ICT Vision
For
Maharashtra Forest Department

SUBMITTED BY

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Contents

1 Executive Summary

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 Maharashtra 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.

This document is the ICT Vision Report for the Maharashtra Forest Department. The Report presents detailed recommendations of the consultants to the department in regards toICT initiatives proposed for next 5 years, current Assessment Report, change management and capacity building requirements, project timelines and costing.

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

This report pertains to the proposal of development of Communications network including LAN and WAN till Range level across the state. It proposes for development of Forestry Based application which will act as a decision support system at senior level. It also proposes for the procurement of mobile devices to run MIS and GIS based applications.

Key Findings of the As-Is Assessment

In the initial study, the consultants had reported on the following parameters :

- *Scope for computerization of business processes*
- *Absence of a decision support system*
- *Need for Efficient Monitoring and Control of Funds*
- *Demand for single software for all functional needs of Department of Forest*
- *ICT Infrastructure*

Design Considerations for ICT infrastructure

The Consultants conducted round of meetings and one to one workshops with the officials of the stakeholders of the Department to capture their requirements and expectations from the new system. Consultants have tried to incorporate the best practices where ever possible.
The document provides a complete description of the system architecture. The following architecture components of the ICT project have been covered in this section:

- Solution Architecture
- Application Architecture
- Network Architecture

A detailed description of the network layout and how different user locations will be accessing the central computing facility is also provided.

2 Introduction

Department of Forest, Maharashtra

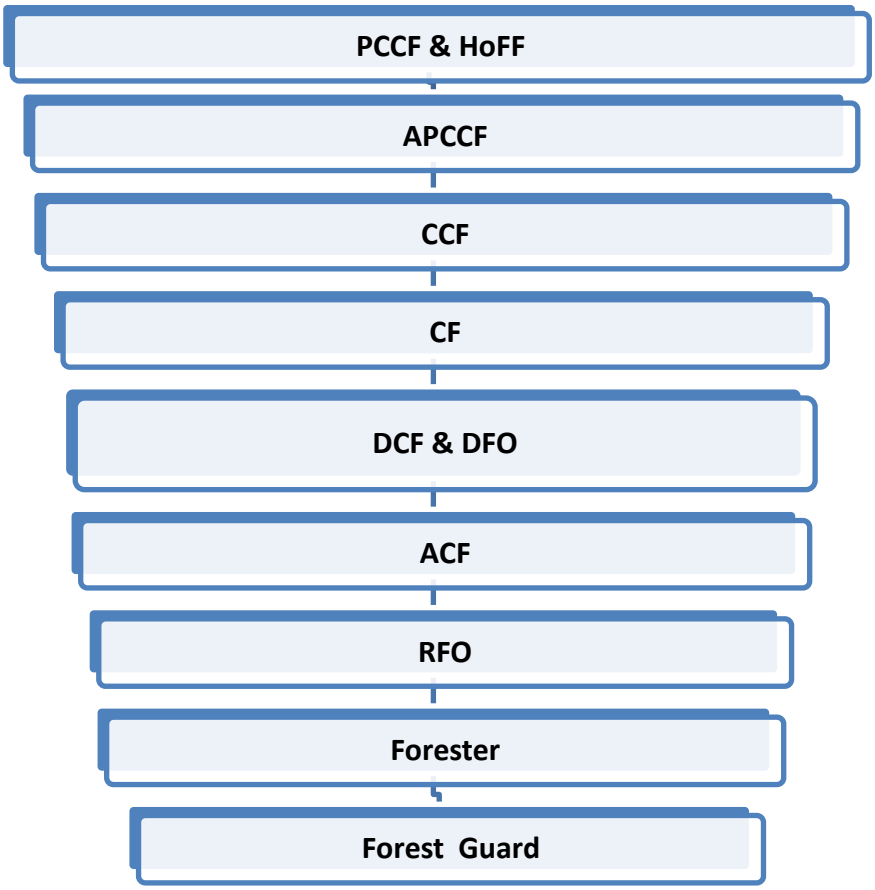
The State Government has set aside the following mandate for the department:

- To protect and conserve forest resources in Maharashtra through sustainable forest management.
- To provide critical mass data to maintain and enhance biodiversity for ecosystem health and vitality.
- To conserve soil and water resources for ecological and environmental stability by effective monitoring.
- To enhance forest productivity using modern scientific tools.
- To meet the requirements of forest products like timber, fuel wood, fodder etc. of the people of the state particularly those dependent on forest.
- To cater to the needs of socio-economic development of villages in and around forest areas.
- To provide baseline data to evolve strategic policy, legal and institutional framework to address emerging needs.

To successfully achieve the mandate and for proper administration and management, the state has 11 Territorial Forest Circles and 4 Wildlife Territorial Circles, 48Territorial Divisions and 14 Wildlife Territorial Divisions, 5 Independent Territorial Subdivisions, 393 Territorial Forest Ranges, 1540 Rounds and 5688 Beats including Wildlife Territorial Ranges, Rounds and Beats. To render specialized services Forest Development Corporation- a Government of Maharashtra undertaking, Wildlife, Working Plans, Research, Education and Extension wings have been established in the Department.

The administrative structure is manned by 180 IFS officers, 333 SFS officers, 936 Forest Rangers, 2792 Foresters, and 8505 Forest Guards and 10843 other employees. Thus total strength of the employees in the department at present is 23589. Principal Chief Conservator of Forests &HoFF is the administrative head of the Department, while Principal Chief Conservator of Forests (Wildlife) heads wildlife wing and the Managing Director of the Forest Development Corporation Limited, Nagpur in the rank of the PCCF heads the Corporation. PCCF &HoFF is supported by a number of officers and the organization chart is as given below:

Organization under PCCF & HoFF



The Department of Forest in Maharashtra is structured and organized as below:

The Core Activities of the Department are as under:

Activity	**Details**
Forest Management	• Preparation of Working Plans • Implementation and Monitoring of Working Plans
Forest Protection	• Forest Fires • Forest Offences under: ▪ Indian Forest Act, 1927 ▪ Wildlife (Protection) Act, 1972
Land Management	• Diversion for non-forestry purposes like mining, irrigation, hydroelectric projects, encroachments for agriculture etc • Manage forest land • Oversee diversion of forest land for non-forestry purposes

	• Settlement of land disputes • Settlement of encroachments • Maintenance and upkeep of forest boundaries
Production	• Timber • Fuel wood • Bamboo • NTFP
Wild-life	• National Parks and Sanctuaries • Protected Area Network • Wild-life Conservation • Eco development
Research & Extension	• Tree improvement programmes • Nursery Management • Production of superior quality of seed of forestry species • Development of seed production areas • Seedling and clonal seed orchards. Conducting applied research in the field of forestry. • Rendering assistance to Maharashtra Forest Department in solving technological problems. • Germplasm collection, sustainable use and conservation of medicinal and aromatic plants. • Development and implementation of tissue culture techniques. • Development of practical, cost-saving techniques of reclamation of mined out areas.

In addition to the above Core Activities, the department is carrying out the routine activities of personnel management, payroll, diary dispatch, court cases management, employee accounting, meetings management etc.

The department has following major business processes:

- **Accounting and Budgeting Management System (ABMS):**

It would cover the following areas:

- Budgeting
- Accounting including Voucher management, Cash Book etc
- Variance Analysis – Budgeted v/s Actuals
- Project wise & Head wise Financial Monitoring

- **Forest Management System (FMS):**

It is for the Work Plan Management. It comprising of two activities:

- Working Plan preparation
- Working Plan implementation

- **Production Management System (PMS):**

It comprising of following activities:

- Marking the trees
- Felling
- Transportation
- Receive in the Depot
- Grading
- Staking
- Auctioning

- **Protection Information Management System (PIMS):**

Aim is to protect the wild life and forests. It covers following activities:

- Updating the First Offence Report Register.
- Sending the case to Division Level,
- Taking action as per the instructions from Division,
- Prosecution of offenders in Criminal Courts,
- Compounding of offences and realization of compensation,

- **Human Resource Management System (HRMS):**

Every forest employee has his/her service records, their earning, deduction, GPF etc. 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.

- **Land Management System (LMS):**

Reserved and Protected Forests are constituted under the Indian Forest Act, 1927 by issue of notification in Official Gazette. For the purpose of forest management, these forests are divided into small units called compartments. Record keeping is necessary to validate authenticity of the notified boundaries of the RF and the PF, and also that of compartments together with length and area of the forest at any given time.

- **Forest Plantation Management System (FPMS):**

There are three kinds of Plantation:

- Compensatory Afforestation: Plantation on the new notified area obtained against requisition of forest land.
- Improvement: existing forest needs to be improved qualitatively and extent wise.
- Re-habilitation of degraded forests.

- **Research Information Management System (RIMS):**

The Application needs to capture

- Total seeds used for plantation (species wise).
- Total Polythene purchased for plants.
- Total Plants grown.
- No. of wasted Plants with Reasons.
- Total cost to prepare a plant. Record of plants (species wise)
- Quantity of transported plants from the nursery.
- Transportation cost.
- Received plants from nursery at any place.
- Total wastage of plants. Etc

- **Protected Area Network Management System (PANMS)**

Forest Department has a separate stream for Protected Area Network.

- Wild Life sanctuary: there are total of 41 Sanctuary in MFD,
- National Parks: there are total of 6 National Parks in MFD,
- Tiger Reserve: there are total of 3 Tiger Reserve in MFD.

The above mentioned Protected Areas are managed by the officers of the rank of DCF/DFO working under the control of the Chief Conservator of Forests (WL) and the Principal Chief Conservator of Forests (WL), MS, and Nagpur.
An application to protect the wild life through online monitoring system would be required which will give the presence of wild animals through their foot prints, scratches etc.

Other Processes:

In addition to the above 9 applications, there would be general office applications also which include:

- Diary Dispatch Monitoring System
- Employees Payroll System
- Employees PF Monitoring System
- Court Cases Monitoring System
- Assembly Questions Monitoring System

All the business processes have the following interfaces and integration requirements 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.

2.1 Need of the Project

Forests are essential for survival and sustenance of life. They are source of many direct and indirect benefits and need to be managed in such a way that extraction of benefits does not deplete the resource. Their growth should be optimized so that greater benefits are derived from them.

State of Maharashtra has a long history of scientific forest management. The forests of Maharashtra have special significance as they represent a variety of habitats which are very important from the forestry prospective. Maharashtra is situated between latitude 15° 41' to 22° 6' N and longitude 72° 36’ to 80° 54' E. The geographical area of the state is 307713 sq. km. The forest area of the state is 61934 sq. km constituting 20.13 % of the geographical area of the state. To maintain this huge area of forest the forest department has got strength of 23589 employees.

With such a large establishment and geographical base, the monitoring and decision making becomes very critical. But, due to lack of adequate information and communication infrastructure, it is challenging to manage and get the day to day activity report for the monitoring and decision making. The inherent delays hamper the decision process required at a particular time. The purpose of this document is to take stock of the current IT Infrastructure and applications and propose a solution thereof.

