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# Data Center Establishment to Run the IT System in Power Utilities

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**Abstract** - In this research we will focus the details of the IT System and business process requirements of IT Package need to be installed at Data Centers. This research details the project requirements, which are to be met by the applications and interfaces required within Data Center between different hardware and software systems. The objective of this research includes the design and development of Data Center architecture, hardware availability, proper installation and commissioning of all related networking equipments, storage devices and high end servers as per the current international standards.

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**GJCST Classification**: B.4.1 , B.4.3



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## I. RESEARCH SCOPE FOR DATA CENTRE

The data centre project scope shall include the deliverables as mentioned in the document. The brief descriptions of the project scope have been described below in this document. HCL Scope as per the requirements given in the tender document as follows:

- Data Cabling
- Computing Setup with DR Solution
- WAN Connectivity

## II. OVERALL SOLUTION DESCRIPTION

The overall solution describes the required hardware need to be installed to run the applications/modules for the purpose of the Subdivision Automation of State Electricity Departments in respect to the business functionality. This solution covers the functionality as mentioned and required in the Document as this is an advanced engineered office management tool. It is developed to manage all types of useful databases, analyzes them by applying standard concepts and implement them in a manner consistent with its purpose or design the logic of electrical engineering and subdivision level management in a modernize way.

After a deep study of RAPDRP requirements and the difficulties of DISCOMs, our research has suggested the solution with additional amenities. DISCOMs related business functionality would be customized in the product on the base of the Document.

The Data Center solution has the capability to integrate with other Business Process Applications as

per the requirement captured in system study and suggested by Document. The integration architecture of Data Center solution is based on SOA (Service Oriented Architecture) and due to this it is easily mapped with the integration middleware for exposing the business functionality to external systems as well as to consuming the business functionality of external systems and other future needs which will be fulfilled by the installed hardware, networking equipments and storage devices for coming decades.

**Features:**

- Flawless Integration of Functions and Processes
- Increase Operation Efficiency
- Process Streamlining
- Enhance Customer Service
- Business Assessment Support for Strategic Issues
- Revenue Augmentation
- Scalability, Flexibility for future application integration

## III. BASIC HARDWARE DESIGN CONSIDERATIONS

In this research we will study the Basic Design Principles for the data centre and disaster recovery solution for APDRP which has been arrived at in conformance with the RFP Guidelines, Industry Best Practices, Critical Nature of the Centralized application and our experience in handling such large data centre and Multi-location projects.

We have considered the following key design considerations for architecting the Data centre -

- Scalability
- Availability
- Reliability
- Performance
- Security

### a) Scalability

In Utility segment the no of consumers are bound to grow with the increase in population and the usage of IT. Also as the various facilities are extended to new geographical areas the no. of offices / no. of consumers are bound to grow. This

**Author** : Restructured Power Development and Reforms Programme, Rajasthan.

necessitates the scalability requirement at the Design level to ensure that there is enough room for growth to meet the future requirements.

To meet the Scalability requirements Horizontal scalability, vertical scalability or a combination of both can be used. As per the RFP guidelines we have both horizontal and vertical scalability based on the product set and the application for which it is being used.

#### b) Availability

This is a one of the most important design objective for the datacenter set-up, especially when all the applications are centralized in nature. Highly available Datacenter design ensures that the end users are able to operate and access the applications at all times with desired response time.

To meet this objective we have taken care of redundancies at all levels and the choice of technology is to ensure that the applications are made available to the users in any event of failure or disaster.

There are two strategies that we have followed in order to meet the above design objectives –

- High Availability within the datacenter.
  - High Availability at DC Core Network level
  - Application Load Balancing for all Web and Application Servers
  - Clustering and failover for all Database servers
- Application Availability in case of DC Site Failure
  - 100% replica of the DC site so that there is no impact on the response time of the application.
  - Continuous Replication of data to DR Site for disaster recovery
  - Transparent failover of users to the DR site in case of a Primary site failure

#### c) Reliability

Product reliability is a very important design criterion while designing various components of the Datacenter. Some of the key aspects which have a direct implication on product reliability are as follows:

- Provision for Redundant Power Supplies
- Provision for Redundant Cooling Fans
- Mirrored Hard Disk Drives
- Redundant Ethernet Connectivity
- Redundant Storage Connectivity
- ECC Memory

Each of the elements contributes towards improving the MTBF of the System / Component. To achieve high reliability we have offered the best in class products which passes through stringent test conditions as well as provides component level redundancy wherever needed.

