telecommunications is SIGET, but their reach over the telecommunications industry is limited at the moment. SIGET is a multi-sector regulator, because it is in charge of a variety of services. The areas regulated by SIGET are fixed telephony, mobile telephony, radio electric phantom, radio, television and cable television. It is important to emphasize the fact that the Internet is not explicitly regulated by SIGET.

SIGET is an organization independent from the government, as well as from the telecommunications companies. It needs to be clarified that independence from the government does not mean independence from the laws and policies of the country. The Board of Directors is made up of the following representatives:

1. One Director, who acts as the Superintendent, designated by the President;
2. One Director elected by the private sector; and
3. One Director named by the Supreme Court of Justice.

There are two Substitute Directors for the private sector and the Supreme Court of Justice.

Every year, SIGET presents a report to Congress, where they detail the work they have done and the situation of the sector they regulate.

SIGET has the power to regulate telecommunications, but the Internet is out of their jurisdiction. It is important to change that fact since technology is advancing and with the e-Government platform the Internet population is expected to grow and become a service that all citizens would use.

SIGET is a good regulatory organization, but it needs to be regularly updated as telecommunication technology evolves. The Internet and IT should have their own place in the organization to guarantee regulation and reform in the new technologies, so citizens have access to them and are guaranteed of the quality of the service.

The following are definitions and principles on the regulatory framework for the basic telecommunications services as proposed by the World Trade Organization (WTO).

5) Definitions

Users mean service consumers and service suppliers.

Essential facilities mean facilities of a public telecommunications transport networks or services that:

- Are exclusively or predominantly provided by a single or limited number of suppliers; and
- Cannot feasibly be economically or technically substituted in order to provide a service.

A major supplier is a supplier that has the ability to materially affect the terms of participation (having regard to price and supply) in the relevant market for basic telecommunications services as a result of:

- Control over essential facilities; or
- Use of its position in the market.

Competitive safeguards

(a) Prevention of anti-competitive practices in telecommunications

Appropriate measures shall be maintained for the purpose of preventing suppliers who, alone or together, are a major supplier from engaging in or continuing anti-competitive practices.

(b) Safeguards

The anti-competitive practices referred to above shall include in particular:

- Engaging in anti-competitive cross-subsidization;
- Using information obtained from competitors with anti-competitive results; and
- Not making available to other services suppliers on timely basis technical information about essential facilities and commercially relevant information, which are necessary for them to provide services.

Interconnection

(a) This applies to linking with suppliers providing public telecommunications transport networks or services in order to allow the users of one supplier to communicate with users of another supplier and to access services provided by another supplier, where specific commitments are undertaken.

(b) Interconnection to be ensured

Interconnection with a major supplier will be ensured at any technically feasible point in the network. Such interconnection is provided:

- Under non-discriminatory terms, conditions (including technical standards and specifications) and rates and of a quality no less favorable than that provided for its own like services or for like services of non-affiliated service suppliers or for its subsidiaries or other affiliates;
- In a timely fashion, on terms, conditions (including technical standards and specifications) and cost-oriented rates that are transparent, reasonable, having regard to economic feasibility, and sufficiently unbundled so that the supplier need not pay for network components or facilities that it does not require for the service to be provided; and
- Upon request, at points in addition to the network termination points offered to the majority of users, subject to charges that reflect the cost of construction of necessary additional facilities.

(c) Public availability of the procedures for interconnection negotiations

The procedures applicable for interconnection to a major supplier will be made publicly available.

(d) Transparency of interconnection arrangements

It is ensured that a major supplier will make publicly available either its interconnection agreements or a reference interconnection offer.

(e) Interconnection: dispute settlement

A service supplier requesting interconnection with a major supplier will have recourse, either:

- At any time; or
- After a reasonable period of time which has been made publicly known to an independent domestic body, which may be a regulatory body as referred to in paragraph 5 below, to resolve disputes regarding appropriate terms, conditions and rates for interconnection within a reasonable period of time, to the extent that these have not been established previously.

Universal service

Any member has the right to define the kind of universal service obligation it wishes to maintain. Such obligations will not be regarded as anti-competitive per se, provided they are administered in a transparent, non-discriminatory and competitively neutral manner and are not more burdensome than necessary for the kind of universal service defined by the member.

Public availability of licensing criteria

Where a license is required, the following will be made publicly available:

- All the licensing criteria and the period of time normally required to reach a decision concerning an application for a license; and
- The terms and conditions of individual licenses.

The reasons for the denial of a license will be made known to the applicant upon request.

Independent regulators

The regulatory body is separate from, and not accountable to, any supplier of basic telecommunications services. The decisions of and the procedures used by regulators shall be impartial with respect to all market participants.

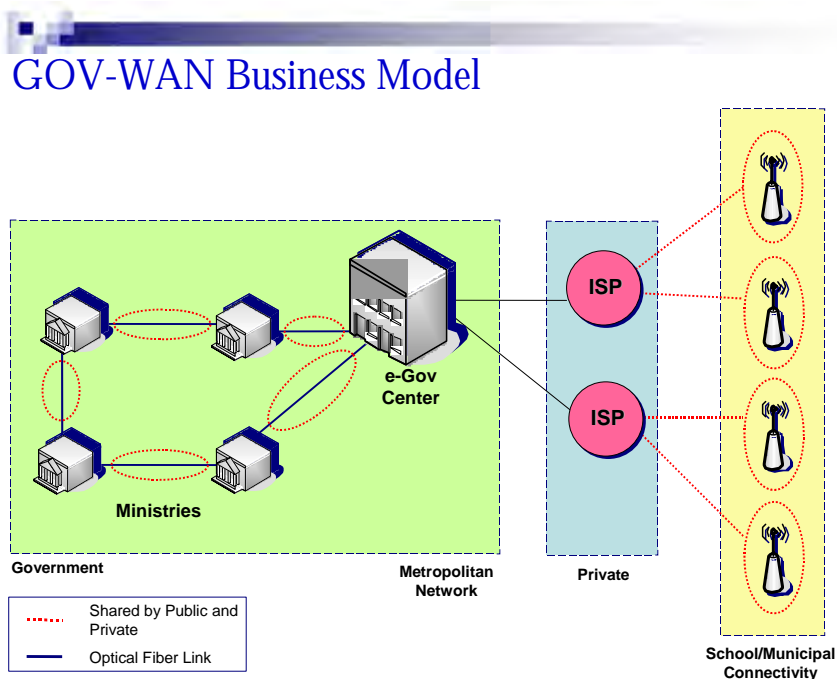
Allocation and use of scarce resources

Any procedures for the allocation and use of scarce resources, including frequencies, numbers and rights of way, will be carried out in an objective, timely, transparent and non-discriminatory manner. The current state of allocated frequency bands will be made publicly available, but detailed identification of frequencies allocated for specific government uses is not required.

6.2.6 Business Model and Benefits

Current telecommunication contracts for the government are limited to one-year tenders. This rule makes telecommunications companies raise their prices to cover the higher business risk.

