Integration Solutions for Telecom Network Management Systems

IONA Technologies PLC
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1 Introduction

Over the past four years, the telecommunications (telecom) industry has been in a state of flux. Customer demand for new services such as third-generation wireless networks, consolidated billing, and consistent and reliable service has been impacted by technology and interoperability limitations.

The difficulties created by legacy back-office systems, known as operational support systems/business support systems (OSS/BSS), are primarily rooted in their complexity, scale, rigid operational requirements, lack of interoperability and lack of service focus. This has led to enormous challenges when attempting to deploy new services and adapt to rapidly changing customer needs. The impact is currently felt by telecom service providers by way of increased customer churn and inability to adapt quickly to changes in the business environment.

Telecom service providers are increasingly looking to partner with telecom OEMs and software vendors who provide a high degree of flexibility, standardization and interoperability with their existing legacy investments. It is a well-recognized fact in the telecom industry that the cost of purchasing product is quite small compared to the cost of subsequent integration and continuing maintenance.

On the other hand, telecom OEMs, software vendors, and integrators are faced with the difficult prospect of supporting widely varying telecom service provider IT environments that are in a state of constant change. The key challenge for telecom OEMs, software vendors, and integrators is to develop robust applications that can perform varied network management operations in a changing, multi-vendor, multi-platform network. OEMs and independent software vendors need to develop and deploy solutions that.

- Reduce time to market.
- Reduce cost.
- Support increasing demands for integration, interoperability and availability
- Incorporate legacy systems and are future-proof
- Conform to industry standards ratified by the TeleManagement Forum (TMF).

This document takes a closer look at telecom Network Management Systems (NMSs) and explores the interoperability challenges faced by NMS vendors as they address these challenges in current and future technology solution sets.

IONA Technologies has a decade long history of living up to its corporate tagline “Making Software Work Together” and of delivering consistent value to the telecom industry with our standards-based integration products, Artix and Orbix.

This document outlines the clear and demonstrable benefits of using standards-based products, such as Artix, to make NMS offerings by telecom OEMs more useful, adaptable and valuable in the following ways:

- Ability to develop more integration friendly offerings, thereby facilitating easier adoption in service provider environments.
- Provide more “out-of-the-box” open connectivity options.
- Improve native support to legacy environments, including mainframes.
- Improve ability to rapidly add additional northbound and southbound interfaces to influence revenue.
- Reduce data mismatches between northbound and southbound data by providing more direct integration choices.

2 Interoperability Challenges at the Telecom Network Management Layer

2.1 Technology Background

Telecommunications networks today are enormously diverse and complex. They comprise a wide array of technologies offered by several OEMs and specialized software vendors offering operational support systems (OSS) and business support systems (BSS).

Telecommunications technology architectures are typically expressed in a more simplified palette using the TMN model shown in *Figure 1*.

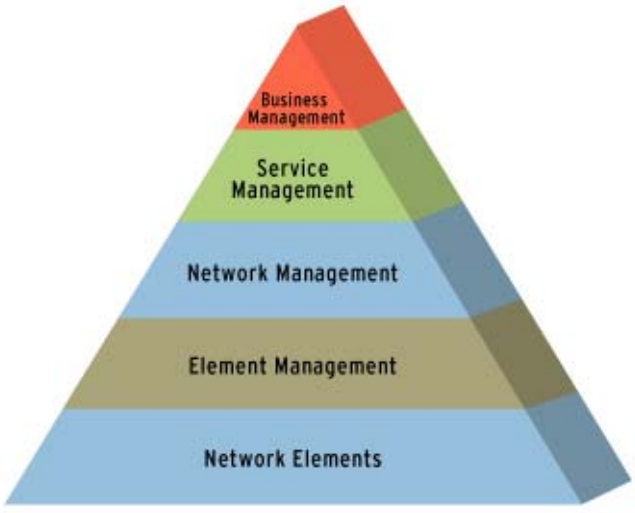

Figure 1: TMN Network Management Architecture

The foundations of telecom networks are based on collections of operational network elements (switches, gateways, routers, and so on), which are responsible for the transmission and distribution of voice and data payload over the network. Most telecom service providers have clusters of network elements purchased from several vendors offering distinctive capabilities such as packet switching, circuit switching, ATM frame relay, and so on. Command and control operations are handled via SNMP, SONET, ASN.1 and TL/1.

