

Invest in Sweden

Wireless Sweden



Driving wireless innovation



Sweden

Why Sweden?

- Home to Ericsson, Sony Ericsson, TeliaSonera and other global wireless companies.
- Sweden is Wireless Valley, the world's leading wireless cluster with cutting edge R&D.
- A large and cost-efficient pool of available wireless engineers.
- About 500 wireless companies, including a broad range of early stage companies.
- A wireless patent portfolio with more than 10,000 patents.
- Early roll out of 3G with wireless broadband infrastructure coverage aiming at 99.98 percent.
- Ideal pilot market for wireless systems and technologies and mobile applications and services.

“Sweden has a well known reputation for pioneering wireless technologies and applications. We therefore see a lot of opportunities for business ideas here.”

*Dr. Dietrich Ulmer,
CEO Siemens Mobile Acceleration GmbH*

The top global ICT nations

1. Sweden
2. Denmark
3. Iceland
4. South Korea
5. Norway
6. Netherlands
7. Hong Kong
8. Finland
9. Taiwan
10. Canada

Source: ITU Digital Access Index, November 2003

Sweden – leading the wireless revolution

For decades Sweden has been synonymous with cutting edge wireless research and innovation. As the world's leading wireless cluster it offers exciting opportunities to capitalize on the next phase – mobile data.

Swedes have always loved phones. Ever since the late 19th century Stockholm has been the most telephone dense capital in the world. Today the wires are gone and wireless communications are booming around the world. Sweden remains at the forefront of this rapid development.

With a solid track record in wireless innovation Swedish companies and academic institutes continue to push the limits, bringing new wireless technologies to the global market. Sweden has constantly been at the forefront of mobile telephony and has produced an attractive portfolio of wireless patents. The third generation mobile technology, WCDMA, now being deployed was developed in large part by Swedish companies, just like preceding technologies.

Apart from well-known names such as Ericsson, TeliaSonera, LGP Allgon Powerwave and Teleca, the Swedish wireless landscape also embraces a swarm of smaller companies, nurtured by an advanced private equity market. The rich supply of start-ups geared towards wireless technologies and applications is unmatched.

At its core, Swedish wireless leadership is driven by research and development. Nowhere else do companies dedicate so many resources to R&D. Their effort is backed by a number of public institutes and universities that are leaders in wireless research and innovation. They provide abundant opportunities to tap into the wireless cluster through joint ventures and research programs.

Gone are the days when wireless just meant telephones. Now it is about cutting all kinds of wires and making the internet mobile. Nor is communication confined to humans; a growing portion of the wireless traffic travels between machines. No matter what the technology – GSM, CDMA, 3G, WLAN, GPRS, EDGE or Bluetooth – it is all part of the Swedish wireless landscape.

Sweden is also a sophisticated wireless market. It has one of the highest mobile phone penetration rates and is a pioneer in public wireless LAN services. Early and extensive roll-out of 3G networks in combination with a demanding customer base make Sweden an ideal market to develop and test new mobile services and applications.

Take advantage of exciting business opportunities

Research & development

- Join projects and partner with Swedish ICT research institutes.
- Establish R&D, competence, product or business development centers.
- Enter joint ventures or strategic alliances with Swedish companies.
- Enter partnerships or projects with Swedish test beds.

Innovative ventures

- Invest in or acquire innovative high-tech SMEs.
- Enter into partnerships or ally with Swedish venture capital firms.

Advanced strategic market

- Test and launch new products or services on an ideal test market.
- Use Sweden as a hub in the Baltic Sea region.
- Set up European, Baltic Sea or Nordic regional headquarters.

Unique source of wireless expertise

The Swedish wireless ICT sector today comprises some 500 companies, ranging from leading wireless systems group Ericsson to a rapidly growing number of mobile application developers. They offer a myriad of business opportunities for anyone searching for excellence in wireless.

Excellence in wireless system development Sweden spearheads the development of integrated wireless ICT systems, the strongest wireless competence area in Sweden including some 37 percent of wireless companies. Stockholm with Kista Science City is home to more than half of all Swedish wireless companies in this segment, including Ericsson's corporate headquarters and main R&D site. Many international companies' wireless R&D centers are located here, as well as suppliers and partners of Ericsson and other major wireless equipment vendors.

