Integration Issues for Multivendor Network Management Solutions

Are you prepared to avoid the pitfalls?

Manage the complexity and technical challenges of multiple network management platforms and technologies

This white paper addresses:

- The importance of network management integration
- Current issues in multivendor network management
- Strategic recommendations for vendors, system integrators, and service providers

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Abstract

Vendors, integrators, and service providers are continuously examining the technical challenges that arise from deploying multiple network technologies and related management solutions. Maintaining an understanding of the integration requirements for each network technology, such as Local Multipoint Distribution Systems (LMDS), point-to-point radio technology, Synchronous Digital Hierarchy (SDH), Internet Protocol (IP), Wavelength Division Multiplexing (WDM), xDSL (Digital Subscriber Loop technologies), Asynchronous Transfer Mode (ATM), Frame Relay, and Legacy Voice is, in itself, a challenge. Exploring the implications of deploying multiple network management technologies increases the complexity of the integration challenge. By the nature of their service offering, wireless services providers that plan to migrate from 2G to 3G wireless networks are often required to deal with this challenge: namely, how should network management systems for 2G and 3G networks integrate before, during, and after the migration? This paper discusses the lessons learned by Lucent Worldwide Services (LWS) in building layered solutions that cross multiple network management platforms and technologies and concludes that properly framing the question, or defining the true objective of a proposed network management integration, is an essential key to success.

"Network elements integrate well. Network Management Systems do not integrate as well."

Introduction

This paper assumes that the reader audience is familiar with the general observation among service providers that network technologies integrate well at the protocol and physical interface level, mainly due to the impact of published standards and inter-vendor agreements. In general, the body of standards, dialects, and differing interpretations notwithstanding, enable Vendor A's wires to plug into Vendor B's box and the network elements to exchange signals and packets across the link.

Once the network elements are connected, communicating and operational, the tasks of network and business management must be addressed. This brings us to the following question: "Do the different vendors' Network Management Systems (NMS) and Operational Support Systems (OSS) integrate as well and as readily as the network elements they manage?" The spectrum of responses to this question ranges from: "Yes, because I picked compatible systems in the first place" to "Maybe, once I solve some tricky software application and database integration problems" to "Well, I thought open software standards like Java, UNIX/Linux, SQL, and CORBA allowed me to integrate software-based network management and OSS systems. Who is now telling me that these standards do not solve my integration problems?"

The essential observation is that multivendor network management systems do not integrate as easily and as automatically as network elements. That said, there is no avoiding the need to manage multivendor networks, and no avoiding the consequence of using multivendor network management systems and their incumbent interfaces.

Several questions arise regarding multivendor, multiservice service provider requirements:

- Which network management functions require the use of multivendor management systems?

- When and how should the multivendor network management systems be integrated to support specific network management functions?
- What problems should be addressed solely by systems integrators and how?
- What integration problems should service providers address themselves when they issue their RFPs?

Before examining the perspectives of vendors, service providers, and integrators and the role each can play in addressing the integration problem, this paper will review some of the common issues in multivendor network management.

Current Issues In Multivendor Network Management Technology

"Better preparation and problem analysis of integration issues is mandatory if service providers are to avoid common deployment pitfalls."

The typical network infrastructure environment and the typical functional solution to manage it are both complex. It is a domain that is hard to decipher and even harder to implement from the viewpoint of network element integration, network management system and an OSS integration. Following are some common issues that confront service providers, vendors and integrators:

