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White Paper

BEYOND NETWORK MODERNIZATION

Advanced Analytics Helps Boost Utility Service Reliability and Facilitate Migration to Packet

The utility industry is undergoing a comprehensive transformation as it modernizes to a more efficient and smarter grid. An important step in this process is the migration from legacy communications networks to packet technologies for services that control and protect the grid.

Network migration is challenging for utilities because the new technologies must be deployed without disrupting current operations. Some of the challenges include:

- The inability of legacy tools to visualize communications network components and conditions
- The need to ensure timely deployment of the IoT for the Smart Grid
- Changing skill sets in the utility workforce

Poor network visibility

Utilities rely heavily on manual processes to keep track of network conditions and inventory. The manual process makes it impossible to develop a comprehensive, real-time view of the system and inhibits a utility's ability to identify potential trouble spots or guide where and when to deploy new infrastructure. Utilities need convenient, automated tools that provide timely visibility of network conditions to inform their technology evolution strategies and support ongoing operations.

Ramping up communications infrastructure

Deploying new telecommunications capabilities to remote utility sites can be risky, time-consuming, and expensive. The process is especially complicated when infrastructure components are supplied by multiple vendors and used to monitor a variety of utility systems, from SCADA equipment and synchrophasors to substations, distributed energy resources, or energy storage. Utilities need tools and analytics that will help guide their deployments so new infrastructure can be installed and activated before legacy systems are decommissioned.

Skills gap

Legacy TDM networking on SONET/SDH infrastructure is becoming increasingly difficult to manage and maintain. In-house experts in legacy technologies tend to be older members of the workforce. Many are retiring and taking their knowledge, skills, and experience with them when they go. The resulting talent shortage can slow the restoration of services during outages, potentially affecting utility reliability metrics, revenue, and customer services. Utilities need tools and strategies that will help their teams make the best use of staff expertise as the organization shifts to newer packet technologies.

Network Functions Virtualization (NFV) and Software-Defined Networking (SDN) have gained significant traction since their initial introduction, providing utilities with network agility, scale, and operational simplicity to smooth the transition to packet. However, with a growing number of applications and a plethora of connected devices, the demands on today's utility networks continue to grow. Fortunately, today's advanced analytics technologies can help.

Reduce risk by using big data and advanced analytics

Advanced analytics refers to sophisticated and modern techniques that uncover deep, meaningful patterns in data or content that help utilities make intelligent decisions for meeting specific business and/or operational goals. The network—over which terabytes of traffic traverse every day—serves as the greatest source of this valuable information.

A term closely associated with analytics is 'big data,' which simply refers to very large data sets collected from multiple sources. In networks, data can come from a broad range of sources including telemetry, physical and virtual network elements, OSS (including customer information and trouble ticketing), smart meters, domain management applications, and more. Because of these large volumes of data, the effectiveness of an analytics solution lies in its ability to process the data at the right speed and assimilate and classify them in a meaningful way.

Data pattern recognition, classification, and clustering are handled by 'machine learning,' a technique implemented as software algorithms. In contrast to traditional network analytics, where the process involves gathering data manually (usually stored in spreadsheets) and requires significant time and human effort in their analyses, modern network analytics that employ machine learning rely on compute power and storage, which are now very affordable and can be deployed at a large scale.

Big data analytics methods essentially fall into one of these three key categories:

- Descriptive – Interprets historical data to determine what has happened
- Predictive – Finds results that predict what might happen based on historical patterns that are sometimes combined with external data. The industry uses the term 'predictive asset management' for this approach, which is especially relevant for aging infrastructure such as legacy SONET/SDH
- Prescriptive – Predicts multiple outcomes for a given scenario based on actions taken. The idea is to show how a different set of actions will affect the situation and point the user toward the best possible option

For a utility, an effective analytics solution should incorporate advanced algorithms and techniques and apply machine learning, which enables analytics applications to address a wide range of business and operational initiatives. Examples of analytics applications include network assurance and security, inventory management, and capacity planning.

Advanced analytics use case

Proactive network assurance for enhancing service reliability

In August 2003, the northeastern U.S. suffered the nation's largest power blackout, during which 50 million subscribers lost power for up to two days, resulting in 11 deaths and an economic impact estimated at $6B. In part, the reaction to this blackout was that utilities turned their increased attention to the role of reliability in the network. That emphasis persists; a 2016 Black & Veatch survey of the utility industry ranked reliability as the #1 priority.

