

# AWARDS SCHEME FOR EXEMPLARY IMPLEMENTATION OF e-GOVERNANCE INITIATIVES

## III. NAME OF CATEGORY- 'INNOVATIVE USE OF TECHNOLOGY IN e-GOVERNANCE'

### 1. Coverage – Geographical and Demographic :-

#### (i) Comprehensiveness of reach of delivery centres,

Implemented Virtual Machines of Server and Client for the Land Records Computerization locations (LRC) at District, Subdivision and Tahsil Levels at Superintendent of Land Records (SLR), Taluka Inspector of Land Records (TILR), Sub Divisional Officer (SDO) and Tahsildar Offices, in the state. As it's the technical concept and the developed Virtual Machines of Readily General purpose Virtual Machines of Various Red Hat Linux 7.2 and Windows XP, Windows 7 X86 ,Windows 7 X64 and Windows 8 Pro X 64 Virtual Machines can be Geographically as well Demographically used anywhere in the country by just download leveraging ftp server through NIC's secured and stable high speed NICNET Network 34/100 MBPS lease line connectivity and use any anywhere at any number of locations by just copy and use as per the need and requirement. Even single Laptop can be used as a complete LRC system to deliver all type of services at any remote location at any time.

#### (ii) Number of delivery centres

Nearly 700 Around half for 7/12 at Tahsil Offices and half for Property card at TILR Offices

#### (iii) Geographical

##### (a) National level – Number of State covered

1

##### (b) State/UT level- Number of District covered

35

##### (c) District level- Number of Blocks covered

358

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Please give specific details:-

As per the server logs **NIC Akola Server logs** at link

[http://akola.nic.in/pdf/NIC Akola ftp server logs.rar](http://akola.nic.in/pdf/NIC_Akola_ftp_server_logs.rar)

The original concept behind the LRC LMIS, PCIS, and NLRMP e-Mutation is to provide the easy and reachable service delivery of 7/12 and property card abstracts to citizens in all part of the rural and urban areas. By using the Virtualization technology the single physical Laptop works as Server as well as client to deliver the service at any time and at any remote part where there is no internet connectivity available and non-availability of power. This way this project covers the complete area of the state of Maharashtra for the delivery of the e-services of 7/12 and property card abstract.

(iv) Demographic spread (percentage of population covered)

100%

2. Situation Before the Initiative (Bottlenecks, Challenges, constraints etc with specific details as to what triggered the Organization to conceptualize this project #):

### **Challenge: Pre-scenario**

#### **Problems Areas :**

Project:

Running Land Record Computerization( LRC) :

Land Management Information System (LMIS ) and Property Card Information System (PCIS)

NLRMP : for switch over from LRC to online LMIS e-Chawdi , e-Mutation

**Targeted Beneficiaries / Stakeholders**

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- **SLR, Dy SLR, TILR offices for Property Card Information System(PCIS), Property card data hosting on district web site.**
- **SDO, Tahsildar Offices for Land Management Information System (LMIS), Agri census, 7/12 data hosting on district web site, e-Chawdi and e-Mutation.**
- **NIC District Units for technical implementation and support , disaster recovery for PCIS, LMIS, Agri census, implementation at district, sub division and Taluka level, 7/12 and property card data uploading on web site, Agri Census, e-Chawdi, e-Mutation, unicode data conversion.**

Need and challenge is the basic background source of every innovation. In around 2011, for present Land Records Computerization applications Land Management Information System (LMIS) and Property Card Information System (PCIS), uploading of 7/12 and property card data on district web site, Agri Census and switching over to National Land Records Modernization Program (NLRMP) Mission mode project (MMP) e-Chawdi and e-Mutation applications, we were facing strong challenges for the availability, operability and maintenance of software, hardware at district and Tahsil level specifically for the Red Hat Linux 7.2 which is necessarily required and no other alternative for all these applications and due to

- Server Hardware is not at all provided for PCIS all over the state.
- The Hardware provided for the LMIS as well as PCIS provided in around 2002-03 becomes nonworking and obsolete
- New computer system are not compatible with the Red Hat Linux Server 7.2
- NIC district units also facing the similar problem of unavailability of compatible required hardware, software resources for Red Hat

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Linux 7.2 Server and Windows System for the sophisticated LRC applications of data uploading on web site, Agri Census etc.

This situation was adversely affecting on service delivery, throughput, efficiency and cost etc. Under this situation running and implementation of the present sophisticated LRC and switching over to implementation of NLRMP with 7/12, property data uploading on district web site and Agri census appears to be a big challenge.

a. **Non Availability of Supporting Compatible sufficient Hardware / Software for 7/12 and Property Card Data Uploading on District web site :**

In Sep 2011, for uploading of 7/12 and Property Card Data on District web site, there is no availability of the Computer Systems with minimum necessary compatible Computer System(s) with 4GB or RAM and Operating System Windows XP/ Windows 7, at NIC District Unit as well as in Collector Office, it is impossible to upload the Land Records 7/12 and Property Card Data on District web site. The Situation is nearly similar for all the Districts over the state except where the latest Computer systems are presently purchased with 4GB of RAM by Collector Office.

As there are no hardware for Red Hat Linux Server 7.2 at NIC District Unit and limited Computer Systems , NIC District Units itself facing the problem with the availability and operational of the Red Hat Linux 7.2. Also using the limited Computer Systems, the Unicode Data conversion, exporting to local SQL Server, upload the Data of 7/12 / Property card data from local SQL Server to Remote SQL Server of website , is possible for only one Tahsil at a time. So for multiple Tahsils it is quite time, technical efforts consuming affecting the public delivery service of 7/12 and property cards to citizens.

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b. **Non Availability of Red Hat Linux 7.2 Server Computer System for PCIS , LMIS locations facing problems with operational of old obsolete Computer Systems and the New Computer Systems not supporting to Red Hat Linux 7.2**

The Land Records related Taluka Inspector of Land Records (TILR) for Processing Property Card Information System (PCIS) , Sub divisional and Taluka Tahsilder Offices in the Districts in Maharashtra for processing Land Management Information System (LMIS) were facing the problems for running and operational of sophisticated client server based applications PCIS and LMIS specifically for the Red Hat Linux 7.2 server , as there is no server hardware provided for PCIS for all the District in Maharashtra and Several LMIS locations facing the problem that the New Computer Systems are not compatible with the Red Hat Linux 7.2 and the Old Computer System became obsolete and maintaining them running itself is proving a big challenge for the user offices at Tahsil level. Therefore availing and maintaining the Red Hat Linux Server 7.2 with IBM Db2 7.2 server DBMS is the biggest grave problem for the LRC PCIS TILR Offices and LMIS users.

c. **Sophisticated, tedious, time and cost Consuming Technical installations and support for Red Hat Linux Server and Windows Client for PCIS and LMIS.**

For every technical support for LMIS as well as PCIS for Red Hat Linux 7.2 Server as well as for Windows Client, the each and every TILR, SDO and Taluka Tahsildar Offices users have to approach and visit to respective NIC District unit with Computer System for activities like installing each and every Operating System, Data Base Management Software, Applications , Database Connections , Network Configurations, Security Settings , backup and Disaster recovery. Every time the users staff have to carry the computer systems into vehicle with the concerned staff. As there is limited

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staff of only two persons DIO and ADIO at NIC, District Units. NIC District units officials also have to visit regularly to the LRC PCIS and LMIS locations in the District for the technical support and smooth operational of LMIS and PCIS and Disaster recovery. This is strongly tedious, time and cost consuming for the LRC PCIS and LMIS users along with heavy technical efforts and exercises. For NIC District unit Officials also it is time consuming, tedious with heavy technical efforts and exercises with heavy technical support to LRC users.

d. **Sophisticated installations of Agri Census Applications at Large Number of Distinct Tahsil Locations.**

The Agri Census Unicode Data Conversion utility and Agri Census application software was so sophisticated requiring the various support software's with specific versions so that around one month time of District unit Officials of 35 Districts was passed in the attempts to make the Agri Census Data utility operational and even after that very few succeeded with full of non uniformity.

**3. Scope of Services/ Activities Covered** (Relevance of choice of application for client/ agency, Extent of e-enablement in terms of number of services, Extent to which step in each service have been ICT- enabled #)

Looking into the challenges faced due to the limited availability and compatible software hardware resources for the NLRMP related applications LMIS, PCIS, e-Chawdi, e\_Mutation and Agricultural Census and 7/12 and property card data uploading on website , there was severe need of efficient and optimized use of technical resources (Hardware, software, network and human resources) due to limited availability for increased throughput, improved service delivery and cost effective framework for e-Governance.

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### **Research Problem: Why this research?**

Looking into the challenges as stated above, aim of this research is to study, use and analyze virtualization to facilitate the effective e-Governance which involves efficient and optimum use of technical resources for the improved service delivery, throughput, efficiency and cost effective solutions, and to provide concrete framework for e-governance in India

Technique: Virtualization as Concept and Virtual Machine as Object

The basic objective is to research, develop and analyze Virtual Machines technique to optimize technical (hardware, software, Network and human) resources in e- Governance. It will include server consolidation, efficient, enhanced, comprehensive, user convenient technique leveraging shared Government infrastructures **to achieve the goal in targeted time with cost effectiveness, testing, backup & disaster recovery, process isolation and running operating system on non-compatible old and new computer systems, laptops etc., with case study of e-Governance project like Land Record Computerization covering**

- i. Investigate Virtual Machines functionality.
- ii. Identification of emergent functionality of Virtual Machines
- iii. SWOT analysis of Virtual Machines.

**The framework applied for the optimized use of technical software, hardware, network and human resources and cost effective solution for e-governance is the use of Free and Open Access Software for development and deployment of e-governance applications, virtualization and server consolidation techniques for management of e-services and cloud computing to deliver, leveraging the shared govt. infrastructure Network NICNET for maximum throughput enhancing the accessibility of**

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### **services among remote locations.**

The major objectives of the project are depicted are under:

- a. Due to Red Hat Linux 7.2 Server is not supported by the newer present computer systems and limited availability of Physical hardware supporting Red Hat Linux 7.2 , develop the Virtual Machine of Red Hat Linux 7.2 Server and run and replicate It on the non compatible systems. Develop the Virtual Machine of the Windows client using the suitable Virtual Machine software
- b. Server Consolidation: Setting up distinct isolated client and/or server operating system on the single computer system to save the server hardware per location/use.
- c. Use server consolidation by running the Virtual Machine of Red Hat Linux 7.2 server and windows client on the single physical computer system to save the server hardware per location and per use for NLRMP related applications LMIS, PCIS, e-Chawdi, e\_Mutation and Agricultural Census and 7/12 and property card data uploading on website.
- d. Use application isolation to use single physical computer system logically as a multiple computer systems : Running multiple OS simultaneously : Instead of using traditional approach of running single operating system at a time on single physical computer system, the initiative is the Innovative use of virtualization technology to run the multiple distinct OS at time on single computer system for resource optimization
- e. Use Virtual Machines to optimize the technical efforts and exercises, under the situation where a typical complex sophisticated application software is to be used at large number of Distinct locations., to achieve the output target within less time with optimal use of the Hardware / software and resources.
- f. Develop variety of Virtual Machines various versions of distinct



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newer operating systems like Windows 8 and Linux with variety of open source and non open source Virtual Machine software's like Vmware workstation, Microsoft Virtual PC, Microsoft Hypervisor V and Virtual Box

- g. Customize the Virtual Machines including the Virtual Machine of client and server with network setting so that they can be readily usable and distributable with just copy and paste over various old, New Computer systems and Laptops
- h. Easy backup and disaster recovery, effortless deployments, security, testing and R &D , by replicating the ready usable distinct Virtual Machines including client and server on e and incompatible various old, New Computer systems and Laptops
- i. Investigate, implement and analyze functionality and utility of the VM's with various operations like creation, updating, removing, renaming, customizing , move, copy, backup and restore, sharing, Auto start, import/export etc., for our objective resource optimization with saving server hardware per location, increased throughput, Improved Service Delivery, effortless deployments backup & disaster recovery and cost effective framework.
- j. Reduced cost of hardware software maintenance and services incurred in facilitating e-governance services to G2G, G2, G2B.
- k. Reduced cooling requirements in establishment as well as maintenance of Government Data Centers (GDC's).
- l. Reduced total cost of ownership on e-governance projects by reducing the costs incurred on acquiring various types of hardware and software licenses from private vendors.
- m. Solution to enhance the availability and accessibility of e-services in disadvantaged areas of country.
- n. Facilitate scalability of e-governance projects as the data volume in e-governance projects increases enormously.

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- o. Promotes interoperability in the e-governance applications for reducing data redundancy and hence increases consistency of data.

- p. Faster Booting and processing

- q. Easy and fast Testing and R & D purposes under Client Server Environment

Customize the shared Hardware configuration settings allotted to the Virtual Machine as per the need and requirements and availability of Hardware, Software and Network Resources, and replicate the readily usable variety of distinct isolated Virtual Machines including VM's of client / server to the distinct remote locations.

### **Technical Strategy/ Methodology: Research line of action.**

#### **Initial study and analysis**

- a. **Initial study** of the problem areas having the valuable need for the scope of the use of the Virtualization using Virtual Machines. Thorough analysis of the initial study with survey, interviews, feedback, meeting, with users and demands from users and stakeholders.
- b. Technical, cost benefit and human resource feasibility analysis.
- c. Select the suitable Virtual Machine Software, Host Computer System and Guest System according to utility, scope and need.

#### **Technical Design ,Development, Implementation and Analysis**

- d. Develop complete stable Virtual Machines of Distinct Operating Systems like Windows and Linux, with application working smoothly with supporting application software's, Data base management system, Network setup and configurations, security measures, so that it can be replicated / deployed large number of distinct locations effortlessly.
- e. Configure the newly developed Virtual Machines of District

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Operating Systems as single computer systems as well as client and server in Network Environment with Network Connectivity.

- f. Setup connectivity between distinct Virtual Machines and Host computer system with various networking options like bridged, Virtual network adapter, physical network etc.
- g. Customize, examine and verify the developed Virtual Machines with various memory, Drives, Hard Disk , Video Card, processors, usb cards etc.
- h. Develop the Virtual Machine of the Operating System which is not supported and not compatible with the hardware of the Host Computer System.
- i. Develop the Virtual Machines of Latest Operating Systems like Windows 8 ( X86 and X64 ) enabling the Virtualization Technology ( VT) on motherboard.
- j. Examine and test Sharing , auto start and creation of image ( for Backup and Disaster recovery ) of Virtual Machines using the latest Virtual Machine software.
- k. Examine and verify import and export of Virtual Machine between different Virtual Machine software's.
- l. Develop Virtual Machine of Physical Computer System.