The following broad requirements have come out of the discussions, based on our understanding:

- Capturing the data at source of origin
- Reliability
- Easy to maintain
- Scalability to encompass information of all key stakeholders
- Secure access and rights based access to stakeholders
- Standardization and integration of applications & data
- Business intelligence to analyse and decision making

The main objective of the ICT deployment in Maharashtra Forest Department (FD) 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.

It is proposed that MFD should execute its technology initiatives in an integrated manner where in all its key functions should 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 enhance efficiency.
In order to bring about the effects as mentioned above following features are essentially required:

- Development of a Communication Network across the state
- Local Area Network connecting each office.
- Development of Forestry Based applications integrating GIS and MIS Data
- Development of Generic and Office applications
- Procurement of Data Collection Devices Like PDA/Smartphones
- Creation of a Hardware and Software Infrastructure
- Sharpening the ICT skills of the manpower
- Introduction GIS technology for Forest Monitoring and Research Development.

These ICT initiatives have been envisaged to improve the overall efficiency, effectiveness, transparency and accountability in the system. The sub-objectives of the project as depicted in the figure below are targeted towards realizing the above mentioned improvement areas.

The project plans to achieve its objectives by using ICT to set up an e-Governance framework for information availability and tracking of Forest related activities across the supply chain, and also involving citizens, villagers and other stakeholder in the entire process.

2.2 Current State Assessment Report

The purpose of the Initial study was to capture the existing processes and systems in the Maharashtra Forest Department to identify issues and areas of improvement that would enable to create a blueprint for an effective ICT enabled System. The assessment also captured most of the activities on the current IT platform thus identifying various manual or partly computerized processes.

Key Results of the As-Is Assessment

- **Scope for computerization of business processes:**
  - The Department has certain existing automated/semi-automated applications and manual applications, which needs to be automated by developing appropriate application software.

- The Department needs to build **centralized repository of data** for accessing through the web.
- The Department needs to **digitize its maps** and want to create a **location based monitoringsystem**.

- **Absence of a decision support system:**
  - The Department needs to procure GPS Based PDAs and use them for capturing data and accessing applications
  - The Department needs to create Web-based **Workflows** for management/monitoring and also desires to create a **Portal** for publishing various types of information on the Internet.
- **Need for Efficient Monitoring and Control of Funds:**
  - The Department intends to build **security** in their IT setup as the application access would be through Internet.
- **System Requirement for Monitoring of Forestry allied activities:**
  - The Department needs to establish internal system of **communication and messaging** to utilize the IT infrastructure and the PDAs.

- **Demand for single software for all functional needs of Department:** As a primary requirementthe Department of Forest wants to establish seamless information exchange between all concerned divisions and offices so that the performance of the Department is improved. Currently as circle and division offices work in isolation, there are a lot of communication gaps due to which decision making process is hampered.

3 ICT Landscape: As part of the study, the assessment of the current ICT setup of the Department of Forest was carried out. We have found that the ICT setup of the department needs to be upgraded to make system capable for hosting an integrated system which will connect all divisionaloffices and range offices to the Head office at the State Level through a statewide WAN. There is no centralized data center.

4 At present Maharashtra Forest department is managing information from multiple systems and different stand-alone applications serving different purposes. Also, there are specialized linkages like GPS based location interface, GIS interface etc which also needs to be established in a scalable manner. Presently, any useful data is not connected, which results jumping from one application to another and one data system to other as well. The end user puts lot of efforts to find any relevant data of his interest. This "island" approach can result in increased maintenance costs and risk. The department's ability to modify or create new systems to meet evolving business needs deteriorates because of the complexity and variance in the technology used.

3 Proposed Solution

It is proposed that MFD should execute its technology initiatives in an integrated manner where in all its key functions should 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 enhance efficiency.

After a thorough assessment of the broad requirements from the department, we have worked out a preliminary solution that 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.

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:

3.1 Hardware and Network Development

1) **Deployment of communication network and Wide area network (WAN) to connect all the offices of the department across state.**

WAN is the basis for any ICT development initiative to be successful considering that all department offices and forest areas both span across the state. Once departmental connectivity backbone is in place, all the forest offices till range offices would be connected by common network with required bandwidth provided by BSNL. The WAN connectivity will act as basis for all ICT development/initiatives which are and will be taken up by the Department. Any it will be possible to set up video conferencing till Division Level.

2) **Deployment of Local area network (LAN) in the department offices.**

Local Area network is being implemented till circle offices currently. The work is in progress and it is informed that NIC will complete configuring and commissioning of entire network in Head office and all circle offices by 7th July 2012. The LAN network in head offices as well as circle offices will help in automating many manual processes and idea of paperless office can be achieves in days to come. LAN will also facilitate in providing necessary infrastructure for the various forestry applications which are being developed. It will also help the employees to get access to internet so as to ensure their exposure to other IT and web applications.

3) Procurement of additional computers and peripherals in the offices.

Currently around 2000 computers are available in the department starting from Mantralaya to Range office. Considering that some of these computers are old and becoming obsolete, it has been decided to procure 200 computers each year to ensure availability. These computers and other peripherals like printers, UPS will aid in expediting exchange of information and bring efficiency in the system. It has also been decided to provide solar power back up for offices which have been located in the remote places to provide uninterrupted supply of electricity to support the IT infrastructure.

Status for Procurement of Computers

S.No	Activity	Procurement Status
1	Procurement of Computers for Mantralaya, Head Office and ICT Cell by NIC.	Mantralaya- 3 Computers Head Office; 70 Computers
2	Procurement for Circles and Range Offices	Circle Offices: 99 Computers

4) Implementation of ICT cell or server farms for centralized monitoring, storage and effective utilization of network.

Infrastructure in the ICT Cell like Servers, Computers and network has been in place and it is ready to be utilized. The ICT cell will majorly be used to support and manage the various ICT initiatives being taken up. The infrastructure will be used for imparting trainings from basic awareness to application oriented.

5) Procurement of Personal Digital Assistant (PDAs) for field level data collection

Considering that Forest reaches to farthest of locations in the state it is very important to have system in place to monitor them at real time. Thus it has been decided to procure PDAs/Smartphone to make the staff and officials equipped with technology to track, store and report the details from the field itself. These PDAs will also act as a platform form running MIS and GIS based applications to store and maintain a geographic database on Fire Alert, Forest Offence and Wildlife management system.

3.2 GIS and Remote Sensing

Geographical Information System or GIS captures, stores, analyzes, manages and presents data that is linked to a location (Forest). Technically, GIS includes mapping software and its application to remote sensing, land surveying, aerial photography, geography and tools.

The Maharashtra Forest Department has taken up an ambitious plan to implement GIS and Remote Sensing Technology across the state and utilize it to enhance and improve forestry activities in the state. Under the project MFD is developing a Web Based GIS application with GIS dataset and interfaces for different departments. The main

objective of the project is to prepare GIS data set and make it available to different departments with secured interfaces with a proper sharing mechanism.
For forest planning and management the Maharashtra Forest Department is developing a GIS and MIS based applications to be deployed on PDA/Smartphones . The following initiatives have been taken in this regard.

1) **Digitization of Maps**: Digitization will ensure the upload of these maps in soft copy for easy access by the public as well as official use. Digitization will also be essential for integration of GIS and MIS based applications.

2) It has also been decided to procure around 1000 **PDAs/Smartphone**s which will be distributed to Forest Staff and officials to ensure data entry and real time instant messaging from the Field. The Digitized map will be uploaded on the devices to provide spatial view of a Forest Area under study.

3) **Remote Sensing**: The composition and viability of a forest may be determined using a combination of remote sensing and Geographic Information Systems (GIS).

   GIS is a decision-making tool based on geographically referenced information. GIS uses different levels of geographical information, such as elevation, hydrology, or location of roads and infrastructure, to create a multi-layered representation of a site. Some remote sensing methods that are used in combination with GIS are aerial videography and Thematic Mapper sensing. These data are available for large areas and can be interpreted to provide information on forest age, tree species distribution, and even estimated timber volume.
   Forests are often at risk of being destroyed by forest fires. Remote sensing can be used in efforts to reduce the risk and minimize damage if a fire occurs.

3.3 Proposed Architecture

In view of the above, **Connected Architecture** framework is being proposed for the **MFD**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 will be able to find updated information i.e. guidelines, procedures, policies and contacts etc. Internal users and departments will have the ability to manage and practice workflow, personalization, content management, and search and business intelligence. Basically, there would be a web-based departmental intranet providing roles based access to its departmental users and restricted connectivity to the public domain information to other users including the citizens. A server farm shall be created

connecting various role based servers (GIS, Web, Application, Database, and Mail Messaging, Workflow etc) to provide integrated accessibility to the departmental users.

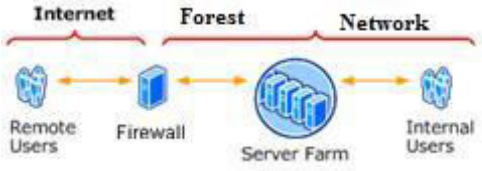
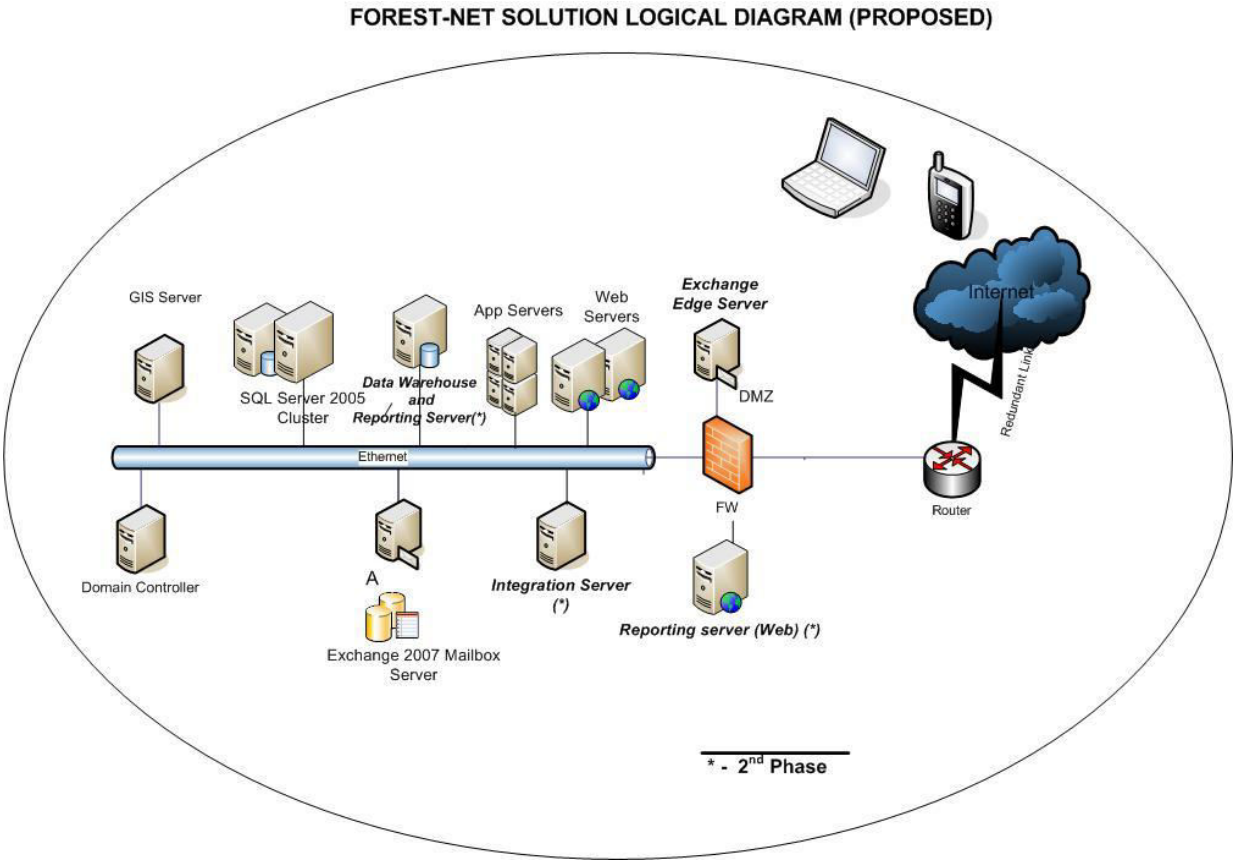


Figure 1: Generic Architecture of MaharashtraForest Applications & Portal

An integrated approach is essential for the department to manage information from multiple systems and web sites.

