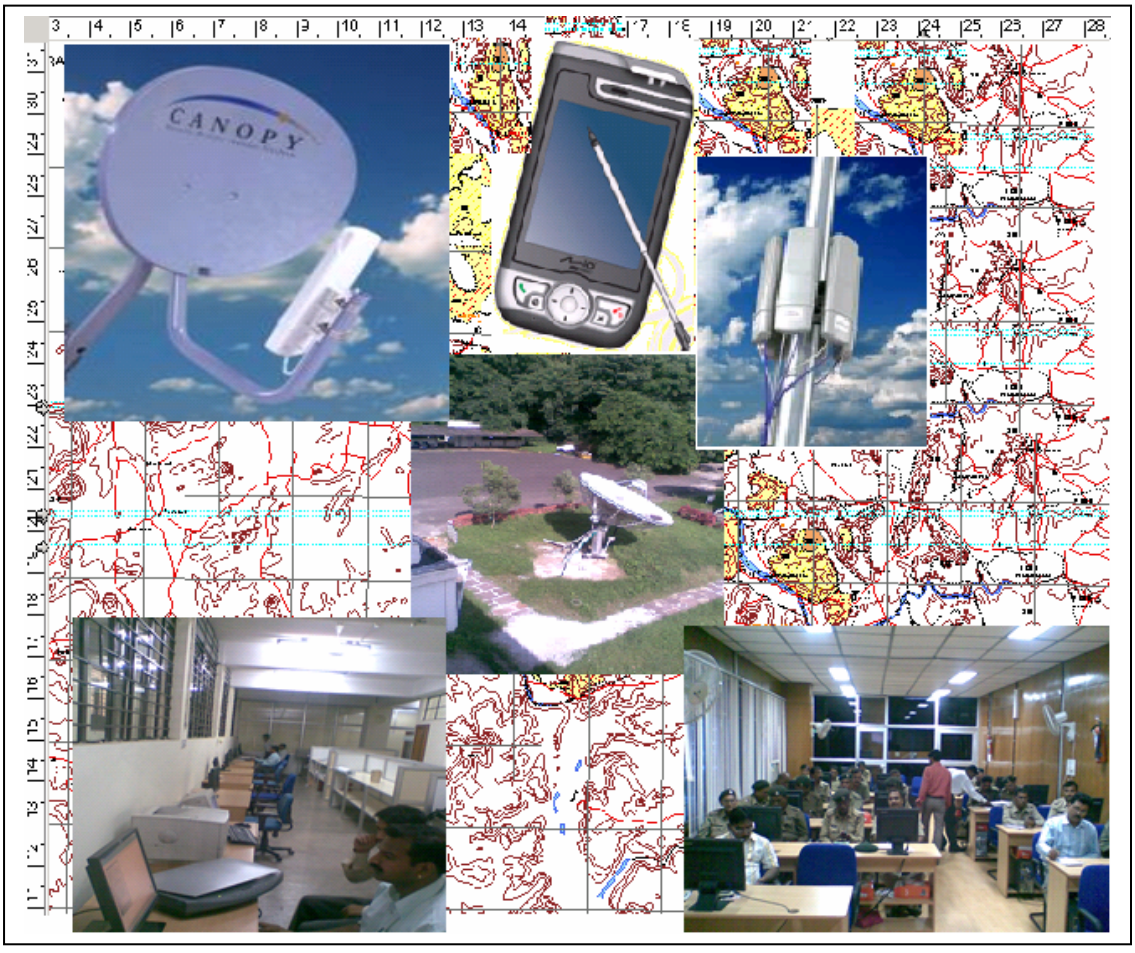
ICT INITITATIVES

IN

MADHYA PRADESH FOREST DEPARTMENT



by

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BACKDROP

Managing natural resources especially forest and wild life is a difficult proposition in present context not because they are living and dynamic components of the ecosystem but due to the fact that their extent is vast, they are in geographically disadvantageous locations and that they not only fulfill the aesthetic and survival needs of the human beings but are also the target of the human greed. Forest managers world over especially in under and developing economies are feeling the pinch to ensure their sustainable management. Situation in India and in the state of Madhya Pradesh in particular is no different.

