

Invest in Sweden
Broadband Sweden



An information society for all



Sweden

Why Sweden?

- Cutting-edge competence in the development and implementation of broadband infrastructure.
- Solid tradition in communication technologies and high penetration rates.
- Early adopters and advanced users offer an ideal pilot market.
- Internet and broadband solutions is part of everyday life.
- Excellent infrastructure with good availability of high-quality connections.
- A vibrant broadband hardware and photonics cluster.
- Strong government support for broadband deployment.

“As leading broadband regions, Sweden and Scandinavia offer us unparalleled opportunity to test-market new technologies in wireless, wired home and SOHO (small office/home office) networking.”

Robert M. Auci

*Director, International Business Development
Linksys*

Foreign investors in the Swedish broadband sector

Alcatel (France)
Cisco (US)
Hewlett-Packard (US)
Huawei (China)
Juniper (US)
Lucent (US)
Nortel (Canada)
TDC (Denmark)
Telenor (Norway)
Tiscali (Italy)
UPC (Netherlands)

Sweden on demand – an online society

Sweden has long been a leader in developing broadband network technologies and broadband Internet access for households and businesses. With one of the best infrastructures in the world, the foundation has been laid for the next generation of services.

A few years back, high-speed Internet access, or broadband, was a luxury in any household. Today it is quickly evolving into our newest commodity, an essential tool for creating growth and boosting productivity.

While development has come at a breathtaking pace, the broadband market is still in its infancy. This is particularly true for the service market, which is growing rapidly as households demand services that take full advantage of the new broadband infrastructure.

Sweden has been a forerunner in making this happen and is quickly transforming itself into a truly digital and online society. And not just for the few. Swedish society and government have made broadband access for everyone a national priority. By June 2004, the broadband infrastructure reached some 85 percent of the population and the official target is to raise that portion to 98 percent by 2005. By mid-2004, the broadband subscriber penetration stood at 25 percent of the households.

Although fixed connections with a bandwidth of over half a megabit per second (mbps) are defined as broadband, a large number of households can enjoy speeds over 8 mbps. In some cases speeds as high as 100 mbps are offered. That makes Sweden the European country with the most extensive high-capacity broadband network.

Furthermore, no other country can compete with Sweden's fiber optic infrastructure with some 200 metro networks in more than one hundred towns. In Stockholm more than a kilometer of fiber per inhabitant lies hidden beneath the streets. Unlike in other countries fiber-to-the-home plays a significant role.

Building on the legacy of Ericsson and TeliaSonera, Sweden has a solid track record in communication technologies and technological innovation. High-tech companies in photonics and network technologies are flourishing. One of Europe's leading photonics clusters, "Photonics Sweden", is centered mainly in the Stockholm region.

Swedish consumers are keen on being first with the latest. This has helped the Swedish broadband market evolve into one of the most advanced in the world with intense competition, and a rapidly expanding service industry with international ambitions.

Attractive investment opportunities

Research & development

- Set up R&D centers in Sweden and take advantage of world-class innovation and competence at a competitive cost.
- Gain a competitive edge by teaming up with unique Swedish test beds and leading research institutes.
- Partner with Swedish broadband and photonics companies.

Innovative ventures

- Invest in Swedish high-tech ventures and gain access to unique new technology, solutions, and applications.
- Do it the easy way by investing in Swedish venture capital funds specialized in ICT.

Advanced strategic market

- Benefit from the world's most experienced broadband market and put new technologies, services, and applications to the test.
- Become a content provider to consumers who are avid Internet users.
- Use Sweden as a reference market for your European expansion.

Broadband at your service

The degree of sophistication in the Swedish broadband market also generates interesting opportunities for developing and launching broadband services. With Sweden as a pilot market, unique experience can be gained for use in the international market.

The focus is now shifting towards services that require high bandwidth. As users migrate from narrowband access to broadband, a clear change in usage patterns can be detected. Streaming media, e-commerce, downloading services, and online gaming all greatly benefit from the move towards broadband.

Advanced communication services IP-telephony facilitates and makes telephone communication cheaper. With several of the major Swedish operators such as B2 and Tele2 now pushing plug-and-play regular voice telephone services over the broadband network – offering an enhanced experience with increased interactivity – IP-telephony is quickly becoming a serious rival to traditional voice technologies. It is perhaps not a coincidence that the world's most loved and feared broadband application – the file-sharing software Kazaa – and the free-phone Internet telephony software Skype both originated in Sweden.

