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TELECOM INFRASTRUCTURE MANAGEMENT

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Introduction:

All electrical utility companies have a communication network. It is used for SCADA(supervisory control and data acquisition) and to communicate internally, and can also be used to lease to third parties and to provide communication services to end customers. In all cases, this communication network needs ,managing –knowing where the network ,the network assets are , how they are connected and how they are performing to delivers services to their end customers.

However, the electric industry is going through a revolution .With world electricity consumption predicted to increase by 87% between 2007 and 2035,and the renewable share of world electricity generation out to increase to 23% by 2035.The electric networks of today need to change to accommodate this growth. A more advanced ,or "smarter " electrical grid solves many of the challenges facing electricity supplies-.This smarter grid is a combination of the electric network with a communication network that can provide intelligent control, operational efficiency and flexibility ,and increased network reliability.

This paper discuss the challenges facing the electric industry ,both managing the existing network and moving towards a more advanced electrical grid infrastructure .It also highlights the central role an advanced electrical grid structure. It also highlights the central an advanced asset management solution will play in managing the communication networks. Based on this solution ,the electric utility will be able to deliver more network reliability ,faster response time to outages reduced costs and increased efficiency.

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The Smart Grid Challenge:

A smarter grid will deliver electricity from supplier to consumers using advanced digital technology that will increase reliability, security and transparency while saving time and reducing costs. To achieve this, the power grid is integrated with a communications net work to create an electricity network capable of continuously monitoring its own health and status, generating and transmitting alerts ,automatically taking corrective action, enabling demand side energy management. One US Department of energy study calculated that modernizing U.S electrical grids with more advanced grid technologies would save between 46 to 117 billion dollars over the next 20 years.

Implementing integrated communications is essential to a more advanced grid,but introduces an exponential number of new network devices and technologies to the electric utility. A more advanced grid cannot exist without an effective integrated communications infrastructure that enables various intelligent electronic devices(IEDs), smart meters, control canters, power electronic controllers, Protection, operation and maintenance(O/M) and user application to communicate as one seamless network. Indeed there are estimates that investments in more advanced grid communication technologies could buy as high as 100 Billion US dollars over next five years. This will require significant planning and management of the resulting communication assets .Following are some of the challenges facing electric utilities as they move towards deploying an advanced network infrastructure.

1) Increasing energy demand: Increasing energy demand (expected to triple globally by 2050) will drive the development of an advanced network infrastructure that will require efficient net work planning, design and asset management.
2) Network investment is huge: detailed planning of both the electrical distribution network and the related communication network is critical to control capital expenditures and reduce on-going operation costs.
3) Bandwidth capacity is a critical resource: - The amount of data required to ensure optimal performance and resiliency of the network will rise exponentially .Planning a reliable ,secure communication infrastructure with the capacity need to carry this data is critical.

4) Communication experts on scarce: - Most electric substitutes have limited communications expertise. With the communications network central to the future network, decision support tools to help plan, build and operates the communication network will be vital.

5) Communications network reliability is vital:- For effective network operations, the communications network needs to have the highest possible degree of reliability to support the mission critical data and applications that control the grid. Communication networks designed for an advanced grid with radio frequency “tower systems” as hubs and mesh networks consisting of pole-mounted routers providing the access network.

6) Communications over medium and low voltage distribution power lines for the access network by broadband power line(BPL or power line carrier) with pole mounted couples connecting downstream includes in the electric network to the utilities and substations and control centres.

7) Traditional fibre based networks with some operators directly deploying Fibre –To The Home (FTTH) solution

In all cases ,the communications network will have the same challenges as any other telecommunication networks, including deployment ,network management, bandwidth management,QOS(quality of service) and security. Indeed, there are grand for arranging that the telecommunications industry has been through the BSS/OSS adaptation process already and even at this early stage of network evolution, can teach the energy industry a lot .

When integrated communications are fully deployed, they will optimize S/M reliability and assured utilisation ,enable energy markets, increase the resistance of the to attack and generally improve the value proposition for electricity. The communication system utilized in the power industry today are not designed to support these integrated requirements, and as such are not equipped to enable a more modernized power grid. Integrated communications will allow real time control and data exchange to optimise S/M reliability, asset utilization and security.

Integrating more advanced grid technologies brings with, if exponential growth in the amount of data must be gathered, verified, stored and transformed in near real time for intelligent responses and decisions support . For instance, merely moving from monthly kilowatt-hour reads to hourly interval meter reads increases data handling requirements more than 730 times .The accurate, cost effective design of the communications infrastructure needed to carry this volume of data is critical to deployment success. Utilisers need to make a decision on what communication technologies all needed to acquire and carry this data. For instance , with Wimax(wireless Microwave axis) technology there is a need to plan these networks in terms of how to provide optimal and cost effective broadband access to the thousands of meters in a service area. This requires the network (eg towers, transmitters ,repeaters backhaul fibre etc)to positioned correctly based on coverage area and signal strength calculations to support the data and reliability requirement .Utilities will also be required to mange bandwidth and latency across this smarter grid communications infrastructure ,especially of value added consumer services.

