


contact

ERICSSON  PUBLICATION FOR EMPLOYEES WORLDWIDE

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Photo: PETER NORDAHL

Pocket phones turn ten

The pocket phone is celebrating its tenth year at Ericsson. In the early years, most efforts were devoted to convincing the organization that the phone had a future. A new book on the mobile phone's history at Ericsson has just been published, aptly titled *The Ugly Duckling*. Today, there is no doubt that what was once an obscure product within Ericsson has now developed from an ugly duckling to a graceful swan. Consumer products in general, and mobile phones in particular, are now an accepted and valued part of Ericsson. Karin Dyrén, a repairwoman at Ericsson in Kumla, displays an early mobile phone and the latest pocket models, above.

Pages 12-13

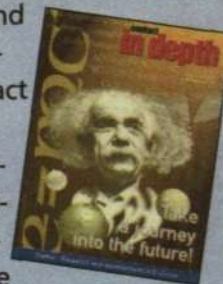
From vacuum-cleaner salesman to executive

This issue of Contact contains the first in a series of interviews in which we profile some of Ericsson's more influential personalities in more depth than usual. The first to be presented more closely is Jan-Åke Kark, president of Ericsson Microwave Systems. One might call him the vacuum cleaner salesman from Electrolux who changed paths, or the president who didn't want to become a lawyer after law school.

Pages 2-3

Research and development

This falls second theme supplement to Contact is about research and development. Ericsson annually spends more than SEK 20 billion in this area and results are bound to show.



Electromagnetic exposure

If radio-frequency magnetic fields affect humans is measured at Ericsson's new laboratory for electromagnetic research. Using robot arms, mobile phones and models of humans, electromagnetic fields are measured to learn for the future.

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VACANCIES SEE PAGES 20-23

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"Personally, I am really gratified to have got this far with a half-decent law degree plus a year's experience as a vacuum cleaner salesman as my main qualifications."

This is how Jan-Åke Kark describes his professional career in a nutshell. Today, Jan-Åke Kark is president of Ericsson Microwave Systems.

From vacuum-cleaner salesman to company president

When Jan-Åke Kark was six months old, his family moved to

Norrköping, where his father took over his grandfather's textile mill. Twenty-one years later, Jan-Åke took his secondary school certificate exam in the same town. Then he moved on to Uppsala, where he studied law, finishing up with a "half-decent" Bachelor of Laws degree.

"Since I did not want to practice law, I started looking for a job as a company lawyer," relates Jan-Åke.

With the help of Hans Werthén, a family friend, Jan-Åke was offered a job at Electrolux. In those days, the first rung on the ladder to a desk job at Electrolux was a twelve-month stint as a vacuum-cleaner salesman.

"It was a really valuable experience," he recalls. "I learned to place the customer in the center and listen to sales signals from customers."

up close with

Jan-Åke Kark

In 1975, his wife Anette was offered a job in Norrköping and the couple returned to Jan-Åke's home town. He began working as an administrator for the Swedish Immigration Board.

"I had planned to stay there for a year or two, but ended up staying for ten years," says Jan-Åke.

One of the reasons for this was that he was given responsibility for a major reorganization.

"It was a very large project, involving lots of work with data-processing equipment. We selected Programmator as our main supplier of computer equipment, and when I suggested that they should become established in our region, they agreed. But on one condition: that I

should personally take charge of getting them established."

So the next move was to Programmator, to help the company set up shop in Linköping.

"The start-up went really well. We were profitable after a few months and enjoying ourselves enormously," he recalls. "We rapidly became Linköping's largest computer consulting firm."

New venture number two

In 1989, the Kark family moved to Karlskrona. It was time for Jan-Åke's second lesson in setting up a company.

Programmator was starting up EP Data in Karlskrona in cooperation with Ericsson. After a while, the company, with some 90 employees focused its attention on developing software for mobile telephony and the MD 110 exchange.

"I persuaded Gunnar M Eriksson, who was with Ericsson Radio Systems at that time, that it would be a good idea to set up a software development center in Karlskrona," relates Jan-Åke.

During his years as president of EP Data, which subsequently changed its name to Ericsson Software Technology, Jan-Åke saw the business grow rapidly.

"Those were fantastic years in Karlskrona," recalls Jan-Åke. "I remember how the construction people would be wheeling barrowloads of concrete through the corridors just about every day - because we were constantly expanding. Since it was somewhat difficult persuading people to invest in Karlskrona, I dedicated myself to the task of developing the region. We coined phrases such as Soft Center and Telecom City."

Jan-Åke's success in the Garden of Sweden - as Blekinge county is often termed - did not pass unnoticed. One day, Ericsson president and CEO Lars Ramqvist telephoned and offered him the position of manager of what was then Ericsson's Microwave Systems business area.

"Frankly, I was unsure at first. We had a

very fine home and the social life in Karlskrona was really enjoyable. It was no easy decision to move to Gothenburg."

"I was given three days to respond to the offer. I spent the last night together with my management group in a tent out in the forest. It was midwinter, and as usual we had a fantastic time. I really thought it might be best to turn down the offer."

But on the way to find a telephone booth to call Ramqvist, Jan-Åke decided to accept the challenge.

Number one hobby is sailing

Today, Anette works as an analyst for the Western Sweden Chamber of Commerce. Their sons are now 16 and 19 years old. When Jan-Åke is not occupying the manager's seat at Ericsson Microwave Systems, he can usually be found pursuing one of his leisure-time interests, since he is an active person in his free time also.

"We mostly go sailing in summer and downhill skiing in winter," says Jan-Åke. "Music is also very important to me - particularly opera and jazz."

Jan-Åke himself plays trumpet, tenor saxophone and synthesizer.

"Anette encourages me - for my fiftieth birthday last year she gave me a series of voice lessons with an opera teacher."

Jan-Åke likes to stretch the limits of his own ability. When a friend persuaded him to buy a Harley Davidson motorcycle, it sparked off an intensive period of motorcycling.

"I've sold the bike, now that I've proved to myself that I can handle it. Maybe I'll rent one some time when I'm on a business trip and head out on the highway. We'll see!"

LARS-GÖRAN HEDIN



Jan-Åke Kark, president of Ericsson Microwave Systems, is a person who likes facing a challenge. And this can apply to a wide range of activities: opera voice lessons, motorcycling, or - his major pleasure in summer - sailing. Jan-Åke's philosophy is to give his all, plus a little extra; an attitude he also aims to instill into his employees.

Photo: MARIE ULLNERT

A good leader cares about people

Jan-Åke Kark believes in a management style that puts his employees in the center. He has had to learn what is needed to achieve success in a knowledge-based company. It is all about keeping employees interested, enthusiastic and motivated.

"It's important not to make life too complicated," underscores Jan-Åke. I have learned this lesson twice over from practical experience - at Programmator and EP Data. Now I am attempting to apply the same management principles to Ericsson Microwave Systems.

"Now we are working hard on our corporate culture - identifying the social rules we operate by and how we behave toward each other," continues Jan-Åke.

Important management forum

Jan-Åke relates that the major management forum which he organized at the beginning of September was an important step in the process of change. The meeting was an important opportunity to impress upon the participating managers and other key individuals that there really is a need for change, even at times when a company is riding a wave of success.

"I had invited several external speakers, including customers, who pointed out that the future will impose new requirements on us. It seems that the message really reached its mark. At the same time, meeting with our customers further enhanced the pride we take in working for Ericsson and Microwave Systems."

Immediately after the management meeting, work began on drawing up plans and concrete action programs based on the changes identified as being necessary. However, Jan-Åke has no intention of mounting any major projects.

"We don't want to get involved in a project like TQM or ISO, but instead let the changes be a more natural and integrated part of our operations," explains Jan-Åke. "We shall continue with a corporate-culture program founded on Ericsson's corporate values - professionalism, respect and perseverance. We propose to introduce a new structure with profit units under the divisions, and to try out the 'small in large' concept in some of the units." Jan-Åke is referring to the plan to introduce a more clearly defined operational responsibility down at the level of the smallest unit, with the focus on people and results.

"But it is important that the process of change does not disrupt our ordinary operations," emphasizes Jan-Åke. "We have an enormous amount to do."

The natural choice

The management of Ericsson Microwave Systems has dedicated much effort to understanding how the company should be adapted to take young people into account. Recruitment of new employees is one of the most crucial challenges a knowledge-based company has to face.

"Our company should be the natural choice for newly qualified young technicians in our part of Sweden," notes Jan-Åke. "This is one of our most important tasks in the Wanted Position and 2005

project - to make Ericsson attractive to young people. Success in this area is highly dependent on young people's perception of the company's management and culture.

"We have much to offer to a young person who is seeking real technical challenges. We are the most advanced electronics company in the entire Nordic region. The areas in which we work - particularly in regard to defense contracts - demand knowledge of the latest developments in the world of new technology. Our aircraft radar systems, which incorporate the latest advances in the miniaturization of electronic components, are at the cutting edge of technology."

Research and development projects, mostly for the Defense Department, account for 35-40 percent of Microwave Systems' sales. Since such projects often take several years to complete, it is fair to say that this operation has already reached the year 2005. As Jan-Åke confirms:

"We are fully aware what will be preoccupying the one-third of the company's employees who work on defense contracts well into the next century. We also know that the whole of Ericsson will continue to benefit substantially from the expertise we build up through our involvement in defense work. Even though Microwave Systems is something of an exception among Ericsson companies, we fit in well in other respects."

"Perhaps the most visible examples of our contribution to the success of Ericsson as a whole are the highly successful microwave links for the Japanese mobile telephone systems and our devel-

opment responsibility for MDE (a central component in radio base stations). Now we are working flat out on other new products that could prove equally successful, in such areas as antenna technology and the application of microwave technology for the 'point-to-multipoint' systems that distribute voice and data traffic from one link to a number of other links. This is a product area with enormous development potential. We aim to become the world leader in this area, just as we are today in conventional microwave links," affirms Jan-Åke.

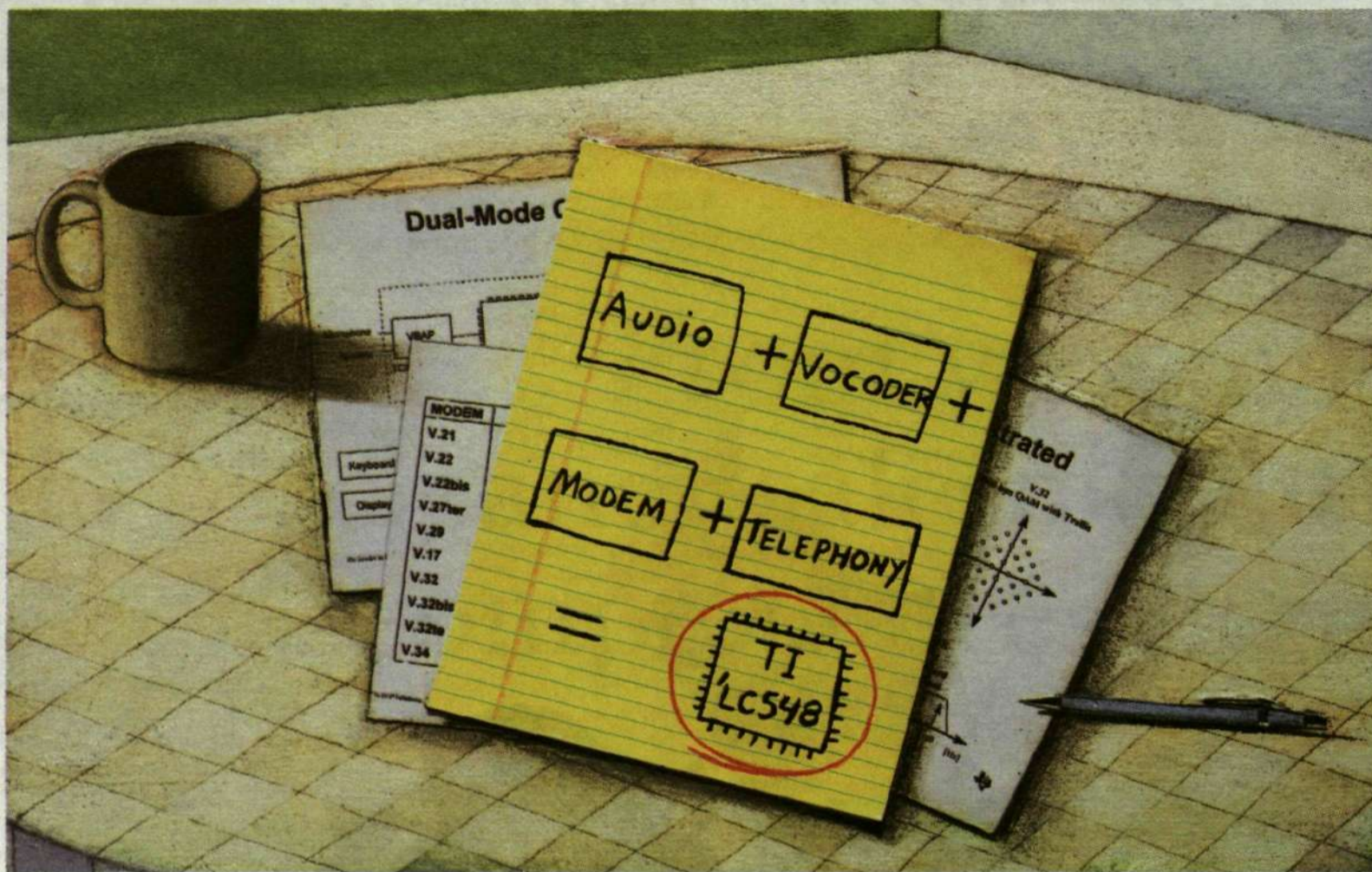
Work needs to be fun

"I predict that the next few contracts will represent a period of highly satisfactory development for our company. The great thing is that this enables us to really enjoy our work. You have to remember that we spend 80 percent of our waking hours at our workplaces, which means that if we are not happy there, we not only have a miserable time but also turn in an inferior performance."

"If people feel needed, they enjoy their work and give 120 percent of their capacity. In my view, this is the primary aim of modern management."

"It's all about maintaining an upbeat mood," he concludes, lapsing into a west-coast Swedish dialect for added emphasis.

