


# Balancing the driving forces of broadband

People clearly want broadband: its impressive growth is testament to that. However, to reach a true global mass-market level – turning millions of users into billions – a range of complex issues needs to be addressed and balanced by market players. These can be broadly grouped into six drivers for broadband take-up: devices, services, connectivity, costs, competition, and government/regulatory incentives.

 **BROADBAND REPRESENTS** the biggest revolution in telecom since the phone went mobile. In fact the speed of broadband adoption even surpasses that of the mobile phones. From virtually no broadband subscriptions in 2000, there are now more than 250 million. We estimate that there will be in the region of 1.5 billion broadband subscriptions by 2011, half of which are likely to use mobile broadband (*see diagram "Broadband subscriptions"*). The tremendous growth in fixed-broadband connections will continue for many years, but it will also be complemented by a similarly strong growth in mobile-broadband connections targeting mobile phones, laptops, homes and enterprises. As the rollout of mobile broadband in coming years largely overlaps fixed-broadband penetration, end users are very likely to be receptive to a combined fixed-mobile offering.

For this phenomenal growth to become reality, the industry faces some challenges. Users want to be connected wherever they are and in the most convenient way, and as content becomes more speed-hungry, there is a need for ever-increasing bandwidth. Devices will require connectivity to allow them to communicate digitally with each

other and with the network. Cost and pricing will have to be structured and new models found. Governments around the globe will also have a role to play if broadband is to become available to all.

All these factors will greatly influence the future growth and usage of broadband and form six important drivers for global mass-market broadband adoption: **I** devices, **II** services, **III** connectivity, **IV** costs, **V** competition and **VI** government/regulatory incentives.

## **I Devices**

We are constantly seeing more – and more advanced – digital devices on the market. Many of them are already connected in one way or another, such as phones, computers and TV sets but we are also beginning to see a lot of new devices with built-in connectivity, such as personal health monitoring systems, game consoles and even cars.

Devices are becoming more advanced as processing power, memory size and other factors develop and costs fall, and they are being used in new ways and for new applications. To increase the speed of adoption, market players can help by standardizing

connectivity, making it easy to pre-integrate into devices and support the user at start-up – the rest will be taken care of by the millions of entrepreneurs out there, eager to catch the market and make their products more interesting to users.

A mobile phone is now often a digital camera, mp3 player, radio, calendar, e-mail device, computer, calculator, alarm clock, gaming device and even a TV. Your TV at home has gone digital and is connected to a media center or has built-in, multi-Gigabyte memory where you can store the week's TV programs. And the quality has become "high definition," demanding three times the speed of a standard TV, lower bit-error rates and greater capacity from TV distribution networks. The number of homes with at least one HDTV set in the US is expected to triple to 65 million by 2010 (*see source 1*), and the rest of the world is expected to follow.

The PC remains the main work tool in offices around the globe and these days it is unusual to find a PC that is not connected to the internet. With increasing processor capacity, memory and sophisticated programs for things such as user-generated content and downloads of films and music,

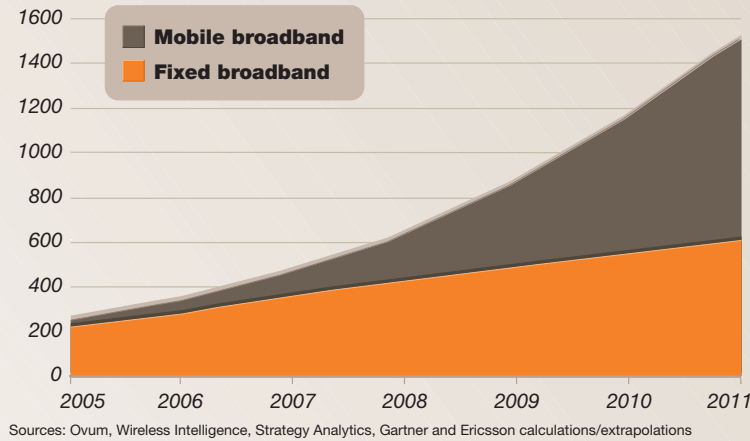




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### Broadband subscriptions

Estimated number of broadband subscriptions in millions, worldwide up to 2011.



the demand for higher speeds is increasing. Likewise it is expected that broadband uptake will double over the next five years to 80 percent of households in the US and 600 million fixed-broadband subscriptions in total around the world.

