TOWARDS AN E-GOVERNANCE GRID FOR INDIA (E-GGI)
AN ARCHITECTURAL FRAMEWORK FOR CITIZEN SERVICES DELIVERY

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TOWARDS AN e-GOVERNANCE GRID FOR INDIA (E-GGI)
NeGP proposes citizen service delivery up to village level

It will be delivered through 100000 kiosks throughout the country including rural areas

This will be possible only through web services based on Service Oriented Architecture (SOA)
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Service Oriented Architecture (SOA)

Service – oriented model
Service Oriented Architecture (SOA)

Evolution of SOA

- Service-Oriented Architecture
- Component Model
- Distributed Objects
- N-tier Applications
- Client/Server Applications
- Object-Oriented Programming
- Structured Programming

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Service Oriented Architecture (SOA)

Key Components of SOA

- Service boundaries are explicit and services interact through explicit message-passing over well-defined boundaries.
- Services are autonomous in terms of data isolation and loose coupling.
- All interactions are based on service contract, data contract and associated policies.
- Service compatibility is based on policy expressions (such as those of WS-Policy) when service contract cannot completely specify all aspects of service interaction.
Mission Mode Projects as part of NeGP

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Mission Mode Projects as part of NeGP

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IMPLEMENTATION STRATEGY & METHODOLOGY

- Software development & implementation for all Mission Mode Projects all over the country
- The application software for all the projects is required to have web services based on SOA paradigm
- For legacy systems SOA layer has to be wrapped around the legacy systems with appropriate web services for interacting with the outside world (while the legacy system shall continue). Legacy Systems can continue with their original platforms from which it is possible to interact with Web Services

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WEB SERVICES

➢ A Web Service is a collection of functions that are packaged as a single entity and published to the network for use by other programs.

➢ Web services are building blocks for creating open distributed systems

➢ Allow organisations and individuals to quickly and cheaply make their digital assets available worldwide.

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WEB SERVICES

- One early example is MS Passport, a convenient authentication service hosted by Microsoft.

- Other Examples: A credit checking service that returns the stock price associated with a specified ticker symbol.
WEB SERVICES

- A web service can aggregate other Web services to provide a high-level set of features.
- For example: A web service could provide a set of high-level travel features by orchestrating lower-level web services for car rental, air travel, and hotels.
- Applications for the future will be built from web services that are dynamically selected at runtime based on their cost, quality, and availability.
- Web services are pretty much guaranteed to be at the heart of the next generation of distributed systems.
WHY WEB SERVICES?

- Interoperability: Any web service can interact with any other web service.
- Thanks to SOAP, the new standard protocol supported by all of the major vendors (and most of the minor ones too), the agonies of converting between CORBA, DCOM and other protocols should be over.
- And because web services can be written in any language (even COBOL), developers do not need to change their development environments in order to produce or consume web services. Any program can be easily converted into a web service.
WHY WEB SERVICES?

- Ubiquity: Web services communicate using HTTP and XML. Therefore any device which supports these technologies can both host and access Web services. Soon web services will be present in mobile phones, cars and anywhere.

- Low barrier to Entry: The concepts behind Web services are easy to understand and free tool kits from vendors like IBM and MS allow developers to quickly create and deploy Web services.
WHY WEB SERVICES?

- In addition, some of these tool kits allow pre-existing COM components and Java Beans to be easily exposed as Web services.

- Industry Support: All of the major vendors are supporting SOAP and the surrounding Web services technology.

- For example, the MS .NET platform is based on Web services, thereby making it very easy for components written in VB to be deployed as Web services, and consumed by Web services written using IBM platform and vice-versa.

- Websphere and other web servers support SOA
WEB SERVICES INTEROPERABILITY

- Web services for e-Governance applications have to be developed at the national level and also at the state level.