### **Experimental Testing and Technical Analysis on wide scale of hardware software**

- m. Use the cloud of Distinct Virtual Machines for the live project / application to analyze practical experience. **Conduct baseline study and experience of pre and post scenario. Study** situation before the initiative (bottlenecks, challenges, constraints etc.)) and post scenario and sustainability with **Scope of Services & Activities Covered** (Relevance of choice of application for client/ agency, Extent of e-enablement in terms of number of services, Extent to which step in each service have been virtualization

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enabled # using Virtual Machine. )

- n. Do all basic system administration tasks including basic operations on Virtual Machines of Distinct Operating Systems, using Virtual Machine Software, like creation, updating, removing, renaming, customizing, import/export, move, copy, backup, sharing, Auto Start etc.,
- o. Run the Distinct Virtual Machines including client and server on various old, New Computer systems and Laptops.
- p. Use the Virtual Machines for the backup and Disaster Recovery and analyze utility.
- q. Use the Virtual Machines to execute the technical activities with minimum trained staff to verify the optimization of the human resource. Provide the operational training with manual to the human resource.
- r. Verify the utility of Virtual Machines for the Testing and R & D
- s. Use the Virtual Machines for effortless deployments.

### **Large scale Deployment over WAN**

- t. Distribute/ replicate ready Virtual Machines of Distinct Operating systems including client & server for the effortless deployments at large number of Distinct locations.,
- u. Host the cloud of Virtual Machines leveraging shared govt. infrastructure with high speed network connectivity of around 100 MBPS like secured stable NIC's NICNET network over state data centre / National data centre / or configure ftp server, for the dissemination and effortless deployments over wide distinct District locations.

### **Final Study and Analysis**

- v. All the levels study, findings, Analysis and feedback from the users and stakeholders in the form of emails, letters, meetings, interviews and records the results.

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### 4. Strategy Adopted

(i) The details of base line study done,

**Base Line Study and Experience:** Looking into the problems faced with the availability and maintenance of the technical resources by LRC offices and NIC District Units as stated above, I am finding the basic need of running multiples distinct isolated operating Systems running simultaneously at a time on the single Computer System particularly Red Hat Linux 7.2 Server and Windows Client for the LRC Deployments, Testing, Backup and recovery as well as we finding the major need of running multiples such servers and clients running on single computer systems for processing /data entry on client and server Environment at large number of distinct locations. With the same needs and for the same purpose and for same LRC project I have earlier used Virtual Machines technical and run Red Hat Linux 7.2 Server and Windows XP Client on the single computer system, in around 2003 in District Chandrapur of Maharashtra for the LRC Processing /data entry on client and server Environment at large number of distinct locations in District Chadrapur. But from 2006 to 2011, I was posted out of Maharashtra and not faced need and opportunity for the same. But in June 2011, I am again transferred Back to Maharashtra at NIC, District Unit Akola and found the same deficiency of Software , hardware resources for the 7/12 and Property Card Data on District web site , so used the same technique again but on Broad and comprehensive level from District Akola to other Districts in the State of Maharashtra with research and Development, analysis and innovative way using various features of Virtual Machine Technique.

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### (ii) Problems identified,

Details of the points given below are explained in Point 2 Pre Scenario

- Server Hardware is not at all provided for PCIS all over the state.
- The Hardware provided for the LMIS as well as PCIS provided in around 2002-03 becomes nonworking and obsolete
- New computer system are not compatible with the Red Hat Linux Server 7.2
- NIC district units also facing the similar problem of unavailability of compatible required hardware, software resources for Red Hat Linux 7.2 Server and Windows System for the sophisticated LRC applications of data uploading on web site, Agri Census etc.
- a. Non Availability of Supporting Compatible sufficient Hardware / Software for 7/12 and Property Card Data Uploading on District web site :
- b. Non Availability of Red Hat Linux 7.2 Server Computer System for PCIS , LMIS locations facing problems with operational of old obsolete Computer Systems and the New Computer Systems not supporting to Red Hat Linux 7.2
- c. Sophisticated, tedious, time and cost Consuming Technical installations and support for Red Hat Linux Server and Windows Client for PCIS and LMIS.
- d. Sophisticated installations of Agri Census Applications at Large Number of Distinct Tahsil Locations.

### (iii) Roll out/implementation model,

#### **Steps towards effective e-Gov**

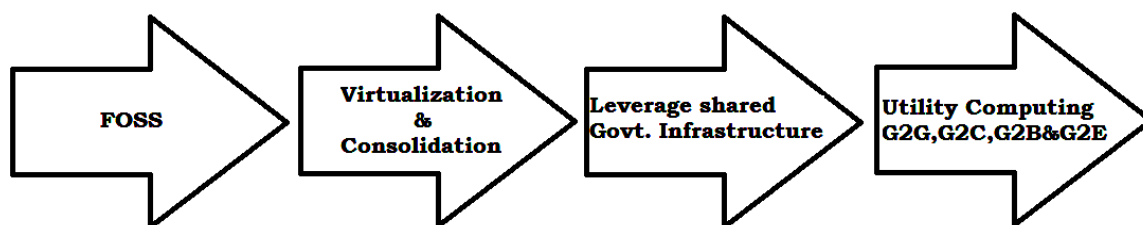
Effective e-Gov is based on

- **Free and open source software (FOSS)**

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- **Virtualization**
  - **Server Consolidation ( to Save Server Hardware per location )**
  - **Cloud computing ( Live Virtual Machines Virtually accessed by users remotely )**
- **Leveraging shared Government infrastructures**



### **Proposed Framework for effective e-Governance**

#### **Features**

The proposed framework can provide a cost effective solution for e-governance by using Free and Open Access Software for development and deployment of e-governance applications, virtualization and consolidation techniques for management of e-services and cloud computing to deliver the maximum throughput enhancing the accessibility of services among remote locations. Major features of the proposed framework are depicted are under:

- a. It will help valuably to deliver maximum throughput
- b. It will help in reducing the cost of hardware incurred in facilitating e-governance services to citizens.
- c. It helps in reducing cooling requirements in establishment as well as maintenance of Government Data Centers (GDC's).
- d. It also reduces the total cost of ownership on e-governance projects by reducing the costs incurred on acquiring various types of hardware and software licenses from private vendors.
- e. It also gives solution to enhance the availability and accessibility of e-services in disadvantaged areas of country.

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- f. It facilitates scalability of e-governance projects as the data volume in e-governance projects increases enormously.
- g. It promotes interoperability in the e-governance applications for reducing data redundancy and hence increases consistency of data.
- h. It helps for the backup and disaster recovery, effortless deployments, security, testing and R &D

### **Motivation**

- Need of efficient and optimized use of technical resources (Hardware, software, Network and human resources) due to limited availability for increased throughput, Improved Service Delivery and Cost Effective Framework for e-Governance in India.
- Use Single Computer system as a multiple Computer Systems : Running Multiple OS Simultaneously : Instead of using traditional approach of running one operating system at a time on single computer system, the initiative is the Innovative use of Technology to run the multiple Distinct OS at time on single computer system for resource optimization
- Server Consolidation: Setting Up distinct isolated Client and/or Server Operating System on the Single Computer System to save the server hardware per location
- All type of Operations which Physical computer system performs on File/Folders as object using operating system, that Virtual Machine Software performs on complete virtual computer along with Operating system as object including creation, updating, removing, renaming, customizing , move, copy, backup and restore, sharing, Auto start, import/export etc.
- Software Hardware Portability:
  - Sharing the same hardware among many software platforms
  - Allowing software to be "portable" between various operating systems, as well as running older software and OS on a newer computer.



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All of these uses of virtual machines are very important to the way that we compute today

### ***Technical Strategy: Research line of action methodology***

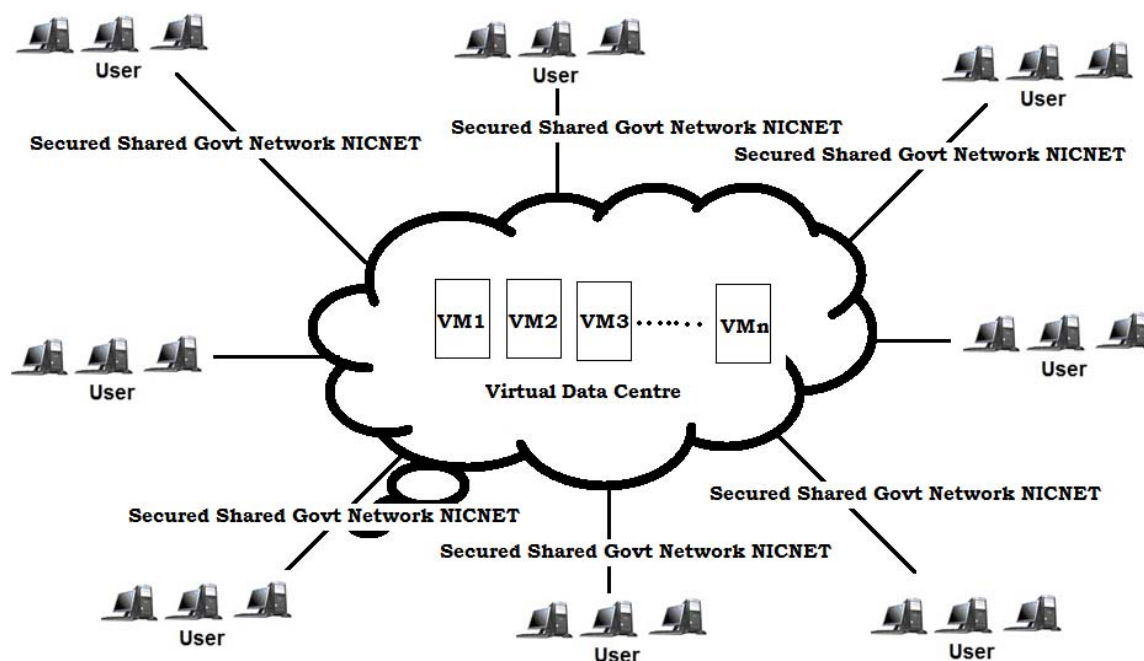
- Developed Cloud of Virtual Machines of variety of OS Windows , Linux etc of variety of version, Distinct Server and Client Operating System and Physical Machines, in order to use single physical Computer virtually as multiple computer systems along with server consolidation.
- Investigated, implemented and analyzed functionality and utility of the VM's with Various Operations for our objective resource optimization with saving server hardware per location, increased throughput, Improved Service Delivery, effortless deployments backup & disaster recovery and Cost Effective Framework.
- Developed a Data Centre and hosted Cloud of VM's on it.
- Distributed readily distributable VM's Widely through Data Centre leveraging shared Govt. Network NICNET to the NIC District Units who has downloaded and implemented the same at their respective locations.

### **Implementation model :Activities with Methodology Adopted:**

- a. The Overall basic concept used is the running distinct isolated multiples Operating Systems at time on the single computer system using Virtual Machines with saving of server hardware per location. Basically in order to optimize and effective use of the **Hardware, Software, Network and human resources and technical efforts and exercises to achieve goal in targeted time configured Virtual Machine** of Red Hat Linux Server 7.2 and Windows Client on the same computer system running simultaneously at a time.

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### Technical Strategy/ Methodology: Research line of action



- b. Developed Cloud of Virtual Machines of Red Hat Linux Server 7.2, Windows XP client for 7/12 RCIS, Property Card (PCIS), Windows XP , Windows 7 Professional X64, Windows 7 Ultimate X86, X64 and Windows 8 Professional 64 etc using the variety of Virtualization software's Vmware, Virtual Box, Microsoft Hyper V, Windowx XP mode, Microsoft Virtual PC etc, of variety of OS Windows , Linux etc of variety of version, Distinct Server and Client Operating System and Physical Machines, in order to use single Computer virtually as multiple computer systems.
- c. Tested the smooth working of readily Distributable LRC VM's of 7/12 and Property Card Red Hat Linux 7.2 server and windows client with neighboring Districts Washim and Buldhana
- d. Then disseminated these readily tested Virtual Machines by copying to large number of Computer Systems between host servers, on Various Old, New Computer System and Laptops, for saving the Server hardware Cost per location, backup and Disaster Recopy, Easy and quick Testing

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and R & D, new effortless deployments and basic system administration tasks and get the Client Server based E-Gov. activities through minimum trained staff.

This way the single computer system is efficiently optimally used logically as multiple computer systems with various distinct operating systems in hand running simultaneously at any time as guest using Virtual Machine Technique using Virtual Machine software of VMware Workstation Server Version 7.x,9.x and 10.x Shared the Virtual Machines and Auto Started it with the local Host as well as configured the remote Host shared Virtual Auto Start with the Respective remote Host.

**The Virtual Machine software handles the guest Operating System Virtual Machines as an instance for basic operations like creation, updating, removing, renaming, customizing , move, copy, backup and restore, sharing, Auto start, import/export etc. between the large number of Computer Systems between host servers with distinct old and new compatible/ incompatible software's and hardware's.**

**Almost all these operations on Virtual Machines are performed for the LRC LMIS, PCIS user convenience , Optimized and efficient use of the Hardware, Software, Network, Human Resources and technical efforts and exercises and achieved goal in targeted time** for client Server based Land Record Computerization project with saving of server hardware per location for Land Record Computerization related applications like Land Management Information System (LMIS), Property Card Information System (PCIS), Agri Census, e-Chawdi and 7/12 data uploading on website, and timely achieved the works for the public service delivery with saving costs for the maintenance and support of the hardware software's and saving Server hardware per LRC locations.

- e. **Dissemination Strategy:** Used **hybrid approach** of utility computing with mixed approach of Cloud Computing and Data centre for the

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dissemination of ready usable Virtual Machines: We have developed the Virtual Machines of Red Hat Linux Server and Windows Client with server consolidation. Tested it for smooth operations at the neighboring district locations. In order to implement these Virtual Machines for the remote tahsil and district locations in the state of Maharashtra though cloud network computing there is a major limitation that NICNET network is available upto district level only and not at the tahsil level. The State Wide Area Network (SWAN) is available upto tahsil level but its connectivity is not smoother and reliable up to tahsil level and we have no facility to host our Virtual Machines over SWAN. Therefore it is decided to use the hybrid approach of Distribution of ready virtual Machines upto district level to NIC District Units through NICNET and then replicate and implement it at the Tahsil level with the help of NIC District Units and the Technical staff available at Tahsil level.

- f. Customized the Virtual Machines of Red Hat Linux 7.2, Windows Client and variety of other Virtual Machines of Distinct Operations systems and made it readily distributable.
- g. **Free and Open Source Software's (FOSS)** : We have used all the variety of free and open source Virtual Machines software's for developing the Virtual Machines. Also we have disseminated our variety of Virtual Machines with the required Virtual Machine Software's to all the beneficiaries free of cost as well as the users can customize and modify all that Virtual Machines as per their own way and their won need and requirement very similar to free and open source software's and ending the dependency of users on us.
- h. By running Linux Server and Windows Client simultaneously on Single Computer, **Server Hardware cost for 7/12 and Property Card per LRC location at District and Tahsil (Block) level is saved.**
- i. Used Virtual Machines of Red Hat Linux 7.2 as Server and Windows XP SP2 client on the single computer system, for LRC 7/12 and property card data conversion and uploading on District web site, Agri Census works,

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Property Card Implementation for all the Tahsils in the District as there are no servers provided for property card . Copied and used these Virtual Machines for uploading LRC Data of multiple Tahsils at a time. Used the same Virtual Machines with Agri Census Utility for Agri census work at Tahsils.