Though the scientific management of the forests in the country dates back to 19th century, the structured information on forestry sector is lacking because not many initiatives were undertaken at national or state level to create forest related databases. Earlier forests were only looked upon as the source of revenue to the state exchequer. The need for the proper protection development and sustenance of forests was never a major issue with the planners. Therefore forestry sector always remained ignored which affected its development including technological innovations.

Now when India is regarded as hub of the Information and Communication Technology (ICT) every sector in the country is talking of using ICT. Though a late starter forestry sector is not lagging behind. However efforts in this direction are state specific while a centralised approach is advocated to avoid duplication of efforts and to maintain uniformity and compatibility.

FOREST MANAGEMENT

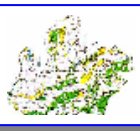
The magnitude and extent of forest and wild life management is large and complex and it involves multi stakeholders breaking all the geographical barriers.

Forest and wild life management involves vast geographical areas therefore it is administered by a huge establishment and a large work force. There is widespread public dealing especially with scheduled tribes and backward communities which mostly dwell in and around forests. Since rural life intimately revolves around forests, forestry sector assumes greater significance and sensitivity.

The silvicultural management involves large number of work sites in geographically disadvantageous locations. Management policies of many other line departments override silvicultural prescriptions therefore foresters have to manage good liaison to minimise risk of forest damage.

National Parks and wild life sanctuaries have different set of management prescriptions which are basically protection and conservation oriented therefore public wild life interface and conflict resolution is a demanding management intervention. Eco-tourism is adding new dimensions to it.

Nature and diversity of works executed by the forest department also speaks out the magnitude and complexities involved in the management therefore monitoring and decision making becomes very critical. The inadequate and age old information and communication infrastructure is challenging to manage and get the day to day



activity report for monitoring and decision making. The inherent delays hamper the decision process required at a particular time thereby affecting the quality of output.

It is in this context that ICT use was inevitable so that the efficient management of the forests is ensured and quality of goods and services by the forest department to the society is improved.

ICT INITIATIVES

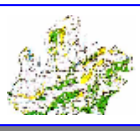
OBJECTIVE

Traditionally forestry information in MPFD used to be managed manually. However a few computers were introduced for the first time under World Food Programme. It was during the World Bank Forestry Project in late nineties that computer use became more extensive and intensive. But the use of computers remained limited only to managing information either in Excel or in Access for a very few jobs. Later on MPFD started using information from multiple systems and different stand-alone applications serving different purposes. Some specialized linkages like GPS based location interface, GIS interface were also developed. Useful data was not connected, which resulted in jumping from one application to another and one data system to other as well. The end user had to put a lot of efforts to find any relevant data of his interest. This "island" approach has been the main cause in increased maintenance cost and risk. Even the organization's ability to modify or create new systems to meet evolving business needs was limited because of the complexity and variance in the technology used.

Therefore a broad decision was undertaken in March 2007 to organise the forestry information in an integrated manner by using the latest technology available. The ICT initiatives are so planned that it ensures smooth integration of multiple technologies like RS GIS, GPS, GSM GPRS and Mobile computing etc to the best advantage of the department.

The main objective of the ICT application in the department is to systematically organize planning implementation and monitoring of forestry and other related operations by systemic collection storage and retrieval of MIS and Geo-spatial data through a computer based communication network.

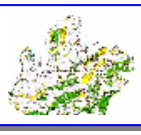
MPFD is executing its technology initiatives in an integrated manner where in all its key functions will be carried out through web based workflows which facilitates each role player to log on to the departmental portal and enter his work/data/information and which also facilitates every employee to remain in constant touch with the latest happenings in the department. This working methodology will not only bring transparency responsibility & accountability but will also bring efficiency.



SYSTEM REQUIREMENTS

Based up on the above strategy the overall ICT system requirements of the MPFD and the selected technology solution for each requirement to efficiently run the system have been identified as follows:

