

white paper

Full Service Broadband access

Any service, any screen – anywhere

Consumers want instant access to and seamless interaction with all services, on any screen, anywhere – and they want it now. Full Service Broadband is the solution.

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1 Executive summary

This white paper describes the vision of Ericsson Full Service Broadband access for fixed and mobile broadband networks.

There are several challenges facing the telecom industry. Broadband, as we know it today, has reached its limits; consumers are no longer happy with the traditional broadband connection to the desk top. They want smartphones, notebook computers and TVs connected to the internet any time and anywhere.

This comes at a time when operators are challenged by falling revenues. Mobile operators are seeing a saturated voice market and falling prices, and fixed operators face challenges in the broadband business from mobile broadband.

With Full Service Broadband access operators can meet the consumer's demand for next-generation broadband, and at the same time secure continued growth in revenues.

The fixed broadband of tomorrow will provide ultra-high-speed access networks that deliver fast internet and high-definition IPTV services to consumers at home, and seamless connectivity to consumers on the move. The mobile broadband of tomorrow will be accessible anywhere.

A combination of technologies will be required to achieve this vision. On the fixed side, for instance, we will see GPON, GbE and VDSL2 technologies in fiber-deep access architecture (FTTH/FTTB/FTTC/FTTN). Likewise, on the mobile side, we will see HSPA upgrade to HSPA evolution and LTE.

IPTV is a digital TV service transmitted over a broadband network using the Internet Protocol. It is delivered over a quality-controlled network.

2 What is Full Service Broadband access?

The vision of Full Service Broadband access is to support any service, on any screen, anywhere. People will use the smartphone screen, the notebook computer screen and the TV screen in a similar way, in that they will expect to get access to the internet and all services (mail, web browsing and media) on all the screens, anywhere. For the big screen, IPTV with high-definition quality is needed.

This vision, which is soon to be realized, will dramatically change the way we use everyday devices such as mobile phones, notebook computers and TV. Homes and businesses are already being connected via ultra-high-speed broadband powering super-fast internet access, high-definition IPTV and a host of other services. With the introduction of mobile broadband, a significant step has been taken towards allowing consumers' smartphones and notebook computers to be used to access applications, services and websites wherever they are.

Full Service Broadband is destined to reach a mass market, to become "must-have" solution by raising the bar dramatically over and above what traditional DSL technologies can provide. Full Service Broadband access with a combination of deep fiber and mobile brings any service to any screen in a way that traditional broadband or mobile broadband alone could not do.

Here are two examples of how Full Service Broadband might be used in the future.

Multiple stream HD unicast TV: A family at home is watching TV. Each family member has their own high-definition, multiple-stream TV. The teenage son is watching YouTube videos in his bedroom and gets a message saying that a friend wants to download a video clip he has just taken from his phone, to display on the TV. The father wants to work in his garage and is watching only the last 30 minutes of the David Letterman show even though it does not "start" for several hours. The mother of the family prefers to watch a late-night chat show even though it's only 6.30pm. Later, she will take a video call over the TV from her best friend who lives in another state. Laughing, the husband says to his wife, "Do you remember the bad old days when we all argued about what to watch on the TV?"

Media on the move: Martin's commute to work normally takes about 30 minutes, but today the roads are packed. He pulls out his smartphone and logs on to his media portal. He then selects his home server as his source and the car stereo for output. Music from his favorite playlists is immediately streamed to his car speakers.

3 Why we need it

Broadband as we used to know it is an ADSL (or cable) connection to the stationary computer on the desk, which is no longer meeting consumer needs. Today, people want more out of their broadband.

They want access to the full range of services including internet, mail, chat, browsing and media, any time and anywhere. New devices such as smartphones and ultra-portable notebook computers in combination with mobile broadband access make that possible.

The traditional way of watching TV – being

limited to the home to watch whatever is on – no longer appeals to the digital natives, or next generation of consumers. Consumers want to be able to watch what they want, when and wherever they want. And they want high-definition IPTV over the broadband connection; this is the way to deliver the TV experience of the future. In order to deliver good high-definition IPTV with support for multiple screens, a broadband connection with at least 50Mbps speed is needed; on the other hand, for mobile broadband with all the services, the speed of HSPA is adequate.

3.1 Drivers of change

It is becoming increasingly obvious that users' choice of technology and services is based more on personal and individual preference than on, say, household or workplace considerations.