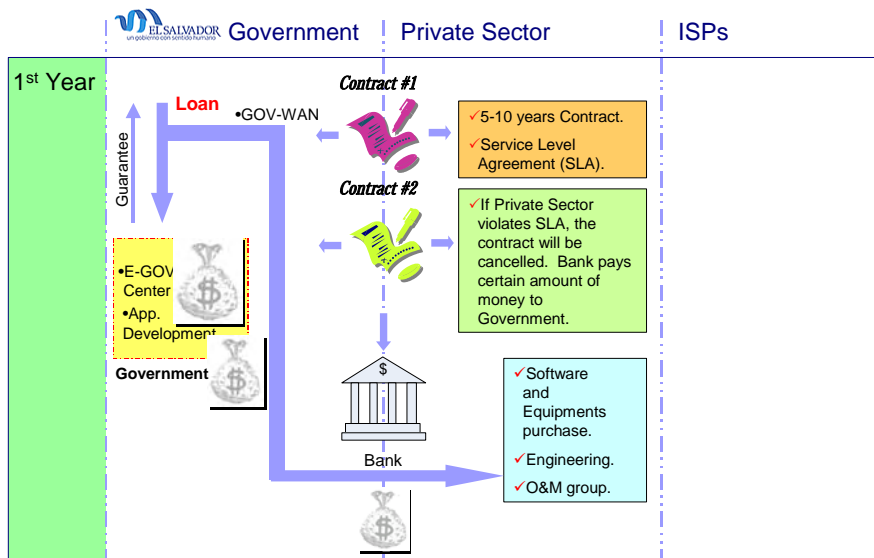
It is suggested that this one-year tender policy be changed to a longer-term contract in order to achieve better prices; leasing is one of the options to be considered.



Source: JICA Study Team

Figure 6.12 Gov. WAN Business Model

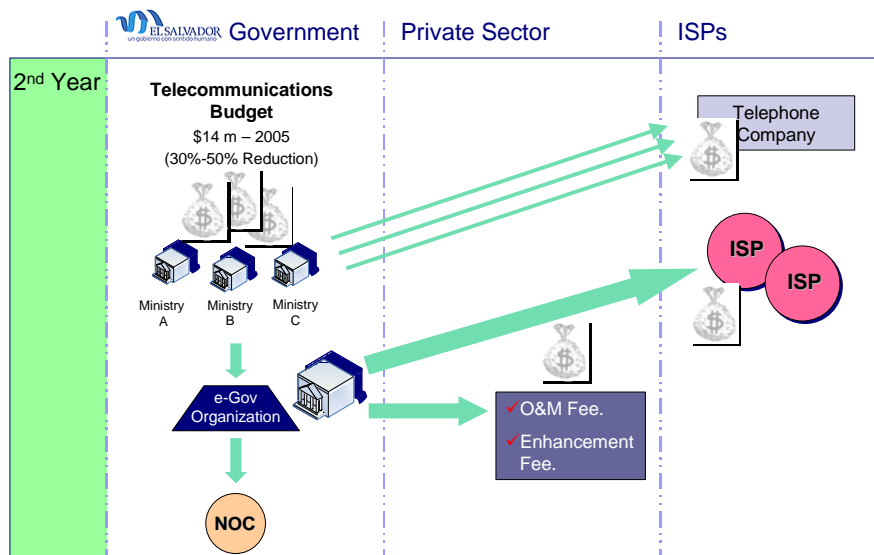
GOV WAN. Money Flow



Source: JICA Study Team

Figure 6.13 Money Flow

GOV WAN. Money Flow



Source: JICA Study Team

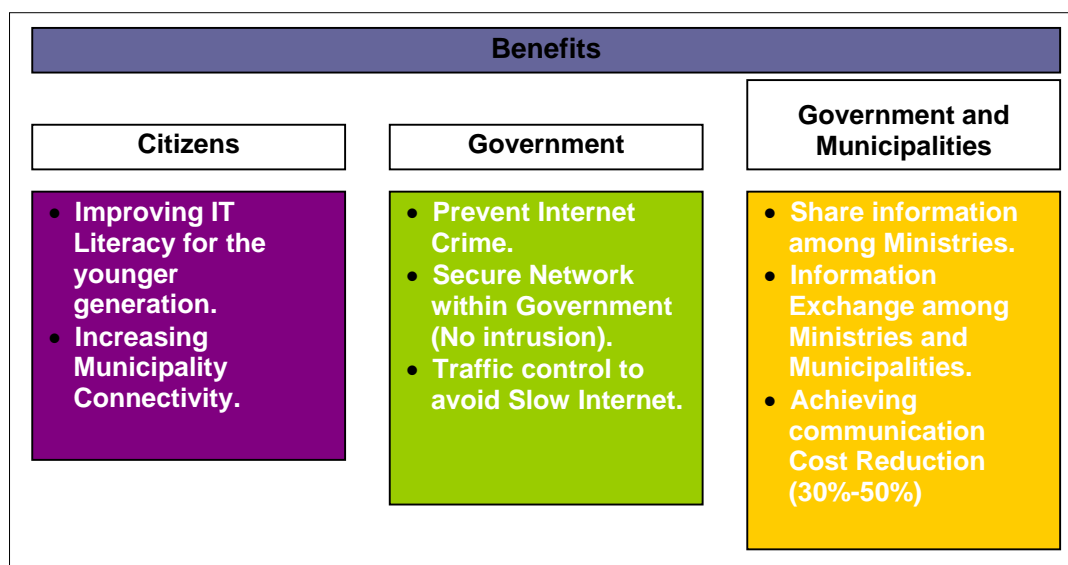
Figure 6.14 Payment Option

Business Implementation Scheme

It is likely that the majority of the Project would be put to tender for implementation by the private sector. The Government would issue Request for Proposals (RFPs) to selected potential bidders for them to

prepare and submit their proposals. Such RFPs should contain the following specifications and business conditions.

- Network design specifications.
- Location and fiber cable installation specification.
- Location and wireless infrastructure installation specification, in the case of school connectivity.
- Network center specification.
- NOC specification.
- O&M specification and organization.
- Business Scheme:
 - SLA (Service Level Agreement) specifications;
 - Required software and hardware will be purchased by the government, according to the design;
 - Private sector will be in charge of the installation and testing;
 - O&M operation will be outsourced to the private sector;
 - The government will pay a design/installation/test fee;
 - The government will pay O&M plus an enhancement fee every year;
 - The government and the private sector will establish a long term service contract for 5-7 years (System lifetime); and
 - The contract will include the following items:
 - If the private sector violates the SLA, a penalty fee will be charged to the private sector.
 - When the lifetime of the networking equipment is close to the end, the private sector will replace this equipment with state of the art technology.



Source: JICA Study Team

Figure 6.15 Benefits

6.2.7 Comparison of Technical Options

(1) Backbone Network

- Fiber vs. Wireless (as the backbone)
 - Fiber cable is the most reliable; it has a long life (20 years and up) and vast bandwidth data transmission line.
 - When a new transmission technology is developed the same cable could be used. It would just be necessary to replace the transmission equipment.
 - Microwave communication is an old technology. It is slow and doesn't have enough bandwidth.
- Fiber cable installed on poles vs. fiber cable installed underground
 - Fiber cables installed underground is the safest option against any kind of accidents.

(2) Local Connectivity

- Wireless LAN standard option
 - Wi-Fi technology (802.11) is IEEE standard technology and currently it is widely used.
 - Wi-Fi provides relatively slow transmission, making it not suitable for broadband.
 - Wi-Fi's latest product provides up to 2.4Mbps. However, it is still not fast enough.
 - Wi-Max is the next generation of the broadband wireless LAN standard.
 - It may be too early to determine the employment of Wi-Max technology.

(3) Network Functions

There are many network functions described in this report. It is recommended that most of these functions should be installed in order to improve standard IT environment in all ministries.