For utilities, failures in the power grid can impact a utilities' reputation and result in penalties of hundreds of thousands or millions of dollars per year, depending on the extent of the breach. Furthermore, failing to meet a customer's service level expectations can lead to the customer's pursuit of alternative sources of power. With predictive analytics and machine learning, utilities can use advanced analytics to keep their networks' health at its peak and, in turn, better meet SLAs' service reliability parameters. This use case enables utilities to analyze historical network data collected from multiple sources to anticipate which network elements and/or specific ports are most likely to fail during a given time period, enabling the utility to take proactive measures to avoid service disruptions.

Blue Planet Analytics and Network Health Predictor

Blue Planet Analytics (BPA) is an advanced analytics platform that enables the intelligent automation and operations of today's fast-evolving networks. Utilities can reduce their risk of problems by using an open system built on an extensible, container-based micro-services architecture. BPA leverages the proven Resource Adapter (RA) technology and applies model-driven templates to assimilate data from any source across a multi-vendor utility network, including physical and virtual network elements, OSS, domain managers/controllers, and management applications. BPA consists of two parts: A robust and flexible software framework responsible for collecting and normalizing data gathered from across a utility network, and advanced upper-layer analytics applications (which can be either developed by Ciena or third parties) designed to work with the framework to address specific business or operational needs. The platform provides advanced machine learning libraries that support predictive, descriptive, and prescriptive methods of data analysis to help address a wide range of use cases. The separation of the data management framework and applications enables utilities to focus on deriving business insights, rather than on collecting data. BPA seamlessly integrates with utilities' third-party big data cluster systems for real-time data processing and storage.

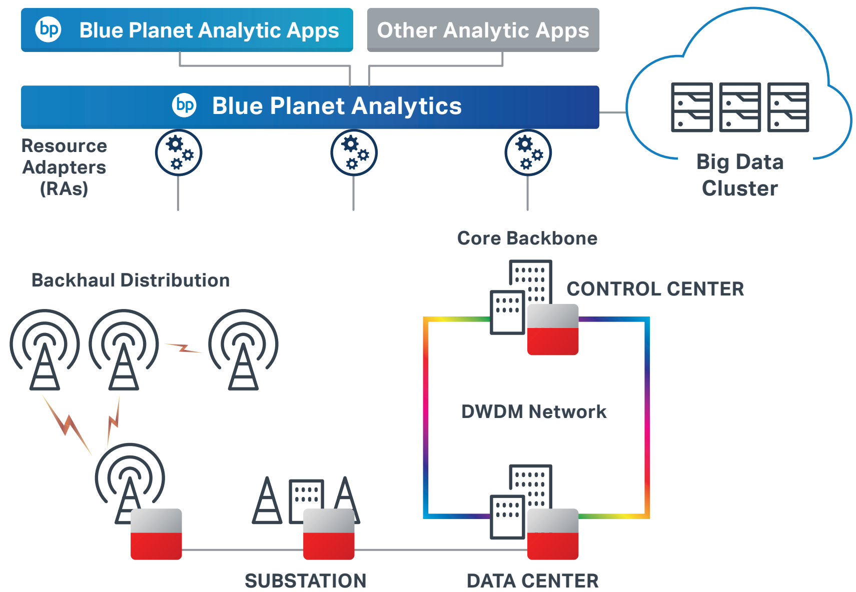

Figure 1. Decoupling BPA framework from analytics applications enables utilities to focus on business insights.

Network Health Predictor (NHP) is the first analytics application developed by Ciena to work with BPA for enabling proactive network assurance. NHP interprets the real-time state of the network and its equipment, using advanced visualization capabilities to allow utilities to identify trends and see areas of risk. NHP leverages predictive analytics and leading-edge machine learning algorithms, developed by Ciena, to assess the probability of network element failures. With NHP, utilities can address problems before they happen to increase network reliability and significantly reduce downtime and associated penalties. One service provider customer is projecting an approximate 25 percent reduction in SLA penalties in the first year after using NHP.

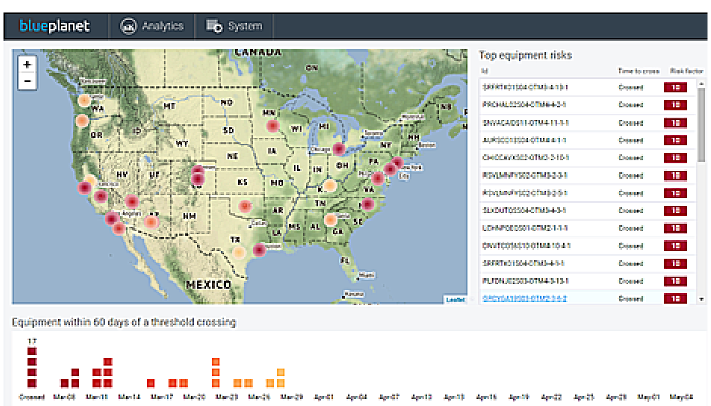

Figure 2. NHP provides real-time network state, identifies trends, and assesses the probability of network element failures to enable timely remediation.