Ready supply of terminal platform and software designers Sweden's leadership in the design of terminal software platforms and applications, and industrial and telematics systems and devices includes some 40 companies, like Spectronics, Sectra and Neonode. Ideon Science Park in the south of Sweden is a major center of excellence in wireless terminals that hosts Ericsson Mobile Platforms, Ericsson Licensing Technology, Teleca, Anoto and Sony Ericsson as the obvious driving forces.

Leading edge in business applications With expertise in the integration of service architectures, core networks and terminals, Sweden offers the ideal environment for mobile application development. There are more than 125 companies in this segment. Business and public sector applications, mobile gaming, messaging, telematics, and sales/work order/maintenance management applications are all Swedish strongholds. Of the centers of excellence, Stockholm/Kista has the largest number of mobile applications companies, InternetBay in the north is focused on distance-spanning applications and Göteborg is a center for telematics and wireless applications linked to the automotive and logistics industries. TelecomCity is in the forefront of innovative mobile consumer applications.

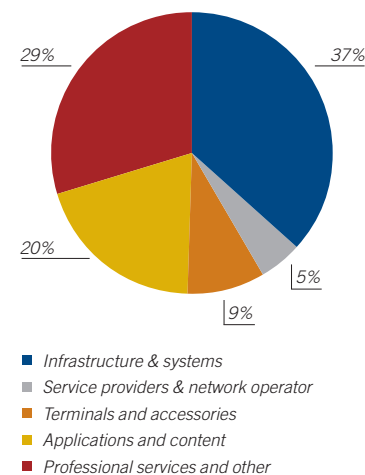
Advanced mobile telecom market and infrastructure GSM operators TeliaSonera, Tele2 and Vodafone dominate the Swedish mobile telecom market. In the 1990s Vodafone acquired the local operator Europolitan and recently Spring Mobile entered the market with a fourth GSM license. In total there are some 20 mobile service providers, including foreign MVNOs like Dj Juice and Chess. Currently three 3G (WCDMA) networks are being deployed, aiming at 99.98 percent coverage. In May 2003, operator 3, a joint venture between Hutchison Whampoa and Investor, launched its 3G services, and in the first half of 2004, TeliaSonera, Vodafone and Tele2 are launching their services, making Sweden a very advanced 3G market.

A pool of unique experience and know-how Sweden's highly skilled professional services companies have strong system integration and application development competence. Constituting 30 percent of the market, this wireless ICT segment is the second largest with expertise in wireless system integration, infrastructure component design and terminal software development. Large system integrators like Enea Data, HiQ, Northstream, Teleca, TietoEnator and WM-Data with customers throughout Scandinavia can be used to successfully enter the Swedish market.

To learn more about Swedish wireless companies, please visit www.isa.se/wirelesscompanies

Wireless Sweden

Percentage of companies by segment



Source: Northstream, 2004

“We chose Sweden because of its strategic location, advanced technology industry and society, and highly skilled workforce.”

*Robert Auci,
Director of International Business
Development, Linksys*

Swedish mobile users

- 98 percent mobile penetration.
- 46 percent of users between 16-30 years send at least one SMS per day.
- 57 percent of the subscriptions are pre-paid.
- Users spend on average SEK 193 (USD 27/EUR 21) per month on mobile services.

Important investments in wireless development in Sweden

- Accenture
- Atmel
- Cap Gemini
- Cisco
- EDS
- Ford PAG
- HP/Compaq
- Hutchison Whampoa/Hi3G
- Huawei Technologies
- IBM
- Infineon Technologies
- Infosys Technologies
- Intel
- Microsoft
- Mobile Internet Capital, MIC
- Motorola
- National Semiconductor
- Nexthaus
- Nokia
- Nortel Networks
- NTT Docomo
- Oracle
- RSA Security
- Siemens
- Sony
- Sun Microsystems
- Sybase
- Symantec
- VIA Technologies
- Yokogawa Electric
- ZTE Corporation

“Sweden has an extremely strong pool of R&D talent in wireless technology.”

*Richard Brown,
Marketing Director VIA Technologies, Inc*

R&D – Investing in a wireless future

Research and development sits at the core of Swedish society. Wireless R&D is carried out in a large number of institutes and centers, many of them world leaders in their fields.

Research and development is at the top of the agenda in Sweden and that is particularly true for the wireless arena. Every year 3.6 percent of GDP is poured into R&D which places Sweden at the very top of the world league. Naturally, a large part of this goes to the wireless sector. Of the SEK 76 billion (USD 10.6/EUR 8.3 billion) that goes into R&D every year approximately two thirds comes from the corporate sector where Ericsson and TeliaSonera are among the top R&D spenders.