Coupled with this is the fact that laptop sales now exceed those of PCs in the US and Western Europe, and that wireless connectivity such as WLAN or 3G is pre-integrated into new laptops. With Intel's decision to include HSPA radio modules as a part of its next-generation mobile technology platform, and other initiatives to incorporate HSPA radio modules into laptops (Dell, Acer, Fujitsu, HP and others), mobile phones and other devices (*see source 2*), it will be very easy to connect with broadband speeds wherever you are.

The Digital Living Network Alliance (DLNA) is a collaboration between more than 300 consumer electronic and communications manufacturers, such as Sony, Ericsson, Microsoft, Panasonic, Motorola, Nokia, HP and Intel, that started in 2003. It focuses on creating a common framework for connection and interaction between consumer electronic products such as TVs, PC/laptops, mobile phones and game consoles. So far, DLNA has

agreed that people will be able to pull or push content between DLNA-enabled devices over Bluetooth, WLAN or Ethernet cable. UPnP is a similar initiative.

An add-on initiative is to connect the home with the outside world via a Home IMS Gateway (HIGA). The concept involves pulling content from any DLNA device at home via your mobile phone over, for example, HSPA, and streaming it to a DLNA-enabled device wherever you are, be it on your friend's TV or your work computer.

Gaming devices are delivered with built-in connectivity (such as X-Box Live) and are becoming increasingly advanced, with joysticks with force feedback, headsets and 3D spectacles.

Haptics (enabling the sensation of actually touching and feeling virtual objects) is a fairly new area, and has traditionally been used in areas such as healthcare, education, research and design, but is now also moving into entertainment. Another area where we see innovation is within healthcare tools for remote monitoring of patients. Connectivity in other niche devices, such as automatic lawn mowers or security systems, is not unrealistic.

The options are numerous the only thing we can be sure of is that connectivity

makes sense for a lot of devices we can only dream of today. And even though not all devices will generate as much data traffic as gaming devices or HDTV sets, the capacity need is expected to increase exponentially.

This raises some strategic questions around connectivity:

- Will the intelligence reside in the device or the network?
- Will devices have multiple connectivity alternatives, such as WLAN, HSPA and Ethernet? Will mobile devices such as mp3 players, digital cameras and so on have built-in SIM cards?
- How will operators handle subscriptions and what will payment models look like? Will we see models similar to those we use already for electricity, where it is free to connect new devices as long as you have a subscription, but usage costs? Or will operators charge a monthly fee per device for connecting it, and usage is free?

#### II Services

Hand in hand with broadband-capable devices, there is a vast number of advanced and innovative services that can be provided to entertain us or make our daily lives easier. The increased number of ser-



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vices provided via broadband will drive broadband business and requirements for speed and other network characteristics, as well as provide new business opportunities for content providers and operators.

Downloading of music has, in just a few years, established itself as a substantial distribution channel for music in many countries. Another example is online gaming – on an average night, hundreds of thousands of gamers are connected, playing against each other all over the globe. The online game World of Warcraft has just passed 7.5 million paying participants.

Our TV habits are becoming more advanced. Broadband is an excellent distribution channel for IPTV, enabling true interactivity, personalization and active participation. If we look beyond personal entertainment, there are a lot of interesting applications where connectivity adds to the value.

Mobile e-mail is on the rise and video conferencing is another area that is receiving more focus after initiatives such as those from Cisco, Sony and others to release full-concept solutions for a more “real-life” feeling.

Haptic tools and 3D spectacles and projections, combined with telemedicine, will

enable doctors at remote locations to feel a broken leg with their own hands, or perform surgery with the same sense of feeling as if the patient was right in front of them. With remote consultations, people in rural areas can get specialist help without leaving home, and health and travel dollars can be saved.

As with devices, it is impossible to predict the future “killer application” or all the services that will benefit from broadband connections, but it is clear that operators can be prepared for the future with a “killer environment” that can support all today’s and tomorrow’s services.

### III Connectivity

Connectivity is a prerequisite for all broadband-based business. High-speed connections, both fixed and mobile, that provide any service to any screen and device will have an impact on the network. We see a transformation to an integrated broadband architecture as the means to achieve this cost effectively.

Offering basic access has, of course, always been a fundamental requirement for operators, and with broadband this area will expand and offer opportunities as a stand-alone business. Since it entails an

increasing range of performance, interoperability, quality and security aspects, access has come to mean much more than just offering a connection. With this wider scope, it is sometimes referred to as connectivity, and there is an increasing focus from different players and regulators to separate the access/connectivity business from services, creating a separate a business in its own right. (*see Don't be afraid, page 8.*)

Broadband has previously been supplied only by fixed telecom and cable operators mainly using copper (DSL) and cable technologies. As an example, DSL is the most common technology within OECD countries, with 63 percent market share, while cable accounts for 29 percent. The rest is split between wireless, fiber and satellite. However, it can be noted that in South Korea and Japan, the net additions of fiber connections outnumbered DSL connections last year, indicating a move towards fiber or deep-fiber access deployment. This trend will probably also spread to many other parts of the world, once more capacity-demanding services emerge and regulatory frameworks become clear.

