Transformation of Network Management

Views of Industry Leadership

White Paper
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Abstract

This paper focuses on the rationale for network management transformation, outlines the paradigm shift and its differentiators, analyzes the dominant legacy vendors and their industry leading alternatives, and concludes with a case study of a leading OSS vendor’s transformation to meet the network management paradigm shift and gain advantage over legacy vendors.

Network providers expect proactive, low cost, high value OSS solutions that will help them manage customer Quality of Service metrics to better deploy and manage revenue-generating services that exceed customer expectations. Network management solutions are evolving to meet new challenges by focusing on end customer Quality of Service rather than equipment views. This paper explores how innovative vendors are applying new technologies and solutions to meet these needs.

The network management landscape has begun to change. Service Providers (SP) are making a strategic move from legacy vendors to alternatives or to a mix of solutions from different vendors. Growing rapidly in the last decade, legacy vendors face multiple problems in adapting to new demands. This paper explores how new vendors are turning legacy vendors’ challenges of aging architecture and high total cost into an opportunity for themselves by offering innovative next generation functionality, flexible architecture, business aware service management, and a greater ROI.

This paper is comprised of two sections:

1. An analytical view of the network management outlook that explores the competitive evolution of network management solutions, compares legacy vendors and alternatives, and outlines key factors for a successful vendor’s transformation from network management to service management.

2. A case study comparing a leading young network management vendor that offers next generation technologies and higher value proposition as an alternative to a leading legacy vendor that offers solutions with aging architecture and high cost of ownership.

This paper explores several key points:

- Changing focus and business priorities for Service Providers
- Transformation drivers and paradigm shift in network management requirements
- Success differentiators and practices for network management vendors
- Emergence of competitive alternatives to legacy network management vendors
- Evolution to new technologies, architectures, and next generation functionality.
- Focus on improving service quality and lowering total costs of ownership
Transforming Network Management to Service Management

Analysis of Market Drivers and Differentiators
Network Management: Transformation Outlook

The IDC Market Analysis report predicts that explosion of data, network complexity, virtualization and cloud, better analytic, and the increased demand for service assurance will drive market growth at a CAGR of 7.5% to $4 billion in the next four years.

The significant growth of data volumes and types, the continuous expansion and complexity of networks, and increasing importance of networks in business operations are placing new demands for network manageability. Service Providers (SP) and enterprises are increasingly leaning on vendors for more assistance and seeking management tools with more advanced functionality, simplicity in operation, and service assurance of business delivery.

Service Providers faced with topology expansion and increased multi-protocol use will make optimization of network use and better management a business priority. New requirements for better network management and user experiences analytics, that can accommodate increased network complexity, will accelerate the search for new solutions.

Enterprise network management solutions will also require increased functionality and will include application awareness and integration with Service Provider solutions to ensure end-to-end visibility of applications availability and performance. They will become an integral part of Enterprise SLA management.

Network management products will integrate with IT and Business process management products. Service Providers will need dashboards that combine KPIs/KQIs from OSS solutions (fault, performance, & service management across multiple platforms and topologies) with BSS solutions (asset & trouble management, fulfillment, billing, customer relationships, etc.). Enterprise network management requirements will increase similarly to Service Provider profiles and will converge with the management of applications, service, storage, IT and Business Management.

Transformation of network management is already occurring. Young new companies with exciting new technologies and innovative solutions are leading competition and driving market differentiation. They provide a new generation of products that offer higher ROI, business aware service management, flexible architectures, and focus on quality of customer experience.
Network Management: Legacy Vendors and Alternatives

Networks continue to change and evolve, and network managers need the best possible network management tools. As a result, the priorities and requirements for network management solutions must align with network evolution. This is a continuous puzzle and a challenge for both young and mature legacy management vendors. Service Providers and enterprises often prefer a legacy vendor with an integrated suite of products but lack of innovation, high cost, and lengthy deployments drive them to seek alternatives.

Network management includes both software and appliance–based solutions for managing network availability and network configurations. Network availability management products collect and correlate fault and alarm events as well as performance anomalies, evaluate their impact on service levels, and assure service availability. Network configuration management products manage, control, and audit changes to the network infrastructure.

The term “network management systems” (NMS) encompasses a broad range of solutions from single point products to element managers to large enterprise-class solutions. The term “enterprise network management systems” (ENMS) includes network-centric management solutions that are used by large organizations’ operations and engineering teams to discover, monitor, assess, troubleshoot, and generally maintain highly distributed enterprise networks.

The ENMS market is dominated by the following five primary vendor hierarchies (listed in order of descending market saturation): IBM, CA, HP, BMC, and EMC. The NMS market is more fragmented. The top five players in NMS space (CA, NetScout, IBM, HP, and Visual Networks) are accounting for about 50% of a $3 billion market (forecasted for 2013). All top players have been around for a long time and have grown significantly through acquisitions.

The other 50% of the NMS market is contributed by the second and third layer vendors as well as a myriad of smaller players. This space is occupied by NMS players that price themselves within the maintenance fee of large players (Monolith, Rivermuse, SevOne, LogMatrix, Spiceworks, Solarwinds), parts players that provide add-ons to the framework of large vendors (Mimic, Tavve, Bluestripe, Abilisoft, Augur Systems), Cloud players (CoolAlerts, Siverback), telecom and quality assurance players (Centerity, Centina Systems, Infosim, Zyrion, Entuity, Kratos Networks, Paesler, NetBoss Technologies) and many others.

