

Transforming to a Sustainable Wireless Business Model

Building optimized strategies for LTE transformation

To meet the ever-increasing demands for more bandwidth, flexibility and reliability, mobile service providers will soon have to make the move to 4G Long Term Evolution (LTE) networks. But to truly leverage all the benefits that IP and LTE offer, service providers must take the opportunity to evolve to a sustainable business model that effectively addresses and capitalizes upon the increasing demand for enhanced services and applications. Successful transformation addresses a service provider's business and network with a comprehensive approach that covers strategy and planning, deployment, optimization and ongoing management.

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Mobile Data Explosion Drives Transformation

Driven by the increasing use of smartphones and other advanced portable devices, mobile service providers are experiencing an unprecedented and continuing increase in mobile data traffic.

Today's end users can choose from multiple smartphones, such as the Apple® iPhone, those based on the Google™ Android operating system and a variety of models from vendors using other mobile operating systems and form factors. But smartphones are just the tip of the iceberg. Consumer and enterprise end users have been just as quick to adopt advanced laptop and netbook computers and other handheld devices that can address a variety of mobile communications, information and entertainment needs.

As technology improves, new devices and transaction capabilities will emerge built on broadband ready notebooks and tablets that will also increase mobile data traffic. While others, such as connected cars, pervasive multimedia, alternative and virtual reality, and highly-reliable machine-to-machine connections will further stretch mobile network capacity. Some may use business models akin to the Amazon® Kindle™ e-book, and others will generate new, advanced and disruptive business models, including joint ventures, shared risks/reward, and contract diversification.¹

Whatever the device or business model, analysts and mobile service providers agree that mobile data traffic will continue to rise exponentially.

An August 2009 study by ABI Research predicted the volume of traffic mobile service providers can expect every month over their networks by 2014 will exceed the total data traffic for all of 2008.² The report stated:

- Global mobile data traffic transferred during 2008 surpassed 1.3 Exabytes (an Exabyte is 1 million Terabytes). By 2014 an average of 1.6 Exabytes will be sent and received monthly.
- Nearly 74 percent of the world's mobile data traffic will be from Internet access by 2014 and 26 percent will come from audio and video streaming.
- Video streaming will experience the fastest growth of any IP traffic type at a Compound Annual Growth Rate (CAGR) of 62 percent between 2008 and 2014.

These figures are supported by ongoing Alcatel Lucent primary research conducted with over 4,500 enterprise and consumer end users. The research provides an indication of future demand for mobile services based on a better understanding of the types of 4G/LTE services end users are willing to pay for.

In general, enterprise end users are interested in applications where data throughput is important, such as faster uploads, enhanced virtual private network (VPN) connections, mail and file synchronization with an on-line server, and peer-to-peer applications. They are also interested in interactive applications where latency is crucial, such IP multimedia services, including video and voice conferencing, application sharing, cloud computing and more. In fact, 66 percent of enterprise users indicated they would use presence-based contact lists daily, and 68 percent said they would use file sharing during a mobile call. Most importantly, the research findings show enterprise end users are willing to pay 20-30 percent more for these advanced 4G services compared to current 3G services — up to \$64 more per month.

Consumer end users are also interested in the benefits LTE offers for smoother and faster photo and video downloading or uploading, better online gaming experiences, and improved on-the-go access to social networks such as Facebook® or MySpace™. LTE will also enable new services such as high-definition audiovisual content formatted for mobile screens and ultra mobile devices (UMDs),

¹ "Increasing Customer Value". Yankee Group 2009.

² "Mobile Data Traffic Analysis", ABI Research, August 2009. <http://www.abiresearch.com/press/1466-In+2014+Monthly+Mobile+Data+Traffic+Will+Exceed+2008+Total>.

geolocalization applications with graphical and contextual content, and multi-user interactive gaming. The Alcatel-Lucent research shows that 76 percent of consumer end users are willing to accept mobile advertising and that most want connectivity to additional devices, including navigation devices, in-vehicle devices, cameras, and MP3 players.