LARS-GÖRAN HEDIN



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news briefs

Cable manufacturing outsourced

■ The Infocom Systems business area wants to outsource its cable production. Ericsson Cables and the independent cable manufacturer, Volex, have signed a Letter of Intent stipulating that Infocom Systems' cable manufacturing in Croatia and Malaysia – employing 280 people in total – is to be taken over by Volex. All employees will be offered employment with the new owner. Infocom Systems uses Ericsson Cables as its supplier of both cables and cabling. Accordingly, the contract whereby Volex assumes operations from Infocom Systems is, formally, between Volex and Ericsson Cable.

Mobitex sold to Korea

■ The South Korean operator, Intec Telecom, has chosen Ericsson to be its supplier of networks for mobile data communications. The order, valued at SEK 120 million, covers installation of Mobitex in the Korean capital, Seoul, and five of the largest cities in South Korea.

"We chose Mobitex for its reliability and capacity," says Yong Nam Hong, president of Intec Telecom.



Yong Nam Hong

BT opts for Ericsson optic network

■ British operator BT has selected Ericsson as supplier and partner in a pilot study of an optic network to be used for telecom traffic and video transmissions. This will involve Ericsson's DWDM technology – Dense Wavelength Division Multiplexing. Optical transport-network technology is well suited for being combined with other transport systems such as PDH and SDH.

GSM sold to Central Asia

■ Ericsson has recently sold a GSM network for installation in Uzbekistan, the first for Ericsson in Central Asia. The contract, worth approximately SEK 60 million (USD 8 million), is seen as a breakthrough in this part of the world. The order includes GSM base stations, AXE switching technology and peripheral services. The customer is the Korean operator, Daewoo.

New mobile phone launched on the Net

The new GF 768 mobile phone is being launched over the Internet. The colorful new phone is designed to appeal to young, active people who care about the kind of gadgets they keep.

"Launching the phone via the Internet is a fitting approach for this target group. The purpose of the site is not merely to provide information, but also to activate the target group," says Per-Axel Larsson, responsible for the campaign.

The site contains everything from a presentation of the telephone to interactive activities, like games and contests. You can even view the phone in 3D, with special glasses.

A gigantic venture

"This is the first time Ericsson uses the Internet as a launch medium for a telephone. Apart from the site itself we are also purchasing advertising space – for example, on the Yahoo and Altavista search engines," says Per-Axel Larsson.

"This is one of the biggest Internet media campaigns in Europe, ever."

The Internet launch began two weeks

ago with a little teaser. By the week this issue of Contact is published, it should be fully under way. A contest will be announced on the Net, where ten telephones can be won every day up to the end of October.

As the Web gets under way, regular advertising and store displays will begin to appear. The campaign is being run simultaneously in Europe, the Middle East and Africa. The message for the entire campaign is "the small colorful phone for active people" and the theme is "Have a nice day."

"The message is aimed straight at young people who like trendy products and well-known brands. They're not sport freaks but they like the athletic image," says Per-Axel Larsson.

Trendy accessories

In conjunction with the GF768 launch, several trendy new accessories will be released onto the market. How about a phone case to strap around the arm or neck of a wetsuit?

The Web address is:

www.ericssonew.com

GISELA ZEIME



The ad campaign for the new mobile phone is aimed at trend-conscious young people. They are not necessarily interested in sports, but they like the trappings.

hello there!

Will Ericsson stay in Sweden?

Britt Regio, Senior Vice President, Corporate Human Resources and Organization, and in charge of investigating the issue of whether the head office should move to a location outside Sweden.



A move about which several newspapers have recently speculated. Will there be a move?

"No decision has been taken on the issue. Lars Ramqvist directed the Group Staff functions to investigate the implications of moving Ericsson's Head Office out of Sweden. Investigations have been carried out by turns, with the work intensifying as we approach year-end. We will soon be in a position to summarize the results of our efforts."

What are the odds? Will it be London?

"London has been named; however, as I said, no decision has been taken. We always have to consider where it would be most advantageous for Ericsson to have the Head Office and Group Staff functions located."

What is your personal opinion – do you think management will move?

"It's not for me to say, but if you look at the replies submitted by the Group Staff functions, a move would imply both advantages and disadvantages. Some functions believe they would operate better in an international environment, whereas others think it would be best to remain in Sweden, near most of the business areas' operations."

Would a move be a political comment on the business climate in Sweden?

"No. In the investigations, we haven't taken any stand on that issue. More than half of Ericsson's employees and 97 percent of its sales are outside Sweden. It goes without saying that Ericsson must be prepared to relocate its operations whenever, for various reasons, this should be necessary. We have only decided on the best location with respect to the various corporate functions. We are approached regularly by representatives of other cities and countries who want Ericsson to establish operations there. And, if they offer a favorable business climate and congenial circumstances in other respects, naturally we have to take it into consideration. However, we must remember that moving the Head Office or certain functions affects only a limited part of Ericsson. If there is going to be a move, it won't mean Ericsson will be leaving Sweden."

When will we see a decision on the issue?

"It's impossible for me to say. It's a question that must be settled by the president and the Board of Directors."

PATRIK LINDÉN

industry news

Fifty million mobile phones in the US

■ An American industrial association for mobile telephony recently announced that 50 million people in the U.S. are mobile phone owners.

Thailand and Malaysia purchase GSM

■ Finnish Nokia is slated to install a complete GSM 1800 mobile system and a transmission system for the Thai Digital Phone Company. At the same time, a jointly-owned Thai-Malaysian company has ordered a new mobile telephony system from the Finnish company.

Motorola sells to India

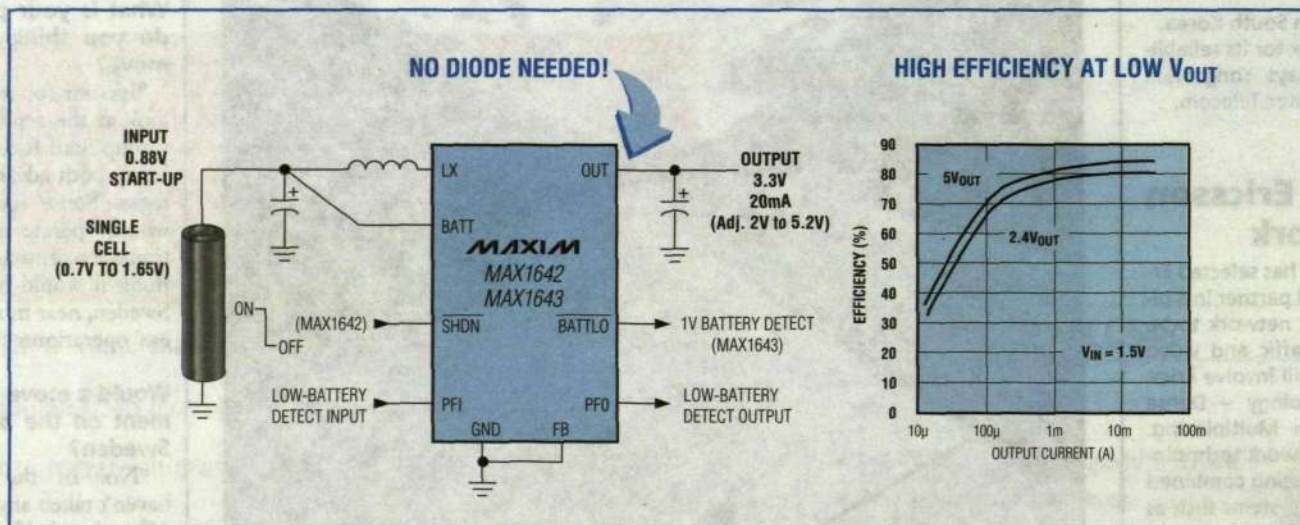
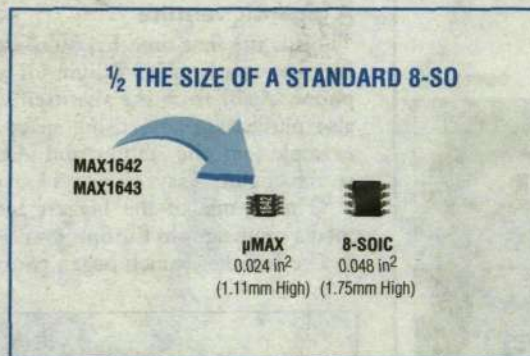
■ Motorola's group for mobile telephony infrastructure has been awarded a contract from BPL Mobile Communications Ltd. in Mumbai, India. The order concerns the extension of Motorola's global communications system for mobile telephony.

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Common efforts leads to partnership agreement

In June, Ericsson announced a five-year cooperation agreement with Telecom Eireann, the Irish operator. The agreement is worth USD 100 million to Ericsson (about SEK 750 million). Most people tend to forget this type of news item rather quickly, but every deal has a story behind it.

Telecom Eireann selected Ericsson as one of its main suppliers in a cooperation agreement which will start to be implemented in 1998. As far as Ericsson is concerned, the agreement covers AXE exchange technology and extension of the Irish telecom network.

Operators want to have long-term strategic cooperation with partners who can help make them more competitive. That was what Telecom Eireann was looking for about a year ago when it put out feelers to a number of suppliers, including Ericsson.

Full offer

Ericsson's bid offered more than the traditional technical specifications.

"It gave a cohesive view of the way we look at developments in the telecom industry, based on the 2005 scenarios. It included our visions, the way we see our role as a supplier of telecom equipment, our views on partnership, product development, market development, the current competitive situation, customers and a great deal more," says Claes-Göran Andersson, marketing manager for Ireland at Infocom System's Public Networks business unit.

Like many other large public-sector operators, Telecom Eireann was obliged to review its methods if it was to become more competitive.

"Partnership is essential if we are to achieve our objectives. This applies both to strategies and practical implementation," says Christy Maher who heads Networks and Group Technology at Telecom Eireann.

Unlimited partnership

Christy Maher emphasizes the importance of an unlimited partnership and doing as much as possible together. As a re-



A successful bid. Telecom Eireann, the Irish operator, has signed a five-year framework agreement for partnership with Ericsson and Alcatel. From the left: Catriona Farrell, Ericsson Ireland; Olle Westerberg, Public Networks; Claes-Göran Andersson, Public Networks; Geoff Shakespeare, Ericsson Ireland; Peter Maxwell, Telecom Eireann; John Hennessy, Ericsson Ireland; Ingemar Nilsson, Public Networks; Christy Maher, Telecom Eireann; Ian Cahill, Ericsson Ireland. Front row: Göran Olsson, Public Networks.

Photo: ANDERS ANJOU

sult, Telecom Eireann has proposed a forum for cooperation with its two main suppliers. This is a rather unusual setup for the suppliers, but arrangements of this kind will probably become increasingly common in the future.

"We share their approach to partnership," says Geoff Shakespeare of LM Ericsson Ireland Ltd, who participated in the negotiation process.

"By joining forces, we can achieve results which are beneficial for everyone. Our role is to supply the customer with services and solutions which can make Telecom Eireann more competitive."

"Our considerable international experience is one of our strengths here, and this also applies to our good relations

with Telecom Eireann over the years."

In Ireland, long-term agreements have proved to be the route to success for Ericsson. Previous agreements in 1972 and 1982 have contributed to the good relations which now exist between Ericsson and Telecom Eireann.

"I am sure that Ericsson will be well-placed when the agreement is renewed in five or ten years' time. In point of fact, I think growing competition will make Ericsson concentrate even more on partnership, as a way of meeting Telecom Eireann's requirements," says John Hennessy, manager of the business area telecom Ireland at Ericsson in Ireland.

LOTTA MUTH

Alliances draw Telecom Eireann out in the world

Telecom Eireann is allied with the Dutch operator, KPN, and with Telia in Sweden. Telia and KPN are part of Unisource and are also linked, via Unisource, to AT&T in the U.S., one of the giants of the telecom industry. This alliance gives Telecom Eireann access to Unisource's international network and services, and is expected to lead to reduced rates for international calls. Telecom Eireann has considerable trans-Atlantic traffic and a high volume of calls to Britain.

As a result of this cooperation, Telecom Eireann is an official distributor of Unisource products.

Ireland is one of the few European countries to be granted temporary exemption from the EU requirements regarding full deregulation of the telecommunications market in 1998. Ireland's respite until the year 2000 applies to fixed telephony.



"The design team responsible for the new interface for the virtual PBX: (from the rear left) Rickard Waerme, Lars Öhrngren, Mattias Hallberg, Per-Johan Andersson, Patrick Thorén and Michael Westgärds. Photo: CICC JONSON

New Java product controls AXE via the Internet

A design team at Ericsson Telecom in Mölndal has used the Java programming language to control functions in an AXE exchange. This makes it easier for operators to handle virtual PBX (Centrex) solutions. A virtual PBX means that a PBX network can be created by using the ordinary telephone network.

Instead of installing a mass of cables and hooking up the customer's telephones to an ordinary PBX, it is possible to use a service provided by the public network exchange.

This service – the virtual PBX – enables a number of ordinary telephone subscribers to be connected to a company network, offering the same group number, abbreviated number and call transfer facilities as an ordinary PBX.

Ericsson's AXE exchanges can provide these services, but the problem has been

that operators have found it difficult to package and manage Centrex in a satisfactory manner. Updating was complicated, involving several stages. But now things are much simpler, thanks to a dedicated design team at Ericsson Telecom in Mölndal. Using Java as the programming language, the team has developed a graphically advanced user-friendly interface which enables the operator to control Centrex via the Internet.

"We came up with this idea at the end of last year," says Patrick Thorén, who is the technical coordinator. "We built a pilot version and demonstrated it to Telia, which uses AXE exchanges to supply Centrex services to its customers."

"Telia became very interested, and we worked together on the specifications for the system. Telia's practical experience of using Centrex has been extremely valu-

able throughout the entire project."

The great advantage of the new interface is that the operator can avoid all the complex programming steps which used to be required when updating a virtual PBX. New graphics symbols and drag-and-drop commands make the interface much easier to use.

"Previously, technology determined use of the product, but now we've tried to do exactly the opposite. A user working with our interface doesn't need to know all the codes sent to the exchange. The program does that," Patrick Thorén says.

The new interface is very flexible. Operators can use it to control any type of exchange, including exchanges made by other manufacturers, and they can also supplement the system by adding other functions.

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Anritsu
Wiltron

Ericsson inaugurated a new electromagnetic research laboratory at the end of September. The lab is currently being used to measure exposure to radio-frequency energy from Ericsson's products, for example mobile telephones and small indoor pico base stations.