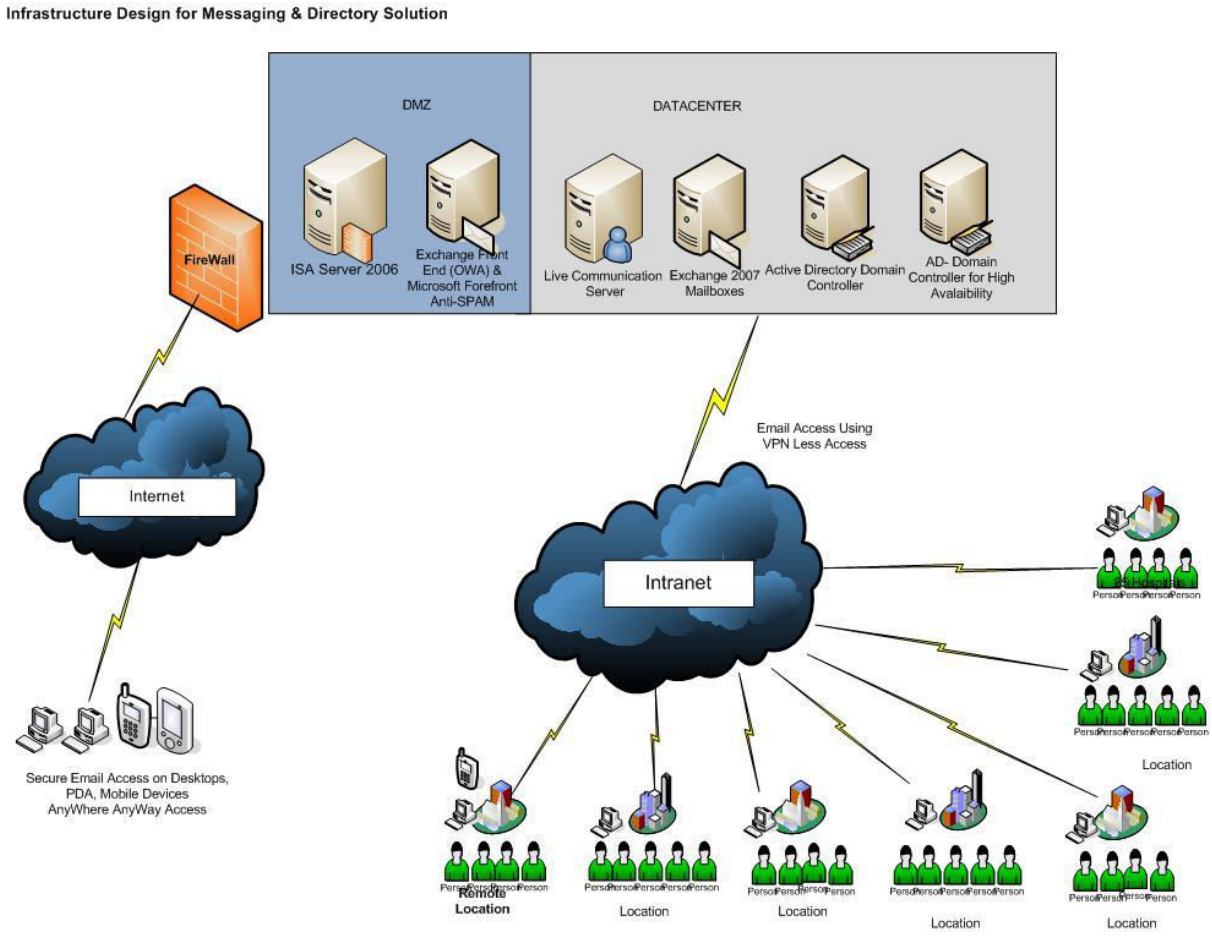
The logical diagram of **Connected Architecture** for the **Maharashtra Forest Department** is as under:



In order to bring about the effects as mentioned above following features are essentially required:

- Server Farm
- Applications
- Communication network

- Messaging solution
- Skill up gradation



3.4 Server farm

There exists a state data centre in Mumbai. We need to first of all explore the possibility of using this facility as this will not only save cost but would also ensure security manpower and recurring maintenance efforts. If this facility is not available then we may try NIC which has a state level office and a well planned data centre. However NIC seldom provides their services as their policy directives in this regard are very stringent and are difficult to follow by any state department. Even if this does not work out then a number of subsidiaries of GoM must be approached as they have its state of art datacenter and they sublet servers and other facilities to host other organization's data etc. However the cost implications and the complexities of going into agreements with such organization are big hurdle. Therefore it is recommended that either MFD should endeavor for its own server farm on the lines of a data center.

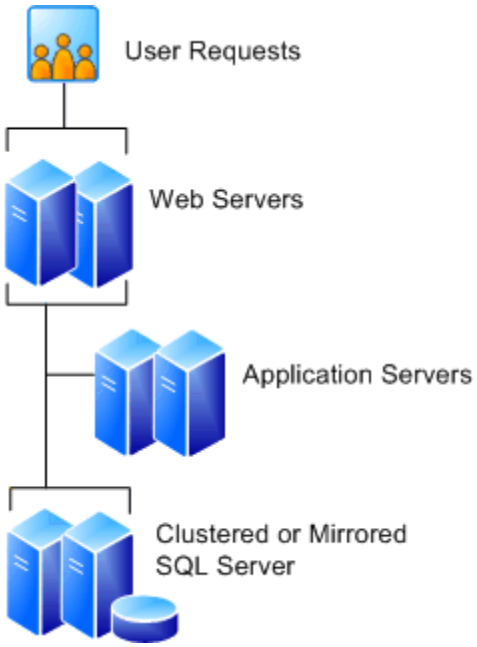
In case MFD decides to have its own server farm then a six sever farm is recommended in the beginning. In the server farm topology one or more computers can be used to host the following server roles:

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

The minimum and recommended system requirement for each server role will be assigned. If more than one role is assigned to a single computer, then minimum requirements for all server roles will be ensured on that computer.

3.5 Six-server farm

For maximum redundancy with a minimum number of servers, deploy an additional application server to the middle tier for load balancing application server roles that are designed to be redundant. This server farm topology consists of six servers. The query role is installed to the Web servers to achieve redundancy.



If it is planned to deploy the Excel Calculation Services application server role or the Office Project Server 2007 application role to the farm and availability of these services is a priority, then this topology is the recommended starting point as it protects these server roles from direct user connections and optimizes the performance of the overall farm when compared to smaller farms.

Firewall cum Proxy Services

To ensure that the MFDServer Farm 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. Microsoft Internet Security & Acceleration Server (ISA) or Unified Threat Management (UTM) or both are recommended as a solution to be implemented as the Firewall, which would protect the infrastructure at two levels (network layer and application layer). All the application servers would be 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 should also be implemented through load sharing mechanism to ensure high availability which is the built-in feature of the ISA Server or UTM.

3.6 Current Application Development

Development and Deployment of Forestry applications integrating GIS & MIS data. The forestry application will become the basis for carrying out various citizens centric and day to day office activities. These applications will be supported by the basic infrastructure being developed in terms of WAN, LAN and ICT cell. Majority of these applications are citizen centric like Forest Land Management system and Key Result areas and Forest Conservation act. The data entry on these applications has started and once complete it will become a central.

Currently the following application are running pilot in the state

Land Management System

Land Management system uses the technology of GPS to track the locations. In this system CCTV is installed at all Check posts and key strategic locations so that operators can monitor the check post activities. PDAs enabled with GPS to be provided to the field staff that help in survey. This system does the following functions:

GIS system should be installed in the forest department

- Maintenance and upkeep of forest boundary
- Settlement of land disputes
- Overseeing diversion of forest land for non-forestry purposes
- Managing Forest Land
- Forest Land Database
- Settlement of encroachments
- Survey, Demarcation Cartography Analysis with software

Fire Alert Management System

This system enables to effectively help in fire fighting by:

- Active Fire Locations are downloaded from the satellite and sent to the server

- XY co-ordinates (Longitude and Latitude information) are recorded and mapped on the GIS maps
- Data is transferred to the Forest Department's data centre
- Division office, range office and beat office pertaining to the fire location are identified
- Relevant officers are informed regarding the Fire locations through SMS / Phone / Email
- Field officials visits the site and give the feedback to the HQ
- Details of the incident are updated in the system from PDAs or Desktops

Forest Offence Management System

The application would build database of different forest offences and offenders. It would also outline sensitive areas on digital maps. The system would work on workflows. Whenever the offence is registered, the complete details of case are fed into the system in Range Office. After the details of case progress is entered online by the respective authorities. All monitoring reports like offence type wise registered cases, investigation status, compounding status, seized material, losses etc. are produced by the system through online system in a query manner. The data captured in such a way that can be integrated with spatial data later on.

- After offence or reporting of offence, offence will be registered including all the details through the system in range offices
- The application will be workflow based and provide easy graphical user interface in the form of eForms for the offence registration
- The System would ask the data as per the details required in PoR and Preliminary case report which typically includes data related to offence locations, POR issuing authority, related forest areas (compartment, beat etc), date of offence ,etc
- All progressive data like investigation details, compounding or court challan details etc. will be entered by the respective authorities online
- After filling of raw data, the system will then process it and produce information in the form of dash boards and monitoring reports eg: offence type wise registered cases, investigation status, compounding status, seized material, losses etc. in a query manner

Wild Life Management System

Wildlife Management System is proposed to be a GPS enabled PDA based application that will use combination of GIS & MIS technologies. The application would capture wild life direct sightings or indirect evidences related data electronically for their geo-coordinates, date, time and images. It will also record the tracking path of patrolling

parties. After fetching the date, the application would create the temporal and spatial database of wildlife movements.