Around a third of all people in higher education are enrolled in ICT-related programs. Swedish universities churn out 1.24 new PhDs in science and technology per 1,000 inhabitants, placing Sweden well ahead of any other nation. Swedish universities and research institutes are undertaking a large number of ICT-related research efforts and are at the forefront in the areas of wireless systems, signal processing and microelectronics. In addition, mobile services and understanding the consumer are quickly taking on a prominent role at universities and research institutes.

The four most important universities from a wireless perspective are the Royal Institute of Technology together with Kista IT University in the Stockholm region, Chalmers University of Technology in Göteborg, Lund University in the Öresund region and Linköping University in central Sweden. Together they account for the bulk of wireless research, but there are 29 other schools throughout Sweden that are also engaged in wireless R&D to some extent.

Alongside the universities there are a number of advanced research institutes with a focus on wireless research. They often emphasize applied research and together with regional test facilities offer great opportunities for rapidly bringing new ideas and technologies to market.

Both the universities and research institutes provide excellent opportunities to participate in research programs through various forms of partnerships and many offer contract research. There is also a developed network of seed capital firms and science parks or incubators collaborating closely with the major ICT research centers, offering interesting opportunities for venture capital investments.

Gain competitive edge – locate wireless R&D in Sweden

The attractive supply of high quality research engineers in the Stockholm/Kista Wireless Valley cluster has convinced several of the best known tech companies in the world to open R&D centers there. When *Intel* and *Sun Microsystems* wanted to open wireless centers outside their Silicon Valley headquarters, Stockholm became the obvious choice due to its innovative climate and good supply of talent.

Fast growing Chinese telecom equipment makers *ZTE Corporation* and *Huawei Technologies* also opted to profit from the concentration of wireless know-how that thrives in Sweden. For both companies locating to Sweden was the best way to keep up with the very latest in wireless research, especially in wireless infrastructure.

Auto giant *Ford* decided to locate their global R&D facility in Göteborg for telematics and vehicle related wireless R&D for its Premier Automotive Group (PAG).

Join a Swedish research institute and stay competitive

Wireless@KTH – www.wireless.kth.se The Royal Institute of Technology in Stockholm together with Kista IT University forms the hub of Swedish ICT research. With 113 researchers in 15 projects, the center focuses on signal processing and mobile systems but also has a growing presence in the area of mobile services.

The Swedish Institute of Computer Science, SICS – www.sics.se SICS has its key wireless competencies in mobile systems, transmission and mobile services. With 35 PhDs SICS publishes around 100 papers a year and also undertakes contract research for Swedish as well as international clients.

Viktoria Institute – www.viktoria.se Located in Göteborg the Viktoria Institute has a clear mission, mobile services and automotive telematics. It facilitates the quick implementation and commercial use of research results.

Santa Anna IT Research Institute – www.santaanna.se This research facility located in Linköping focuses on tools, methods and platforms for delivering mobile consumer services. Santa Anna identifies and prototypes applications and service enablers that constitute new opportunities for the IT industry.

The Interactive Institute – www.tii.se With nine “studios” and 150 researchers throughout Sweden, this institute is dedicated to the area of digital media. The Mobility Studio in Stockholm is devoted to mobile services with a focus on applications for road transport. In Visby the institute is turning the city into one vast mobile game based on positioning technology.

Acreeo – www.acreeo.se Acreeo, with five locations in Sweden, performs contract research and product development in microelectronics and photonics. A current wireless project is software-defined radio that can handle both cellular and WLAN air interfaces.

Socware – www.socware.com Socware is a major government initiative, focusing on the integration of wireless systems on silicon chips. A number of international companies have already opened design centers in Sweden with global responsibility for wireless applications.

CDT and Mäkitalo Research Center – www.cdt.luth.se In northern Sweden the Center for Distance-spanning Technology combines computer and communications technologies with the ambition to sharpen regional businesses’ competitiveness.

“Sweden is a very interesting market for us. There are many interesting high technology ventures developing new and unique cutting-edge technology.”

*Ikuo Nishioka,
CEO and CIO Mobile Internet Capital, MIC*



Sweden sets the wireless standard

Several of the international standards in wireless communication have Sweden as their birthplace. When mobile telephony started to gain momentum in the 1980s it was through the analog *NMT standard, Nordic Mobile Telephony*, which was largely developed by Ericsson and Telia.