E

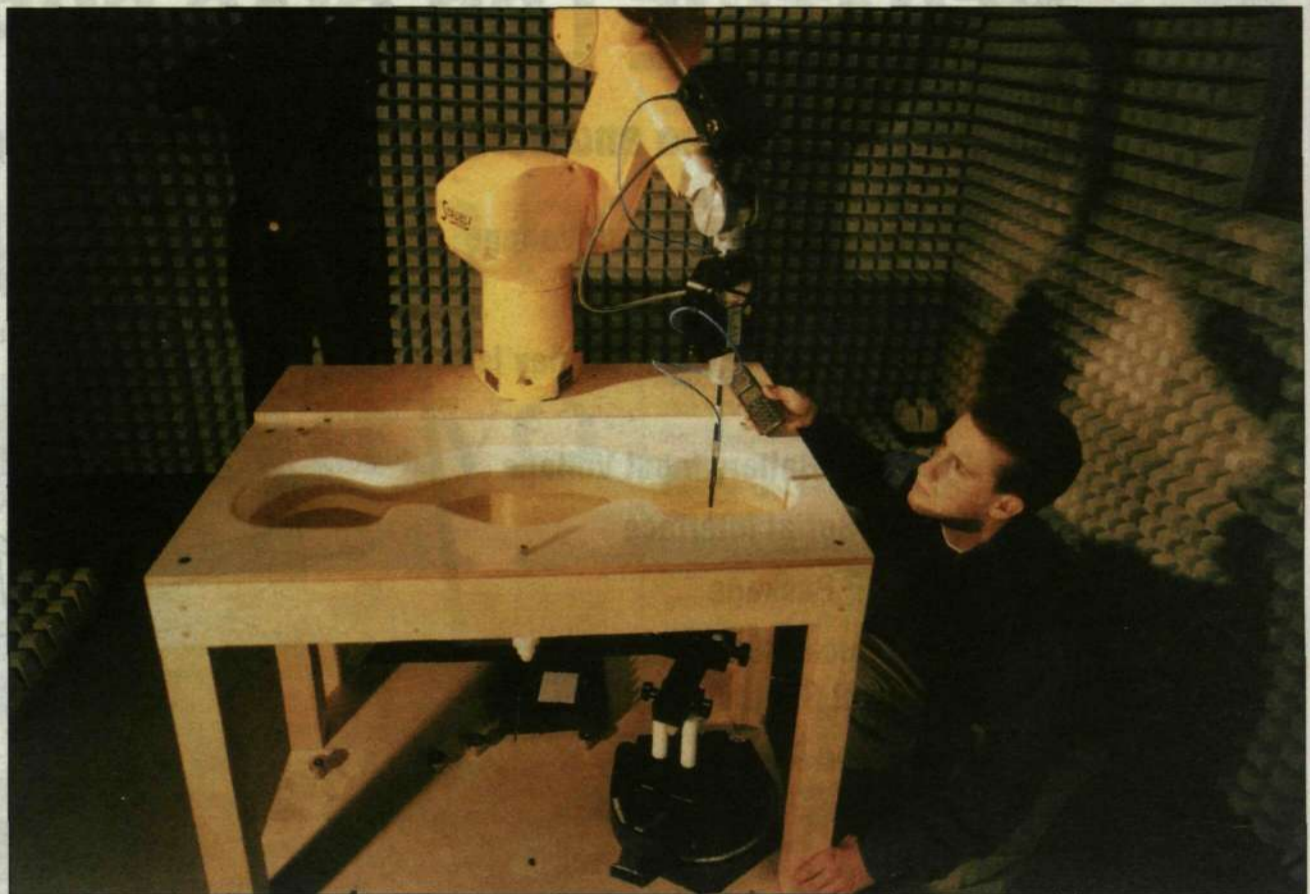
ricsson Radio's research department in Kista now has a state-of-the-art laboratory on the with top-notch equipment.

The most striking part of the lab is a sealed room which is both heavily screened and radio damped to ensure that not even a billionth part of the radio waves generated are emitted.

Automatic

There is a stand in the middle of the room which looks like a table. The surface is fiberglass, with two recessed models of a human head – a right-hand and a left-hand segment, filled with a viscous fluid consisting of sugar, water, salt and other

New electromagnetic research laboratory



Martin Siegbahn prepares to measure human exposure to radiation from a mobile telephone. The telephone is placed under the recessed section of the stand to the right, which is shaped like a human head.

Photo: ULF BERGLUND

ingredients which have the same electrical properties as body tissue.

A measuring instrument is attached to the stand. This consists of a robot arm equipped with a probe with three tiny antennas, each a few millimeter in size. The probe is lowered into the fluid to measure the electromagnetic field produced by a mobile telephone, for example, located underneath the stand and in contact with the head. Systematic and highly precise measurements are made at some one hundred points of the electromagnetic fi-

eld from a mobile telephone, for example, which is placed against the head below.

The mobile telephone can be placed at several different angles to simulate the various ways in which users tend to hold their phones.

Four angles are normally measured, and each position takes about 15 minutes. In other words the total measurement process takes about an hour. Measurement values are displayed on a computer screen located outside the sealed room. The screen clearly shows the distribution pattern of the electromagnetic field in color, and the way in which the energy is absorbed by the head.

"We already have two labs for mobile telephone measurements, one in Lund, Sweden and one in Raleigh, North Carolina," says Christer Törnevik, who heads the Mobile Systems research department's project on the measurement of the effects of electromagnetic fields.

"Our new lab covers a wider range of applications and will be used to measure human exposure to all types of radio products. One of our tasks is to verify that our mobile telephones and other handheld radio transmitters comply with the current safety limits for radio-frequency electromagnetic exposure. Determining a safe distance for exposure to signals emitted by radio base stations is another job we do."

Safety limits

The laboratory equipment was developed by Professor Niels Kuster at the Federal Institute of Technology in

Zürich, and manufactured by Schmid & Partner Engineering AG, a Swiss company.

The equipment is being used primarily for dosimetric measurements which indicate how radio frequency energy is absorbed and distributed in body tissue. The measurement results are given as SAR (Specific Absorption Rate) values, which have the unit watts per kilo. Those are compared with the safety limits. The equipment can also be used to measure the close-range electronic fields in the vicinity of a telephone or a base station, for example.

Pure research is also going to be conducted at the laboratory – for example research on new measurement procedures or antennas, or scientific verification of the accuracy of the theoretical methods used by Ericsson for electromagnetic calculations.

Finally, the lab can be used to study electromagnetic interference, for example in connection with medical apparatuses.

LARS CEDERQUIST



Christer Törnevik studies readings for the latest mobile phone. The products tested are selected at random, thus ensuring objective results.



More information about health and safety in mobile telephony

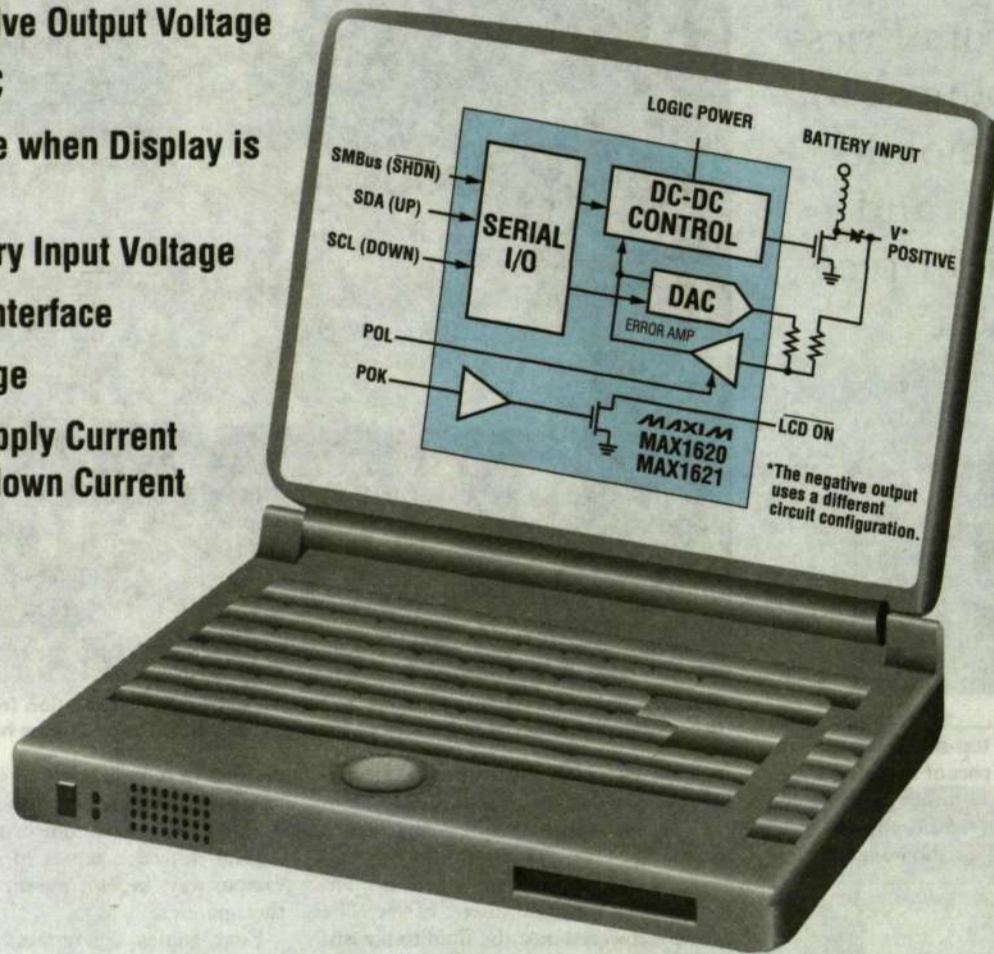
Ericsson's "Health and Safety in Mobile Telephony" brochure provides further information about electromagnetic exposure.

The brochure can be ordered via Memo on ERA.ERAKOP. The document number is SV/LZT 123 4060 (Swedish version) or EN/LZT 123 4060 (English version).

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the portrait

Michael Line's journey to working at Ericsson Mobile Communications Japan K.K. lead from Kansas to Tokyo via New York and North Carolina. In Japan, he works with PDC Product Management of mobile terminals for the Japanese market.

An American in Tokyo

In the spring of 1996, Ericsson and the major Japanese trading company Marubeni signed a cooperation agreement for marketing and sales of mobile telephones. Michael Line began working at Ericsson Mobile Communications Japan K.K. in October last year. He had previously worked for Ericsson Inc. at Research Triangle Park in North Carolina.

"I was raised in Kansas and after college, I worked for an American telecommunications company in New York," he relates.

Software development

In the spring of 1993, he moved to North Carolina and began working for Ericsson Inc. at RTP. He worked with software development for cellular telephones and the D-AMPS standard. Eventually, he began working with cellular phone design for the Japanese PDC standard.

"When I began working at Ericsson, Research Triangle Park was small enough that I knew everyone. That is no longer the case, since more than 1,100 people work for Ericsson there," he says.

One of his colleagues has also moved to Tokyo and works with product support at Ericsson Mobile Communications Japan K.K.

Michael's job in North Carolina entailed a great deal of travel, so when the opportunity arose to work in Japan, he jumped at the chance. His wife is Japanese and he had been in the country several times before. His present job allows him to see a great deal of the country. The customer is located in Osaka, so he travels to the city often.

Tedious time difference

Michael enjoys living in Japan and finds it easier to live in the country than he thought it would be. He was prepared for a great deal of overtime, which is usually the case when working abroad. The large time difference is, however, much more difficult than he expected. Most of his contacts are with Ericsson in the U.S., which means a twelve-hour time difference. E-mail is his most important working tool, but everything cannot be handled electronically, so he travels often to the U.S. as well as Lund and Kista in Sweden.

Michael finds the atmosphere at Ericsson to be very relaxed, and based on his experience, he feels that there is more internal cooperation than at other large companies. He could remain at Ericsson in Japan for a long time and then he would gladly take another foreign assignment.

Reads Japanese comics

Michael lives with his wife on the fringe of central Tokyo with a 40-minute commute to the office, which is considered short by Japanese standards. In his free time - that is, on weekends - he spends



Michael Line works with PDC Product Management of mobile terminals for the Japanese market at Ericsson Mobile Communications Japan K.K. in Tokyo. Photo: GUNILLA TAMM

time with his family, watches TV and reads comic books (both to learn Japanese). Comics for adults are very popular in Japan.

"I've learned enough of the language to be able to read and speak like a five-year-old," he laughs.

In early 1998, Ericsson will launch the sale of its cellular phones in Japan. "It will be an enormous challenge in this huge market," says Michael. "But," he adds, "it's a case of giving the market what it wants, just as in other countries. It's a simple rule that usually works."

GUNILLA TAMM

diary

The week before the première

The Mobile Phones and Terminals business area opened its new Internet web site on September 27. Katarina Granstedt is the project manager. Here, she recounts the last hectic days before the curtain went up.



Photo: PATRIK LINDEN



Monday Start off this last week of a life in the shadows by being interviewed by the local evening tabloid as I step off the subway car: "Is it a good thing that mobile phones can soon be used even underground?" They laugh when I tell them where I work and make me pose with a mobile phone in the midst of the rushing morning crowds.

Since I was away most of last week, I spend the whole day dealing with mail in printed and electronic form.

I have intentionally avoided making too many commitments this week, as I know I'll need the time to go through the site, make the last adjustments, and so on. The magical date is Saturday, September 27; however, what few people realize is that it's actually going to be on Friday evening.

The countdown has begun.

Tuesday Start the day by buying carrot juice. Several people around me have succumbed to various viruses, but I'm determined to resist.

My computer stalls and Mattias, from IT support, becomes a regular guest for the rest of the week. Perhaps a reminder of my own and everyone's vulnerability? What would life be without the Internet? In my job, you can't sit and ruminate over such questions. I send yet another list of changes to the producer in London, facts to be corrected, an illustration to be shifted, links to be made, etc.

I surprise myself by going jogging in the evening. My new shoes feel comfortable.

Wednesday Yet another day when the telephone and the memo system keep me more than fully occupied. Not that I'm complaining, it's a sign that our idea of decentralization has worked. There are a lot of us submitting info around the world and everyone's sending in their last-minute corrections now.

Camilla calls from the European market region. They're going to have an Internet seminar for their local

markets tomorrow. Could I come and talk to them? No, I'd rather not. I say this with a good conscience because I know that she, like all

the other contact persons in the regions and business groups are fully capable of explaining the strategy by themselves nowadays.