The golden years of the NMS first decade (1991-2000) with plentiful budgets for “Best of Breed” solutions were followed by the NMS second decade (2001-2010) with “Dark Ages” solutions. Lower customer budgets and new technologies allowed large vendor companies to re-design product strategies and start acquiring small “Best of Breed” NMS companies to fill gaps in their emerging ENMS road map and replace their own outdated product solutions. This decade of consolidations has added significant new revenue streams for IBM, CA, HP, EMC and BMC but resulted in stagnation, a long integration phase, and loss of innovation for their portfolios.
The emergence of large vendor ENMS portfolios offered a one stop shop opportunity for large customers that reduced their implementation risks. The longevity of these tools in the market means that some large enterprise customers have so heavily invested in and customized these solutions that it would require a significant investment and an overhaul of the network operations in order to remove them. At the same time, these solutions are a good fit for younger organizations that have grown and matured to the point where the disparate low-end solutions they had been using do not scale and are too difficult to maintain.

New connectivity requirements and the need for better and lower total cost solutions opened a door for alternative vendors. As the ENMS solutions market has matured, newer entrants have come into the market. They offer a particular set of functionality, addressing operational needs that were not fully met by existing solutions or have not been easily achieved with the traditional tools of choice. Often solutions from more than one of the vendors are being used in conjunction with each other or even just in a standalone manner.

Some customers disappointed in current large vendor solutions replaced them with another large vendor solution. Others use a combination of multi-vendor solutions and face a sizable integration effort. For example, the need for an alternative to Tivoli arises mainly due to over complexity, price, and poor architecture that resulted from a buying binge of companies in 2000-2008. This problem has several aspects: cost of personnel, annual maintenance costs, product survivability, rigid license models, duplicate functionality, and competition from alternative vendors. Even on a high end spectrum there are better solutions with lower total cost of ownership than IBM/Tivoli.

Virtualization, WLAN, VoIP, mobile devices, and “everything that gets an IP address” are all driving an increase in the amount of IP traffic that needs to be enabled and supported. Such hyper-growth in connected devices is making the network increasingly critical. As a result, many new alternative players are profiting from their ability to scale and monitor a variety of IP devices, and provide assurance of network performance and availability. Newer players have found particularly firm footing in the medium enterprise – a market that has been historically underserved by the bigger IT vendors.

- As networks grow in complexity and multi-function, enterprises are moving from a single legacy vendor to alternatives or to a mix of solutions from different vendors. While the strategies of large enterprises focus on continuing with evolving legacy solutions, the mid-market is shifting to alternatives for several reasons.

- In a growing number of cases the buying decision for mid-market ENMS solutions is made by an operations manager in the datacenter rather than the NOC. But the fastest growing area for purchasing exists in NMS, where solutions are largely driven by a need for support of multi-vendor devices with multi-service assurance requirements and decisions are often made by a network operations and/or customer support manager.
Network Management: Paradigm Shift

Network providers expect pro-active, low cost, high value NMS and ENMS solutions that will help them manage complex networks and compete for customers. NMS and ENMS are evolving to meet new challenges. Vendors are applying new technologies and innovative solutions to improve basic functionality, add service orientation, and reduce cost of ownership.

Service Providers today are facing the challenge of operating and maintaining multiple networks, based on multiple technologies. With the accelerating trend in network complexity, NMS solutions are shifting from tightly coupled with Element or Core network components to a comprehensive common solution for managing the “multis” (multi-vendor, multi-service, multi-protocol, multi-application).

Changing business priorities are forcing Service Providers to transform their networks and place an increased focus on customer satisfaction and service assurance. They are shifting to managing based on business impact and ensuring SLAs, and are pushing for NSM solutions that offer a simplified, real-time OSS network monitoring integrated with their BSS business solutions.

Service Providers are accelerating the drive for lowering costs of implementing NMS solutions. Integrated solutions offered by legacy vendors often result in significantly higher deployment costs and long delays. Many Service Providers are shifting to integrated, but lower total cost solutions. This shift is starting to include outsourcing of network management. However, switching to a new Managed Service may actually increase overall cost when the old NMS tools are replaced.

While traditional NMS and ENMS solutions vary in architecture and implementation, they all offer the following functionality:

- Discoveries – ability to auto-discover elements to be brought under management.
- Correlation – more advanced solutions add topology, service, and application correlations.
- Fault isolation – many solutions include Root-Cause-Analysis (RCA) plug-ins that employ complex rules for identifying actionable causes and their impact.
- Alerts/alarms – managing alerts and alarms is one of the key activities of network operators.
- Monitoring – many solutions provide additional management data that helps operators to analyze captured alerts/alarms.
- Business impact analysis – crucial for understanding which business systems, applications, or processes are impacted by any outage and responding based on business priorities.
• Executive KPI Dashboards – provide “how is my business running” summary in graphical format that is mobile-enabled for smart device use, and is interactive for drill-down.

The dramatic change in network complexity, increased connectivity, new devices, and monitoring instrumentation is shifting the evolution of traditional NMS and ENMS solutions and increasing advances in device support and auto-discovery, fault and performance monitoring, event management and correlation, service assurance, and business impact dashboards.

Combined with new innovative and flexible architecture, automation improvements that will dramatically speed up deployment and customization, and cross-technology analytics and presentation, the new network management paradigm will enable significant reduction in vendors’ time to market and providers’ total cost of ownership, while driving a substantial increase in the quality of customer experience.