Most equipment manufacturers offer software products to manage network element clusters known as Element Management Systems (EMSs). EMSs typically provide capabilities related to service and network provisioning, inventory management, service assurance, network monitoring and control. Some examples of companies that provide EMSs are Lucent, Agilent Technologies, Cisco, Siemens, and Fujitsu.

Several software vendors as well as OEMs and equipment manufacturers provide Network Management Layer (NML) software to the telecom vertical. These software systems typically enable telecom operators to perform integrated fault management and service provisioning in multi-vendor and multi-platform environments. These systems also integrate, summarize and correlate information for Service Management Layer (SML) applications such as billing, order management and SLA management. Examples of NMS products include HP TeMIP, IBM Tivoli, CA Unicenter, Metasolv, Nortel Optivity NMS, and Lucent VitalSuite.

The SML is where telecom operators have sought to differentiate themselves by purchasing numerous specialized, “best of breed” applications for managing service usage, assurance and activation. Business process and inter-relationships between applications at this layer are constantly evolving and are not standardised. Telecom operators have typically used Enterprise Application Integartion (EAI) and messaging hubs to ease connectivity with NML and Business Management Layer (BML) products. Examples of SML products include IBM MQSeries, Tibco, BEA Tuxedo Amdocs, and Convergys.

The BML is highly customer focused and comprises portal applications, corporate dashboards and edge devices.

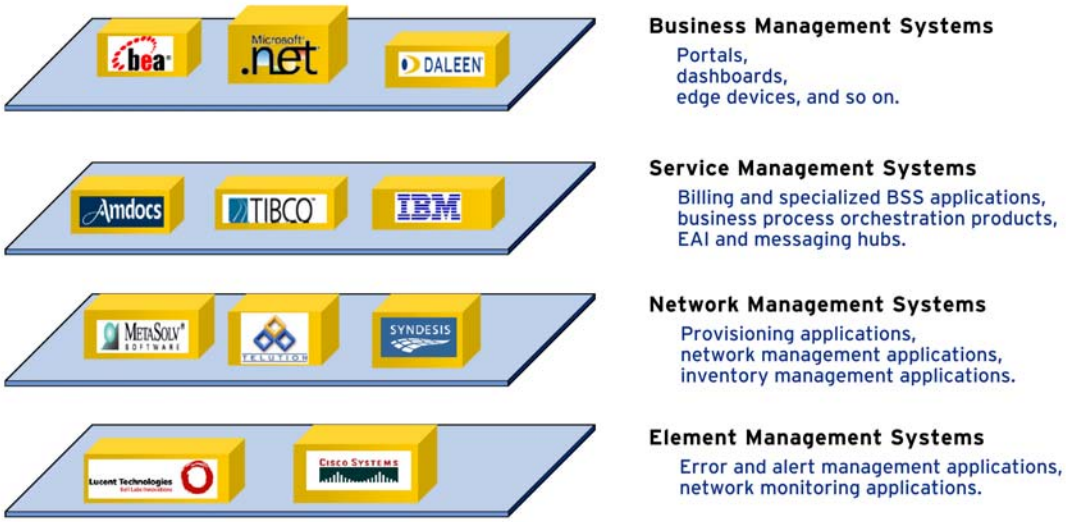

Figure 2: Typical Applications and Application Stacks

2.2 Network Management Layer Interoperability Challenges

Network Management Layer (NML) applications are the most heavily used systems in telecom operator environments. These applications are the focal point of telecom operations and provide both customer-centric and network-centric support to the SML and EML applications respectively. Integration, performance and interoperability with a wide variety of products at the SML and EML are crucial for adoption and success in widely varying telecom operator environments.

NML systems are required to provide interfaces for northbound traffic from EML applications (faults, alerts, and so on) and the ability to tap into the EML system interfaces provided by several different OEM vendors. Similarly NML applications are required to offer NML system interfaces to messaging hubs and specialized applications at the SML (see *Figure 3*).

The inability to predict what legacy technologies, products and software choices are present in any given telecom operators IT environment creates the following integration and interoperability challenges for NML application vendors, telecom operators and their end customers:

- Limited interoperability with existing telecom IT infrastructures.
- Limited support for legacy environments results in higher maintenance and integration costs.
- Continuous requirements to add additional interfaces and to support different versions of EML and SML applications.

- Complexity and cost in maintaining continuous interoperability with adapter-based, non-standard and non-compliant interfaces.

This in turn directly impacts their ability to create a better customer experience for telecom operators and their end customers.