Based on this research it is safe to say that mobile service providers will continue to experience unprecedented demand for advanced services. Some expect that demand will far outstrip predictions. As Dick Lynch, Chief Technology Officer (CTO) of Verizon and former CTO of Verizon Wireless noted, projections for 3G and LTE traffic will skyrocket as mobile data growth rises at three orders of magnitude more than the scale of the previous projections.³

As a result, more than ever before, service provider sustainability is being threatened by factors beyond a service provider's direct control — new devices, applications and user demand. This reality is based on the simple fact that end users now expect and demand more from their mobile devices and services. Having been exposed to the potential for more than just a way to stay connected with family, friends and colleagues while on the move, end users now expect mobile services that can be adapted to their lifestyle based on the true convergence of wireless, wireline, and Internet-based multimedia applications.

A 4G Long Term Evolution (LTE) mobile network offers service providers an opportunity to transform their operations to meet the ever-increasing demand for more bandwidth, flexibility, and reliability. This next-generation mobile network offers a flat, all-IP architecture with higher capacity and greater speeds, as well as the quality of experience (QoE) required for the advanced services end users are demanding.

LTE will co-exist with today's 3G networks for many years, so the capacity and speed requirements will be shared and optimized across different technologies and assets. But, transformation to next generation wireless broadband is more than just a switch to a new access and packet IP technology. Evolution to next generation wireless broadband requires business transformation (new business models, revenue sharing, managed services, outsourcing of legacy management, focus on new services, partner collaboration) that will enable service providers to effectively address and capitalize on the increasing demand for more applications and services.

To truly reap all the benefits LTE offers, service providers must consider a complete transformation strategy, which includes network and business transformation. Similar to large-scale, fixed IP transformation projects, this complex task has multiple stages — from strategy and planning to deployment and optimization — all of which must be successfully implemented together as part of a complete, integrated transformation. Executed properly, this strategy will create a High Leverage Network™ (HLN) that will enable mobile service providers to address immediate and future end user requirements.

Realize the Potential of Wireless Broadband

To address the mobile data explosion mobile service providers must become more services-centric rather than network-centric. However, service providers are already finding it increasingly difficult to cope with demand for advanced services and applications.

The Global mobile Suppliers Association (GSA) reports that 3G subscription rates grew significantly between 2008 and 2009 to 506 million subscribers worldwide.⁴ But, although 3G/3.5G technologies deliver significantly higher bit rates than 2G technologies, they do not fully satisfy the wireless broadband requirements of instant-on/always-on multi-megabit throughput.

³ "Signals Ahead: Volume 5. No. 14", Signals Research Group, November 19, 2009.

⁴ "GSA Fast Facts," GSA, December 2009, <http://www.gsacom.com/news/statistics.php4>.

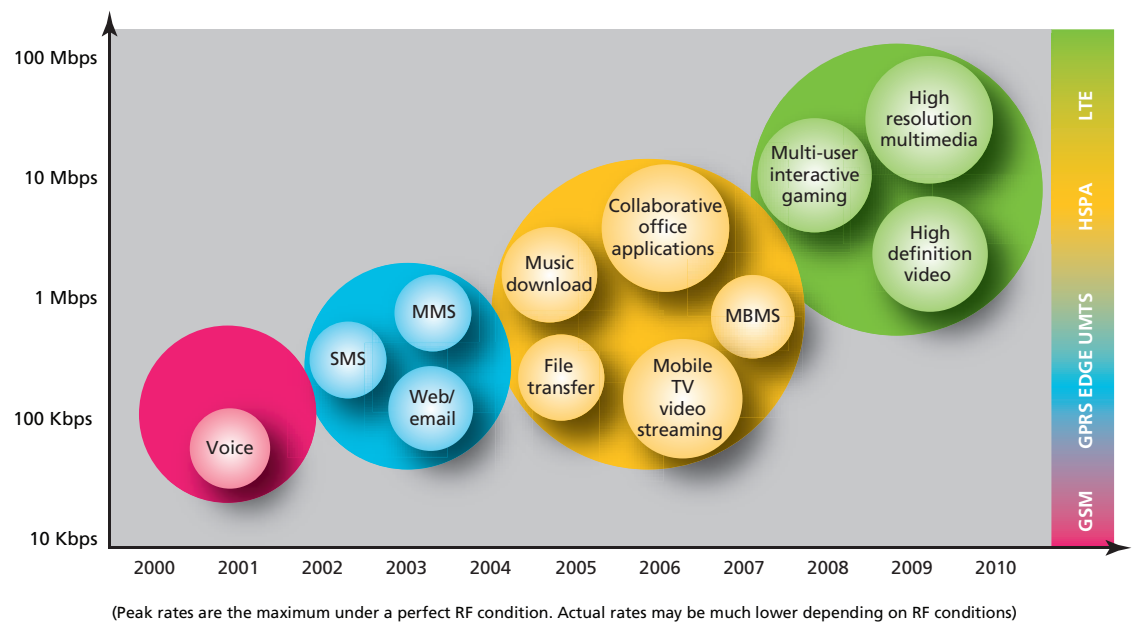
In addition, while subscriber rates may be increasing, the cost of providing services is also increasing because of higher mobile data bandwidth usage and a lack of an accompanying increase in revenues. Recent Alcatel-Lucent findings and numerous industry reports show that although LTE traffic will outpace 3G traffic in a few years, the marginal cost to supply and backhaul services will be a challenge without an optimization strategy. These trends are a call to action for service providers to transform their operation to a more profitable and sustainable business model where new revenues can be derived by leveraging network assets with new application and content providers (ACPs) in revenue share models. Without this transformation, service providers face the potential of significant customer churn, waning profitability, and brand devaluation.