6.3 e-Government Center

6.3.1 Issues

(1) Vulnerability to Earthquakes

The plate-tectonics in Central America can be described as being situated between the Caribbean Plate and the Cocos Plate, the latter pushing itself under the former in the southwestern direction. Because of this unstable condition, there have been many extremely violent earthquakes in El Salvador as shown in the attached CGI material. The earthquakes of 1650 and 1917 accompanied the eruption of Mount Boquerón situated northwest of San Salvador. The earthquake of 1986 with a magnitude of 5.4 caused 1,500 casualties, 10,000 injuries, and 60,000 damaged houses, with an estimated loss of US\$1,352 million. The earthquakes of January 13, 2001 with Magnitude 7.6 and of February 13, 2001 with a magnitude 6.5 caused 944 and 1,352 casualties respectively, 252,600 injuries, and an estimated loss of US\$1,600 million. These earthquakes had their epicenters 30-60 km underground and had strength of a little less than 5.0 to a little more than 5.0 on the scale of Japan's Meteorological Bureau. The most severe earthquake on record in Central America is the Guatemala Earthquake of February 4, 1976, which caused 22,700 casualties, 76,000 injuries, and 254,750 damaged houses. It should also be noted that the earthquake of April 16, 1854 devastated San Salvador, leaving the city in ruins, and forcing the capital to move to Santa Tecla.

Perhaps the most serious problem associated with government IT systems at present is the fact that almost no agency maintains a system back-up in an environment safe against an earthquake. Once a severe earthquake hits San Salvador, an event likely in the future, virtually all computer systems of the government with their vast databases would be lost. It would take tremendous effort to put them back in place, costing millions of dollars and cause disruption of government services for an extended period.

(2) Inadequate Server Environment

Servers and other computer-related equipment in each ministry are invariably placed in inadequate conditions as shown in Table 6.4. Data Housing and Security are key aspects of the platform and should be considered top priority not only related with servers environment but also in terms of the building and infrastructure. This point is covered in each related topic. Also room spaces diverge but in some of them servers are piled up or not provided with proper interval space between them.

Table 6.4 Server Room Spaces

Organization	Housing Services	Needs
Ministry of Foreign Affairs	Servers in a Data Center located in Washington DC (COGENT).	-
Ministry of Internal Affairs	The space they have at the moment is limited and there is no external housing service.	Uninterrupted services in a different location
Municipality of Santa Tecla	The space they have at the moment is limited and there is no external housing service.	More space
Ministry of Economy	The space they have at the moment is limited and there is no external housing service.	More space
Ministry of Agriculture and Livestock	The space they have at the moment is limited and there is no external housing service.	More space
Ministry of Public Works	The space they have at the moment is enough.	-
Ministry of Finance (Hacienda)	The space they have at the moment is not enough and there is no external housing service.	More space

Source: JICA Study Team

Table 6.5 Summary of Problems of Existing Server Rooms

Existing Situation of Server Rooms	
Building	No earthquake resistant design. No preparedness against natural disaster.
Location within the Building	Many are in storage-rooms or even modified garage.
Server Room and System Development/Operation Room	Most are placed side by side. Those of Ministry of Hacienda are located at a distance of 10 minutes on foot. Not suitable for emergency.
Space	Minimum 5m ² (SNET), Maximum 90 m ² (Ministry of Hacienda) Average 20 m ² .
Floor	Most are of ordinary office type without raised floor (max. load 300 kg.) except for Ministry of Hacienda, Ministry of Education and RNPN. Difficult for cabling.
Equipment Layout	Un classified by kinds and functions of the equipment. Servers, storages, gateways, security servers, etc. are placed in mixed arrangement.
Installation of Equipment	Typically placed on rack board. Often board is bent in the middle due to the weight of the equipment.
Fixing of Rack	In most cases computers are placed on racks assembled from sheet metal bars and boards. Racks are not fixed on the floor.
Power Supply	Most keeps UPS and little problem for short period power cut.
Emergency Power Supply	Most lack emergency power supply for whole building. Where there is one, capacity is insufficient for air conditioning. Lacking starter batteries for emergency power supply generators.
Air-Conditioning	Most server rooms are equipped with air-conditioners of heat-pump type with condenser unit placed outside of the room, keeping independence from building air-conditioning system. Outside units however are vulnerable to earthquake.
Replace Space	Space for replacing work of obsolete or damaged computers is lacking.
Fire Extinguisher	No system except for two to three ministries.
Monitoring	No monitoring room.
Maintenance	No preventive, but reactive. When problem arise the responsible team or person act. This is not necessary for all agencies, but in general is the norm.

Source: JICA Study Team

(3) Wasteful Duplication of Efforts and Facilities

Virtually every ministry and government agency does perform IT work independent of others. A large portion of development functions and operations and maintenance is duplicated in human efforts as well as facilities. A single agency or combination of entities much smaller than the force of existing IT departments in each ministry and agency can do them collectively.

(4) Lack of Support Services and Inadequate Development and Expansion Capacity

Because of the independent nature of IT departments in ministries and agencies, support services are not adequately provided. If support services for organizations are combined, such an entity can provide much better services to them. This is also true for development activities. Such an arrangement will benefit organizations and agencies with a small group of IY personnel the most. Some are so weak that they cannot undertake major expansion even though such an expansion is urgently needed.

6.3.2 Requirements to e-Government Center

(1) Building

1) Necessity for Earthquake-Resistant Structures - Adoption of a - Quake-free Structural System

It is essential to adopt a quake-free structural system for a building that requires absolute safety like the e-Government Center in San Salvador. The San Salvador area is covered by Silos soil that absorbs large amount of water in the rainy season and is situated at a mid-point of a relatively steep slope from the mountain ranges with peaks exceeding 2,000 meters to the shore of the Pacific Ocean. Once a subduction zone earthquake caused by a shift in the tectonic plates-takes place, buildings lacking anti-earthquake measures would easily be destroyed, as proved many times in the past.

2) Necessity for Locating the Building with Appropriate Considerations to the Site Conditions and Surrounding

Many active geological fault lines exist in the area of San Salvador centering on Mount San Salvador and, therefore, numerous places within the area are in danger of earthquakes directly above the potential epicenter. Rivers flowing from Mount San Salvador are also conduits of destructive floodwaters. Areas in which safe buildings can be constructed are limited. A thorough investigation should be made on site conditions and the effect of construction on the surrounding areas including social impacts.

(2) Services

The e-Government Center will not simply be a physical building housing a data center, but will provide several layers of functional services to various government agencies and other organizations in El Salvador. In effect, it will become a center of stimulation for the purpose of promoting the growth of the ICT sector in the country, in terms of both quantity and in quality. Types of services provided by the e-Government Center may include the following.

Table 6.6 Requirements to e-Government Center

Category	Services	Remarks
Network	Web Hosting Service	Web applications can be hosted by the Center by sharing resources (hardware / network connection) for multiple organizations that want to own web sites, resulting in savings in cost and human resources. Municipalities are the most likely users.
System Operation	Housing Services	Hardware owned by some organizations may be accommodated in the Center to be free from operational upkeep under a better environment. Back up systems can also be set up in here. Each organization can be freed from maintaining separate backup facilities.

