IT VISION & APPLICATIONS- 2013

MINISTRY OF HEALTH

DEPARTMENT OF INFORMATION SYSTEMS

KUWAIT

Table of Contents

Vision Statement

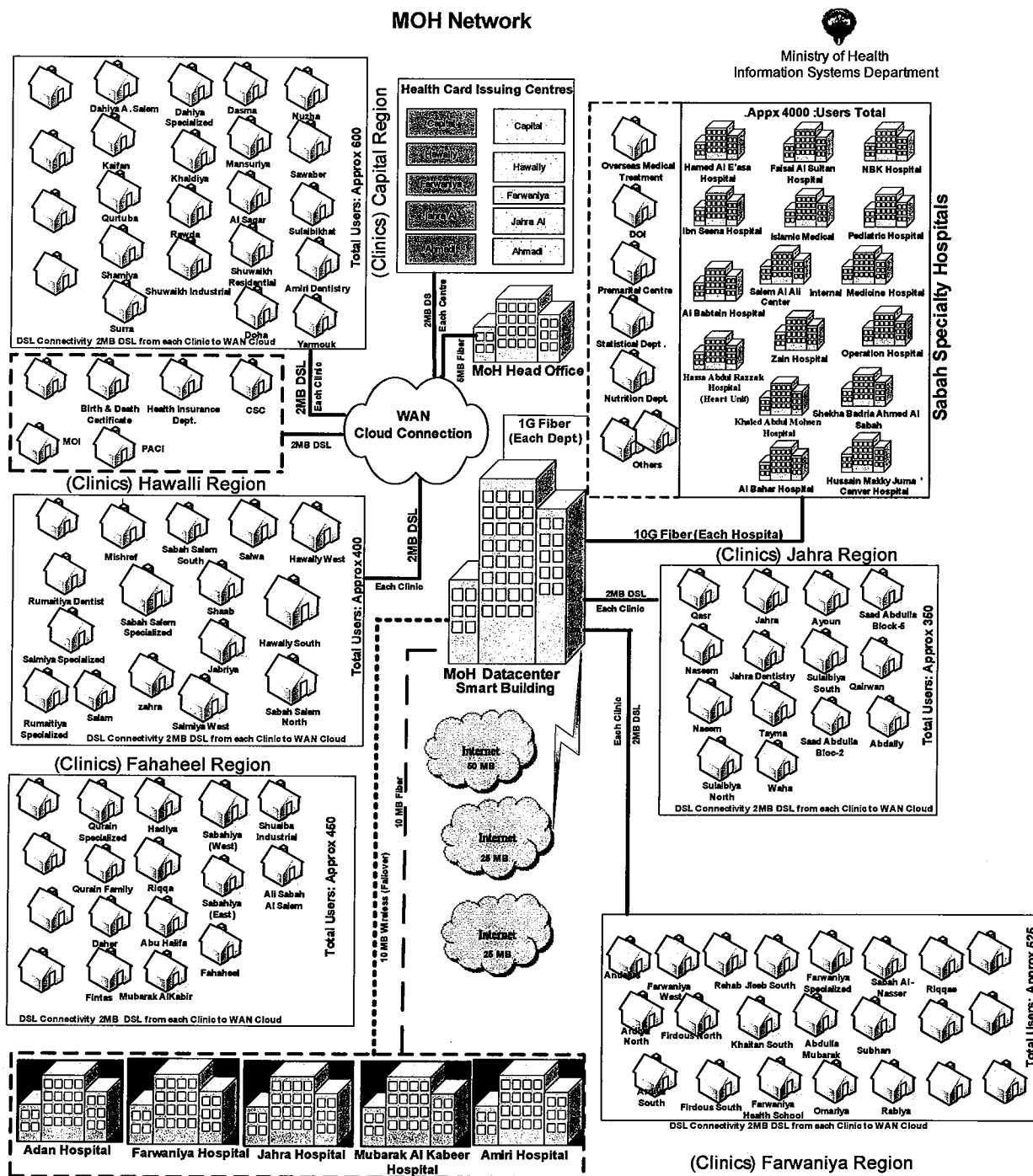*Achieve comprehensive, resilient, secured, state-of-the-art health care system by procuring latest technology and consolidating all health records of a patient in a single electronic file, for the people of State of Kuwait to enhance the health care services in Kuwait and worldwide, following internationally practiced standards of Health Information System and Kuwait standards of Privacy for patient's record.*

MOH Health Network Vision 2013

MOH Network

Ministry of Health
Information Systems Department

Health Card Issuing Centres

Capital · Hawally · Farwaniya · Jahra Al · Ahmad

(Clinics) Capital Region — Total Users: Approx 600

Dahiya A.Salem, Dahiya Specialized, Dasma, Nuzha, Kaifan, Mansuriya, Khaidiya, Sawaber, Qurtuba, Al Sagar, Rawda, Sulaibikhat, Shamiya, Shuwaikh Residential, Amiri Dentistry, Shuwaikh Industrial, Surra, Doha, Yarmouk

DSL Connectivity 2MB DSL from each Clinic to WAN Cloud

(Clinics) Hawalli Region

Birth & Death Certificate, Health Insurance Dept., CSC, MOI, PACI

WAN Cloud Connection

MoH Head Office

1G Fiber (Each Dept)

.Appx 4000 :Users Total

Overseas Medical Treatment, DOI, Premarital Centre, Statistical Dept., Nutrition Dept., Others