Increased bandwidth, reduced costs, and High QoE

LTE is a mobile best-of-breed technology that offers the increased speeds, reduced costs, and QoE required to enable service providers to deliver always on and always available, personalized applications and services. As such, it is a key foundation of a mobile HLN and a mobile application enablement environment that leverages key network assets to enable the evolution to a sustainable business model.

With LTE service providers can achieve greater peak throughputs in a higher spectrum bandwidth and benefit from greater capacity at a reduced cost for real-time services, such as voice over IP (VoIP), multi-user gaming over IP, high definition video on demand, and live TV (Figure 1). For all these services, Alcatel-Lucent research shows that LTE reduces the cost per byte by a factor of six compared to High Speed Packet Access (HSPA). This cost reduction is derived from network simplification and the enhanced capacity delivered by new radio technologies, including a new modulation scheme and the latest antenna technologies, such as multiple-input and multiple-output (MIMO).

Figure 1. Mobile services and throughput trends⁵



With this simplified and faster, IP-based mobile network, service providers can become truly services-centric. They will have application and service control at the packet layer. They will be able to control content, content delivery and context, and scale services more accurately to address market demand. As a result, LTE puts service providers in a better position to introduce new, collaborative business models with ACPs built on a common set of Application Programming Interfaces (APIs)

⁵ "Long Term Evolution Overview", Alcatel-Lucent, 2008.

in a single Service Delivery Environment (SDE). This enables service providers to share the risk for the development and delivery of new services for enterprise and consumer end users. Most importantly, it allows service providers to capture a higher percentage of the estimated \$100 billion market opportunity for advanced, personalized applications and services.⁶

Many service providers have already recognized the benefits LTE offers. In a June, 2010 report, the GSA confirmed 80 LTE network commitments in 33 countries and emphasized the growing global commitment and support for LTE as the next generation mobile broadband system of choice. The report confirmed an additional 30 pre-commitment pilot LTE networks, technology trials and studies in 15 more countries.⁷

To ensure success with this transformation, service providers must not only plan and deploy the new network architecture, they must also transform their business processes to support the incredible market potential LTE offers.

Evolution to Wireless Broadband Includes Network and Business Transformation

Meeting the demands for new services with LTE requires transforming today's access network, backhaul, and core networks to an entirely IP infrastructure and IP-based control systems, such as IP Multimedia Subsystems (IMS). Before migrating subscribers and systems from old networks service providers must consider the full-lifecycle costs of moving away from legacy technologies in a rational, profit-oriented fashion. This transformation is a complex task that must be balanced against the need to maintain and improve profitability by reducing costs and accelerating time-to-market with new applications and services.