- Different solutions from different vendors – Network element technologies integrate relatively well due to necessary compliance with hardware, electrical, and protocol standards. Network management technologies do not integrate as well "off the shelf." One reason for this is the characteristic of software that permits alternative solutions to the same business problem (such as provisioning, for example). How many user interfaces must a service provider interact with in order to accomplish the same result on different vendors' equipment? The answer is one interface per vendor, at a minimum. The market abounds with differing approaches to the design, presentation, and interaction of the operator interface at the network management console. This is just one component of a typical NMS application.
- Poorly defined operational requirements – Better preparation and problem analysis of integration issues are mandatory if service providers are to avoid common deployment pitfalls. Integration preparation must take into account both the service provider's network needs and its operational needs. These two categories of needs are not generally addressed as joint requirements in service provider-issued RFPs. Typically, RFPs contain an extensive discussion of network connectivity issues to assure necessary compliance with connectivity, interoperability, and performance to support the defined service type. The issue of how the new or evolved network will be managed as a business is often an afterthought. This is not to lay fault at the RFP process. Rather, this is the manifestation of a natural tendency to first solve the network connectivity problem, and only later follow up with the required network management solution to support it. A key recommendation of this paper is that both issues be defined and addressed at the same time.
- Open yet incompatible systems – Vendors commonly adopt open, adaptable standards and practices into the design of their NMS/OSS products. However, "open" and "adaptable" do not automatically translate into "compatible" and "inter-operable." Network management

products continue to be developed and delivered as standalone systems. Complicating the situation, few readily universal standards allow vendors to present their network management data from system to system. Let us look at a trivial yet illustrative example:

> Network Vendor A's method of representing a U.S. telephone number may use the following format "NPA-NXX-LINE." Dashes are used to separate the area code, exchange, and line fields of the number string. Vendor A uses this format to store telephone numbers in its "accessible" database. Vendor B represents the same data element as a continuous string without the use of dashes to format the telephone number: "NPANXXLINE." Vendor B stores telephone numbers using this format in its "accessible" database. This simple example illustrates that an integration solution, which allows both records to be correctly recognized, will require the implementation of a translation routine. This is despite the fact that both vendors are maintaining the information in open, accessible databases.

"The desirable objective of seamless access to network management data does not necessarily require that all network management systems be consolidated onto a single platform or into a single system."

Vendor Perspective of Current Multivendor Network Management Issues

In this section, we review the network integration management issues that confront vendors and the strategies they should adopt to best serve their customers (the service providers). The desirable objective of seamless access to network management data does not necessarily require that all network management systems be consolidated onto a single platform or into a single system. It is sufficient to identify and implement selective communications between systems furnished by different vendors so that information required to serve the needs of network managers is accessible in a seamless, easy-to-access, easy-to-use fashion.

Vendors are likely to encounter the following issues:

1. Design data sharing into solutions – Vendors must allow selection, filtering, and extraction of NMS data for the purposes of sharing that data with external systems. This requires the vendors to define and publish preferred extraction rules and methods. Integrators and service providers can use this information to assess whether the vendors' network management systems possess the underlying information required to perform the integration.
2. Offer toolkits and other data sharing mechanisms – Vendors are typically required to allow integrators and/or service providers to develop their own extraction tools and applications without the need to modify the underlying NMS product. This allows the NMS database to be tapped as a repository of value-added data, thereby enabling it to support other business functions and needs. This can be achieved by providing toolkits, development tools, and service packages along with the NMS product.
3. Provide consulting services to customer who require them – Another approach for vendors is to offer professional consulting services to integrators and customers. For example, Lucent's trained consulting team stands ready to solve multivendor network integration issues with the *NavisXtend*™ toolkit.
4. Publish architecture framework – Vendors may decide to define and publish an architecture framework, that permits customers, integrators,

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and compatible vendors to understand how the different components of the network management systems perform specific functions such as communicating with network elements, processing and refining incoming data, and storing and sharing NMS data.

5. Develop data sharing policy – Another strategy for vendors is to develop a policy that outlines when and where NMS products can share information with other vendors' products, even if the other vendor may be a competitor. The service provider and/or integrator will then have the necessary means to determine whether the NMS product is suitable for inclusion in a multivendor solution.

Integrator Perspective of Current Multivendor Network Management Issues

This section reviews the technical network management integration issues that confront integrators, as well as the most helpful responses from the vendor and service provider.