The system would have three components, Mobile, Desktop & Web:

- Mobile application is the core application which will be used by the frontline staff (Patrol Parties) to key in the data in field itself through PDAs.
- The desktop application will be used to configure PDAs and upload collected data to server. However, facility to upload data directly from PDA to server is also available in mobile application but due to limited bandwidth (~10-12 Kbps) of GPRS based transmission some time direct uploading may not be feasible.

Additionally, application may also provide following functions:

- Maintaining the number of animals records based on the species of the each wild life
- Records on the basis of the wildlife based on each location (Sanctuary, national forest) etc to get published in animal census
- Record of revenue from wild life Sanctuaries

Quarry Permit Order System

- This application should capture various details like Name of the Consignee, Age, Time & Date, Type of mineral uplifted, Quantity of minerals uplifted, and financial value of the Material, place of upliftment and destination of the materials uplifted.
- The application should have a print option for printing electronic permit order with the requisite details.
- MIS Reports: Date wise permit order issued.
- MIS Reports: Date wise Cash receipt against permit order number.

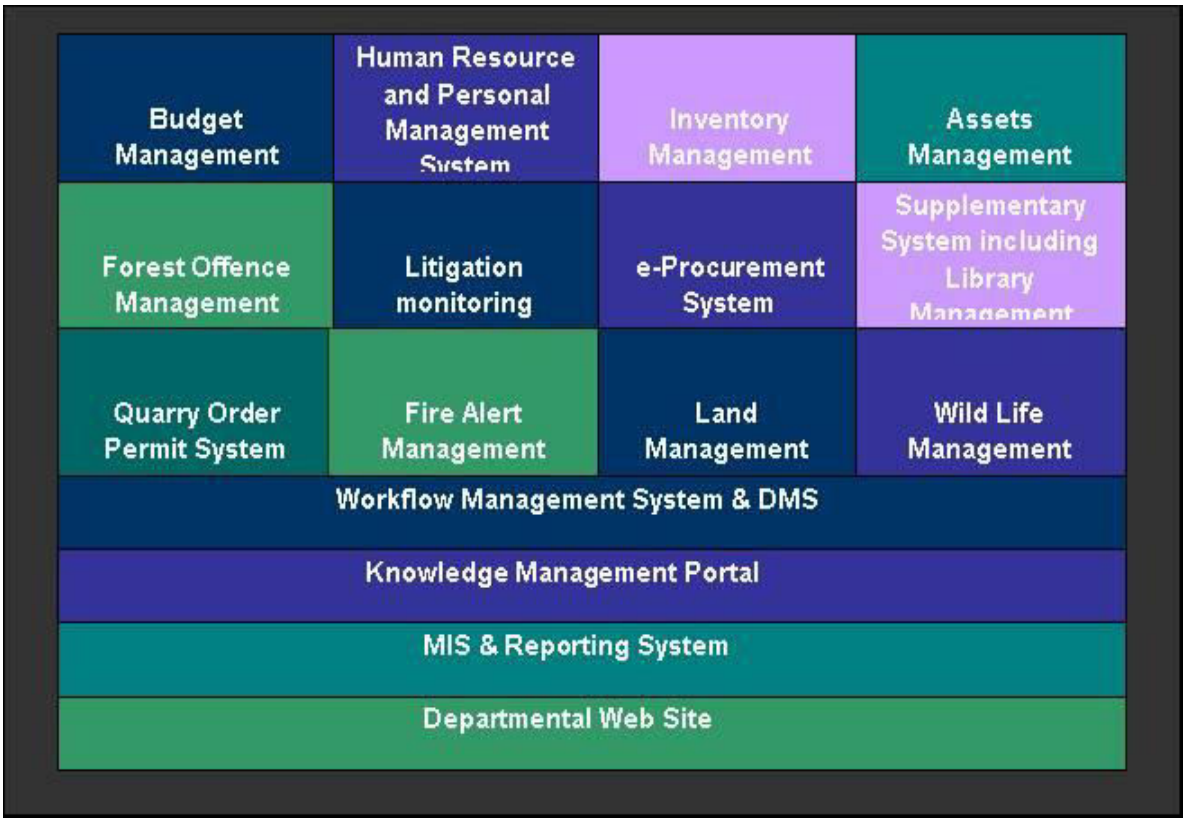
3.7 Application Solution Requirement & Details

This section aims to give an insight to the applications that are suggested to be implemented for the Maharashtra Forest Department. The applications can be divided in the following categories:

Integrated Applications: These are the applications, which can cut across the department in the state. It provides a backbone for information dissemination throughout the department. Example: Knowledge Management Portal, DMS & Workflow Management System etc.

Core Applications: These applications are the applications which cater to the core functionalities and requirements of any department that require seamless interoperability within themselves like HumanResource Management System, Account & Budget Management System, Inventory Management, Asset Management, etc.

Departmental Applications: These are the specialized application catering to the different requirement and specialized processes of the department eg: Wilde life management system (WLMS), Forest offence Management Systems (FOMS), Fire Alert Management System (FAMS), Forest Land Management, e-Procurement etc



The section below detailed the various application systems with functions and features suggested for the Forest Department. The associated modules are also described in the respective systems.

Account & Budget Management System

Budget Management Module

- Budget preparation & monitoring
- Maintain budgets for consecutive years
- Estimation of fund requirement
- Budget approval / modification
- Budget Variance report as time progress through the year
- Expenditure Management : Both planned and unplanned expenditure salaries expenses and other contingent expenses
- Setting up budget for different heads of expenditure
  - Soil and Water expenditure
  - Expenditure on forestry

- Expenditure on ecology and environment

- Processing of expenditures which includes standing charges, new item expenditures, work in progress etc.
- Processing of receipt estimates including Receipt and Disbursement Estimates for the state for the budgeted financial year
- Processing of revised estimates
- Supplementary Demand and Supplementary grant Release Order
- Re-appropriation and Surrender of grants / Funds

Cash Management Module

This module would help in preparation of various bills and consolidated reports

Accounting Module

The functionalities of this module are as follows:

- Keeping the records of the receipts under different heads:
  - Wildlife Circle, Territorial circle, Royalties from forest produce, Revenue from public gardens, Miscellaneous expenses
- Support to the basic accounting practices
- User defined GLA structure with Recurring Journal entries
- Inter departmental transfer of payables with Automatic GL transaction
- Statistical accounting masking
- Reversal of accrual transaction
- Automatic Year end processing with feature of reopening of closed
- Detailed and summary ledgers with on line review
- Transfer of WIP (work in progress) and the finished goods among the departments
- Comparison of Budget with actual income & expenses
- Current vs. last year Budget Comparison
- Tax calculations for purchases and sales.
- Prior period adjustments
- Maintenance of Accounts payable and receivables
- Preparation of expenditure statement, revenue statement, saving statement, Asset & liabilities statement
- Operation of Bank accounts
- Funds management for statutory funds

- Approval of payments for budgetary expenses for above funds
- Making payments for non-budgetary expenses after approval from required authority and reporting of such expense
- Making temporary urgent payments and reporting of the same
- User defined Financial Reports
- MIS Reports on:
    - Chart of accounts, Consolidated financial statements, Financial statement comparison for individual review period, Income statement comparison, GL transaction register
    - Trial balance by primary and full account, Cash flows

Payroll Fixation Module:

The following are the things which come under this module:

- Loans & Advances
- Employee Information
- Leave Information
- Centralized and decentralized administrator module
- Search engine for module search and people search
- Publishing reports and documents
- Income Tax and Professional Tax Calculation
- Maintenance of global parameters such as DA rate, Medical Allowance, Leave entitlement etc
- Processing of Payroll
- Reports including Electronic files to be sent to bank / Treasury for crediting the salary of individual employee

Human Resource & Personnel Management System

The application will capture every aspect of the employees, establishment, and budgets. The details are discussed below:

Employee Module

- Maintenance of Service Records
- Leave processing
    - Maintenance of leave calendars for different types of leaves
    - Leave entitlement based on the level in the hierarchy

    - Spill over of leave to the next year
    - Maintaining of rules on accruals, ceilings and combination of leave
- Loan and advances
- Maintenance of the General Provident Fund (GPF) for the individual employees
- Retirement Benefits
- Pay Increment and Fixation
- Reimbursement
- Service Register
- Leave Travel Concession
- Tours and Travel
- Retirement Traveling Allowance
- Disciplinary Action & Punishment

Establishment Module

- Recruitment and allocation
- Departmental Training
- Transfer and promotion
- Performance appraisal
- Retirement
- Manpower Planning

Asset Management System

There are various assets of the Department; management of those assets would be done by the Asset Management module. The following are the functions of the asset management module:

- Maintenance of the inventory records with the location, reference number etc.
- Checking the availability of all the office inventory
- Allocation of the inventory on the basis of the requirement by the department.
- Support the process of approvals for the acquisition of the inventory, and keeping the records for them
- Management of fixed asset register including asset description, asset category, purchase date, asset reference number.

- Monitoring of the condition of the assets, so that it can help in their maintenance
- Keeping the maintenance records
- Generate alerts for the warranty expiry and the renewal of annual maintenance contract, payment of bills in advance
- Management of depreciable asset as well as non depreciable asset
- Keeping the details of the vendor for the AMC and warranty etc.

Inventory Management System

The inventory management deals with the acquiring of inventory and its efficient management. Following are the function performed by the system:

- Availability of the user defined vendor category, vendor types and vendor payment priority codes
- Option of tracking of the purchase order
- Tracking of the last price or the price which is paid in past for an particular item
- Calculation of Purchase price variances and the other various discounts
- Record of the allocation the different items to different people
- Reports on the actual versus expected purchase cost
- Tracks lead time by the vendor product comparison
- Tracks the dates during the acquiring of any item
- LIFO and FIFO in recording the products
- Detail tracking of the movement of the inventory
- System to provide alert , when the inventory of a certain item falls below a certain level
- Records in details about the number of the items procured including the price, name of the vendor and the date of purchase.

Inventory tracking Module

Carries on the task of tracking of inventory

Stores Module

The Stores module will cater to the following store related functions

- Indenting, Tender, Quotation, Purchases, Issue of stock

Billing module

- Clearance of bills
- Maintenance of record of bills

Requisition Module

Let all the offices raise requisition indents for stationary goods and materials

Litigation Management System

Litigation Management enables the following activities:

- Management of the pending Cases
- Managing of the other litigations
- The system will maintain a record of all legal cases
- The system will allow creating new court case record.
- The system will capture writ petition appeal, case number, Name of Petitioner / Appellant, Amount Involved, type of the case and subject in brief.
- The system should record the details of the case like complaints
- The system should have an option of scanning / uploading option for important documents as an attachment

eProcurement System

This system will help the department in tendering and other auction related activities. This system will work on "time based access ", which means no activity can be carried out before due time. The following functions will be performed by the system:

- e-Tendering
- Reverse Auction
- e-Auction- which can help in online disposal of goods
- e-RFQ - by which online quotes can be invited
- Market Making- which can help in Supplier identification by rating application
- e-Sourcing: which is the catalogue based procurement

Supplementary System

Training Module

- Identifying training needs
- Captures data of employees requiring training in different fields
- Planning training session
- Developing training plans
- Keeping records of the people, who are undergoing different types of training.