Transformation challenges

To make an effective transition, service providers must consider how the transformation will affect their daily operation and their ongoing business processes:

- When is the best time to deploy LTE based on specific business requirements?
- What should the strategy be for current 2G and 3G networks and should managed outsourcing be considered?
- Will the new LTE network deliver a superior customer experience?
- How can interoperability be ensured in a multi-vendor wireless broadband network?
- What is the right approach for testing LTE and certifying LTE devices?
- What is the best way to migrate and consolidate older technologies and revenue streams?
- How can services and applications be monetized over LTE networks for consumer and business segments?
- How should existing operations systems and billing systems evolve?
- Will existing network security programs be effective enough to manage risks introduced by adding IP based services?

There are many strategies for transformation to next-generation wireless broadband. The right strategy will be determined by the service provider's unique business objectives and market environment. A smooth migration from existing networks, building an LTE network overlay, and outsourcing models are some of the options available.

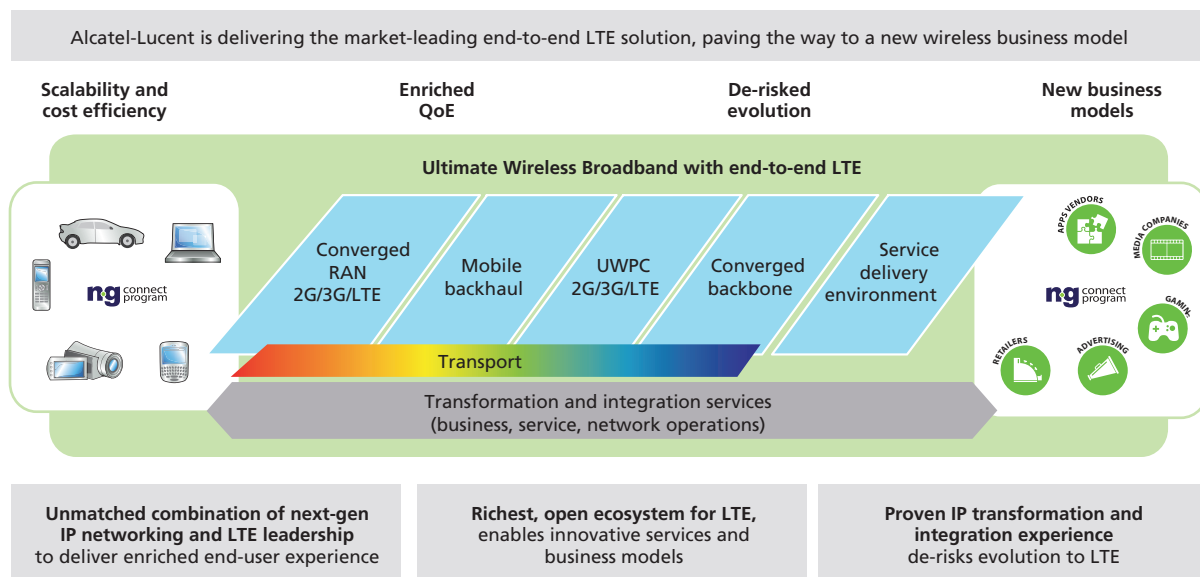
⁶ Alcatel-Lucent analysis of Alcatel-Lucent Market Advantage research and Bell Labs economic modeling.

⁷ "GSA Report: 110 Operators in 48 countries investing in LTE Networks", GSA, June 2010, http://www.gsacom.com/news/gsa_302.php4.

Comprehensive transformation

Whatever the approach chosen, evolution to wireless broadband with LTE requires a comprehensive transformation to all-IP. That transformation process must include the network architecture, service delivery and operations, as well as the right outsourcing strategy (Figure 2).