1. Integrate in order to satisfy business needs – It is strongly recommended that integrators apply selective integration to NMSs/OSSs so that it matches the true integration need of the underlying network management process(es) being deployed. Consider integrating network management systems only when there is a pressing need to integrate the network management functions.

   For example, it is often the case that separate provisioning systems provided by vendors do not need to be integrated with each other. As long as each provisioning sub-system can interface with the service provider's order entry system in a coordinated manner, there is no requirement for the systems to communicate with each other.

   Depending on the specific requirement, it may be sufficient to ensure that each vendor's system provisions its segment of a common service as long as each network management system keeps an appropriate record. In comparison, alarm management systems may require instant and immediate integration of alarm data originating from different vendors' alarm databases in order to support the network managers/operators need to quickly and easily correlate alarms originating from multiple network elements.

2. Select vendors that have a proven track record – Integrators will tend to select management systems from vendors who have proven capability to extend their applications to support the mutual exchange of network management data, when needed. Integrators will wish to verify that vendors can support and maintain any custom extensions that they propose to furnish or build.

3. Judicious use of vendor professional services – Integrators must reserve the right to retain consulting and professional services support from vendors to help build integration solutions as part of a multivendor task team. Assembling multivendor deployment teams does not absolve the integrator from the responsibility to identify compatible meeting points and to define interfaces between the systems and applications provided by the various vendors. Often vendors are willing to extend their systems outwards to meet the integration needs of a solution, but more often vendors compete with each other to define the meeting point between their competing systems, regardless of their integration capability.

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4. Apply return on investment analysis to integration activities – Integrators are advised to select integration points in a practical manner. Integrate where the business need is greatest and refrain from spending valuable time and money integrating business functions where the return on investment in integration is questionable.

Service Provider Perspective of Current Multivendor Network Management Issues

Finally, we explore the appropriate role and responsibility of the service provider who requests an integrated solution by presenting a business problem.

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1. Clearly define the business problem, not the solution – Service providers would do well to begin by clearly defining the problem through a complete integration preparation and analysis. This begins with a simple cross-platform service and process definition. Service providers are cautioned against attempting to define the technical issues and solutions that are required to perform a proposed integration. A far better approach is to ask vendors to respond and state how their products can integrate with each other (perhaps using a Systems Integrator to mediate) to meet a specific business need, rather than respond to how they plan to solve a specifically defined technology gap. Vendors should be given the opportunity to respond with alternative technical solutions and technologies to meet a specific network management process need.
2. Develop a plan for integrating with legacy systems – If a service provider operates and wishes to preserve legacy systems, a mechanism for interoperating with the new network management systems must be clearly described. Each vendor's ability to integrate to the legacy systems can be evaluated based on their solutions systems' ability to extract, exchange and cooperate with the legacy system across the defined interface.
3. Consider using OSS consultants – Service providers always have the option of using the services of an OSS Consultant to perform the mapping between service order attributes and equipment protocol configurations (e.g. IP, ATM, DSL, etc.) that differ between the various vendors' network elements. This way, the service provider can be certain that each vendor knows and understands whether its specific network element management system has a specific datum within its data model that needs to be declared or handled in the integration scenario.
4. Adopt a measured approach to integration – Service providers should refrain from requesting the implementation of a comprehensive multidomain integration solution within the scope of a single deployment. Service providers should view full automation as a multiphase activity and should encourage participation from the appropriate vendors in order to solve integration issues of provisioning, billing, customer care, and fault management.

5. Ensure that requirements important to you are addressed by the vendor's solutions – Vendors typically develop network management systems that support the most important functions, such as initial provisioning of network elements, as opposed to those functions required to manage and control an element after it has been manually provisioned. Often vendors develop and offer different NMS products to perform these functions. Service providers must ensure that their requirements for provisioning, billing, fault management, and customer care are carefully segregated and defined with equal detail.

