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Your Cell Phone has an Operating System, isn't it time your network did too?

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Today, handheld devices smaller than a wallet are able to transmit volumes of digital voice, video and data traffic to enable multimedia communication and entertainment from virtually any location. Now that converged services visions of anywhere-anytime communication are coming to fruition, why aren't service providers reaping more profits than ever? The success and growth of these new "Quad Play" devices – and the networks and services that support them – has been enabled by astounding progress in wireless and broadband networking technologies. This progress can be traced back to rapid advances in computer processing and storage components. However, as they have followed Moore's Law, the latest line-up of advanced PCs, notebooks, PDA's, iPODs™, cell phones, video games, and a myriad of other devices – have grown increasingly complex. And what they all have in common to effectively manage that complexity is an often overlooked, yet equally critical component to their success: the development and evolution of an operating system (OS). Given the parallels of rapid change, convergence and complexity in telecommunications networks and devices, it is time that the industry – and communication services providers (CSPs) in particular, apply the concept of a "network operating system" (NOS) to achieve similar benefits as in the PC industry.

If it were not for operating systems, the growth in PCs would never have taken place driven by the multitude of applications that have been built for them. As in the PC market, most telecommunications end-users are more interested in services or applications rather than the detailed understanding of the hardware itself. But anything beyond "Quad Play" may seem like a step into the unknown for CSPs when many are still getting to grips with implementing the latest voice, video and data services bundles. Today, Quad Play services are all too often just "marketing packages", with convergence only really taking place at the point of sale and billing. With no truly converged services delivery, CSPs are left with more complexity, but many of the same associated capital and operational costs as they were for the separate services. The intention, of course – and the whole premise behind XoIP services, service delivery platforms (SDPs), and the 3GPP's IP Multimedia Subsystem (IMS) – is to be able to rapidly rollout new services on increasingly

converged Next Generation Networks, with high quality and significantly lower costs.

A common SDP for all services starts to address these key concerns. However, SDPs rely on OSS/BSS systems underneath them, which in turn interface to the network elements (NEs) through element management systems (EMSs). The problem is that a fundamental disconnect persists between the NE and OSS layers of the network – a problem that has become costly and complex due to the continuous changes taking place at both levels. Rapid innovations made in network element technologies have to be constantly married to new operational support systems (OSS) above them. As the number of OSS and network technologies grows, the problem grows exponentially with it – the classic N-squared, full-mesh scaling problem.

To address this, sometimes a single application is used to do everything; "to get the job done". This usually means no Service Orientated Architecture (SOA) is used, which limits a service provider's ability to deploy best-in-breed applications. Often, in-house systems are built organically or toolkits are used, and so they become nonstandard interfaces that create complex and expensive management software to maintain and manage. Or if the all too common mistake is made of just considering a single service, it results in all components from the SDP through to the network being tightly coupled and each operations function (billing, device management, fault management, etc.) being designed specifically for that service. As NEs change so too does the OSS/BSS interface layer, which may have a ripple effect on the overlying services. If CSPs wish to implement a new OSS/BSS application, these interfaces need to be rebuilt and tested to both the SDP and to the underlying EMS layer. An architecture that considers all these elements is critical if a sustained advantage is to be held in the market.

The proposed solution is to implement a "network operating system" (NOS) that abstracts the network complexity and disengages it from direct integration with the upper layer OSS's in the same way that the operating system on your PC or cell

phone separates its hardware from its applications. This mediation and abstraction function allows higher-level applications or services to be developed independently while simultaneously enabling new hardware or peripherals to be introduced and updated beneath it; yet all the while ensuring the entire system still works together. Standards bodies, primarily the TMF, are helping to solve the problem by providing interface standards for EMSs such as MTNM (Multi-Technology Network Management) and MTOSI (Multi-Technology Operation System Interface). However, we termed this a "NOS" and not just an "EMS", "interface" or "API", because it not only provides a stable environment and single point of integration that uses these standards-based Northbound interfaces into the upper layer OSS/BSS systems; but it also touches the NEs directly Southbound and includes key applications such as auto-discovery of their physical and logical topology, inventory, and fault information.

To accomplish this, the NOS must have some key characteristics that include the ability to: work with multiple vendors' network equipment, to incorporate EMS functionality (through tool kits or standard interfaces such TL1, SNMP, MTOSI) and to be customizable to incorporate new network types or vendor-specific features. Like any OS at the heart of a system, it must work reliably and – importantly for CSPs, it must also be able to grow and scale over time and conform to open standards initiatives such as the TMF's NGOSS, eTOM, and SID. With a NOS in place, a Service Provider is better equipped to retain and build a differentiated service offering in the market and will be ready for their move beyond Quad Play, keeping services affordable over time, while deriving the follow three key benefits:

1. Speed to market – roll out new services faster

How often have new service launches been delayed or not worked as predicted? CSPs need to launch new services at least as fast as their competitors do in order to gain market share and bring in the new revenues that are critical to success. In the new world beyond Quad Play, where product marketing creates innovative and complex "blended" services in which voice, TV, mobile, and data services start to interact with each other, the risks and costs of delays greatly increase. Having separate "stove-piped" management systems for each service and network element is no longer financially viable, and may not even be technically possible to continue. The introduction of a NOS into a service provider enables incremental services and network equipment to be added much more easily. It overcomes the issue of deploying new NEs each with their own vendors' EMS, which then need to be integrated to the OSS to deliver new services. If the NOS is already aware of the NE and has an "adaptor" or "driver" for it, then there may even be no integration required at all.

2. Reduced Opex Costs

Critical to long-term viability of any service is that there is a constant reduction in the costs of running and maintaining it. This applies even more so to Quad Play and beyond as unit prices of services are reduced. Tier-one service providers estimate that it normally takes several months and costs $1-3 million to integrate each new network element type or EMS into their back office systems. As discussed, a NOS would not only reduce the amount of time it takes to deploy new NEs, but it could also reduce or eliminate altogether the operations "integration tax" associated with bringing them into a "service ready" state. Additionally, because a NOS by definition supports multiple vendors' equipment, a service provider would then have a single set of standard procedures across all their network elements. This would reduce the amount of operations staff training and the number of product specialists required to run the network and perform common tasks such as software upgrades or back up and restore functions.

3. Reduced Capex Costs

The intention of building next generation networks is to enable many more new services to be run over a single, converged network; thus amortizing the network build costs over a broader range of services. While there will always be a business case for evolving with new and improved network elements, deploying a NOS would allow service providers to stop purchasing individual vendors' EMS/NMS suites and the annual software maintenance fees that go along with them. In addition, a NOS could even help forestall the purchase of new equipment by providing a more accurate picture of what is currently in the network. With a single point of integration, all the various higher-level OSS applications (such as fault, provisioning, inventory etc.) would be working from a common set of data that is updated in real time via auto-discovery, instead of each one attempting to build this information itself or having it entered manually. With more accurate network data available across all FCAPS applications, the risk of provisioning fallout and stranded assets would be greatly reduced – meaning less equipment would be required to support the same number of services.

Networks almost never become simpler or smaller to manage, they evolve and expand as new requirements, services and technologies are rolled out. The problem of managing them will continue to expand, taking up more operational resources unless as new approach is adopted. The PC market found a solution to the issue that helped to reduce their costs and accelerate new application developments. Communication services providers are starting to recognize that to move to a new, much lower operational cost basis, a fundamental change is needed. Deploying a network operating system solution provides a sea-change possibility for faster services rollout, lower costs and leaner operations on which new services and networks can be built.