Today's broadband has reached its limits

Traditional ADSL is not enough. It cannot provide the speeds needed for IPTV or the mobility needed for internet any time, anywhere. New technologies and services such as high-definition IPTV, mobile TV, gaming and interactive entertainment call for far more powerful networks and much higher bandwidth than is presently available.

Apart from raw capacity, Full Service Broadband must also deliver seamless access to all services. To stay competitive, networks must be able to deliver IPTV in the home and broadband services on the move.

Falling ARPU

Operators in developed markets face challenges including a saturated mobile-telephony market and falling voice prices. Fixed-line operators are facing potential lost broadband revenues as customers move to mobile broadband. Understandably, operators want to do something to reverse this trend.

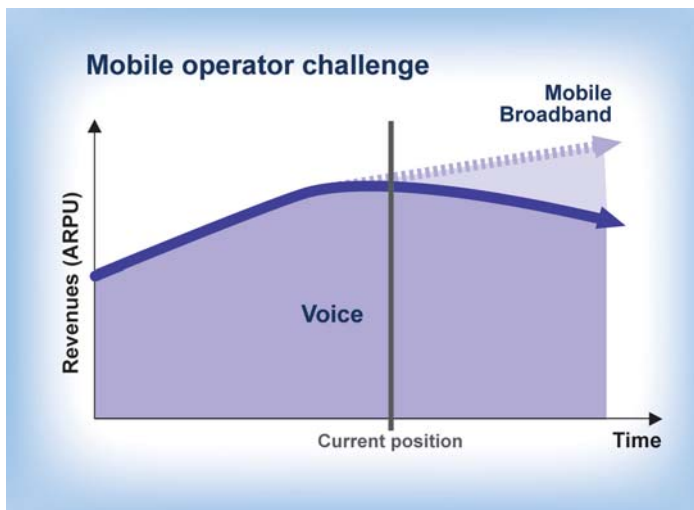


Figure 1: Mobile broadband and voice revenues (ARPU)

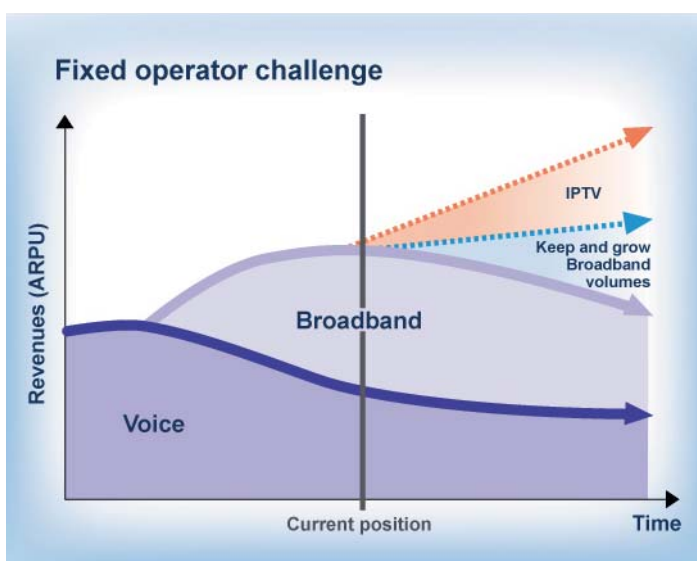


Figure 2: Fixed broadband, IPTV and voice revenues (ARPU)

Figure 1 shows that mobile voice revenues are at static levels and starting to fall, while mobile broadband ARPU is expected to rise.

Figure 2 shows fixed-voice revenues falling for the fixed operators, while broadband volumes are steady and IPTV revenues are expected to rise dramatically. The growth in IPTV will secure continued growth in broadband volumes.

Operators can continue to secure healthy revenues with a focus on Full Service Broadband access. Consumers want both the high-definition IPTV access through the evolved fixed network and the internet any time, anywhere delivered over mobile broadband. This combined high value to the consumers is securing continued growth in the broadband business.

Here are some of the main reasons fixed

and mobile operators are looking to Full Service Broadband as a solution:

- IPTV has become attractive because it points the way for operators to retain existing broadband customers and to gain additional revenues.
- With the right offerings, consumers will be prepared to spend more money to get high-quality services, such as IPTV at home and internet access on the move.
- Mobile operators need to enter the broadband market in order to secure business volume. They need to continue to evolve HSPA (and later LTE) services to stay competitive.
- Operators need to keep up with the competition. Anyone not delivering Full Service Broadband access will soon start to lose customers.