- j. **In order to distribute the Ready Virtual Machines the Stable , Secured ftp server is developed, and hosted the Cloud of ready usable Virtual Machines of Red Hat Linux Server 7.2, Windows XP client for 7/12 RCIS, Property Card (PCIS), Windows XP , Windows 7 Professional X64, Windows 7 Ultimate X86, X64 and Windows 8 Professional 64 on the ftp server over leverage of Shared Government infrastructure NIC's secured and stable high speed NICNET Network 34/100 MBPS lease line connectivity for download and use by the District in Maharashtra.**
- k. Districts in Maharashtra downloaded readily usable Virtual Machines through ftp and using it smoothly and implemented it at the LRC locations in the respective District in Maharashtra, with effortless deployments, server consolidation and optimization of the technical, financial and other resources.
- l. The technical implementation of this project "Virtual Machines" for Land Records Computerization is smoothly executed with the optimum use of the available technical Hardware, Software, Network and human resources without any fund and expenses.

### **Capacity Building :**

As VMs can also be easily moved, copied, and reassigned between host servers to optimize hardware resource utilization. Also we can change the shared Hardware configuration settings allotted to the Virtual Machine as per the need and requirements. For Deployment of the ready Virtual Machines at Various distinct locations in local office and Tahsils we have used the just the copy, customize as per local hardware availability and use method

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The LRC users are given a operational training with documentation of handling, backup, restore Disaster recovery, to all the LRC Virtual Machines of Red Hat Linux Server and Windows Client using the Virtual Machine with VMware software and use of ftp for the data transmission between Red Hat Linux server and Windows XP client with both the client and server Virtual Machines are enabled with easily usable ftp software's. For Akola District the same training is provided to LRC user by NIC District Unit, Akola and for the other District the same training is asked and may have been provided by the respective NIC, District Unit.

(iv) Communication and dissemination strategy and approach used.):

**Dissemination Strategy :** Used **hybrid approach** of utility computing with mixed approach of Cloud Computing and Data centre for the dissemination of ready usable Virtual Machines: We have developed the Virtual Machines of Red Hat Linux Server and Windows Client with server consolidation. Tested it for smooth operations at the neighboring district locations. In order to implement these Virtual Machines for the remote tahsil and district locations in the state of Maharashtra though cloud network computing there is a major limitation that NICNET network is available upto district level only and not at the tahsil level. The State Wide Area Network (SWAN) is available upto tahsil level but its connectivity is not smoother and reliable up to tahsil level and we have no facility to host our Virtual Machines over SWAN. Therefore it is decided to use the hybrid approach of dissemination of ready virtual Machines up to district level to NIC District Units through NICNET from data centre and then replicate and implement it at the Tahsil level with the help of NIC District Units and the Technical staff available at Tahsil level. Customized the Virtual Machines of Red Hat Linux 7.2, Windows Client and variety of other Virtual Machines of Distinct Operations systems and made it readily distributable. Developed secured data centre on the Dell Rack Mounting Server and hosted the cloud of ready usable Virtual Machines on the Data Centre. Distributed the readily

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usable Virtual Machines to the NIC District units in the state of Maharashtra. NIC District units downloaded, through NICNET and replicated and implemented the ready Virtual Machines of client and server to the Tahsil level TILR offices for Property Card Information System with the help of TILR technical staff, Tahsildar offices for the Land Management Information System, Agri Census application with the help of DBA's and also used it at District level for the 7/12 and Property card Data hosting on District web site and for NLRMP e-Mutation.

**Leverage of Shared Government infrastructure NIC's secured and stable high speed NICNET Network 34/100 MBPS lease line connectivity for download and use by the District in Maharashtra.**

### 5. Technology Platform used-

#### (i) Description,

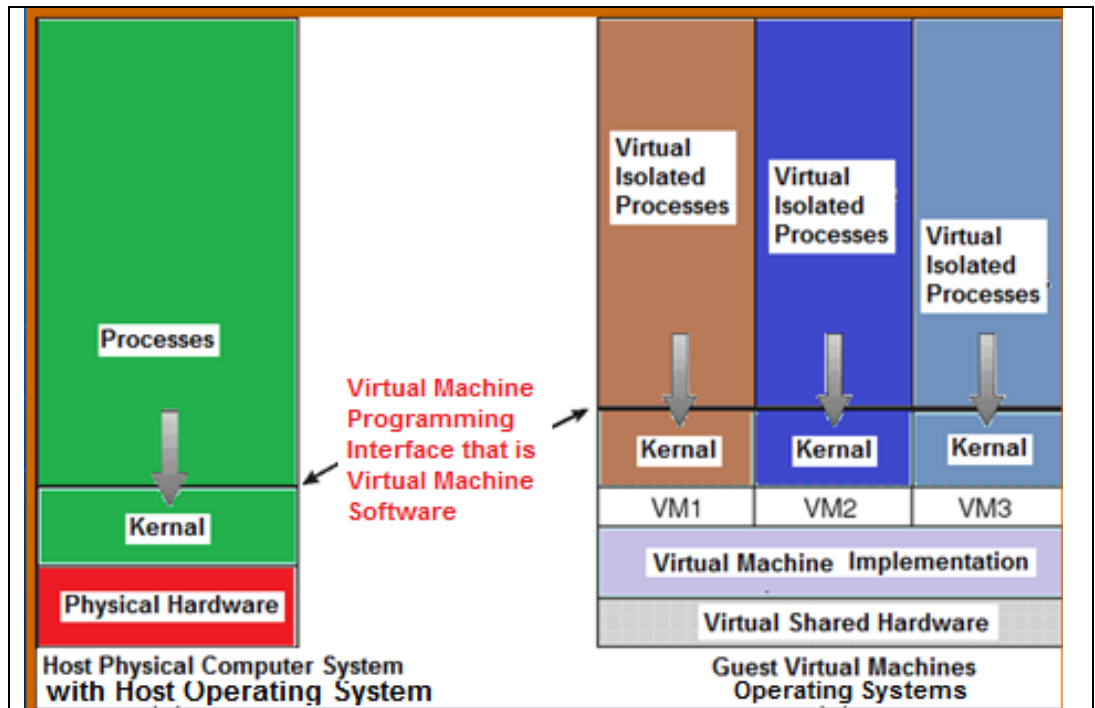
Virtualization simply means **Virtual Running of Virtually developed element on Physical**

- Virtual isolated execution of Virtually Developed Machine(s) on the Physical Machine simultaneously
- Another way it is Virtual isolated execution of the multiple software platforms ( layers) on the same physical hardware simultaneously
- allows one computer to do the job of multiple computers, by sharing the resources of a single hardware across multiple environments

**The original meaning of Virtual Machine, sometime called hardware Virtual Machine is that number of discrete identical execution of environments (instances) on a single computer, each of which runs an Operating System(OS).** Basic use of Virtual Machine is running multiple Operating Systems at a time Simultaneously on single computer System.



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**Fig: Logical Structure of Virtual Machine**

Virtual Machine Logically divide the single Computer System and resources into several isolated different sizes same like the slices of the bread each of which works and feels as a separate computer System / Server of different client / server Operating System and simultaneously run different isolated processes.

- More than one instance of that operating system run on the same hardware at the same time
- Another operating system can run in that simulated hardware
- More than one *different* operating system can share the same hardware at the same time
- Virtual Machine Operating System creates illusion of multiple processors
  - Each capable of executing independently
  - No sharing, except via network protocols



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- *Host Operating System:*
  - The operating system actually running on the hardware
  - Together with *virtualization layer*, it simulates environment for ...
- *Guest Operating System:*
  - The operating system running in the simulated environment
- Virtual-machine concept provides complete protection of system resources

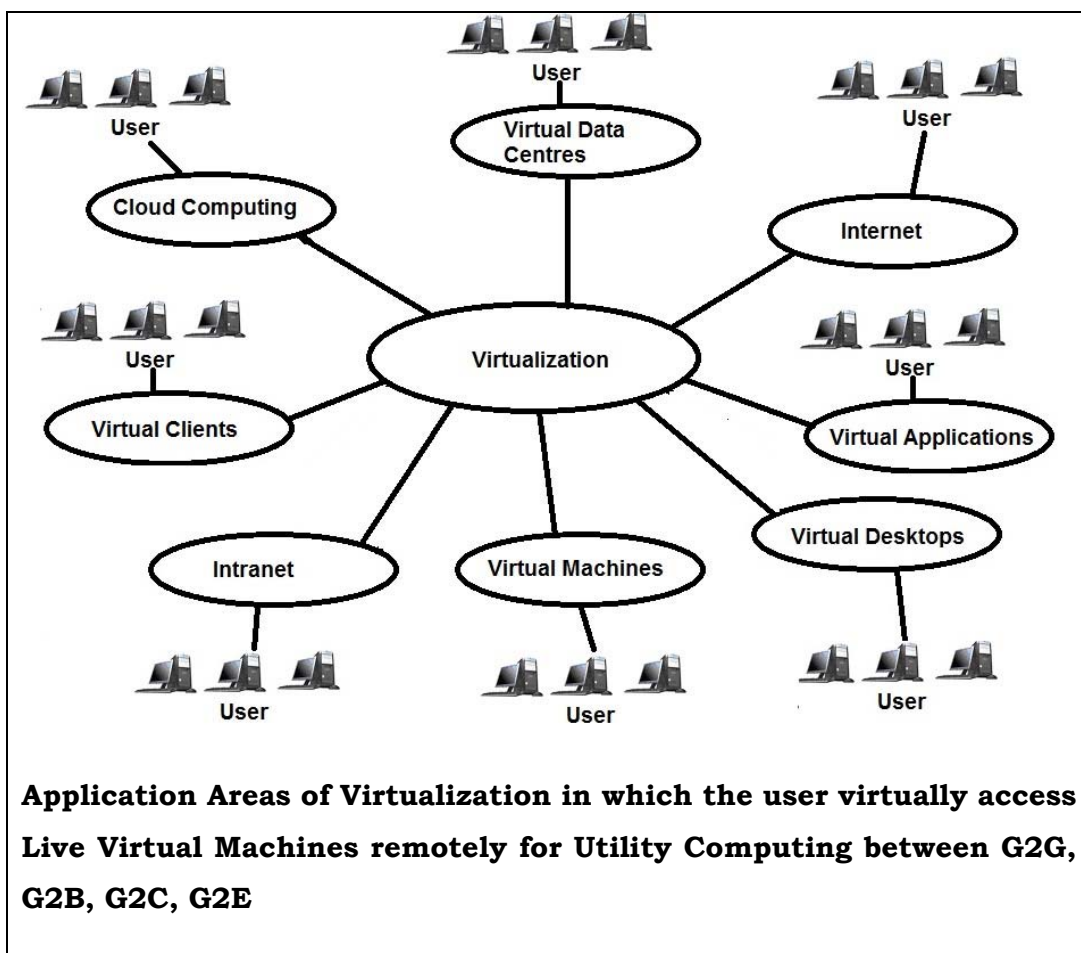
Each *virtual machine* is isolated from all other virtual machines. Isolation ensures that applications and services that run within a VM cannot interfere with the host OS or other VMs

**Therefore its one use is for the isolation of processes with specific resources so that the processes should not collide and affect each other.**

- The resources of the physical computer are shared to create the virtual machines under which
  - CPU scheduling can create the appearance that each user has own processor
  - Spooling and a file system provide
    - virtual card readers, virtual line printers
  - Disk partitioned to provide virtual disks
  - A normal user time-sharing terminal serves as the virtual machine operator's console

By using the virtual machine Software we can install the new operating system as guest or we can configure and run the preexisting operating system in dual boot mode, as guest operating System.

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### (ii) Interoperability

Variety of Virtual Machines of distinct operating systems interoperate with each other and other physical machine in the heterogeneous networks using the Virtual Machine software interface using various operations of data and information exchange, sharing, device sharing, network sharing, exactly same as like the physical computer systems interoperate with each other.

### (iii) Security concerns

All the developed Virtual Machines cloud is hosted over the NIC's secured National Network NICNET which are protected with centralized antivirus server. The Virtual Machines running at the Tahsil and remote locations are protected by running in

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offline environment where there are very less chances of cyber attacks. FTP Server Developed with Secured Microsoft FTP server.

**(iv)** Any issue with the technology used

When we are running Virtual Machines on the host Operating system the performance of the Virtual Machine decreases as the number of Virtual Machines running on the host increases.

In order to run guest Virtual Machine, the compatible host Virtual Machine is to be operational with supporting Virtual Machine software interface deployed and operational.

In replication when we replicate virtual machines on Variety of Old and New Computer systems and Laptops Hardware and Host Operating Systems sometimes we may need to customize the Virtual Machine setting as per the available hardware configuration and host OS. There are easy user friendly GUI menu available for setting the Memory, HDD, Network etc. For example: If our Virtual Machine is having Virtual configured Ram of 4GB and the computer system on which we have replicated the Virtual Machine is having Physical RAM of 2GB only then we have to reduce the Virtual RAM and configured it to nearly 1GB for the function of the Virtual Machine. Similarly if the we have replicated the same Virtual Machine of the Physical Machine having Physical Ram of 16 or 32 GB then we may extend the Virtual RAM and configure it up to 8 GB or more as per the configuration.

**(v)** Service level Agreements(SLAs) (Give details about presence of SLA, whether documented, whether referred etc. #)

The Implementation Agency is National Informatics Centre and the implementation is carried out with the help of NIC District

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units.

6. **Demonstrate innovative use of ICT for development** (Give details about use of new and emerging technology, innovative usage of ICT for process change to improve quality of the life/ organizational effectiveness, relevance of technology to provide the service #)

### **Government Process Reengineering (GPR) / Innovation Applied**

*more from less for more and more*

**Full Virtualization with Isolation, Server Consolidation, effortless deployments, backup, disaster recovery, software hardware portability, leveraging shared infrastructure NICNET.**

**Improved service delivery, efficiency, throughput and cost effectiveness**

**To achieve Adaptability, Scalability, New models of Service Delivery, Efficiency, Enhancement, User Convenience, sustainability, Leverage of Shared Govt. Infrastructure**

- **Used single Physical Computer Systems logically as Multiple Computer Systems:** Efficient and optimized use of technical (Hardware, software, Network and human) and variety of resources like environmental, financial , time etc for increased throughput, Improved Service Delivery and Cost Effective Framework for e-Governance.