New NMS and ENMS solutions will require evolution of the aforementioned traditional functionality re-packaged into more advanced Best-of-Breed plugs-ins that are smartly integrated into a plug and play architecture. Innovation and focus on automation, seamless multi-functional integration, simplicity of presentation, and completeness of end-to-end service visibility will differentiate successful vendors and implementations.
Paradigm shifts and increased competition will force vendors to deliver more advanced functionality, simpler deployment designs, and efficient NMS & ENMS integration capabilities to service provider operational teams faced with supporting and managing multiple services and applications provided over multiple service elements with multiple ways to display faults, performance, and service quality information. The implications are significant and success will come to vendors who will be able to differentiate.

Managed networks exist everywhere – Telecommunications networks, Utilities networks, TV and radio broadcast networks, Government and Public safety networks, and Transportation networks. Each encompasses equipment that can fail with various built-in levels of self-monitoring and capabilities for external monitoring. Diversity of equipment is a major challenge for NMS and ENMS vendors that must deliver a seamless integration.

The rapid increase in network complexity, new technologies and protocols, new applications and services, customer demand for visibility into quality of provided services accelerate providers’ demand for advanced and cost effective NMS and ENMS solutions.

Faced with this paradigm shift, vendors hurry to adapt new approaches, improve network auto-discovery and registration, add more advanced root-cause & correlation capabilities for event reduction, build robust analytics for service assurance in shared multi-service networks, re-design aging architectures, increase automation and integration, and focus on End User QoS.

This is a daunting task for vendors, that requires innovation, critical thinking, technical and business partnerships, and the ability to adapt, simplify and offer common management solutions across multiple domains of technology.

It is difficult to predict what the future will bring but differentiations for successful vendors are clear. The light is starting to appear at the end of the current tunnel, however, transition to new technologies like Cloud and Grid computing is going to change the NMS and ENMS landscape even further.
Customers desperately need the agility that Cloud brings. The big four will need massive architecture changes to adapt to the new model. Customers will need to adapt too. End-to-End solutions in the Cloud landscape are just the TIP of the iceberg. Customers may need to undergo transformation of business processes, organizational structures, and knowledge management that in combination with a more advanced hardware and software will offer more comprehensive end-to-end solutions. This will add to vendor transformation challenges but the changes they undertake to differentiate now will make it easier.

Conclusion

- Rapid growth of networks and endpoints, convergence of services and instrumentations, and cloud computing and virtualization will drive a paradigm shift in NMS and ENMS that will necessitate increased end-to-end visibility, technology-independent service assurance, flexible architecture, support of many hundreds of device types, automation, and powerful GUI and analytics.

- New customer demand for more visibility of provided service, and Service Provider demand for dramatic cost reduction will change the NMS and ENMS vendor landscape. As vendors must adapt and bridge instrumentation, innovation will gain importance. Large vendors will either leap again by buying new companies or most likely offer re-packaging and enhancements of the current portfolio.

- Aging architecture, loosely integrated portfolio, large customer base, and rigid product licensing models will impair their ability to change fast and meet customer demand for value. This will open an opportunity for experienced mid-size NMS vendors to gain market share in mid-size or regional service provider markets by offering game-changing innovations. With the right packaging some vendors will be able to leverage Best-of-Breed functionality by partnering with large vendors.
Alternative to IBM/Tivoli for Network providers

Case Study of NetBoss and Netcool product portfolios
This section analyses two Network Management solutions that started their journey two decades ago and have since gone through substantially different stages of evolution. The focus is to examine their role in the marketplace today and assemble a clear picture of how they differ in terms of product approach, functionality, architecture, implementation and their relative strength to meet the NMS and ENMS paradigm shift to the future.

The analysis methodology includes reviewing the product evolution, product positioning, technical architecture and functionality, strength and weaknesses, and comparing their approaches to succeeding in the current and future marketplace.

Analysis areas in comparing these two solutions:

1) Evolution and positioning
2) Architecture and functionality
3) Deployment and administration
4) Integration and support

The first vendor solution of this study is part of IBM's network and event management portfolio. It includes several Network Management products packaged with a very fast and robust Event Management MOM (Manager of Managers). This solution developed twenty years ago scales well and primarily targets ENMS in large enterprises that need to process a high volume of events.

The second vendor solution of this study includes the NetBoss Technologies product family for managing fault, performance, and service assurance of Network Service providers. NetBoss Technologies is a privately held young company that incorporated three years ago with a goal to develop a new generation service management platform to improve and transform their installed base of NMS Fault Management products and associated customers acquired from Harris Corporation into the Best-of-Breed Service Assurance solution for multi-service multi-technology network providers.

These two companies are very different and compete most directly in selling to network service providers. IBM is the largest revenue vendor of ENMS solutions that include nearly a dozen products in the Tivoli portfolio that were acquired from smaller companies.

Tivoli solutions use a technical architecture based on the loose integration of acquired legacy products and require expensive deployment and administration. IBM is neither an innovator nor focuses on customer value and costs. NetBoss Technologies, in contrast, is creating a shift in the network management paradigm and implementing differentiators in functionality, architecture, automation, advanced features and innovations that focus on customer value and associated service management.

Moreover, NetBoss Technologies is partnering with customers and third party vendors to offer integration of customers' OSS solutions by bridging the gap between their Customer Care, CRM, Billing, Service Assurance, Service Fulfillment, and Network Planning and management tools.
Evolution and positioning

IBM/Tivoli Solutions

The Tivoli Netcool product family comprises several products acquired by IBM in 2006-2009. In 2006, IBM made a large acquisition valued at $865 million. It purchased Micromuse, which had a significant share of the Telecom market. Micromuse had also assembled the Netcool family through a number of acquisitions. Micromuse established itself as a Best-Of-Breed MOM with a large in-memory database capable of processing millions of events and a large library of probes for capturing and manipulating events. With the Micromuse purchase IBM rapidly became the largest player in the Telecom market.