S#	Requirement	Technology(HW/SW) selected
1.	**Developing appropriate application software**.	.NET is the development platform and IIS is the Application Server. Also, **Web Servers** have been installed to access the applications through Internet.
2.	**Data capturing.**	.NET Compact Framework, Mobile Device Software Development Kit and SQL Compact/Mobile would be required for application development and capturing data. **GPS facilitated Personal Digital Assistant is the major MIS and GIS data capturing device in the field.**
3.	**Centralized repository of data**.	Processor based **Database Servers** with High Availability have been used. SQL Server is the technology selected.
4.	**Digitization of maps for location based monitoring.**	Arc Geographical Information System of ESRI Technology is being used on a separate **GIS Server.**
5.	**Web-based Workflows for management/monitoring and a Portal for publishing various types of information on the Internet.**	Share Point Server Internet on the **Web Server** has been planned and is yet to be used.
6.	Establishing internal system of **communication and messaging** to utilize the ICT infrastructure and the PDAs.	**Exchange Mail Server**, communication network
7.	Establish **identity & rights based access management** for **built-in security** and to provide **single sign-on** for accessing multiple applications and emails etc.	Directory Services using **Domain Controller**.
8.	Building **security** in ICT setup as the application access would be through	Firewall and DMZ Firewall



	Internet.	

In order to execute ICT initiatives following four major work groups were identified:

- Development of applications
- Creation of a Data Center
- Development of computer based communication network and
- Sharpening the ICT skills of the manpower

APPLICATION DEVELOPMENT

The department has classified various core activities into 9 applications as given under:

DEVELOPMENT OF GIS BASED RESOURCES INVENTORY QUERY SYSTEM

This is the most ambitious and important application of the MPFD. The main objective of this GIS based application is to develop Forest Resource Inventory and its annual updation using RS or cartosat data so as to facilitate forest management planning with high degree of accuracy.

To develop GIS based query system for resource inventory, it is necessary to have digital data of the entire forests. Digitisation of the stock maps of state's entire forest area is in full swing and would be completed in another six months. GIS based query system is under development by NIC.

The GIS based query system will make it possible to access all the information about forest stock up to Coupe level at the click of the mouse from any location through internet since the whole data will be posted on GIS server.

FOREST LAND MANAGEMENT SYSTEM (FLMS):

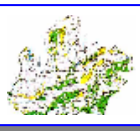
An extensive chunk of forest land is constituted in to a Block and is notified in gazette as forest area. It is this block which is the basic record of forest land in a forest division. The block record contains all the information of various khasras of revenue records which have been included in the forest block. It is also accompanied by a map. For the purpose of recordkeeping for future reference all the records and maps of all the forest blocks would be digitized and linked with above mentioned GIS application being made specifically for this purpose.

FOREST PROTECTION MANAGEMENT SYSTEM (FPMS):

This application aims to monitor protection status of forest and wild life. It mainly covers forest offences, forest fires and forest protection related information. This system has following three sub systems:

1. Forest Offence Management System (FOMS)

This application combines MIS & GIS to register forest offences electronically on GPS facilitated PDAs at the location of offence itself



and then transferring data either to main server (if GPRS connectivity is available) or to Range computer in offline mode. The application helps building database of different forest offences and offenders long with their photographs. It also outlines sensitive areas. The application has been operationalized and is very useful in containing the forest offences.

2. Fire Alert Messaging System (FAMS)

Fire alert and messaging system is a small but very useful computer program which combines GIS & MIS technologies. It uses processed remote sensing data of active fire locations obtained from MODIS satellite& sends alerts to concerned field staff from Beat Guard to CF through Short Message Service (SMS) & e-mail. It also builds the database of fire locations which can be used to identify fire sensitive zones scientifically and also to plan fire control strategy. The response module is designed to collect feed back about correctness of alert locations, extent of fires and also the gap time to attend the fire for control.

3. Protection Information Management System (FIMS)

FOREST MANAGEMENT SYSTEM (FMS):

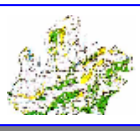
Forests are managed through various silvicultural systems which are prescribed by a forestry management expert after carrying out detailed study and taking into consideration all parameters. There are many silvi-operations under each silvicultural system which needs to be monitored w.r.t. their effect on the forest development and growth so that mid term corrections could be done based upon the actual field results. This requires regular collection of huge amount of data annually for at least 7 years its compilation and analysis and report generation. It is a difficult task indeed. The application will facilitate the whole exercise and location wise details along with maps will be possible. The application will have MIS and GIS interface. In the 1st phase following important silvicultural systems are in the process of development.