Streaming media Music video broadcaster Musicbrigade and online movie provider SF Anytime are seeing customers flock to their services. Betting operator ATG is launching full-scale, live streaming of horse races. To cope with the demand for streaming media, operators such as B2 and many metro networks are looking at cutting edge technologies such as multicasting, which will make large scale TV and video distribution over the broadband network possible.

Realtime gaming Demand for online and mobile gaming is growing fast, and Swedish developers are capitalizing on that by tapping into a vast pool of experience from Internet development and wireless technologies. The Electronic Arts EUR 8.5 million investment in Digital Illusions is one result of successful Swedish games development.

eGovernment In the "24/7 Government" program, the aim is to use state-of-the-art technology to make authorities and government services more accessible and easy to use and to provide more information and increase productivity for both government and business. For example, annual income tax returns can now be filed with the Swedish Tax Authority online, via SMS, or via telephone. Nine out of ten Swedes can use this service.

Broadband services facilitating qualified healthcare



A doctor in every home Vast, sparsely-populated areas and large, geographical distances have prompted Sweden to pioneer the use of telemedicine, or distributed health care. Using cutting-edge broadband technology, equal access to health care and specialists for everyone is ensured while cost is kept down.

For example, a patient in Gällivare in northern Sweden who is suffering from a hemorrhage can be X-rayed at the local hospital. The diagnosis can then be determined by specialists at the university hospital in Umeå, more than 500 km away.

In Uppsala, near Stockholm, a new general proton therapy center is being established. Proton therapy allows specialists to determine radiation dosage by considering the size of the tumor. Hospitals around Sweden send patient records to Uppsala, and the appropriate diagnoses and radiation treatments are sent back.

Sjunet – The Swedish health care network

Sjunet is a virtual private network that connects Sweden's 80 public hospitals, 800 primary care centers, 900 pharmacies, and a number of private health care institutions. Many of Sjunet's services involve telemedicine including secure patient information transfers, teleradiology, clinical rounds, and cooperation between hospitals.

In Sweden, neurophysiology specialists are only found in the large university hospitals. Using Sjunet, local hospitals and clinics can consult specialists for EEG analysis and nerve conducting studies. The specialists can easily access patient information at the referring clinics.

In a similar fashion, the Radiology Clinic of Sollefteå Hospital in northern Sweden uses the services of the radiologists at the European Telemedicine Clinic in Barcelona. Because Sollefteå lacks radiologists and Spain has a surplus, radiology nurses in Sollefteå send Magnetic Resonance Imaging (MRI) examinations to Barcelona for analysis. Three hospitals in northern Sweden use this service, which has cut the waiting time for MRI scans in half.

Broadband penetration

Korea	67%
Canada	35%
Taiwan	25%
Sweden	25%*
Denmark	23%
Japan	22%
Belgium	22%
US	18%
Netherlands	17%
Singapore	15%

*August 2004

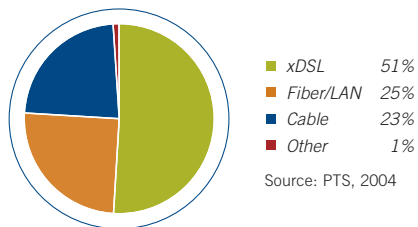
Source: ITU, UN, Point Topic, April/Sept 2003

Sweden – ICT penetration & usage

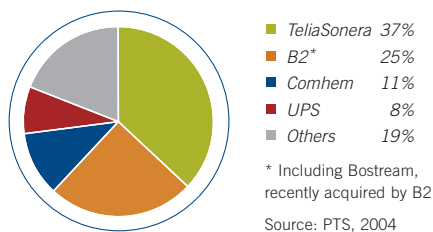
Broadband access penetration	85%
PC residential access	80%
Internet users	78%
Internet banking customers	57%
3G Coverage	75%
Residential cable TV subscribers	75%
Digital TV access	32%

Source: ISA, August 2004

Access technology shares



Sweden's leading service providers



Trade groups and other organizations

Bredbandscentrum
www.bredbandscentrum.com

IT-Företagen
www.itforetagen.se

Kista Broadband Alliance
www.kista.com

Photonics Sweden
www.photonicsweden.com

Swedoptronics
www.branschgrupperna.se/ta/optronics.html

The National Post and Telecom Agency (PTS)
www.pts.se

The Swedish Urban Network Association
www.ssnf.or

Speed up with Swedish broadband

The combination of advanced technology and a fast-growing, sophisticated market makes the Swedish broadband industry an exciting investment. The opportunities span the entire value chain from operators to hardware start-ups.