One way to take broadband the next step towards true mass-market level would



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be to make it accessible everywhere, in a cost-effective way. Mobile broadband – enabling broadband connectivity on mobile phones, laptops and other devices – is now available through technologies such as the WCDMA-based High-Speed Packet Access (HSPA) and EDGE (see “*The business case for rural broadband*”, page 44).

The mobility factor is important in giving the user the “everywhere” experience. However, in addition to providing broadband everywhere, mobile technology can also be used to provide user experiences similar to fixed ADSL technology.

Fixed or mobile solutions for delivering broadband are complementary. Fixed technology will, for the foreseeable future, have advantages in terms of access speeds per user and be more suitable for video and large screens, while mobile technology can be used for “traditional” internet services and is important to make broadband accessible everywhere, in a cost-effective way. We believe different fixed and mobile access forms will continue to coexist. The biggest growth within mobile broadband will be with HSPA, and on the fixed side with deep-fiber access such as VDSL2 and GPON.

The quality of broadband connectivity and service is also going to be crucial. For some broadband services, such as surfing

on the internet, users are prepared to accept some latency. However, if you are watching TV over a broadband connection you will not accept the picture freezing in the middle of the movie. Likewise, gaming over the internet is very sensitive to latency.

When designing the network, it is important to understand how one service will affect another and take that into account. A single broadband connection to a family household will create a number of needs. Operators must therefore consider what the network needs to provide for each service to function correctly, and also how to handle the sometimes-conflicting optimization rules. Operators will require smart networks that can handle these needs and prioritize the right services.

Another important factor relating to connectivity and user convenience is making any service available to a user, regardless of which device or screen the user has. This will require an access technology with sufficient up- and downlink capacity, together with a platform that is capable of handling both fixed and mobile access as well as adapting the content/service to the device and screen in use. This can be achieved in the network with IP Multimedia Subsystem (IMS), a standardized tech-

nology that can control all broadband services. IMS makes it easier to accommodate different devices and provides a standardized interface, to the benefit of device manufacturers, end users and content providers.

An evolved, open-standard architecture is essential in building a profitable and sustainable business. It provides the consumer electronics industry with the required economies of scale. It drives usage by offering the user transparency and convenience, by enabling anyone to reach anybody (or any device) at any time, and by making the same services accessible anywhere. It improves cost effectiveness by commoditizing equipment and simplifying interoperability and management. Above all, it encourages a common ecosystem that is beneficial to all parties involved. One such example is the Full Service Broadband Architecture.

#### IV Costs

For broadband usage to reach even higher penetration levels, it has to come at the right price. This means providing connectivity, services and devices at a cost that consumers are willing to pay.

New business models will be required and methods of charging found to attract

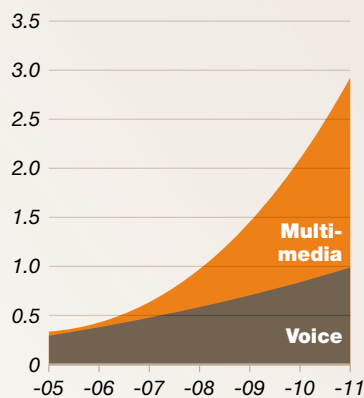


## Worldwide mobile and fixed traffic

Strong traffic growth related to broadband.

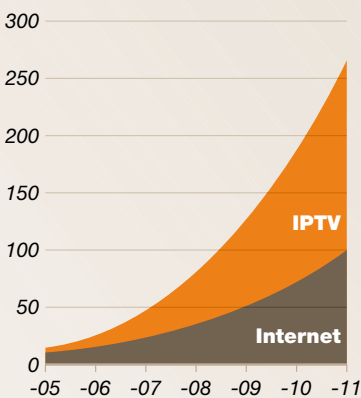
### Mobile networks

Terabyte, millions



### Fixed networks

Terabyte, millions



Source: Ericsson's estimates

future broadband users – there is still a relatively large number of subscribers using dial-up modems. When it comes to connectivity, it is likely that mobile broadband providers that follow the example of their fixed counterparts and offer access with clear and practical pricing, such as a fixed monthly fee, will be more competitive. Roaming costs are a major issue for mobile operators to sort out.