With the Micromuse acquisition, IBM/Tivoli has offered their large customer base a phased migration path from aging TEC (Tivoli Enterprise Console) and Netview (Network Management product). In the years since acquiring Micromuse, IBM has also purchased several more companies and integrated their products into the Tivoli Netcool family. In addition, Tivoli moved to integrate Netcool with a monitoring solution acquired from Candle. Further, Netcool integration with an auto-discovery product (TADDM) and a business service impact product (TBSM) added a BSM value to the Netcool portfolio.

With this strategy of integration, Tivoli continued expanding its customer base and revenues primarily in the Enterprise Management market. With its Micromuse/Candle acquisitions, IBM replaced a very complex product with a pair of equally complex, equally expensive, and only partially compatible products. Investment in integration fit well into IBM’s Enterprise Management strategy and relationship with large customers. However, IBM has made no effort to replace this aging architecture or to reduce total cost of ownership, often forcing large companies to search for Tivoli alternatives and medium/small companies to exclude IBM from consideration or to switch to Best-of-Breed vendors.
NetBoss Technologies Solutions

The NetBoss Technologies product portfolio is evolving rapidly to meet service provider challenges in transforming Network Management solutions to Service management. A cornerstone of NetBoss Technologies’ portfolio, NetBoss XT is the latest generation of network and service management products targeting multi-vendor, multi-protocol, multi-service environments. The NetBoss XT product is well positioned in OSS by offering Best-Of-Breed Network and Service Management functionality.

Unlike IBM’s Netcool Solution, NTI’s XT product is a new solution based on state of the art software platforms and network/service information modeling paradigms. This forms the basis for dramatic improvements in automated deployment, highly effective root cause analysis and associated reduction in professional services costs and ongoing operations. The XT product line benefits from over 15 years of experience with NTI’s first generation product, Manage. IT, that runs to this day in over 200 customer installations.

NetBoss Technologies, Inc. is a private corporation that incorporated in 2010 after buying the NetBoss business from Aviat Networks, Inc. Harris Corporation started the NetBoss Manage. IT business in 1995 which subsequently sold into the joint-venture company, Harris Stratex, in 2007 later rebranded as Aviat Networks, Inc. Aviat Networks invested in the NetBoss XT product and, in 2010, introduced NetBoss XT to provide service quality management capabilities that focused on customer experience.

Since acquiring the NetBoss business, the NetBoss Technologies team extended the NetBoss portfolio by adding superior model based root cause analysis, the ability to identify impact to End User services, improved visualization, and performance management, and is in the process of integrating today’s distributed software bus architectures, while enabling third parties and customers to develop their own interfaces into new network technologies and devices. NetBoss Technologies focuses on innovation to differentiate its portfolio in network service assurance and continues to invest substantially in new technology.
Architecture and Functionality

IBM/Tivoli Solutions

IBM/Tivoli offers an integrated network and service assurance solution portfolio, comprising performance management and fault management, plus customer experience, service quality, and business service management. Almost a dozen products comprise the Netcool portfolio:

- Netcool Network Manager for IP Edition
- Netcool Network Manager Transmission Edition
- Netcool Configuration Manager
- Netcool Performance Flow Analyzer
- Netcool Performance Manager
- Netcool Service Quality Manager
- Netcool Omnibus
- Netcool Impact
- Netcool Webtop
- Tivoli Business Service Manager (TBSM)

IBM acquired the aforementioned products and still continues their re-packaging and integration. Each product provides specific functionality and plays a specific role in the overall solution. Each product comes with a long established architecture, separate databases, and middleware. Instead of re-designing architectures, IBM focuses on building interfaces, re-packaging components, and creating shared framework for virtualization through the Tivoli Integrated Portal.

IBM uses product packaging to offer end-to-end Network Management and integrate network management with other Tivoli solutions like server, database, and application monitoring, and IT and business process management. Netcool products can be grouped into three major areas of functionality:

1) Network discovery, status monitoring, performance monitoring, and configuration (the first six products);
2) Event correlation, root cause analysis, visualization and management (Omnibus and Impact); and
3) Network visualization and service impact dashboards (Webtop and TBSM).

The event processing and service impact dashboard functionality is also used by Tivoli’s non Netcool solutions for managing a wide variety of applications.

Netcool solutions are product bundles that are integrated to provide end-to-end business functions. Some product licenses include a full version of other products that are also offered separately. This product bundling approach exposes IBM’s outdated architecture, duplicate licensing schema, and the limits on its ability to re-design and innovate. It also burdens customers with the high cost of training, complex custom integrations, and limited availability of skilled resources.
In addressing functionality, it is fair to evaluate how well this function performs what it is designed to do, and its role in contributing to the business value of particular Netcool solutions. IBM’s packaging and branding can be confusing. For example, Netcool Network Manager for IP (ITMN) is called a product rather than a solution but its end-to-end customer value is provided by components in ITNM, Omnibus, Impact, and Webtop products.