Figure 2. An end-to-end LTE transformation includes an integrated set of activities



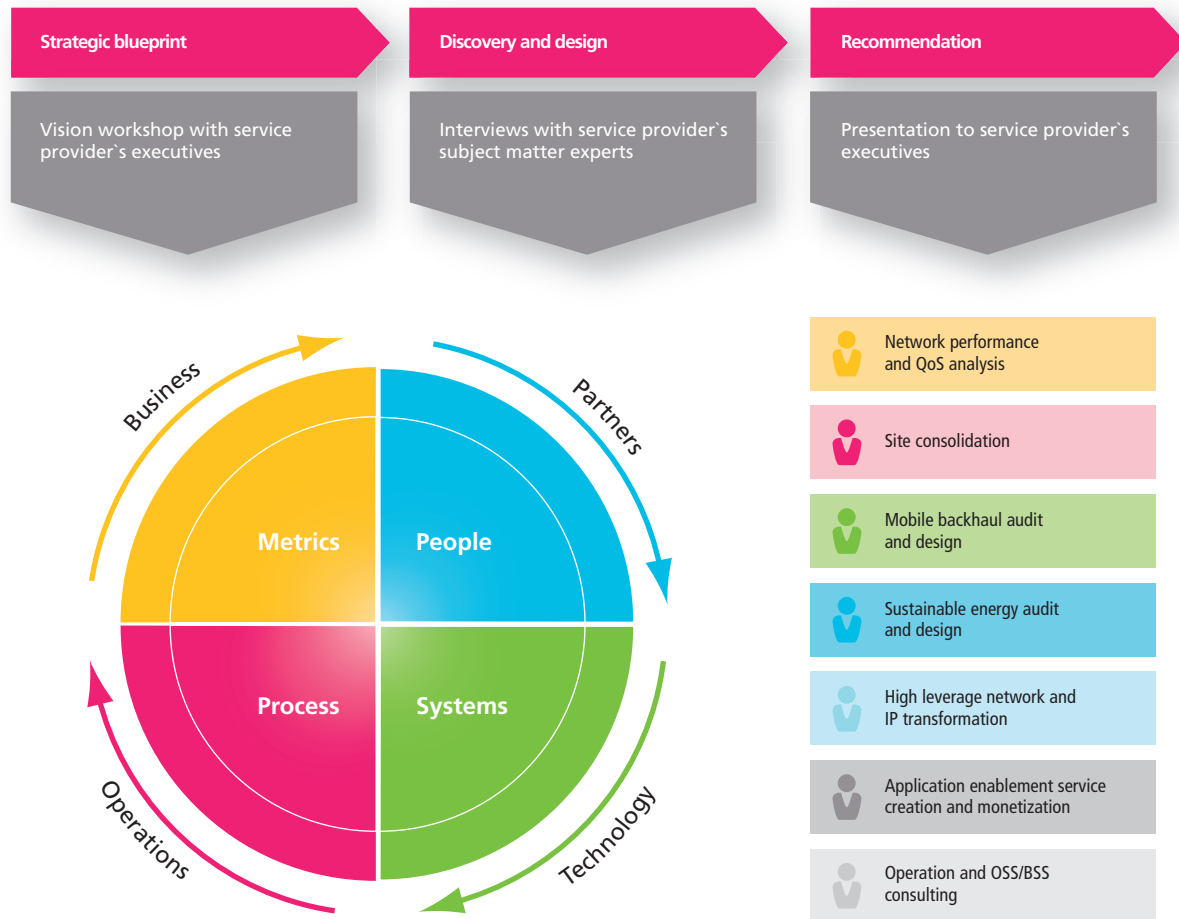
Strategic consulting

To build an optimized approach for evolution to wireless broadband service providers must start with the right business strategy. They must make strategic decisions about where to invest and when to cost-effectively operationalize the network to support traffic growth. This requires consideration of many factors, including:

- How can the business evolve to a sustainable wireless broadband business model?
- Will LTE drive incremental revenue, lower costs, or both?
- What is the right timing for evolution to wireless broadband?
- What are the migration options for moving from today's present mode of operations to the wireless broadband future mode of operations?
- When and how should LTE be launched and in what areas (including deployment in urban zones)?
- Which investments in existing networks should continue (for example, Universal Mobile Telecommunications System (UMTS)) and which networks should still be in operation (for example, Global System for Mobile Communications (GSM)) and for how long?
- How can voice traffic be supported and what is the spectrum re-farming strategy?
- How can energy conservation initiatives be supported?