Hamed Al E'asa Hospital, Faisal Al Sultan Hospital, NBK Hospital, Ibn Seena Hospital, Islamic Medical Center, Pediatric Hospital, Al Babtain Hospital, Salem Al Ali Center, Internal Medicine Hospital, Zain Hospital, Operation Hospital, Hassa Abdul Razzak Hospital (Heart Unit), Khaled Abdul Mohsen Hospital, Shekha Badria Ahmed Al Sabah, Al Bahar Hospital, Hussain Makky Juma Cancer Hospital

Sabah Specialty Hospitals

10G Fiber (Each Hospital)

(Clinics) Hawalli Region — Total Users: Approx 400

Mishref, Sabah Salem South, Salwa, Hawally West, Rumaitiya Dentist, Shaab, Sabah Salem Specialized, Hawally South, Salmiya Specialized, Jabriya, zahra, Salam, Sabah Salem North, Rumaitiya Specialized, Salmiya West

DSL Connectivity 2MB DSL from each Clinic to WAN Cloud

(Clinics) Jahra Region — Total Users: Approx 350

Qasr, Jahra, Ayoun, Saad Abdulla Block-5, Naseem, Jahra Dentistry, Sulaibiya South, Qairwan, Naeem, Tayma, Saad Abdulla Bloc-2, Abdally, Sulaibiya North, Waha

DSL Connectivity 2MB DSL from each Clinic to WAN Cloud

(Clinics) Fahaheel Region — Total Users: Approx 450

Qurain Specialized, Hadiya, Sabahiya (West), Shuaiba Industrial, Qurain Family, Riqqa, Sabahiya (East), Ali Sabah Al Salem, Dahar, Abu Halifa, Fahaheel, Fintas, Mubarak AlKabir

DSL Connectivity 2MB DSL from each Clinic to WAN Cloud

MoH Datacenter Smart Building

Internet 50 MB · Internet 25 MB · Internet 25 MB

10 MB Fiber · 10 MB Wireless (Failover)

Adan Hospital · Farwaniya Hospital · Jahra Hospital · Mubarak Al Kabeer Hospital · Amiri Hospital

(Clinics) Farwaniya Region — Total Users: Approx 525

Andalus, Farwaniya West, Rehab Jleeb South, Farwaniya Specialized, Sabah Al-Nasser, Riqqae, Ardiya North, Firdous North, Khaitan South, Abdulla Mubarak, Subhan, Ardiya South, Firdous South, Farwaniya Health School, Omariya, Rabiya

DSL Connectivity 2MB DSL from each Clinic to WAN Cloud

1. New Datacenter

Ministry of Health, Information Systems Department is operating from New Datacenter which is located in Sabah Medical Specialty Region since February 2012. The purpose of this Datacenter is to cater various ICT related services to all the hospitals and clinics in Kuwait. The facility comprises of four floors which houses Main Computer Datacenter, Crisis Monitoring and Management, Operational Support staff, Software development and management teams and senior management staff.

Objective of New Datacenter

The primary objective is to serve IT services to all regional general hospitals, all the primary health centers, specialized hospitals and different departments of Ministry of Health using best of the breed systems, IT governance and standards.

No.	Site Description	No. of users
1	5 x Regional General Hospitals	1500
2	96 x Primary Healthcare Center	4000
3	Other departments	1000
4	16 x Specialized Hospitals in Sabah Health Region	2000
5	Future Regional Hospitals, Primary Healthcare center, Specialized Hospitals and departments.	5000 to 10000 additional users (Approximately)

2. Infrastructure

Infrastructure includes Centralized Microsoft services, Security services, and Network Services for the entire Ministry of Health which would be hosted from Datacenter.

Microsoft Infrastructure

The Ministry of Health is rapidly expanding its Information Technology capabilities to meet the demand for automation and efficiency from the Health Services departments, as well as contributing to the Health delivery process with tools and services to improve the well-being of patients.
For this purpose, the Ministry of Health Information Systems department will soon be deploying Microsoft Infrastructure for providing new superior services to the ministry users like secure desktops, productivity tools, email, unified communications, business applications, and other services. A major part of these services is based on Microsoft Technology.
Ministry of Health Information Technology Department divided its services into three major layers:

Business Productivity Infrastructure, constituting:

- Centralized and Virtualized Active Directory with Global catalogs for all hospitals, primary healthcare clinics and departments.
- Centralized Systems Monitoring and Management.
- Desktop Productivity tools.
- Email, Calendar, Contact and Task Management.
- Unified Communications, presence, and conferencing.
- User workspaces, document management, workflow, and enterprise search.
- Project Management.

Network & Security Infrastructure

The Ministry of Health, Information Systems Department is in a process of deploying security capabilities to cater for the demand for automation and efficiency from the Health Services departments.In order to achieve this, the core network and security infrastructure would be robust, scalable, reliable and highly available meeting best industry standards and practices.

From a network perspective, the Datacenter would have following components:

- Clustered high performance Core Switches.
- Clustered high performance Server Farm Switches.
- High performance PoE edge switches.
- Structured cabling using ANSI/TIA/EIA 568B.1 standards using CAT6 cables.

- All new "Green field builds" or major renovations would consist of minimum 1 x 24s 50u (10GX laser optimized) MM fiber and 1 x 24s SM fiber to each TR from the ER and 1 x 24s 50u (10GX laser optimized) MM fiber and 1 x 24s SM fiber to each TR from the ER using alternate redundant routing design strategy.

Above mentioned network components would facilitate to provide below mentioned services:

- Wired Infrastructure.
- Wireless Infrastructure.
- VoIP (Voice over IP).
- Video Conferencing.
- Telemedicine.
- Various Application services hosted centrally or distributed.