Key functions of Network Management solutions include auto-discovery of network elements and topology, polling status of network devices, collecting network performance data, enriching events, reducing event flow, visualizing network topology, device status, KPI/KQI dashboards, and management reporting. The Netcool portfolio delivers key functions as follows:

- Network Manager for IP auto-discovers Layer 2 (Ethernet Switch) and Layer 3 (Router) discovery and supports MPLS, OSPF, VPN, VLAN, BGP, NAT, HSRP, ATM network protocols. It provides a set of ready-to-use device and interface polls, including ICMP polls and MIB variable threshold polls that generate alert events.
- Network Manager for Transmission provides discovery for multi-technology telecommunication networks and supports WDM, SONET/SDH, xDSL, and ATM (EMS integrations) network protocols. It collects any network data, including fault, inventory, facility, and connection information.
- Performance Manager supports fixed/IP (wireline) and mobile (wireless) networks and provides a comprehensive, flexible, and scalable performance management with visualization and reporting of network performance data for complex, multivendor, multi-technology networks.
- Performance Flow Analyzer provides visibility into end-to-end resource usage and generates detailed network traffic reports from flow information records such as NetFlow and IETF IPFIX.
- Configuration Manager provides extensive configuration management capabilities for network devices, as well as network policy thresholding capabilities.
- Omnibus tracks alert information in Object Server, which is a high-performance, in-memory database, and presents information through configurable filters and views. Omnibus has automation functions that can perform intelligent processing on managed alerts forwarded from external programs such as probes and gateways.
- Impact enables event enrichment and intelligent event correlation through context driven automation. Impact provides an advanced policy engine that allows an administrator to define actions for event prioritization, analysis and impact.
- Webtop provides a Web console for visualization of network topology views, faults, services, and key performance indicators.
- TBSM monitors Omnibus events based on a service dependency model built by users, calculates service status and KPIs, tracks SLA violations in real-time, and visualizes them in Webtop Web console.

Most products come with a built-in failover/failback capability. Out-of-the-box, IBM delivers products that contain framework components and management applications functionality that uses the aforementioned key functions to provide default set of customer value through product integration.
As a Network Management Solution, for example, ITNM allows a customer to perform the following functions:

- Discover, poll, and visualize complex networks, containing a wide range of device types.
- Visualize organized network views of discovered networks.
- Visualize topology of hop views of discovered network devices.
- Determine Root Cause Analysis of network outages based on topology dependencies.
- Visualize real-time network status events in customizable Omnibus event lists.
- Visualize business impact in customizable Webtop dashboards.

The IBM/Tivoli Netcool portfolio includes two key products that are a cornerstone of Tivoli product integration:

**Omnibus**

- Omnibus software provides a central point for real-time, centralized monitoring of complex networks, IT domains, applications, and business services with scalability that exceeds millions of events per day.
- Omnibus includes probes and gateways that collect managed events, use automation functions to process them, store and manage them in the Object Server database, and display them in the event list.
- The Object Server uses de-duplication to ensure that event information generated from the same source is not duplicated in the event list. Repeated events are identified and stored as a single event to reduce the amount of data in the Object Server that maintains the count (tally) of the event total recurrences.
- Omnibus provides a number of standard desktop tools that enable manipulation of the events in the Object Server (Conductor, Event List, Filter Builder, and View Builder applications) and allow viewing of the current state of the database and systems being managed.

**Impact**

- Impact software provides an advanced policy-engine that allows development of policies for enriching event information, defining actions, and automating tasks.
- Impact can automatically collect context from any existing tools and data stores and inject it directly into events and incident tickets.
- Impact can dramatically reduce event volumes by suppressing maintenance events, non-service impacting events, false alarms, and by contextually correlating multiple events into a single actionable event.
- Impact can streamline event escalation and notification, display and launch corrective actions directly from event and incident views, analyze the business impact, and correlate against business service models.
NetBoss Technologies Solutions

NetBoss Technologies offers a portfolio of several NetBoss products pre-integrated into a turnkey-system for managing complex multi-vendor networks. The NetBoss portfolio also provides interfaces to several trouble, asset, and fulfillment management products.

The flagship NetBoss XT product offers a rich set of features in a single application. Its state of the art technology provides significant enhancements over their mature OSS Manage IT product that has benefited from over 15 years of NOC implementation experience.

These NOCs are designed to manage and monitor multi-vendor, multi-protocol network infrastructure, including various subscriber access, 4G/LTE access, IP backhaul, and core network technologies, as well as network elements providing energy, security, and surveillance controls. It provides around-the-clock network surveillance, performance monitoring, and trouble ticket management for voice, video, and data networks.

NetBoss Technologies, the Best-of-Breed solution provider in Service Assurance, offers five tightly integrated components:

- **NetBoss Acuity** is an End-User Service Quality Management solution.
- **NetBoss Statewise** is a next-generation Service Impact and Root-Cause Analysis and Service Impact solution.
- **NetBoss Performance** is an all-in-one appliance that provides performance management across both the telecom and IT domains.
- **NetBoss Executive Dashboard** delivers highly mobile and interactive analytics across the fault, performance, service and trouble management domains.
- **NetBoss XADE** is an agent development toolkit that enables customers to create their own model-based interfaces to element management systems, network devices and/or OSS/BSS solutions.