- Interoperability can be achieved using BPEL (Business Process Execution Language) which can enable process orchestration across diverse web services based on SOA.
WEB SERVICES INTEROPERABILITY

- As a pilot attempt in AP State we can integrate property registration (CARD project) and Land records (LRMIS project) after converting them into Web Services & using BPEL Interoperability

- In Karnataka web service consumption is already being made across Registration and Land Records for interoperability
Common Web Service Definition Framework

- For the whole country a single Common Web Service Definition has to be made for all functions and for all mission mode projects by a Committee which has members from all the important mission mode projects (design teams).

- For central projects the Web Services will be unique anyway.

- For state projects (as Land Records) a Common Web Service Definition has to be made. This Common Web Service will interoperate with the local State level Web Services for extracting information and supplying the same to the other Common Web Services (State code has to be included for Common Web Service Definition). For District level Web Services a similar approach can be adapted by adding the District code in addition to the State code.

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Common Web Service Definition Framework

- State level web services will be wrapping the legacy applications and retrieve the requisite information from the legacy systems for supplying to common web services as above.

- District level Web Services will also be wrapping over the legacy district level applications to provide a common district level Web Service which will be interoperating with other district level Web Service and also State level Web Services.
WEB SERVICES REPOSITORIES

- National level Web Services Repository (NWSR) for National level e-governance initiatives of NeGP, residing on National Data Centres
- State level Web Services Repository (SWSR) for the state level e-governance services residing on State Data Centres
- District (or Sub district) level Web Services Repository (DWSR) at the district and sub-district (taluka or village) level residing on District level Servers

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Web Services Repositories on E-Government Grid of India (E-GCI)

National E-governance Network

State Wide Area Network

District Level Web Services Repository

Citizen Services Delivery

Village Kiosks

District Data Centres

State Data Centres (SAN)

National Web Services

National Data Centre

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This huge task requires extensive computing and network infrastructure and resources as per the requirements of NeGP.

Grid computing can be used to share resources to minimize the cost by optimizing the utilization of the resources so as to meet the objectives.

Grid computing uses the same concept as consumers draw electric power from the Power Grid.
What is Grid?

- A type of parallel and distributed system that enables the sharing, selection, and aggregation of geographically distributed “autonomous resources” as:
  - Computers – PCs, workstations, clusters, supercomputers, laptops, notebooks, mobile devices, PDA, etc.
  - Software – e.g. ASPs renting expensive special purpose applications on demand
  - Catalogued data and databases
  - People/collaborators

Depending on their availability, capability, cost, and user QoS requirements.

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Type of Services Modern Grids Offer

- **Computational Services** – CPU cycles
  - NASA IPG, WWG, TeraGrid, Set1@Home
  - Data Services
    - Data replication, management, secure access - LHC Grid/Napster

- **Application Services**
  - Access to remote software/libraries and license management - NetSolve

- **Information Services**
  - Extraction and presentation of data with meaning

- **Knowledge Services**
  - The way knowledge is acquired and managed – data mining
According to Gartner all computing including e-governance will be completely transformed by using grid enabled services.

In a country like India, where the government administration is structured in a 3 tiers—Central, State and District levels—Web Services Repositories can be launched and operationalized in the same three levels in the Grid.
The current grid technology initiatives are based upon OGSA (Open Grid Services Architecture)

This latest standard evolved by Global Grid Forum (GGF)

It integrates the conventional grid computing features such as resource allocation and monitoring, mirroring, etc., with web services facility in SOA (Service Oriented Architecture)

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OGSA Supports WSRF (Web Services Reference Framework)

WSRF provides standard architecture for Stateful Web Services

Stateful Web Services will be useful for applications that require reference to data of past transactions, for continuity of processing

**TOWARDS AN e-GOVERNANCE GRID FOR INDIA (E-GGI)**
GLOBUS TOOLKIT

- Open source, popular & successful middleware software for the grid which evolved out of various experimental grids in the world
- GT4 offers full fledged support for Web services delivery in Java, C & Python
- It has various modules such as Grid Resource Allocation & Monitoring (GRAM), Grid File Transfer Protocol (GridFTP), Replica Service Location (RLS), Data Recovery Service (DRS), Monitoring and Discovery Service (MDS)-A total of 17 modules
**GLOBUS TOOLKIT**

- Authentication and Authorization through PKI provided with an inbuilt CA within GT4
- GT4 has been installed and tested for its functionality in NICNET and can be utilized for any grid application in e-governance domain. Grid web services are also developed on trial basis for some applications. Training on GT4 installation and deployment has been provided for various application divisions and State Centres of NIC. In future also training can be provided on GT4 to them and also Data Centre Staff.