Cost is also important to operators. For example, they need a very cost-effective network. But cost is important not only to end users; operators also need a very cost-effective network. As mentioned above, video services via broadband in different forms, such as broadcast HDTV and download/streaming of films or video clips, will have a major impact on future data traffic in the networks. The increase of mobile broadband usage will, of course, also have an impact on traffic (see graph "Worldwide mobile and fixed traffic").

It is not likely that average user revenues will increase in line with traffic, thus making it even more important for operators to evolve to a cost-effective network. This can be done by transforming the network towards all-IP, with a layered architecture, cost-effective access technology, multi-access edge, IMS and communication

enablers together with a common transport layer for optimized cost and performance in routing and switching.

### v Competition

Fixed line, mobile, IT and media used to be distinctly separate markets. Now, all players aim to provide complete offerings of content and connectivity to the same market. We are already seeing the triple play of telephony, internet access and TV being bundled in one offering, or what is called quadruple play, which brings mobility to this mix.

Market conditions imply that there is direct competition between mobile, fixed and cable-TV operators and internet service providers such as never before. At the same time, telecom operators around the globe are asking themselves if the business case for IPTV holds water, where some analysts claim payback times will be long. Meanwhile, cable-TV operators are expanding by offering triple play to compete head-on with telecom operators.

For consumers, bundled services will often lead to lower total costs as well as the convenience of having services invoiced on the same bill. At the same time, studies (see source 5) show operators will in turn benefit from bundled services

through reduced churn, increased subscriber numbers and higher user revenues.

Competition will exist in all layers and operators can aim to be the best on the horizontal offerings, such as the physical access or broadband connection itself, or make sure they have a combined total offering, with advanced communication and multimedia services with telecom quality.

In this new business environment there are also important factors relating to the regulatory framework, which also has a large impact on which role the operator can take.

### VI Government/regulatory incentives

Governments around the globe are increasingly placing more value on the potential benefits of broadband. Broadband will increase competitiveness, stimulate economic growth by creating new business and job opportunities, reduce unnecessary travel, facilitate distance learning and telemedicine, and ultimately help bridge the digital divide.

The government of South Korea has a vision to enable "Broadband service to anyone, anywhere by 2010," and is well on its way to achieving that. South Korean regulators published clear national goals



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(see source 6) for the broadband build-out. The outcome was above 70 percent household penetration in 2005, putting South Korea in the No.2 position worldwide, beaten by Hong Kong at 75 percent.

South Korea's government worked closely with providers to decide what the infrastructure would look like and how to improve take-up rates. This had a great benefit on the country's economy. Between 1995 and 2003, the market for IT servers and network equipment increased by more than 400 percent, and 13 percent of South Korea's GDP came from equipment and services related to the project. Revenue from online content has also exploded.

The US is the only country in the world where the number of broadband subscribers over cable (30 million in 2005, see source 7) exceeds those using copper (23 million over DSL in 2005) where fiber is also used (5 million 2005). The US has also pushed for technology neutrality, which on one hand opens up the market for competition and lets the best technology win. But if not managed correctly this may have the drawback of jeopardizing global initiatives in cases where International Telecommunication Union (ITU) recommendations on frequency allocation and so on are not followed.

In Western Europe, the copper network is well built out and is the main broadband access alternative (45 million subscribers in 2005), used more than four times as often as cable (10 million subscribers in 2005). There is a relatively low

penetration rate for fiber, but there are markets where fiber is growing quickly, such as the Netherlands.

Local politicians see broadband as a way to improve regional competitiveness and use taxpayers' money to build out broadband coverage in competition with established commercial operators. This is fine providing offerings to users are based on normal business rules. But when municipalities change the business environment by offering "free-of-charge" connectivity, the playing field becomes fragmented and the incentive for other players to offer competitive solutions becomes limited. Municipalities also risk their taxpayers' money in the long term – it is costly to keep up with technology development if you do not have a big enough income to balance investments.

In the end, broadband connection is about giving equal opportunity to all inhabitants of a country, no matter where they live. And governments have everything to win by spurring on investment in technology that enables higher speeds and broadband coverage everywhere.

Broadband has true mass-market appeal and is becoming a basic necessity in today's information society. Growth is inevitable because once people start using broadband they will never turn back. Therefore, it is up to market players to address the six drivers we have identified to ensure there are no barriers to further broadband penetration and usage



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