### Value proposition differentiators:

More contemporary technology
- Runs on a variety of Platforms
- Scales from small to large
- Model and Object Oriented based
- Retains a real-time Network Model
- Rapid install & deployment time
- Tight Integration of applications

Greater ROI
- Requires less ongoing admin
- Tools for customization
- Tools to build your own Agents
- Ability to create Policies
- End to End Visibility
- Equipment Vendor Agnostic

Lowers MTR
- RCA-Correlation Value Packs
  - Topology Correlation
  - Service Impact
- Vendor Neutral
  - OSS/J Interface to Remedy
  - Open API for interfacing to other applications

Next Generation Performance Appliance Technology
- Scales from Small to Very Large Network
- Integrated with Faults

Next Generation End User OSS
- TR-069 Capability
- GIS
- Integrated with OSS/BSS (Trouble, Service Order, Billing)

Smaller Company
- Customers get more detail attention
- System installed by NTI experts
- Supported by NTI support staff
The current NetBoss XT architecture is data-driven, cross-platform, and includes patented modeling technology that adapts to network changes automatically. It is optimized for high-volume event processing, includes an online data repository, and provides a rich set of graphical interfaces. It is integrated with other NetBoss products via data and event adaptors. NetBoss Technologies is also integrating a new more flexible software bus architecture that will enable plug & play component plugins.

**NetBoss XT – Role and Functionality**

NetBoss XT focuses on delivering Service Assurance for wireless, fixed and converged networks, value added service delivery platforms and server farm platforms. This feature-rich product offers configuration management, performance analysis, service impact analysis, trouble management, interactive dashboards, and network modeling capabilities. NetBoss XT supports a high volume of event processing and a large range of network device types. It provides superior situational awareness through superior GUI, advanced interactive dashboards, and automated service impact analysis and response.

**Key functions:**
- Built-in agents for several hundreds of device types
- Agent development environment
- GUI based Network modeler and Policy modeler
- Multi-protocol network support
- SNMP manager and trap-based auto-discovery
- Alarm/trap processing and event correlation
- Domain and Path management
- Alert reporting and alert/MO history
- Topology, Geographic, and Active control diagrams
- Policy management and auto-notifications
- Customizable context-sensitive actions
- Rich Service Assurance GUI

**Statewise – Role and Functionality**

NetBoss StateWise is a fundamentally different Root Cause and Service Impact analysis platform. Incorporating a pre-built, automatically maintained “topology model” that accurately reflects the structure of the real problem state, it also contains state propagation mechanisms and connectivity information. The immediate benefit of this approach is that it vastly reduces the number and complexity of the rules: scenarios that currently require hundreds of rules can be implemented easily using a small number of high-level rules.

In addition, a powerful but easy-to-use GUI allows problem domain knowledge to be expressed using natural, familiar constructs, enabling easy definition or modification of the few rules that are required to handle a particular scenario.
StateWise provides Value Packs (FTTH, DWDM, MPLS, RAN, IPL2, Power, etc.) with predefined rules to support these technologies. The Value packs also interrelate to each other as the carrier expands their network and installs the new technology. This will reduce the time required to get a customer up and running and reduce the ongoing admin versus writing countless rules.

StateWise uses data-driven network models and simple yet powerful high-level rules to achieve complex correlations. A user with problem domain knowledge can quickly and easily construct correlations for any type of network using the visual tools provided. This is achieved without having to invest in understanding proprietary technologies or recourse to complex rules and expensive and time-consuming software development. StateWise achieves the same result as the human operator - quickly, reliably, efficiently and automatically, vastly improving fault resolution times and reducing service impact.

Fundamental to the operation of StateWise is the state mesh. At its simplest level, it is a structural model of the managed network it is attached to and associated services. It incorporates a set of objects, each representing some (physical and / or logical) component of the managed network, linked together by a set of navigable (associative, containment and / or inheritance) relationships.

The availability of the state mesh considerably simplifies the whole process of constructing rule-based event correlations. This is because it handles the following tasks that are traditionally the responsibility of the defined rule-base in simpler systems:

- Dynamic establishment and maintenance of relationships between modeled network components.
- Dynamic establishment and propagation of state information between modeled network components.

Key Functions:
- Collecting event and topology data from NetBoss XT for processing by Statewise state models
- Scenario Manager GUI to configure Filtering & Mapping rules and store them in Value Packs
- Alarm mapping directly onto state aware topology model object with efficient cashed DB lookup
- Maintain state-aware network models of physical, logical, and service entities and relationships
- Correlation rules automatically identify network problems and generate problem reports
- Correlation rules automatically identify service impact and generate service reports
- Root Cause Analysis continuously maintains relationships between Service and Problems reports
- Raise, update and clear alarms, associate and disassociate contributory and sympathetic alarms
- Create, update, and close trouble tickets associated with generated Problem and Impact reports
- Continuously monitor Service Level Agreement in real-time using Service Impact reports

The StateWise appliance is applicable to virtually any type of network model and is capable of cross-domain correlation.

**Acuity – Role and Functionality**

Acuity provides a revolutionary top-down approach to management from the customer QoE perspective, and is offered as an appliance or cloud-based solution. Acuity focuses on how service interruptions are impacting end users for proactive analysis by customer service and field teams. Acuity directly monitors
network elements looking for service impacting events, filters and correlates these events, and acts just like an operator who diagnoses and pinpoints the problems that are impacting end customers.

With executives and staff having a real-time status of network services, and a Google map that pinpoints what requires resolution, Acuity transforms end-user service data, combines trouble ticket, billing and location data into actionable information to assure rapid proactive problem resolution.

Key Functions:
- Direct Interfaces to OSS and BSS systems
- Multiple levels of users and roles
- Role based dashboards and navigation flow

Acuity benefits a broad spectrum of users and purposes:

**Operations and field technicians**
- Interfaces directly with network devices to deliver pinpoint issue identification.
- Delivers trouble tickets based on service impacting events.
- Combines information from BSS applications, including billing and trouble ticketing.