Category	Services	Remarks
System Operation	Online Data Back Up Service	Data that are in the primary system of each organization (user) are transmitted to backup servers in the Center and to be kept in safe environment. When a damaging incident takes place in the primary system such as data crashed or natural calamity, intact data can be transmitted back to restore the status of data at the time of crash.
	Data Replication Service	Data can be periodically transmitted from primary system to the Center. In case of data crash, they can easily be recovered.
	System Stand by service	When a primary system fails by whatever reasons and is difficult to resume, this service can take over the system in HOT or COLD stand-by although it may be smaller than the primary system.
	Data Exchange Services	Support data exchange between organizations by a standardized way.
Monitoring	Virus protection	Anti virus software is installed in the server and to update in order for all of users inside the Government WAN to be protected from virus in higher level.
	Access log management services	Access to important database and systems is captured and reported to find out illegal access and data leakage.
	Client Management	Any motions on each PC can be monitored to prevent any illegal usage and data leakage. Useless applications are also identified.
Security	Authentication service	Citizens' are identified and authenticated to access to e-Government portal. They are allowed to jump to only the authorized application system. This is the function linked with the e-Government Portal.
	Access control services	Profile for governmental users are managed to provide rights to access to correct application systems. This function links with Intra-Government portal.
	PKI	Public Key Infrastructure (PKI)
Operation	Technical services	Hardware problems and implementation will be supported here.
	Network Engineering services	All if LAN construction and network connection will be supported.
	Operation services	Agencies' IT division can ask remote operations for systems accommodated in those agencies locations.
Application	Intra - Gov. Portal	All government internal application will be linked from this function.
	e-Government Portal	One single entry to e-Government for citizens.
	Open Document	Web based common applications like web-office are hosted to reduce license fees and to standardize document format.
	Payment Gateway	When citizens have to pay fees for services, this function is used along with certain services.
	Video Conference	Videoconference rooms will be prepared for government users. It is also used for training.
Others	Technology bank	Common subsystem or common program components for all of agencies are managed here. All agencies can use them to improve productivity and quality. Software packages developed by an agency are also stored for reuse.
	Training Center	Training for IT staff in the government will be executed. It will also be done via a videoconference system. Contents are not only general ones like MS, Oracle conduct, but include more specific ones like standards and norms as they are defined.
	Help Desk.	Technical problems occurring in government agencies are received via a help desk mechanism.
	Call center	Single contact points for citizens to ask anything about e-Government systems. Issues that are related to particular agency's system will be directed to the responsible agency.

Source: JICA Study Team

(3) Systems

Some systems for e-Government services have to be tailor-made for specific purposes. See below.

1) e-Government Portal

All e-Government users (users from outside the Government) will access this portal. All G2C, G2B services are linked within it so users need not know URLs of each service and other web sites.

Users automatically receive messages from the Government. This helps to remind users the necessary processes for government services that are available both online and offline. Common services are available without user authentication even for foreign travelers.

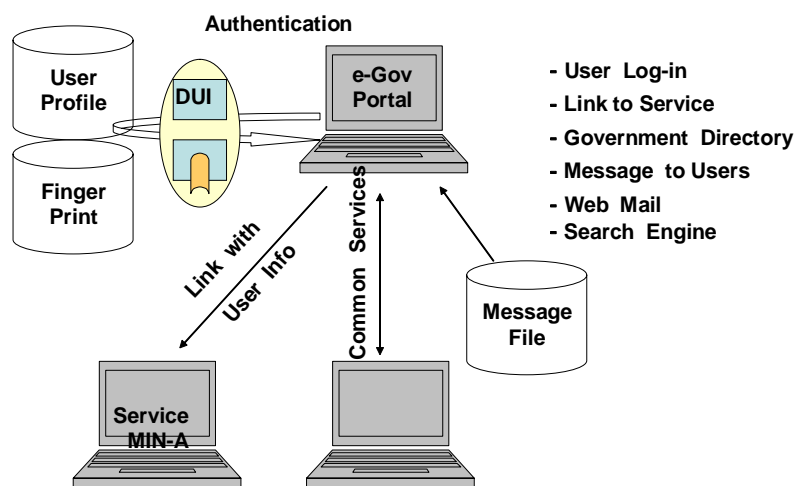
2) User Authentication Function

User profiles are managed behind the portal. When a user accesses portal, he needs to scan his DUI card to identify user code as DUI. Also, fingerprints are verified in order to check whether a DUI card has been lost or stolen.

Users using their own PC or office computer without card scanners and fingerprint recognizers can access this function in different ways. One is the way with registered TCP/IP address and another is with user code and password. In this case, the same services as PAT are available, but at limited PCs (these need to be registered in advance). Another case is by User code, password, and some data entry to identify the individual. This case may not allow for all services, because of the lower authentication level.

Substitutes can be registered for parents of small children, or assistants of elder persons, etc.

Authorized services are registered and this information will be passed to each application. (Authentication functions of existing systems may have to be modified.) Each application system has to consider that only an individual user's or his or her principal's data can be handled.



Source: JICA Study Team

Figure 6.16 e-Government Portal and Authentication

3) Intra-Government Portal

This is for government users. When a user logs in on his or her PCs only application systems, which are allowed to the user, are shown on his or her desktop. Each user also manages access rights and usage rights of each application. The use of card scanners and fingerprint recognizers is considerable.

4) Payment Gateway

This function will link with bank systems or credit card systems. When the service is charged, this function is utilized. For example, getting birth certificates charges amount one US dollar for each. Using this, users need not go to bank or to government offices.

6.3.3 Functions and Building Design

(1) Functions

1) Planning

- Business planning is coordinated. This including the implementation of new services, arrangement and design of the charging scheme, evaluation of services, cost calculation/evaluation, contractual matters with subcontractors, etc.
- The estimated number of staff in this group is 3 to 5.

2) Administration

- This group is responsible for the overall administration of the *e*-Government Center.
- The estimated number of staff here is 3 to 5.

3) Standardization Promotion Committee

- Consists of ad hoc persons from several agencies including the academic and private sectors. Details are described in Section 6.6 standards and norms.

4) System Auditing Committee

- Consists of ad hoc persons from a several agencies including the academic and private sectors. Details are described in Section 6.6 standards and norms.

5) Procurement

- All facilities within the *e*-Government Center and its procurement of services are handled here. Applications for procurements in agencies are reported the *e*-Government Center and this group approves based on the procurement rules defined in the standards and norms.
- The 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 subsystems.
- Operations include regular operation and monitoring (detecting troubles, performance checking), regular maintenance, and system recovery. Operation services for systems in other locations can be done as well. Any problems should be found before an end reports the problem.
- An operation management system should be installed to assist these tasks.
- Operators have to be employed for more than normal government office hours including on the weekend. Two shift schedules are required, while three shifts are planned for the future. They do not necessarily have to be filled by government officials. They can be staffed from private outsourced companies.
- Call centers for citizens are under this group. Call centers have to keep close communication with operators in data centers to know the situation of the system currently running, and with agencies which provide *e*-Government application systems linked with the *e*-Government portal.
- The estimated number of internal staff here is 3 to 5 who are dedicated to planning and management. Actual operations are outsourced to private sectors. 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.
- Research on technology trends and general trainings are held for systems such as Oracle, MS, Cisco, etc by trainer from training institutes. There are trainings specified in *e*-Government such as standards and norms defined. Common subsystems ready in-use, common components that are for web applications, usable software developed by some agencies, etc.
- Training programs are developed. In the future, *e*-Learning will be facilitated for the users outside of San Salvador.
- Close communication with the Standardization Promotion Committee, Technology Bank and other *e*-Government Center organizations are important. The estimated number of internal staff here is 2 to 3 who are dedicated to planning and arrangement. Actual instructors are asked from other organization including private sectors.

8) Field Service

- Services to government agencies are provided. Call centers for government users (help desks) will receive requirements from them. If necessary, staff here will visit users' offices to repair users' requirements.
- The estimated number of internal staff here is 2 to 3 who are managers and operators.

9) Network Services

- Located in the NOC, the government WAN is operated. Further details are described in Section 6.1.1.