- Selection cum Improvement Management System(SCIMS)
- Improvement Felling Management System (IFMS)
- Rehabilitation of Degraded Forests Management System (RDFMS)
- Plantation Management System (PMS)

PROTECTED AREA NETWORK MANAGEMENT SYSTEM (PANMS)

There are 11 National Parks and 31 wild life sanctuaries in the state and they together form the Protected Area Network. 7 national parks are declared as Tiger Reserves .The application aims to monitor all the protected areas with respect to habitat status and population variance of various wildlife species and managing the wild life tourism. This system has following three sub systems:

1. Wild Life Habitat Management System (WHMS)
2. Wild Life Population Management System (WPMS)



3. Wild Life Tourism Management System (WTMS)

FOREST PRODUCE PRODUCTION MANAGEMENT SYSTEM (FPPMS):

It monitors location based production process of timber fuel wood and bamboo, tracks transport of forest produce, control receipts and dispatch in sale depots and also revenue remittances.

RESEARCH INFORMATION MANAGEMENT SYSTEM (RIMS):

There are eleven research and extension centers spread all over the state. Their main responsibility is to manage seed production areas (SPAs) and nurseries. These centers prepare planting material of various species and sell them mostly to farmers to be planted in private farms or lands. The system aims to monitor production and sale of planting material and management of SPAs.

ACCOUNTING AND BUDGETING MANAGEMENT SYSTEM (ABMS):

This application monitors the budget allocations and expenditure. It also facilitates accounting including voucher management and Cash Book writing. Variance analysis between budgeted and actual expenditure promotes better utilisation of funds. Project wise and location wise financial monitoring will bring financial discipline. Revenue realisation will be streamlined and pilferages or misappropriations will be minimised.

HUMAN RESOURCE MANAGEMENT SYSTEM (HRMS):

Every forest employee has his/her service records wherein their posting promotion salary and leave account etc is entered. The entire service book would be automated and digital service books would be created. It will capture the life cycle episode of all the employees.

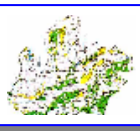
INTEGRATED FOREST PORTAL:

The basic purpose of using portal module is to provide a single window access to both MPFD functionaries and public at large including all stakeholders and those who use goods and services offered by the MPFD. MPFD portal has two domains one for the public and business clients while the other is for the departmental functionaries.

INTERFACE AND INTEGRATION REQUIREMENTS:

The applications would be interfaced and integrated in following ways to meet the needs of the department and to provide effective tools for management decision making & regional planning:

- GIS application interface



- Location based tracking and monitoring using GPS technology
- Mobile application interface to capture data at source.

PRESENT STATUS OF APPLICATION IMPLEMENTATION:

Most of the applications are in various stages of development. Two applications namely FOMS and FAMS are complete and have been implemented while another two will be rolled out early next year. All applications will be complete by October 2008.

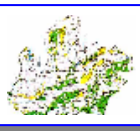
DATA COLLECTION AND MIGRATION STRATEGY

Data capturing in various applications will be done both in the field with the help of hand held devices such as Personal Digital Assistant (PDA) and in the various offices directly in computers. Capture the data at source or where it originates is the basic principle as it not only distributes the work load but also saves time. Consequently applications have been designed in such a manner that data migration is possible from data collection devices either to servers in State Data Center or to the computer in any of the remote offices.

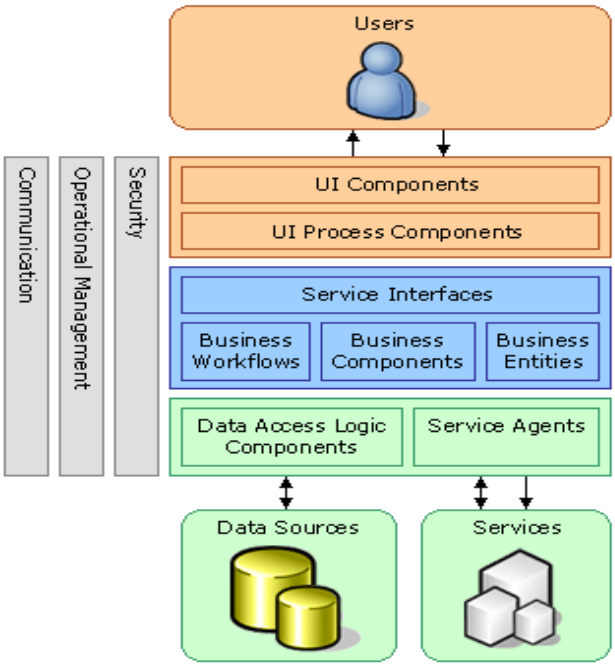
Hand held GPS facilitated PDAs have been successfully introduced in MPFD to collect and transport data from the field itself. This is a wonderful device which is capable to perform multi-functions. PDA is a computer a camera a mobile phone with GSM GPRS GPS and GIS facility. Therefore it can collect MIS and Geo-Spatial data in all formats and can transport it along with location details anytime and anywhere.