Mathematical modeling of scenarios — for example the different paths for migration to wireless broadband, including leveraging existing assets, investing in new assets, operating expense optimization, and outsourcing options — can help service providers build the right strategy. As part of this process, a strategic and cost analysis can assist with the evaluation of which assets to use and which technology to focus on. Developing these strategies includes objective analysis of the current business model and mode of operation, prioritizing business goals, and the creation of the optimal path to a new business model and mode of operation based on a strategic vision. Figure 3 illustrates an example of the factors that must be considered when building the strategic plan.

Figure 3. A strategic and network assessment examines all aspects of the business



Architecture and network design

Migrating to an all-IP backhaul will be a key to differentiating the user experience in wireless networks and managing the cost of dealing with escalating demand for services. To support the high bandwidth demands of tomorrow, service providers need a backhaul network with high capacity, availability and scalability. But because LTE and 3G business cases are very sensitive to backhaul costs, service providers should carefully set goals and assess potential risks as they select the right options for transitioning away from leases and engineering their backhaul network. Typical goals include:

- Leverage assets to generate new revenue opportunities and advantages
- Maximize the capital expenditures (CAPEX) associated with legacy networks and newly introduced LTE equipment

- Analyze services offered to mobile subscribers in light of costs and local regulations
- Lower CAPEX and operating expenditures (OPEX) in the short and long terms

The potential risks of not setting goals include implementation delays that cause added OPEX and CAPEX, a sub-optimized network that is ill-prepared for future demands, or no action at all, which can lead to capacity issues and escalating expenses. Effective architecture and network planning can eliminate the risks and lower the overall cost of transformation.

For example, a significant portion of backhaul costs are incurred with equipment leases. Further cost cuts could be achieved by changing the bandwidth leasing terms and/or purchasing backhaul equipment. Both measures could result in significant cost reductions with a short payback period.

IP transformation and integration

An LTE network is an all-IP network and migrating to IP is one of the most important processes in a complete transformation strategy. The migration process should include the network and systems architecture for LTE access, IP backhaul, an evolved packet core and IMS. But it should also cover:

- Device interoperability and certification
- End-to-end latency and reliability design and testing
- Multimedia and IMS load testing
- Application and multi-party prototyping and integration

In addition, the service provider should find ways to extract more value from the overall investment in IP. This is important because although an all-IP network is essential, it will no longer be the differentiator that the Public Switched Telephone Network (PSTN) infrastructure once was. General deregulation of the industry has lowered barriers to entry and access is now widely available to both new entrants and competitors. However, differentiation is possible based on how a service provider manages the cost and quality of IP service delivery and leverages intelligence in the network.

Quality and optimization

Service providers are looking for better ways to improve end-to-end QoE to reach key performance indicators (KPIs). Specific root causes (including new application and device behaviors) may be hidden from the assurance layer or not well understood, or existing service provider resources may already be too busy with existing projects. Exclusive wireless and best-in-class fixed probes and tools are available today that, when coupled with a complete set of end-to-end network expertise, can assess and analyze flows down to the subscriber and device, offering guaranteed business results.

The first step requires mapping customer care and operations business indicators against industry best practices for IT and operations, such as the TM Forum benchmarking program. This involves evaluating resource, process, and systems metrics in light of new work required for LTE launches. The network simplification implied by LTE will force operational efficiencies and remove bottlenecks from the system in the long term, ensuring the network permanently runs at peak efficiency. However, legacy systems must still be watched and systems and processes need consolidation. Fault management systems, activation tools, and real-time billing modules should be designed for long term growth. Specific root causes should be addressed by leveraging cutting-edge tools for radio access network (RAN), core and end-to-end network, as well as a proper assessment and analysis of the flows down to the subscriber and device to ensure and validate the intended business results.

Service delivery and operations

Business and operations enablement is an essential part of a transformation to LTE. A service provider's disparate operations for existing networks must be streamlined and simplified end-to-end. Manual and custom approaches must be automated, including back office systems, to support the industrialization of operations.

While most service providers have focused on supporting subscriber growth, enabling thousands of new partners and applications while providing high QoE requires a holistic, industrialized approach. The addition of a SDE and partnerships with third party ACPs will bring new challenges to the back office in terms of services growth and scale, speed-to-market, security of exposed operations support systems (OSS) and business support systems (BSS) assets, onboarding process of new partners along with their applications, governance across telecom and IT domains, and more.