By the end of 2004, broadband will be the dominant way for Swedish households to go online. More than 85 percent of Swedish households have the option of subscribing to broadband services at home. This makes Sweden one of the most wired countries in the world with a network of the highest quality. Unlike other markets, pure fiber connections make up a stunning 25 percent of all of Sweden's connections. This has fueled competition, leading to affordable prices and increased connection speeds.

From an international perspective, the Swedish broadband market was one of the first to take off. A unique feature is its two hundred high quality fiber metro networks scattered throughout the country. The trend is towards open networks where competing service providers target end users. This of course makes for an easy entrance into and investment in the Swedish market.

A narrowly defined Swedish broadband industry encompasses around 350 companies with more than 5,000 employees. At the core are some 100 operators, most of which are small and local. The four major players hold over 80 percent of the market and incumbent operator TeliaSonera is the dominant force with a 37 percent market share. In this segment an ongoing consolidation process creates an opening for interesting investment opportunities.

Sweden also features more than 40 companies dedicated to broadband equipment. Most of them develop network equipment and optical components. The flagship is telecomm giant Ericsson, which recently sealed a partnership with Cisco. Together they intend to capture a large share of the global market for merging present telecom and datacom networks.

The smaller equipment makers are generally backed by venture capital. The Swedish venture capital market is among the world's most developed and offers investment opportunities both indirectly via funds and directly in technology ventures, often in syndication with local VC firms.

The Swedish broadband industry

From hardware to operators and service developers, some 350 companies create the value chain of Sweden's broadband industry.

Segment	No of companies	Examples of companies
Residential broadband access	119	Bredbandsbolaget (B2), UPC, Bitnet, Bjäre Kraft
Local infrastructure	102	Stokab, Sollentuna Energi, Hemmanet
Business broadband access	72	Telenor, Utfors, IP-Only
Equipment makers	41	Ericsson, Lumentis, Transmode, Optillion
Network integration	25	Telesys, Prevas, Datametrix
Network rollout	21	Dotcom Solutions, Fiberdata, Flextronics
National infrastructure	11	TeliaSonera, Svenska Kraftnät, Song Networks
Software	11	Operax, PacketFront, Gatespace, QBrick, Thalamus
Broadband services	8	Kamera, Smartv, Fronto, Jarowski
Hot spots/WISP	7	TeliaSonera, Powernet, Default City

Source: The Swedish Broadband Market Industry, Bredbandsutveckling 2004

Get enlightened in the Photonics Sweden cluster

Sweden has an expansive cluster in photonics and other technologies related to high-speed data networks. This opens for interesting investment opportunities.

Building on expertise in optics, laser technology, and semiconductors developed at companies such as Ericsson, TeliaSonera, and Saab, Sweden today houses a vibrant cluster specializing in photonics and networking technologies.

This cluster is mainly concentrated in the Stockholm/Kista region but companies working with these technologies can be found throughout the country. They have international ambitions and strong ties with universities such as the Royal Institute of Technology (KTH) and Chalmers University of Technology, as well as research institutes such as Kista Photonics Research Center and Acreo. The Sweden Photonics cluster organization coordinates and promotes research and technology exchange in the sector.

Particularly outstanding is the optical equipment sector. Companies such as Optillion, Wavium, Northlight Optronics, Lumentis, Transmode, and Net Insight are introducing some of the most advanced equipment applicable for metro networks on the market.

Other interesting areas are network management and surveillance technologies featuring companies such as PacketFront and Service Factory. Kreatel and i3 micro have earned international acclaim for their residential broadband services equipment.

Sweden also has a solid presence in high performance processors for network equipment with companies such as Switchcore and Xelerated.

