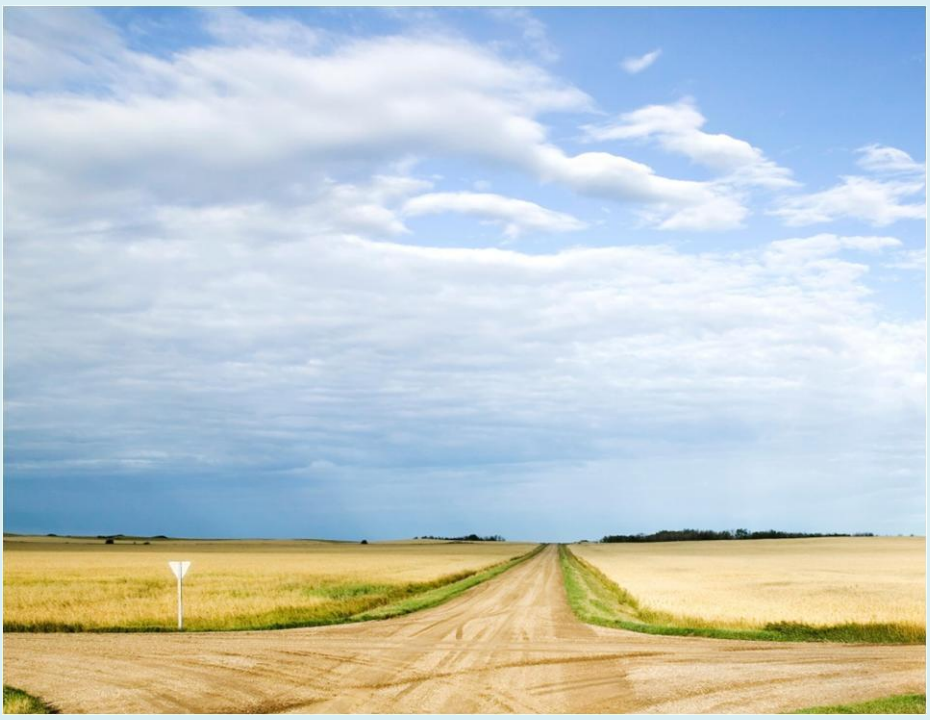
MAHAGOV CLOUD



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Maharashtra State Data Center

Directorate of Information Technology,

Government of Maharashtra

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ABSTRACT

This case study documents the Cloud implementation at Maharashtra State Data Centre which is one of first of it's kind in India. MahaGov Cloud is an initiative by Directorate of Information Technology, Government of Maharashtra to provide Cloud based services to various departments. The objective of this initiative was to reduce the overall Data Centre cost drastically while increasing the IT capacity with maximum flexibility.

KEYWORDS

Cloud Computing, Cloud, Service Delivery, Cloud Services, e-Governance

NOTE TO THE PRACTIONERS

State Data Centre is envisioned as ***the 'Shared, reliable and secure infrastructure services centre for hosting and managing the e-Governance Applications of State and its constituent departments'***. SDC is envisaged to establish a robust infrastructure to enable the Government to deliver the services quickly and effectively to its stakeholders.Creating and providing the traditional IT model for e-Governance would require very large capacity and computing power for the state which will result in huge investments. Moreover, apart from the predefined e-Governance initiatives, there are many more ICT initiatives undertaken by each of the departments which run in silo mode. In order to meet the specific ICT requirements for each of the projects, Secretary-IT, Directorate of Information Technology envisaged to create a robust, shared, flexible and reliable Cloud which shall be capable enough for handling the current and the future loads without too much of efforts not only for the User Departments but also in terms of managing the ICT infrastructure.

PROJECT DESCRIPTION

Background

The National e-Governance Program (NeGP) is aimed to significantly transform and improve the way the Government provides services to its citizens. It is envisaged to move from a government-centric to a citizen-centric paradigm in service provisioning; to start treating citizens as customers; and to empower them to demand convenient, cost effective and transparent services from the government.