6. Document specific integration problems – Service providers can ask vendors to demonstrate how they utilize open, adaptable NMS/OSS interface standards such as those based on UNIX, CORBA, Java, etc. When a service provider has a specific integration that must be solved, its architecture can be documented and used as an example of the roles and responsibilities vendors and integrators will be expected to perform relative to solving the integration problem.

"Service providers must remain committed to the integration project throughout its lifecycle."

7. Define an integration strategy and objective – Service providers must ensure that the objective of the integration is understood. If the service provider's primary objective is to deploy "best of breed" applications, this may be accomplished only by incurring a high price in terms of incompatible NMSs that are difficult to integrate.

   a. If the goal is to simplify network management processes and procedures, then attention must be given to the functions, features, and requirements of the new process.

   b. If the purpose is ultimate automation of OSS tasks and workflows, legacy systems and data that are to be re-used must be clearly identified along with programmable, open interfaces that are available to the integrator. Legacy systems that must be replaced must also be clearly identified.

   c. If the purpose is to link up islands of systems, then the underlying data model must be clearly defined and documented, as well as the messages that the systems will be required to exchange via integration gateways.

8. Stay the course – Finally, service providers must remain committed to the integration project throughout its lifecycle. In many cases, only the service provider has the necessary leverage to bring multiple, possibly competing, vendors to the integration "sandbox" and to ensure that they play together for the benefit of the project.

Summary

Let us recap the questions we asked in the introduction and summarize our conclusions:

- For vendors – Greater cooperation and publication of underlying data-models and data formats are clearly needed.
- For integrators – Learning from vendors and heavy research into the specifications underneath the glossy brochures is necessary. Access to specifications that define accessible interfaces, sources, and extraction methods for network management data is not only mandatory, but is far more important than knowledge of the programming or development standard (CORBA, Java, or C or legacy COBOL) that a vendor adheres to.

- For service providers – Providing access to the internal technical specifications that describe the network management information that needs integration is productive. There must also be a defined purpose to the integration-automation, workflow management or linking up islands of NMS. Unduly emphasizing technologies that must play a role in the integrated solution is often counter-productive. Instead, service providers should share information regarding the data models needed to support the defined operational or business functions that are the target for the integration.

About Lucent Technologies Worldwide Services

Lucent Worldwide Services (LWS) is the industry's leading network services organization with more than 20,000 consultants, network designers, engineers, installers, and technicians located in offices around the world. LWS offers a complete range of professional, deployment, operations, and maintenance services to help maximize your network value. These services support the entire network lifecycle – from initial consultation to network design and optimization, engineering and installation, program management, network monitoring, and ongoing technical support.

No other services organization in the world can offer you a higher level of support to successfully design, deploy, and integrate multivendor and multitechnology networks. From high-bandwidth core optical and multiservice data networks to metropolitan and broadband access networks, LWS combines an extensive portfolio of network solutions with advanced network diagnostic and response tools developed by the world-renowned research and development teams at Bell Labs. LWS can help you achieve rapid deployment of network infrastructures, reduce time to revenue, and gain a clear, competitive advantage.

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Anatole Sykley is a Principal Consultant and Manager of the Lucent Worldwide Services Custom Software Development Team based in Westford, Massachusetts. Mr. Sykley specializes in OSS Software Architecture Integration problems and has, in cooperation with his Custom Software Team and other Lucent Customer and Service Teams, addressed several unique OSS-BSS-NMS integration problems via unique or custom developed software solutions that are maintainable and at the same time, based on open standards.

A noted presenter and discussion group leader at several network management conferences and seminars in the U.S and Australia, Mr. Sykley has also participated in the development of custom integration software for several OSS-BSS-NMS integration projects for customers such as: AT&T, NTT, SBC, StarHub, Winstar, UUNET, and Primus.

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Mr. Sykley graduated with a combined degree in Physics and Applied Mathematics, and a Computer Science Degree from LaTrobe University, Melbourne, Australia. He has a Masters in Business Management Applications from Lesley College, in Cambridge, Massachusetts, and is a member of the IEEE and the American Association for Advancement of Science (AAAS).

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