Instead of traditional non virtualized approach of running single operating system at a time, Installations of Operating System and Application Software's, Data base and Network Configurations, installation of Devices, Data Backup and Disaster Recovery, Repeated Deployments of Sophisticated applications at large number of Distinct locations, the broad innovative efficient and enhanced, user convenient approach of Virtualization using Virtual

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Machines of isolated execution of multiple operating system at a time simultaneously is adopted for the efficient and optimized use of the technical , financial and other resources to facilitate effective e-Governance by sharing and replications of Complete Virtual Computer system including Operating System instead of just files, dissemination of Sophisticated Applications Software of client / Server completely working with Operating System for the effortless deployments, backup and disaster recovery.

- **Server Consolidation:** Set Up distinct isolated Client and/or Server Operating System on the Single Computer System and saved the server hardware per location
- Instead of traditional approach of performing all type of Operations using Physical computer system on File/Folders as object using operating system, used the innovative approach of performing the operations of complete computer system by using the virtue of Virtual Machine Software to performs all type of operations on complete virtual computer along with Operating system as object including creation, updating, removing, renaming, customizing , move, copy, backup and restore, sharing, Auto start, import/export etc. is used.

**The real virtue of VMs sw is that, all type of Operations which physical computer performs on File/Folders as object using OS, that VM sw performs on complete virtual computer along with OS as object including creation, updating, removing, renaming, customizing, move, copy, backup and restore, sharing, Auto start, import/export etc**

**Performed all these operations for project implementation, utility analysis and R and D of VMs**

- **Software Hardware Portability:** Sharing same hardware among many sw platforms, allowing software to be portable between

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various OS, as well as running older software and OS on a newer computer

For effortless deployments, optimization of tech resources, backup, disaster recovery, efficient, enhanced use by running a typical sophisticated Appl on non supporting Hw / Sw

**VMs can also be easily moved, copied, and reassigned between host servers to optimize hw resource utilization. Also we can customize the shared hw configuration settings allotted to VM as per need and requirements. and availability of hw, sw and Network resources**

VM HDD file is like image of OS/ Partition including all sw, setting installed on that OS / Partition. Its like mirror Image/ Ghost / Clone of OS/ Partition

Therefore by just copy paste and using, we need not have to install the OS, Application sws and do exercising of setting configuring sws and applications with each other. This is very useful in case of complicated sophisticated sws. It save efforts of setting and configuring and deployment

Developed VM of RH Linux 7.2 Server including sophisticated IBM Db2 DBMS, network configuration on present age non supporting hardware, developed VM of Win Client with sophisticated LRC applications, Database and network configurations, customized and replicated ready usable VMs to large number of old and new computers and laptops for effortless deployments, optimization of technical resources, backup and disaster recovery

In order to optimize and effective use of hw/sw resources and technical efforts and exercises to achieve goal in targeted time, I have developed VM of RH Linux Server, Win Client on same

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computer running simultaneously at a time and then by copying readily tested VMs to large no of Machines between host servers ,on Various Old, New Computers and Laptops, for saving Server hardware cost per location. For deployment of ready VMs at various distinct locations in local office and Tahsils, I used just copy, customize method as per local hardware availability and use

- **Dissemination Strategy** : Used **hybrid approach** of utility computing with mixed approach of Cloud Computing and Data centre for the dissemination of ready usable Virtual Machines: We have developed the Virtual Machines of Red Hat Linux Server and Windows Client with server consolidation. Tested it for smooth operations at the neighboring district locations. In order to implement these Virtual Machines for the remote tahsil and district locations in the state of Maharashtra though cloud network computing there is a major limitation that NICNET network is available upto district level only and not at the tahsil level. The State Wide Area Network (SWAN) is available upto tahsil level but its connectivity is not smoother and reliable up to tahsil level and we have no facility to host our Virtual Machines over SWAN. Therefore it is decided to use the hybrid approach of dissemination of ready virtual Machines up to district level to NIC District Units through NICNET from data centre and then replicate and implement it at the Tahsil level with the help of NIC District Units and the Technical staff available at Tahsil level.
- Customized the Virtual Machines of Red Hat Linux 7.2, Windows Client and variety of other Virtual Machines of Distinct Operations systems and made it readily distributable.
- **Free and Open Source Software's (FOSS)** : We have used all the variety of free and open source Virtual Machines software's for developing the Virtual Machines. Also we have disseminated our

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variety of Virtual Machines with the required Virtual Machine Software's to all the beneficiaries free of cost as well as the users can customize and modify all that Virtual Machines as per their own way and their own need and requirement very similar to free and open source software's and ending the dependency of users on us.

- Developed secured data centre on the Dell Rack Mounting Server and hosted the cloud of ready usable Virtual Machines on the Data Centre. Distributed the readily usable Virtual Machines to the NIC District units in the state of Maharashtra. NIC District units downloaded, through NICNET and replicated and implemented the ready Virtual Machines of client and server to the Tahsil level TILR offices for Property Card Information System with the help of TILR technical staff, Tahsildar offices for the Land Management Information System, Agri Census application with the help of DBA's and also used it at District level for the 7/12 and Property card Data hosting on District web site and for NLRMP e-Mutation.
- **Leverage of shared infrastructure NICNET:** Distributed VMs over NICNET with 34/100 MBPS high speed secured, stable lease line connectivity through secured data centre
- **Data Centre :** Developed Secured data Centre on Dell Rack mounting server R715 using Microsoft data server using Windows server 2008 R2 OS
- **Easy Testing and R and D under Client Server Environment:** Instead of practically visiting to client and server for testing I used VMs to switch for testing between client and server on single computer. We can mount the drives and disks between VMs and share data and resources. This way it is quite useful for Testing and R and D
- **Faster Booting:** Booting and restarting a VMs can be much faster



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than with physical machine, since it may be possible to skip tasks such as hardware initialization

- Used VT technology for developing the VM of Win 8 and installation of Microsoft Hyper V

### 7. Citizen Centricity (Give specific details on the following#)

(i) Impact on effort, time and cost incurred by user,

The original concept behind the LMIS, PCIS, e-Chawdi and e-Mutation is to provide the easy and reachable computerized service delivery of 7/12 and property card abstracts to citizens in all part of the rural and urban areas to save their efforts, time and cost with transparency. By using the Virtualization technology the single physical Laptop works as Server as well as client to deliver the service at any time and at any remote part where there is no internet connectivity available and non-availability of power.

Complete LRC PCIS, LMIS, 7.12 and property card data uploading, Agri census and switching over to NLRMP e-Chawdi and e-Mutation applications are directly related to public. Land and property is major aspect for the public. RH Linux 7.2 server is the most necessary and essential component for all these applications have no alternative than Virtual Machines in present age as the todays hardware is not compatible with RH Linux 7.2 server.

In pre scenario where continuing operations of LMIS, PCIS and uploading of 7/12, property card data on district web site and switching over the MLRMP e-Chawdi and e-Mutation appears to be a big challenge due to the availability, operability and maintenance of the compatible software, hardware for the Red Hat Linux 7.2 server, e-Governance framework implemented by NIC, Akola of Virtualization using Virtual Machine has major contribution in continuation and timely completion of all targets and goals with

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smooth and concrete functioning of all these applications and smooth public service delivery of 7.12 and property card with online availability of the 7/12 and property card to the public saving their effort, cost and time.

Saved Environmental Resources: By Server Consolidation and replicating VM's, used less number of equipments and optimized technical efforts and exercises, testing and saved variety of resources like time, financial, space, civil , electricity energy consumption, furniture, fuel ,Vehicles, Human resources for taking the Computer Systems to NIC for support and for visits of NIC officials to Tahsil level environmental resources for timely completion of LRC PCIS, LMIS, Agri Census , 7/12 and Property Card Data Uploading ,e-Chawdi and e-Mutation, in the Districts of Maharashtra

With the availability of 7/12 and property card abstracts on district web site, the citizens are able to view the updated concerned 7/12 and property card online from any location. This saved their time, cost, and effort to visit to service delivery offices and centre with increased transparency.

With the Virtualization, server consolidation, Virtual Machines cloud, software hardware portability, leveraging shared govt. infrastructure, Virtual Machines cloud ,effortless deployments, easy backup and disaster recovery, and processing for multiple Tahsils/ blocks at a time simultaneously isolated to each other by running the multiple Virtual Machines for the homogeneous and / or heterogeneous processes on the single physical computer, the throughput in optimized and the specified respective purpose is achieved in optimum time for all the LRC and NLRMP related applications and activities.

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- a. Used server consolidation by installing Red Hat Linux 7.2 Server and Windows Client on the single physical computer system and this way saved server hardware cost for around more than 500 locations / use.
- b. Saved approximate cost of around 1000000 Rs. for the maintenance of the sophisticated software / hardware, deployments of the Operating Systems, Applications software and Network and Database management, Disaster recovery , by replicating the ready usable Virtual Machines all over state with effortless deployments and backup and disaster recovery.
- c. Reduced hardware and operating costs by as much as 50 percent and energy costs by as much as 80 percent, saving more than 150,000 Rs. per year for each virtualized server workload.
- d. Reduced cooling requirements in establishment as well as maintenance of Government Data Centers (GDCs).
- e. Reduced total cost of ownership on e-governance projects by reducing the costs incurred on acquiring various types of hardware and software licenses from private vendors.
- f. Reduce the time it takes to provision new servers by as much as 70 percent.
- g. Decrease downtime and improve reliability with process continuity and built-in disaster recovery.

By reducing the quantity of computer systems to large extent nearly 50% , significantly contributed in reduction of pollution in the form of Heat generated. By saving vehicles and fuel also reduced pollution.

By server consolidating existing hardware utilization increased from as low as 5 percent to as much as 80 percent. Energy consumption reduced by decreasing the number of servers at LRC locations. VMware server virtualization reduce hardware requirements by a

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15:1 ratio, enabling to lessen the environmental impact of organizations IT without sacrificing reliability or service levels.

Server and desktop hardware consolidation helped to achieve a 20 to 30 percent lower cost per application.

It helped in background to complete the NLRMP e-Mutation works as early as possible. Under NLRMP program online e-Mutation is operational from 1 Aug 2014 for Tahsil Telhara of district Akola which is one of the three Tahsils in the state of Maharashtra from where the online transaction of e-Mutation is started first time from 1 Aug 2014. This way Akola is the leading district in Maharashtra where the online transaction of e-Mutation is operational. This way the e-Governance framework implemented by NIC, Akola has indirectly important contribution in public service delivery of the LRC, NLRMP related applications.

### (ii) Feedback/grievance redressal mechanism,

Citizens may log feedback/ grievance on email to the concerned office as below and to collector office by email and on e-Lokshahi grievance redressal portal

- SLR, Dy SLR, TILR offices for Property Card Information System (PCIS), Property card data hosting on district web site.
- SDO, Tahsildar Offices for Land Management Information System (LMIS), Agri census, 7/12 data hosting on district web site, e-Chawdi and e-Mutation.

### (iii) Audit Trails,

The server logs showing Audit trails **NIC Akola Server logs** as available at link [http://akola.nic.in/pdf/NIC\\_Akola\\_ftp\\_server\\_logs.rar](http://akola.nic.in/pdf/NIC_Akola_ftp_server_logs.rar) on district web site of Akola.

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(iv) Interactive platform for service delivery,

- **Dissemination Strategy : Used hybrid approach of utility computing** with mixed approach of cloud computing and Data centre for dissemination of ready usable VMs. As there is a problem with centralized deployment and computing due to major limitation that NICNET is available up to district level only. SWAN available upto tahsil level but its connectivity is not smoother and reliable up to tahsil level and we have no facility to host our VMs over SWAN. So it is decided and used hybrid approach of dissemination of ready VMs upto district level to NIC District Units through NICNET and then replicated and implemented it at Tahsil level with help of NIC District Units and Technical staff available at Tahsil level
- **Free and Open Source Software's (FOSS)** : We have used all the variety of free and open source Virtual Machines software's for developing the Virtual Machines. Also we have disseminated our variety of Virtual Machines with the required Virtual Machine Software's to all the beneficiaries free of cost as well as the users can customize and modify all that Virtual Machines as per their own way and their won need and requirement very similar to free and open source software's and ending the dependency of users on us.
- **Leverage of shared infrastructure** :NICNET Distributed VMs over NICNET with 34/100 MBPS high speed secured, stable lease line connectivity through secured data centre

(v) Stakeholder consultation

Interactive consultation with stakeholders NIC District unit scientific officials, NIC Facility Management Engineers ( FMS), DBA's of Tahsils and Taluka Inspector of Land Record (TILR) office technical staff , over Video Conference facility, e-mail over NICNET and data transmission over data centre over NICNET. All

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the relevant manual and material is hosted over data centre.

8. **Adaptability and Scalability** (Give details about Local language support, ability to leverage shared Government infrastructure, Standardization of technology used (hardware, software, application etc. #)

➤ **Local Language Support :**

LRC applications LMIS, PCIS are having local language with CDAC ISM with Devnagari Bilingual font DVB TT Surekh for Marathi local language.

For completion of the works of uploading LMIS 7/12 and PCIS Property card abstracts on district web site, Agri Census and for switching over to NLRMP e-Mutation we have converted the data into Unicode using the Virtual Machines of Red Hat Linux Server 7.2 and Windows Client with the necessary Unicode conversion applications for the respective applications and presently all these applications are running with Unicode support in Marathi Language.

- **Leverage of shared infrastructure NICNET:** Distributed ready usable cloud of Virtual Machines over NICNET with 34/100 MBPS high speed secured, stable lease line connectivity through secured data centre. NIC District units downloaded, replicated and implemented the ready Virtual Machines of client and server to the Tahsil level TILR offices for Property Card Information System with the help of TILR technical staff, Tahsildar offices for the Land Management Information System, Agri Census application with the help of DBA's and also used it at District level for the 7/12 and Property card Data hosting on District web site and for NLRMP e-Mutation.

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### ➤ **Standardization of technology :**

Used Virtualization Technology with software, hardware portability, Server Consolidation, cloud of Virtual Machines and secured Data centre over NICNET.