Assembly query and reporting module

- It enables to do reporting activities to the assembly
- Gather information about various systems functioning at different levels of the department
- Process the information to generate desired reports for the State Government , Legislative Assembly
- Would be able to provide G2G interface to the other departments interacting with the department to get the requisite information required
- To provide replies , appropriately and timely response to the issues raised in the State Legislative Assembly
- The system should capture the Diary No., Questions No/Notice No., MLA Name, Question details; Starred / Unstarred options, Answer, Annexure etc would be the inputs to the system whereas outputs / reports would be Pending Questions of the Assembly, Question status, district wise overall report etc
- The system should be able to allow user to record details of action taken to address issues raised in the assembly.
- The system should be able to provide adequate interface with master databases to prepare appropriate and timely replies to issues raised in Assembly.
- The system should be able to generate report of issues addressed/ un-addressed in the Assembly on the department.

Desk dispatch module

- Management of inbound and outbound letters

Complaints and query supervising module

- Detailed issue recording
- Streamlined corrective actions-Collaborate in development and implement corrective actions plans
- Real time tracking of issues
- Redressal mechanism- The system should analyze the trends and take the suggestive actions in future .The features of the system includes:
    - The system should provide the current status of all complaints at various Field offices and the complaints at Department proper and the allied offices
    - The system should maintain a record of all enquiries at the fore said offices.
    - The system should allow creating new enquiry record.

- The system should generate a report of number of enquiries between any given periods and the reasons thereof.
- The system should record inquiry details like dates of enquiry, dates of examination of witnesses and recording the evidences and any other field defined by the department.
- The system should provide for drafting of Inquiry Report.
- The system should send Inquiry report online to the Competent Authority.
- The system should record the date of the verdict and the verdict given by the Competent Authority.
- The system should record the dissent note, if any, of the Competent Authority on the draft Inquiry Report.
- The system will record re–inquiry details

Suspension charge sheet supervising module

- The system should maintain a record of all charge-sheeted/suspended employees and the details like section, department and the Charge -Sheet.
- The system should update the service record and personal file of employee, if charge-sheeted/suspended.
- The system should record the status of complaints and enquiry details against charge-sheeted/suspended employees.
- The system should be able to generate report of charge-sheeted/suspended employees as specified by the department.
- The system should be able to provide the details of the departmental enquiry proceedings and list the enquiry officers, presenting officers.
- Monitoring the queries
- Generating reports based on that

Library Management Module

The library management contains the books, journals and other research works

- Cataloguing- Add , copy ,edit and delete records
- Circulation- Loan , Return, Renew, and booking Item Status(of the book)
- Searching – visual, customized search option
- Generation of the general and ad hoc reports

Workflow Management System

Work flow management helps in tracking of the processes in the department. It works in two phases a) Spoke - Initiation of an activity b) Hub – Continuation of that activity. The module does the following activity

- Routing different processes via routing rules engine
- Queue management of the activities
- Process monitoring
- Defining turnaround time

Document Management System

DMS is basically Document Management System. It does the following activity:

- Data capturing- Imaging of the data is done to get the data in digitized format
- Archival- The captured data is archived properly to be used effectively later
- Search options- The records and the data can be searched based on various options

Knowledge Management System

The Knowledge Management System (KMS) is the flexible solution that helps to find, share, and publish information easily and provides a common platform for information dissemination of information for the entire staffs of the Department. The following features would be enabled in the KMS:

- Administrative automation system, which includes salary, e-muster, e-leave and provident fund
- Answers to frequently asked questions
- Database driven mailer to communicate to employees
- Employee page , where the personal information of the employees to be stored
- Repository of old articles for reference
- Medium for top down and bottom up communication
- Updated news of the department to be provided
- Automated Content Tracking - which means that the documents will be uploaded by the process owner or the authorized person and could be viewed as per the access rights given to them
- Publishing of the reports and the Acts in the portal
- Search Engine

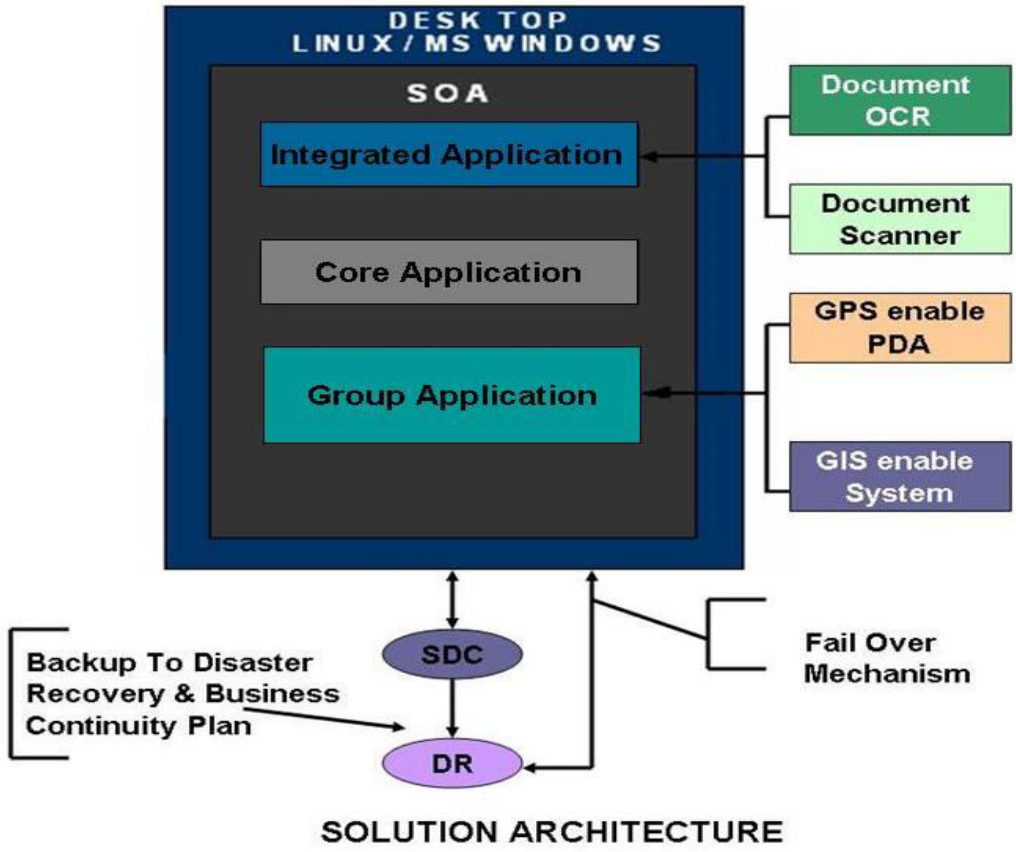
Upgraded Forest Department Website

The website of the Forest department is proposed to be upgraded which will enable the department to communicate with the citizens more effectively. Following are the some of the proposed modules in the website:

- Other information on general awareness activities
- Right to Information
- Forms , which needs to filled by the user agency for the purpose of land use
- Wildlife census for a certain year
- Grievance redressal mechanism for the citizens
- Online tracking of service request
- Forms to visit wild life sanctuary- This form will contain information following details:
    a. Name of the visitor and the sanctuary , citizen wants to visit
    b. Address
    c. Nationality
    d. Purpose of visit
    e. Period of visit
    f. Entry fee
    g. accommodation

Solution Architecture

For the applications to function it requires data from various devices. Certain data synchronization is periodic where data will be captured at field level and synchronization which will be done at the range level. The schematic representation of the devices and the data synchronization mechanism for the entire solution to function is shown here.



SOLUTION ARCHITECTURE

The other features that are proposed for the solution to function are as follows:

- Each of the application should integrate the work flow of each of the processes for which the module is being designed
- Provisions for integration of digital signatures should be kept to authenticate the approval (at present it is not in the scope. In future department may go for PKI provision).
- Proper validations at each level of the module should be defined and imposed.
- The security of the system should be such that, database and the applications should not be vulnerable to hacking by an external source i.e. internet.
- The application should be designed for Internet and intranet Application. Some of the features shall be available in Internet and departmental people will access the system through Intranet.
- The developed system should have an extensive search facility at appropriate level.
- The application should support built in work flow for all the modules as per the department business process.

Logical Data Bases in Data Center

The applications of the forest department now proposed to be hosted in the Maharashtra State Data Centre (SDC) that would centrally host multiple applications in high availability environment and would act as a mediator and convergence point between open unsecured Public Domain and sensitive Departmental data. Each suggested application should have the following logical data base at the State data centre.

People Related

- Citizen Database: This would contain details of all citizens availing services of the Department / lodging complaints, or coming in contact of the services/processes of the Forest Department.
- Employee Data Base: This would contain details of all the employees who is serving the department or have served the department in past.

Work Related

- Accounts Database: This would be used to maintain the accounts, budget, income and expenses of the department.
- Asset Database: This would be used to maintain the movable and immovable asset details maintained by the Department. Vehicles and modern equipments that are bought by the department would also be maintained here.
- Inventory Database: This would be used to maintain the details about the number of the item purchased including their prices, name of the vendor and the purchase date, store details and the payment details against the purchase that are bought by the department.
- Document & Report Database: This would be used to store all the key documents/files of the Department in electronic format along with the entire letters memorandum etc. All manuals and latest version of the Indian Forest Act and Research Papers and News copies would be stored here.
- Government Resolution: All government orders issued by the state or central government and is of the interest of the department would be stored here along with the dates and subjects for quick references.
- Land Management Database: All the information related to the land and the demarcation of the forest boundary is kept in the form of data base. The information is kept in the form of Coordinates of latitude and longitude in the mentioned database for reference and to carry on day to day land management activity.
- Quarry Order Processing Database: The data related to various details like Name of the Consignee, Age, Time & Date, Type of mineral uplifted, Quantity of minerals uplifted, and financial value of the Material, place of upliftment and destination of the materials uplifted etc are stored here.

- Wildlife & Plantation Database: All the records related to the wildlife & Plantation, like the records of the animals, plantation and their various details are stored here. The revenue details are also stored here along with the other information.
- Litigation Database: All the data on matters relating to the different court cases and their status and the activities performed are stored over here.
- Assemble Query Database: All questions raised from the Legislative assemble would be stored here with the details that the system would capture.