It is important to mention here while above components provide ICT services, the enhancement and protection of MOH Networking Infrastructure and to support its increased networking requirements must be maintained. Comprehensive threat protection is the top priority for MOH-ISD and mitigation of risk of network and applications exploits.

From a Security Perspective, ISD would have a comprehensive multi-layer security threat protection system(s) that will provide protection at the network and application layers. ISD Security Infrastructure would have Purpose-built platform(s), with Dedicated, processing hardware and software, to provide advanced routing functionality, multi 10 gigabit Universal Threat Management (UTM) firewall throughput, high-performing IPSec VPN concentration, Application Firewalls and sophisticated Network Intrusion Prevention capabilities with Network Admission Control for wired as well as wireless infrastructure. There would be provision of virtual appliances for Web Security, Mail Security, Data Loss Prevention (Data encryption, Server & Application Protection) and end point security with Antivirus. Policy based internet access to the end users using best of the breed cache engine in a clustered environment.

Physical security such as multiple level of Access Control and CCTV system would be in place to secure the datacenter.

MOH-ISD* - Ministry of Health Information Systems Department
ISD- Information Systems Department

Management of Infrastructure

In order to monitor and manage the entire IT infrastructure in a pro-active manner, ISD would setup following industry standard methodology using **ITIL V.3*** to run the systems efficiently with minimum downtime.

Service Desk

The Service Desk would be the first point of contact for all the users of the organization with IT service's needs. The Service Desk is a single of point of contact for all end users who need any assistance from IT. The Service Desk handles day-to-day user issues, end users calls and service related issues. The Service Desk is not merely a call center or a help desk but it would offer a broader range of services through a global approach to IT. It would handle incidents, problems and questions and serve as an interface for other activities such as user change requests and availability management.

> ***ITILV3: "The Process responsible for managing the Lifecycle of all Incidents. The primary Objective of Incident Management is to return the IT Service to Users as quickly as possible."**

Incident Management

Incident Management would enable the organization to Support services and better align IT to the needs of business. Following the Incident Management map provides:

- Timely resolution of incidents resulting in reduced business impact. It can help organization to reduce unplanned downtime from 50% to 75%
- More efficient resource utilization of Service Desk and other staff. 10% to 25% labor productivity benefits, as less time is spent on repetitive firefighting activities and rework.
- Enhanced ability to measure and monitor IT performance relative to SLAs
- Better data to support executive decisions regarding service quality
- Proactive identification of process enhancements

Problem Management

The primary Objectives of Problem Management would be to prevent Incidents from happening and to minimize the Impact of Incidents that cannot be prevented. The goal of problem management activities would be to ascertain the root causes of incidents and to minimize their impact on the business operations. This would be done through the following processes:

- Problem control
- Error control
- Proactive problem management

Change Management

The primary objective of Change Management would be to enable beneficial Changes to be made, with minimum disruption to IT Services. ITIL Change Management is an extremely important process. The ITIL Change Management process depends on the accuracy of the configuration data to ensure the full impact of making Changes is known. Ultimately there is a very close relationship between Configuration Management, Release Management and Change Management.
Goal of ITIL Change Management is:

- Provide a standardized approach to managing infrastructure change
- Understand and minimize risks associate with infrastructure change
- Ensure business continuity and support of corporate initiatives

Network Monitoring & Management

In order to assure the availability and performance of critical business services and Healthcare Infrastructure, ISD would setup a Intelligent Network Monitoring & Management system that will benefit in the operations as follows:-

- Reduce operational costs by delivering a central point of management for all IT and network operations, providing rapid results measured on both time to value and return on investment.
- Maximize service availability and reliability through automated event correlation, problem isolation and resolution capabilities, enabling rapid identification and resolution of the most Critical problems.
- Maximize return on infrastructure investment through accurate discovery of deployed IP-equipped assets and their configuration, identifying unused ports and recovering lost capacity
- Improve staff productivity by providing real-time web dashboard views with customizable displays for events, service views and operational indicators for true consolidated operations management.

3. Web Portal Services and Integration with Applications

MOH Web Portal

It is MOHs' vision to align data from disparate applications, such as PCIS, HMIS, Overseas Treatment System and Back office support applications like Tendering and Purchase system, General Stores Inventory System, Maintenance system, Document Management System etc. using Web portal technology. In turn, that will provide an environment for interoperability and integration of current and future systems and thereby help in achieving the goal of better Patient Safety, Delivery of Health care, Operational efficiency, and Cost control to a higher level.

The objective of MOH Web Portal would be to distribute any type of information across and between multiple diverse systems and applications, providing delivery of the right information, in the right format, at the right time .Reduce the number of point-to-point interconnections and simplify application programming by removing integration logic from the applications. Powerful publish-and-subscribe matching engine routes information in real time based on topic and content to any endpoint Validate and transform messages in-flight between any combination of different message formats, including Web Services, other XML and non-XML formats. Route messages based on (evaluated) business intelligence rules to match information content and business processes. Improve business agility by dynamically reconfiguring information distribution patterns without reprogramming end-point applications. Access control to securely deliver personalized information to the right place at the right time

The web portal would support all basic content and features of a public sector organization in the health care industry. The portal would provide the look and feel and corporate identity of the Ministry of Health. The portal would be developed using globally recognized standards and technology which is in compliance with the W3C requirements. Web Portal would initially provide the following services with provision to incorporate future service requirements:

Patient Self Service portal

The portal would have a Patient Self Service System that will allow patients to register online and perform basic functionality that is related to:
- Register with the MOH Portal
- Booking Appointments with Doctors online
- View Doctor Schedules
- Receive News / Alerts / Updates
- Access Information about MOH Hospitals, Clinics, Partners, Etc.