#### d) Performance

We also understand that the systems should be designed keeping in view the performance requirement so that the desired response is met at all times. This requires capacity planning at all level to meets the performance availability criteria. Some key aspects which have been taken care in the design to meets the performance requirements are:

- All the Servers have been sized keeping in mind the appropriate concurrency at User Level
- The Servers are being load balanced to ensure that there is no performance choke due to excess load on one server
- The Interconnectivity between servers are on high performance network with Non-Blocking Architecture
- The Bandwidth Capacity planning is done keeping in mind the appropriate user load.

#### e) Security

It's an inevitable fact that security is required at all levels to ensure that the application is available to the users as well as the data is protected from any kind of unauthorized access. In today's environment where the users access the Datacenter from both Intranet as well as Internet it becomes a challenge to ensure that we protect the datacenter from any damage due to different attacks. We have taken care of the following design considerations on the Infrastructure side to ensure end to end security from edge location to the Datacenter -

- End Point Security – Provision of Antivirus and Antispyware.
- Gateway level Security – Multi Layered Antispam and Antivirus for Mail Messaging; AV, Content filtering and URL Filtering for Web.
- Transmission Security – IPSec for edge to DC encryption.
- Datacenter Security –
  - Perimeter security - Intrusion Prevention, Firewall and extended ACLs on required VLANs.
  - Identity and Access Management for user authentication, authorization and accounting
  - Security at OS Level by OS Hardening

#### IV. BASIC COMPONENTS OF THE PROJECT

As per our research and available international standers, the overall data centre project will include the following modules:

##### a) Active Directory Implementation

- Validating the proper installation Windows 2008 Operating System as per best practices and basic OS hardening to be configured in New AD servers
- Design & Implementation of Active Directory Infrastructure for APDRP
- Active Directory Integrated DNS will be configured.
- Creation of users and their mailboxes (email addresses) as per defined naming convention by customer
- Configuration required for Integration with IAM (if any)
- Testing AD functionality and GPOs

##### b) Enterprise Messaging Setup on Exchange 2007 - DC & DR

- Validating the proper installation Windows 2008 Operating System as per best practices and basic OS hardening to be configured
- Design & Implementation of Exchange Server for Enterprise wide messaging setup
- Extending Exchange 2007 attributes in AD Schema
- Installing and configuring Exchange 2007 Active/Passive cluster
- Configuring Exchange Single Copy Cluster Replication (SCC) for primary site and Standby Cluster Replication (SCR) from Primary site to DR site
- Enforcement of mailbox quota & mail attachment size policies
- Enforcement of delivery restrictions
- Configuration of protocols - MAPI, HTTP/HTTPS and S/MIME for access by different types of clients, although the preferred client would be Microsoft Outlook 2003/2007
- Augment email services with other collaboration tools such as calendaring, scheduling, contacts, tasks
- Configuration of Deleted item recovery for end-user mail management. Customer will define the maximum period for which a mail, which has been removed from the recycle bin, be kept for the end user to recover.
- Integrate the Exchange mailing setup with Antivirus Solution to prevent it from viruses and spam.
- The system should automatically ensure that users are properly authenticated to access their mailbox.

- Configuring the web based secure mail access for the use
- Configuring Outlook on 10 Sample User Desktops for Exchange 2007.
- Testing of mail flow, routing, failover and other Exchange 2007 features

##### c) ISA 2006 Server – DC & DR

- Validating the proper installation Windows 2003 Operating System as per best practices and basic OS hardening to be configured
- Integrate with Windows domain for basic authentication and users directory
- Installing and configuring ISA servers in 2 Node NLB at DC & DR sites
- Configuration of reverse proxy rules on ISA server for Exchange web access & MOSS Portal
- Testing and validating web publishing