10) Software Services

- The major role is developing common programs, which can be used for any common application program in any agency. Customization and implementation support of Common Subsystem and the Technology Bank under this group store and notify the agencies of software developments.
- This group will inform all agencies about any new software developed by any agency or municipality. This software is for reuse by other agencies after customization, if necessary. These may be ported on hosting servers for multiple agencies to use these without the need for installation in each agency as an ASP service.
- The estimated number of internal staff here is 3 to 5 who have software development project management experience. The actual software development is outsourced to the private sector.

11) Facility Management System (FMS)

- In order to control building and building equipment, the establishment of a FMS, which manages, automated building controls for security purposes such as security cameras, lighting, air conditioning, generators, sprinklers, and fire alarms. According to the FMS as directed by the O&M, the installation of FMS to the building network system will be through the bridge system between each network.
- The estimated number of internal staff here is 5 to 7 who have professional maintenance experience. FMS is to be developed with an architectural consulting firm.

(2) Building and Design

Various factors were taken into account in designing the *e*-Government Center in El Salvador so that it could become the leading facility of its kind in Central America. Factors included past experience in disasters and their analytical data, meteorological conditions, other environmental conditions, technical conditions such as city planning, building codes, construction techniques, costs, material procurement, and construction schedule, and social factors such as administrative structure and practice, labor conditions, life customs, and social tourism. This part will be refined in the next stage of this study but so far the following guidelines are to be considered.

Location

The location of *e*-Government Center will be determined in consultation with SNET, Civil Protection, and experts in geology in relation to earthquakes. Points indicated by OMPASS will also be considered. The results of site surveys will be analyzed in terms of ease of construction work, distance from client organizations in the government, access, telecommunication, electric power, water supply and sewage, effects on residents in the surrounding areas, and effects from surrounding establishments such as factories.

Internal Space

A plan of functions of the Center will be determined after the requirements are determined by various organizations, which in turn will establish requirements for the internal space of the building. The internal blueprints will follow building codes and anti-fire regulations.

Functional Movement of Persons

Functions are bundled by flow and each floor will be made to represent a clear functional role. The relationship between rooms is to be reflected in the placement of rooms. The balanced flow of people is to be desired so that some functions can be carried out in the same room, resulting in spatial efficiency. Evacuation in the event of a disaster will be considered in the form of designating evacuation routes and location of rooms.

Building Structure

San Salvador is on the Silus Plateau, which has a tendency to be liquified, and excessive movement can cause mudslides in the event of earthquake. A structure suitable for such conditions will be adopted and design standards published by the Japan Society of Architects and Engineers will be utilized.

Earthquake-Resistant Structure

An earthquake-resistant structure is to be adopted. Earthquake-resistant building structure technology is the most advanced in Japan. Depending on the geological condition of the site in question, it is possible that the structure may resonate with an earthquake's vibration, no matter how well designed the device may be. A thorough analysis of vibration patterns around the site and a design of the foundation and lower structure that minimizes vibration should be made with the best combination adopted. The analysis will be based on the "Earthquake-Resistant Structure Calculation Guidelines and Manual" edited and published by Japan Society of Architects and Engineers.

Facility Design

The *e*-Government Center will house servers and storage facilities that contain important government information as well as computers and communication systems that connect the Center with other government organizations continuously. It is therefore extremely important that the facilities of the Center will to ensure a completely safe operation of such devices. A building management system including the monitoring of unidentified intruders should be considered. Furthermore, energy saving measures and devices will also be considered to achieve low cost operation.

Operation and Management

Operations of the *e*-Government Center should be conducted by taking into account the fact that computers and related devices would have a short period of time for optimal utility and should be replaced periodically under a concomitant re-investment plan. Obviously it is even more important to ensure the continuous provision of services at high level. Section 6.8 describes suggestions for how operation and management can be done.

Construction Cost

Construction cost may vary up to 30% depending on the location. A careful investigation of costs will be made concerning the local unit construction methods as well as by means of the consultation of

contractors and documents together with location and design factors so as to minimize the lifetime cost of the building.

Organization

The organization of the e-Government Center will really be a crucial factor affecting the success of the Center. Section 6.8 discusses this matter in more detail.

Some design factors have been studied and the following points have been discussed with relevant government officials and other experts in El Salvador.

Building Site

The government of El Salvador unofficially suggested the use of two sites, either a site designated for the new building of Ministry of Foreign Affairs or another site designated for the new building of Civil Protection Bureau. The investigation into the two sites has begun.

Building Size

The size of this type of computer center is on a trend of down-sizing world-wide because of the ever down-sizing of equipment including servers and electrical equipment. It is possible that the required room size in the future may be smaller than the size presented in this report. Extra spaces in the future may be used for non-computer activities.

Equipment Size

Machine rooms can also become smaller in the future as new technology for energy-saving and the packaging of several machines into one space is making the required space for machines ever smaller. A study will determine whether placing emergency power supply and/or air-conditioning equipment in the basement or on the roof-top will be the best option. Cost/performance and local availability will be taken into account in the selection process.

Quake-Resistant Structure

There are many actual examples tested in the field for such methods and devices. However, this is still a research topic in El Salvador. A salient feature of earthquakes in El Salvador is a short period of preceding tremors and a sudden strong horizontal sway. It is possible to make the building heavy with high inertia to counter such a strong horizontal force.

6.4 Basic Strategy and Design for Citizens' Master Database

6.4.1 Current Situation and Issues

A new ID card system was implemented in 2002. The system provides ID cards for citizens over 18 years old with personal data also kept in database including photos and fingerprints. This system is managed by RNPN. Actual operation and maintenance is outsourced to DOCUSAL. DOCUSAL is a Mexican private company responsible for operation and maintenance of the ID card, system including data input, and ICT management and card issuance.

There are other cards to identify individual citizens for specific purposes. Examples are passports and visas, drivers' licenses, and tax cards (NIT). Those cards are issued without linking to the Citizens' master database. Also there is a DUI (Identity card) and DUIM (Identity card for minors) and on a gradual scale, this Study Team also suggests should be incorporated to the system.

Database of individual citizens' data are possessed by various systems at various organizations. There is a lot of duplicate information such as addresses, telephone numbers and birthdays, etc. Because those data have been entered by responsible ministries into the system independently from one another, data inconsistency and operational complexities may occur. To provide the function to enable data linkage

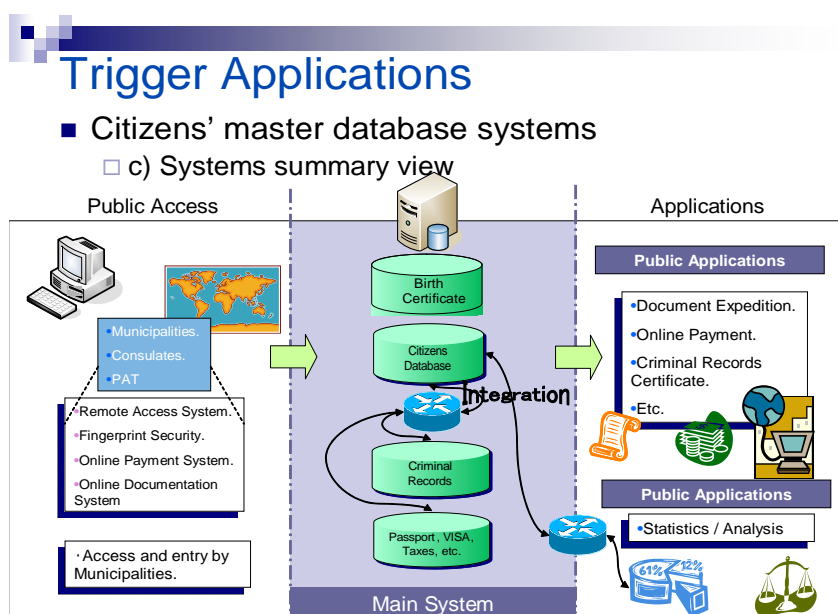
between RNPN and the other systems would eliminate these problems. Up to now RNPN has realized the following in relation to other agencies.