### **SCALABILITY OF TECHNOLOGY**

**Modularity, re-usability and scalability of technology used**

#### **Modularity:**

#### **Variety of VMs of distinct OS**

- a. VM of sophisticated RH Linux 7.2 with IBM Db2 7.2 server DBMS, ftp enabled with data transmission and backup with Win client, applicable for all applications LMIS, PCIS, 7/12, property card data uploading on web site , Agri Census, NLRMP e-Chawdi and e-Mutation
- b. VM of Win client with IBM Db2 7.2, Network, database configurations, and applications LMIS,PCIS installed
- c. Bundle of VMs of Client,Server: Customized VMs of RH Linux 7.2 server/ Win Client so that they can be replicated easily with just copy, paste or move as a bundle
- d. VM of Win client with IBM Db2 7.2, SQL Server 8 DBMS and Unicode Data conversion utility, utilities for uploading 7/12, property card abstracts on District website installed
- e. VM of Win client with IBM Db2 7.2, SQL Server 8 DBMS and sophisticated Agri Census Application with supporting sws and utilities installed and configured with network and database connections.
- f. VM of Win client with IBM Db2 7.2 , postgresSQL and Unicode Data conversion utility with supporting sws for NLRMP
- g. Generic VMs of Win XP, 7 X86,X64 and Windows 8 Professional 64 with common application sws like MS Office, pdf reader, ftp,

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Unicode etc

**Data Centre:** Developed secured data Centre on Dell Rack mounting server R715 using Microsoft data server using Windows server 2008 R2 OS

**Leverage of shared govt. infrastructure NICNET:** Distributed ready usable VMs over NICNET with 34/100 MBPS high speed secured, stable lease line connectivity through secured data centre

**Re-usability:**

**Effortless deployments, optimization of technical resources, backup and disaster recovery**

As VMs can also be easily moved, copied, and reassigned between host servers to optimize hw resource utilization. Also we can customize the shared hw configuration settings allotted to VM as per need and requirements and availability of hw, sw and Network resources

VM HDD file is like image of OS/ Partition including all sw, setting installed on that OS / Partition. Its like mirror Image/ Ghost / Clone of OS/ Partition

Therefore by just copy paste and using, we need not have to install the OS, Application sws and do exercising of setting configuring sws and applications with each other. This is very useful in case of complicated sophisticated sws. It saves efforts of setting and configuring and deployment

Developed VM of RH Linux 7.2 Server including sophisticated IBM Db2 DBMS, network configuration on present age non supporting hardware, developed VM of Win Client with sophisticated LRC applications, Database and network configurations, customized and replicated ready usable VMs by simply copy paste method to large



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number of old and new computers and laptops for effortless deployments, optimization of technical resources, backup and disaster recovery

### **Scalability:**

- **used single physical computer logically as multiples Computers by running multiples distinct OS running simultaneously and isolated to each other**

Run distinct isolated OSs RH Linux 7.12 Server with Win XP Client Software at a time on single physical computer for optimum use of sw, hw, Network and human resources saving server hardware per LRC location

- **Instead of traditional approach of performing operations on file and folder as an object using OS, innovative approach of performing operations on complete virtual computer using VM sw is used**

**All type of Operations which physical computer performs on File/Folders as object using OS, that VM sw performs on complete virtual computer along with OS as object including creation, updating, removing, renaming, customizing, move, copy, backup and restore, sharing, Auto start, import/export etc**

**Performed all these operations for project implementation, utility analysis and R and D of VMs**

- **Dissemination Strategy : Used hybrid approach of utility computing** with mixed approach of cloud computing and Data centre for dissemination of ready usable VMs. As there is a problem with centralized deployment and computing due to major limitation that NICNET is available up to district level only. SWAN available upto tahsil level but its connectivity is not smoother and

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reliable up to tahsil level and we have no facility to host our VMs over SWAN. So it is decided and used hybrid approach of dissemination of ready VMs upto district level to NIC District Units through NICNET and then replicated and implemented it at Tahsil level with help of NIC District Units and Technical staff available at Tahsil level

- **Free and Open Source Software's(FOSS)** : We have used all the variety of free and open source Virtual Machines software's for developing the Virtual Machines. Also we have disseminated our variety of Virtual Machines with the required Virtual Machine Software's to all the beneficiaries free of cost as well as the users can customize and modify all that Virtual Machines as per their own way and their won need and requirement very similar to free and open source software's and ending the dependency of users on us.
- **Software Hardware Portability:** Sharing same hardware among many sw platforms, allowing software to be portable between various OS, as well as running older software and OS on a newer computer  
For effortless deployments, optimization of tech resources, backup, disaster recovery, efficient, enhanced use by running a typical sophisticated Appl on non supporting Hw / Sw
- **Effortless deployments, optimization of technical resources, backup and disaster recovery for description refer previous section re-usability in the same point**
- **Data Centre:** for description refer previous section re-usability in the same point
- **Leverage of shared govt:** for description refer previous section re-usability in the same point
- **Easy Testing and R and D under Client Server Environment:**  
Instead of practically visiting to client and server for testing I used

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VMs to switch for testing between client and server on single computer. We can mount the drives and disks between VMs and share data and resources. This way it is quite useful for Testing and R and D

### **Replicability:**

The variety of Virtual Machines including the VMs of RH Linux 7.2 server and Win client of LMIS and PCIS are replicated to around 700 locations in the state of Maharashtra to NIC District units and District level land records offices, Subdivision offices and at remote Taluka / tahsil (Block) level to Taluka Inspector of Land Records (TILR) officers for property card processing Property Card Information System (PCIS) and at Tahsildar offices for 7/12 processing Land Management Information System ( LMIS)

**Free and Open Source Software's(FOSS) :** We have used all the variety of free and open source Virtual Machines software's for developing the Virtual Machines. Also we have disseminated our variety of Virtual Machines with the required Virtual Machine Software's to all the beneficiaries free of cost as well as the users can customize and modify all that Virtual Machines as per their own way and their own need and requirement very similar to free and open source software's and ending the dependency of users on us.

### **Import and Export of Virtual Machines**

In order to import and export the Virtual Machines between variety of Virtual Machines software's like Virtual Box, VMware, Microsoft Virtual PC, Microsoft Hyper visor V, the Virtual Machine needs to be either exported to or imported from the Open Virtualization Format ( OVF).

Downloaded Virtual Box 4.3 Software and its extension patch and installed both. Converted the Red Hat Linux 7.2 Virtual Machine in VMware to OVF ( Open Virtualization Format ) and imported the OVF into Virtual Box Software and run the Virtual Machine of Red Hat Linux

# AWARDS SCHEME FOR EXEMPLARY IMPLEMENTATION OF e-GOVERNANCE INITIATIVES

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7.2 in Virtual Box Successfully

## 9. Adaptability Analysis

### (i) Measures to ensure adaptability and scalability

Measures to use adaptability and scalability is the direct applications software and output reports of the applications, online abstracts on the district website , use of Free and Open source softwares ( FOSS), effortless deployments and easy backup and disaster recovery with direct copy paste and move with hardware, software portability, server logs of Data centre, feedback from the users

### (ii) Measures to ensure replicability

Effortless deployments and backup disaster recovery of Virtual Machines with direct copy phase and move with hardware software portability, server logs of Data centre, feedback from the users

Practically used import / export of Virtual Machines with variety of Virtual Machines software Vmware, Virtual Box, Microsoft Virtual PC and Microsoft Hyper V etc by export/import to Virtual Machines in Open Virtualization Format (OVF) as per need and requirements.

### (iii) Restrictions, if any, in replication and or scalability

In replication when we replicate virtual machines on Variety of Old and New Computer systems and Laptops Hardware and Host Operating Systems sometimes we may need to customize the Virtual Machine setting as per the available hardware configuration and host OS. There are easy user friendly GUI menu available for setting the Memory, HDD, Network etc. For example: If our Virtual Machine is having Virtual configured Ram of 4GB and the computer system on which we have replicated the Virtual Machine is having Physical RAM

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of 2GB only then we have to reduce the Virtual RAM and configured it to nearly 1GB for the function of the Virtual Machine. Similarly if the we have replicated the same Virtual Machine of the Physical Machine having Physical Ram of 16 or 32 GB then we may extend the Virtual RAM and configure it up to 8 GB or more as per the configuration.

When we are running Virtual Machines on the host Operating system the performance of the Virtual Machine decreases as the number of Virtual Machines running on the host increases.

In order to run guest Virtual Machine, the compatible host Virtual Machine is to be operational with supporting Virtual Machine software interface deployed and operational.

### (iv) Risk Analysis

The Virtual Machine needs to be safe backup for the effortless deployments, backup and disaster recovery, Testing and R & D so that if the present fails then backup can be used to recover.

If the complete data centre of cloud of Virtual Machine or the live Virtual Machine fails then it may be a big disaster. In order to protect this there should be live migration of Virtual Machine over the live backup mirror data centre in order to backup and disaster recovery.

Ex. Recently in around 2013-14 it heard that the due to the failure of some application on state data centre, the data of the bult number of applicants of MPSC ( Maharashtra Public Service Commission) exam lost.

Presently our data centre is also not having that facility but we take backup of complete date centre over another server in regular intervals and we are working on live migration of data centre and Virtual Machines.

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10. **New Models of Service Delivery** (Give details about type of partnership model use, Links to/Supported by Public/Private Organization Links provided to relevant websites etc. #)

### **New Models of service Delivery**

#### ***more from less for more and more***

**Full Virtualization with Isolation, Server Consolidation, effortless deployments, backup, disaster recovery, software hardware portability, leveraging shared infrastructure NICNET.**

**Improved service delivery, efficiency, throughput and cost effectiveness**

- **Instead of traditional approach of running single OS at a time on computer, used single physical computer logically as multiples Computers by running multiples distinct OS running simultaneously and isolated to each other**

Run distinct isolated OSs RH Linux 7.12 Server with Win XP Client Software at a time on single physical computer for optimum use of sw, hw, Network and human resources saving server hardware per LRC location

This way achieved able, capacity, Load Handling, portability and strengthened use of available computer s and achieved more from less for more and more

This way single Laptop is used as a complete LRC LMIS, PCIS system with client as well as server to provide the service delivery to public from any remote location. This way achieved reach of service delivery. Recently for this Laptops are provided to all Talathis in district for public service delivery from any remote location

RH Linux 7.2 server is most necessary and essential component for all LRC and NLRMP related apps and have no alternative than VM in present age as the todays hardware is not compatible with RH Linux 7.2

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server. Here skill lies as there is a big challenge overcome in development of stable Virtual Machine of R H Linux 7.2 server on incompatible hardware

- **Instead of traditional approach of performing operations on file and folder as an object using OS, innovative approach of performing operations on complete virtual computer using VM sw is used**

The real virtue of VMs sw is that, all type of Operations which physical computer performs on File/Folders as object using OS, that VM sw performs on complete virtual computer along with OS as object including creation, updating, removing, renaming, customizing, move, copy, backup and restore, sharing, Auto start, import/export etc

**Performed all these operations for project implementation, utility analysis and R and D of VMs**

- **Dissemination Strategy :** Used hybrid approach of utility computing with mixed approach of cloud computing and Data centre for dissemination of ready usable VMs. As there is a problem with centralized deployment and computing due to major limitation that NICNET is available up to district level only. SWAN available upto tahsil level but its connectivity is not smoother and reliable up to tahsil level and we have no facility to host our VMs over SWAN. So it is decided and used hybrid approach of dissemination of ready VMs upto district level to NIC District Units through NICNET and then replicated and implemented it at Tahsil level with help of NIC District Units and Technical staff available at Tahsil level
- **Free and Open Source Software's(FOSS)** : We have used all the variety of free and open source Virtual Machines software's for developing the Virtual Machines. Also we have disseminated our variety of Virtual Machines with the required Virtual Machine Software's to all

## AWARDS SCHEME FOR EXEMPLARY IMPLEMENTATION OF e-GOVERNANCE INITIATIVES

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the beneficiaries free of cost as well as the users can customize and modify all that Virtual Machines as per their own way and their own need and requirement very similar to free and open source software's and ending the dependency of users on us.

- **Software Hardware Portability:** Sharing same hardware among many sw platforms, allowing software to be portable between various OS, as well as running older software and OS on a newer computer

For effortless deployments, optimization of tech resources, backup, disaster recovery, efficient, enhanced use by running a typical sophisticated Appl on non supporting Hw / Sw

**VMs can also be easily moved, copied, and reassigned between host servers to optimize hw resource utilization. Also we can customize the shared hw configuration settings allotted to VM as per need and requirements. and availability of hw, sw and Network resources**

VM HDD file is like image of OS/ Partition including all sw, setting installed on that OS / Partition. Its like mirror Image/ Ghost / Clone of OS/ Partition

Therefore by just copy paste and using, we need not have to install the OS, Application sws and do exercising of setting configuring sws and applications with each other. This is very useful in case of complicated sophisticated sws. It save efforts of setting and configuring and deployment

Developed VM of RH Linux 7.2 Server including sophisticated IBM Db2 DBMS, network configuration on present age non supporting hardware, developed VM of Win Client with sophisticated LRC applications, Database and network configurations, customized and replicated ready usable VMs to large number of old and new computers and laptops for effortless deployments, optimization of technical resources, backup and



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disaster recovery

In order to optimize and effective use of hw/sw resources and technical efforts and exercises to achieve goal in targeted time, I have developed VM of RH Linux Server, Win Client on same computer running simultaneously at a time and then by copying readily tested VMs to large no of Machines between host servers ,on Various Old, New Computers and Laptops, for saving Server hardware cost per location. For deployment of ready VMs at various distinct locations in local office and Tahsils, I used just copy, customize method as per local hardware availability and use

- **Leverage of shared infrastructure** :NICNET Distributed VMs over NICNET with 34/100 MBPS high speed secured, stable lease line connectivity through secured data centre
- **Data Centre** : Developed Secured data Centre on Dell Rack mounting server R715 using Microsoft data server using Windows server 2008 R2 OS
- **Easy Testing and R and D under Client Server Environment:** Instead of practically visiting to client and server for testing I used VMs to switch for testing between client and server on single computer. We can mount the drives and disks between VMs and share data and resources. This way it is quite useful for Testing and R and D
- **Faster Booting:** Booting and restarting a VMs can be much faster than with physical machine, since it may be possible to skip tasks such as hardware initialization
- Used VT technology for developing the VM of Win 8 and installation of Microsoft Hyper V

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### 11. **Efficiency Enhancement** (Give specific details about the following #)

#### (i) Volume of transactions processed

**Using a single computer system as multiples computer systems with the Virtualization, Server consolidation, Virtual Machines cloud, software hardware portability, effortless deployments , easy backup and disaster recovery , leveraging shared govt. infrastructure, Virtual Machines cloud, Free and Open Source Virtual Machines** by running variety of distinct optimum number of Virtual Machine running simultaneously and isolated to each other on single physical computer system the variety of homogeneous and / or heterogeneous processing like uploading and /or unicode data conversion or 7/12 and/or property card or the same or different blocks like 7/12 and /or property card executed. This way processed the large volume of transactions with optimized throughput

#### (ii) Coping with transaction volume growth

Using a single computer system as multiples computer systems with the Virtualization, Server consolidation, Virtual Machines cloud, software hardware portability, leveraging shared govt. infrastructure, Virtual Machines cloud by running variety of distinct optimum number of Virtual Machine running simultaneously and isolated to each other on single physical computer system the variety of homogeneous and / or heterogeneous processing like uploading and /or unicode data conversion or 7/12 and/or property card or the same or different blocks like 7/12 and /or property card data can be executed. Therefore as per the volume of the data the running of the number of Virtual Machines and software / hardware can be varied and modified.

With the Virtualization, server consolidation, Virtual Machines cloud, software hardware portability, leveraging shared govt. infrastructure, Virtual Machines cloud ,effortless deployments, easy backup and disaster recovery, and processing for multiple Tahsils/ blocks at a time

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simultaneously isolated to each other by running the multiple Virtual Machines for the similar and /different processes on the single physical computer, the throughput in optimized and the specified respective purpose is achieved in optimum time for all the LRC and NLRMP related applications and activities.