##### d) MS Infra Enablement for Applications - DC, DR & 3 CC Sites

- Validating the proper installation Windows 2008 Operating System as per best practices and implementing the basic OS hardening for all servers in DC, DR Site & 3 Customer Care Sites.
- Adding all Windows servers as part of Active Directory Domain
- Backend Infra –
  - Preparing the systems for Windows cluster
  - Configuring Windows 2008 Active Passive Cluster for SQL Database usage
  - Installing and configuring SQL Failover Cluster
  - Creating the SQL Instance for Application usage
  - Test and validate failover clustering
- Front end Infra -
  - Installing and configuring the Windows Network Load Balancing for the front end application (if required)
  - Test and validate Network Load Balancing
  - Publishing the Application to AD Users
- Test & Development
  - Installing and configuring Windows Hyper-V based virtualization for testing environment (if required)
  - Installing and configuring the OS for the application usage similar to Production deployment
- Setting up the Active Directory environment for test lab

e) *Enterprise Management System (EMS)*

- The IT platform shall assist in capturing and validating the energy and revenue model to gather in a transparent manner with accuracy.
- To monitor network and server infrastructure for fault and performance issues reducing outages and interruptions by proactive monitoring of infrastructure.
- To improve IT staff efficiency by enabling process-driven management, automated actions based on business policies and rapid root-cause analysis
- To improve service availability by integrating event and performance management across all domains: systems, network, storage, database and applications
- To improve IT support management by providing a thorough, versatile set of functionality that leverages ITIL principles and other practices and improves IT governance
- To collect hardware and software inventory for network devices, servers and desktops and to deploy software packages / patches remotely.
- To Setup customer care center in the towns along with supply, installation, testing and commissioning of all necessary hardware, software and managing the facilities.
- To setup Data center & Disaster Recovery center at identified location and set up the Local Area Network and Wide Area Network. Data from primary site to be replicated to DR site in a synchronized mode.

f) *Identity and Access Management Systems*

- Installing and configuring the IM, SSO and Site Minder
- Configuring the IM for enterprise identity of users
- Deploying the agents for the web server of the application
- Deploying the agents for the desktop clients
- Validating the functionality of the deployed software's

g) *Customer care center solution*

- Unified Administration – manage inbound, outbound, email, workflow and web interactions
- Unified Routing – apply unified routing strategies across your contact center
- Unified Reporting – eliminate the need to integrate reporting data from multiple point solution data sources
- Automatic Call Distribution – answer calls and intelligently route them to available agents based on the customer profile, service level goals and agent availability

- Predictive Dialing – leverage the capabilities needed to make your outbound collections, sales or telemarketing strategies successful
- Voice Portal – deliver rich voice self-service applications to your customers via standard speech enabled Voice XML or dual tone multi frequency (DTMF) applications
- Web Interaction Management – offer assisted service to customers who visit your website
- Email Management – efficiently handle the volume of email messages by providing service levels, prioritization, queuing, auto acknowledgement, auto response and reporting
- Knowledge Base – manage a repository of frequently asked questions (FAQs) and empower your agents with information to quickly respond to customer inquiries
- Contact Recording and Quality Management – whether for quality control or compliance purposes, Aspect Unified IP provides you with the tools needed to monitor, record, score and analyze the performance of your contact center
- Choice of Transport – empower IT to select their transport of choice using either open source voice over IP (VoIP), such as the Asterisk® IP-PBX, closed source VoIP or traditional voice. Migrate from traditional switching technologies to SIP-based VoIP, single-site to virtual contact center, centralized to localized management or any combination thereof
- Multi-Tenancy – take advantage of the secure partitioning and SIP-based VoIP applications that support software as a service (SaaS) models to provide hosted contact center functionality to internal and external customers

h) *Antivirus*

- Installing the Antivirus server
- Configuring the Antivirus policies
- Deployment of anti-virus clients on all the servers and desktops
- Installing and validating gateway anti-virus for SMTP
- Installing and validating gateway anti-virus for HTTP

i) *Storage and Backup*

- Configuration of Storage and the SAN switches
- Creation of storage group/LUNs for the servers
- Configuring the storage replication
- Installing the backup software
- Deploying the backup clients
- Configuring the tape library
- Configuring the backup policy
- Validating the backup and restore process

j) Network and Security

- Creating the LAN at DC, DR, CCC and other utility offices
- Creating the WAN for the DC, DR, CCC and other utility offices
- Creation of VLAN
- Creation of firewall policies
- Creation of IPS policies