PERFORMANCE METRIC FOR APPLICATIONS

The applications being developed have high availability to web based access for critical monitoring of various functions. The application and data access has been planned in 24x7x365 mode so that applications and data can be accessed anytime, anywhere on multiple devices. The applications are scalable and extensible to handle the present as well as future requirements of the department. The ICT gadgets and tools selected to handle the applications are easy to manage with a minimum scaling of the present manpower and the skill set available in the department. The applications being developed are web based and menu driven and are very simple to operate. All the applications have similar interface so that if any employee gets acquainted with one application should easily get conversant with the other application. A single sign-on access is being provided to each employee to access all applications. However, for each application, the users have been given limited access as per the role and privileges of each application. Inbuilt capability has been provided in the database for data warehousing and analysis capabilities to analyze the historical data for deducing various trends and extract the critical mass data for decision making & policy formulation.



The Applications are being developed using the .NET Framework with SQL 2005 as the Database in N-tier architecture as explained below:



.Net Application Architecture
(M.P. Forest Department)

THE DATA CENTER

MPFD uses various technologies therefore these have to be integrated in such a manner that they work in tandem and provide a seamless environment which is secure and is easy to operate and maintain. The best solution that works well in such a scenario is largely focused on creating web based applications framework which will suit the state government's broad vision of information at a mouse click for the stakeholders.

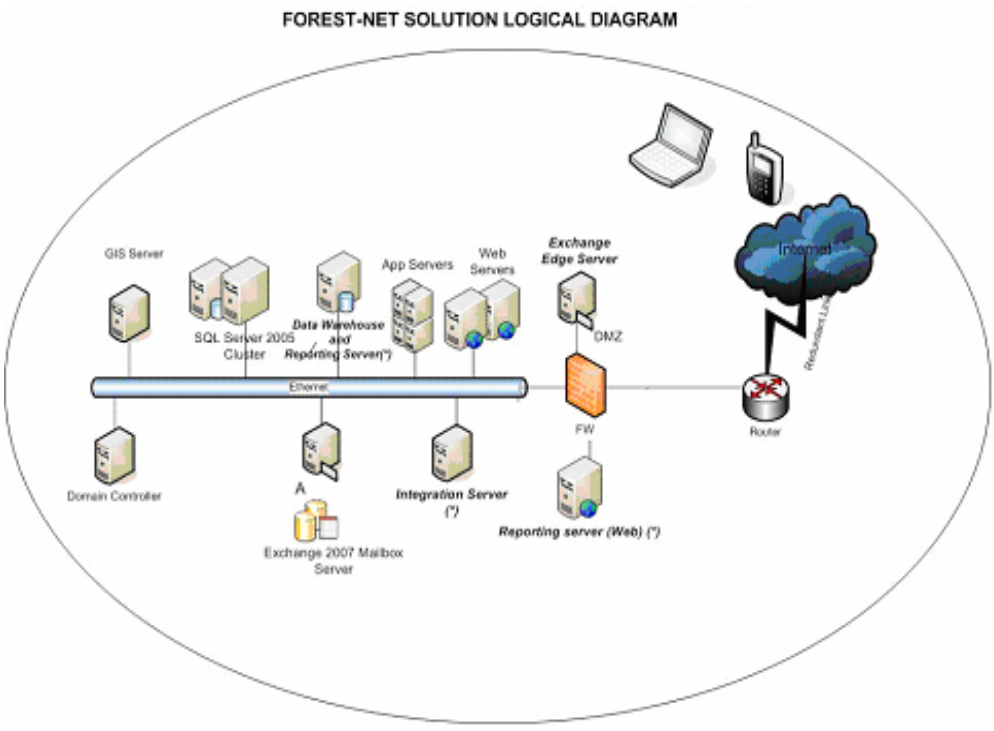
Web based applications are generally made in client server architecture. The remote client logs on to a server in a data center through internet, intranet or VPN and do his/her business on workflows. In case of MPFD all circle level divisional level and range level offices are remote clients while server is at HQs. The group of servers in the HQs constitutes the Data Center. There are more than 900 remote clients of the rank of Range Officers and above who will use the various applications and workflows in order to carry out their function.