**(iii)** Time taken to process transactions,

Using a single computer system as multiple computer system with the Virtualization, Server consolidation, Virtual Machines cloud, software hardware portability, leveraging shared govt. infrastructure, Virtual Machines cloud, effortless deployments, easy backup and disaster recovery, and processing for multiple Tahsils/ blocks at a time simultaneously isolated to each other by running the multiple optimum number of Virtual Machines for the homogeneous and / or heterogeneous processes on the single physical computer, the throughput in optimized and the specified respective purpose is achieved in optimum time for all the LRC and NLRMP related applications and activities. Like operations like uploading, Unicode conversion of 7/12 and/ or Property card data of same or different tahsils at a time running separate isolated suitable same Virtual Machines running simultaneously to each other for the 7/12 and property card data uploading, Unicode conversion.

**(iv)** Accuracy of output,

As the Virtually developed Virtual Machine works very same as physical Machine it gives the same accuracy as the physical machine without any leakage with data, application software, network and database setting. Instead even if Virtual Machine software performs operations on the complete Virtual Computer system it works with full same as accuracy as physical computer system works with files/ folders using operating system.

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**(v) Number of delays in service delivery**

By using single computer system with Virtualization, server consolidation, software hardware portability, leveraging shared govt. infrastructure, Virtual Machines cloud, effortless deployments, easy backup and disaster recovery, and processing for multiple Tahsils/blocks at a time simultaneously isolated to each other by running multiple Virtual Machines for homogeneous and / or heterogeneous processes on the single physical computer, the throughput is optimized and this way the delays in service delivery is minimized

**12. User convenience** (Give specific details about the followings #)

**(i) Service delivery channels** (Web, email, SMS etc.)

Readily usable Virtual Machines of distinct Virtual Machines of client and server, **with the Virtualization, Server consolidation, Virtual Machines cloud, software hardware portability, effortless deployments, easy backup and disaster recovery, leveraging shared govt. infrastructure, Virtual Machines cloud**

Ready Usable Virtual Machines of Red Hat Linux Server 7.2, Windows XP client for 7/12 RCIS, Property Card (PCIS), Windows XP and Windows 7 Ultimate X64 and Windows 8 Professional 64 with common usable software's like MS Office, Adobe Acrobat reader, Printer Configured etc, kept on NIC Akola's secured ftp servers. NIC District unit officials downloaded the same through NICNET and provided to the block locations and implemented with the help of technical staff of DBA for LMIS and TILR technical staff for PCIS available there.

**(ii) Completeness of information provided to the users,**

Ready Usable Virtual Machines of Red Hat Linux Server 7.2, Windows XP client for 7/12 RCIS, Property Card (PCIS), Windows XP and Windows 7 Ultimate X64 and Windows 8 Professional 64 with common

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usable software's like MS Office, Adobe Acrobat reader etc, kept on NIC Akola's secured ftp servers with effortless deployments and easy backups and disaster recovery.

**Free and Open Source Software's (FOSS) :** We have used all the variety of free and open source Virtual Machines software's for developing the Virtual Machines. Also we have disseminated our variety of Virtual Machine with the required Virtual Machine Software's to all the beneficiaries free of cost as well as the users can customize and modify all that Virtual Machines as per their own way and their won need and requirement very similar to free and open source software's and ending the dependency of users on us.

**(iii) Accessibility (Time Window),**

Accessibility to stakeholders to cloud of ready usable Virtual Machines hosted on data centre over NICNET with through login and password facility. ftp servers 10.152.73.6 user: nicakolaftp password: \*\*\*\*\* accessible on NIC network.

**(iv) Distance required to travel to Access Points**

In pre scenario it was required but by using the proposed framework with virtualization, server consolidation provided in hand ready usable Virtual Machines of Red Hat Linux Server 7.2, Windows XP client for 7/12 RCIS, Property Card (PCIS), Windows XP and Windows 7 Ultimate X64 and Windows 8 Professional 64 with common usable software's like MS Office, Adobe Acrobat reader etc., with effortless deployments and easy backups and disaster recovery. This way the need and distance travel to access point is optimized.

**(v) Facility for online/offline download and online submission of forms,**

Accessibility to stakeholders to cloud of ready usable Virtual Machines hosted on data centre over NICNET with through login and password facility. ftp servers 10.152.73.6 user: nicakolaftp password: \*\*\*\*\*

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accessible on NIC network.

(vi) status tracking

The status tracking is done with the server logs **NIC Akola Server logs** is available at link [http://akola.nic.in/pdf/NIC Akola ftp server logs.rar](http://akola.nic.in/pdf/NIC_Akola_ftp_server_logs.rar) on district web site of Akola.

13. **Sustainability** (Give details about sustainability w.r.t. technology (technology used, user privacy, security of information shared – Digital Encryption etc. #), Organization (hiring trained staff, training etc. #), financial (Scope for revenue generation etc. #))

### **Sustainability w.r.t Technology :**

All the LRC Virtual Machines of Red Hat Linux 7.2 server , Windows XP SP2 client are tested at NIC District Unit , Akola on various old and New Computer Systems and Old and New Laptops for their smooth stable operation and the same Virtual Machines are implemented for all the property card locations in the District Akola and running smoothly error free.

**The real virtue of VMs sw is that, all type of operations which physical computer performs on File/Folders as object using OS, that VM sw performs on complete virtual computer along with OS as object including creation, updating, removing, renaming, customizing, move, copy, backup and restore, sharing, Auto start, import/export etc**

**Software Hardware Portability:** Sharing same hardware among many sw platforms, allowing software to be portable between various OS, as well as running older software and OS on a newer computer

For effortless deployments, optimization of tech resources, backup, disaster recovery, efficient, enhanced use by running a typical

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sophisticated Appl on non supporting Hw / Sw

**VMs can also be easily moved, copied, and reassigned between host servers to optimize hw resource utilization. Also we can customize shared hw configuration settings allotted to VM as per need and requirements, and availability of hw, sw and Network resources**

VM HDD file is like image of OS/ Partition including all sw, setting installed on that OS / Partition. Its like mirror Image/ Ghost / Clone of OS/ Partition

Therefore by just copy paste and using, we need not have to install the OS, Application software's and do exercising of setting configuring sws and applications with each other. This is very useful in case of complicated sophisticated software's for the effortless deployments , backup and disaster recovery

### **Security**

All the developed Virtual Machines cloud is hosted on data centre maintained by NIC's scientific officials over the NIC's secured National Network NICNET which are protected with centralized antivirus server. The Virtual Machines running at the Tahsil and remote locations are protected by running in offline environment where there are very less chances of cyber attacks. FTP Server Developed with Secured Microsoft FTP server.

**Free and Open Source Software's (FOSS) :** We have used all the variety of free and open source Virtual Machines software's for developing the Virtual Machines. Also we have disseminated our variety of Virtual Machine with the required Virtual Machine Software's to all the beneficiaries free of cost as well as the users can customize and modify all that Virtual Machines as per their own way and their

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won need and requirement very similar to free and open source software's and ending the dependency of users on us.

### **Sustainability w.r.t Organization**

Capacity Building and support: As VMs can also be easily moved, copied, and reassigned between host servers to optimize hardware resource utilization. Also we can change the shared Hardware configuration settings allotted to the Virtual Machine as per the need and requirements. For Deployment of the ready Virtual Machines at Various distinct locations in local office and Tahsils we have used the just the copy, customize as per local hardware availability and use method

The LRC users are given a operational training with documentation of handling, backup, restore Disaster recovery, to all the LRC Virtual Machines of Red Hat Linux Server and Windows Client using the Virtual Machine with VMware software and use of ftp for the data transmission between Red Hat Linux server and Windows XP client with both the client and server Virtual Machines are enabled with easily usable ftp software's. For Akola District the same training is provided to LRC user by NIC District Unit, Akola and for the other District the same training provided by the respective NIC, District Unit.

All the Virtual Machines with various necessary required supporting software's with necessary documentation are hosted on stable secured ftp server on NIC's secured 32 MBPS lease line Network, for anytime download, use and support.

The Virtual Machine are designed are nearly complete with the entire users requirement by almost very few user face any difficulties for technical implementation of the LRC Virtual machines. If any problems arise in few cases, full support is provided by NIC, District Unit Akola



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by taking remote Desktop through NIC's Network, NIC, Akola's stable Secured ftp server on NIC's NICNET Network and through telephonic guidelines, and the Virtual Machines are running smoothly in the Districts in the state of Maharashtra.

### **Sustainability w.r.t financial**

The LRC, LMIS and PCIS applications are presently used for the Distribution of the 7/12 and property card abstract and used for the revenue generation. The e-Chwdi and e-Mutation are the applications under process of implementation for NLRMP which will be used for the revenue generation. The Virtual Machines are used indirectly for the server consolidation in PCIS and LMIS application and for the implementation of e-Chawdi and e-Mutation . This way it is indirectly used for the revenue generation and

**Server consolidation, effortless deployments, optimization of technical resources, backup and disaster recovery , leverage of shared govt. infrastructure , software hardware portability this all saved time and cost of maintenance, Free and open source Virtual Machine and Virtual Machine software's.** Therefore it reduces the financial burden abide by the Govt. As the input financial burden and expenses reduced with improved service delivery, throughput, efficiency with optimization of technical resources with server consolidation, this way it increases output revenue as well as reduces input financial expenditures and heavily contributes in revenue generation as below

- a. It reduces hardware and operating costs by as much as 50 percent and energy costs by as much as 80 percent.
- b. Reduces cooling requirements in establishment as well as maintenance of Government Data Centers (GDCs).
- c. Reduces total cost of ownership on e-governance projects by

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reducing the costs incurred on acquiring various types of hardware and software licenses from private vendors.

d. Reduces the time it takes to provision new servers by as much as 70 percent.

e. Decrease downtime and improve reliability with process continuity and built-in disaster recovery.

By reducing the quantity of computer systems to large extent nearly 50% , significantly contributes in reduction of pollution in the form of Heat generated. By saving vehicles and fuel also reduced pollution.

By server consolidating existing hardware utilization increased from as low as 5 percent to as much as 80 percent. Energy consumption reduces by decreasing the number of servers. VMware server virtualization reduce hardware requirements by a 15:1 ratio, enabling to lessen the environmental impact of organizations IT without sacrificing reliability or service levels.

14. Result Achieved/ Value Delivered to the beneficiary of the project-(share the results, matrices, key learning's, feedback and stakeholders statements that show a positive difference is being made etc):

**(i) To organization**

**Targeted Beneficiaries / Stakeholders**

- **SLR, Dy SLR, TILR offices for Property Card Information System(PCIS), Property card data hosting on district web site.**
- **SDO, Tahsildar Offices for Land Management Information System (LMIS), Agri census, 7/12 data hosting on district web site, e-Chawdi and e-Mutation.**
- **NIC District Units for technical implementation and support , disaster recovery for PCIS, LMIS, Agri census,**

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**implementation at district, sub division and Taluka level,  
7/12 and property card data uploading on web site, Agri  
Census, e-Chawdi, e-Mutation, unicode data conversion.**

***more from less for more and more***

**Full Virtualization with Isolation, Server Consolidation, effortless  
deployments, backup, disaster recovery, software hardware  
portability, leveraging shared infrastructure NICNET.**

**Improved service delivery, efficiency, throughput and cost  
effectiveness**

**Optimized, efficient, enhanced, user Convenient use of  
Technical Hardware, Software, Network and Human  
Resources, technical efforts and exercise, time, financial  
Resources, Civil and environmental resources, using Virtual  
Machines for timely completion of LRC activities PCIS, LMIS,  
Agri Census , 7/12 and Property Card Data Uploading , e-  
Chawdi and e-Mutation, in the Districts of Maharashtra**

- Overcame Problems faced by LRC locations and NIC District Units in the Districts of Maharashtra for availability, operability and maintenance of Technical Resources of Windows Client and Red Hat Linux 7.2 Server for the sophisticated PCIS and LMIS setup by developing the ready Distributable Virtual Machines of Client as well as server, Agri Census Application, Unicode Data Conversion Utility for 7/12 and Property Card Data hosting on web site, Agri Census, e-Chawdi, e-Mutation.
- Used the various features of Virtual Machines between the large number of Computer Systems between host servers with distinct old and new compatible/ incompatible software's and hardware's ,for user convenience , Optimized and efficient use of the Hardware, Software, Network, Human Resources and technical efforts and exercises for timely completion of LMIS,

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PCIS, Agri Census, e-Chawdi , e-Mutation and 7/12 data uploading on website, with full efficiency, enhancement and user convenience optimizing time, costs, technical hardware, software, Network and human resources, space, electricity, furniture's etc.,.

- Used server consolidation by installing Red Hat Linux 7.2 Server and Windows Client on the single physical computer system and this way saved server hardware cost for around more than 500 locations / use.
- Software Hardware Portability: Ready usable Virtual Machines replicated to large number of old and new computer systems and laptops between variety of host operating systems with effortless deployments, backup and disaster recovery.
- Saved approximate cost of around 1000000 Rs. for the maintenance of the sophisticated software / hardware, deployments of the Operating Systems, Applications software and Network and Database management, Disaster recovery , by replicating the ready usable Virtual Machines all over state with effortless deployments and backup and disaster recovery.
- Reduced hardware and operating costs by as much as 50 percent and energy costs by as much as 80 percent, saving more than 150,000 Rs. per year for each virtualized server workload.
- Reduced cooling requirements in establishment as well as maintenance of Government Data Centers (GDCs).
- Reduced total cost of ownership on e-governance projects by reducing the costs incurred on acquiring various types of hardware and software licenses from private vendors.
- Reduce the time it takes to provision new servers by as much as 70 percent.
- Decrease downtime and improve reliability with process

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continuity and built-in disaster recovery.

### **(Logs, Feedback and stakeholders statements)**

#### **Data Centre Server logs**

The data centre server logs showing Audit trails **NIC Akola Server logs** as available at link [http://akola.nic.in/pdf/NIC Akola ftp server logs.rar](http://akola.nic.in/pdf/NIC_Akola_ftp_server_logs.rar) on district web site of Akola.

#### **Key Learning's**

Server consolidation based on virtualization technology simplifies system administration, reduce the cost of power and physical infrastructure, and improve utilization in today's internet-service-oriented enterprise data centers. The basic use of virtualization is the optimization of technical resources, improved service delivery with valuable reduction of the cost. The benefits of virtualization are typically considered to be server consolidation, increased availability, isolation, ease of operating system deployment and simplified disaster recovery. As the size and complexity of modern computing systems keep increasing to meet the demanding requirements of performance applications, manageability is becoming an important concern to achieve both performance and productivity computing. Here I have presented analytical framework for utility computing for effective e-Governance using Virtual Machines to achieve testing and R & D, new effortless deployments, basic system administration, adaptability, scalability, new models of service delivery, efficiency, enhancement, user convenience, sustainability, and leverage of shared government infrastructure. However to deliver the maximum throughput requires careful attention toward system details for the minimal loss of CPU performance and I/O efficiency. This work suggests a deigned framework to deliver the maximum throughput using technical resource optimization with improved and cost effective e-governance services. The involvement of technologies like virtualization,

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consolidation and cloud computing and adoption of free and open source software in designing and deploying e-governance will lead towards maximum throughput using resource optimization with reduction in total cost associated with both hardware as well as software. Therefore it reduces the financial burden abide by the state and central governments. For ensuring the effectiveness of e-governance projects the traditional framework and approach of delivery mechanism needs to be reengineered. The impact of any e-governance project depends upon its utilization by the concerned group and hence there accessibility needs to be enhanced drastically.