RNPN in Relation to Other Institutions

- RNPN - Immigration
- RNPN - Social Security
 - Identity verification by consulting DUI for data and image. Relation between the Social Security Number and the Unique Identity Number.
- RNPN - PNC (National Police)
 - Identity verification by consulting DUI for data and image. Finger print verification through the information stored on AFIS Data Base of RNPN.
- RNPN - JUSTICE INSTITUTIONS
- RNPN - (Ministerio de Hacienda –Ministry of Finance - NIT) (Internal Revenue Service)
 - Identity verification by consulting DUI for data and image.
- RNPN - COEN
 - Production of statistical data related to citizens’ residences in high risk areas, where the citizens need to be evacuated in case of natural disasters. Also, specific information could be produced on specific locations and emergency data related to citizens, such as those needing assistance in case of evacuation in specific areas. RNPN - AFP’S (Pension Fund Administrators)
- RNPN - Financial Institutions (Banks)
- RNPN - Drivers’ License
- RNPN - Foreign Affairs

It is troublesome for citizens to get a birth certificate, as they need to go to the municipal office where they are registered. (Presentation of a birth certificate is common in asking for jobs and visas, etc. in El Salvador) It is a waste of time and money. In the case of applying for new jobs, criminal historical records are sometimes required along with a birth certificate. For this, citizens have to visit a police office to get records and certification. Integrating these data to one database for users’ retrieval would save citizens’ time greatly.

6.4.2 Expected System Functions



Source: JICA Study Team

Figure 6.17 Trigger Application: Citizens’ Master Database

National Master Database is the core of this system, which keeps all the personal data. Current system keeps fingerprint data, which are also included in ID cards, document scanned data such as birth certificate, marriage certificate, etc as well as digital data of over 100 items.

These data are originated by citizens' registration at municipal offices. Currently these data are sent manually to RNPB whether digitalized or not. New functions are:

1. Data retrieval and printing by citizens. At least birth certificates with criminal records will be included, but more information may be added following further survey;
2. For users' retrieval, database is created by integrating RNPB database and other data sources, which complement RNPB data such as criminal records;
3. Data entry by municipalities. The data will be transmitted to RNPB and municipality offices will be able to search and review the data;
4. Data transmission to other systems and institutions. RNPB data will be ready for other systems for retrieval by standard method; and
5. Data analysis and statistical function for agencies.

One of the biggest concerns for e-Government is how to identify authorized users. Existing web services by government agencies identify users by the user code, which is provided by each agency. This means, whenever a new service is provided, users have to enter the same information (Name, address, telephone number, bank account, etc).

6.4.3 Benefits

The following is the benefits of this system for citizens.

- a) Citizens
 - No need to spend time and expenses to go to municipality where they are registered in order to get birth certificates.
 - Overseas Salvadorians can also enjoy this convenience overseas.
- b) Municipalities
 - Municipality offices will reduce the work of issuing birth certificates.
 - Birth records will be transmitted to RNPB quickly and easily.
- c) Central government agencies
 - The agencies will have access to RNPB data to use them to verify their own data, or to know any changes. This makes data management more efficient and more accurate.
 - Statistical and analysis system to meet specific requirements of government agencies.

6.4.4 Standardization

Since this is the first project to develop an application system, some important standard and norms will be prepared along with design, development and operation/maintenance.

- System development methodology
- Project management methodology
- Programming standards (Some common program modules are also prepared.)
- Data standard (especially related to citizens' personal data)
- Data exchange standards

Common sub-system will be utilized.

- Data Exchange System (EAI)
- Project management system
- Business intelligence

6.4.5 Database and Data Exchange

Citizens’ database contains one of the most important types of data to identify individual people. There are two directions for data integration. One is outward from RNPN and the other to create integrated database. It is referable by citizens, municipalities and government offices.

Individual personal data are used by various systems at many agencies, such as passport system, visa system and tax system. In order to keep consistency among these databases, data will be exchanged by a standardized way, which may be provided as one of common subsystems.

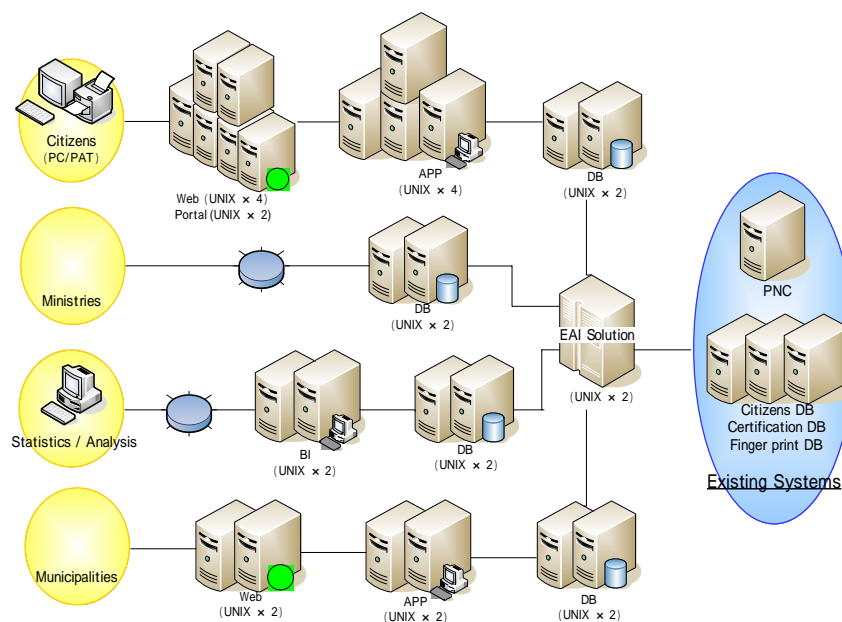
Standardization of data is done based on the original RNPN data. That means that other agencies may have to change their data scheme and/or data.

6.4.6 Hardware and Software

Some servers are required for this system including those provided as a part of the common sub-systems. They are web servers, application servers and database servers and storage servers.

Estimation of data volume is:

- Data of 8,000,000 citizens have to be stored in integration database in addition to existing database for citizens’ access. Record size for each citizen is large because of the size of scanned data of a birth certificate and finger print data. It is estimated to be about 100KB/person. In total 800GB storage is required; and
- Number of transactions from citizens, when all of implementation is completed, is expected to be about 2 million annually. Equipment configuration is considered to be as below at present.



Source: JICA Study Team

Figure 6.18 Hardware and Software for Citizens Master Database

6.4.7 Place of Installation and System Accommodation

Some servers and systems will be accommodated in the server room of e-Government center. It is because some of the sub-components in this application system do not belong to a specific ministry and e-Government center can guarantee secure and efficient environment for them. Also agencies frequently exchange many kinds of data. Such operation is difficult for individual agencies to manage. Moreover, e-Government center provides the most secure and safety environment for this system.

6.4.8 Participating Organizations

Currently RNPN is responsible for managing national data and issuing ID cards. RNPN will take initiative in this. But many other organizations including the private sector will also participate in this system in terms of possession of data interface and integration with Citizens' Maser Database.