ARCHITECTURE

In view of the above, the **Connected Architecture** framework has been used for the MPFD Data Center with an objective to enable a single window access to information and services being provided by various functionaries of the department and to establish a collaborated environment within the department. Existing employees and other stakeholders are now able to find updated information i.e. guidelines, procedures, policies and contacts etc. A server farm has been created connecting various role based servers (GIS, Web, Application, Database, Mail Messaging, Workflow etc) to provide integrated accessibility to the departmental users.

Generic Architecture of MP Forest Applications & Portal

An integrated approach has been adopted to manage information from multiple systems and web sites. The logical diagram is as under:

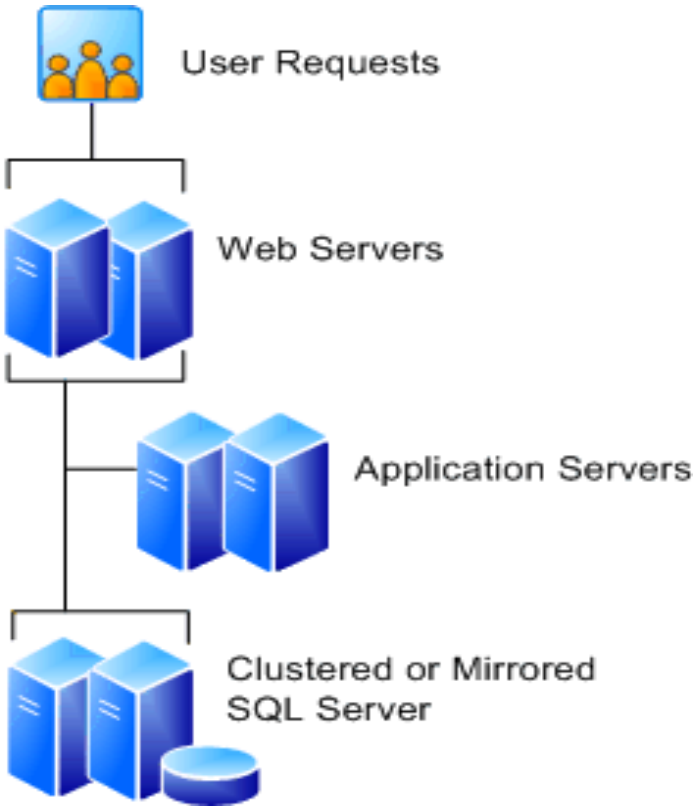


TOPOLOGY

The server farm topology has been used in the Data Center to host the following server roles:

- Application server
- Front-end Web server
- Database server

This server farm topology consists of six servers. The query role is installed to the Web servers to achieve redundancy.