Its digital successor, *GSM* was also conceived by Ericsson and quickly became the world’s most widely used mobile technology with more than a billion users today. The standards for the related technologies *GPRS* and *EDGE*, that handle packet data traffic on GSM networks, also had their start in Sweden. The third generation technology *WCDMA*

standard also bears Ericsson’s hallmark and is the fastest growing 3G standard today.

Bluetooth, a short range radio technology named after a Viking king, was designed in the Ericsson lab in Lund and is quickly becoming a favorite way of cutting the cords and letting machines communicate with each other. Today it can be found in everything from headsets to keyboards and printers. It is integrated in a growing number of electronic consumer goods by manufacturers like *Sony* and *HP*.

A selection of Swedish innovative wireless ventures

Alice Systems www.alicesystems.com
Configuration solutions for all wireless technologies
Anoto www.anoto.com
Digital pens and digital paper
Appear Networks www.appearnetworks.com
Wireless solutions to WISPs
Appload www.appload.com
Software for mobile multimedia and content
Aptilo www.aptilo.com
Solutions for public hotspots
Aspiro www.aspiro.com
Mobile applications developer
Bluefactory www.bluefactory.com
Mobile service delivery software
Brainpool www.brainpool.se
Mobile solutions and applications development
Carbello www.carbello.se
Mobile games development
Columbitech www.columbitech.com
Software for secure wireless datacom
ComOpt www.comopt.com
Wireless network planning
Connectblue www.connectblue.com
Bluetooth development
Cypak www.cypak.com
Technology components
Decuma www.decuma.com
Handwriting recognition
DruTT Corporation www.druTT.com
Service delivery infrastructure
HotSip www.hotsip.com
Multimedia communication applications
ipUnplugged www.ipunplugged.com
Mobile IP based networking products
It's Alive www.itsalive.com
Mobile games developer
Mobeon www.mobeon.com
Messaging solutions
Mobilehits www.mobilehits.com
Content provider
Neonode www.neonode.com
Terminal design
NoWire www.nowire.se
Wireless broadband services
Ocean Observations www.oceanobservations.com
Graphical designs for interactive media
Operax www.operax.se
Bandwidth control in IP networks
ServiceFactory www.servicefactory.se
Internet services developer
Spinbox www.spinbox.se
MVNO support
Synergenix www.synergenix.se
Mophon gaming platform
Thinking Materials www.thinkingmaterials.com
Wearable technology
WIP www.wip.se
Wireless internet provider
Wireless Car www.wirelesscar.com
Telematics for auto industry
Visual Wireless www.visualwireless.com
Revenue assurance
Zoomon www.zoomon.com
Vector graphics

Go wireless with a Swedish venture

There are about 500 companies in the Swedish wireless sector. Many of them are young and still reliant on venture capital to continue growing. This creates attractive opportunities for both investment and partnerships.

The largest segment in the Swedish wireless industry is the wireless infrastructure business with Ericsson as the obvious focus. But the Stockholm/Kista region is also teaming with smaller business. Of some 500 wireless companies close to 37 percent are in the early stages of their development, and of those, two thirds are located around Stockholm.

They are funded by a venture capital industry considered highly competitive and sophisticated in an international context. Syndication with prominent foreign VC firms is common, and there are several firms such as BrainHeart and Argnor that exclusively invest in wireless ventures. The open business environment and high technological level of ventures have convinced players such as Intel Capital, Siemens Mobile Acceleration and Apax Partners to open up offices in Sweden to fully exploit the wireless sector. 3i took a step further by acquiring a local player and is now a leading regional force in the private equity industry.

But promising ventures can be found in all sub-segments in the industry. Around a tenth of the wireless companies are active in the terminals and accessories segment with Sony Ericsson as the dominant force.

The application and content segment of the wireless sector makes up a fifth of the Swedish wireless sector and is teaming with start-ups relying on venture capital for their development. The majority of these companies are focused on either communication with messaging technology as one prominent feature or the entertainment segment with games and ring tones. Applications and content is expected to be the fastest growing sub-segment in the wireless sector in the next few years, riding on the budding demand for mobile data services.

Investing in wireless innovation

Swedish wireless startups have caught the attention of several international venture capital firms. One of the most active has been *Siemens Mobile Acceleration* with a local office and a handful of investments including *Appload Nordic*, *Mediabricks* and *the Phone Pages*.