Swedish broadband ventures

Alyata	www.alyata.se	Broadband networks
Dotcom Solutions	www.dotcom.se	Network design
i3 micro technology	www.i3micro.se	IP network products
Kreatel	www.kreatel.se	IP set-top boxes
Lumentis	www.lumentis.com	Optical transmission technology
Net Insight	www.netinsight.se	Networking equipment
Northlight Optronics	www.northlightoptronics.se	Fiber-optic transceivers
Operax	www.operax.se	IP network software
Optillion	www.optillion.com	Fiber-optic transceivers
PacketFront	www.packetfront.com	Broadband networks
Repeatit	www.repeatit.se	Wireless broadband solutions
Service Factory	www.servicefactory.se	ISP systems
Transmode	www.transmode.se	Optical networking technology
Wavium	www.wavium.se	Optical network solutions
Xelerated	www.xelerated.com	Network processor design
Zitius	www.zitius.se	Broadband service distributor

Broadband technology investment cases

Lumentis

In June 2004, Swedish optical equipment provider Lumentis raised USD 9 million in its final financing round. Lumentis' commercial success outside Sweden attracted London-based Chandaria Group as well as domestic investors. The new funds are destined to help boost the company's strong growth and to address the needs of a larger number of customers.

Lumentis offers fiber-optical data and telecom solutions for city and regional networks that reduce capital and operational costs. Through an innovative architecture where CWDM, DWDM, and SONET/SDH platforms share the same chassis, fiber pairs, and management platforms, the focus can be on deploying services rather than technical issues.

www.lumentis.com

Optillion

Started in 2001, Optillion is one of northern Europe's most ambitious ventures in optical equipment. Leading US and Swedish venture capitalists such as Crescendo Capital Partners, Cisco Capital, Investor Growth Capital, and Itact have together committed more than USD 80 million to develop and manufacture optical transceivers with extremely high capacity.

Optillion is already shipping from its Stockholm manufacturing facility and is at the forefront of developing hardware for today's as well as tomorrow's high speed data networks. With optical transceivers that can handle up to 40 gbps per second, the company is breaking new ground.

www.optillion.com

PacketFront

When Swedish broadband infrastructure provider PacketFront needed more funds to expand its international organization and beef up marketing, US venture capital firm Amadeus Capital Partners, together with existing backers, provided PacketFront with USD 18.5 million.

"We believe PacketFront has the potential to become a global force in infrastructure for the broadband networks of the future," said Amadeus venture partner Simon Cornwell.

PacketFront delivers a service control and provisioning system that enables operators to manage fully automated "true broadband" networks. It also allows network owners to deliver "triple play" (TV/video, telephone, and Internet) from multiple providers, thus increasing revenues.

www.packetfront.com

Broadband anywhere – It's wireless

Wireless broadband access is growing quickly and challenges include how to integrate different wireless technologies and the convergence between fixed and wireless technologies.

Just as consumers want mobile telephony, they also increasingly want broadband access wherever they are. Sweden has been one of the first countries to aggressively build out both major technologies for high-speed wireless data connections, the short range WLAN, and long-range 3G.

Operator TeliaSonera has one of the world's most extensive WLAN networks with 700 hot spots in its core Swedish and Finnish markets. Alongside the major players, there are also a number of smaller independent operators. Most hotel chains for example run their own hot spot networks.

Sweden has four separate operators with their own third generation wireless networks. Mobile operators now scramble to not only offer wireless broadband via their own networks, but also through local hot spots that offer higher transmission speeds. By mid-2005, 98 percent of the population is scheduled to be covered by the 3G networks.

Swedish operators are leading the way in seamlessly integrating the WLAN, 3G, and other wireless technologies. TeliaSonera is the first to offer international hot spot roaming via a mobile phone subscription using technology from Swedish startup Service Factory. Vodafone and Tele2 are working to offer both 3G and WLAN access in the same subscription.

Microsoft, Hewlett-Packard, and TeliaSonera are also using Sweden as a test bed for a new mobile office product. This product uses technology from Sweden's Columbi-tech that allows users to roam seamlessly between the different wireless broadband technologies. Swedish IpUnplugged is another provider of seamless connectivity through different networks.