Thursday Finally managed to fit in a visit to the hairdresser's. Leave the hairdresser's wondering "Was it really this short last time?" (Not the first time I've asked that question.)

Prepare a presentation for the Latin American market region. When that's done, all of our regions have received information about the project, and they can begin planning for their regional sites. They are given guidelines so that we can coordinate our web activities within the entire business area. Unlike in the real world, on the Internet, our markets are but a mouse-click apart.

In the afternoon, meeting with my consultant. We review the changes for the site and coordinate the Miami presentation we are going to make together. Check out our hotel on the Internet.

Friday Don't dare look at the site today. Know it's too late for any changes.

Meeting with our Channel Marketing manager to discuss how our experiences can be used in his project - an intranet for distributors and partners. Write up the agenda for a meeting next week and publish it on our project web site. Everyone involved can get all their documentation from here, at their convenience, and it works just fine.

It ends up being a long evening. A little after 6 p.m. the call comes in from London. We're on the Internet! The life in the shadows is over!

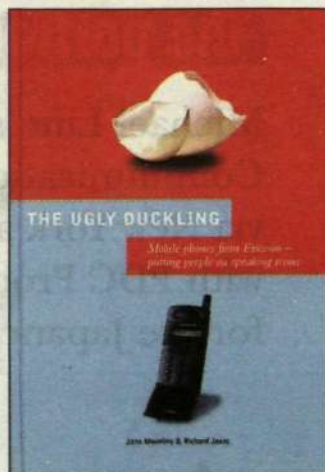
I click back and forth on the site and, yes, everything works.

The plane leaves 7:30 tomorrow morning. Time to pack. Maybe I'll take my specially designed T-shirt and stroll along Miami Beach with our URL on my back: <http://mobile.ericsson.com>.

The pocket telephone celebrates its 10th anniversary

Ten years have past since the first pocket telephones bearing the Ericsson name saw the light of day. To celebrate, Ericsson Mobile Communications has published a commemorative book, *The Ugly Duckling*. The book is about the

people behind the scenes and about how difficult it can be for an traditional system company to break into the entirely different consumer market. However, it also describes how the "ugly duckling" finally developed into a beautiful swan.



The Ugly Duckling by John Meurling and Richard Jeans describes the ten-year anniversary of the Ericsson mobile telephone. It took several years for Ericsson to realize the business opportunities in consumer products.

The ugly duckling that became a swan

The mother duck looks at her little son and thinks he is very large for his age. He doesn't look like the other ducklings. Will he really develop into a duck?

According to the authors of *The Ugly Duckling*, John Meurling and Richard Jeans, there are obvious parallels between Ericsson's first uncertain efforts in the direction of mobile telephones, and Hans Christian Andersen's *Ugly Duckling*. Few believed the modest little operations being carried out at Ericsson would develop into a division, and then into a business area.

As early as the 1940s

Mobile telephony made a partial entrance with the use of radio communications and the walkie-talkie in the World War II. Serious attempts were also made in the US, for example by General Motors and Motorola, in the late 1940s. But the times were not yet ripe. Both microelectronics and computer technology were needed.

Not until the 1980s did the dawn finally break. Gradually, national telephone companies worldwide began to be deregulated. The first automatic mobile telephone network was built in 1981 in Saudi Arabia. The UK, the US, Sweden and Finland were also early in starting to think along newer, freer lines. It would soon become apparent that liberalization was the most important condition required for the growth of mobile telephony.

Here, Ericsson had a head start. Thanks to its experience in radio technology, the company was able to start building infrastructure for mobile telephone networks at an early stage.

The first real breakthrough came with NMT

450, which was the first modern mobile system. In 1981, Denmark, Norway, Finland and Sweden, along with Saudi Arabia, were the first countries to use the new system. In the same year, The Swedish operator Telia also got a competitor, Comviq, on the market.

Ericsson was one of the suppliers selected to deliver telephones for fixed installation in trucks and cars in Saudi Arabia. Shortly thereafter, the first portable telephone appeared. It was, granted, functional – but hardly attractive. Moreover, it was expensive to manufacture and purchase. Today, we can laugh at the mobile telephones that the yuppies of the 1980s were so fond of displaying.

Systems company by nature

The Ericsson telephone of 1878 notwithstanding, the company had little experience of the consumer market. Ericsson was by nature and tradition a systems company.

Therefore, there was also strong resistance in the organization. Not even in 1987, when the mobile telephony section was made into its own business unit, was it considered a strategic product. The mobile telephone appeared then more as a service, but a necessary pre-condition for selling mobile network systems.

The first tentative attempts at a technology park had been made in 1982, resulting in the laboratory in Lund that was inaugurated the following year.

In their book, the authors also describe the

long series of quality problems that beset the development of the mobile telephone – everything from melting Saudi Arabian car phones to all types of faulty design. There were also problems making delivery deadlines because production proceeded too slowly. This gave the competitors an edge. Mobile radio people did not see any future for mobile phones – and, in the words of the book, "to be quite frank, mobile telephone people didn't either."

The first of the HotLine series was the Curt model – the first pocket telephone, or "put-it-in-your-pocket (almost)" phone, as the authors choose to call it. It was introduced in 1987, and based on an old police radio design. It became a success. It also became Ericsson's baptism of fire – the task of combining telecom functions with the complicated technology of the mobile phone in one and the same unit.

Curt also became the turning point for the Kumla plant, which had manufactured most of the mobile phones up to this point.

The story about how the traditional system company broke through in the consumer market

After Curt came the first "female model," Olivia, in 1989. A lighter-weight telephone than Curt, with three circuit boards instead of seven. Next in line was Sandra, which was also the first GSM telephone. Sandra was ahead of the competition, in terms of function, design and weight. All of Ericsson's telephone models have

been given a project name internally. Apart from Curt, they have all been female names.

In the 1990s, Jane and Emma appeared. External designers have been engaged for all models except Emma. Emma, the latest telephone in the series, was designed by the lab in the US.

In 1988, 37,000 telephones were manufactured at the Kumla plant, as compared with 200,000 telephones three years later. In 1991, the plant was reorganized into a dedicated mobile telephone plant with 650 employees.

A forgiving market

The scarcity of capable personnel has been a constant problem throughout the history of the mobile telephone. In the early stages, new productions meant a great deal of work, in automation, purchasing, training personnel, etc. The GSM Sandra version took 64 weeks to develop, which would be completely unacceptable today.

Quality problems persisted, but the technology was still relatively simple, so repairs could be made using simple instruments. Luckily, this extremely new product also found itself in a forgiving market.

Early confidence in GSM

It soon became apparent that GSM was what the future had in store. In the early 1990s, development was well under way in Lund. Motorola was still the most successful, with Nokia at its heels. Ericsson held only three percent of the world market! The aim was to catch up with Nokia before the year 2000. We accomplished that this year.

Ericsson's GSM career had been sluggish, but the turning point came with the delivery of 30,000 GSM telephones to the German op-

erator Mannesmann, in 1992. The following year, Ericsson's GSM was the only pocket telephone on the market. At that time, however, it was not fully understood that GSM would be an essential factor in increasing market volumes.

The US was an important market, but difficult to penetrate. In 1989, Ericsson still hadn't sold a single mobile phone there. With the formation of the joint-risk company with General Electric, the need arose for research operations in the US as well. The result was Research Triangle Park in North Carolina. The Lynchburg plant intensified its operations and is today a high-volume plant for mobile telephones. However, it was not until late last year that Ericsson's involvement finally began to pay off.

Ericsson's success in Asia began in China in 1994. Within two years, sales increased from 50,000 to one million telephones sold. After China came Australia. Then came Singapore, Hong Kong, Taiwan, Malaysia and Thailand. The appearance of the Jane model was well-timed and it became a natural success.

In its foray into the European market, the company has also held its own very well. Today, its market share is 30-40 percent.

Until the mid-1990s, convincing people at Ericsson that the mobile telephone was worth fighting for was a tough task. Consumer electronics was a whole new ball game, as were the implications involved – high volumes, low costs, design, product development, marketing and sales.

Was it really worth the effort? Yes – as it turned out. However, a lot of people were caught unawares.

GISELA ZEIME



Ten years of telephone development. In the background, the earliest HotLine model: the HotLine Combi. Other models have all been given personal names internally. From left: Olivia, Curt, Sandra, Jane and EmmaTio är av telefonutveckling.

Management by walking around.

Tänk tanken att du hade en telefon med dig var du gick. Att folk kunde nå dig i bilen, bankkiosken eller hos kunden så att du slapp drivas med telefonapparat på kontoret. Att du kunde utnyttja ditt ledarskap i bilen eller på flygplatsen och ringa de där saken som sällan väntar till i morgon.

Nej är det möjligt för alla och omvar att skjuta jobbet också utomför kontoret. För nu finns HotLine Pocket, in-mob-telefon som när behövs. Du kan ha den i bil eller på flygplatsen, och tack vare ett lätt click-in-GSM förvandlas den till en fullvärdig biltelefon på en sekund. Du kan ta en riktigt hands-free och prata i telefon med båda händerna på rattet.

HotLine
Ring 020-78 88 88
In-Information om erbjudande HotLine-Pocket
HotLine Pocket är ett varumärke för Ericsson.
HotLine Pocket är tillgängligt i Sverige, Norge och Danmark.

A look back at the 1980s

As late as 1989, this is what Ericsson's ads looked like. It's hard to believe only eight years have past since then. The text in the ad reads as follows:

"Imagine you had a telephone with you wherever you went. So people could reach you in the car, at the bank, or at a customer, so you wouldn't have to deal with those piles of telephone messages back at the office. So you could make use of dead time while riding in a taxi or walking around at the airport, and make those calls that would otherwise have to wait till tomorrow.

"Now, it's possible. Anyone can continue working even when not at the office – thanks to the new HotLine Pocket, the portable telephone that can reach any point in the world. Carry it in your pocket or in your attaché case. With a clever clip-on mechanism, you can transform it into a full-size car phone in a split second. You can even go hands-free, and talk on the phone while keeping both hands on the wheel."

No doubt about it, a lot has happened in eight years. Not only in mobile telephones but in men's fashions as well.

PATRIK LINDÉN



For several weeks now, large areas of Malaysia and Singapore have been covered in smoke from the intense forest fires on Borneo and Sumatra. Not even the Twin Tower of Kuala Lumpur rises above the smoke.

Photo: PRESSENS BILD

Families offered chance to return home after forest fires

As the devastating forest fires in Southeast Asia continue unabated, Ericsson has offered families of all **malaysia** non-local personnel on long-term contracts in Malaysia and Singapore the opportunity to return to their respective home countries. At the same time, business will continue as usual, however.

For a number of weeks, extensive areas of Malaysia and Singapore have been enveloped in clouds of heavy smoke from the intense forest fires raging in Borneo and Sumatra. Measurements of air pollution in the form of airborne carbon particles, sulfur oxides, nitrogen oxides and carbon monoxide at various locations in the region have indicated levels which are unhealthy, and in some cases injurious to health, and which could lead to respiratory problems and eye infections.

Apart from the areas where the fires are centered, the situation is worst on the Malaysian mainland, which has for some time been affected by prevailing winds from Borneo.

"While all employees are working as usual at present, we are monitoring developments closely," says Olle Ulvenholm, president of

Ericsson Malaysia. "Several times each week, we meet representatives from other Swedish companies and the Swedish embassy to discuss the situation and appropriate measures."

Since exposure to the unhealthy air can be substantially reduced by staying indoors in air-conditioned buildings, all employees are being advised to cut down on outdoor activities as long as the problem persists.

In addition, all families of non-local personnel on long-term contracts in Malaysia and Singapore have been offered the opportunity to travel to other parts of the region to escape the smoke from the forest fires. Now they have also been given the chance to return to their respective home countries.

"Some 50 employees who have been in southern Thailand for two weeks have now returned, but the majority are considering returning to their home countries later this week," says Ulvenholm, but adds that the situation has improved noticeably in the past few days.

At the time of writing - Tuesday, September 30, heavy monsoon rains have made the air cleaner. The critical factor now for Ericsson employees with families in the region is whether the wind direction will change and whether the rains will continue.

NILS SUNDRÖM

Ericsson in Canada - a mature developer

■ Ericsson Research in Canada has been assessed as a Level 3 according to the Capability Maturity Model (CMM), an American model applied to determine the degree of maturity of a company's software-development operations.

The model, which originates in requirements set by the American defense industry on software suppliers,

focuses on local improvement work, employees' involvement and enthusiasm, and the possibilities for comparing the company's results with those of other organizations.

The CMM is organized in five levels of maturity. According to the evaluation, Ericsson Research Canada has attained to Level 3 in its software development operations.

Airships serving telecom

■ Perhaps the age of the airships has not passed. Japanese scientists are testing helium-filled balloons as media for relaying the radio signals of mobile telephony.

With a projected altitude of 20,000 meters, the balloons are well under the altitude of satellites, which means their transmitters don't have to be as strong. The Japanese state-run Mechanical Engineering Laboratory, which is running the tests, claims that the balloons can stay up for several years and can be operated with a solar engine. The Californian Sky Station company is planning a network of 250 balloons.

Source: KLM in-flight magazine, holland herald

Small base station, big success

■ On July 1 this year, the Brits left Hong Kong. This event focused the world's attention on the area more than previously. The mobile networks became overloaded by the enormous numbers of people wanting to call. To cope with the load, the operator in the city of Shen Zhen, which is adjacent to Hong Kong, installed the small Ericsson base station, the RBS 2301. The RBS 2301 is excellently suited to providing coverage where radio shadow is otherwise likely to be a problem. Indoors, for example, in shopping centers, airports, etc. It was the first time this type of radio base has been used in China. The customers are pleased and orders have now started to come in.

Breakthrough for public networks in Romania

Ericsson recently sold 12,000 access lines with DRA 1900 connected to an AXE switch, to Rom Telecom in Romania, in tough competition with Siemens and Alcatel.

The switch will be centrally located in Bucharest, and installation will begin next year. Ericsson has operated in Romania since 1992. Earlier, there was

only one AXE station in the country. It is now hoped that this deal will generate volume business in both AXE and DRA 1900.

The actual installation will be carried out by Ericsson in Hungary.

The team from the Central European unit of Ericsson Telecom's Public Networks (below) landed the contract: Sorin Pintelie, Johan Westberg, Cristina Nicolescu, of Ericsson in Romania, Torbjörn Engström and Björn Källrot.



Ericsson praised by financial analysts

■ Ericsson's relations with investors are good. In a survey carried out by the Financial Times, the analysts interviewed consider Ericsson to be "a highly competent company that is always well updated."

