

A Guide to Adapting IT Tools for Smart Grid OT Management Challenges

Randy Rhodes

Smart grid technologies span all of the domains that Gartner applies to energy utilities: IT, operational technology (OT), communications, emerging energy technologies and consumer technology (CT). The number and variety of data-producing sensors are growing rapidly, whether at renewable energy sources, on the transmission and distribution infrastructure, or at energy consumer locations. Each type of smart grid device has its own life cycle, so utilities are confronted with increasingly diverse management requirements. To what degree can utilities move toward a unified environment that supports both IT and OT needs? This research explores IT tool capabilities relative to smart grid device requirements.

Key Findings

- Expanding smart grid initiatives are introducing a wide range of OT devices, and each one requires life cycle management.
- OT management requirements are still being defined.
- Smart grid opportunities will prompt some IT vendors to extend their capabilities for use in OT.
- Neither market requirements nor vendor offerings are yet well-defined in this emerging market.

Recommendations

- CIOs and enterprise architects: Use existing Gartner software market definitions as a resource for helping smart grid teams structure and formalize device management requirements.
- Smart grid teams: Leverage existing IT frameworks, standards and definitions as a resource for understanding your needs.
- Smart grid strategists: Refer to Gartner Hype Cycles, MarketScopes and Magic Quadrants for help in evaluating the viability and capabilities of technologies and vendors discussed in this research.

Introduction

How to deploy smart grid devices in a manageable and secure manner is a huge unresolved issue. These devices are deployed across the energy value chain — across generation plants, transmission lines, substations, distribution networks and even on customer premises (see Note 1 for examples).

Smarter devices each have their own hardware, firmware and software life cycles. Viewed objectively, those patterns of management requirements are not unlike those of traditional IT-managed devices. Utility IT organizations already have experience managing their IT assets. While there may not be a direct correlation in all cases, Gartner believes that smart grid opportunities will prompt many existing IT vendors to extend their product capabilities into OT.

Seven Technology Areas Applicable to Smart Grid OT Management

Here, we present an analysis of seven technology areas where vendors are extending product capabilities.

OT Security

Operational technology security is the category of products and services providing security and protection of networks, systems, data, and applications required for real-time monitoring and process control of operational systems in industries such as energy, manufacturing, utilities and transportation. OT security places a particular focus on the incorporation of security functions during the development of OT technology and services, and in the management of the technical processes and integrity of the assets. Such environments have requirements not found in typical IT environments. OT security is required across substation endpoint processors, networks, and systems, and must address firmware, protocol, messaging, and transactional layers of those systems. A data model of security configuration and usage must be established to collect security activity and event intelligence for analysis and decisions. As OT security evolves, concerns about "big data" — that is, datasets whose scope is beyond the ability of commonly used software tools — will place increasing emphasis on analytics based on this security data model.

In any smart grid environment, both serial and IP-connected configurations abound; precision timing features must be supported; and physical environment demands such as temperature, humidity or electromagnetic field shielding are extreme compared to the usual IT environments.

- Sample vendors in OT security include AlertEnterprise, Byres Security, Cisco, CoreTrace, Digital Bond, IBM, Honeywell, Industrial Defender, Invensys, IOActive, Lockheed Martin, Owl Computing Technologies and Waterfall Security Solutions.

IT Asset Management Tools

The IT asset management (ITAM) process entails capturing and integrating inventory, financial and contractual data to manage technology assets throughout their life cycles. ITAM encompasses the financial management (for example, asset costs, depreciation, budgeting and forecasting), contract terms and conditions, life cycles, vendor service levels, asset maintenance, ownership, and entitlements associated with IT inventory components.

Until now, OT software products have not needed close management because the embedded software was unchanging, proprietary or hardwired. As smart grid applications produce more

complex software products and converge with IT architecture, Gartner believes utilities will adopt the same robust ITAM processes and tools.

- Sample IT asset management software vendors include BMC Software, CA Technologies, HP, IBM, Provance Technologies, PS'Soft, Staff&Line and Symantec (Altiris).

Configuration Management

Configuration management is a process that IT organizations use to manage the life cycles of the systems and software that comprise the IT services used to deliver value to the business. Tasks specific to the configuration management process include system and software provisioning, discovery (and inventory), patching, and configuration auditing. Typical IT systems managed with this software include smartphones, tablets, PCs, servers, networking devices, storage and mainframes. Software that is placed under configuration management includes packaged applications and homegrown applications, databases, middleware, and even test environments. Extending this software to smart grid applications could enable autodiscovery of meters and other devices as they are added to a network, as well as automatically mapping the relative topology of those devices.

- Sample configuration tool vendors include BMC Software, CA Technologies, EMC, HP, IBM and Microsoft.

Network Performance Management

Network performance management tools provide performance and availability monitoring solutions for the data communications network (including network devices and network traffic). Typical capabilities include performance baselining, threshold evaluation, network traffic analysis, service-level agreement monitoring and reporting, trend analysis, and historical use reports. IT network managers use these tools to recognize trends and predict capacity issues before they happen.

- Selected vendors in this space include AccelOps, AppNeta, CA Technologies, HP, IAPsolutions, IBM Tivoli, InfoVista, ManageEngine, NetScout Systems, Network Instruments, Opnet Technologies, Riverbed Technology, SevOne, SolarWinds and Visual Network Systems.