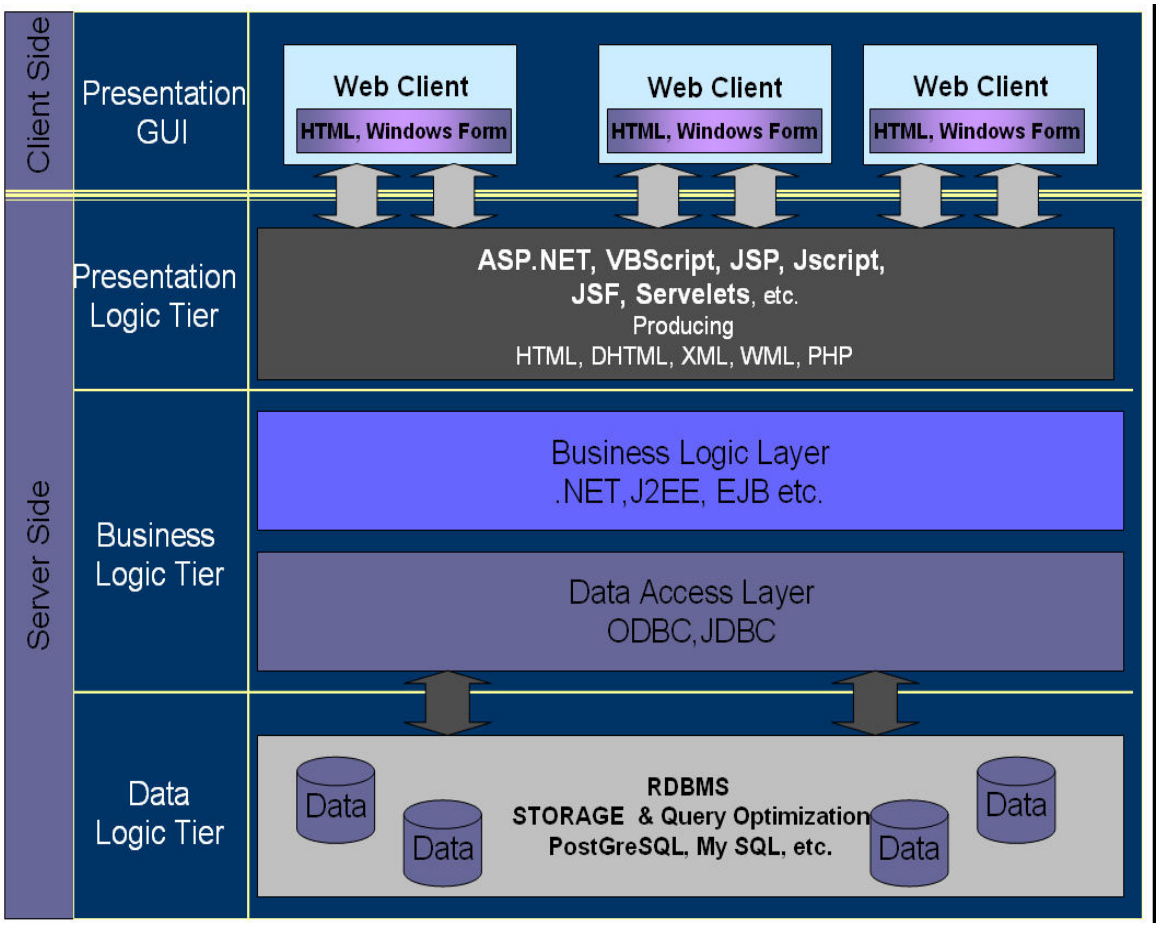
External Agent

- Business Users Database: list of all vendors, their contract period satisfaction leveled the vendors should be mentioned here.
- Grievances Database: This would be used to maintain the details of the grievances/complaints registered by citizens and the employees along with the dates and the status of the complaints.

The suggested applications (as described in the previous section) of the Forest Department, would be residing at the State Data Centre and the entire department would be able to access the Integrated and Core applications. The Departmental applications would only be available to the particular circles or offices.

Application Architecture

The proposed architecture is a web based application with three main layers i.e. a) Data layer, b) Business layer, c) Presentation layer. It is proposed that each and every layer should have very minimal touch-up with other layers. The whole point is to allow Maharashtra Forest Department to plug each layer in and out (very modular) without too many hassles and without limiting the technology used at each tier/layer. The main goal of layer wise architecture design is to explore the entire business and define an application and infrastructure framework that has the potential of delivering workable solutions for the foreseeable future. The solution should support business growth or shrinkage, and replacement of application and technology components over the period of time. The application architecture is as follows



The Maharashtra Forest Department Application should conform to an application development and integration methodology based on a *Service Oriented Architecture (SOA)*, and the integration methodology should be based on XML and Web services standards. The solution should be developed to be an orchestrated sequence of messaging, routing, processing, and transformation events capable of processing the rich (XML) documents.

The solution shall be developed in conformance to the IIP/IIS Standards as prescribed by Govt. of India. The core components of the Maharashtra Forest Department such as User Registration, Authentication & Authorization, Message/Transaction handling shall be reusable components and such components/services of Gateway should be exposed for any external G2B & G2C related service delivery channel established at the department level.

The solution should be architected to ensure that current and new services/applications of the department can be seamlessly integrated into future proposed and implemented solution architecture with minimal impact and changes.

Solution Design Considerations

Scalability

One of the fundamental requirements of Solution architecture proposed is its scalability. The architecture should be highly scalable and capable of delivering high-performance as and when the transaction volumes increases. It is required that the application and deployment architecture should provide for Scale-Up and Scale out on the Application Server and Web Servers, Database Servers, and all other solution components. The application developed should have the provisions to add, delete, modify any of the parameters and a single change in the master parameters should be reflected into the entire system.

Scalability of solution is to be achieved as described below:

i. **Scalability in terms of the volumes of transactions handled.**

This translates to the facility to enhance the hardware, software and network capacities to maintain the performance levels always in tune with the SLA metrics.

ii. **Scalability in terms of addition of new modules**

This translates to seamless and effortless integration with the backend application such that new module can be integrated.

iii. **Scalability in terms of addition of new channels of delivery.**

This translates to designing the systems suitably to provide services through other delivery channels including external portals, mobile phones, PDAs etc.

Security

The systems implemented should be highly secure, considering that it is intended to handle sensitive applications relating to Maharashtra Forest Department. The application and database security should integrate with platform security.

The security services used to protect the information infrastructure should include Identification, Authentication, Access Control, Administration and Audit and support for industry standard protocols. The solution should ensure guaranteed once only delivery, message routing, queuing and load balancing features and optimize both data-level and process-level integration. Specific capabilities of such a solution should include, but are not limited to, a robust and secure messaging infrastructure, graphical data transformation capability, automated business process integration (both internal and cross-enterprise), workflow management, and powerful business to- business transaction capability. The solution should provide option for maintaining an audit trail of all the transactions

User Accounts

A single login should be provided to each user for an application. The Login filters should be built-in and time-out should be built-in for inactivity, and the access should

get locked, such that a reauthorization is required to continue. Last login for every user should always be displayed.

Audit Trails

All audit trails at the database levels should be enabled. Audit trails should be built at the application level and a policy for audit generation, review and retention should be formulated and implemented.

Priority of Application Recommendation & Value Proposition

The recommendations are prioritized as high, medium and low. A recommendation with high priority implies, it needs to be implemented on priority. A recommendation with medium priority implies that though they are necessary, still they can be implemented once the implementations of High priority applications are over. Some of the recommendations may be implemented in future to enhance & improve the department processes and the citizen service delivery mechanism further so that the stakeholders are able to reap the benefit of this exercise to the full extent. These recommendations are sort of add-ons to the existing ones. These recommendations are given a low priority. It is to be noted that the priority is based on certain parameters like:

- Improved information availability
- Improved Service Access
- Improved Service Delivery
- Improved quality of service
- Transparency in system

It is also to be noted that the recommendations suggested are so that they can be implemented in parts or whole. However, if implemented as a whole, it would create a service delivery mechanism that would be efficient, flexible, transparent and integrated.

Priority of Recommendation		**HIGH**	**MEDIUM**	**LOW**	
RECOMMENDATIONS	**PRIORITY**	**TARGET BENEFIT METRICS**			
		Reduction in Time of Service	**Improvement in Quality of Service**	**Over All Departmental Efficiency**	**Employee/ Citizen Satisfaction**
Application	**Account & Budget Management System**	**High**	✓	✓	

	Assets Management System	High		✓	✓	✓
	Inventory Management System	Med	✓		✓	
Priority of Recommendation			**HIGH**	**MEDIUM**	**LOW**	
RECOMMENDATIONS		**PRIORITY**	**TARGET BENEFIT METRICS**			
			Reduction in Time of Service	**Improvement in Quality of Service**	**Over All Departmental Efficiency**	**Employee/ Citizen Satisfaction**
Suggested Software	Human Resource and personnel Management System	Med	✓	✓	✓	✓
	e-Procurement system	High	✓	✓	✓	
	Wild Life management System	High	✓		✓	✓
	Knowledge Management System	Low	✓	✓	✓	✓
	Upgraded Forest Department Website	High	✓	✓		✓
	Quarry Permit Order System	Med	✓	✓	✓	✓
	Fire Alert Management System	High	✓		✓	✓

	Supplementary Systems	Low	✓		✓	✓
	Forest Offence Management System	High	✓		✓	✓

Priority of Recommendation			HIGH	MEDIUM	LOW	
RECOMMENDATIONS		PRIORITY	TARGET BENEFIT METRICS			
			Reduction in Time of Service	Improvement in Quality of Service	Over All Departmental Efficiency	Employee/ Citizen Satisfaction
Software Application	Litigation Management System	Med	✓	✓	✓	✓
	Work Flow System & Document Management System	Low	✓	✓	✓	
	MIS & Reporting System	Low	✓		✓	✓
	Land Management System	High	✓		✓	✓

Implementation Plan

The initiatives that have been suggested are to be implemented in a phased manner for smooth roll out of the improved computerized system for Forest Department of Maharashtra across all its offices in the state. However, implementation across the state at one go is not feasible considering the topography and accessibility in the state.

The implementation strategy to be adopted comprises of the following:

- Phase I: Project Support & Infrastructure Implementation (2012-2013)
- Phase II: Pilot Implementation Phase (2012-2013 and 2013-2014)
- Phase III: Roll-out throughout the State (2014-2015 Onwards)

However, for implementation of the project, the application software of the Maharashtra Forest Department requires to be hosted at the State Data Centre, which should be available for the implementation. The hardware rollout in the state has been spanned over a period of three years starting from FY 2012-2013.

Rationale behind the Suggested Implementation Approach

The project is proposed to be implemented in three phases and in three years. Phase one will comprise of the four quarters of FY 2012-2013. Phase two will comprise of four quarters of FY 2013-2014. Phase three will start from first quarter of financial year 2013-2014. The rationale behind proposing this implementation approach is to well spreaded hardware procurement, software development & implementation cost and efficient monitoring & implementation of the projects in various years.

In the first two years, it is proposed to have implementation of project support infrastructure along with application pilot implementation. During the Pilot implementation, the result of computerization can be seen, the staffs can be trained and their comfort level can be examined, feedbacks can be taken and the service levels can be examined. If required any feasible alterations may be proposed at this juncture by the Department for the rollout implementation. From third year onwards the project can be rolled out to the entire state and the hard ware and other electronic goods would be procured and the application software scope would be rolled out. The handholding and the training for the pilot implementation will continue in this year. As well as training would be implemented simultaneously with the rollout.