In the survey, the analysts defined four criteria that a company should fulfill to create good relations with investors. The companies should be open and honest, the people in charge of investor relations should be knowledgeable in their field, the company management should be available to contact and the management should also be involved in contacts with the investors.

Linked up with MiniLink

Ericsson's MiniLink radio links are marketed worldwide. A recent three-day seminar in Gothenburg attracted 150 people – from 29 countries – who make daily use of the system. The purpose of the seminar was to exchange experience of MiniLink and discuss ideas for the future.

Ericsson's objective to secure 40 percent of the market by the year 2000. One way to achieve this is to listen to customers.

Several of them were invited to express their views on MiniLink and Ericsson Microwave Systems. Participants included customers from Telkom in South Africa, Bosch and Mannesmann from Germany, Turkcell from Turkey, Vimpelcom from Russia and Can TV from Venezuela.

The seminar program included a visit to the world's largest plant for short-haul links, namely Ericsson Microwave Systems in Borås.

Russian market opens up to cables

Ericsson Cable's Tele Cable Division has gained approval to sell cable in the Russian market. As a result, the division is now about to enter a new market with thirteen different types of optic cables.

To sell cable and other telecommunications materials in Russia, it is necessary to have a certificate – or type approval – which is a costly process. Several certification institutions have been appointed by the Communications Ministry.

Göran Hallander, export marketing manager at the Hudiksvall plant, explains:

"We decided long ago to invest in a sales program in Russia. I first met with the certification institution in May to sign an agreement which included plant visits with a study of certification tests. And the second week in September, a delegation of four arrived, led by the institution's manager.

"They stayed a week and studied our current tests and the results from previous tests to ensure that our cables met the requirements. In Russia, the demands imposed on cable design are very stringent due to the extreme climatic conditions. For example, atmospheric cable



Ericsson Cables celebrate its Russian certification which opens up a major cable market in Russia. The success was celebrated with champagne.

Photo: LENA ZACCO-BROBERG

must cope with -60 C to be able to withstand the elements in Siberia."

Everything was settled on Friday, with confirmation that Ericsson Cables would be certified. This was celebrated in the appropriate style with champagne.

And since the agreement was signed on the same day as Moscow celebrated its

850 anniversary, the Russians gave Ericsson Cables a present, a rug bearing Moscow's coat of arms – St. George and the Dragon.

"This is a joint contract between the TeleCable and the Networks divisions, further underscoring cooperation among the divisions. LENA ZACCO-BROBERG

Intense activity in UK golf challenge

Golfing activity has been intense among the Ericsson employees who responded to the challenge from the Force Computers company. Qualification to the final match has been under way throughout the summer, both in the UK, at the East Sussex National Championship course and in Stockholm, at the Haninge Strand Golf Club.

The finals were held on September 1 at Belfry in the UK, the scene of many major international golf tournaments, such as the Ryder Cup. Ericsson's finalists were Tor Isaksson, Ericsson Business Networks, Jan Holm, Ericsson Utvecklings AB, and Keith Roberts and Ian Hendersson, Ericsson in the UK. Force Computers was represented by James Hole, Anders Due-Boje, Alan Beveridge and Bernhard Horstmann.

It was a perfect day for golf. The stableford competition was won by Force



It was a perfect day for golf. The stableford competition as won by Force Computers' Bernhard Horstmann, with 30 points.

Computers' Bernhard Horstmann, with 30 points.

"I'm looking forward to defending the

beautiful trophy in next year's challenge," said Bernhard Horstmann as he received the prize.

New web site for mobile telephones

A new Internet web site for the Mobile Phones and Terminals business area had its premier on 27 September.

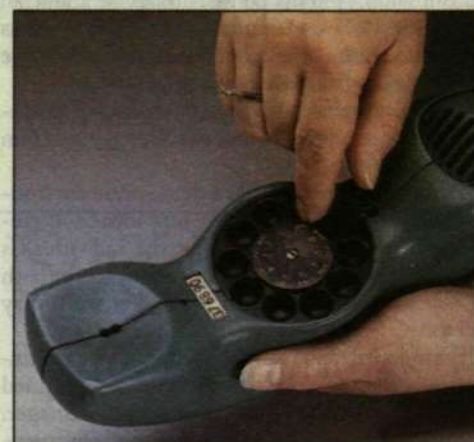
"The idea behind the new site is that it should comply with our brand platform, from which all new information and marketing materials will be designed," explains Katarina Granstedt, project manager.

Katarina says that what is now on view at the web site is merely the first phase. During the fall it will be further developed, visually and functionally.

Among other things, you can view new products, read about activities at trade fairs and so on, as well as making inquiries and expressing opinions on the web site.

The address is:
<http://mobile.ericsson.com>

from the past



This one-piece telephone was first demonstrated in WW II, but the response was not favorable. It was much too advanced and never went into mass production.

Unifon – a telephone ahead of its time

On January 28, 1944, with a World War raging on every front, Hans Kraepelien presented a revolutionary new telephone which he called the Unifon. As the name suggests, this was an all-in-one telephone, with mouthpiece, headphone and dial all in the same module.

Ergonomically speaking, the Unifon was well designed, and it weighed less than 600 grams. This compared well the bakelite handset of a contemporary standard Ericsson phone which weighed in at 500 grams.

Hans Kraepelien joined Ericsson in 1929, and was already toying with the idea of a unitary telephone in his first year with the company. But he was soon posted to Italy, and put the project in cold storage until 1932.

When he returned to Sweden, he worked on his idea in a tiny workshop in his home. In 1935, he was transferred to Poland, where he was technical manager of the Polish telephone company. After the outbreak of war in September 1939, Kraepelien returned to Sweden where he combined service as an officer in the reserve with work at Ericsson's telephone division.

The Unifon was not ready for a demonstration until 1944, but it was apparently still considered too advanced. A decade elapsed before Ericsson could launch its one-piece Ericofon telephone, which rapidly made a name for itself all over the world.

Hans Kraepelien took the Unifon with him when he moved to the U.S. in

1945 to manage LM Ericsson's New York office. He used his Unifon constantly in his many assignments, which included a spell as president of the North Electric Co. in Ohio, an Ericsson subsidiary. In 1958, he left Ericsson to join the U.S. telephone industry, and the Unifon followed along with him.

When he retired, he arranged for the return of his unique brainchild to Sweden, where the only two Unifons ever made can be admired in the Museum of Telecommunications in Stockholm. Both of them are still working perfectly.

There is no doubt that the Unifon was an example of futuristic design which was presented a couple of decades too soon.

THORD ANDERSSON

column

We need more creativity and less bureaucracy

As was clear from our six-month report published a few months ago, we performed extremely well during the first half of the year. GSM is growing explosively – 49 million subscribers in July could well become almost 70 million by year-end. D-AMPS, which has made somewhat slow progress so far, is now beginning to pick up. We are hopeful that the number of subscribers – currently slightly more than 5 million – will double by year-end. In Japan, growth continues at a rapid pace, and we have also secured two important orders for test systems for mobile multimedia equipment based on broadband CDMA.

Even in a situation characterized by intensifying competition and pressure on prices, we can still improve our profitability. Increasing volumes give us advantages of scale, and the stronger dollar is having a positive effect on earnings. Our sales growth is about 25 percent based on the exchange-rate trend of the krona, but only half as much based on dollars. We can no longer afford to take rapid growth for granted.

However, as the market leader, we are in a good position to exert an influence on the entire industry and its growth – and hence on our own growth. We can help our customers to grow by rapidly working toward the quality level of the fixed networks and by continuously adding new services and functions to stimulate increased traffic volumes. By

once again assigning top priority to a truly innovative corporate climate and encouraging creative ideas, we can ensure continued strong growth in the future.

As we have grown and become successful, we have allowed a certain degree of sluggishness and bureaucracy to creep into our organization. To maintain sound profitability, we must be able to deal with everything that is unnecessary or needlessly complicated. This could for example include massive handbooks, excessively long reports, barely comprehensible rules and unproductive meetings.

Naturally we want everything to be well organized, but it should be a simple order based on common sense. In short, less bureaucracy!



STEN FORNELL
Executive Vice President
and Chief Financial Officer,
Mobile Systems

News from Mobile Systems

All employees who work with Mobile Systems in Sweden receive a supplement to the Swedish Contact. Some of the articles in this supplement are also valuable information for people working outside Sweden. To ensure that this information is spread internationally we will occasionally include special pages in Contact, marked News from Mobile Systems.

GUNILLA TAMM
Editor, Business Area Mobile Systems
E-mail: gunilla.tamm@era.ericsson.se

Rapid technical development and increased competition places new demands on Ericsson's product renewal. The Mobile Systems Business Area is placing a long-term emphasis on promoting creativity and taking notice of new business ideas. The success of the Cellular Transmission Systems business unit at Ericsson Radio Access is an ideal example of a technical solution that originated in a market demand.

Customer needs spur a profitable business concept

new transmission solutions for mobile telephone systems are a very profitable business concept – both for the customers and for Ericsson.

however, it also gives Ericsson's competitors access to our customers. We would like to block this access, of course, while simultaneously projecting Ericsson as a total supplier," says Tsviatko Ganey.

Tsviatko Ganey and the Cellular Transmission Systems business unit have succeeded in attaining annual sales of SEK 500 million within three years. Transmission costs are often a gradually emerging problem for mobile phone operators. While development is moving towards denser radio networks with more and smaller radio base stations, the need for a fixed transport network for radio equipment is also increasing.

Ericsson's studies show that transmission represents an average of 30 percent of operating costs.

"This is an alarmingly large cost percentage and a problem that many buyers have underestimated. The problems do not arise until the network becomes operational. In the long-run, it means that the transmission becomes more expensive than the actual network equipment," explains Tsviatko Ganey, manager of the Cellular Transmission Systems business unit in Kista.

Customer interviews

Tsviatko Ganey studied the various mobile systems to find improvements on assignment by the technical director Jan Uddenfeldt in the autumn of 1993. Tsviatko, who had previously been microelectronics manager at Ericsson Components, quickly developed a business concept for a more efficient transmission solution. The need for cheaper, more secure and flexible transmission in the fixed network was also confirmed in a series of interviews with operations managers at major mobile operators, among others.

"If we have a product that can reduce the customer's costs, then we will also profit," Tsviatko Ganey explains. "Each percentage point in transmission costs saved by the operator gives greater competitive strength, which translates into better opportunities for our customers to grow.

Since RBS 2000 for GSM is based on an open interface for transmission systems, there is an additional reason to offer a new transmission solution.

"An open interface gives the customer freedom to choose its supplier of transmission equipment,

Billion goal

When Tsviatko presented his business concept to executive management in January of 1994, he described an operation that would invoice one billion kronor within three years. Today, three years later, the one billion mark is in sight. During the first six months of 1997 alone, equipment and services have been sold for SEK 500 million.

In order to be up and running quickly, a contract was signed in the autumn of 1994 with Telabs, an external supplier. Additionally, a cooperation agreement was signed for further development of the transmission systems that Ericsson wanted.

"It is important to react quickly to customer needs. It wasn't always popular internally that we chose a system we didn't manufacture ourselves, but our own solutions weren't effective enough," says Tsviatko.

"Ericsson must offer the best solutions. We know that we can't develop everything ourselves, which is why it has been the company's official line not to do so for quite some time. We must be more open, flexible and we must find partners for cooperation in order to be a market player and attain profitability."

After having been a handful of people, Cellular Transmission Systems consists today of about 70 employees. Half are from Ericsson Radio Systems and half come from operators, so they are equipped with "customer vision."

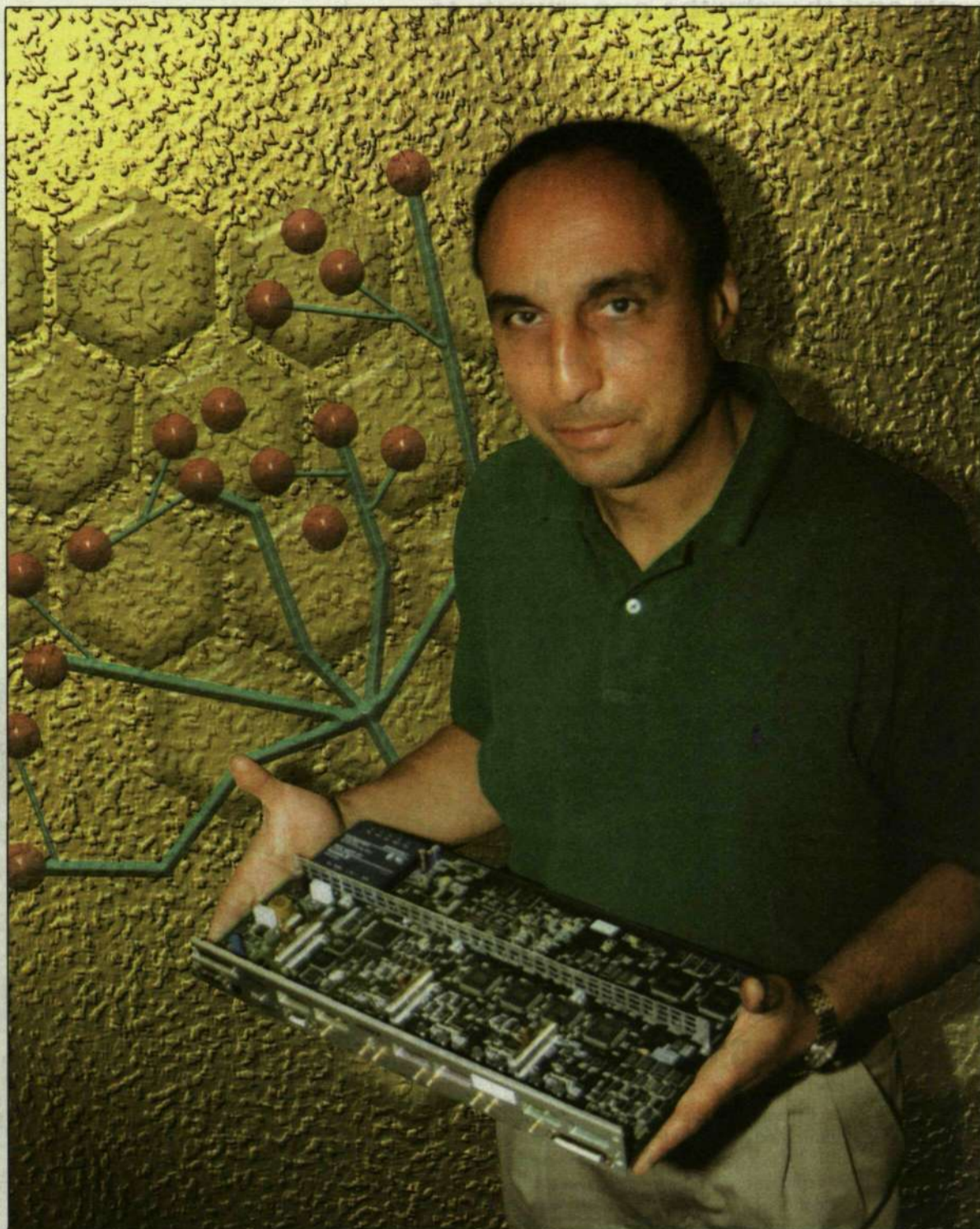
Tsviatko emphasizes the importance of entrepreneurship, endurance and quickly taking action to achieve results.