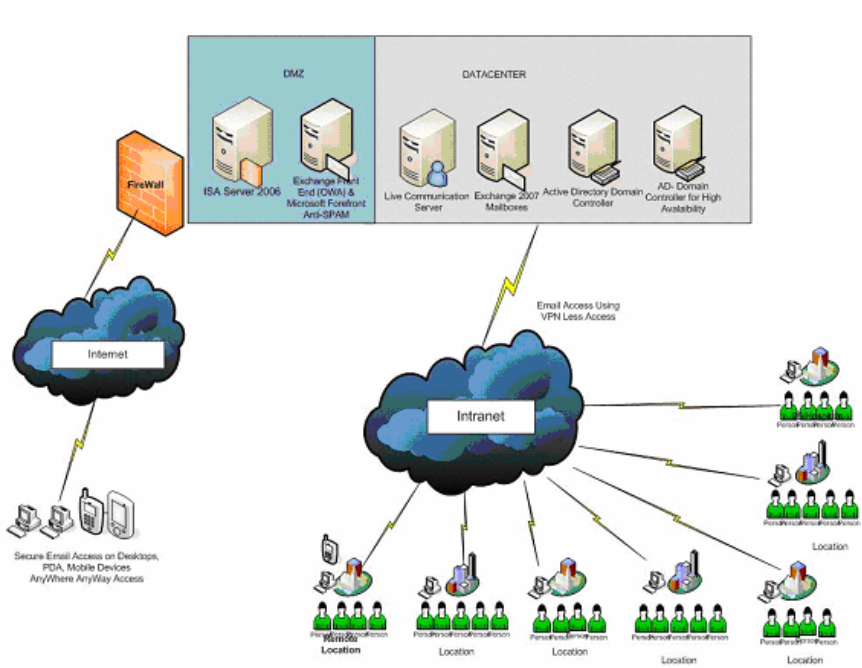


This topology protects these server roles from direct user connections and optimizes the performance of the overall farm when compared to smaller farms.

MESSAGING

To efficiently run the overall management of an organization live and real time interactive communication among its work force is the basic need. This is more pertinent in organisation like Forest Department which is spread over extensive areas and which has a huge work force. MPFD needs a solid communication infrastructure that is readily available and low-cost to operate. 24x7 e-mail access has been considered as the most robust and economic method. Consequently email is being augmented with other forms of electronic communication such as web

portals and instant messaging to provide benefits to both end users and management team at HQs. Therefore a mail server has also been integrated in the State Data Center.

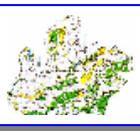


SECURITY

To ensure that the State Data Center is secured from any attacks, vulnerabilities or misusage of the services, it is proposed to implement a second level of Firewall cum Proxy between Internet & the Data Center. Internet Security & Acceleration Server (ISA) has been used as the Firewall, which would protect the infrastructure at two levels (network layer and application layer). All the application servers have been published on to this firewall, which would ensure that even valid requests from valid users would not be directed to the actual server that hosts the service. Instead the requests are reinitiated by the ISA server on behalf of the client. Firewall service would also be implemented through load sharing mechanism to ensure high availability which is the built-in feature of the ISA Server.

COMMUNICATION NETWORK

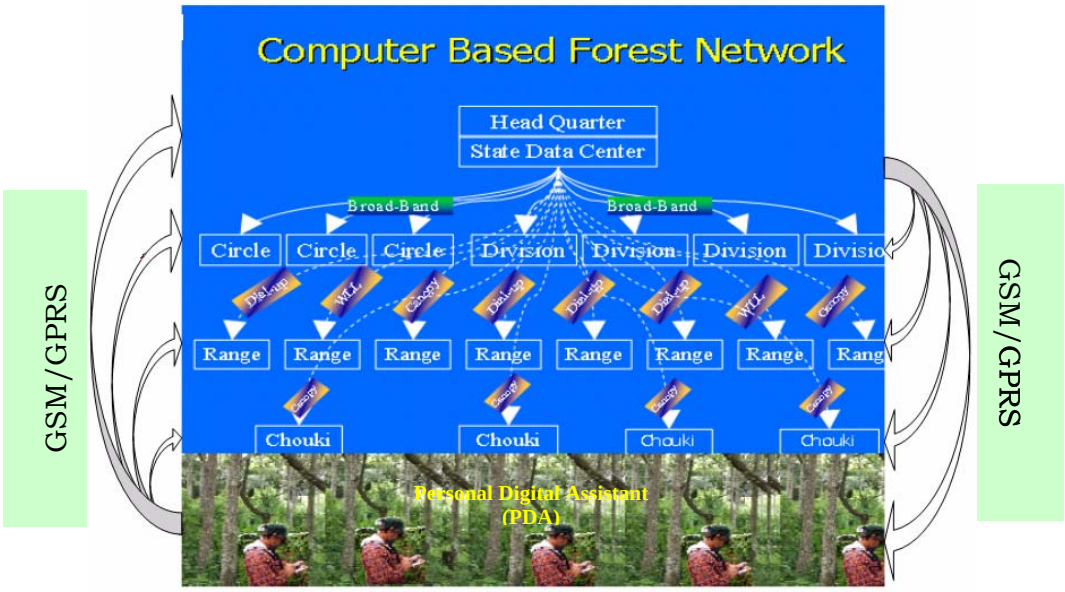
In the wake of the decision that MPFD will adopt client server architecture to operate its web based applications and also that data should be captured where it originates, it is essential that all the remote users i.e. all the functionaries have computers or must have access to a computer which is connected to State Data Center. The choice with the MPFD was to either build its own VPN i.e. virtual private network or use the existing services of an ISP. MPFD chose the second option as first one is not only very expensive but would also take long time to become operational. However the option selected by MPFD has some limitations as no ISP provides complete connectivity in forest areas. A quick survey was conducted and it was found that BSNL provides connectivity in almost 60% of the villages in forests and due to the policy of the central government they are spreading their network very fast and have prospective plan to cover the entire Madhya Pradesh in a year. Therefore a conscious decision was taken to establish a