Standards bodies such as the TMF have recognised this problem and have announced standards such as TMF 814 and 3GPP to standardise interfaces between the NML and the EML. They have found strong support for these standards among the majority of OEMs, OSS product vendors and telecom operators. However there are still some OSS products that do not offer an implementation for the relevant TMF standards. This creates an ad-hoc requirement for the NML product to interoperate with non-standard EML interfaces in the telecom operators' environments.

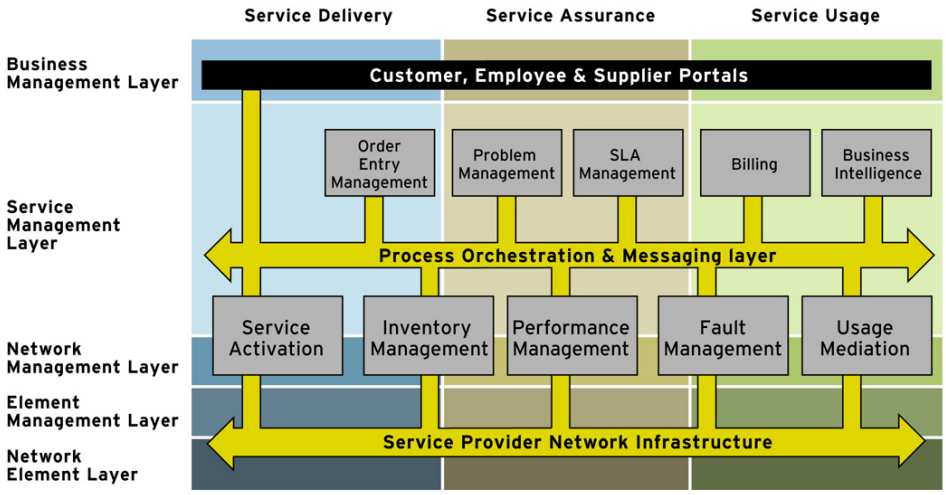

Figure 3: Integration and Interoperability Needs at the Network Management Layer

At the SML, for example, there are no clear standards to provide direction for standardised interfaces or for clear business process. These issues lay the foundation for a great deal of data mismatches and the inability to consume information from the multiple application data sources. In addition, the lack of standardised communication models means that specialised "best-of-breed" SML application vendors offer custom interfaces over their own chosen protocol (for example, billing application Amdocs embeds Tuxedo as its communication protocol).

Telecom operators themselves may have invested in messaging hubs and BPO/BPM tools such as IBM WebSphere MQ. This creates immense difficulties for NML application vendors trying to effectively support these technologies while reducing time to market and lowering costs for telecom operators.

2.3 The Need for Simple and Effective Service Oriented Integration

Telecom NML application vendors need to address interoperability and connectivity to EML offerings, and applications and messaging hubs at the SML in a simple, consistent and uniform manner. A uniform service oriented approach to integration can drive down costs; improve time to market and boost adoption of NML applications.

Service oriented integration must enable NML application vendors to achieve the following:

- Ability to express EML and SML application interfaces and metadata as *standards-based service contracts* using a service definition language (such as WSDL) that can be versioned, maintained and easily renovated over time.

- Ability to decouple underlying protocols and transport dependencies in the service contracts, thereby introducing integration choices to EML and SML applications at the protocol and transport layer.

- Ability to offer services contracts that can be securely published, discovered and invoked by EML and SML applications in a common way, independent of their implementation language (C++, C#, Java, and so on) and platform dependencies.

- Ability to provide seamless interoperability with applications offering RPC-oriented connectivity (J2EE, CORBA, .Net, and so on) and document-oriented connectivity (WebSphere MQ, TIBCO, BEA Tuxedo, and so on) in a uniform and consistent manner.

3 Building Agility and Interoperability in Network Management Solutions using Artix

3.1 Technology Background of Artix

Artix is IONA's service-oriented integration product. It is a platform-independent, standards-compliant set of infrastructure products for powering Java, C/C++ and mainframe-based applications. For the telecom NML systems vendor, Artix can be applied as an embedded, cost-effective solution for integrating with OSSs at the EML and NML, and with BSSs at the SML and BML.

Artix assists NML systems vendors in building 'integration-ready' applications that can be easily adopted and applied to diverse telecom service provider environments.