Sweden's top ICT universities

Chalmers University of Technology

www.chalmers.se

Linköping Institute of Technology

www.lith.liu.se

Luleå University of Technology

www.ltu.se

Lund Institute of Technology

www.lth.se

Royal Institute of Technology

www.kth.se

Research institutes focusing on broadband/photronics

Acreo

www.acreo.se

Center for Distance-Spanning Technology (CDT)

www.cdt.ltu.se

Chalmers Microtechnology and Nanoscience (MC2)

www.mc2.chalmers.se

Kista Photonics Research Center

www.kprc.se

Santa Anna IT Research Institute

www.santaanna.se

Swedish Center for Internet Technologies (SCINT)

www.scint.org

Swedish Institute of Computer Science (SICS)

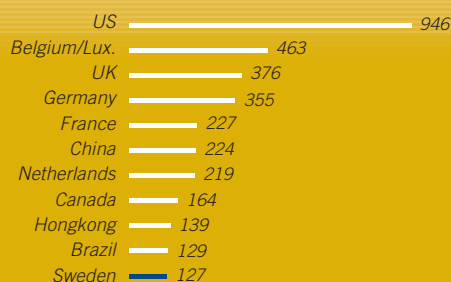
www.sics.se

Sweden – Engine for growth

There are several reasons why Sweden is attractive to foreign business. For one, investors gain access to sophisticated products and technologies, skills, innovations, and first-rate infrastructure. Establishing a position in Sweden means a triple market presence in Scandinavia, the Northern Europe/Baltic Sea region, and the European Union – home to some 450 million consumers. Additional advantages include a qualified workforce, extensive R&D facilities, an advanced testing market, and demanding customers and suppliers providing the foundation for business operations of the highest caliber. The Swedish business climate and growth prospects earn high rankings in most internationally recognized studies and surveys.

Among the largest recipients of FDI, worldwide

1998–2002, USD billion



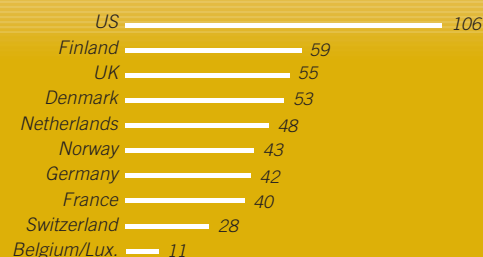
Foreign investors are discovering Sweden's many business and investment opportunities. As a result, Sweden has become one of the world's main recipients of foreign direct investment (FDI).

Note: Figures for Belgium/Luxembourg are not comparable since the registered capital flows to a large extent are channelled to other countries

Source: Unctad, 2003

Foreign-owned companies – important employers

2003, employees in thousand



Sweden is an internationalized business community. The number of Swedish employees working in foreign-owned companies illustrates this fact. In 2003, 10,100 foreign-owned companies employed a total of 564,200 Swedes, or approximately 23 percent of all employees in the private sector.

Source: Swedish Institute of Growth Policy Studies, 2004

Broadband centers of excellence in Sweden

Linköping/Norrköping

Home communications, networks, and broadband access technologies

- Linköping Institute of Technology
- Mjärdevi Science Park
- Santa Anna IT Research Institute

InternetBay – the north of Sweden www.internetbay.nu

Distance-spanning technology and telemedicine

- Luleå University of Technology
- Aurorum Science Park, Uminova Science Park
- Center for Distance-spanning Technology
- Digital Network Umeå, Test bed Botnia

Wireless Valley

www.kistasciencecity.se
www.bas.stockholm.se

Network technologies, photonics, and wireless technologies

- Kista Science City
- Royal Institute of Technology, Kista IT University
- Test bed Stockholm
- Acreo broadband test bed
- Kista Photonics Research Center
- SCINT, SICS research institutes



Team up with a Swedish test bed

There is enough room for everyone in a Swedish test bed. Generous access and specialization make these testing sites ideal for trying out new broadband technologies and services.

Facilities established for the testing of new services and technologies can be found throughout Sweden, often in connection with regional competence clusters in information and communication technologies (ICT). In general they are open to outside companies, researchers, and developers. Many offer various types of partnerships. They collaborate through the Swedish Test Bed Network which facilitates the transfer of information and benchmarking between the individual test beds.