computer based communication network using BSNL's services. It was also decided to go in for different kind of technology to provide connectivity in such remote locations where there is no chance of any ISP to provide connectivity in future. Consequently MPFD signed a MoU with BSNL for connectivity at a highly concessional rate. Also Canopy Technology of Motorola was selected to provide last mile connectivity in the left over areas.

In all there are 43 CF level 94 Dy.CF level 157 ACF level and 602 Range level of offices of MPFD spread all over the state. To establish a complete communication network from these offices with HQs (through State Data Center) every office requires a computer a telephone line and internet connectivity. This is a stupendous job and requires huge money. Therefore the implementation has been phased out. In first phase all territorial and wild life offices which cover almost 80% of the MPFD offices have been covered in the current financial year while the rest will be covered in next financial year.

The diagram below depicts the communication network of MPFD using various technologies.

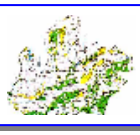


CAPACITY BUILDING OF HR

As explained in the preceding paragraphs MPFD has undertaken a big ICT initiative to automate all its processes. In order to attempt and succeed such a mammoth task, which involves more than 27000 employees, it is necessary to build in-house capacities.

The in-house capacity building strategy has been designed in such a manner so that it is easy to implement, again using best tools and techniques, and that HR is capable to absorb and sustain the IT applications and automated environment in a natural way. The underlying principal is to provide them alternative working environment which lightens their work load and saves them time and energy and which also improves their performance.

For such a stupendous exercise, the training need analysis has been done.



TRAINING NEEDS

Training needs for various categories of the HR have been identified based upon the type of the work and the role assigned to them in ICT initiatives. The following groups have been formed

- Personals of IT Cell
- Master Trainers to act as mentors for staff
- Planning Monitoring and Supervisory staff
- Executive and Ministerial staff

TRAINING FACILITY

Following training facilities have been created for various groups of HR:

- IT Lab at HQ for training of personals of IT Cell and Master Trainers. IT Lab is set up using latest state of art technology and is fully equipped to accommodate 30 trainees.
- 16 Regional Centers for Monitoring and Supervisory Staff. Training in these centers is given from HQ directly and in live interactive environment through the Video Conference System (VCS) which has been specifically designed and implemented for the purpose. The VCS can accommodate up to 480 officers in a single batch of training.
- 54 Satellite Interactive Terminals (SITs) at Divisional level are in the process of establishment and they will commence their activities soon. These centers have been established using EDUSAT facility of Indian Space Research Organisation (ISRO). Teaching in these SITs is also centralised from HQ for the purpose of uniformity and utilisation of best resource. Training through these SITs would be live and interactive. All front line executive and ministerial staff would receive training in these SITs. For the time being they are using facility as described above. The EDUSAT facility can accommodate up to 2140 staff in one batch. This ensures quick ICT capacity building of the huge number of staff.

INFORMATION TECHNOLOGY LAB

In IT Lab IT professionals have already imparted suitable training especially to staff of the IT Cell and master trainers on the following to enable them to take care of various technical requirements of Forest Department:

- Programming best practices under .NET with mobile functionality
- SQL Server Databases and its tools
- Project Management
- Network Maintenance
- Geographical Information System

Similarly training on use of hardware and data collection devices i.e. GPS facilitated PDAs to 400 front line staff and roll out training on operationalisation of two applications namely FAMS and FOMS to 1470 executive and ministerial staff has already been imparted. Many more are in the offing as and when applications are ready either for testing or for operationalisation.

OOOO