**Customer service and dispatch**
- Identifies service-impacting events (alerts, alarms, and performance), filters and correlates these events, and acts just like an operator who diagnoses and pinpoints the problems that are impacting end customers.
- Shows staff a real-time display (also sends emails or text messages) pinpointing exactly what requires resolution and is able to track the trouble management progress.
- Automatically passes significant detail to a trouble management system to:
  - More efficiently schedule and dispatch repairs.
  - Send the right technician to the right location to improve efficiencies.
  - Improve overall customer satisfaction to facilitate new service introduction.

**End customers**
- Accommodates each company configured with an SLA by making a portal available for the end customer (the CSP’s customer) to view the current SLA status.

**Executives**
- Automates processes and pinpoints problems to provide immediate value and a rapid ROI.
- Minimizes unnecessary and re-service truck rolls.
- Identifies problems faster and with fewer staff.
- Focuses the entire staff on “customer first.”
- Provides a single view with details of customer’s service package, usage statistics, and trouble repair history.
- Lowers cost by reducing the need for additional network operators and improving customer satisfaction by directing staff to resolving the issues that are directly affecting customers.
Deployment and Administration

IBM/Tivoli Solutions

IBM/Tivoli’s focus on delivering a product integrated framework with a large number of customizable components leads to costly deployments with lengthy rules development. IBM/Tivoli products can be installed in hours but configuring and customizing them may take days and sometimes weeks. Some products come as toolkits with many scripts that need customization. Others, like Omnibus, come with a large knowledge library of scripts that can be customized and reused. But any new automation requires new rule development.

Most of IBM/Tivoli’s products include interactive GUI installers along with console and silent install options. Very few products provide GUI for customization, however. This could be explained by product evolution. New products must adhere to IBM standard policies that mandate use of GUI installers, use of WebSphere middleware, use of Eclipse tools for customization, and a TIP/Cognos framework for reporting.

This increases ease of customization but often elongates its process. Initial product deployments require skillful and costly SME resources that deploy, configure, and customize products and create detailed instruction guides for ongoing effort by customer staff. A new IBM strategy for packaging includes shipping VM images with pre-installed products. This strategy, however, has not significantly reduced product deployment time which is driven primarily by the required customization and integration effort.

Administration of installed Tivoli products is costly as well. Because of a large customer base and the diversity of platforms and devices, IBM/Tivoli usually delivers maintenance Fix Packs quarterly. They are often large and may break the installed version of the product. IBM also makes available small incremental patches and provides fixes to PMRs opened by customers. Unless customers need them to fix an immediate problem, most customers wait until Fix Packs become available. Many customers are risk adverse and skip maintenance or opt for lengthy testing in test environments.

Product administration is more straightforward and can be easily handled by a customer’s resources. However, maintenance delivery by development teams can vary by products and product dependencies sometimes require prerequisite fixes to other products. Tivoli provides detailed instructions for installing fixes with automatic backup of replaced modules.

Of greatest concern to prospective users of IBM/Tivoli products is they are not installed and commissioned by IBM. Instead, integration partners with varying degrees of experience are used and results vary greatly. Often, inevitable technical challenges encountered during the integration and support phases of a project fall in the gap between IBM as the product owner and the integration company.
NetBoss Technologies Solutions

NetBoss Technologies solutions are simpler and installed turnkey using in-house engineering teams led by PMP certified Program Managers. They are much faster to install and configure. No rules programming is required and all customizations except custom agent development can be performed via GUI. Custom agent development, if needed, is done by NetBoss Technologies staff.

NetBoss Technologies provides training and agent development environments. Local integrators and large customers have also developed agents.

Product deployment as well as code patches when required are handled by NetBoss Technologies support and field personnel. NetBoss Technologies delivers maintenance code several times a year.
Integration and Support

IBM/Tivoli Solutions

Low quality architecture for the whole Tivoli line is a problem. The same functionality can be provided more elegantly and more flexibly, with less complexity and with less cost. Tivoli portfolios became a strange mix of the products that were bought, not developed in-house. This underlying architectural diversity, with its functionality overlaps, is a serious issue. IBM’s focus on integration is driven more by product strategy than by a desire to simplify and improve outdated products.

The Netcool product line does not represent state of the art in the fast moving network management field. It suffers from non-uniformity of architecture and an unfriendly scripting environment. With its focus on product integration, IBM/Tivoli is trying to defend and expand its market share at all costs. Product integration to add cross-product management applications provides customer value while using product bundling to accomplish it, often increasing support costs for IBM/Tivoli and significantly increasing the total cost of product ownership for customers.

The majority of integrations between various IBM/Tivoli products is provided by development teams, and planned activities. IBM/Tivoli does not provide integration with other vendors unless they are demanded by large customers or strategic considerations. IBM/Tivoli products are complex and include many components. Loose product integration and bundling require more than one SME for implementation. IBM has a large services organization but still lacks resources to meet demand, particularly for custom automation and rule programming required by Omnibus.

This has created an opening for third party integrators/consultants but has caused significant burden/risks for existing and prospective customers. Technical challenges, costly delays, scarcity of skilled resources, customer inexperience and need for training, are increasing the rate of failed implementations. Moreover, results vary greatly depending on third party experiences and resource availability. Customers are also greatly concerned about long-term sustainment costs for already implemented IBM/Tivoli solutions.

Product bundling increases maintenance and support fees. IBM L2 and L3 teams have a product-related structure. Development cycles for many products are different. So version compatibility is a big problem, particularly for applications sharing the Common Data Model (CDM) or Tivoli Integrated Portal (TIP). In addition, integration related problems force customers to deal with several support teams. Often the cost of maintenance and support becomes too high compared to the value provided, and forces customers to look for alternatives.
NetBoss Technologies Solutions

In contrast with IBM/Tivoli solutions, NetBoss Technologies’ turnkey solution provides a large number of features in a single fully integrated product (the NetBoss XT product). Network Technologies’ turnkey solution often includes design of Service Assurance for customers as well as deployment of NetBoss XT to manage it.