4 Creating Full Service Broadband access

Full Service Broadband access calls for parallel upgrades of the fixed and mobile access networks as follows:

- Copper access networks will be upgraded to deep-fiber access networks (FTTH/FTTB/FTTC/FTTN) with VDSL/GbE/GPON as access technologies in all areas, with competition from cable and/or fiber access provided by utilities and municipalities.
- Mobile-access networks will evolve with HSPA being upgraded to HSPA evolution and the introduction of LTE.
- A combination of mobile and copper access will be used where deep-fiber access cannot be built due to reach or revenue-potential issues.
- Backhaul connectivity from radio base station sites has to evolve to keep up with the growing capabilities of the radio technologies. Fiber-to-the-site and the next-generation microwave links provide the technologies needed.

Most operators will want to approach these upgrades in phases, over time. There are limits, for example, to how much they can or want to invest at any given time. For fixed access, the most obvious way forward is to start in urban areas, replacing ADSL2+ broadband with VDSL/GbE/GPON. In rural areas, they can replace ADSL and dial-up access with VDSL/GbE/GPON or perhaps even mobile access, depending on the geography and business potential.

For mobile access, operators can upgrade urban 3G/WCDMA and HSPA to HSPA Evolution and LTE, while in rural areas with GSM networks, they can gradually expand HSPA coverage.

Mobile broadband offers the advantage that larger areas can be covered with a much smaller investment than that needed for deep fiber.

It is worth taking a closer look at these access technologies.

4.1 Deep-fiber access

Fiber is making its way closer and closer to the home. In the industry, this is termed deep-fiber access. FTTC extends the reach of fiber to within a kilometer of the end users; FTTB takes it to an office or residential building; and FTTH extends its reach all the way into the home.

Only deep-fiber access is powerful enough to provide the 50Mbps capacity needed to support multiple IPTV channels and to allow end users to enjoy high-definition, interactive and personalized TV services. Using GPON point-to-multipoint technology, one can split a 2.5Gbps optical signal into 16-64 parts near the end users. As a result, GPON FTTH can support HDTV with several channels per household at capacities of between 100Mbps and 2.5Gbps. With fiber GbE point-to-point (GbE P2P) there is no splitting or sharing of the fiber, which is important for some business users from a security perspective.

With GbE P2P the bandwidth is

symmetrical, facilitating ultra-high speeds both downstream and upstream, supporting consumed and produced HD content. Fiber GPON and fiber GbE P2P are complementary technologies and will be deployed side by side to cater for various end-user needs.

Ordinarily, fiber will be used to complement copper access from the local exchange to the cross-connect DSLAM node, and to the home. For example, for the access network, an operator might use legacy broadband copper, and for backhaul, an optical fiber network to the curb. The choice of fiber or copper networks depends on the quality of the copper network, geography and local regulations.

Regardless, however, the tendency is clear: fiber is coming closer and closer to the home – with copper ADSL2+ reaching peak rates of 24Mbps and VDSL2 approaching 50-100Mbps.

4.2 HSPA Evolution

HSPA, the “turbocharged” version of 3G, uses WCDMA technology for radio access. The next version, HSPA Evolution, will provide even better performance – with peak rates of up to 42Mbps and beyond – thanks to more advanced modulation and the use of multiple-antenna technology (MIMO).

HSPA Evolution:

- provides higher data rates and lower latency;
- provides greater network capacity and makes better use of spectrum thanks to higher-order modulation and advanced antenna systems;
- runs on existing WCDMA/HSPA spectrum and coexists with legacy HSPA/WCDMA services;
- usually requires only a software upgrade to current HSPA networks.

4.3 LTE

LTE, a further evolution of the radio access network, will become available in 2009 and offer peak rates of 150Mbps. Later, LTE Advanced, due around 2013, will offer peak cell rates of 1Gbps.

Each of these mobile access technologies (GSM/EDGE, WCDMA/HSPA, LTE) belongs to the same family of 3GPP standards. Operators can therefore adopt a gradual approach to expanding their networks.

When operators introduce LTE they will combine HSPA with LTE on the same evolved core network. HSPA, which currently offers basic broadband internet services on a par with ADSL, will guarantee coverage. LTE, in turn, will provide extreme performance where such peak rates are needed. Then, over time, operators will expand LTE coverage.