### **Feed Back from Stakeholders NIC, District Units**

#### **Email from DIO, Washim Dated 15 May 2013**

----- Original Message -----

From: **Sagar** <mahwas@nic.in>

Date: May 15, 2013 10:39:56 AM

Subject: Re: Virtual Machines of NIC, Akola received Special Mention Excellence Award

To: NIC Akola <mahako@nic.in>

Dear DIO

Thanks for ur help for virtual machines . At washim NIC we are using this virtual machine concept . 5 server .for property card and 3 server for 7/12 are in use without any problem . This concept had save money as well as time .

thanks for ur cooperation and congrates for it .

From

DIO Washim

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### Email from DIO, Beed Dated 15 June 2013

----- Original Message -----

From: **PRAVIN CHOPADE** <mahbee@nic.in>

Date: Jun 15, 2013 11:30:47 AM

Subject: Support extended for Linux server as Virtual Machine by DIO Akola.

To: siomsu@nic.in

Cc: mahako@nic.in, mahbee@nic.in

Respected Sir,

As we are aware that hardware with Linux server supplied by Settlement Commitioner Office for Land Record Project was absolute. But right now, it is mandatory to use Linux server for 7/12 Land record project for important phase of data conversion. For Beed district and for all 11 talukas, Linux server hardware was not in use because of hardware problem. To install linux server (Virtual Machine) for data conversion, DIO Akola helped us a lot and by using virtual machine server we started data conversion work with minimum effort. And beacuse of virutal machine, the problem of linux server get solved. Whenever we stuck up for linux server installation, Shri Nitiin Chaudhary, DIO Akola extended full support by taking control of server and made necessary installtion. Now we are and Maharashtra state moving toward web based 7/12 under NLRMP project with kind support and crucial technical guidance under your leadership Sir. This is for information please sir.

With thanks and regards

Pravin Chopade,

DIO and TD

NIC, Beed.

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### Email from NIC, Wardha Dated 31 July 2013

----- Original Message -----

From: **NIC WARDHA DISTRICT CENTRE** <mahwar@nic.in>

Date: Jul 31, 2013 1:44:43 PM

Subject: Usefullness of Virtual Machine concept.

To: NIC Akola <mahako@nic.in>

Dear Sir,

The virtual m/c concept was actually used in NIC, Wardha for creating server and client for 7/12 and property card computerization for 3 talukas-Deoli, Selu and Karanja.

**Prescenario** – In 7/12 and property card computerization project the server platform was Linux 7.2 and DB2 7.2 and client was windos XP. On the new machines Linux 7.2 doesn't get installed because it doesn't support new H/W therefore need was felt to create virtual server and client on through VM software on those new machines.

We have used virtual m/c created by NIC Akola for server and client for deploying on our machines. Deployment was easy through vm s/w and saved lot of time. Only data was needed to be restored for our talukas.

**Post scenario-** Client and server was delivered to actual user within one day after deployment and restoring their data back up. High user satifaction was achieved.

I would like to mention that DIO, DIA, NIC Akola put great efforts putting VM concept to use and worked for helping other DIOs of NIC in 7/12, property card computerization. They are only DIO, DIA who though of helping other DIOs by reducing their efforts.



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I wish DIO, DIA, NIC, Akola success in their future technical endeavours.

Regards.

Jayant Borade

DIA,NIC, Wardha

**On 6<sup>th</sup> April 2013 at 11 am Video Conferencing is taken by Hon Chief Secretary Shri Banthia of Maharashtra on e-Governance with DIO's and District Collectors of Maharashtra , in the presence of Shri Rajesh Agrawal , IT Secretary Gove of Mahrashtra and Shri Moiz Hussain Ali, State Informatics Officer, NIC, Mumbai**

Myself Shri Nitin V. Choudhari, DIO, NIC , Akola Informed the Following in the VC Session.

“Sir,

We have developed the Readily Distributable Virtual Machines of Red Hat Linux Server and Windows Client for 7/12 as well as Property Card and using it at District and Tahsils in Akola District and this way saved the server Hardware for all the Tahsils in Akola District for Property Card.

Our Virtual Machines of 7/12 and Property Card put on NIC Akola's ftp server and that are downloaded by around 15 Districts and Washim, Buldhana, Wardha Districts etc are using it “

**During the VC Several DIO's informed that they are using the Virtual Machines of NIC, Akola**

**Hon Chief Secreatary said that “ The efforts taken by DIO, Akola**

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are very much appreciated”

### (ii) To citizen

Complete LRC PCIS, LMIS, 7.12 and property card data uploading, Agri census and switching over to NLRMP–Chawdi and e-Mutation applications are directly related to public. Land and property is major aspect for the public. RH Linux 7.2 server is the most necessary and essential component for all these applications have no alternative than Virtual Machines in present age as the today's hardware is not compatible with RH Linux 7.2 server.

In pre scenario where continuing operations of LMIS, PCIS and uploading of 7/12, property card data on district web site and switching over the MLRMP e-Chawdi and e-Mutation appears to be a big challenge to the public service delivery due to the availability, operability and maintenance of the compatible software, hardware for the Red Hat Linux 7.2 server, e-Governance framework implemented by NIC, Akola of Virtualization using Virtual Machine has major contribution in continuation all the applications for public service delivery and timely completion of all targets and goals with smooth and concrete functioning of all these applications, with Server consolidation, replication of ready Virtual Machines of client and server, increased throughput, with effortless deployments, optimization of technical resources, backup and disaster recovery this all saved time and cost of maintenance. With server consolidation saved more than 500 server costs and saved the public money

By Server Consolidation and replicating VM's, used less number of equipments and optimized technical efforts and exercises, testing and saved variety of resources like time, financial, space, civil , electricity energy consumption, furniture, fuel ,Vehicles, Human resources for

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taking the Computer Systems to NIC for support and for visits of NIC officials to Tahsil level environmental resources for timely completion of LRC PCIS, LMIS, Agri Census, 7/12 and Property Card Data Uploading ,e-Chawdi and e-Mutation, in the Districts of Maharashtra

This way the single Laptop is used as a complete LRC LMIS, PCIS system with client as well as server to provide the service delivery to public from any remote location. This way achieved reach of service delivery. Recently for this the Laptops are provided to all the Talathis in the district for public service delivery from any remote location.

It helped in background to complete the NLRMP e-Mutation works as early as possible. Under NLRMP program online e-Mutation is operational from 1<sup>st</sup> Aug 2014 for Tahsil Telhara of district Akola which is one of the three Tahsils in the state of Maharashtra from where the online transaction of e-Mutation is started first time from 1<sup>st</sup> Aug 2014. This way Akola is the leading district in Maharashtra where the online transaction of e-Mutation is operational. This way the e-Governance framework implemented by NIC, Akola has indirectly important contribution in public service delivery of the LRC, NLRMP related applications.

With this even though there is no compatible software hardware available, it is possible to upload the 7/12 and property card data on district web site. Also it is possible to upload the data of multiple tahsils using the single physical machine at a time simultaneously isolated to each other. Similar technique is applied for the Agri Census. Due to this it is possible to complete the uploading optimum time using the optimum use of the available technical infrastructure saving the technical, environmental, financial resources and time.

### **(iii) Other stakeholders**

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Similar ( I ) To Organization in this para point.

15. Extent to which the Objective of the Project is fulfilled-(benefit to the target audience i.e.G2G, G2C, G2B, G2E or any other, size and category of population/stakeholder benefited etc):

**It is basically G2G initiative and indirectly for the G2C**

***more from less for more and more***

**Full Virtualization with Isolation, Server Consolidation, effortless deployments, backup, disaster recovery, software hardware portability, leveraging shared infrastructure NICNET. , Free and Open Source Virtual Machine and Virtual Machine softwares.**

**Improved service delivery, efficiency, throughput and cost effectiveness**

**Optimized, efficient, enhanced, user Convenient use of Technical Hardware, Software, Network and Human Resources, technical efforts and exercise, time, financial Resources, Civil and environmental resources, using Virtual Machines for timely completion of LRC activities PCIS, LMIS, Agri Census , 7/12 and Property Card Data Uploading , e-Chawdi and e-Mutation, in the Districts of Maharashtra**

- Overcame Problems faced by LRC locations and NIC District Units in the Districts of Maharashtra for availability, operability and maintenance of Technical Resources of Windows Client and Red Hat Linux 7.2 Server for the sophisticated PCIS and LMIS setup by developing the ready Distributable Virtual Machines of Client as well as server, Agri Census Application, Unicode Data Conversion Utility for 7/12 and Property Card Data hosting on web site, Agri Census, NLRMP e-Mutation.
- Used server consolidation by installing Red Hat Linux 7.2 Server and Windows Client on the single physical computer system and this way

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saved server hardware cost for around more than 500 locations / use.

- Software Hardware Portability: Ready usable Virtual Machines replicated to large number of old and new computer systems and laptops between variety of host operating systems with effortless deployments, backup and disaster recovery.
- Saved approximate cost of around 1000000 Rs. for the maintenance of the sophisticated software / hardware, deployments of the Operating Systems, Applications software and Network and Database management, Disaster recovery , by replicating the ready usable Virtual Machines all over state with effortless deployments and backup and disaster recovery.
- Reduced hardware and operating costs by as much as 50 percent and energy costs by as much as 80 percent, saving more than 150,000 Rs. per year for each virtualized server workload.
- Reduced cooling requirements in establishment as well as maintenance of Government Data Centers (GDCs).
- Reduced total cost of ownership on e-governance projects by reducing the costs incurred on acquiring various types of hardware and software licenses from private vendors.
- Reduce the time it takes to provision new servers by as much as 70 percent.
- Decrease downtime and improve reliability with process continuity built-in disaster recovery.

By reducing the quantity of computer systems to large extent nearly 50% , significantly contributed in reduction of pollution in the form of Heat generated. By saving vehicles and fuel also reduced pollution.

Saved Server hardware per location, saved maintenance costs, saved visits of Tahsil staff to NIC and vice versa this way saved resources like vehicle , fuel, Driver

Saved Environmental Resources: By Server Consolidation and replicating

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VM's, used less number of equipments and optimized technical efforts and exercises, testing and saved variety of resources like time, financial, space, civil , electricity energy consumption, furniture, fuel ,Vehicles, Human resources for taking the Computer Systems to NIC for support and for visits of NIC officials to Tahsil level environmental resources for timely completion of LRC PCIS, LMIS, Agri Census , 7/12 and Property Card Data Uploading ,e-Chawdi and e-Mutation, in the Districts of Maharashtra

- **Leading District in online e-Mutation.**

In earlier system (Pre-scenario) continuing the operations of LMIS, PCIS and uploading of 7/12, property card data on district web site and switching over the MLRMP e-Chawdi and e-Mutation appears to be a big challenge due to the non-availability, operability and maintenance of the compatible software , hardware for the Red Hat Linux 7.2 server which is necessarily required and no other alternative for all these applications and as the latest present computer systems and hardware not supporting to Red Hat Linux 7.2 Server. In the present scenario with the new system with virtualization using Virtual Machines , operations of the LMIS and PCIS are continued smoothly with server consolidation, 7/12 and property card data uploaded successfully on the district web site and speed up the process of e-Mutation under NLRMP for all over the state of Maharashtra, with server consolidation, effortless deployments , easy backup and disaster recovery.

Under NLRMP program online e-Mutation is operational from 1<sup>st</sup> Aug 2014 for Tahsil Telhara of district Akola which is one of the three Tahsils in the state of Maharashtra from where the online transaction of e-Mutation is started first time

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16. Comparative Analysis of earlier Vs new system with respect to the BPR, Change Management, Outcome/benefit, change in legal system, rules and regulations

***more from less for more and more***

**Full Virtualization with Isolation, Server Consolidation, effortless deployments, backup, disaster recovery, software hardware portability, leveraging shared infrastructure NICNET. , Free and Open Source Virtual Machine and Virtual Machine software's.**

**Improved service delivery, efficiency, throughput and cost effectiveness**

**In the earlier with the local client server environment at LRC location with Red Hat Linux server 7.2 and Windows client , where the continuation of itself service delivery, efficiency, throughput and cost effectiveness appears to be a big challenge , in the present system all these things are achieved to large extent with Full Virtualization with Isolation, Server Consolidation, effortless deployments, backup, disaster recovery, software hardware portability , leveraging shared infrastructure NICNET with the points explained below.**

➤ In earlier system ( Pre-scenario ) continuing the operations of LMIS, PCIS and uploading of 7/12, property card data on district web site and switching over the MLRMP e-Chawdi and e-Mutation appears to be a big challenge due to the non-availability, operability and maintenance of the compatible software , hardware for the Red Hat Linux 7.2 server which is necessarily required and no other alternative for all these applications and as the latest present computer systems and hardware not supporting to Red Hat Linux 7.2 Server.

The Virtual Machine is the technical concept it can be used in any e-Governance project for the utility computing and cost effective solutions using optimum use of the available resources. This is practically very useful when we have to do the processing /data entry on client and server

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Environment at large number of distinct locations and where the server is just required as a background service. Under such situation we can install the client and server on single system and process the work and this way save the cost of the server hardware per every location. In the present system using the new system the same concept is efficiently and optimally implemented for the Land Record Computerization related applications.

In the present scenario with the new system with virtualization using Virtual Machines, operations of the LMIS and PCIS are continued smoothly with server consolidation, 7/12 and property card data uploaded successfully on the district web site and speed up the process of e-Mutation under NLRMP for all over the state of Maharashtra, with server consolidation, effortless deployments, easy backup and disaster recovery.

Under NLRMP program online e-Mutation is operational from 1<sup>st</sup> Aug 2014 for Tahsil Telhara of district Akola which is one of the three Tahsils in the state of Maharashtra from where the online transaction of e-Mutation is started first time

- In the earlier system as the Server Hardware is not at all provided for PCIS all over the state and as the systems provided at that time before more than 10 years are now obsolete and New computer system are not compatible with the Red Hat Linux Server 7.2, the PCIS cannot be run in the present age and there is no alternative other than to use the Virtualization with server consolidation. In the new system with Virtualization and server consolidation, effortless deployments, backup and disaster recovery, PCIS is working very smoothly. Till now as there is no program initiated till now for the online processing of PCIS. There is no alternative to Virtualization and server consolidation, effortless deployments, backup and disaster recovery for the running the present PCIS and switching over to online processing of PCIS.