"I think that Ericsson has a democratic environment where there is room for new ideas and creativity. But it also requires that the individual is prepared to step into the limelight and accept both the success and failure that his or her work may lead to.

"Each department should have a budget for trying new ideas, provided that there are well-defined 'check points' and the supervision of a manager. It's a matter of small projects that, with inexpensive solutions, can prove to be profitable in both the long and short term," he concludes.

NILS SUNDRÖM

NEWS FROM MOBILE SYSTEMS



Customer need gave rise to business concept. Tsviatko Ganev and the unit for Cellular Transmission Systems have rapidly reached success with a new transmission solution for mobile telephone operators. The idea is based on cross-connections, in which a transport- and access interface in each base station gives the operator full control over transfer and capacity in the fixed network.

Photo: NILS SUNDSTRÖM, Montage: MIKAEL EKLUND

Transmission in the fixed network is an important area also for mobile telephone operators. Cross-connections provides the operator with more effective supervision and lower costs.

Within mobile telephony, the only communication that takes place via radio is between the mobile telephone and the radio base station. The continued transfer, from the base station to the mobile exchange and other parts of the network, takes place via fixed lines, which may be

Intelligent transport networks

traditional copper wire, modern optical fiber or microwave radio links.

In the rapid development of mobile telephony, fixed network transmission has lagged behind. This has created difficulties for operators when planning traffic and quickly identifying and fixing problems.

The Cellular Transmission Systems business unit offers transmission solutions for GSM, NMT, TACS and D-

AMPS/AMPS systems. The technology is based on cross-connections, where the transfer finds a new path if, for example, a line is blocked.

By installing an integrated transport and access interface in each base station in the network, the base stations become intersections, or nodes, for traffic to, as well as through, the point. Central supervision allows the operator the capability to redirect traffic. So far, the sys-

tem has reduced customers' transmission costs by about 20 percent.

The unit has a total of 35 large networks installed worldwide, mostly for GSM systems. About 35 percent of current sales consists of the business unit's own products and services, including network design of transmission networks, transmission planning for microwave links, customer training and operator services to run the system during a period of time.

NILS SUNDSTRÖM

how is it going?

Bo Carlgren
manager of the newly-formed Telecom Management Solutions sub-business unit



How are you?

Very well, thank you, and very excited even if there's a lot to do.

What will the new unit be doing?

The sub-business unit, referred to internally as ERA/N, has a product range that is common to all of Mobile Systems' three systems units. The new unit was formed on May 1, and will provide services and solutions for Ericsson's cellular systems customers worldwide. There is a great need among our customers and the new business unit is a step in Ericsson's important emphasis on service sales.

Ericsson will now be able to provide solutions for customers who have networks consisting of equipment from several suppliers. An operator can turn to us for services and solutions for everything from operation to subscriber management. The basis of our work is, of course, close cooperation with the three systems units.

How many colleagues do you have?

Today, there are 90 people employed in Kista and we will be 130 by the end of the year. We are currently recruiting personnel and are considering establishing regional centers outside Sweden. The cities we are looking at are São Paulo and Kuala Lumpur. Some employees will move to these cities, but we will also hire local personnel. Sales and the provision of services will take place at the local companies throughout the world.

How long have you worked at Ericsson?

I started at Ericsson in 1983 and from 1987-1991, I worked at Ericsson in Dallas. Afterwards, I left the company to work for Comviq (a Swedish mobile operator) for three years. In 1994, I returned to Ericsson Radio Systems in Kista and worked in the Japanese systems unit.

GUNILLA TAMM

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A wider range of work assignments and thereby the opportunity to improve one's skills through daily work routines. This is cited by employees as being one of the advantages of the new technology organization implemented about six months ago at the department for Radio Networks Products (RNP) Applications Development.

New organization broadens skills

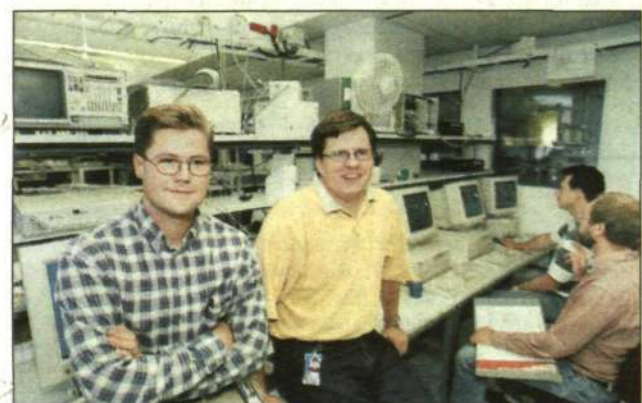
a major reorganization took place on February first this year that has affected more than a thousand people both in and outside of Sweden. One of the reasons for the reorganization was to cut development costs on the current base stations, which are facing increasingly tough competition. There are many similarities between D-AMPS and PDC, so by combining base station development for both of these standards, an organization was created for further development.

"The RNP Applications Development department was formed directly after the reorganization and has 140 employees today. The most significant change is that we have received greater development responsibility for more products and the entire department works with them from beginning to end," relates Maria Khorsand, department manager.

"We presently develop software for the Mobile Base Station Subsystem (MBS), the Mobile Radio Subsystem (MRS) and the Operation and Support System (OSS). Another major change is that we work with both D-AMPS and PDC systems," she adds.

The entire chain

The work being done by one department today was previously done by departments at three different units – two at the American Standards business unit and one at the PDC business unit. Work assignments now encompass the entire development chain, from systems development to function testing.



Joakim Berg (left) and Magnus Prebert are members of the first project group for joint development of both PDS and D-AMPS.

"Since we are working with all the different phases, we have the opportunity to influence quality by ensuring it's there from the start," says Maria.

She also emphasizes the synergy effects between D-AMPS and PDC in terms of software.

Cooperation

When it comes to base station development for D-AMPS, there are local design centers at several locations both in and outside of Sweden. At these local design centers, Radio Network Products has its own local units. RNP Applications Development has especially close ties

"An interesting learning experience to also have Japanese customers"

with Erisoft in Luleå, Sweden, Ericsson in Ireland and Ericsson Communications Inc. in Canada.

"All of us who work here represent many different cultures, which definitely is a reflection of Ericsson as an international company. Since our customers are located around the globe, the department's multi-cultural composition is an advantage," says Maria.

A fresh start

Lena Insulander is responsible for Operations and Maintenance, a group consisting of 19 people who work with software products that manage and control the base stations. This entails everything from specification and system management to construction and testing.

"I basically have the same work assignments that I did in the previous organization, but they have been expanded," she explains.

"Even though most of the job is the same as before, it still feels like a fresh start, since some products are discontinued while new ones are added. For instance, everything to do with the PDC system is new.

"Now, it is important that we use the best from both systems and reuse technical solutions," she

explains. "We are starting the first project in which both product lines – PDC and D-AMPS – will be developed together. Building up and taking advantage of the department's existing skills is an important task in the new organization."

Japanese view of quality

Vanda Tilver and her eight colleagues work with product and process improvements.

"We administer the products that are used by the customers. The new organization has allowed us to work with the entire world, which is both exciting and a learning experience. Working with

Japanese mobile telephone operators is entirely new for us. We have a lot to learn from the Japanese Standards unit and the PDC system about quality," she says.

"The potential synergy effects are enormous, since our products for D-AMPS and PDC are very similar. For example, we can ensure that major system errors are corrected in both standards as necessary."

Magnus Malmberg also emphasizes the synergy between D-AMPS and PDC. He is responsible for a group that works with the entire production chain, from systems development and construction to function testing. His previous responsibility was only for function testing.

"Today, we participate in feasibility studies and up until the function testing is completed. We also participate in FOA activities, that is, First Office application at the customers' premises. Having Japanese customers is both interesting and educational," he says.

Magnus also mentions the increased amount of responsibility the group has received, which speeds up the decision-making process.

Like a new job

"It's all very exciting; almost like having a new job with more responsibility and new products," says Daniel Löving, manager of a 12-person group that works with Operation and Support Systems (OSS). Daniel comes from the Japanese Standards unit, where he was responsible for development of software for parts of

the PDC products. He views the fact that everyone has the chance to improve their skills at RNP very positively. Those who wish may try new assignments and improve their skills within the framework of the project, without having to change their workplace or the people they are working with.

New for Kista

OSS is a new area for Kista that has now become a section within RNP Applications Development for this area. Contacts abound with colleagues in Canada, Australia and Linköping, Sweden, who all work with the same area.



Wider responsibilities

"Having new products and broader responsibility is both stimulating and a learning experience," agree (from left) Magnus Malmberg, Maria Khorsand, Vanda Tilver, Daniel Löving and Lena Insulander. Together with their colleagues, they have received new job assignments that are included in the entire chain from systems development through function testing.

Photo: KURT JOHANSSON

organization was to utilize experience and synergy effects in the best possible way. We are going to prove our capabilities by being a 'doer' organization that makes things happen."

GUNILLA TAMM

Extremely compact

At the Cellular Systems – American Standards business unit, an extremely compact construction technique, called flip-chip technology, is being examined. The technology, which uses a thin film with a conductive bonding agent instead of a solder between the contact surfaces, is rather new, but has been available for some time within consumer electronics in Japan.

"No construction method available today is more compact," according to Arne Tolvgård, who works with micro construction methods at the business unit. "We have decided to examine this technology further to determine if it can be used for circuit boards in radio base stations in our mobile systems."

Flip-chip technology

This micro construction method has many advantages. It saves space, energy and money, to name but a few. Consequently, it may also have environmental benefits. Constructing on a small scale is a necessity, so a logical step, of course, is to try new construction methods.

Flip-chip technology, which is the collective name for methods of connecting a circuit with a substrate, has been used by the Japanese during the past few years. The main area of usage is displays, in which the components are assembled directly on the glass, but the technology is also used in other sensitive components that are difficult to solder. Typical end-products are notebook computers, video cameras and radios.

Conductive particles

The flip-chip technology uses an anisotropic conductive bonding agent between the contact surfaces. The bonding agent gets its conductive properties from small metal particles that are 4-7 µm in size (one µm = 1/1000 millimeter). The contact surfaces contain so-called bumps, or tiny gold-coated nickel elevations.

When the surfaces are pressed together under extreme pressure in 180-degree heat for 20 seconds, some of the particles are pressed in between the bumps, thereby conducting electricity.

The particles that end up alongside the bumps are insulated in the bonding agent (which also functions as a filler)



"It's vital that we pay attention to what is happening in the field of consumer electronics," says Arne Tolvgård, who works with micro construction methods for base stations and is now investigating the feasibility of a technique using conductive bonding agents, used by the Japanese for radios and video cameras, among other areas.

Photo: ANDERS ANJOU

and are not in contact with any other surface.

Several leading companies such as IBM, Motorola, Hitachi, Toshiba and Sony use this technology.

Testing

Testing has come to the point at which there are 48 tested 6-layer printed circuits ready to be equipped with four bare ASICs each. Hitachi of Japan, which produces conductive bonding agents, is participating in the project and is responsible for developing the test circuits.

"Trials of the test circuits will be performed during the spring. A new testing phase is starting in 1998, in which both digital ASICs and radio ASICs will be tested on existing circuit boards with respect to moisture, temperature, heat and so forth.

"We need to further investigate oxidation, cracking and the movement of particles," says Arne Tolvgård, who also emphasizes that flip-chip technology for base stations will be available after the turn of the century, and then most likely for small pico base stations. The technology may be introduced earlier for mobile telephones.

LARS CEDERQUIST

Research projects design factory of the future

■ How should Mobile Systems' global production operations be controlled and organized in the future? Help in finding the answers to these questions will soon be forthcoming in the form of four doctoral dissertations currently being produced by students of the International Graduate School of Management and Industrial Engineering (IMIE) at Linköping College of Technology in Sweden.

"We began introducing what we term the 'model factory' concept at the end of the 1980s," explains Åke Fahlén, manager of foreign production at

Mobile Systems. "The concept brings together the systems, production and test equipment and processes that support the business area's production strategy. It is now applied at all of Mobile Systems' plants, and since it is a living concept, we must look ahead to be able to make necessary changes.

"For Ericsson as a whole and for our business area, the focus is on five main issues relating to our strategic global production structure. These five issues form the basis for four research projects which are currently in progress," says Åke Fahlén.

"Product manager for configuration management"

AXE Research and Development are looking for people in Älvsjö, Sweden.

UAB has total responsibility for the continuing development of AXE as a core platform product for public networks, fixed and mobile. It is the task of UAB to supply Ericsson and its customers with competitive telecommunication platform products, service and support to enhance their profitability. UAB is the company with responsibility for integrated AXE subsystems, including technology, engineering, software, methods, tools and training.

The company employs about 2.000 highly qualified professionals. Design, development and production is mainly performed at company units in Stockholm and Östersund but also in a number of Ericsson design centers around the world.

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ERICSSON 

"Short Message Services (SMS)"

Ericsson Radio Systems AB is looking for people for GSM Development in Älvsjö.

The Product Unit "Digital Switching Systems and Applications" (DSA), provides competitive switching, service control and application products to GSM operators through Ericsson marketing and sales channels.

At the Local Design Centre in Älvsjö we are responsible for development of SMS functions in the Ericsson GSM network. The work is performed in an international environment together with colleagues in other Ericsson design centres e.g. Aachen, Madrid, Dallas and Athens.

The increased interest in SMS applications is placing requirements for further SMS development. We are now expanding and have the following positions open:

Software Developers (LK/NLB and LK/NLD).