SAE (System Architecture Evolution) is an evolution of the packet side of the core network introduced with LTE. The most important driver in the context of Full Service Broadband is the ability for user terminals to move seamlessly between different access

networks – for example, 2G, 3G/HSPA, LTE and non-3G access technologies, such as fixed-access networks and wireless LAN (WiFi).

Attractive characteristics of LTE:

- LTE can be deployed on all existing IMT2000 frequency bands as well as on non-IMT2000 bands. LTE will support bandwidths ranging from 1.4MHz to 20MHz (compare this with 3G, which works on 5MHz or GSM on 200kHz).
- LTE also gives much reduced latency, with round-trip times in the radio network of about 10 milliseconds. Very important for real-time services, gaming and speech.
- Together with the SAE core network, LTE will form a simple architecture consisting of just two types of nodes. In SAE all interfaces are IP-based.
- LTE is cost-effective for operators – it is optimized for high data throughput and it incorporates “plug-and-play” and self-configuration concepts. Operators can introduce LTE smoothly into existing networks.

4.4 Backhaul

The mobile backhaul network has to be upgraded to match the performance improvements in the radio interface. Initially the backhaul has to be dimensioned to meet up with the peak data rates. In high-traffic areas even higher backhaul speeds are needed in order to deliver the full capacity of the base station.

In the past, mobile operators leased fixed-network lines for transmission. Given the dramatic increase in traffic volumes, however, it now makes good business

sense for them to acquire or own broadband transmission capacity in the form of microwave systems or optical equipment. Today, approximately 60 percent of all backhaul networks are self-built, with microwave as the dominant access technology.

The new-generation Ethernet microwave technologies play a crucial role in aggregating and transporting mobile and fixed broadband traffic.

5 How Full Service Broadband access fits into the overall architecture

The key to seamless Full Service Broadband access lies in the Full Service Broadband architecture.

The overall network architecture has to be flexible, both in order to adapt to changes and to suit the needs of all players. Some operators, for instance, have only mobile or fixed networks; others have both; and still others, such as power companies and local or national government networks, are now getting into the business.

To replicate the success of mobile telephony, broadband must be built on a standardized architecture. This is also a prerequisite for the convergence of mobile and fixed services. Yet another driver of standardized architecture is the need for mobile devices to connect to digital home networks, now that home devices are

increasingly becoming mobile. Accordingly, the architecture must support the delivery of standardized multimedia services to a wide range of devices.

From the end-user perspective, Full Service Broadband architecture must guarantee a simple and painless user experience by avoiding the need for manual configuration. Similarly, from the operator and service-provider perspective, it must be designed to minimize the cost of introducing new services and new access technologies.

The challenge is not so much building the parts of the Full Service Broadband architecture (indeed, they already exist) but, rather, putting them together successfully. The architecture is an open, converged, fixed and mobile solution. Figure 3 shows the Full Service Broadband architecture as follows:

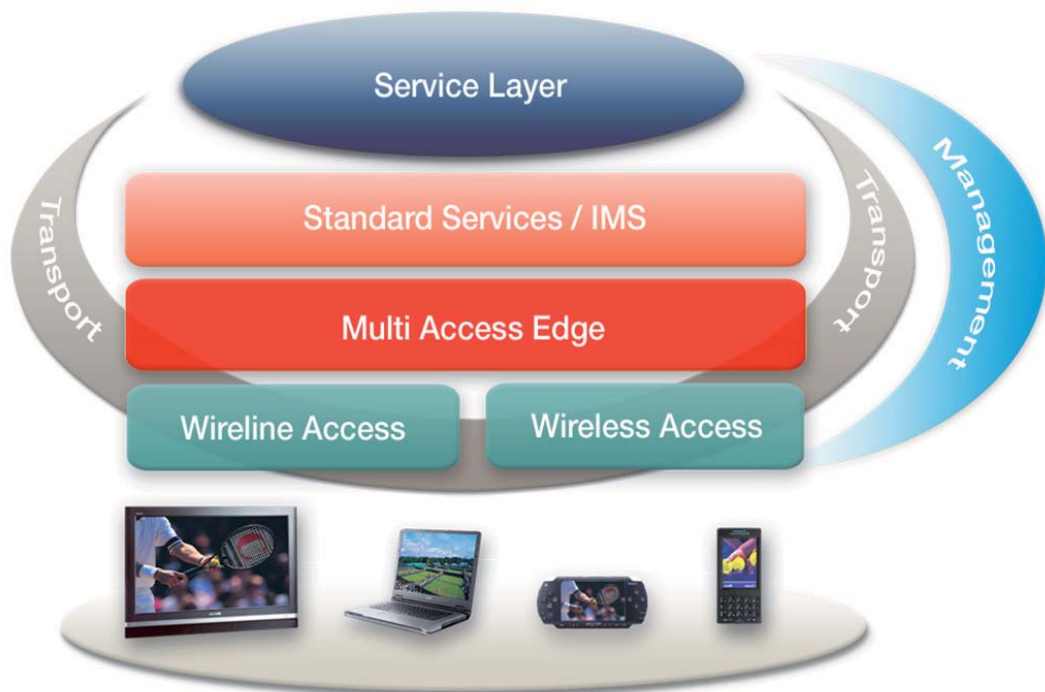


Figure 3: Full Service Broadband architecture

The network has one multilayer interface for users (the user-to-network interface or UNI) and one network-to-network interface (NNI) with other operators, enterprises and the internet. This approach makes it easier to ensure access to any broadband service, anywhere, using any device.

The basic parts between the user and network interfaces are:

- ❖ a reliable, cost-optimized, Ethernet transport network (with aggregation networks and IP backbone)
- ❖ Full Service Broadband access, which allows the evolution of services. (Evolved wireline access with deep fiber and the latest mobile broadband technology meet user demands. It is possible to use these access technologies in a complementary way in a single solution. If the same

services are to be provided across multiple access technologies, then the capacity and maximum bit rates must be similar)

- ❖ IMS, together with standardized and converged services such as multimedia telephony, messaging and presence, is used to establish and maintain end-to-end sessions. The multi-access edge domain contains support for mobility, deep-packet inspection (for controlling data packets), authentication, security, policy control and real-time charging
- ❖ Access edge evolved to handle the growing traffic on mobile and fixed broadband access. SAE, the 3GPP evolution of the mobile core network, is one basis for tying all the disparate parts together.

6 Conclusion

Consumers want more out of their broadband than the traditional ADSL link to the desktop can offer. They want internet any time, anywhere and they want high-definition IPTV to the living room. At the same time, the telecom industry is facing the serious challenge of declining revenues.

How best to move forward? Ericsson advocates Full Service Broadband as a way of solving the dilemma. With an architecture that provides seamless access and a layered approach to any service, on any device, anywhere, Full Service Broadband means the user is always connected to the best available network at the best possible price. This makes it easier for operators to build viable and effective business cases and to deploy optical fiber and mobile broadband networks.

The Full Service Broadband vision uses cutting-edge, high-capacity technologies to

provide the access part of the architecture. For fixed access, the most effective solution is optical fiber as close as possible to the home (FTTH), and/or evolved copper technology (VDSL2). For mobile access, the best approach is to use HSPA and LTE. This combination provides mobility with a good broadband speed: access to the internet on the move, and 50Mbps speeds to the home. This opens the door to the services that users are demanding: high-definition IPTV at home, and advanced internet services on the move.

When migrating to Full Service Broadband access, operators will benefit from working with a supplier that can deliver both leading mobile access and deep-fiber technology as well as handling the network migration to the Full Service Broadband architecture.

7 Glossary

3GPP	3rd Generation Partnership Project
ADSL	Asymmetric Digital Subscriber Line
ADSL2+	ADSL with doubled data rates
ARPU	Average Revenue Per User
DSL	Digital Subscriber Line
EDGE	Enhanced Data rates for GSM Evolution
FTTB	Fiber-to-the-building
FTTC	Fiber-to-the-curb
FTTH	Fiber-to-the-home
FTTN	Fiber-to-the-neighborhood
FTTx	Fiber-to-the-x, the collective name for FTTB, FTTC and FTTH
GbE	Gigabit Ethernet
GPON	Gigabit Passive Optical Network
GSM	Global System for Mobile communications
HDTV	High-Definition TV
HSPA	High-Speed Packet Access mode of WCDMA
IPTV	Internet Protocol TV
LAN	Local area network
LTE	The next mobile access technology in the 3GPP family
MIMO	Multiple Input Multiple Output (multiple antennas)
NNI	Network-to-network interface
P2P	Point-to-point
SAE	System Architecture Evolution
UNI	User-to-network interface
VDSL2	Very High Bit-rate Digital Subscriber Line 2
WCDMA	Wideband Code Division Multiple Access
WiFi	Family of wireless access technologies

8 References

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