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VIRTUALISATION AND CLOUD COMPUTING

- Multiple virtual machines (with multiple OSs) can be created by hypervisor Xen on Linux latest versions.
- GT4 can be installed on the same machine
- WS-Core of GT4 will operate upon Xen
- Nimbus can be installed over GT4 and Xen
- A Cloud computing environment will be created for allocation of virtual resources as per the customer requirements dynamically
- Each node in the e-Governance grid can be a cluster of virtual machines which can be transferred upon requirement across the grid as per the needs from time to time. This can be used for DR/DCP applications for various Data Centres.

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E-GGI

- Data Centres & SWANs are being established in all 35 States/UTs through NIC, as part of NICNET.
- State Data Centres & SWANs are also being established by the individual States.
- Data Centres & SWANs are individually connected but there is no concept of a single integrated National Network which is a pre-requisite for grid computing being implemented. (Network is the physical layer of the grid)

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They are independently operating without any resource sharing or even without replica/mirroring storage elsewhere (only for Delhi Data Centre a Disaster Recovery Centre is operationalized at Hyderabad)

All the SWANs should be integrated with a National Network as NICNET resulting in National e-Governance Network which can go upto the Block Level with Village Level connectivity. It should be a private Network of the Government to enable complete control and security (Internet should be kept away from this Network)

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By implementation of grid technology, utilizing GT4 software can result in better utilization of the resources, while also providing the backup recovery features along with mirroring and replication services (in the remote sites of the Grid). Grid web services can be developed for replication and recovery either for each application separately (for critical applications) or for specific servers or storage completely. This will overcome the need for separate DR site for each State Data Centre servers and storage.
This will result in cost savings and overall productivity improvement, in addition to obtaining all the benefits of grid computing.

The objective is to harness and adopt grid computing for e-Governance purposes.

The city e-Governance grid of Shanghai is in operational use connecting the government offices with the municipality offices and kiosks.

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The proposed e-Governance grid of India will be the first of its kind in the National scale of e-Governance in the world. It will adapting the grid paradigm for e-Governance which is largely data intensive and not a conventional computational grid.
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ACTION PLAN FOR IMPLEMENTATION

- All the Data Centers will have to be integrated with the SWANs and the SWANs have to be integrated with NICNET, finally into a grid (1 gbps and above) up to block level which will provide access to the e-Governance Grid (Intranet) right from the village level. (Presently only BSNL services are available for Internet access from village level)

- It is better to isolate Internet from the Intranet of e-Governance Grid which comprises all SWANs integrated with NICNET. This will be the private data network of the Government exclusively, with adequate security provisions so as to minimise vulnerability. This will be the network layer of the e-Governance grid of India. The end users will access the Grid instead of Internet.

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ACTION PLAN FOR IMPLEMENTATION

➢ GT4 has to be installed in all the nodes of the Grid. Virtualisation software and Cloud software also has to be installed for virtual clusters in the nodes.

➢ Parallely the Common Web Service Definition framework has to be completed and Web Services Interoperability has to be tested and established. All the Web Services which wrap over the legacy systems have to be completely implemented.

➢ All the above Web Services for all sectors have to be executed and the Central, State and District level Web Service Repositories over the Grid.

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Model State Level Web Services Repository

List:
- District Select
- Taluka Select
- Village Select
- All citizen information & Reports through Web Services with Photo & Thumb
- Get Family Detail (BPL)
- Search_Card_Village_Wise(Ration Card)
- Election Card by Part
- Bill Status(Treasury)
- Get Request ROR
- Get ROR Data
- Get Reg Data(EMP)
- Printing ROR using smart client application

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THANK YOU

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