BPA and NHP can be also combined with actionable systems like Multi-Domain Service Orchestration (MDSO) to take corrective actions such as activating and provisioning a back-up network appliance should a failure be imminent. MDSO fully supports intent-based networking, a mechanism that enables the corrective action to take place.

Topology Discovery, another key analytics application for utilities, is an advanced algorithm that determines the physical connectivity of multi-vendor TDM components and new packet networking equipment and characterizes the utilization of each link. Utilities can use the information provided by this application to develop an inventory of network equipment, optimize network performance and utilization, recover unused assets and bandwidth, and improve operational decision-making. All components can be managed in a single database and viewed in a single dashboard, without a need for spreadsheets.

Why BPA?

Network analytics are especially important when the utility has legacy network components at elevated risk of failure, since actionable insights can be used to guide network migration to new equipment. Components that are functional and healthy can be retained longer, while those at risk can be decommissioned sooner. Over the last several years, Blue Planet software customers have gained the benefits of a truly open, vendor-agnostic solution that embraces a collaborative

1 Intent based networking, as defined by Gartner, involves systems that continuously validates that the original business intent of the system is being met, and can take corrective actions (such as blocking traffic, modifying network capacity or notifying) when desired intent is not met.

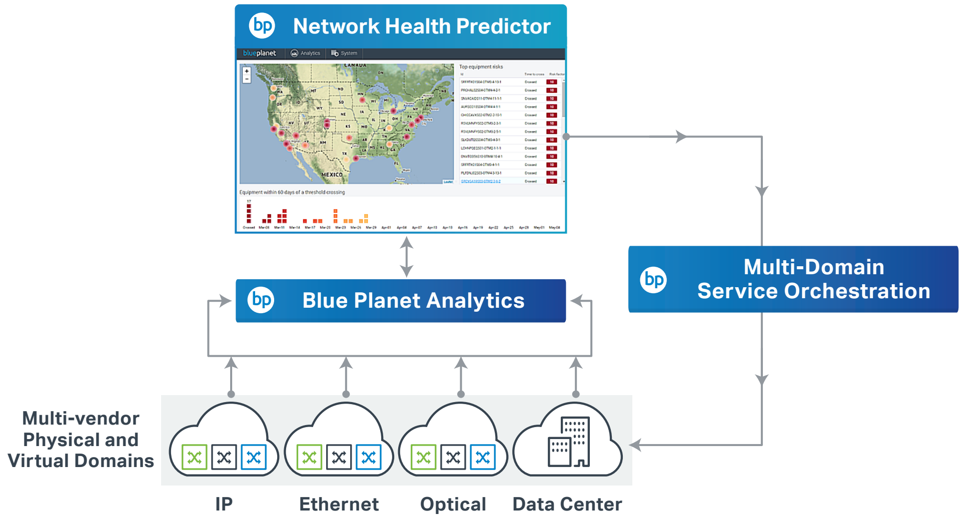

Figure 3. BPA and NHP combined with actionable systems enable closed-loop network control for remediation of possible service disruptions

approach to solving their business problems. Ciena firmly believes that choice and flexibility enable utilities to innovate rapidly and address the challenges of network transformation by providing solutions and technologies that best suit their unique business needs. BPA was designed with this same governing philosophy.

With BPA, utilities can:

- Simplify data collection across data sources using RA technology, which enables data aggregation from network elements, systems, OSS/management applications, and tools from any vendor, and extension to additional data sources as needed
- Achieve computational scale and accuracy through a robust framework that includes advanced processing libraries such as machine learning and real-time data streaming
- Enable intelligent, data-driven network control through seamless integration with actionable systems through standard open APIs
- Pave a path toward the more autonomous and self-adapting networks of the future when combined with orchestration, policy, and control systems
- Take advantage of enriched support and collaborative development through the DevOps Toolkit and DevOps Exchange

Utilities must keep their TDM networks up and operating until the new network is in place and ensure its ongoing performance and health after it is deployed. A practical approach is to use analytics tools that enhance understanding of the network and system conditions and deploy versatile networking components that ensure a safe network migration process.

Big data analytics will play a crucial role in enabling utilities to build efficiency in almost every aspect of their business operations while optimizing customer experiences and engagement. Ciena is committed to providing the best analytics tools necessary to help its customers drive new strategies and business outcomes. Ciena differentiates from other vendors by offering solutions that enable customers to take full, self-service control of their network transformation in aligning with the needs of the ever-evolving market.

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