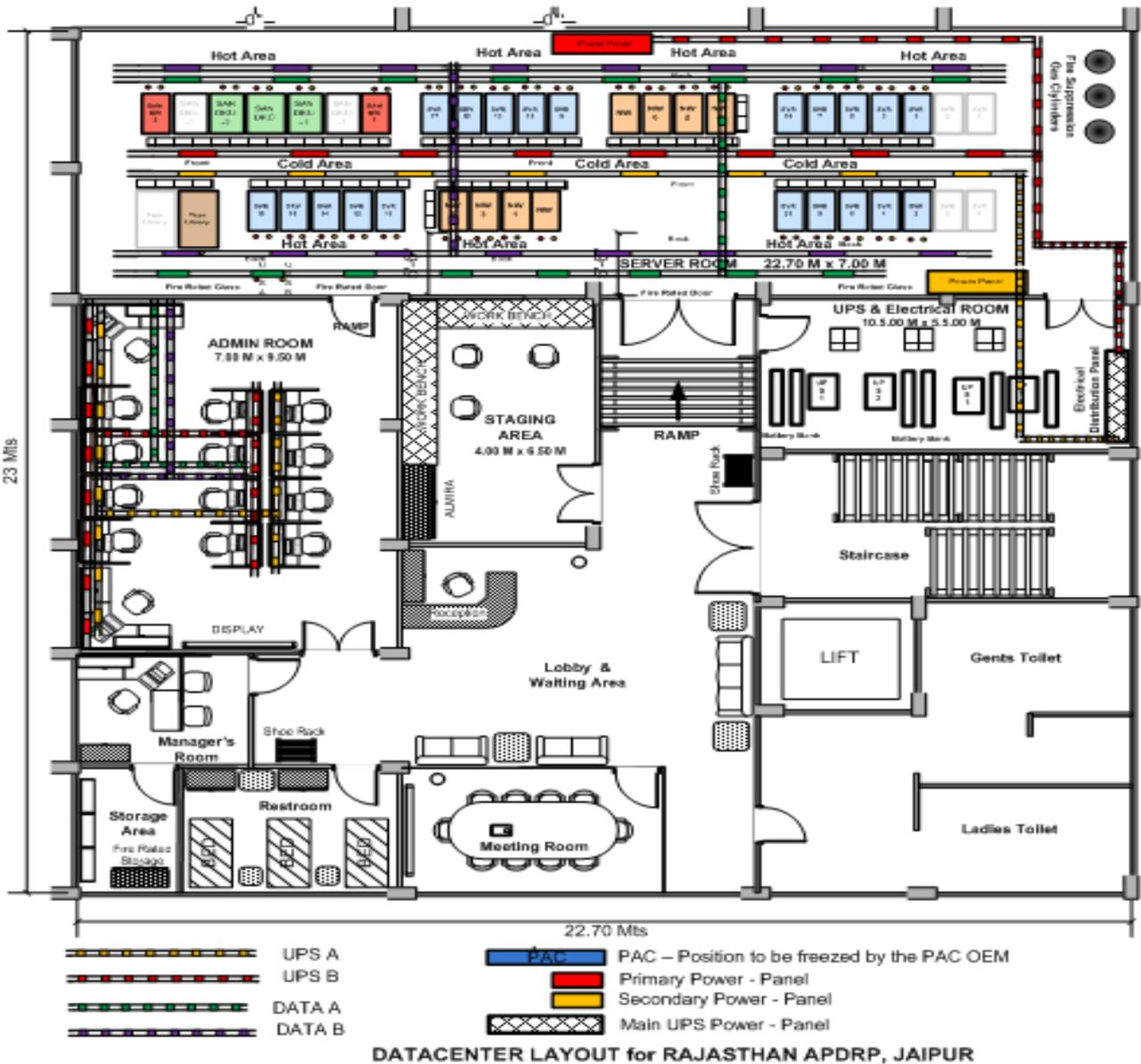
- Configuring the load balancer
- Validating the functionality

V. DATA CENTER PROPOSED SOLUTION ARCHITECTURE

The proposed solution diagram for datacenter has been defined below as per the scope of work.