Artix is designed to enable high performance, optimized interaction between software services using existing transport mechanisms such as MQSeries, Tuxedo and Web services on platforms such as .NET and J2EE, with full support for heterogeneous security, transaction and management requirements. Combined with flexible deployment options, Artix delivers maximum “out-of-the-box” connectivity to existing enterprise application interfaces and infrastructures, while increasing the ROI of existing applications and skills.

The key salient features of Artix as it relates to NML offerings include:

- High performance and small footprint integration that can be quickly embedded into existing NML solution stacks.
- Advanced multi-protocol integration using a simple, consistent approach.
- Integrated security capabilities that span technology platforms (Kerberos, RACF, and so on).
- On-host and off-host integration support for legacy and mainframe environments.

Artix supports de facto standards such as MQSeries and Tuxedo, as well as J2EE, .NET, CORBA, SOAP, and WSDL. It supports the propagation of transaction and security data. In addition, mandatory enterprise features such as load balancing, fault resilience and third-party systems management integration are built into Artix.

Lastly, the ART foundation in Artix can be extended with customer written plug-ins to accommodate new or proprietary protocols. This extensibility ensures that Artix-enabled communication systems are future-proof and facilitate new technical and business requirements.

3.2 Building Integration Ready Applications with Artix

For an NML application Artix can be applied as follows:

- Northbound and southbound interfaces of specialized EML and SML applications are expressed as simple, XML-based WSDL interfaces.
- The WSDL interface documents also express the following:
  - Data marshalling rules that need to be applied to the incoming or outgoing data payload at the service endpoint (that is, the NML application boundary).
  - Protocol and transport choices for specific incoming and outgoing requests.
  - Load balancing, fault tolerance, routing rules, and so on.
- The Artix runtime component operates as an interface proxy object that applies the rules specified in the WSDL interfaces to incoming and outgoing requests directed at EML and SML applications.