NeGP comprises of several projects spread across a number of sectors which are to be implemented either by the line ministries/departments at the central government or by state governments, as well as integrated projects spanning across multiple ministries/departments/agencies. To support implementation of the Mission Mode Projects under NeGP and also to ensure adherence to common principles and policies towards realization of the vision, NeGP has identified 3 core components, core infrastructure projects, including:

- State Wide Area Network (SWAN)
- Common Service Centre (CSC)
- State Data Centre (SDC)

State Data Centre is envisioned as ***the 'Shared, reliable and secure infrastructure services centre for hosting and managing the e-Governance Applications of State and its constituent departments'***. SDC is envisaged to establish a robust infrastructure to enable the Government to deliver the services quickly and effectively to its stakeholders. The proposed State Data Centre, connected to the State Wide Area Network (SWAN), shall provide the access to the e-Governance applications & Services to Government employees through Intranet and to the citizens through public Internet/CSCs etc. Through such a Shared Service Centre implemented and managed by a competent Implementation Agency, the individual departments can focus more on the service delivery rather than on the issues surrounding the Infrastructure.

In reference to the guidelines of DeitY for State Data Center, it was proposed to create a Maharashtra State Data Center (MH-SDC) for the State to consolidate its services, applications and infrastructure to provide efficient electronic delivery of G2G, G2C and G2B services. MH-SDC infrastructure shall provide adequate space to house ICT assets of various departments within the state in an environment that meets the need for reliability, availability, scalability, security and interoperability. Maharashtra State Data Centre will act as a mediator and convergence point between open, unsecured public domain and sensitive government environment. It has enabled various departments to host their services/applications on a common infrastructure leading to ease of integration and efficient management, ensuring that computing resources and the support connectivity infrastructure (MSWAN) is adequately and optimally used. The MH-SDC is equipped to host

/ co-locate systems (e.g. Web Servers, Application Servers, Database Servers, SAN, etc.) in a heterogeneous IT environment.

There has been typical challenges faced by the User Departments in terms of long IT Infrastructure procurement cycles, building silo applications, procuring IT Infrastructure, underutilization of computing resources, hiring external agencies / expertise for running the individual ICT applications and infrastructure, scalability, reliability, Disaster recovery, provisioning, availability, etc.

PROJECT OVERVIEW

Continuing to the Shared Service centre, during the implementation of Maharashtra State Data Centre, the state had conceptualized on implementing Virtualization for efficient utilization of the infra in SDC. The objective of this initiative was to reduce datacenter cost drastically while increasing the IT capacitywith maximum flexibility.

Cloud computing is the use of computing resources (hardware and software) that are delivered as a service over a network (typically the Internet)

Soon, Government of Maharashtra realized the potential of using Cloud Computing as a medium to provide shared, cost effective, faster, reliable, secure, and agile services to the Government Departments. As a part of State Data Centre set up, state had the required computing resources for enabling the Cloud services for the User Departments. The added advantage GoM had was that the State Data Centre was still under implementation mode wherein necessary upgradations required for enabling cloud services was feasible.

It was envisaged that Government of Maharashtra will use multi-tenanted services, shared and managed by Directorate of Information Technology, Government of Maharashtra. Shared resources, infrastructure, software and information will be provided to a range of User Departments via MSWAN /Internet; this will be supported by new delivery and supply models. It will be dynamically scalable, agile, and easy to move in and out of the service. MahaGov Cloud is not a single entity; but, it is an ongoing and iterative initiative which will enable, the use of a range of cloud services, and changes in the way the State procures and operates ICT, throughout the Government of Maharashtra.

Implementation

Instead of going ahead with a giant leap towards providing the complete Cloud Services, GoM initiated the services by implementing IaaS and Paas.

In order to kick start the initiative, a Proof of Concept on virtualization was started in November 2011 by using VMWare and Microsoft Hyper V. The overall capacity for each of the resources was increased to a desirable level which ranged from CPU, RAM, NIC, Licenses, software, etc. For effective operations and management, the Data Center team was provided with necessary trainings.

The benefits of virtualization were achieved after the PoC and soon the next step of moving to complete implementation of Cloud Setup was initiated. The fully operational cloud was commissioned in May 2012. With all the modules of Cloud implemented the stakeholders could realize the value of using shared resources from the State Data Centre. It has surely improved the major constraints of operation with better quality of service, reduced time for infra provisioning and lower cost of hosting.