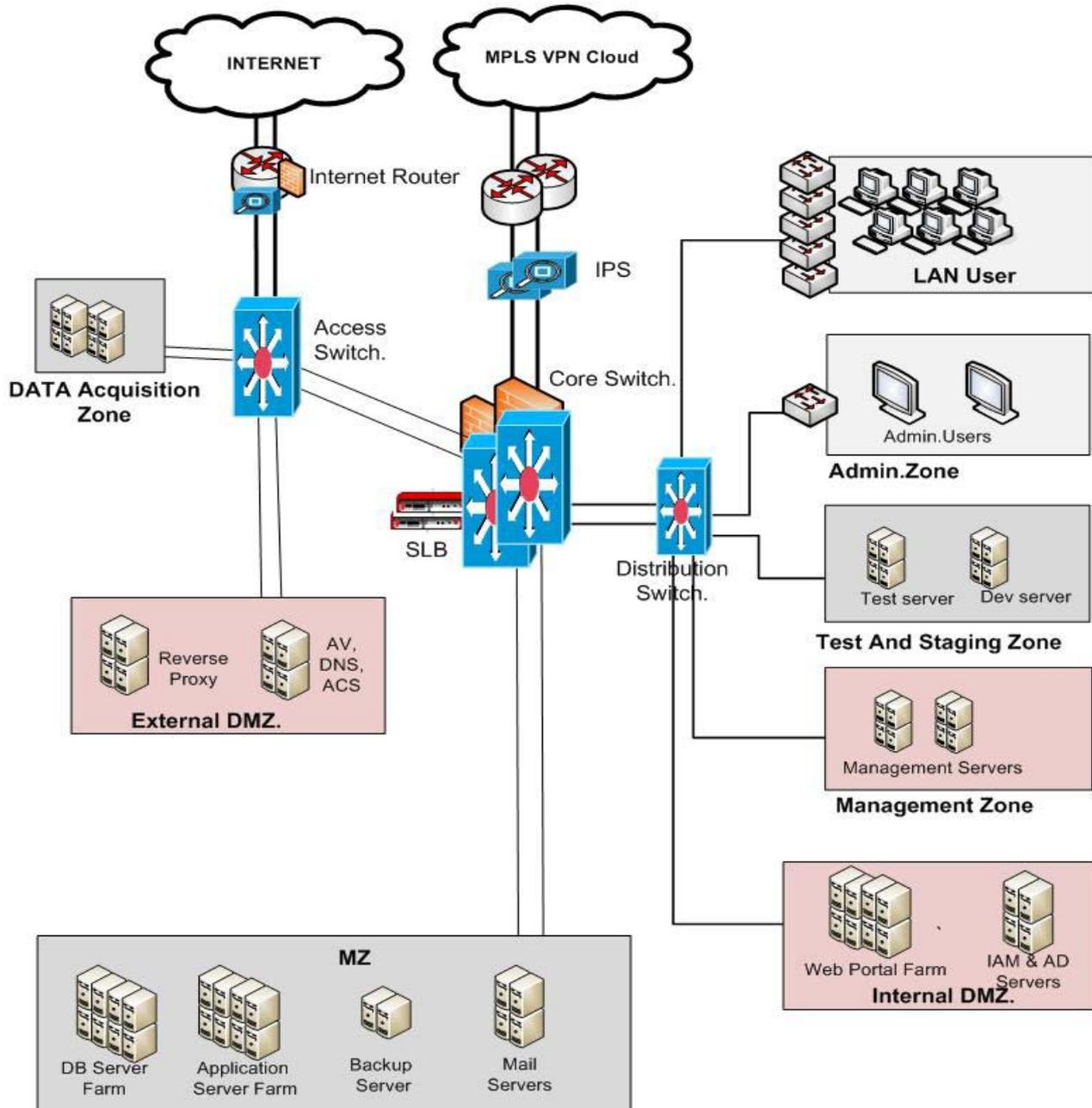
a) Overall layout for data center

DATA Centre Floor layout



b) Overall Architecture of the datacenter

The diagram below gives an overall snapshot of the datacenter architecture –



During Research it has been found that the DC layout will be divided into the following Zones from datacenter security perspective –

- **Meter Data Acquisition Zone** – This Zone Comprises of Servers required for Meter Data acquisition.
- **External De-Militarized Zone** – This Zone Comprises of Reverse Proxy, Antivirus, External DNS Servers, SMTP & HTTP Gateway, and Access Control server.

- **Internal De-Militarized Zone** – This Zone will comprise of Web Portal Farm, IAM servers and Active Directory Servers.
- **Militarized or Trusted Zone** – This zone comprises of the application, database, Backup, Mail DB, Integration Servers, DWH and BI servers and Storage infrastructure
- **Test and Staging Zone** – This Zone will host the Test and Staging servers. This zone will be created using the firewall Blade given in Core

Switch or using Extended ACLs feature as per the need basis.

- **Management Zone** – This Zone will comprise of Management Servers. We have created a separate Management Zone as per Industry best practices. This zone will be created using the firewall Blade given in Core Switch or using Extended ACLs feature as per the need basis.
- **Administration Zone** – One zone will be created for the Administrative users of the Data Center.
- **LAN Users** - One zone will be created for the LAN users of the Data Center.

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