- Access ongoing initiatives and projects related to general public
- The patient self-service portal aims at serving the primary audience of the portal which are patients served by the government hospitals and clinics in State of Kuwait and later scale it up to support all population of Kuwait even if they are visiting private hospitals for healthcare visits and treatments.
- All MOH patients to create their profile on the web site.
- Provide a user friendly access and interactive user experience on the MOH Portal
- Provide complete bi-lingual content and information available for the users.
- Provide access to doctors schedules, key announcements, open clinics
- Provide an interactive map of Kuwait with information about which hospitals and clinics are open, their timings, types of healthcare they offer, etc.
- The portal would provide the patients with key announcements and programs that are underway at different hospitals and clinics.
- MOH and government announcements and warning related to healthcare would be made available for the patients.
- The portal is required to have the necessary integration with the different Hospital Information Management Systems and bring necessary functionality and information to the internet through easy access with complete security of information and protection of privacy.
- The portal would handle patient referrals from one doctor to another or from one clinic / hospital to another.
- The portal would have the functionality to provide access to the patients to their Medical Records and History.

Doctor's Self Service Portal

Doctors would have a self-service portal that provides them with the features and functionality to create their schedule. Access different content and documentation / papers online, view patient history / patient profile as appropriate and as governed by the Access Control System and Identity Management System. The doctors would be able to create / modify their schedules and other information related to their respective experiences.

Employees Self Service

MOH aims at providing its employees with added functionality through the MOH Portal. Primarily MOH's objective is to make available additional services for employees that are currently not available through the existing Information Technology Infrastructure and applications. In general the functionalities would include and are not limited to:

Employees would have access to features related to access content specific to MOH Employees like duty schedules and events / announcements.

The MOH Portal would allow employee access to webmail access.

Additional services currently not available for employees through existing IT Infrastructure

Workflow Enabled

The MOH Portal would be empowered with state of the art workflow management system. The MOH Portal would allow:

- Creation of online workflows and transaction flows as per MOH requirements easily.
- The system would allow acting different workflow steps and actors as needed.
- The system would allow scanning and easy printing of different input / output documents.
- The portal system would allow the workflows to be executed online with optimum performance and considering access rights and security / data encryption concerns / requirements.
- Typically the workflows will be needed for booking appointments, employee processes like leave requests or requisition requests, patient transfer cases, etc.

In short, MOH objective is to use the portal and leverage the web technology to bring all of its possible business online.

Web Portal Integration

Integration of Portal with Primary HealthCare System

The web Portal would be integrated with the upgraded Primary HealthCare System. The integration would ensure that the needed / required data and parameters are successfully passed between the two systems. The integration aims at leveraging the existing IT & Application Infrastructure at MOH.

Integration of Portal with Health Information System for all Hospitals

The Web Portal would be integrated with the Health Information System for the all hospitals of MoH. The integration will ensure that the needed / required data and parameters are successfully passed between the two systems. The integration aims at leveraging the existing IT & Application Infrastructure at MOH.

Integration of Portal with Health Insurance Application

The Web Portal would be integrated with the Health Insurance System. The integration will ensure that the needed / required data and parameters are successfully passed between the two systems. The integration aims at leveraging the existing IT & Application Infrastructure at MOH.

Integration of Portal with Overseas Treatment Application

The Web Portal would be integrated with the newly developed web based Overseas Treatment application. The idea is to make the application available locally and overseas as an integral part of portal where the users can do all the work related to the application online by using the application which is linked with Portal.

Integration of Portal with Expat Examination Application

The Web Portal would be integrated with the upgraded Expat Examination Application. The integration would ensure that all needed / required data and parameters are successfully passed between the two systems. The integration aims at leveraging the existing IT & Application Infrastructure at MOH.

Integration of Portal with Birth & Death Certificate Issuing Application

The Web Portal would be integrated with the Birth & Death certification Application. The integration would ensure that all needed / required data and parameters are successfully passed between the two systems. The integration aims at leveraging the existing IT & Application Infrastructure at MOH.

Integration of Portal with Dental Application

The Web Portal would be integrated with the Dental Application. The integration would ensure that all needed / required data and parameters are successfully passed between the two systems. The integration aims at leveraging the existing IT & Application Infrastructure at MOH.

Integration of MOH Systems with PACI & MOI

The integration of MOH Systems with PACI and MOI will be done by using the Message Broker solution.

4. E-Governance

To utilize the consolidation, achieved by above means, to serve the citizens(G2C) , to connect to other Governments(G2G), Businesses (G2B) and government employee(G2E) thus providing better service to Citizens and Expatriates and bring about transparency and accountability to workplace which are among the primary objectives of making E-Governance a reality.

E-Governance is the next logical step in Automation. It is only logical for e-business to be conducted through internet and related technologies to reap the benefits that it brings.

Connecting Governments (G2G)

It will yield better operations and decisions. MOH can achieve by taking this path. Some of the major benefits could be

1. Connecting to PACI directly for Civil Id information, which is the primary method of registration at:
   - PHCs, Hospitals, Specialized centers for appointments.
   - Health Insurance System
   - Birth and Death Registration etc.,

   Instead of manually transporting and uploading the data into Health care system. This will help in cutting costs and time involved, Avoiding redundancy of data among Govt. agencies, avoiding manual error while loading data, avoiding theft while transporting data etc.

2. Connecting to **Ministry of Finance** and be part of a trusted financial Management which will give better control over budgeting cycle and other transactions, better financial tracking and reporting, better worker productivity, increased efficiency.
   All this can result in funding reduction. Thus the challenge of achieving more with a smaller budget is achievable.