Operations transformation expertise helps service providers evaluate their requirements and priorities for lowering operations costs and reducing total cost of ownership, improving QoE, onboarding of partners and applications and efficiently launching new broadband services by preparing their platforms, processes, and people to support network operations and new service delivery models, which leverage industry best practices and standards. This ensures that services are measured and exceed industry benchmarks for operational and customer care key business and technical indicators.

Launch LTE effectively

With all the key pieces in place, a service provider can launch LTE effectively as the foundation of a new approach to the market. A typical launch program will include the following activities:

1. Complete all of the steps, such as data collection/analysis/planning, to meet LTE readiness requirements. Decide and implement VoIP and handover/coverage plans.
2. Ensure the transformation plan is larger than access upgrades to encompass the entire network and service design and architecture in a holistic manner. The plan should cover upgrading backhaul to meet demand and a migration strategy that offers the most cost-effective approach without leaving the service provider as the last mover in its markets.
3. Implement an LTE trial plan with clear gates and robust and varied lab and field testing with clear performance measurements.
4. Execute a staged deployment that includes installation, pre-and post radio frequency (RF) optimization, security hardening, and multi-vendor and multi-system integration of RAN, ePC, VoIP, multimedia, games, and open APIs, as well as other service environment components. Alternative energy options for mobile sites and data centers should also be deployed, if required.
5. Ensure ongoing management, streamlined and fully automated operations, continuously improving delivery, and an introduction of an increased number of revenue generating partnerships.

Alcatel-Lucent and LTE

Based on its involvement in the early stages of defining LTE specifications and its pioneering approach to application enablement and the High Leverage Network, Alcatel-Lucent offers comprehensive services for managing end-to-end LTE transformation. The Alcatel-Lucent process can be customized to address specific technical, business and market requirements and assist service providers with every step of an integrated LTE transformation, from strategic planning, through end-to-end network integration, to managed services.

An Alcatel-Lucent managed LTE transformation supports our Ultimate Wireless Broadband End-to-End LTE solution. This solution allows service providers to successfully evolve their business models to realize the revenues, reduced costs, and increased efficiency delivered by LTE. It provides an integrated, pre-tested end-to-end LTE network, an open ecosystem of devices, content and application partners, plus transformation and integration services. This enables service providers to harness the advantages of wireless IP service delivery and evolve to an open Web-based business model.

The complete Alcatel-Lucent approach supports a streamlined, secure evolution from 2G, 2.5G, and 3G to LTE. It is backed by a proven methodology and transformation centers for end-to-end integration testing. In addition, because this approach draws upon 2300 multi-vendor migration projects, including IMS and wireless access, plus best practices gained in wireline broadband transformation and integration projects, it enables Alcatel-Lucent to support service providers with a smoother and more efficient LTE transformation.

Alcatel-Lucent LTE transformation services include:

- *Strategy development*, which includes vision workshops and a transformation roadmap to lead a service provider from its present mode of operation and delivery to a future mode, and includes a baseline assessment of pain points and dependencies, as well as prioritization of decisions based on business criteria and a balanced approach to transformation planning
- *Planning*, which includes definition and validation of architecture, network and operations design, consumer and vertical services, and ecosystem development
- *Execution*, which includes multi-vendor LTE and IP deployment and integration, installation, service migration and systems integration, as well as operations readiness for all-IP and LTE, including the people skills and operations of multiple networks (2G/3G/4G and IP/IMS core), and leveraging full or partial outsourcing to achieve OPEX requirements
- *Lifecycle management*, which includes multi-vendor maintenance and regular network optimization to deliver maximum network performance (network outsourcing and managed infrastructure are additional options)

Alcatel-Lucent transformation at work

Alcatel-Lucent is actively engaged in LTE trials and deployments around the world. A typical transformation requires a variety of activities determined by each service provider's specific requirements, but may include:

- Early stage business consulting to determine business models that will yield profitable services for LTE, while also considering spectrum costs and availability, migration processes and timing.
- Technical data discovery for access, backhaul and packet core infrastructure to determine the future network and overall solutions architecture.
- Migration management planning and spectrum planning using sophisticated tools with forecasting capabilities for backhaul, radio, and application/multimedia throughput. This includes transformation planning with lifecycle solutions that optimize use of CAPEX for legacy equipment and services.
- Overall solutions architecture and program management.
- Auditing and configuration of RF to optimize use of spectrum and equipment before and after launch of networks.
- Formal customer training on LTE technology, engineering, and operations.
- Design and architecture of eNobe B, Extended Memory Specification (XMS), S/P gateway, Policy Charging Rules Functions (PCRF), Session Border Controller (SBC), antennas, and other new and legacy equipment.
- Installation and engineering, and multi-vendor platform and network integration.
- In-building planning for large, high-traffic venues, such as stadiums, hospitals, stations, and airports.
- OSS/BSS assessment and organizational strategies for minimizing silos brought on by IP and LTE towards a strategy for business and operations enablement.
- Security hardening across an entire IP network.
- Solutions-oriented maintenance and repair support to cut problem resolution intervals.
- Additional transformation planning:
 - LTE network sharing in various types of locations
 - 2G and 3G network renovation and simultaneous LTE introduction, including swaps of legacy 2G and 3G equipment
- Investigation of managed services options for LTE and legacy networks, such as build, operate and manage, and outsourcing of legacy network and operations management.

Conclusion

With a successful migration to LTE, mobile service providers can take a leadership position in the wireless value chain. Transformation includes business transformation that capitalizes on the increasing demand for more advanced and personalized applications and services. This transformation process must be managed end-to-end to properly address business and market requirements and it must be strategically executed with a combination of interrelated activities:

- Strategic consulting
- Architecture and network design
- IP transformation and integration
- Quality and optimization
- Service delivery and operations

Alcatel-Lucent offers complete services for managing wireless broadband transformation, which can be customized to assist service providers with every step of an integrated transformation that addresses technical, business and market requirements. By leveraging these comprehensive offerings, service providers can create a High Leverage Network supported by LTE and all-IP that will enable new business models and competitive sustainability, while addressing immediate and future end user requirements. With a managed, end-to-end Alcatel-Lucent transformation process, service providers can evolve to a sustainable mobile broadband business model today.

Acronyms

ACP	application and content provider	OPEX	operating expenditures
API	Application Programming Interface	OSS	operations support systems
BSS	business support systems	PCRF	Policy Charging Rules Functions
CAGR	Compound Annual Growth Rate	PSTN	Public Switched Telephone Network
CAPEX	capital expenditures	SDE	Service Delivery Environment
CTO	Chief Technical Officer	QoE	quality of experience
ePC	Evolved Packet Core	QoS	quality of service
GSA	Global mobile Suppliers Association	RAN	radio access network
GSM	Global System for Mobile Communications	RF	radio frequency
HLN	High Leverage Network™	UMD	ultra mobile device
HSPA	High Speed Packet Access	UMTS	Universal Mobile Telecommunications System
KPI	key performance indicator	VoIP	voice over IP
IMS	IP Multimedia Subsystem	VPN	virtual private network
LTE	Long Term Evolution	SBC	Session Border Controller
MIMO	multiple input multiple output	XMS	Extended Memory Specification
MPLS	Multi-Protocol Label Switching		

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Jean Jones has held several product and solutions marketing positions supporting wireline and wireless businesses at Alcatel-Lucent. Jean directed the solutions team that brought to market two strategic wireless solutions for Alcatel-Lucent, META and End-to-End LTE. In her current role, Jean leads wireless transformation solutions, focusing on the services capabilities that support the end-to-end wireless broadband infrastructure.

Prior to joining Alcatel-Lucent, Jean held the position of Director of Product Marketing for Tenor Networks, a top-funded start-up in Massachusetts. Jean also served as Senior Marketing Manager at Bay Networks/Wellfleet, an industry pioneer of IP routing that was later acquired by Nortel Networks, where she helped to drive some of the first IP-VPN managed service deployments with major service providers.

Jean holds a MBA from Babson College located in Wellesley, Massachusetts. She has published numerous articles and has been quoted in notable publications, including *InformationWeek*, *Network World*, *Fiber Optics Online*, and *MASS High Tech*.

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