Asset management solution:

Whether managing an existing network supporting SCADA or a new network to support advanced grid technology deployments the utility must, hence a solution for managing their communications infrastructure, just as they do for this electrical infrastructure. Utilities must prepared for this network transformation by having a centralised aspect infrastructure S/M(system maintenance) in place that incorporates technology rules and business process best practice. Without this foundation ,for too much effort will be spend on manual record keeping and playing catch up after the fact. The T/M(technology and management) needs to be built upon communications industry standards and well established workflows.

GE’s geospatial network infrastructure managed solutions are foundational elements to help simply the challenges of designing and maintaining the complex aspects and configurations of the electric and communication networks throughout this entire life cycle. In particular ,GE’s utility telecom infrastructure management solution is fundamental to managing the communications B/W(both way) within a utility ,enabling cost-effective plan ,design ,build, operations and maintenance of network.UTIM chucks available for network capacity, generates network plans to meet demand and produces detailed engineering designs for network build. It also provides a single consolidated cross-network end- to -end view (both inside and outside plant) of the communications network with detailed physical connectivity.

The UTIM portfolio of applications includes:

- Small world Physical Network Inventory(PNI)-Network planning can model the entire physical networks(wired and wireless) both inside and outside plant. The accurate database of record supports the full asset management life cycle, including network planning design and build.
- Small world Logical Network Inventory (LNI) –circuit designs can document and design the logical network(network elements and bearer circuits) that run across the physical network to provide communications capabilities. For more advanced grid communications there is likely to be a fairly standard logical layer.IP/MPLS will be fairly common across the backhaul and distribution access, whether the underlying physical infrastructure layer is fibre, microwave ,copper, wireless mesh or BPL/PLC LNI will provide: one end to end /inventory database for all the logical layers.
- Capacity/traffic design and planning.
- Topology management: SONET,DWDM,VLAN,VPN WAN, HAN etc
- Small world network inventory gateway.: Data can be made available across the enterprises ,with internet and access to the data in the small world network inventory database.
- Additionally, the small world portfolios supports integration to other business critical S/Ms within the utility environment. For instance ,the smaller world business integrator for business processes navigating between applications in these systems .More generally, the small world geospatial server solution is a Service Oriented Architecture(SOA) platform for system integration and business process integration , supporting common business services for utility and communications applications.

Summary:

GE's UTIM solution for managing the communications networks, electric utilities will need to meet the business challenges of the next generation power network with which provide several competitive advantages.

- Deep and broad domain expertise – GE has more than 10 years of experience providing telecommunications solutions to more than 120 customers worldwide. Combined with extensive knowledge of electric transmission and distribution industry,GE can offer unparalleled expertise to customers.

- Proven telecoms net work engineering capability- GE had become an industry leader for designing & engineering the telecommunications networks of telecommunications service providers throughout the world. Smarter grid communications networks for the same challenges as major telecommunications networks and require a mature ,proven solutions to meet this demand.
- Comprehensive technology coverage: Advanced grid communications will be based on a standard logical layer-IP/MPLS will be common across the backhaul and distribution access. GE's UTIM solution will be able to manage all logical technologies (Sonet/SDH/DWDM/GigE/VLAN/VPN etc) needed for grid communications .GEs solutions will be also support the entire physical infrastructure(fibre,microwave,copper,wireless mesh,BPL,PLC etc) of the smarter grid communications network.
- Best –in –class solutions: GE provides best –in-class solutions to help customers reduce network capital and operational expenditures by ,improving network utilization through general knowledge of how the existing network aspects are currently used, Reducing network capital expenditures through cost effective network upgrades, reducing new build costs by up to 20%.

Accelerating response to network outages through accurate knowledge of network location, reducing network down time by 25%.

Full forms of abbreviations:

1. SCADA-Supervisory control and data acquisition
2. O/M- Operation and Maintanance
3. S/M-System maintenance
4. QOS- Quality of Services
5. T/M- Technology and Management
6. B/W- Business warehouse
7. UTIM- Unity Telephony Integration Manager
8. BPL- Broadband over power line
9. PLC- power line communications/programmed logic control
10. IED-Integrated electronic device
11. LNI- Logical network inventory
12. Gig E-Gigabit Ethernet

13. SONET- Synchronized optical network
14. DWDM-Dense wavelength division multiplexing
15. HAN-house area net work
16. SOA- servie oriented architecture
17. VLAN-Virtual LAN
18. LAN-local area net work
19. OSS- Operational support system
20. BSS- Business support system
21. IP-Internet protocol
22. MPLS- Multi protocol label switching
23. VPN- Virtual private network
24. SDH- Synchronous digital hierarchy
25. Wimax-Wireless microwave axis
26. IED- Intelligent electronic devices

References.

Various sites in internet