3. **Sick leave Management** can be done by directly connecting all the ministries to MOH Repository and providing the day to day sick leave related transactions online thereby helping them to act immediately instead of waiting for the delay. This could also be connected to **Civil Services Commission (CSC)** Agency and thus affect them in Payroll instantaneously.

4. In short connecting to ministries which will help in making void all the redundant processes that exist between various organizations.

Connecting employees (G2E)

Some of the major benefits could be efficient internal human resource process resulting in cost savings and improved services to employees by connecting our ministry to **Civil Services Commission** who is having a plan to implement e-governance.

Some of the processes that can be automated are:-

- Allowing the employees/review committee members to monitor employee performance.
- Update his/her career and educational achievements, achieved after employment, by way of trainings, certifications etc. which will help in furthering his/her career.
- Annual Vacation Process.
- Better focus on manpower planning and recruitment process.
- Deployment of manpower resources, Development of their skills as per the demands of various projects.

These are the tasks that require compliance to certain procedures and are labor intensive which could be automated and thus save enormous cost and time.

Thus MOH will focus in establishing an environment that will result in following benefits to the organization and employees:

- Optimally Sourced workforce.
- Align workforce to organizational needs.
- Connect people, content and community.
- Compete globally in terms of implementing various compliances at global level, and focus locally.
- Decrease cost while increasing value.

Finance ministry can set the budget based on ground conditions and existing trends, enforce and track the utilization of budgets and thus identify Cost 'Hot spots' as they occur and sort them out immediately in consultation with respective managers.

Connecting Citizens (G2C)

To provide a citizen centric process or citizen data integration wherein a **single source** of truth record exists in what is known as a **Citizen Data** hub and all registrations and renewals like Health insurance renewals, and other services are done by connecting to this hub. This will cut down on cumbersome manual process of registration which involves extra labor in different agencies, Resources like costly IT resource requirements and end up with redundant data.

From the Healthcare service point of view Laboratory results could be provided from the **Library Information system (LIS)** online to citizens and to concerned medical professional and thus act upon according to the severity of the problem. Messaging services could be integrated which can be utilized by the medical professional to intimate the citizen of the result, according to the severity.

Connecting to Business (G2B)

This provides the single point of interaction for business community thus allowing Strategic vendor relationship and can result in reduced costs and services.

Procedures and Policies for Approvals and Registrations of Vendors can be made available online.

As MOH utilizes the service provided by Healthcare Operators globally the business part of it like getting Visa, Accommodation, Tickets with travel agents etc. could be done using this service.

Kuwait Intelligent network

Kuwait Intelligent Network, popularly known as KIN is the connecting highway to various Government Agencies using high standards of network availability and securities to meet the challenges of future. Ministry of Health is in a process of availing the facility of KIN for connecting to various government agencies.

Why Web Portal & E-Governance?

- Improved Health care to individuals and communities.

- To achieve better administrative and operational efficiency among the Healthcare community in the form of saved time, cost control etc.

- To achieve better administrative and operational efficiency at the administrative level thus providing better Back office support, Strategic vendor relationships thus connecting businesses, Improved services to employees etc.

- To provide access to the citizens and Expatriates of the country about Health facts and awareness. Health education and about various programs and policies addressed to the general public.

- To provide Valuable information to decision makers using **Business Intelligence tools** and **Decision support system** thus enabling them to come with effective solutions at the right time and place.

- To connect Government to Businesses(**G2B**) thus gaining strategic vendor advantage, transparency in business dealings, Government to Government(**G2G**) business transactions thus reducing duplication of information, reduced procedures and formalities etc. ultimately making a citizen's life easy in dealing with government(**G2C**) various issues.

5. IT Governance

Effective IT governance, risk and compliance (GRC) is essential for MOH to meet increasingly stringent regulatory and audit requirements and reduce business operational risk. By instituting the appropriate IT GRC controls, MOH would demonstrate regulatory compliance in areas of specific concern to auditors. At the same time, these controls would take MOH beyond the immediate need to pass an audit and into the realm of reduced operational risk exposure through process improvements.

In practical terms, meeting every set of regulatory and audit requirements is a tremendous undertaking, given the number and scope of regulations that MOH faces, and the multitude of controls that must be put into place to comply with these regulations and to pass audits.

6. Disaster Recovery Site

MOH would implement a disaster recovery site and business continuity plan with the best option to have least downtime by constructing a HOT-SITE in a strategic location preferably far away from its current location having different communication exchange and power distribution facility to replicate data in real time.

In addition MOH would consider availing the services of a major vendor called Electronic Vaulting Services where MOH could hire storage space in their highly secured disaster recovery site in another geographically located Country backed by Non-Disclosure Agreement (NDA) and Service Level Agreement (SLA) whereby we move data securely offsite with minimal network bandwidth and encryption technologies. In addition, it would allow MOH to perform reliable automated backup of regional hospitals, clinics and remote sites. This would protect the vital data of MOH in event of major disaster like WAR and natural calamities (earthquake, tsunami, flooding etc.).

7. Training Center & Seminar Auditorium

MoH, ISD foresees a rapid growth in terms of Operations and will require a lot of talented skilled professionals to be able to meet the growing needs of services through Information technology. Thus, it has setup a Training center within the premises of the new datacenter to provide hands on training's to fresh national graduates who wish to build a career in Hospital Information Systems by improving and enhancing their skills sets, productivity and efficiency for high skilled jobs in various disciplines of Healthcare Informatics so that they can be seamlessly absorbed into MoH or pursue a career in healthcare services elsewhere.