We are looking for you, an experienced AXE Designer or newly graduated Software Engineer.

You will be a member of a Design Team

that will design and implement new functions in Ericsson GSM system.

You will have the opportunity to learn the Ericsson GSM system and to work with development of Short Message Services in GSM networks.

For further information please contact:
Lars Marklund, phone +46 8 719 91 97
memoid: ERAC.ERALSMD
e-mail: lars.marklund@era.ericsson.se

Function Tester (LK/NLT).

We are looking for an experienced AXE Tester or newly graduated Software Engineer.

You will be a member of a Testing Team that performs function test of new Short Message Services (SMS) and other functions in the GSM network.

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For further information please contact:
Claes Lillerskog, phone +46 8 719 91 80
memoid: ERAC.ERALILG
e-mail: claes.lillerskog@era.ericsson.se

General information:

For all positions it is essential that you are open-minded, flexible and enjoy working in a dynamic, fast growing organisation. The ability to communicate effectively in English is a must. Earlier experience from GSM and AXE is not a requirement but would be an advantage. We especially welcome female applicants.

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Ericsson Radio Systems AB
KI/ERA/LK/HS Anya Brännström
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vacancies

AT ERICSSON

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Contact no. 15 1997

Updated October 6

Ericsson Radio Systems AB

SUPERVISOR DATA TRANSCRIPT

CHALLENGING OPPORTUNITY FOR LONG TERM CONTRAT IN VENEZUELA

Cellular Systems - American Standards has established a Regional Implementation Center (RIC) in Venezuela. RIC shall support the Latin American Region with technical knowledge and resources. RIC will be used during peak periods by the Local Companies in the region, or when new functions are introduced. The organization can also be used in global methods development projects.

● We are now looking for a person to lead the Data Transcript team for this organization. The tasks for the supervisor beside some production is to plan and secure the teams competence development according to the development of D-AMPS/AMPS systems. To plan and allocate resources to projects for customers within the region.

The successful candidate shall have several years experience of Data Transcript, or equivalent. Proven leadership is preferred. English is essential and if you don't know Spanish, you must be prepared to learn.

Contact: Peter Lindfors, phone +46 8 404 2972, +46 70 586 0627, MEMOID: ERA.ERAPETL Application: Ericsson Radio systems AB AH/H Marianne Molin, 164 80 STOCKHOLM

Compania Anónima Ericsson, Venezuela - CEV

SUPERVISOR INSTALLATION ENGINEERING, MSC

CHALLENGING OPPORTUNITY FOR LONG TERM CONTRACT IN VENEZUELA

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ment of D-AMPS/AMPS systems. To plan and allocate resources to projects for customers within the region.

The successful candidate shall have several years experience of Installation Engineering, or equivalent. Proven leadership is preferred. English is essential and if you don't know Spanish, you must be prepared to learn.

Contact: Peter Lindfors, phone +46 8 404 2972, +46 70 586 0627, MEMOID: ERA.ERAPETL Application: Ericsson Radio systems AB AH/H Marianne Molin, 164 80 STOCKHOLM

Ericsson Eurolab Deutschland GmbH, Aachen

The AXE Mobile Core organization (AMC) is looking for a

PROCESS ENGINEER

● The main responsibility is the improvement of the work processes in EED/U and AMC according to the TQM plan at EED/U. The position reports to EED/U/OQC

The main tasks are: Support the AMC Process Manager. Coordination of process management (PM) activities, such as maintenance and improvements of processes. Supporting and being the driving force on process management methods. Support the organization with specific knowledge within the current work area.

As a suitable candidate, you have a very good knowledge in how to maintain and improve processes. You should be familiar with the Ericsson-way-of-working and the existing processes in your work area. Knowledge of different methodologies used in software engineering is a definite plus. Since you work as a moderator/consultant we require a structured way of thinking, good communication skills, perseverance and the ability to be the driving force behind PM. Overall you should see this job as a challenge in improving our existing way of working.

Contact not later than 971030: EED Human Resources Doerte KauDial: +49-2407-575163 Memo: eed.eeddka or Quality and Methods Andreas Bleeke Dial: +49-2407-575394 Memo: eed.eedanb

The AMC project office has a dynamic group of overall project-managers and administrators managing key project at the core all mobile applications. These projects encompass subproject-associated projects in Holland, USA, Ireland, Finland, Sweden/Norway, England, Spain, Italy, Germany and Greece covering a range of development areas at the leading edge of technology. Due to the need for new challenging projects in the AXE Mobile Core we are looking for an

emergency support, trouble reports handling, trouble shooting on site and in the test plant, system upgrade and general support for the customers.

You will play an active role in providing support and advice to customers as well as building up the local competence.

You need to have 3-5 years of experience in the GSM related node (MSC, BSC, RBS, OSS, DXX), especially in trouble shooting.

Switch Implementation Manager

We are also looking for a Switch Implementation Manager who will report to the Operation Director, to handle the switch rollout of the GSM network in Romania.

AMC PROJECT MANAGER "AMC Feasibility and Development"

● You will lead a large AMC project with full responsibility for fulfillment of Ericsson's commitments to our worldwide customers in close cooperation with other Ericsson subsidiaries. The position reports directly to Imo Freese, Manager of the AMC Project Office. The job holder should have a Bachelor of Engineering degree with specialisation in telecommunications, or equivalent. We expect minimum of four years work experience in technical aspects of telecommunication as well as relevant and proven experience in project management.

Good knowledge of PROPS, project planning, budgeting and management methods therefore is a must. Good knowledge of mobile advantage.

Resourceful, flexible, initiative, good communication, cooperation skills and a good ability to work under pressure are important personal qualities. Traveling is a natural part of the job. Fluency in written and spoken English is also required. Furthermore you should have strong interest in people and be willing to develop as a leader. The department and Human Resources will give support for your implementation and start in the new position.

Contact not later than 971030: Human Resources Doerte Kaulard Dial: +49 2407 575-163 Memo: EED.EEDDKA or AMC Project Office Imo Freese Dial: +49 2407 575-469 Memo: EED.EEDIWF

Telefonaktiebolaget LM Ericsson, Technical Office Oman (TKO)

MSC SUPPORT ENGINEER

● We are looking for a MSC Expert to our Field Support Center for a long term contract in Oman.

You have a good knowledge of support activities, providing emergency and day to day support to the customers, by answering their queries, providing solutions, visiting sites, providing emergency support, trouble reports handling, trouble shooting on site

You will play an active role in providing support and advice to the local engineers and build up the local competence. You need to have 3-5 years of experience in the GSM related node MSC.

Contact: Richard Karam, tel +46-8-404 93 11, MEMOID: ERAC.ERARIKM Application: Richard Karam, MEMOID: ERAC.ERARIKM or fax +46-8-757 26 20

Ericsson Telecomunicações, Portugal

Ericsson Telecomunicações in Portugal is supplier to the two existing GSM operators and there are expanding opportunities for both GSM 900 and 1800. The networks growth are exceeding the expectations of the operators and therefore we need to fill positions in the following areas.

RADIO NETWORK PLANNING

● Tasks are related to complete responsibility for Cell planning and Optimization for an operator, but also to work with swapping out other suppliers BTS's. Requested experience is minimum 2 years of Cell planning or Optimization, preferable both areas.

Contact: Kjell Petterson, tel. +351 1 4249486

RADIO IMPLEMENTATION

● To increase our capacity and competence to implement RBS2000 and DXX equipment we are looking for experienced engineers in the following areas:

INSTALLATION ENGINEERING: Specification of installation material, production of site documentation and CAD drawings, site surveys, methods and process improvements and competence transfer to local personnel.

Contact: António Gonçalves, tel. +351 1 4249464

● TESTING/COMMISSIONING: Testing of new radiobasestations, extensions and swapping out other suppliers BTS's, commissioning test with customer, methods and process improvements and competence transfer to local personnel. Knowledge of GSM required, DXX knowledge is an advantage.

Contact: António Gonçalves, tel. +351 1 4249464

● SWITCHING IMPLEMENTATION The number of projects have quadrupled during the last 6 months and that amount will remain or rather increase, therefore we are looking for experienced engineers in the following areas:

● INSTALLATION ENGINEERING: A-pack specification, C-module production, site surveys, methods and process improvements and competence transfer to local personnel.

Contact: Conny Andersson, tel. +351 1 4249386

● DATA TRANSCRIPT: Collection of exchange requirements, I-module production, methods and process improvements and competence transfer to local personnel. Knowledge of GSM is required, MIN is an advantage.

Contact: Conny Andersson, tel. +351 1 4249386

● TESTLEADERS INSTALLATION TEST: Test planning, testing of extensions and new switches, acceptance test with customer, methods and process improvements and competence transfer to local personnel. Knowledge of GSM required, MIN and other third party products an advantage.

Contact: Conny Andersson, tel. +351 1 4249386

FIELD SUPPORT CENTER

The networks are expanding, number of nodes have doubled in 2 years and will continue to increase, new products and new business opportunities, all this together results in a need for us to look for experienced engineers in the following areas:

Ericsson Telecommunications Romania S.R.L - ETR

The FSC department consist of 35 people in total. The Field Support Center was established in May 1997, and because the network in Romania is growing rapidly we are looking for the following competencies for long term contracts in Bucharest.

FSC Manager

You should have good knowledge of GSM and should be a customer focused person with 3-5 years of management experience. The FSC Manager will report to the President of ETR.

Support Engineers

- 3 BSS
- 3 MSC
- 1 OSS
- 3 RBS
- 1 DXX
- 1 Mini-link

For the above positions, you should have a good knowledge of GSM support activities, providing


For further information please contact:

Walid Alsheikh, Operation Director, phone +40 1 336 5705, GSM +40 92 200220 or memo ETR.ETRWAAL

Ulrika Martinius, Global Resource Co-ordinator, phone +46 8 404 25 65 or memo ERAC.ERAMSSS

Please send your application to:
Walid Alsheikh, Operation Director, memo ETR.ETRWAAL or fax +40 1 336 5708

Ulrika Martinius, Global Resource Co-ordinator, memo ERAC.ERAMSSS or fax +46 8 404 37 40

ERICSSON 

● **MSC/BSC SYSTEM EXPERT:** We are looking for System Experts with at least 4 years GSM experience and good knowledge in the BSS or SS/BSC area. Having worked with the latest phases of CME 20 is considered a benefit.

Main tasks: advanced trouble shooting, 24 hours emergency support, correction package handling, support roll-outs, provide technical support (on-site/off-site) and be the customer interface towards the FSC. The ideal candidate shall be customer oriented, good team spirit and be able to transfer knowledge to the local staff.

Contact: Luiz Ofner, tel. +351 1 4249465

● **OSS/DXX EXPERT:** To be responsible for OSS/DXX and IN nodes towards customer. Solid experience of OSS and support activities is required. DXX and IN/SMAS knowledge is a benefit. The responsibilities include on-site trouble shooting, problem analysis, technical support of IN system integration testing on customer sites, technical consultation and communication with customers and take part on technical meetings with the customer. The work also includes installation and testing of SMAS SW. The ideal candidate shall be customer oriented, good team spirit and be able to transfer knowledge to the local staff. You will be also the interface customer-FSC.

Contact: Luiz Ofner, tel. +351 1 4249465

● **IN/SMAS EXPERT:** To be part of the FSC's technical pool. Solid experience of IN/SMAS and support activities is required. The responsibilities include on-site trouble shooting, problem analysis, technical support of IN system integration testing on customer sites, technical consultation and communication with customers. The work also includes installation and testing of SMAS SW. The ideal candidate shall be customer oriented, good team spirit and be able to transfer knowledge to the local staff.

Contact: Luiz Ofner, tel. +351 1 4249465 Application (CV by memo) not later than 971031: RMOG Resource Agency, ERA/LY/RA, Att: Lars Ander, ERAC.ERALSAR or Faxnr: +46 8 4043740.

Ericsson GmbH, Business Unit New Networks Operators

Part of our company philosophy is to offer first class products and services to the market. On the way to achieve our goals on the telecommunication market in Germany, we are looking for our business unit New Network Operators, Department Product Management, in Düsseldorf to the earliest possible date for a

PRODUCT MANAGER SWITCHING

● Internet access solutions and IP based services in telecommunication networks gain a constantly growing importance for our product portfolio. For this, your professional support is required.

The interesting and varied area of responsibility contains a.o.: elaboration and development of product strategies.

Product Life Cycle Management". definition of technical product requirements in close co-operation with the customer. running of competence transfer workshops with customers. coordination with Ericsson Global Product Management.

In order to fulfill this job you should have the following qualifications and skills: a sound knowledge of telecommunication products and total solutions. very good knowledge of the German data and telecommunication market, its suppliers and operators. M. Sc. or equivalent. job experience in Product Management is desirable, but it is not a must. very good command of written and spoken German and English. readiness to close co-operation with New Network Operators during the challenging "Start-Up" phase. customer and solution oriented thinking and acting.

Should the challenge of this duty and the work in a young, success oriented team motivate you and furthermore, should you be used to act flexible and with engagement, so please send your complete application documents to:

Contact: Stefan Reuther (Department Manager Productmanagement), Phone: ++49-211-534-4770 or Hans-Jürgen Vratz (Human Resources), Phone: ++49-211-534-1441 Application: Ericsson GmbH, Business Unit New Networks Operators Human Resources Fritz-Vomfelde-Straße 14-18 40547 Düsseldorf Germany Ericsson Radio Systems AB, Kista

KEY PERSONS FOR BRAZIL AND MALAYSIA

The Sub-business Unit for Telecom Management Solutions, TMS, is spreading its wings. We will establish regional TMS organisations at 4 locations worldwide starting with Sao Paulo in Brazil and Kuala Lumpur in Malaysia. We are looking for managers and key persons who will build-up these organisations and make them successful.

TMS provides services and systems to cellular operators. These solutions will develop the operators' organisations to deliver higher service quality to the end customers (mobile users).

The regional TMS organisation will be responsible for the Marketing Support as well as the Supply of our Services and Products regarding Network Operation & Maintenance, Network Management Services, Customer Care and Business Development Services.

● The local TMS manager will report directly to ERA/NC as well as the MLC management.

The Local TMS Manager will be responsible for: Organisational Development. Development of the TMS Business in the region.

Requirements for the candidate: At least 10 years working experience from one or more of the following areas: Mobile Telecom Operator environment (management position). Business Operations within Mobile Telephony Systems. Customer Services. Operation/Development of Mobile systems.