As described at Section 6.4.1, there are many agencies, which require data integration with RNPN. They should apparently participate in the implementation organization.

6.4.9 Change of Business Operation

Data entry process will be changed when implementing this system. This change effects to both of municipalities and RNPN.

Currently operation in municipalities is not unified among them. Computerization situation is very different from each other. So implementation of new business process operation in the short period is quite difficult. Basic idea is a phased approach that a few computerized municipalities will be pilots where new procedures are implemented. And then taking a few years, this will be penetrated. Brief image of procedure change is shown below.

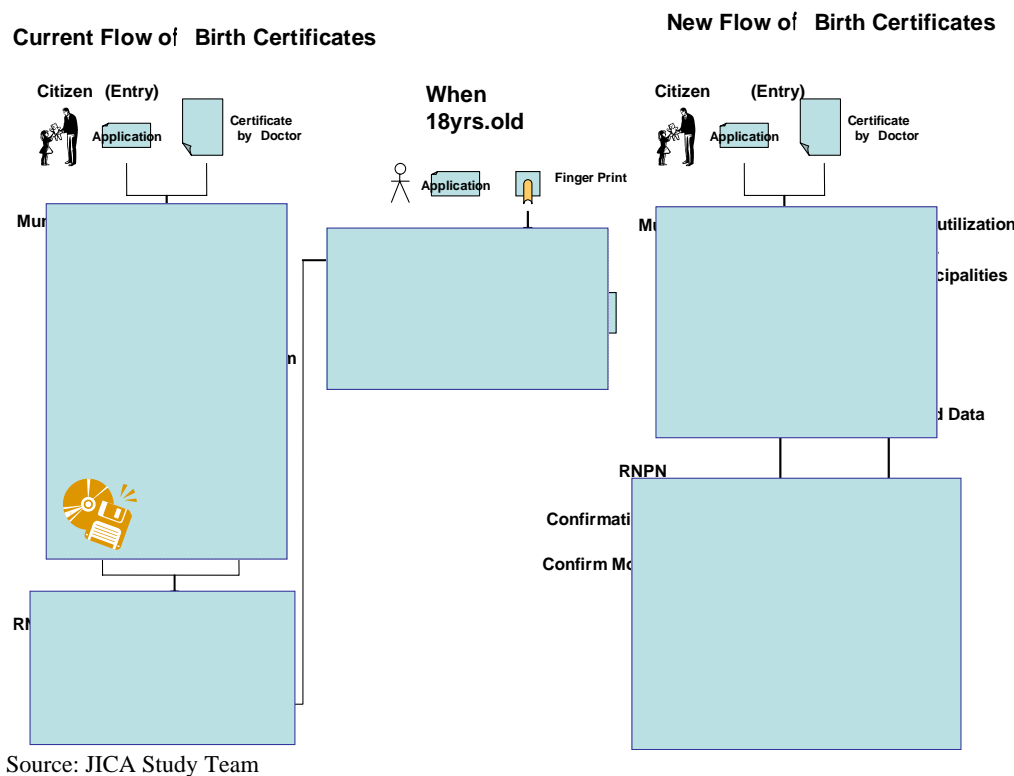


Figure 6.19 Flow for Citizen's Master Database

6.4.10 O&M

e-Government center is responsible for securely operating the system, which is directly accessed by citizens. Data retrieval function by citizens from replication database is to be operated and managed by them. Some services will be provided by e-Government center, such as e-Government portal management, data exchange services and data mining services, which are used for this system.

However, data themselves (citizens' master database) should be managed by RNPN. In order to coordinate additional requirement from related institutions, meetings should be held regularly.

6.4.11 Possible Expansion

The mechanism of data input system including application of birth certificates might be considered to promote Internet access by citizens. However, it may not be probable to assume this task in the near future because of necessity of handling documents issued and signed physically to be submitted to local offices and existence of data confirmation process by local offices. It may be difficult to change the whole process involving citizens, local offices and RNPN.

The effect will be reduction in the infant kidnapping etc. by expanding identification card issuance to people younger than 18.

6.4.12 Options

There are several options, which eliminate some of the functions defined above.

1) Nothing to be Developed

No changes from the current situation, though minimum development might be required for achieving other components such as existing citizens' database transmission to authentication systems.

Another solution will be required in order to achieve the objective such as participation of citizens and municipalities.

2) No Involvement of Municipal Governments

Technically, it is possible. But from the project's point view, involvement of municipalities is very important. In addition, citizens' direct access to e-Government will look as if the central government is taking over the municipalities' operation.

3) No Intra-ministry Data Exchange

RNPN need to discuss with each institution in need of data integrity with RNPN data. It affects not only the government internal systems but also e-services provided by each agency. Many ministries have personal information of the same people but inconsistency may occur due to inconsistent data input and difficulty of quick reflection of any changes.

6.5 Basic Strategy and Design for Disaster Information System

6.5.1 Issues

Earthquakes are frequent in El Salvador and so are other types of natural disasters. It is important to quickly and accurately inform the citizens about forecasts of natural disasters, and about where to find shelter.

The provision of timely and accurate information to citizens at the onset of a disaster may actually save lives. The acquisition of information on disasters and its management are currently done by SNET. Information from field investigators or monitoring facilities covering the entire country is gathered by SNET, and this information is then provided to the public.

The main information provided by SNET includes:

- Real-time information from automated systems published on the website as graphs and tables;
- Dynamic web maps of hazards and exposed infrastructure;
- Notification via e-mail or fax of seismic and extreme meteorological events (not immediate!);
- Daily meteorological forecasts (for 24 and 48 hours) – general purpose information; and
- Telephone alerts to community leaders in flood hazardous areas during storms – (not automated).

When a disaster actually occurs, SNET gathers and stores information from these monitors and investigators and provides the information to Civil Protection.

Once a disaster occurs, an emergency headquarters is established and the responsible parties from related ministries gather at Civil Protection. The mayors of municipalities hit by the disaster or those, which have suffered damages, report updates to governors of departments. The situation report and the requests for aid are then dispatched to Civil Protection through the governors. These requests are reported to relevant organizations through Civil Protection (in many cases, those in charge of relevant organizations come to and stay at the headquarters, i.e., Civil Protection), and they handle the necessary operations. For instance, requests for the use of helicopters are sent to the Ministry of Defense, and requests for food are requested to the Ministry of Agriculture.