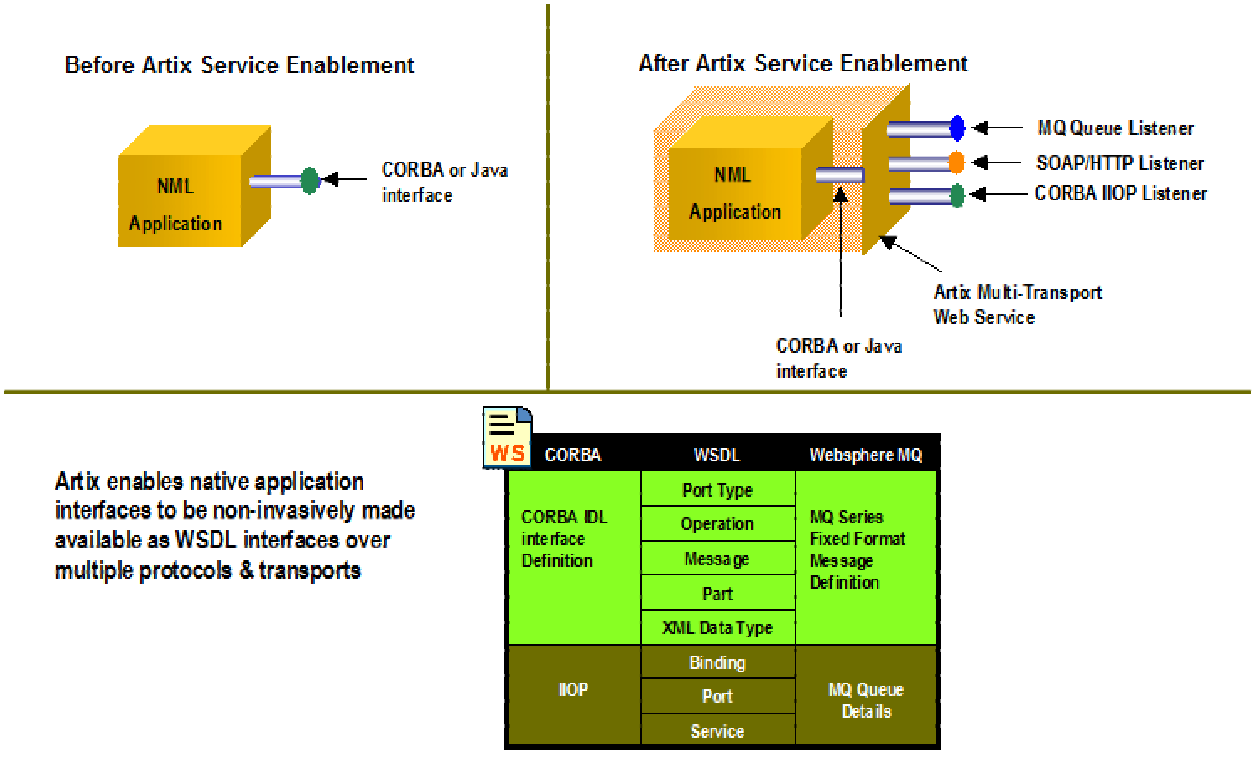

Figure 4: How Artix Works

Figure 4 illustrates how an existing NML application is made service oriented and integration ready by applying Artix. For example, if the NML application was originally designed to offer a CORBA interface to other applications, it can now *non-invasively* offer the same interface over a range of different transports and protocols. In addition, if any northbound or southbound interface offered by other applications cannot be directly consumed by the NML application, the payload can be easily re-marshaled by Artix to ease the ability to consume the message. This could include custom transforms and rules developed by the telecom NML OEM vendor.

3.3 Business Benefits of Service Oriented Integration for Network Management Layer Application Vendors

To a telecom company, an Artix offering that effectively mediates between various application islands at the EML and SML, and enforces policies and standards represents immediate IT benefits, including:

- Lower technology risk profile.
- Independent evolution of NML applications while conforming to different standards and technologies.
- Better control of issues and lower maintenance costs.
- Wider and better Web services support over native protocols.
- Automatic native marshalling and unmarshalling of messages between protocols and transports.
- Immediate realisation of the Web services vision without getting bogged down in standards debates (J2EE, CORBA and DCOM/.Net) or messaging models advocated by EAI vendors.
- Improved performance characteristics such as scalability, flexibility and reliability.
- Reduces application pairing on either side of an interface (that is, the creation of tightly coupled sets of applications).
- Improves business process orchestration (that is, the sequencing of multiple interactions, aggregating them into a larger unit of work, thereby providing easy reuse of existing and new services).

4 About IONA Technologies

IONA has been providing the telecom industry with integration solutions since the early 1990s. For more than 75% of the world's telecom service and equipment providers, IONA's technology provides the network management infrastructure, which cannot go down.

Our technology was chosen for its reliability, its performance, and its adherence to industry-mandated standards. And as new centralised national telephone and wireless networks come on line, IONA continues to be the obvious choice to provide the network management infrastructure. More than 170 telecom companies around the world rely on IONA's high performance integration products to connect and support network management, configuration, security, operations, performance, and fault management and administration systems.

Today, IONA's products, including Artix and Orbix, are integrating business applications and middleware subsystems from various vendors into a coherent, strategic architecture. IONA continues to provide mission-critical infrastructure to demanding technical applications requiring high-performance integration. These applications include large-scale manufacturing systems, high-end financial systems, telecom network management and OSSs, and e-government and other federal computing initiatives.

While other integration and infrastructure vendors have, as their basic business strategy, increasing the penetration of proprietary technology stacks into every aspect of the enterprise, IONA is focused on making disparate and accumulated infrastructure investments interoperable, while preserving performance, scalability or reliability. And unlike other vendors, IONA promotes an incremental, non-disruptive approach to making infrastructure elements work together. Lastly, as has been true throughout its history, IONA is dedicated to fostering integration through standards-based technologies, including CORBA, Web services and J2EE.

IONA has more experience than any other vendor in developing and managing complex distributed systems, and has an unmatched record of successfully deployed high-performance, mission-critical systems. IONA's critical role in the rollout of the world's biggest integration projects is a reflection of more than just IONA’s products. It also reflects a customer support organization that has proven itself indispensable to managers of critical enterprise systems, 24 hours of every day, everywhere in the world, and a consulting organization that has no rival in its ability to help organizations architect and implement high performance integration projects.

5 Summary

In summary, IONA's Artix product enables telecom OEMs to launch integration-ready applications that can be deployed in diverse telecom service provider environments at a significantly lower cost.

Telecom NML application vendors can benefit from Artix in the following ways:

- Create more integration friendly offerings thereby facilitating easier adoption in service provider environments.
- Provide more "out-of-the-box", open-connectivity options.
- Improve native support to legacy environments including mainframes.
- Improve ability to rapidly add additional northbound and southbound interfaces to influence revenue.
- Reduce data mismatches between northbound and southbound data by providing more direct integration choices.

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