Seminar auditorium is fully equipped with Audio/Visual system with a smart board facility for white board presentation and latest product seminars from the parent companies to showcase the latest technology and carry out presentations.

Current Applications at MoH

Disparate Systems (Back office)

MOH will effectively use its portal solution in **integrating its legacy back office applications** and thus reaping the benefits in the form of Operational efficiency and cost control and be more transparent in its operations. The systems that are to be integrated are the **Tendering and Purchase system** and **General stores Inventory System** which together will handle local Purchasing, Tendering process and Goods Receipt and Inspection at the General stores and Goods distribution across Kuwait from the main stores.

IT Department that receives its goods through above mentioned system does its Hardware, Software Inventory Management requirements through its **Maintenance system** which keeps track of the movement of equipment from the local stores of the IT Department to other departments, sections and sub-sections across Kuwait. This helps in Asset management, System availability before the introduction of particular projects etc.

Document Registration system is used to register all incoming and outgoing documents to the ministry as well as correspondence within the ministry.

Attendance System provides details as to total no of employees, No of people on sick leave, other leave Employees on vacation, No. of late comers etc. which will help in manpower resource planning and for other decision making issues.

All the future projects will also be linked to the portal.

Health Care Systems

PRIMARY CARE INFORMATION SYSTEM

Introduction

Primary Care Information System (here after **PCIS**) is a system that helps in achieving the objective of having an electronic medical record for patients. The electronic medical record that resides in a system is specifically designed to support users by providing accessibility to complete and accurate data, alerts and clinical decisions support system.

Decision support system refers to clinical consultation systems that use statistics to assist practitioners in diagnosis or in formulating treatment plans.

PCIS

All health centers at different location in the country run Primary Health Care System application which was developed in-house at MOH Information systems department. This is a Client/Server based application built on RDBMS which connects all sections through local area network. The application keeps record of patient through Civil ID number. It automates the entire care process which includes reception, the doctors, Nursing pathways, labs and automatically furnishes data to pharmacy. Pharmacy department runs fully automated label printing system with patient information and medicine dosage details.

Main Modules of PCIS:

General Treatment Modules
- Reception/Queue Screen/Filing
- Doctor's Module
- Investigation Module
- Pharmacy module
- Nursing module
- Patient query
- System administration & Reports.

Specialized Treatment Modules
- Diabetes
- Maternity
- Dental
- Psychiatry
- Vaccination (In progress)

Future modules to be added
- Dermatology, Ophthalmology & ENT

There are several other modules developed on doctor's request to meet the clinical requirement. The application helps generate various kinds of reports based on patient diagnosis, age, demographic data, disease, drugs and many other choices.

Central Server (MOH H.Q.)

MOH HQ has Central Servers which are connecting to all Primary Health centers in different regions through Wide Area Network. The server and the database are clustered to provide resilient, efficient and fail proof solution for data protection at high level. The patient data is stored centrally at these servers.

HOSPITAL INFORMATION SYSTEMS

The Ministry of Health has modern hospital information system that encompasses computer hardware, software special package and network for all the regional general hospitals. MOH has implemented state-of-the- art system components in each of the mentioned hospitals. Each of these General hospitals serves a specific health region. Currently there are six health regions in the state of Kuwait.

- Hawally Health Region served by Mubarak Al-Kabir Hospital.
- Al-Farwaniya Health Region served by Al-Farwaniya Hospital.
- Al-Jahra Health Region served by Al-Jahra Hospital.
- Capital Health Region served by Al Amiri Hospital.
- Al Ahmadi Health Region served by Al Ad'an Hospital
- Al Sabah Medical Specialization Region served by Al Sabah Hospital.

It must be mentioned that above first five General hospitals are completed with full computerization and they are up and running. However, differences and variations do exist among the clinical sections and medical specializations in each of the general hospitals mentioned above. In general, any two regional hospitals may differ in the number and type of specializations (specialties), thus, one hospital may have obstetrics and gynecology section where the other according to the needs of the community it serves, may have eye/ophthalmology section according to the specific needs of the region. However, these differences are normally kept to the minimum. So that the hospitals are properly called general regional hospitals and referrals of patients from these general hospitals can be made properly to specific specialty hospital in Al-Sabah Medical Specialization Region for seeking specific treatment. All six (6) regional hospitals mentioned above constitute secondary health care in Kuwait.

MOH has implemented solution based on UNIX and Oracle® relational database as to have enterprise solution to work towards Single Medical Electronic file as a whole.

1. The expected large volumes of transactions/patients per minute/day and as required by doctors and practitioners the response time must be less than three (3) seconds at most.
2. The hospital information system will be on-line, real-time and is based on GUI and currently it is under implementation.

This standard forms the basis, to connect Regional General Hospital
LAN with MOH HQ' network via high-speed fibre optic connection as well as high-speed wireless
connections.

Eventually all primary health care center and secondary health care systems will be connected to form
the basic source of patient information system to enquirers through internet and/or top management of
MOH. To achieve this target, a further higher level of connection will be established between the
regional hospitals and the DOIS (Department of Information Systems) systems through MOH- Health
WAN (Wide Area Network) network via high-speed communications lines and wireless links, Thus
achieving and establishing a long sought objective of MOH and consequently producing and promoting a
much better health care delivery that can be harvested and readily obtained.

Hardware:

All the Hardware utilized at Hospitals are of high standards and reliable with high availability, durability
and resiliency.

Servers:

Mid to High end servers with Multi-processors system with large memory configuration are utilized in a
clustered mode along with Clustered storage to provide high availability and resiliency.