Deployment and maintenance costs are low. Furthermore, a flexible licensing and agent development environment keeps the total cost of ownership (TCO) low for customers while retaining the flexibility to grow and evolve with changing network management requirements.
Case Study Conclusion

NMS and ENMS customers and vendors are undergoing an evolution that requires a new structural model. Vendors must be innovative and have the ability to address changes in technologies and adapt to customer practices. Customer focus, flexible architectures, and product strategies for adapting to a complex mix of technologies and applications, becomes a very important factor in NMS and ENMS vendor success.

Customers are re-engineering their networks and moving from outdated WAN technologies to cloud and virtualization. They are making a transformative shift and are willing to invest in new solutions that ensure an integrated end-to-end view of their data center and network infrastructure. They are challenging NMS and ENMS vendors to rapidly change from simply monitoring network infrastructure to managing customer’s service, business availability and performance, including solutions that integrate well with business process management system.

In responding to new challenges, IBM/Tivoli and NetBoss Technologies use different approaches and differentiators:

- **IBM/Tivoli** responded by re-packaging and re-branding old products. In response to customers’ shift to Cloud infrastructure, IBM re-branded Tivoli products into IBM Cloud and Smarter Infrastructure. There are hundreds of applications that IBM is trying to slightly re-package under this re-branding umbrella. IBM is not making needed investments to improve architecture.

- **NetBoss Technologies** responded by expanding functionality, transforming architecture and visualization, focusing on adding customer value applications and advancing service assurance. With new product offerings, innovations in their flagship NetBoss XT product, flexible plug and play architecture, automation and technology independence, innovative Root Cause Analysis and End User QoS solutions, NetBoss Technologies is building Best-Of-Breed NMS multi-technology multi-services solution.

NetBoss products have a significant advantage over Netcool products in customer value proposition, including:

- Total cost of ownership
- Out-of-the-box customer value
- Vendor neutral integration
- Ease of use, deployment and administration
- Next generation technologies
- Greater ROI

Moreover, as a small company NetBoss Technologies offers customers more detailed attention, including installs and support by company experts. NetBoss’s better technology and better value proposition make NetBoss products an excellent alternative to Netcool products in the NMS Server Provider market space.
Case Study Results

The main focus of this study was on the NMS value of Netcool and NetBoss portfolios and their differentiation as alternatives in the service provider marketplace. This analysis evaluated IBM/Tivoli NMS and NetBoss Technologies NMS offerings, their technical capabilities, ease of use and implementation, integration capabilities, operational effectiveness and value to customers.

- Compared to Netcool products NetBoss products provide several next generation functions.
- NetBoss architecture is more flexible and modern, while Netcool architecture is outdated.
- NetBoss offers significantly more advanced GUI and administration tools, much easier to use.
- Netcool integrates well mostly with other Tivoli products while NetBoss interfaces are open.
- Netcool requires skilled rule programming while NetBoss provides GUI modeling tools.
- Customer focus is much better and the total cost is much lower for NetBoss vs Netcool solutions.

Evaluation criteria and evaluation results for both solutions are summarized in the table below.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>IBM/Tivoli</th>
<th>NetBoss Technologies</th>
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<tbody>
<tr>
<td>Correlation &amp; Root Cause Analysis</td>
<td>Gateway plug-in that provides root cause analysis through downstream event suppression, Limited.</td>
<td>Statewise provides logical model, state and stream correlation, automated root cause analysis, and service impact. Superior.</td>
</tr>
<tr>
<td>Ease of Deployment</td>
<td>Ease of product installs but complex product configuration, product dependencies.</td>
<td>Straightforward vendor deployment and customization,</td>
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<tr>
<td>Customization</td>
<td>Long and costly customization, extensive rule programming, require SME consultants.</td>
<td>GUI modelers, no programming.</td>
</tr>
<tr>
<td>Integration</td>
<td>Loose integration, complex product bundles increase cost of maintenance and support.</td>
<td>Turnkey solution, single product architecture.</td>
</tr>
<tr>
<td>Scalability</td>
<td>In-memory database, scalable to support large event volume.</td>
<td>Scalable, supports intelligent event reduction.</td>
</tr>
<tr>
<td>Extensibility of architecture</td>
<td>Low quality, outdated and inflexible architecture.</td>
<td>Changing to provide plug &amp; play flexible architecture.</td>
</tr>
<tr>
<td>Fault &amp; Impact Analysis</td>
<td>Limited basic analytic, extensive rule programming, advanced requires TBSM.</td>
<td>Extensive analytics, Service assurance, rich set of default dashboards, focus on QoE.</td>
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<tr>
<td>Clustering &amp; Failover</td>
<td>Primary/backup server configurations, automatic failover and failback.</td>
<td>Clustering via Distributed Bus Grid.</td>
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<tr>
<td>Total Cost of Ownership</td>
<td>High license costs, high maintenance cost, high implementation and support costs.</td>
<td>Low cost flexible licensing, low deployment &amp; maintenance &amp; and support costs.</td>
</tr>
<tr>
<td>Product value</td>
<td>Outdated, in-flexible, high cost, large customer base, long/complex deployment.</td>
<td>Innovative, flexible, low cost, extensible, small customer base.</td>
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