Microsoft Private Cloud Architecture of MH-SDC

Microsoft Cloud has 44 VMs running on 13 Physical Servers

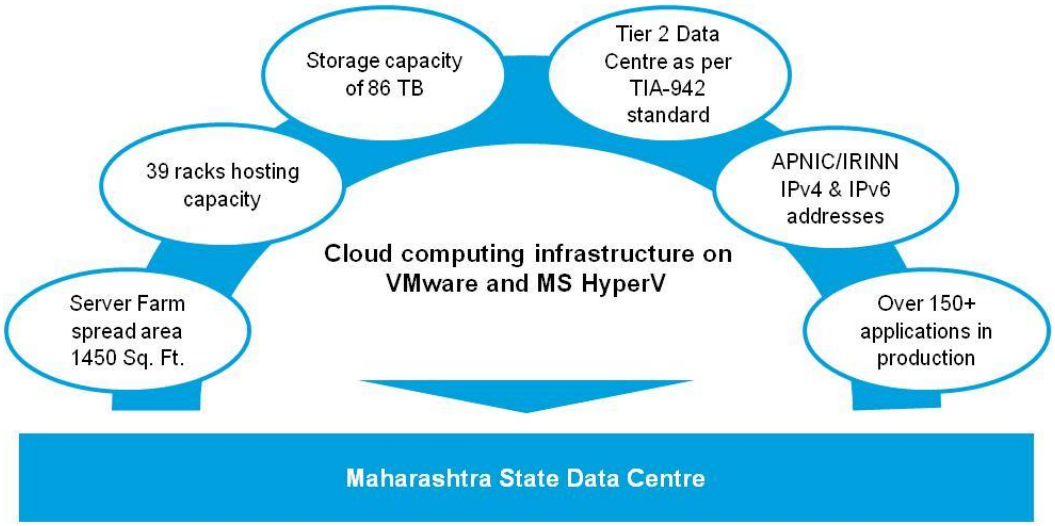
Total Applications in production at MH-SDC on MS Cloud = 37

VMware Private Cloud Architecture of MH-SDC

VMWare Cloud has 400 VMs running on 36 Physical Servers

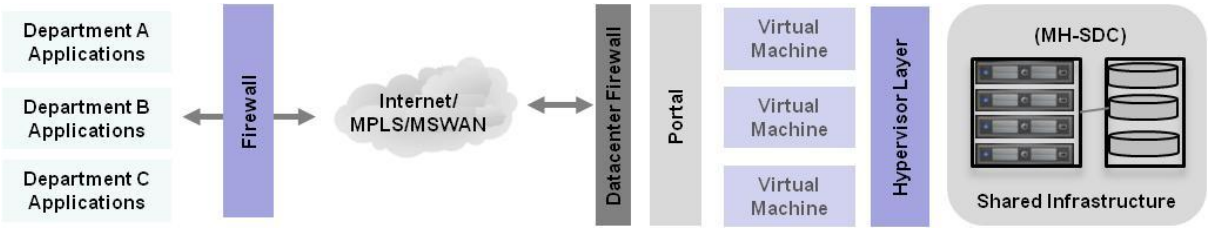
Total Applications in production at MH-SDC on VMware Cloud = 233

Salient Features of MahaGov Cloud



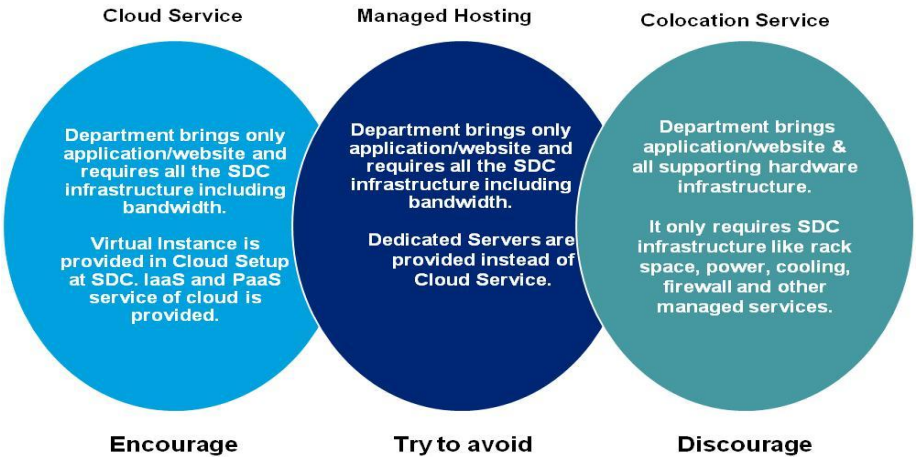
Hosted Compute as a Service - Architecture

Unifying the ICT Infrastructure resources of Government of Maharashtra at State level and facilitate provisioning of services in a secure & efficient manner.