Clustered Storage:

High capacity clustered storage with fiber interface and optical drives are deployed to store large
volume of data and to handle the query of data at very high speed. The state-of-the-art technology is
implemented to reach the goal of high standards and quick retrieval of data.

Software:

Operating System

The Unix® Operating System with the following standards are implemented as to keep the security & provide Open Architecture Standard:
- System V Interface Definition (SVID3 Base and Kernel Extension) with Support for UNIX System V application.
- Compliant with the Open System Foundation (OSF) Application Environment Specification (AES).
- Comply with Industry Standard Specification including FIPS, POSIX,). X/Open, XTI and AT&T System V Interface Definition (SVID)

Database Engine:
Database Architecture RDBMS

Keeping in view the expected high volume of transactions, and the 24/7 needs of the hospital systems ministry has Enterprise Relational Database, application server for Web-based requirements, and allied tools running on Real Applications Clusters for database servers

Application Software:

The characteristics of the package are as follows:
- The package is MODULAR.
- It is a real-time application
- The package responds to doctors and others' queries within three (3) seconds at most.
- It is bi-lingual: Arabic and English/Latin
- It is WWW based, and has its own Internet/Intranet component with firewalls and security protection levels and installed as WEB based Application.
- It is designed to communicate directly with all MOH standard existing packages/subsystems (likewise: primary healthcare and laboratory systems) and hospital information system and the medical stores system.
- It is open ended to accommodate other modules in future.

Main Modules

1. Patients Master Index

This module handles mainly registration of all patients at the hospital through a unique Patient Identification number. It also holds vital medical and financial details which are of long-term significance. The module generates embossed/computer readable identification cards, adhesive labels and patient folder front sheets. The module is designed to support multi-site operations to operate across multiple health care establishments. It helps in central repository of patient details.

Registration
- Accommodation of current manual numbering schemes.
- Integration with PACI data for Demographic details of patient.
- Automatic as well as manual allocation of unique Patient Id number.
- Temporary registration of visitors and new born and conversion from temporary patient to a permanent registration later if need be.
- Facility to identify possible duplicate registrations and merge into one.
- Possibility for block registrations in case of accidents and epidemic breakout.
- Facility to register birth using mothers details and death.
- Facility to generate registration cards, labels and print them.

Classifications
- VIP indicator. This must flash across all screens.
- Facility to withhold display of Classified patient particulars.
- Active/inactive patient classification/indicator
- Generation of active patients mailing list.

Search facility:
- User definable search criteria, with Soundex search provided in Eng/Ara.
- Provision for on-line look-up/list of values pop-up window for coded fields.
- Facilitate capture of certain medical information.
- Facility to link a patient to family and display the hierarchical family tree.
- Capture referral source.

Other features:
- Integration to the billing system.
- Maintenance of user definable master codes.

2. Appointment Scheduling/Outpatient Clinics

This module handles the automated function of outpatients' transactions. Hospital clinics and other resources are accurately defined so that appointment booking can be easily done and processed. Also, it produces notifications for patients system and possibility of over-booking. Walk-in patients are allowed based on emergency needs. System follows Standards such as ICD10 standards for diagnosis, complain codes.

Other features include

- Weekly Work Scheduling for Doctors, Nurses and other medical personnel which also includes no of slots per work day, overbooking limits etc. Transfer of schedule including the existing appointments to another day due to emergency reasons is possible.

- The system is completely integrated with the billing system with flexibility in settlement types and to AR system to cater to insurance / company tie-up arrangements.

- Facility to indicate type of visit whether new / fresh or repeat / revisit, whether walk-in or with appointment. It is possible to allocate different time slots depending on the type of visit.

- System is integrated to internal and external sources (other hospital systems) to capture referral source information.

- Facility to view/pop up Past medical history, allergies and vital signs, family history and high risk categories (with password protection).

- System to be capable of monitoring the waiting time of a patient as well as the actual consultation time.
- Integration to Lab module for doctors / nurses to enter orders for investigations, verify status, view results and compare with previous results.

- System to generate a pick-list for the medical records department in order to extract the patient files well in advance and sends them to the concerned clinics / doctors.

3. Order Management

This part of the package handles all requests for services such as requests for conducting laboratory tests, radiology, pharmacy, kitchen and housekeeping. Also, all internal requests/mail from one department to the other is handled by this module. That is it forms the main communications hub of the hospital's system.

- The order entry closely integrated with billing system and provides the possibility to charge the patient either after the service is rendered or before depending on the billing rules. It is possible to define this at each service level and should be governed by parameter settings. priority indicator to show the urgency, number of times the order may need to be repeated, if applicable and free text for any instructions are provided. The order entered is instantaneously made visible at the destination department for initiating the service process. This way, for e.g.,

in case of inpatients for some investigations relating to blood, the system prompts the concerned authorities to collect the sample.

- The system allows bi-directional interface for all the standard laboratory equipment. For result entry, the system should provide facility to enter results directly into the system where direct interface with equipment is not available. This should include word-processing like features including free-format text entry.

- System provides for interface with bar-coded label printing so that the labels can be stuck on the sample containers. The label formatting can be user-definable.

- For security reasons the system records the date, time and id of the person issuing the request, person conducting the test, entering the results and authorizing the results etc.

4. Pharmacy

This module support MULTI-PHARMACIES. Such as:

- Main Pharmacy.
- Outpatients Pharmacy.
- Emergency/Casualty/trauma Pharmacy.
- Medical Stores. This module is integrated with existing Medical Stores Information Systems so that they can be connected together. Stock Maintenance
- Pharmaceutical Laboratory.