Acreo broadband test bed This is the largest broadband test bed in Sweden for new technologies and services. It is located both in the Stockholm area and in Hudiksvall, 380 km north of Stockholm, and includes the transmission network between these two Metropolitan Area Networks (MANs). It is open to the international community. Acreo's test bed focuses on cost-efficient infrastructure for broadband services, paying special attention to important aspects such as services to be offered, business models to be applied, hardware costs,

and network architecture. The open network concept and end-to-end Quality of Service (QoS) is demonstrated in real networks with real end-users. All of these characteristics make this test bed unique. It is selected as an EU test bed. Acreo is partner in several EU projects such as MUSE (Multiservices Everywhere) and NOBEL (Next Generation of Optical Broadband for European Leadership). www.acreo.se

Test bed Stockholm StockholmOpen.net is an open network platform. The idea is to make wired or wireless single access points or local networks publicly available and to let the users decide which Internet operator to use. Test bed Stockholm is the start of a citywide, open-access network, which will provide local services and the freedom to choose one's own ISP. The test bed is a joint project between universities, business, and local government. www.stockholmopen.net

Test bed Botnia In Luleå in northern Sweden, the focus is on mobile services for

wireless and broadband networks. Test bed Botnia also looks at digital TV networks and is constructing an IPV6 network. Test bed Botnia is operated by the Center for Distance-spanning Technology (CDT) at Luleå University. www.testplats.com

Digital Network Umeå In Umeå, the test bed concentrates on mobile and broadband services in telemedicine, e-government, domestic services, and education. It has an open test platform and a test pilot population in a region with the world's highest Internet penetration. www.snic.se/DNU

Community Hub A national test bed set up to explore the opportunities in connecting scarcely populated areas to major population hubs by means of high-speed fiber connections of up to 2.5 gbps. Emphasis is on how to bring services and cultural life out to the countryside through broadband. It is open to everyone at cost. www.folketshub.com

ISA – Business facilitator

Invest in Sweden Agency (ISA) is the government agency responsible for informing about investment opportunities in Sweden. Companies planning to establish or expand business operations in Sweden can obtain information and assistance free of charge from ISA and its regional and international network.

With headquarters in Stockholm, ISA has international operations in major European, North American, and Asian cities. The vast majority of ISA staff has a background in the corporate sector and expertise in the investment process. These attributes help to ensure professional guidance for successful business launches in Sweden.

The Photonics Sweden cluster strives to promote research and technology exchange, facilitate new business and growth within photonics, and create useful contacts.

*For more information please visit
www.isa.se/photonics and www.itsweden.com*

<p>ISA HQ (Stockholm) Tel: +46 8 402 7800</p> <p>IT Sweden Project itsweden@isa.se</p> <p><i>Karin Ruiz</i> karin.ruiz@isa.se</p> <p>Photonics Sweden cluster <i>Ciro Vasquez</i> ciro.vasquez@isa.se</p>	<p>China (Shanghai) Eddie Chen Tel: +86 21 5404 0910 eddie.chen@isa.se</p>	<p>Japan (Tokyo) Åke Larsson / Robert Grönborg Tel: +81 3 5562 5014 isa@isatokyo.org</p>	<p>US (Los Angeles) Göran Eriksson Tel: +1 310 204 6790 goran.eriksson@usa.isa.se</p>
	<p>China (Beijing) Jane Sun Tel: +86 10 6532 5664 jane.sun@isa.se</p>	<p>South Korea (Seoul) John Kim Tel: +82 2 739 1460 john.kim@swedishtrade.se</p>	<p>US (New York) Erik Enroth Tel: +1 212 702 8780 erik.enroth@usa.isa.se</p>
	<p>China (Guangzhou) Shirley Ma Tel: +86 20 3891 2383 ext. 8204 shirley.ma@isa.se</p>	<p>Taiwan (Taipei) Rita Huang Tel: +886 2 2757 6573 rita.huang@swedishtrade.se</p>	<p>US (Boston) / Canada Ron Sutherland Tel: +1 978 764 5335 ron.sutherland@usa.isa.se</p>
	<p>Germany Jörn Gallwitz / Micke Bayart Tel: +46 8 665 18 00 germany@isa.se</p>	<p>UK (London) Christina Knutsson Tel: +44 20 7535 7396 christina.knutsson@isa.se</p>	<p>Representation offices in Denmark, Finland, Italy and the Netherlands.</p>