

Integrated Distribution Management System on a Cloud

System Integration – Approach and Considerations



People matter, results count.

Introduction - Distribution Management System

Distribution Management System (DMS) is the primary system used by distribution center controllers to operate the distribution network efficiently while improving safety, reliability, asset protection and service quality. With the evolution of Smart Grid technologies the traditional scenario of managing the network is undergoing a rapid change. A large number of electric distribution utilities are evaluating the business case for integrating their three main operational systems, SCADA, OMS and DMS. The integration of these systems is now referred to as an Integrated Distribution Management System (IDMS).

Functions & Relevance

While an IDMS can significantly augment the traditional outage management functions, it also includes applications that enhance the management of the entire electric distribution system. To name a few, advanced applications like relay protection analysis, switch order creations with validation, fault location isolation & restoration, Volt/Var Optimization all form part of the new suite of tools that are becoming standard with the new breed of IDMS's.

The importance of the IDMS will increase as additional amounts of distribution energy resources (distributed generation, energy storage) and demand response get integrated to the distribution systems.

IDMS helps us realize these objectives and go beyond

Integration in utilities means performing a wide spectrum of roles. Utilities may want SI's to not only focus on assessment, solution implementation and benefits realization; they may also want them to play a key role in the development of their business cases. An experienced SI would be able to identify the key drivers and challenges of the utility for the particular opportunity, for example IDMS integration and to ascertain a roadmap with clear visibility of benefits realization.

Integration in the utility landscape would include data exchange and transactions with numerous other systems such as the GIS system, AMI and MDM systems, SCADA, Corporate Applications (e.g. CIS and IVR systems) as well as Business Process Management (BPM), Analytics and Dashboard applications.

An IDMS would bring in several benefits in addition to the core DMS objectives. For example, typical advantages of an integrated DMS/OMS/SCADA would ensure a single shared model for applications, common permissions managed and enabled via a single login, alarm management, event logs, and a single common UI for the applications.

Similarly, an IDMS with AMI/MDM can ensure better outage management through meter pings, enabling enhanced crew dispatch accuracy. Improved network performance can be obtained via information received from smart meters providing customer and system load profiles. Voltage levels reported by the Smart Meters help to validate network and engineering data accuracy as well as support volt/var optimization processes.

Integration Challenges

There are numerous challenges that need to be understood while considering an integrated DMS solution, such as,

- Multiple Interfaces – Numerous interfaces with systems exchanging data in different formats
- Data Quality – Adapt to dynamic network models to ensure all IT/OT/ET are using the appropriate and validated data.
- Communications – Robust communication infrastructure to address the huge volume of field data transfers based on their criticality, periodicity & volume
- Business Process Change – Streamline & improve operational efficiencies by modifying and/or eliminating redundant processes and leveraging the data across various business applications
- Security – Strict adherence to security governance policies are required to prevent against confidential information leaks, firewall penetration and control breaches.

Integration Standards

The IEC-61968 standards for systems integration between electrical distribution systems maybe leveraged here. IEC 61968 aims at providing an extensible Common Information Model (CIM) for integration of DMS with legacy applications and/or new applications.

Role of SI in IDMS - Its importance and benefits

A well planned and standardized approach will ensure the overall system reaches a robust and maintainable state. Such environments also require multiple vendors to work together which may lead to complexities in project management and governance related issues.

A lead partner, in the form of an experienced System Integrator would be strategically positioned to manage the overall project, design the solution architecture and perform the business and technology integrations to ensure the entire solution knits together. In addition to this, the SI manages operational areas like program schedules, budget, resources, change controls and risk management aspects of the project.

The typical SI benefits would therefore be in the following areas.