This module creates and updates continuously a database of prescriptions and/or medications prescribed to patients. It gives the facility to answer all requests and specimens. Also, it communicates results and/or queries to and from the enquirer. The system can print labels of prescribed medicines and drugs with dosage details (Age related) and patient demographic details. Also, the system is able to check drug-drug interactions when a prescription is entered by the doctor and notifies the doctor. In case the doctor insists to proceed, he must justify his action. The system must allow entry of multiple diagnoses for each patient for justification and for other similar purposes.

- ATC Grouping: It is possible to classify drugs based on Generic names and grouping based on Anatomic, Therapeutic and Chemical Classifications.
- Indications / Contra-indications and Precautions are maintained in coded form and as monographs
- Authorization Indicator: Flag to indicate whether the drug is restricted and needs to be authorized by the pharmacist before dispensing.
- Conditions for storage and whether the drug is a combined preparation
- Drug Information: The following aspects are indicated like Poisonous drug ,affects driving ability / drowsiness, Photosensitive, Hygroscopic, Affects Lab- results, Discoloration of Urine/faeces, Affects Mother's Milk.
- Facilitate one-time bulk or repeat prescription. Facility to look-up previous prescriptions for a patient and repeat, if necessary.

- Inventory: The system can automatically update the stock quantity as per the batch being dispensed. Provision for return of drugs from the patient with automatic updating of stock corresponding to the batch number with a expiry verification. This should also allow for billing refunds as per rules. System allows definition of multiple units of stock/ dispensing. System caters for multiple stores with a concept of Central Store, Sub-Store, Non-Stock Store, etc. Inventory is in turn linked to the Purchase system.

5. Radiology

This module must be capable of communicating and accepting and/or delivering data to/from already existing information that is currently been used in few hospitals or will be installed in the future. The existing modules have been accepted by MOH radiologists.

6. Operations Theatre Scheduling and Processing

This is to schedule and sequence operations on a certain time frame.

- Handling of MULTI operations per patient.
- ICD-10-CM coding schemes.
- Allocation of SURGERY medical team.
- Scheduling of ANESTHESIOLOGIGTS and other medical personnel.
- Reservations and appointments for surgeries, with Block reservation of Operation Theatres for specific days of the week for a specified period and specialties/surgeon.
- Linking with the inventory module.
- Must allow for descriptions of operations and to capture Pre and post operation details like anesthesia given time, recovery time, complications, etc.
- System should allow for retrieving general medical information about types of operations that take place, there number
- Provision for definition of surgical supplies and articles associated with each operation i.e pre-operative checklist.
- Provision for entry of risk factors, medicines, anesthesia and complications associated with each operation.
- The system has appropriate interfaces with billing, inventory control and pharmacy modules of the overall system.

7. Laboratories

This is capable of communicating and accepting and/or delivering data to/from already existing module that is currently been used in few hospitals or will be installed in the future. The existing module has been accepted by MOH Laboratories. It must also accept data from existing or future installed module and produce required reports (final and/or interdepartmental).

The package must communicate with MOH laboratory system. The package must be connectable to the MOH system. It must read/write to the will be installed package in the hospitals.

8. Dietary Control

This module allows dieticians to register and book the required diet specified by doctors to patients by deciding e.g. low fat, low salt meals.

Diet Orders:
- User definable menu, diet type, and classification.
- Patient meal requirement orders received directly from wards
- Accommodation of meals to patient transfer and Discharge.

Diet management:
- Dietary profiles for patient while be able to view past history.
- Appointment for diet counseling.
- Requisition for special dietary to kitchen
- Meal distribution list
- Patient Dietary follow up notification list.
- Inventory Control

9. Emergency Admission

This section handles emergency patients and accidents. It must generate numbers for incoming patients. Also, it should handle medications and/or laboratory and/or radiology requests. It must keep track of police reports and other legal requests. Patient Demographical details, Allergy, chronic disease warnings, medical history etc. should be available.

14. Personnel Management

Personnel management constitutes a range of administrative applications. Leave applications, holidays, and sick leave are included. Recruitments, legal investigations, Manpower development and training are supportive programs. Personnel and financial management application are integrated for the purpose of payroll generation, leave management and other back office support.

15. Administrative Affairs

Hospital runs a complete module to serve functions of administration.

16. Hospital Management

This module enables the management of the hospital to run, enquire and follow up procedures and actions. The module tracks all actions, and allows the management to monitor and taken action accordingly. Also, the system should include Doctors Evaluation Annual Report facility. The system locks the patients file after being entered so that NO further editing is allowed except after being authorized from hospital director. This is very important issue in medico legal cases.

Business Intelligence & Decision Making

Organization of various factors affecting services provided by health centers and Hospitals:

- o Distribution of population to various clinics and Districts etc.
- o The numbers medical professionals serving them at the clinic level.
- o Distribution of Resources like Hardware equipment, Laboratory Equipment etc.

Statistical reports on events that affect the organizational factors like:

- o Patient visit breakups by age, nationality, sex
- o By sections (Male, Female, Child, Diabetic, Gynecology) etc. at PHC and Specialized Clinics.
- o Peak Hour statistics.
- o In patient / Outpatient details, Occupancy of beds, availability of staff to handle different scenarios that come up from time to time at Hospitals.
- o Transfers or Referrals to Specialized Clinics and Hospitals are monitored.
- o Sick Leave management by work places based on different period like Day, Month, Year, Clinics, Physicians etc.
- o Healthcare Professionals Performance reports etc.
- o Vital statistics like total fertility rates, fertility rates by nationality, age etc.
- o Birth rates, Mortality rates like Infant Mortality rates, Maternal mortality rates.
- o Diseases and allergy statistics etc.