Phase I: Project Support & Infrastructure Implementation (FY 2012-13)

The detailed phase wise implementation is shown in the following table. The breakdown of the application software is shown in the consecutive tables thereafter.

Phase Wise Approach for the Implementation	
Sl No	Activity

1.	Phase I	Selection of the Project Management Consultant
2.		Constitution and empowerment of Department eGovernance Mission Team (DeMT) for the program management & necessary support for the implementation
3.		Setting up connectivity at the Department, Wide area network till range offices and LAN in Head office
4.		*Site Preparation at the Head office, its annexes & Field Offices
5.		**Hardware Procurement for the Head office, circle offices and offices where it is required
6.		Procurement of necessary specialized hardware devices for the projects eg: PDA, CCTV, etc

***** The site preparation would include electrification and earthing works, small civil works as and where required in the Head office and the allied Offices of the MFD.

** The hardware procurement would also include installation of the System software in the procured Hardwares.

Phase II: Pilot Implementation (FY 2012-13 & FY 2013-14)

Phase Wise Approach for the Implementation		
Sl No	Activity	
1.	Phase II	Finalization of locations for Pilot Implementation phase
2.		Selection of Application Vendor and Award of Contract (For all the applications listed below in the table, Part I & Part II)
3.		System Requirement Study
4.		Procurement, Customization & Development of Part I application software

5.		Pilot Implementation of the application software developed in this phase
6.		Procurement, Customization & Development of Part II application software
7.		Pilot Implementation of the application software developed in this Phase
8.		Data Migration
9.		Training on Application Software and Hand Holding

Phase Wise List Of Application Software To Be Developed

List Of Application Software - Part I	
Sl No	Name Of Application Software
1.	Accounts & Budget Management System
2.	Asset Management System
3.	Fire Alert Management System
4.	Forest Offence Management System
5.	Wildlife Management System
6.	eProcurement System
7.	Land Management System
8.	Improved Departmental Website

List Of Application Software - Part II	
Sl No	Name Of Application Software
1.	Human Resource and Personnel Management System

2.	Inventory Management System	
3.	Litigation Management System	
4.	Quarry Permit Order System	
5.	Document Management System	
6.	Knowledge Management System	
7.	Work Flow Management System	
8.	Supplementary Systems	Assembly Query & Answer Management System
		Library Management System
		Desk Dispatch Management System
		Suspension Charge sheet Management System
		Complaint & Query Management System
		Forest Training Management System

Phase III: Implementation Roll-out throughout the State (FY 2014-15 Onwards)

Phase Wise Approach For Roll-out		
Sl No	Activity	
1.	Phase III	Site Preparation for the field offices throughout the State
2.		Hardware Procurement & rollout throughout the state
3.		Roll-out of the application Software throughout the state
4.		Data Migration throughout the State
5.		Training on Application Software and Hand Holding

Besides these a major initiatives are taken towards capacity building, Videoconferencing and Digitization of Maps.

- Digitization will ensure the upload of these maps in soft copy for easy access by the public as well as official use. Digitization will also be essential for integration of GIS and MIS based applications.
- Video Conferencing have been implemented in the head office and thus will ensure easy and fast communication across the offices to ensure quick decision making. Video conferencing set up can be extended to all circle & Territorial offices. Also, after all the offices are connected through common network. Video conferencing can be done using the WAN till range offices. It will save lot time of public officials and also save on funds by reducing travel costs.

4 Approach and Methodology

The first step in a Large Scale Computerization is the development of an ICT management plan, which describes the major tasks and schedule of work for the project activity.A systematic approach is recommended to assure the development of a ICT system that is fully responsive to a Maharashtra Forest Department performance objectives and resource constraints. This approach will include the following components:

- Systems analysis, which includes information needs assessment, requirements analysis, and requirements specification
- Systems design, which includes synthesis of alternatives, specification of criteria for selecting a preferred alternative, selection of a preferred alternative, top-level design, and detailed design
- Systems implementation, which includes forms development, specification of data collection and entry procedures, development of editing and quality control procedures, software coding and testing, development of training materials and training, integration of the software components with other system components (e.g., personnel, communications, data transfer and assembly, report preparation and distribution, feedback), and system-level testing
- Systems operation and support, which includes not only routine operating procedures but also provision for on-going system financing and management, quality control, software maintenance and updating, personnel training, and system maintenance and improvement (including periodic review of system performance and diagnosis and correction of problems) While the preceding system development phases are completed in sequence, there is some time overlap between them.

The following paragraphs discuss aspects of each of the above components. The approach to management information system design should be based on the modern software/system engineering discipline, which consists of structured analysis and structured design (top-down design).

Systems Analysis

Systems analysis will include to assess current set up & information needs and shortcomings; specification of system goals, objectives, and constraints; a survey of potential system users to assess their information needs; identification and analysis of alternative system concepts; specification a system concept; and system requirements analysis and specification.

This phase will include an analysis of major system functions and the development of system architecture (identification of the major system components and their interrelationships). Heavy emphasis should be placed on end-user requirements. It is essential to involve the end-user in the system requirements activity, to insure the development of a system that is fully responsive the user's needs. The review of the current system and survey of potential users can be done by a variety of means, including review of documentation, site visits, questionnaire surveys, interviews, and focus-group discussions.

Systems Design

The systems design phase is generally broken into two subphases, top-level design and detailed design. Top-level design consists of the identification of the major system components and their functions. In order to specify the top-level design, a number of alternative system design concepts are synthesized and evaluated in terms of a variety of selection criteria, which include cost (implementation, operation and maintenance), performance, satisfaction of requirements, development risk, flexibility for expansion/upgrading, and political acceptability. The important aspect of top-level design is to present several feasible solutions to the system managers and users, to describe their advantages and disadvantages, and to obtain a consensus on a preferred design concept.

An example of a design decision is the decision concerning which functions should be implemented using computers and which should be manual (e.g., should data collected at a regional level and needed at a central level be transmitted via the Internet (e.g., SWAN, MPLS VPN or e-mail).

Detailed design consists of specifying all of the system components and functions in detail. In the detailed design phase, decisions are made concerning what data elements are to be collected, how they are to be coded, how frequently they are to be collected,

and at what levels of detail they are to be aggregated. The decision on the unit of analysis has a significant impact on both the cost of the system operation (especially the data collection burden) and on the flexibility of ad-hoc reporting. This design decision is particularly important. While it is an easy matter to revise a data entry screen or report format, it is not possible to produce a desired report about a particular type of unit if data on that unit are not included in the data base. For example, if it is desired to produce a report about the frequency distribution of ponds by some characteristic, pond-level data must be included in the data base (or capable of being constructed by aggregation of lower-level units).

For a software subsystem, the structured analysis / structured design approach involves the use of techniques such as data flow diagrams, functional decompositions, and structure charts. Since we recommend making heavy use of fourth-generation database management software, the amount of detail depicted in the detailed software design is generally minimal.

The detailed design phase also identifies the initial reports to be produced by the system (reporting levels, frequency, content, and format). With fourth-generation database software it is an easy matter to change reports or develop new reports, so the specification of the output reports is not critical (since it will almost surely change over time).

It is recommended to adopt a rapid-prototyping approach for the software development. This will consist of developing an initial version of the software, testing it, modifying it, and then producing a second, improved, version. This iterative process is repeated one or more times until a desired version is obtained. With the rapid-prototyping approach, the "design" is continually evolving, and a minimum amount of effort is expended in documenting each of the prototypes.

The system design phase specifies what computer/networking equipments is to be used.

The following paragraphs mention some practical aspects of system design.

- System Size. Modern microcomputers are so powerful that most pplications can be done using commercial off-the-shelf (COTS) microcomputers.

- There are several types of database models, including indexed, sequential, network, and relational. For general-purpose applications, such as management information systems, the relational model is almost always used. Relational databases are based on a mathematical framework (“relational calculus”) that makes it easy to maintain data integrity and perform ad-hoc queries.

- Selection of Software. For most applications, the choice is between using a very expensive system, such as Oracle, or Microsoft Access or SQL Server.

- Another option is to use open-source (free) software, such as MySQL.

- Query Design. The major factor affecting database performance is the quality of the design of the queries (procedures used to retrieve data). In a relational database system, queries are implemented using the SQL programming language.

There are many other factors to be considered in conducting the detailed design of a ICT project, such as whether data should be archived year by year or included in a single large database (to facilitate time series analysis); whether the data should be entered at a central facility or on-line via many distributed workstations (e.g., in different districts); procedures to be used for primary data collection (e.g., questionnaires); data-cleaning routines; and security.

Systems Implementation

Systems implementation consists of developing all of the system components -- data collection forms; data collection, transfer and processing procedures; data entry procedures and screens (including on-line edit checking); software; report forms; report distribution; quality control procedures. As mentioned, we recommend the use of an iterative, rapid-prototyping approach to the software implementation. It is highly recommended to field-test major systems in a single geographic area before going full scale. This field testing involves not only software, but all aspects of the system (e.g., data collection procedures, training, and quality control).

The importance of allowing for prototyping and field testing cannot be minimized. A key problem faced in developing countries is data integrity. From previous experience, we know that users become much more interested in data integrity after seeing the data they reported in a printout.

The system procedures will allow for regular feedback of data to the source levels, for review and correction. A considerable amount of time must be allowed for implementation. Because of the many uses to which an MIS may be applied, all of the collected data may not be included in a single file. Instead, there may be a variety of data files, involving a variety of units of analysis. For example, there may be State-level, regional-level, and local-level files; facility files, personnel files, program files. Data from these files may be aggregated and combined as desired, as long as there is a "key" (identifier) linking the file records.

System Operation and Support

System support should include all of the resources required to operate, maintain, and improve the system. Because of the known eventual departure of the system development contractor, it is necessary to develop a system that is easy to use and improve, and that will not collapse with the departure of a key government person. To accomplish this goal, training materials and procedures will be developed that can be used to assure the continued operation of the system in the future.

4.1 Design Considerations

The design considerations for the proposed technology solution in any large scale IT project are:

- High Availability
- Scalability
- Interoperability
- Portability
- Performance
- Extendibility
- Security

The following section details out each of these design considerations with respect to the project and the proposed technology solution.

- **High Availability:** It is an ability to withstand failure or individual components.

The proposed architecture addresses these requirements through the use of clustering, load balancing and redundancy. Cluster environment should be built for critical applications with fail-over and fail back features.

The application Server should be kept lighter than the Database Server. Web Server should be much lighter than the Application Server. Redundancy and Load balancing features should be built in Application Server, Web Server and Database Server to achieve the High Availability.

- **Scalability:** Scalability refers to ability to service significant increase in load or page request, without noticeable degradation of performance by means of deploying additional hardware without making any changes to existing code.