- Better governance and project management in complex multivendor situation
- Managing issues, risks and change control activities
- Ensuring uniformity and adherence to integration standards and meeting security requirements
- Ensuring the solution aligns to the business needs and fits into the overall enterprise architecture

Taking IDMS to a Cloud

Hosting a IDMS application in a cloud will enable utilities to leverage full benefits offered by cloud computing including reduction of capital costs, streamlined processes, lower training costs and efforts and leverage a “pay-as-you-go” model anticipating the possibility of an increasing amount of data being generated in the future. This will necessitate tackling a few challenges related to data security and privacy, governance, performance, maintenance and ensuring scalability, high availability and reliability.

Security is a key concern for any hosted solution and a hosted DMS is no different. Data integrity and Data origin authentication are of primary importance here – This can be addressed through Transport layer security, implemented using HTTPS and Message level security, implemented using cryptographic mechanisms. NIST’s open cryptographic standards can be leveraged for this purpose. Use of SHA-512 for message digests and RSA with 3072 bits key length for both data encryption

and digital signature can be considered as this will ensure that systems remain complaint past 2030.

Future State

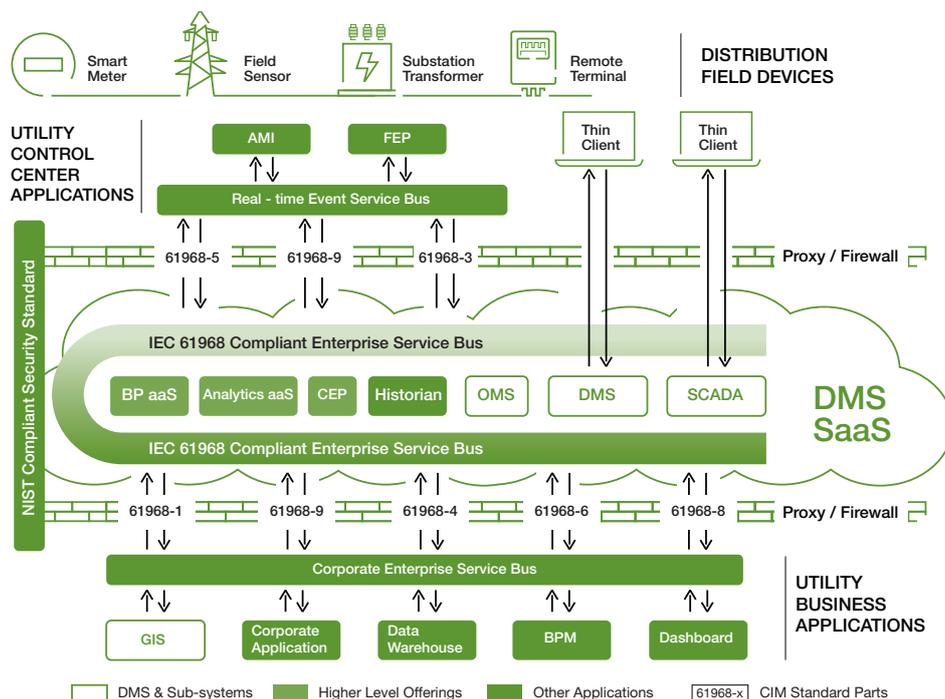
Capgemini envisages a future state where the true power of a cloud based solution can be harnessed by the utilities. This will entail an IDMS SaaS / IaaS cloud which hosts other applications such as Analytics, Complex Event Processing engine and the SCADA to be present in the cloud along with the core IDMS solution. The IDMS is accessed at the utility control room via thin clients and are integrated to the on-premise applications.

IDMS in a Cloud – Best Practices

Capgemini suggests the following best practices for the scenario of Integrated DMS in a cloud.

- Establishing a solid data governance policy for both on-premise and cloud systems
- Complying with various data and security standards
- Robust Data Center security ensuring and availability of data adhering to regulatory compliance
- Streamlined disaster recovery policies with capability to provide data backup to an offsite location ensuring business continuity & service level assurance
- Industry compliant & certified pre-built connectors to various applications & cloud services
- Standards based XML format data transformation without compromising on firewall security

DMS – Cloud Integration Architecture



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