IT Event Correlation and Analysis

Other related software capabilities that will eventually be deployed — together with the above-mentioned items — include event correlation and analysis (ECA) tools. Commercial IT ECA products are used by IT operations personnel to manage events generated within IT infrastructure and help identify potential business impact (see "Hype Cycle for IT Operations Management, 2011" and "Magic Quadrant for IT Event Correlation and Analysis"). This software is analogous to supervisory control and data acquisition (SCADA) in utility distribution operations, in that events are reported by exception, and alarm filtering tools help eliminate operator overload in network operations centers. IT organizations invest in ECA tools to improve the productivity of the IT operations staff.

Vendors in this space may be in a position to extend their products to interface with smart meters or other devices within the communications or distribution networks. Ultimately, if the analysis capabilities of these products can be distributed back to the edge devices, those devices can communicate on a peer-to-peer basis and provide the sense-and-respond capabilities needed to resolve network problems.

Ultimate integration of these two environments offers the potential to make the communications network more aware of the power grid, and vice versa. If models of actual grid devices can be virtualized within the communications network, the communications network can help protect the reliability and security of the distribution grid.

- Leading vendors here include IBM, HP, BMC Software, Tibco Software, CA Technologies and Microsoft.

Application Infrastructure and Middleware

Most utilities have deployed some type of enterprise service bus (ESB) and associated middleware to orchestrate the complexity of their enterprise applications. Smart grid initiatives are extending the envelope of networked applications and devices further into the field. Middleware technologies can help integrate the environment end-to-end — all the way from back-end legacy systems to in-plant systems, substations, and even meters or on-premises control systems. Ideally, new integration schemes will be able to handle many diverse footprints in terms of intelligent devices and the technology stacks that are running on those devices.

Gartner groups middleware with other integration software capabilities. The "Hype Cycle for Application Infrastructure, 2011" includes ESB suites, as well as newer technology profiles such as service-oriented architecture (SOA) backplane and other capabilities required for a full SOA implementation.

- Examples of ESB Suite vendors include Fujitsu, IBM, Microsoft, Oracle, Progress Software, SAP, Software AG and Tibco Software.

Telecommunications Network Management System Software

Gartner's coverage of operational support systems and business support systems in telecommunications also has some applicability to smart grid requirements. Network management encompasses tools and procedures for optimizing network and service performance. Communications service providers use this for:

- **Performance monitoring and management:** Commercial performance management and monitoring systems provide reporting on usage trends, alerts on service degradation and data input for service-level agreements in multivendor environments.
- **Service management:** This software is intended to help carriers provide greater operational insight into availability and performance of services.
- **Fault and event management:** These systems help operational staff in resolving problems in the network. They interface with the network elements and element management systems to filter out downstream events not relevant to problem isolation, and attempt to identify the cause of an alarm.

For more detail, see "Market Definitions and Methodology Guide: Telecom Operations Management Systems, Worldwide."

- Software vendors offering these capabilities in the telecommunications open-source software market may well find some opportunity in the IP-connected smart grid arena, because of their existing maturity and expertise in these areas. Examples include Telcordia and IAPsolutions.

Other Related Market Activity

The largest vendors in this report are already positioning their products for applicability to smart grid OT management. They are developing a more encompassing approach to managing smart grid applications and devices. For further discussion, see "Smart Grid Architects Aim for System-of-Systems Advantage."

RECOMMENDED READING

Some documents may not be available as part of your current Gartner subscription.

"Smart Grid Architects Aim for 'System of Systems' Advantage"

"Smart Grid Standards Activity Heats Up"

"Market Share: Application Infrastructure and Middleware Software, Worldwide, 2009"

"Hype Cycle for IT Operations Management, 2010"

"Hype Cycle for Utility Industry Operational Technologies, 2011"

"Applying IT Asset and Configuration Management Discipline to OT"

"High-Performance Applications Need High-Speed Monitoring"

"How to Optimize IT Configuration Management (Process and Tools)"

"Market Definitions and Methodology Guide: Telecom Operations Management Systems, Worldwide"

Note 1

What Are Smart Grid Devices?

Examples of devices referred to in this report include:

- Capacitor and regulator control units
- Communication network stations and nodes
- Customer gateways
- Dynamic line rating sensors
- Grid-friendly appliances
- In-home energy consumption displays
- Home energy management systems
- Meter reading equipment
- Microprocessor-based meters
- Phasor measurement units
- Pole-top line sensors
- Protective relays

- Reclosing switches
- Remote terminal units
- Substation master computers
- Substation network gateways and routers
- Transformer monitors

REGIONAL HEADQUARTERS

Corporate Headquarters

56 Top Gallant Road
Stamford, CT 06902-7700
U.S.A.
+1 203 964 0096

European Headquarters

Tamesis
The Glanty
Egham
Surrey, TW20 9AW
UNITED KINGDOM
+44 1784 431611

Asia/Pacific Headquarters

Gartner Australasia Pty. Ltd.
Level 9, 141 Walker Street
North Sydney
New South Wales 2060
AUSTRALIA
+61 2 9459 4600

Japan Headquarters

Gartner Japan Ltd.
Aobadai Hills, 6F
7-7, Aobadai, 4-chome
Meguro-ku, Tokyo 153-0042
JAPAN
+81 3 3481 3670

Latin America Headquarters

Gartner do Brazil
Av. das Nações Unidas, 12551
9º andar—World Trade Center
04578-903—São Paulo SP
BRAZIL
+55 11 3443 1509