IPv6: The Foundation of a Connected Smart Grid

Business Challenge

Around the world, electric utilities face the challenge of modernizing aging infrastructure, to support more reliable and efficient power delivery. Operators are looking for ways to optimize the productivity of investment in new and existing facilities, and integrate more distributed energy resources onto the grid. At the same time, they must help ensure grid security and manage operating expenses (OpEx), while complying with continuously evolving regulatory requirements. An undertaking of this scale requires a communications infrastructure architected to support crucial business priorities and lower the total cost of ownership (TCO).

Solution

The Smart Grid initiatives seek to improve operations, maintenance, and planning by making sure that each component of the electric grid can communicate with the others (using standards-based protocol). An extensive list of technologies must be deployed to make the Smart Grid initiatives a reality.

For example, Neighborhood Area Networks (NAN), also known as last mile networks, support a variety of applications including not only electricity usage measurement and management, but also advanced applications such as Demand-Response (DR), which gives users the opportunity to optimize their energy usage based on real-time electricity pricing information, Distribution Automation (DA), which allows distribution monitoring and control, and automatic fault detection, isolation and management, and serves as a foundation for future Virtual Power Plants, which comprise distributed power generation, residential energy storage (e.g., in combination with Electric Vehicle (EV) charging), and small scale trading communities.

Advanced metering infrastructure (AMI) which is an architecture for automated, two-way communication between a network connected smart utility meter with an IP address and a utility company is used to provide utility companies with real-time data about power consumption and allow customers to make informed choices about energy usage based on the price at the time of use.

Field Area Networks (FAN)- the combination of NAN and communication devices offering the backhaul WAN interface(s) have emerged as a central component of the next generation grid network infrastructure. In fact, they can serve as backhaul networks for a variety of other electric grid control devices; multi-tenant services (gas and water meters), and data exchanges to Home Area Network (HAN) devices, all connected through a variety of wireless or wired line technologies.

This has created the need for deploying the IP (Internet Protocol) suite of protocols, enabling the use of open-standards that provide the reliability, scalability, security, inter-networking and flexibility required to cope with the fast-growing number of critical applications for the electric grid that distribution power networks need to support. IP also facilitates integration of the NANs into end-to-end network architecture.

Benefits

Using IPv6 in the FAN and NAN offers a number of key benefits that are unmatched by any other solution:

- A huge address space accommodating projected multi-millions meter deployments (AMI) and hundreds of thousands of sensors (DA) over the thousands of secondary substations.
- Additional flexibility of address configuration that helps adapting to the size of deployments as well as the need to lower field workers tasks when installing small devices.
- The structure of the IPv6 address is flexible enough to manage a large number of sub-networks that may be created by futures services such as e-vehicle charging stations or distributed renewable energy.

Cisco offers the industry’s first multi-service, IPv6 and IPv4 communications infrastructure for FANs. Cisco’s open standards-based solutions support applications such as AMI and DA, as well as workforce automation over a common network platform. Cisco’s solutions offer integrated critical infrastructure-grade security and support multiple communications systems including fiber, wireless mesh, cellular, and 4G (WiMAX and LTE) networks. Based on a ruggedized field router, Cisco networks provide a reference design for endpoints (such as meters) and device management for field crews.

The Infoblox Grid provides a modular, layered architecture that enables a collection of appliances to perform and be managed as a single, unified system.
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Infoblox, the market leader in automated network control, offers a utility-grade DNS, DHCP, IP Address Management (DDI) appliance-based solution (SW/HW) that fully supports IPv4 and IPv6. The Infoblox Trinzic DDI appliance employs state-of-the-art IP address management and automated error-checking technologies.

Trinzic DDI delivers massive scalability to manage the proliferation of IP-based devices, and the explosion of IPv6 addresses (i.e. smart meters for example). Trinzic DDI ensures network reliability and 24x7 operations, and with the Infoblox Grid, provides resilient network services, failover, recovery and seamless maintenance. The Infoblox patented Grid technology removes single points of failure and other operational risks inherent in legacy DNS, DHCP and IP address management infrastructure with a distributed relationship between individual or paired appliances, inside a single building, across a networked campus or across geographical locations.

IPv6 offers several benefits to a Smart Grid such as expanded addressing capabilities, structured hierarchy to manage routing table growth, auto-configuration and reconfiguration, streamlined header format and flow identification as well as improved support for options/extensions. Trinzic DDI simplifies the process of configuring IPv6 addresses on end devices through its built-in support for DHCP IPv6, auto network discovery, with an easy to use web GUI for simplified management and administration.

Trinzic DDI also offers advanced reporting and logging capabilities with almost every aspect of an IPv6 operation logged for auditing or debugging purposes. Using an Infoblox Trinzic DDI solution in a Cisco Connected Grid environment provides a highly scalable, reliable and resilient platform to support a Smart Grid infrastructure with millions of nodes.

For additional information about Infoblox Trinzic DDI and IPv6, please visit:

For additional information about the Cisco Connected Grid, please visit:
http://www.cisco.com/web/strategy/energy/external_utilities.html
http://www.theconnectedgrid.com/

About Infoblox

Infoblox (NYSE:BLOX) helps customers control their networks. Infoblox solutions help businesses automate complex network control functions to reduce costs and increase security and uptime. Our technology enables automatic discovery, real-time configuration and change management and compliance for network infrastructure, as well as critical network control functions such as DNS, DHCP and IP Address Management (IPAM) for applications and endpoint devices. Infoblox solutions help over 6,100 enterprises and service providers in 25 countries control their networks.