- In the earlier system

**Sophisticated, tedious, time and cost Consuming Technical**



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### **installations and support for Red Hat Linux Server and Windows Client for PCIS and LMIS.**

For every technical support for LMIS as well as PCIS for Red Hat Linux 7.2 Server as well as for Windows Client, the each and every TILR, SDO and Taluka Tahsildar Offices users have to approach and visit to respective NIC District unit with Computer System for activities like installing each and every Operating System, Data Base Management Software, Applications , Database Connections , Network Configurations, Security Settings , backup and Disaster recovery. Every time the users staff have to carry the computer systems into vehicle with the concerned staff. As there is limited staff of only two persons DIO and ADIO at NIC, District Units. NIC District units officials also have to visit regularly to the LRC PCIS and LMIS locations in the District for the technical support and smooth operational of LMIS and PCIS and Disaster recovery. This is strongly tedious, time and cost consuming for the LRC PCIS and LMIS users along with heavy technical efforts and exercises. For NIC District unit Officials also it is time consuming, tedious with heavy technical efforts and exercises with heavy technical support to LRC users.

In the present system effortless deployments with easy backup and disaster recovery by just copy and paste of ready usable variety of Virtual Machines

**Saved Environmental Resources:** By Server Consolidation and replicating VM's, used less number of equipments and optimized technical efforts and exercises, testing and saved variety of resources like time, financial, space, civil , electricity energy consumption, furniture, fuel ,Vehicles, Human resources for taking the Computer Systems to NIC for support and for visits of NIC officials to Tahsil level environmental resources for timely completion of LRC PCIS, LMIS, Agri Census , 7/12 and Property Card Data Uploading ,e-Chawdi and e-Mutation, in the Districts of Maharashtra

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- **Dissemination Strategy** In the earlier system there is no proper dissemination strategy for the deployments and maintenance of sophisticated hardware software. **Used hybrid approach of utility computing** with mixed approach of cloud computing and Data centre for dissemination of ready usable VMs. As there is a problem with centralized deployment and computing due to major limitation that NICNET is available up to district level only. SWAN available upto tahsil level but its connectivity is not smoother and reliable up to tahsil level and we have no facility to host our VMs over SWAN. So it is decided and used hybrid approach of dissemination of ready VMs upto district level to NIC District Units through NICNET and then replicated and implemented it at Tahsil level with help of NIC District Units and Technical staff available at Tahsil level
- **Free and Open Source Software's (FOSS)** : We have used all the variety of free and open source Virtual Machines software's for developing the Virtual Machines. Also we have disseminated our variety of Virtual Machine with the required Virtual Machine Software's to all the beneficiaries free of cost as well as the users can customize and modify all that Virtual Machines as per their own way and their own need and requirement very similar to free and open source software's and ending the dependency of users on us.
- In the new system used server consolidation by installing Red Hat Linux 7.2 Server and Windows Client on the single physical computer system and this way saved server hardware cost for around more than 500 locations / use.
- **Software Hardware Portability:** Ready usable Virtual Machines replicated to large number of old and new computer systems and laptops between variety of host operating systems with effortless deployments, backup

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and disaster recovery.

- **Leverage of shared infrastructure** :NICNET Distributed VMs over NICNET with 34/100 MBPS high speed secured, stable lease line connectivity through secured data centre
- **Data Centre** : Developed Secured data Centre on Dell Rack mounting server R715 using Microsoft data server using Windows server 2008 R2 OS
- In the new system saved approximate cost of around 1000000 Rs. for the maintenance of the sophisticated software / hardware, deployments of the Operating Systems, Applications software and Network and Database management, Disaster recovery , by replicating the ready usable Virtual Machines all over state with effortless deployments and backup and disaster recovery.
- Reduced hardware and operating costs by as much as 50 percent and energy costs by as much as 80 percent, saving more than 150,000 Rs. per year for each virtualized server workload.
- Reduced cooling requirements in establishment as well as maintenance of Government Data Centers (GDCs).
- Reduced total cost of ownership on e-governance projects by reducing the costs incurred on acquiring various types of hardware and software licenses from private vendors.
- Reduce the time it takes to provision new servers by as much as 70 percent.
- Decrease downtime and improve reliability with process continuity and built-in disaster recovery.
- Easy testing and R & D

By reducing the quantity of computer systems to large extent nearly 50% , significantly contributed in reduction of pollution in the form of Heat generated. By saving vehicles and fuel also reduced pollution.

Saved Server hardware per location, saved maintenance costs, saved visits

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of Tahsil staff to NIC and vice versa this way saved resources like vehicle , fuel, Driver

17. Other distinctive features/ accomplishments of the project:

### **Features / Accomplishments**

#### ***more from less for more and more***

The proposed framework can provide a cost effective solution for e-governance by using Free and Open Access Software for development and deployment of e-governance applications, virtualization and consolidation techniques for management of e-services and cloud computing to deliver the maximum throughput enhancing the accessibility of services among remote locations.

The major features of the proposed framework are depicted are under:

**Full Virtualization with Isolation, Server Consolidation, effortless deployments, backup, disaster recovery, software hardware portability, leveraging shared infrastructure NICNET.**

#### **Improved service delivery, efficiency, throughput and cost effectiveness**

- a. The Virtual Machine is the technical concept it can be used in any e-Governance project for the utility computing and cost effective solutions using optimum use of the available resources. This is practically very useful when we have to do the processing /data entry on client and server Environment at large number of distinct locations and where the server is just required as a background service. Under such situation we can install the client and server on single system and process the work and this way save the cost of the server hardware per every location. The Same concept is efficiently and optimally implemented for the Land Record Computerization related applications.
- b. Instead of traditional approach of running single OS at a time on computer, used single physical computer logically as multiples Computers by running multiples distinct OS running simultaneously and isolated to each other with

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server consolidation

Run distinct isolated OSs RH Linux 7.12 Server with Win XP Client Software at a time on single physical computer for optimum use of sw, hw, Network and human resources saving server hardware per LRC location

- c. Instead of traditional approach of performing operations on file and folder as an object using OS, innovative approach of performing operations on complete virtual computer using VM sw is used

The real virtue of VMs sw is that, all type of Operations which physical computer performs on File/Folders as object using OS, that VM sw performs on complete virtual computer along with OS as object including creation, updating, removing, renaming, customizing, move, copy, backup and restore, sharing, Auto start, import/export etc

Performed all these operations for project implementation, utility analysis and R and D of VMs

- d. **Dissemination Strategy** In the earlier system there is no proper dissemination strategy for the deployments and maintenance of sophisticated hardware software. **Used hybrid approach of utility computing** with mixed approach of cloud computing and Data centre for dissemination of ready usable VMs. As there is a problem with centralized deployment and computing due to major limitation that NICNET is available up to district level only. SWAN available upto tahsil level but its connectivity is not smoother and reliable up to tahsil level and we have no facility to host our VMs over SWAN. So it is decided and used hybrid approach of dissemination of ready VMs upto district level to NIC District Units through NICNET and then replicated and implemented it at Tahsil level with help of NIC District Units and Technical staff available at Tahsil level

- e. **Free and Open Source Softwares(FOSS)** : We have used all the variety of free and open source Virtual Machines software's for developing the Virtual Machines. Also we have disseminated our variety of Virtual Machine with the

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required Virtual Machine Software's to all the beneficiaries free of cost as well as the users can customize and modify all that Virtual Machines as per their own way and their own need and requirement very similar to free and open source softwares and ending the dependency of users on us.

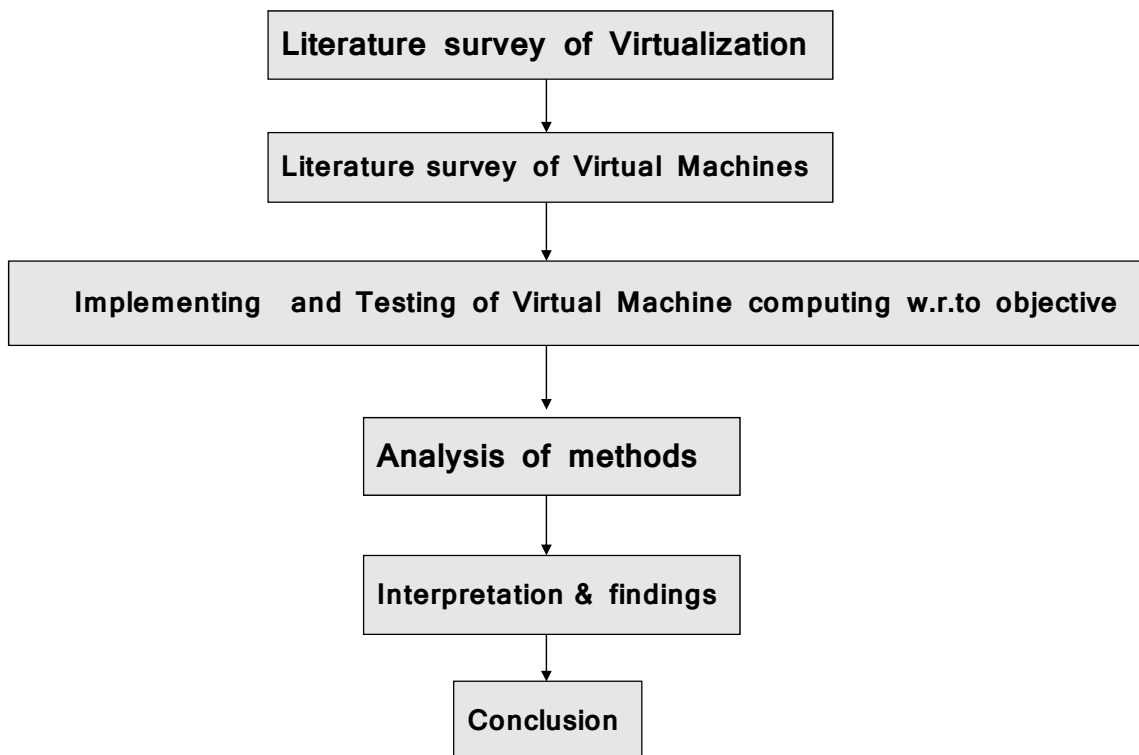
- f. Software Hardware Portability: Ready usable Virtual Machines replicated to large number of old and new computer systems and laptops between variety of host operating systems with effortless deployments, backup and disaster recovery.
- g. Used hybrid approach of utility computing partial cloud using NICNET up to NIC District units and partial through NIC District units to end user.
- h. Developed Secured data centre.
- i. **Leverage of shared infrastructure NICNET:** Distributed VMs over NICNET with 34/100 MBPS high speed secured, stable lease line connectivity through secured data centre
- j. Easy Testing and R and D
- k. It will help valuably to deliver maximum throughput
- l. It will help in reducing the cost of hardware incurred in facilitating e-governance services to citizens.
- m. It helps in reducing cooling requirements in establishment as well as maintenance of Government Data Centers (GDC's).
- n. It also reduces the total cost of ownership on e-governance projects by reducing the costs incurred on acquiring various types of hardware and software licenses from private vendors.
- o. It also gives solution to enhance the availability and accessibility of e-services in disadvantaged areas of country.
- p. It facilitates scalability of e-governance projects as the data volume in e-governance projects increases enormously.
- q. It promotes interoperability in the e-governance applications for reducing data redundancy and hence increases consistency of data.
- r. It helps for the backup and disaster recovery, effortless deployments,

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security, testing and R &D

### 18. ROADMAP



### 19. Honors:

- In Skoch Awards for Excellence 2014 selected as amongst the best project in the country as “ Skoch Order of Merit”
- Winner in e-Governance Category of Manthan South West Award 2014 ( Winner out of 180 entries from 12 States )
- eMaharastra 2013 Excellence Award: Best G2G Initiative
- Nitin V. Choudhari, DIO, NIC, Akola honored as e-Gov Champion 2013 on UN Public Service Day 23<sup>rd</sup> June 2013 by the hands of UN resident coordinator Ms Lise Grande

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### 20. PRODUCERS PROFILE

**Nitin V. Choudhari , Scientist C and DIO, NIC, Akola ( Maharashtra )**



Nitin V. Choudhari completed his M.Sc. Computer Science degree under Dr. Babasaheb Ambedkar Marathwada University, Aurangabad in 1995. Presently his Ph. D. on topic “ Research , Development and analysis of Virtualization using Virtual Machines for concrete and

effective e-Governance” is in process. He is working from 1996 in National Informatics Centre (NIC) govt. of India's premier S & T organization. Presently Shri Choudhari is working from June 2011 as Scientist C and District Informatics Officer at Akola, Maharashtra

He is working on the Virtualization Technology for the Land Record Computerization project from around 2002 while working as DIO, NIC, Chandrapur ( Maharashtra). He has developed Virtual Machines for Land Record Computerization and NLRMP ( National Land Record Modernization Program ) and designed the proposed framework for the effective and concrete e-Governance. Recently his research project titled “ Virtualization using Virtual Machine for the effective e-Governance “is selected in Skoch Awards for Excellence 2014 selected as amongst the best project in the country as “ Skoch Order of Merit”. The same and also is the winner Manthan South West India awards 2014 in the highest important e-Governance category. He also recognized as eGovernance Champion for year 2013-14 on the occasion of United Nations(UN) public service day, 23<sup>rd</sup> June 2013 in the presence of Ms. Lise Grande, UN Resident Coordinator, India. His same work also received the e-Maharashtra 2013 Excellence Award for Best G2G initiative for the project Virtual Machine initiated and implemented by him from 2011 to 2013.

He is highly experienced with development and implementation of various e-Governance projects and technologies. In 1996 to 1997 he worked at General Stamp Office, Mumbai on Stamp computerization project. From 1997 to 2005 he worked as DIO at Chandrapur, Maharashtra. In 2005-06 he worked as DIO at Hingoli, Maharashtra and from 2006 to 2011 he worked as DIO at Datta Madhya Pradesh. He



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is experienced with working in different states at top metro cities like Mumbai up to socially unsecured city Datia in the Chambal area of Bundelkhand in Madhya Pradesh. Shri Choudhri's expertise lies in resource management, System Administration, Software scripting and networking and time to time provided unique technical solutions for variety of e-Governance projects. Along with the various e-Governance projects his major achievements are the Personnel Information System software design and development on unix platform while working at Chandrapur during the period 1997-98, District Court Information System (DCIS) implementation in 1997-98, Ruralsoft Project Implementation in the state of Maharashtra in 2002-03 as project coordinator, Network Desktop Video Conferencing project of All sections in Zilla Parishad in around 2002-04. Land Record Computerization Land Management Information System (LMIS), Property Card Information System (PCIS) from 1997 to 2014 and presently NLRMP e-Chawdi and e-Mutation from 2011, Successful Parliamentary , Legislative Assembly election works conduction at Wardha, Maharashtra in 1995, Chandrapur 1999 and 2004, Datia ( Madhya Pradesh ) in 2007 and 2009 and at Akola 2014.