Network Visualization for Telecommunications

INTRODUCTION
The telecommunications and networking industries continue to change as they respond to competitive pressures, technology innovations, and shifts in consumer behaviors and regional regulations. In particular, Communication Service Providers (CSPs) are experiencing unprecedented growth in network traffic and data volume resulting from smarter devices, data intensive services, the widespread use of social media, and faster access technologies.

To maintain their competitive advantages, CSPs must continue to enhance operational excellence by efficiently scaling and managing their networks while deploying new technologies within relatively flat Capital Expense (CapEx) and Operational Expense (OpEx) budgets. To complicate matters, industry mergers and acquisitions frequently lead to fragmented networks, systems, and operations, resulting in poor data quality and accuracy.

In addition, emerging trends, such as mobile computing, cloud computing, social media, and virtualization require more effective use of big data analytics by CSPs to improve their network operations and Quality-of-Service (QoS). The challenges of gaining value from big data involve not only managing the volume, velocity, and variety of data but also filtering out the noise in the data. Consequently, the techniques CSPs use to gain insight from big data sources differ from those used by conventional Business Intelligence (BI) methodologies. Instead, they rely on solutions that facilitate discovery of insight through an iterative modeling process. As a result, CSPs are turning to visualization, big data architectures, and advanced analytic techniques to gain better operational insights from all of their data assets.

PROBLEMS AND CHALLENGES
In today’s enterprises, nearly all communication is Internet Protocol (IP) based, allowing CSPs to support data, voice, video, and other services together across a common standards-based infrastructure. This convergence around IP-based Next Generation Networks (NGNs), service-centric network architectures, and the introduction of new technologies such as Software-Defined Networking (SDN), has led to an increase in both the diversity and volume of services, shorter service life-cycles, growth of mobile data access, expanded use of cloud computing, and greater integration of customer and market data with operational data. In a world where a single network transaction typically includes voice, video, and data transmissions crossing different Operations Support Systems (OSSs) and Business Support Systems (BSSs), IP NGN service architectures are becoming increasingly complex to operate. This has led to solutions based around visualization and...
data to understand all the data associated with networks and services.

The BI and business analytics solutions implemented in the past enabled CSP decision makers to monitor, understand and improve network and business performance. However, the full breadth of data required for making good decisions often resides in multiple disjointed legacy systems, OSSs, and BSSs. For instance, typical OSS/BSS environments contain thousands of systems, including packaged applications, spreadsheets, and business process management tools. In addition, valuable information is often located externally on the web, or internally within content management systems, in email, and in file systems.

As the complexity of managing IP NGNs increases, CSPs are realizing that visualization and big data analytics can lead to better network operations and QoS by providing:

- Superior network intelligence for more efficient network utilization
- Improved inventory consolidation and collaboration to complement and leverage existing inventory investments
- Discovery, assimilation, and reconciliation of network configuration data with other upstream systems
- Enhanced end-to-end visibility of network configurations across multiple inventory systems
- Intelligent network analytics for agile planning, optimization and network migrations
- Minimized customer churn through improved use of social media data to enhance 360-degree customer information

CSPs have traditionally managed large volumes of data about their networks and customers from sources such as transactional data, network performance, service quality, and web interactions. However, most of this data is not correlated, sanitized, or extrapolated to enable a 360-degree view of their networks and customers. With the rapidly accelerating volume, variety, and velocity of available data, they must look to new technologies, such as graph visualization and big data analytics, to generate more accurate insights into customer experience and network performance. In particular, the complex nature of IP NGNs requires CSPs to include graph visualization as a key component in their network management solutions. The Tom Sawyer Software visualization and analysis technology provides one of the most flexible and powerful means to understand information about networks and customers.

NETWORK VISUALIZATION AND TOM SAWYER SOFTWARE

Tom Sawyer Software is a leader in the field of graph visualization and analysis, providing products used to build and deploy sophisticated network management applications. Leading CSPs and enterprise network management groups use these applications to manage network inventory and performance, analyze what-if scenarios, plan network topologies and capacities, and integrate trends and anomalies from social media to recognize emerging opportunities. Backed by more than two decades of pioneering research, development, and enterprise deployment experience, Tom Sawyer Software products are designed to address the needs of the most challenging visualization and analysis application projects.

Regardless of the volume and variety of data facing CSPs, one of the best ways to discern important relationships is through graph visualization and analysis. When data relationships are modeled as graphs, the graphs expose patterns that allow improved query and exploration, leading to faster and more effective decisions about networks and services.

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Graph visualization and analysis software uses nodes and edges to represent network elements and communication links. A graph visualization — based on the relationships between components, sub-networks, events, communication volume, customers, and other network intelligence elements — can highlight crucial information. For instance, inefficient concentrations of nodes due to consolidation of networks resulting from acquisitions, can be easily identified for better management of CapEx planning.

The graph visualization and analysis of network data can enhance overall operations by presenting information in ways that support visual thinking among network managers and analysts. Data can be displayed around the concept of a dynamic network, to make it easy to organize and understand important information. For example, critical information about customer behavior on the network can be quickly discovered by merging data on network volume associated with a new service along with customer sentiments on the service to reveal trends that impact future capacity planning.

Tom Sawyer Perspectives is sophisticated software for building enterprise-class graph visualization and social network analysis applications. It is a complete Software Development Kit (SDK) with graphics-based interface to support an iterative design-preview development process. Tom Sawyer Perspectives combines the capabilities of the company’s federated data integration and interactive visualization, layout, and analysis technology in a flexible platform architecture.

Tom Sawyer Perspectives enables teams to quickly develop production-quality, data-oriented visualization and analysis applications. Developers use two graphic modules — the Designer and Previewer — to build applications around the specific types of data that drive each project. Using the Designer, they define schema, data sources, bindings, drawing templates, views, filters, and searches and can specify flexible rules for the visual representation of the data. Developers can also use the Designer to create context menus to specify custom toolbars, tooltips, and graphical viewing and editing behaviors. With the Previewer, developers can iteratively view the application design without needing to recompile. When used together, the Designer and Previewer provide an efficient round-trip process that dramatically speeds up application development. Resulting applications can then be deployed to desktop, applets, image maps, and HTML5 Rich Internet Applications (RIAs). Because of the flexibility, ease of use, carrier-grade reliability, and the ability to manage large and diverse array of data, Tom Sawyer Perspectives is ideally suited for use in graph visualization and analysis systems associated with today’s IP NGN.
A Tom Sawyer Perspectives’ application showing a visualization of a small network, with a tree view of devices by location, table views of devices and connections, and an inspector view.

SUMMARY

The advent of smart phones, mobile broadband, social media, and video-based services has contributed to unprecedented data volume growth over the last few years. As data-based services become easier to use and more attractive to consumers, the volume of data traffic on service provider networks continues to intensify. For CSPs, the evolving complexity of network management tasks has created a need to better understand all of the actionable data involving network topologies and elements, network operations, and customer behavior. As the need to support the transition to more service-centric models continues for CSPs, the inclusion of advanced graph visualization and analysis applications based on Tom Sawyer Perspectives can lead to improved operational efficiencies in network management.