Service offered from MH-SDC

Services such Cloud services, Managed Hosting and Colocation services are being provided as a part of overall MH-SDC initiative.



Uniqueness of MahaGov Cloud

- Only Government Cloud Setup in India
- High volume of servers and applications
- Own block of 4 B ASN no. and IPv4 & IPv6
- Membership in APNIC/IRINN, making it vendor independent.
- Cloud Services offered for Government and by Government
- High Availability & Load Balancing at ISP level
- The rate chart serves as a benchmark for the User Departments
- First state in India to enable IPv6

Benefits

Following are some of the benefits of cloud implementation in Maharashtra SDC:

Lower costs	•Sustainable reduction in the operational costs of ICT across the Departments •A significant reduction in Physical Resources •Aggregated demand for the reduced numbers of resources. •Reduced Foot print •Better control and administrative benefits over the cloud.
Agility	•Cloud computing provides an opportunity for Maharashtra to eliminate hierarchical procurement process. •Time to provision a Server along with OS and Database has reduced •Using features of thin provisioning of storage and memory, resources are efficiently utilized and allocated •Features like Live Migration has helped to manage planned maintenance without requiring any downtime of the application
Universal resource access	•Cloud helps in establishing a common platform for all e-Governance initiatives, one that is easily accessible by the citizens and other stakeholders •Management and monitoring of Cloud setup is effectively done using the dashboard, alerts and reports generated •Backup of VMDK or VHD files leads to quicker restoration of the server whenever required
Continuous update	•The onus of upgrading technology is on the DIT in cloud delivery model who ensures Departments have access to the most up-to-date solutions. This also reduces the need for personnel dedicated to monitoring and updating of IT applications
Collaboration	•Applications and documents accessible from anywhere, facilitating group collaboration on documents and projects •Server creation and roll out is faster. Time taken to allocate a system to department has been reduced from hours to minutes. •Departments can focus in their core sector and are not required to be IT Experts

KEYLESSONS

1. Study possible Business Models and alignment of the IT Procurement Policies with the Cloud setup.
2. Define methods for finance and funding, including the sustainability models.
3. Plan the cloud implementation in a phased manner.Start with IaaS and PaaS before jumping to SaaS.
4. It is of paramount importance to plan the capacity required for all the resources for implementing the cloud solution as per the requirement. Make provision for the number of cores per CPU required, Memory required, what should be the ratio of minimum RAM required per core CPU, Hard Disk capacity required, Storage capacity required, etc.
5. Requirements for Network and security needs to be provisioned effectively and efficiently so that each physical server is having enough bandwidth so as to serve the Virtual Machine traffic originating from private/public network as well as the management traffic.
6. The licenses required for Operating System and Databases needs to be provisioned according to the licensing policy for deploying cluster which shall ensure the optimum utilization of the licenses procured.If majority of servers are on Windows Server OS then DataCentre edition license for Windows Server may be procured.
7. Along with cloud implementation, tape backup software should be configured for backup of VMDK or VHD files so that incremental backup is available for entire Virtual Instance.
8. Awareness sessions to departments and consulting firms should be done regularly to ensure acceptance of Cloud for all the projects
9. Create a self sustenance model for continuation of resource upgradation like creating charging for availing the various Cloud services through predefined rate charts. For projects which already have funding through Government of India's funding scheme, the cloud service charge can be levied so as to make the Cloud setup self-sustainable.

KEY TAKE AWAYS

Before proceeding with the Cloud adoption four options are proposed that can be explored.

Option 1: Private Cloud Service Provider in SDC

State Data Centre (SDC) is identified as one of the important element of the core infrastructure for supporting e-Governance initiatives and is currently operational in many states. A private cloud service provider/operator can be selected using a competitive bidding/ RFP process for implementing the cloud infrastructure at SDC.