Japan's *Mobile Internet Capital*, *MIC*, has invested in *ipUnplugged* and *Columbitech* as part of an alliance with Swedish VC *Ledstiernan*. Strong technologies and Sweden's generally innovative climate were pinpointed as key factors.

When *Sony* invested EUR 3.1 million in handwriting recognition company *Decuma* they were already using the software in the *Clie* PDA. *Sony* appreciated the high level of expertise but also saw the possibility of giving *Decuma* a hand in Asian and US markets.

That combination of technology and partnership was also crucial for *Bell Net's* EUR 5.3 million injection in SIP technology companies *HotSip* and *Ingate*. While they provided *Bell Net* with a technological edge, the Japanese company provided an Asian platform.

There is also great interest from US VCs like Silicon Valley-based *Vision Capital*, who invested in rapidly growing *Visual Wireless* that helps operators maximize revenues and prevent fraud.



Wireless centers of excellence in Sweden

Telematics Valley – Göteborg

www.telematicsvalley.org
www.businessregion.se

Vehicular & logistics telematics

- Lindholmen Science Park
- Chalmers University of Technology, IT University on Lindholmen
- Telematics test bed

IT Öresund – Malmö/Lund

www.oresundit.org / www.oresundit.com
www.positionskane.com

Wireless terminals & technologies, Socware

- Ideon Science Park
- Lund Institute of Technology

InternetBay – in the north of Sweden

www.internetbay.nu

Distance spanning technologies and mobile applications

- Aurorum Science Park, Uminova Science Park
- Luleå University of Technology, Umeå University and Umeå Institute of Design
- Test bed Botnia, Mobile City, Digital Network Umeå

Wireless Valley – Stockholm/Kista

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

Wireless systems & technologies and mobile applications & services

- Kista Science City
- Royal Institute of Technology and IT University in Kista
- Test bed Stockholm

TelecomCity – Karlskrona

www.telecomcity.org

Mobile applications & services

- Karlskrona Innovation Center & Softcenter
- Blekinge Institute of Technology
- WirelessPeople test bed



Stretch out in a Swedish test bed

From north to south, Sweden boasts five distinct clusters of wireless ICT test facilities capable of assisting companies in evaluating new technologies and applications. A national network of test beds is also underway.

Test beds often fall into three categories. Simulated tests often aim at helping application developers to test their software. They are typically linked to a service platform vendor, and some examples from Sweden include Ericsson Mobility World, Sun Wireless Lab and Intel Wireless Competence Center. These resources can sometimes also be accessed over the internet. System acceptance tests ensure that hardware and software have interoperability.

Dedicated test plants with real systems are typically used to provide this kind of environment and are provided by large vendors like Ericsson. Sweden offers at least ten installations with different functionality, and sometimes operators use their live networks for this kind of testing.

The end-user test bed uses access infrastructure and a test population. With consumers keen on trying out new technology, Sweden offers good opportunities across the entire test chain, and all categories can be found in several of the wireless clusters.

In 2003 the government launched a program to create a national network of test beds, called Servnet. This will involve the six leading test beds and commercial networks and will create a giant resource for testing primarily wireless applications.

Wireless test beds

Test bed Botnia www.testplats.com
Mobile services and telemedicine. Mobile, Broadband and Cable. 3,100 test pilots. IPv6 network. Center for Distance-spanning Technologies (CDT).

Test bed Stockholm www.stockholmopen.net
(mCity, StockholmOpen.net)
Fixed, mobile services and technology based on open networks, customer usage and willingness to pay. 40,000–50,000 users. Public and private companies.

WirelessPeople
Mobile services and platforms. GSM/GPRS/UMTS network with Vodafone. 2,500 test pilots.

HomeCom test bed (Linköping)
Mobile and broadband services in homes and healthcare environments.

Telematics test bed www.telematicsvalley.org
Information services and connectivity in vehicles. AMPS-, CDMA-, Mobitex- and Tetra-networks. Building fleet of vehicles as test platform. Members from car-, defense- and rescue industries.

Vendor's test beds
Ericsson Mobility World, Intel, Sun, 3.

ISA – Business facilitator

Invest in Sweden Agency (ISA) is the government agency responsible for informing foreign investors about business 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 and representation 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 ensure professional guidance for successful business launches in Sweden.

ISA's IT Sweden Project is a special initiative for the international promotion of the Swedish ICT industry in general, and wireless technology and mobile communication in particular. IT Sweden assists foreign ICT companies in finding business and investment opportunities in Sweden and facilitates the investment and establishment processes.

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

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