6.5.2 Expected System Functions

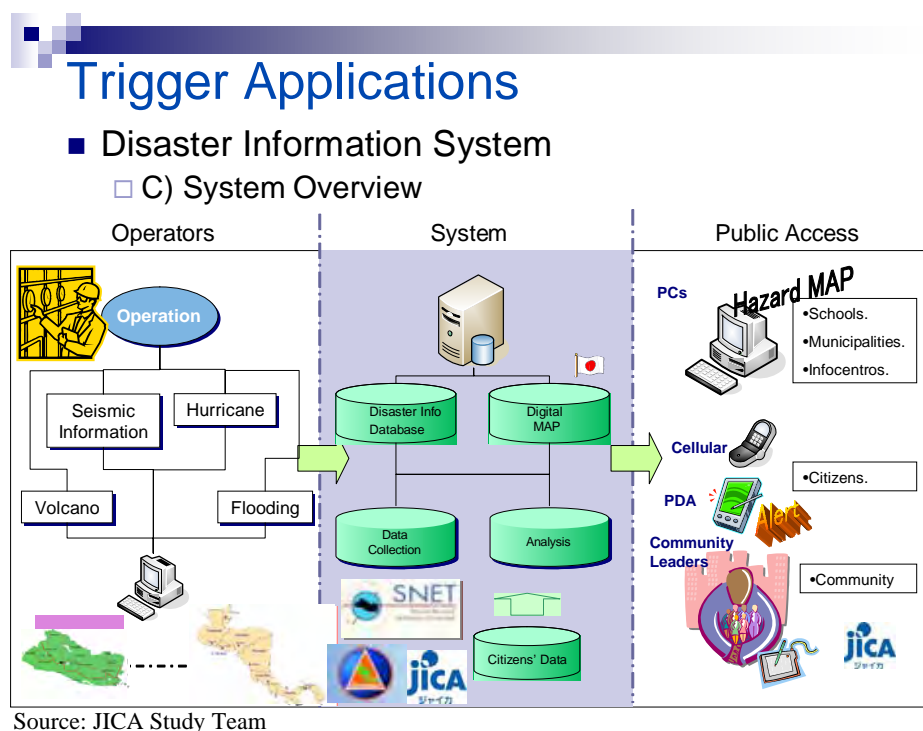


Figure 6.20 Trigger Applications: Disaster Information System

At the first stage, the function will focus on information gathering stored by manual input and distribution of the information to citizens' terminals, which are personally-owned facilities.

The first function is the hazard map, which tells citizens the places where damages tend to occur. The hazard map is still offered by SNET through its website. However, it remains a method of dissemination for specialists. SNET intends to provide user-friendly information to as many citizens as possible, including information about the dangerous zones. The information provided by SNET is helpful to citizens in purchasing a house, traveling, etc. Consequently, it leads to the reduction of victims of disasters.

Another function is to establish a mechanism to deliver urgent information such as how the disaster has occurred, the location of shelters and support information to pre-registered representatives of the citizens and communities, although detailed functions will be determined at a later stage. This information will be sent mainly to mobile terminals such as cellular phones and PDAs. One third of the population use cellular phones while PDA terminals have come into use among businessmen in El Salvador. The information will also be sent to the personal computers (PCs). However, it is estimated that the effect will be larger in the case of mobile terminals in comparison to PCs as mobile terminals will receive the information automatically as soon as a disaster occurs.

6.5.3 Benefits

- a) Citizens
 - Identify dangerous areas before citizens decide to purchase a house, travel, invest, etc.
 - Immediate access to information on disasters, such as damaged areas and shelters
 - Initiate timely evacuation or other prevention procedures when floods or other disasters are about to occur
- b) Municipalities
 - Prepare adequate emergency response plans
 - Make sound decisions for land use planning to reduce the vulnerability to disasters
- c) Government users
 - Coordinate risk prevention and emergency response activities
 - Make sound decisions for new infrastructure and social benefit projects

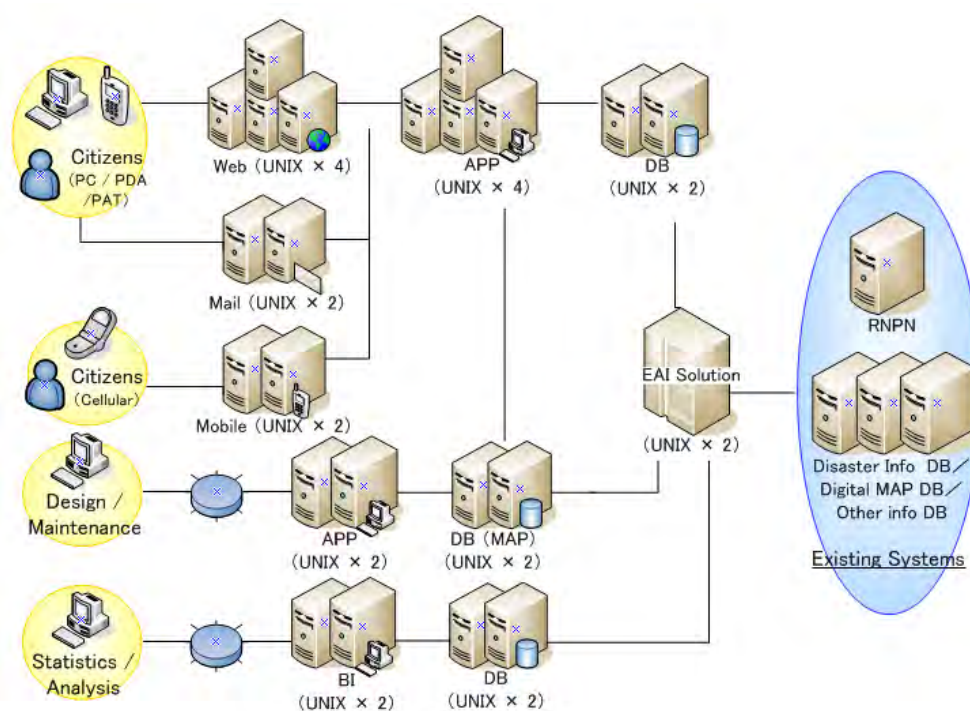
6.5.4 Hardware and Software

Necessary hardware for this system includes web servers, application servers and database servers. Some of SNET's existing equipment will be used while others have to be upgraded or changed to meet the standards. Some back-up facilities need to be procured.

Data volume is estimated below.

- Accessing the hazard map is very infrequent. Approximately 5 % of the population attempt to access to the map.
- It is estimated that 5,000 people will wish to be registered at the beginning of the notification service. A few years after the first implementation this number will increase up to 500,000. When a disaster occurs, the maximum number of registered people will receive simultaneous notification.

The envisioned hardware configuration is shown below.



Source: JICA Study Team

Figure 6.21 Hardware and Software for Disaster Information System

6.5.5 Place of Installation and System Accommodation

This system has to survive the disasters. Thus necessary equipment must be located in an anti-disaster environment. The *e*-Government Center will satisfy this condition.

6.5.6 Participating Organizations

SNET is responsible for this system. But in the future, data transmission will become necessary with other organizations such as the Vice Ministry of Civil Protection, Presidential House, municipalities, and even neighboring countries.

As a part of the Disaster Center, regular meetings should be held with related institutions.

6.5.7 Operations and Maintenance (O&M)

O&M will be performed by SNET while some part, such as the system operations of the equipment located at the *e*-Government Center, will be maintained by the *e*-Government Center. However, SNET will perform the data management of this system.

6.5.8 Possible Expansion

Some other functions may be developed at a later stage.

- Monitoring cameras can be installed in critical areas and/or shelters. To some extent, this takes over the existing process whereby field staff report updates to SNET. The new system can periodically report the same information electronically.
- Decision support systems, which are based on the data provided by SNET, Civil Protection and other related institutions, will participate in this.
- Data feedback from citizens can be applicable. Data may be related to high-risk area information, safety information and information delivery.
- It may be tempted to include in the System a procedure of information feedback from citizens at the disaster hit area such as the safety of a particular person. Such an information is of great concern for relatives of the person, for example. The reason not including feedback from citizens at the initial stage is the high level of difficulty in verifying information given by citizens in the state of great confusion that inevitably follows a large scale disaster. Integrating information feedback into the Disaster Information System should be made only after establishing such a verification system.

6.5.9 Options

1) Do Nothing

Some application systems which aim attract citizens to public access terminals and experience the Internet are necessary. In case of the absence of these application systems, some alternative systems must be considered in order to encourage the diffusion rates of PCs and Internet use to increase among citizens.

2) Partial Implementation

The highest priority should be given to the rehabilitation of SNET facilities. Currently its facilities do not have enough resources and lack effective standardization. It is important to store the nation's important data in a safe and secure environment.