The service provider/operator can then leverage the existing physical space and non-IT infrastructure of SDC.

IT procurement for cloud implementation will be done by the selected cloud service provider.

However there are a few concerns in this business model as mentioned below:

1. Since SDC might be operated and maintained by a DCO (Data Centre Operator, another service provider like Wipro, TCS, Sify, Reliance, etc.) selection of a private cloud service provider would be a major concern of this business model.It may be possible that existing DCO may not be selected as a L1 bidder for cloud implementation.
2. DCO's consent might be required and a tri-party agreement needs to be established between the State nodal agency, DCO and new cloud service provider for the following:
    a) Providing information about current SDC setup (system documentation, network architecture, etc.)
    b) Access to SDC infrastructure (for e.g. Network device access, BMS components)
    c) Other implementation support activities
3. Monitoring and review of the SLAs (for uptime, problem resolution etc.) of both the service providers would be a concern as well. Nodal Agency as a Cloud service provider in SDC

Option 2: State's nodal agency can take a lead and act as a cloud service provider.

This model is best suited for the nodal agencies having:

1. Availability of sufficient funds to aid future capacity planning and procurement of infrastructure to support the cloud environment
2. Highly skilled composite team working in coordination with the DCO to provide the required support

Agreement and SLA needs to be established directly between the State nodal agency and OEMs like Microsoft, VMware etc. for support activities, providing training to composite team, DCO staff etc.

The following type of cloud services could be provided by the nodal agency:

1. Infrastructure as a Service (IaaS)
2. Platform as a Service (PaaS)
3. Software as a Service (SaaS)

A monthly chargeback mechanism needs to be implemented depending on the requirements such as:

Infrastructure as a Service	•CPU •RAM •Storage •Operating System •Database •Public IP and Internet Bandwidth •Total bandwidth •Rack space, Dedicated rack with power requirement •Physical / Virtual Server
Platform as a Service	•Microsoft SQL Server •Oracle Enterprise Database •IBM DB2 •PostgreSQL DB •Operating systems
Software as a Service	•Microsoft Exchange 2010 per mailbox of 2 GB

Option 3: Other State SDC as Cloud service provider

In this business model one can use to leverage the SDC outside the home State and its cloud infrastructure.

This can be used for:

1. Sharing Common Applications (e.g. Maharashtra has offered Gujarat its UID enrolment Survey App (Android tablet based), along with customized Reporting system, from its SDC.)
2. In situations to set up DR capabilities for critical applications.

All the procurement will be done by the other State nodal agency (NICSI, DGnSD rate charts come in very handy) and the services will be charged as per the chargeback mechanism agreed and signed between the two States.

This is mostly suitable for small states in which instead of spending on creation of SDC, the services of other state can be utilized. A concern in this model is that political conflict among the states may lead to hostile situation for continuity of Cloud service, or sometimes with change of officers at either end, there may be change in thinking.

Option 4: Dedicated Government cloud for multiple states

At the Central Government level, National data centers are set up to host the central governments applications.

These data centers in addition to hosting the central government applications can be connected to all the states and provide cloud environment.

The manner of relationship with the state SDC, the method of access, storage amount and retention period, SLAs will have to be defined for these National data centers. However, till now, experience has not been that good (NIC, CDAC and others have huge unused Infra, sparsely used, but no cloud based Apps being offered to others.)

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PROJECT CASE FACT SHEET

The MahaGov Cloud project has been undertaken with the technical support from the different OEMs and the Data Centre Operator (Wipro). The project has been successfully running since May 2012. The following team has been involved for the overall implementation and management of the MahaGov Cloud.

Project Name : MahaGov Cloud

Live since : May 2012

Current Utilisation : 80%+

Implementing Agencies :

- Wipro
- VMWare
- Microsoft

***Maharashtra IT Secretary Shri Rajesh Aggarwal**, the key driving force behind MahaGov Cloud, envisaged providing services to various departments from SDC at the initial stage of SDC implementation. It was envisaged that most of the applications owned by respective Departments and other eGovernance Projects will be hosted on SDC. To cater to a large number of applications and departments, cloud implementation was necessary.*

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