To address the scalability challenge, the proposed architecture is build around the Service Oriented Architecture (SOA) paradigm. Interactions among the various services and integration with the existing application are achieved using XML open standards. There is a clear cut demarcation between data and business and enterprise applications. This will enable the implementation team to plug in new applications and new features at any point of time to address the application level scalability requirements.

In conclusion, there must be well defined capacity management plan at the time of design phase to clearly define hardware changes to be done for servicing increasing load.

- **Interoperability:** The success of MIS application initiative would largely depend on the flow of information among the heterogeneous applications. The proposed architecture is built around the web services standard and adopts open standards for interacting with various applications to address the interoperability requirement. ANSI SQL standards should be used to ensure the Interoperability.

- **Portability:** MIS application should be portable. It should address the following requirements,
  - No part of implementation should be portable
  - Any COTS products used should provide tools for exporting & importing data using open standards
  - Developed source code should conform to open standards

- **Performance:** Performance is defined as the responsiveness of MIS application. It should manage the user load and response time. It would be the key challenge for MIS portal as more and more citizens take part in MIS online initiative and volume of data grows. It is essential that the performance of the portal must not deteriorate with increase in volume of data or number of end users. The proposed architecture takes care of the application level performance requirement by load balancing and caching technique.

  The performance is taken care of by restricting the number of users to consume various services by defining an access control mechanism. However, regular performance tuning initiatives like purging and archiving of data are to be adopted to ensure optimum performance.

- **Extensibility:** Extensibility refers the ability to add new functionality without requiring major changes to the existing code. MIS application should be extendible to adopt following of changes with minimal or no changes to existing code
  - Providing new content processing, content management system
  - Significant growth of the content
  - Providing new functionality or feature or service

- **Security:** The security requirements should address data privacy, confidentiality and access control mechanism. In addition, the security should address the following features,

- DMZ policy
- Encryption
- Authentication
- Authorization

The following security related considerations are being made:

I. *Application server level:* The access to various applications is controlled by active directory authentication services at the Portal level. The Portal would keep AD user data for authentication and authorization at MIS employee data level.

II. *Database level security:* Only authorized users are allowed to upload / change the data. The data backup is performed as part of schedule task and is encrypted to ensure safeguard against data theft.

III. *Other Security Features:* In addition, system should provide the following security features
   - System should support integration with third party authentication services or tools
   - System should provide unrestricted access to administrator or super user
   - Transactional State services are accessible only to authenticated users
   - Confidential information such as login pages and pages related to transactional services should be served over https.

Database Features: The following are the Database Features of the MIS Web application

- Should support data base partitioning and parallel processing
- Should support Active-Active Configuration
- Allow users to connect and use the same database from multiple nodes by using resources of the individual node
- Should be available under maximum number of Operating Systems and supported under maximum number of Application Servers.
- Should have support for generation, consumption of XML data and XML based query capabilities.
- Allow multi dimensional OLAP capabilities for Data Warehousing

4.2 Problems and Issues addressed by the proposed system

This project is envisaged to improve the overall efficiency, effectiveness, transparency and accountability in the Forest Department. The sub-objectives of the project as depicted below are targeted towards realizing the improvement areas:

a) Efficiency

- Ensure online Management Information System of Key / Necessary information
- Improve efficiency of the Department operations

b) **Effectiveness**
- Ensure accurate Data reach the intended users on time
- Minimize data duplication
- Enable effective monitoring of data

c) **Accountability**
- Ensure traceability of decisions
- Ensure adherence to service level

d) **Transparency**
- Establish an effective system for redressal of grievances
- Make all important information available to Departmental users / citizens

e) **Centralized Repository of Data**
- Make sure Data is available as and when required by Dept Users
- Data to be available in digital format and stored at central location
- Data to be stored in central place / repository which can be used in future / Quick decision making

5 Project Details

5.1 Overview of Functional Requirement

User interface:

Any DATA needs to be entered only once and is then should be available as often to all the systems require to use the said information.
All the modules should be homogeneous with respect to the key board use screen layout and menu operation with Graphic user interface.

GUI form administration should support:-

- Changing fields or tab labels
- Hiding fields or tabs
- Changing position or size of the field or labels
- Adding restriction or mandatory or not
- Setting default value in a field
- Changing list of value (LOV) contents

- Capability to setup logic to trap conditions to pop messages in response to conditions like logical data entry errors, certain conditions etc.
- Ability to provide these configurations down to the user level so that the screen can be made to have different functionality for a given user.
- The separate information can be consolidated from a number of systems as required to produce reports and carry out ad-hoc analysis and reporting.

The system developed should facilitate Maharashtra Forest Department for decision support system to assist users for optimum utilization of the available resources.

Access & Data Security

- Role based authentication to various functionalities mentioned in different modules with encrypted passwords. Rights can be given to Individual users or groups.
- Flexibility to define separate role and designation to the users. Upon transfers of officers/employees, applications/letters.
- User rights to various forms should be either Create New Record or View Existing Record or Edit Existing Record.
- An audit trail of changes to data in the system shall be maintained to identify the users responsible for the modification. There should be a facility to create reports on audit logs.
- System should be easy to support & reduce tampering.
- Should capture exceptions to detect frauds/mistakes.
- Information security i.e. Integrity, Confidentiality & Availability of data to be maintained.
- Data needs to be protected against following threats:-
- Unauthorized access to data base or application

Scalability

- The System offered should be scalable to cater to the present and future requirements of Department.
- The system should be built using Service oriented, Open Architecture.
- It should be possible to add more fields to the data input screens for capturing additional business specific information without having to write any code.
- Capability to modify existing forms to suit the requirements without requiring additional development tools.

Functional Features and Requirement of the proposed Applications

The Proposed solution should be designed using the industry's best practices and is based on n-tier service oriented architecture.

- The users should get authenticated before the access to the application is made available. The users are to post the request for service and deliver services interfacing with the applications hosted or connected through the MIS deployment environment.
- As applications are build under the Centralized Architecture specification, we build High Availability solution at the web server, application server and database server level to avoid complete failures of services, which are delivered through MIS application. High- Availability solution works under Active-Active modes.
- In Active-Active Configuration, in Normal circumstances, both the nodes configured in a cluster continuously provide the services to users, so both the nodes are utilized in online enquiries, transactions, etc. while running the same application. When one node goes down, the entire load of the application switches over to the second node.

5.2 Overview of Technical Requirement

Application Development should conform to the following:

- Data storage in Database.
- Data structured in accepted normalized method.
- All code and data structures documented.
- The application should require no add-ons unless such are well-established, likely to be available for the known future, have no special maintenance requirements, and no ongoing licensing costs.
- Application will require a typical log-in infrastructure, including the following:
    - Initial email sent to user, with hyperlink for activation.
    - Hyperlink leads to registration form. Passwords required being strong.
    - Acknowledgement email sent after successful registration.
    - Form available for lost passwords.
- Application should have a user management system to add, delete or edit users and their permissions as well as manage passwords by one single administrator
- Application should be "email-ready". That is, they should have the entire infrastructure in place to send out data-triggered email alerts, although none are needed at present.
- Application hosting, including DNS, web server, and database server hosting will be provided by Forest dept.

The following are not recommended in application:

- Animated interfaces such as Flash.
- Graphical design elements – a straightforward, attractive look and feel is sufficient.
- Any EDI (electronic data interface)

5.1 IT Infrastructure Architecture

Maharashtra Forest Department Infrastructure will be hosted at State Data Centre or ICT Cell Nagpur and users will access it through SWAN / Internet. In Head Office all Application such as Mail & Messaging etc will also be deployed on the servers at ICT Cell. Network Connectivity can be described here as:

- For Head Office Nagpur
  - Provisioning and Configuration of MPLS 4 Mbps BW connectivity to Head Office (HO),
  - Provisioning and Configuration of 10 Mbps dedicated Internet leased lines at Head Office (Nagpur)
- For Circle Offices
  - It is suggested to have Installation, Provisioning and Configuration of MPLS 1 Mbps BW connectivity to all Territorial and Wildlife Circles

- For Division Offices
  - It is suggested to have Installation, Provisioning and Configuration of BBoVPN 512 Kbps BW connectivity to all Division offices.
- For Range Offcies

  - Provisioning and Configuration of BBoVPN 256 Kbps BW connectivity to all Feasible(connectivity) Range offices
  - Provisioning and Configuration of connectivity(GSM, CDMA, VSAT, etc) to all non Feasible(connectivity) Range offices

6 Implementation Strategy

6.1 Implementation Considerations

Since operationalization of the Solution will have larger involvement of Department of Forest, a centralized implementation model is proposed under the scheme. In this model, there will be one implementing agency selected after due consideration to all the

competent authorities:It is suggested to have different **Implementation Agencies for each major task such that the department is bale to have a better control over the project. The development of forestry based applications can be done eiither by procurement from MP Forest Department or developed through a private agency through competitive bidding.** The Applications would be audited by STQC (Standardization, Testing and Quality Certification, Directorate of Department of Information Technology and Government of India).

Implementing Agency would be responsible for design, development, implementation, enhancement and maintenance of the project Intiatives. The IA will design and develop various modules based on data exchange guidelines / Requirements of Department.

It is most important that all solution with all its components should be scalable to handle any additionality from time to time. Scalability must be in terms of Hardware, Software, Customization and functionality etc keeping in view to next 10 Years of requirements.

The following key parameters should be addressed by the MIS Application:

1. Key Parameters:
   a) Maximum Number of users: 2000
   b) Maximum Number of Concurrent Users: 500
   c) Number of Reports / Returns / Statements: 200
   d) Period of Storage of Data: 10 Years

2. The Sizing of the Solution should be done keeping in view all the above parameters, including next 10 Year requirements and a detailed Sizing Document incorporating proposed System Architecture, Parameters and Justification thereof must be submitted by the selected IA.
3. IA shall be responsible to ensure generation of desired output as finalized through SRS Process and that the System doesn't demand any enhancement in Sizing during next 10 years.
4. The solution must be sized to provide a reasonably good response time on the User Terminal with about 300 Concurrent Users.
5. Proposed solution should ensure all Security Aspects viz. Database Security, Application Access Security, Communication Channel Security, User level Security, etc and Compliance of all Terms and Conditions of this document.
6. It would be Implementing Agency's responsibility to ensure that the Sizing of the Hardware, Software, Middleware etc meet complete requirement of the Dept within the stipulated performance parameters.
7. It would be Implementing Agency's responsibility to ensure that the performance of the Solution delivered i.e. Application Software, etc. (other than RDBMS and O/S)

meets specified performance parameters as detailed in this Document. It would be sole responsibility of the Implementing Agency's to upgrade the Software etc so as to meet the stipulated performance parameters without any cost to Department.

Proprietary rights

The Implementing Agency shall indemnify the Forest Department against all third party claims of infringement of patent, copyright, trademark and trade designs arising from use of the goods or any part thereof in India.

Patent rights

The Implementing Agency shall indemnify the Forest Department against all third-party claims of infringement of patent, trademark or industrial design and intellectual property rights arising from the use of the Goods or any part thereof.