The candidate should also have the following qualifications: Excellent proven managerial skills. Excellent language skills, English and in the case of Brazil, Portuguese and/or Spanish.

Excellent negotiation skills. Proven social capability. Adaptability to foreign cultures and working environments. Master of Science degree in e.g. Electrical Engineering, Economics or Business Administration.

Contact: Bo Carligen, phone 08-757 1260, memoid ERA.ER-ABOCA or Bernhard Nijenhuis, phone 08-404 4702, memoid ERAC.ERAHUIS

Network Management Solutions will be responsible for delivering Operation and Maintenance services according to the TMS service portfolio. The services are from consultancy type of services to full-scale outsourcing of O&M function. Our focus is on implementing the developed services.

● Manager for Network Management Solutions, who is responsible for supplying the TMS O&M Services in the region. The person will have a crucial impact on preparing for the possibility to offer and supply the O&M Services in the region. Main activities for this position are to build-up and lead the unit, recruit and train the staff needed for the supply in the region, but also to participate in technical sales support in the region and promote the services sales in the region. The position will also participate as Implementation Manager.

SERVICE MANAGER

● This person will together with the local company's M&S function perform technical sales support, promote and lead a structured way of sales, which secures a good platform for a successful implementation. The candidate for the position must be driven by professionalism to act to create win-win situation for Ericsson and the customer in the long-term.

Other tasks within this position are to argue for the value of the services, create business cases for Ericsson and the customer and to perform cost analysis of the offered services. The position will also train supply resources in the services and interact with product manager function at central TMS in the requirement handling for new and changed services. cellular operator within O&M, Engineering/Planning function, or similar. The successful candidate will also have good interpersonal and presentation skills and an interest and adaptability to different cultures. Travelling will in some periods be extensive.

Contact: Ola Svanberg, phone 08-404 2955, memoid ERA.ERAOVA Andre Fabo, phone 08-404 2402, memoid ERA.ERAEFA Herman Stenström, phone 08-404 7812, memoid ERAC.ERASTOM Bernhard Nijenhuis, phone 08-404 4702, memoid ERAC.ERAHUIS

Network Management Systems is a portfolio of systems that support operation and maintenance of a mobile network including network elements of several different types from several different vendors. They complement Element Management Systems, dealing primarily with one type of equipment, in forming the full support systems required for operation and maintenance.

PRODUCT MANAGER FOR NETWORK MANAGEMENT SYSTEMS (NMS).

● Regional Product Management for Network Management Systems is responsible for regional product management activities and technical sales support. Focus is on creating business opportunities for the centrally defined Network Management Systems portfolio and to feedback market requirements to the centralised product management. The product manager shall seek to have a continuous dialogue with the customers in the region and will take a large responsibility in the promotion of the products and services and in the production and follow-up of offers towards the customers.

Experience from Telecom Network Operations or Management, general product knowledge in the TMN Network Management area and product management experience is required. The successful candidate will also have good interpersonal and presentation skills and an interest and adaptability to different cultures.

Contact: Sverker Oldebäck, phone 08-757 1490, memoid ERA.ERAOE Håkan Messén, phone 08-404 2401, memoid ERA.ERAHAME Herman Stenström, phone 08-404 7812, memoid ERAC.ERASTOM Bernhard Nijenhuis, phone 08-404 4702, memoid ERAC.ERAHUIS

The Business Operations Support (BOS) team address Telecom Operator processes such as Marketing, Sales, Customer Services and Billing aimed at enhancing operator competitive edge and profitability. We are responsible for developing and implementing a portfolio of BOS Solutions.

SENIOR BUSINESS OPERATIONS CONSULTANTS

● whose main tasks are to identify, develop, drive and retain business challenges and opportunities through marketing strategies as well as operations in close contact with the market. Main responsibilities are to secure contracted business with top level management in the local Ericsson company and the customer's organization. Projects shall maintain a close relationship without service development organization. One of the Senior Business Operations Consultants will also act as manager of the local BOS team. The other one will also manage BOS implementation projects.

You should have several years of experience as a Consultant in the area of BOS, Business Operations Support, with in-depth knowledge of services and systems needed in the areas of Marketing, Sales, Customer Services and Billing. Confidential communication directly and comfortably with top management teams and adaptability to different cultures are crucial.

Contact: Tomas Keller, phone 08-404 6539, memoid ERAC.ER- AKELR Stefan Johansson, phone 08-404 3619, memoid ERAC.ERAJSS Herman Stenström, phone 08-404 7812, memoid ERAC.ERASTOM Bernhard Nijenhuis, phone 08-404 4702, memoid ERAC.ERAHUIS

"Senior Technical Manager to Romania."

Ericsson Radio Systems AB

Do you wish to become a member of a successful team to pursue our GSM break-through in Romania?

Romania of today is an exciting country, now turning towards the West. This is certainly the case when it comes to GSM, which was introduced during this spring/summer by two consortia, managed by international operators. They both had a flying start, which surpassed all expectations and we now need to strengthen our local organisation.

In February we signed the contract with our customer, MobiFon, dominated by Airtouch and TIW. In March a temporary system was launched, followed by commercial operations in April and the "cut-over" to the permanent system in June. The tempo is high, the customer is in a tough competitive situation, but by offering the right support at the right time, we want to contribute to MobiFon's continued

success as the leading mobile operator in Romania.

We are now entering a second phase, and we are establishing a Market Operations unit locally. In this connection we are looking for a senior Technical Manager. Your responsibility will be to advise and support the customer in technical matters when it comes to its continued expansion plans. You will also ensure that our offers are the best solutions for the customer. In addition you are expected to build up the technical function in the Market Operations unit we are now establishing, i.e. introducing routines and processes, recruiting local personnel and training them in order to take over in the long run. A Technical Manager, a Project Manager and an Area Manager are the three members of a Core Three team, all of them reporting to the same manager. Jointly the Core Three Team has the main responsibility for the customer relation and support.

We are looking for somebody with a solid technical education and with experience from mobile telephony. You should have a solid experience of your field of expertise. You can work independently, you take initiatives and you communicate well with others. You are used to working at a high speed and you make your decisions quickly. You must have a commercial understanding and you must be a good representative of the company. Good knowledge of spoken and written English is mandatory.

For further information, please contact:
Per Karlbohm, phone +46 8 757 22 38 alt.
+46 70 557 23 84

Please send your application to:

Ericsson Radio Systems AB
LP/HA Siw-Britt Johansson
164 80 Stockholm

Ericsson's 90,000 employees are active in more than 130 countries. Their combined expertise in fixed and mobile networks, mobile phones and infocom systems makes Ericsson the world-leading supplier in telecommunications. You can get more information about us on our homepage www.ericsson.se/SE/

ERICSSON 

Business Development Services (BDS) provides Management Consulting Services to operators on a global basis. We work closely with our partners, world-class Management Consultancies, in delivering increased profitability and competitiveness to our customers.

SALES EXECUTIVE

● who identifies, develops, drives and retains business challenges and opportunities. The person will make an important contribution in securing business through establish "buy-in" with the Top Management both in the Ericsson subsidiary and the customer organization, and coordinate sales activities with key individuals in our partner organizations.

SENIOR PROJECT MANAGER

● acting as the main interface between ongoing Business Development Services, the customer and the Ericsson subsidiary on a Top Management level. Main responsibilities include securing the supply of consultant competencies required for the project delivery, project management and co-ordination, and developing and maintaining customer relationships. The candidates for above positions have a well experienced background from the Management Consultancy Industry within strategy and/or operations, preferably with a specialisation in telecommunications. Confidence in communication directly and comfortably with Top Management teams and adaptability to different cultures are essential. Travelling will in some periods be extensive.

Contact: Lars-Gunnar Wallin, phone 070-514 0398, memoid ER-AC.ERAWALN Lennart Neujd, phone 070-556 5162, memoid ER-AC.ERANEUJ Herman Stenström, phone 08-404 7812, memoid ERAC.ERASTOM Bernhard Nijenhuis, phone 08-404 4702, memoid ERAC.ERAHUIS Application: Ericsson Radio Systems AB NHS Ingrid Wideberg 164 80 STOCKHOLM

Ericsson Radio Systems AB, Kista

RNC TRAFFIC SYSTEM DESIGN

● The RNC Traffic group is part of the Systems department at Product Unit - Wideband Cellular Radio Network Systems (PU-WCS) at ERA/JR. The mission for

the PU-WCS is to develop test systems and commercial products for the next generation of cellular systems. These systems are based on Wideband Code Division Multiple Access (W-CDMA) technology. The RNC Traffic group has the responsibility for the functionality and characteristics of the Radio Network Controller (RNC) node in the W-CDMA system.

During test system development, the group also works with the Mobile Services Center (MSC) node. Both these nodes are built on a new platform including an ATM switch and an OSE-Delta based control system.

We need to strengthen the RNC Traffic group with system engineers with solid software competence. Active experience of, or knowledge about the Radio Network control, Call control, TCP/IP, ISDN, RTO5a or ATM areas is meriting.

Contact: JR/TTC Jan Häglund +46 70 648 16 55
Application: Ericsson Radio Systems AB J/H5 Ann Beer
164 80 STOCKHOLM

Ericsson Australia

ENGINEER REQUIRED FOR KOREA TELECOM

● This person is required for 6 months from the beginning of November 1997.

Attributes: As we have recently installed a new switch based on BM3+ and Ericsson IN services for the first time for this customer. The person required will need skills in the following areas. AXE O&M Experience, Must. IN / SMAS Experience, Must. DT Experience, Desirable. SW Handling, Must. BM3 Product Line Knowledge, Desirable. This resource will be seconded to Korea Telecom for the duration of the contract which is 6 months.

Contact: Connie Malligeorgos, Regional Centre, Ericsson Australia Telephone: 61 3 9301 1864 Memo id: EPACMM

Ericsson Telecomunicazioni S.p.A.

AXE SYSTEM DESIGN

TEI LOCAL DESIGN CENTER, located in Rome, is consolidating and enlarging its activities and responsibilities in the AXE prod-

ucts. To meet this challenge we want to increase our capability in the AXE system.

● We are looking for people with more than four years of experience in the AXE System Design. The role to be covered on a long term contract basis is System Manager of SSS Subsystem for the products covered by TEI-LDC. This implies responsibility for prestudies, quick studies and technical interfacing towards other AXE Subsystems. Participation to coordination of System Management committee and network is included. Moreover he/she will be the chairman of the PC-SSS in TEI-LDC.

Contact: Angelo Tognoni (EITA.TEIAN TG) Application/CV no later than 971031: (EITA.TEIGRMR)

Ericsson Communications Canada, Infocom systems.

The newly established product team, Public Networks will provide solutions towards selected Canadian market segments within Public Networks products and service areas.

PRODUCT-MANAGEMENT & -MARKETING, PUBLIC NETWORKS

● You will select and manage a product and service portfolio competitive, short and long term, towards the Canadian market. Communicate market requirements, opportunities and trends towards the product owners within BU- Public Networks. Develop and communicate the value selected products and services offers for the end users in business cases. Map products/solutions towards customers needs. Keep pace of competitors' activities. Actively support sales activities. Secure expert support, whenever necessary, from the BU.

You will also be responsible for transfer BN product competence towards the Canadian organization. You have product and network understanding within areas such as internet/ wireless/ broadband/ fixed access and switching products that must represent the state of the art for the industry.

The candidate has a degree in engineering and several years of experience from similar work within the business unit. Understanding of the ANSI requirements is an advantage in this job. You must be able to communicate fluently in English. You are used to compose and make customer presentations.

You will be working in a matrix organization and your ability to take decisions based on facts and support activities with little daily guidance are a necessity to be successful. We offer you the possibility to work in a start up "company" atmosphere with a creative and demanding team with focus on success. For further information please contact,

Contact: Luis Blanco-Alonso, 1-905-206 7484, Memo Id:Emc.Emclubl or Johan Lindskog, 1-905-206 7409, Memo Id: Emc.Emcjoli Application: Barbara Lloyd, Ericsson Communications Canada, HR. 1-905-629-6792 Memo Id: Emc.Emcball

Ericsson Radio Systems AB, Kista

FIELD SUPPORT CENTER MANAGER IN PANAMA CITY

● Due to a successful sales of D-AMPS (with RBS 884) in Panama we need to recruit a Field Support Center Manager who can help us to build up the FSC organization and support the customers Network.

The FSC manager should have the following profile: AXE knowledge, minimum 5 years (i.e. from Installation & Test). Field Support experience from i.e. D-AMPS/AMPS, TACS, GSM. Process oriented/structured (TR Handling, Modification Handling). Customer oriented, good communicator. Able to run an office by her/himself. Management experience. Good communication skills in English is required. Spanish knowledge is an advantage but not a requirement.

The position is to be filled as soon as possible and duration of the assignment is at least 12 months. Please apply with a short resume of your background and experience.

Contact: Rolf Johannesson, phone + 46 8 404 38 20, memoid: ERA.ERARRRR or Helene Ujueta, phone + 507 265 51 40, email: hujeta@pty.com Application: AH/Henrik Bergqvist 164 80 STOCKHOLM Fax +46 8 404 7733

Ericsson Radio Systems AB, Kista

"Would you like to help us steer the development of the AXE system in the future?"

AXE Research and Development is looking for new co-workers.

AXE Research and Development is responsible for the continuing development of the AXE system, the world's most widely-installed telephony system. AXE is used in over 120 countries, and serves as the basis for mobile as well as fixed telephony.

We at the Application Platform Development unit are looking for someone who can take advantage of the opportunities that we will face in the future. We are responsible for the Resource Module Platform (RMP) as well as for the Application Platform Service Interface (APSI), which is the platform in the latest generation of AXE systems.

Although we are located in Älvsjö, we co-operate closely with our local companies round the world. If you are interested in working with system management

questions, we can offer you interesting assignments that include, for example, technical product management, coordination and product handling. You will also participate in prestudies and feasibility studies. Perhaps you'd even like to lead one of our product committees. At system management, we work across a broad area in the centre of the AXE system and have a comprehensive view of the system as a whole.

We work globally, at the leading edge of technology development, and of course with the newest technologies. For example, we have recently been involved in the implementation of Internet access applications, and are currently working with developing support for a multi-processor environment. Soon we will be examining areas such as self-configuration (i.e. "plug and play") and the possibility of

"opening up" the system.

It is an advantage if you have experience of system management and/or RMP and APSI. Experience in testing and design is also a plus.

If you are interested, please get in touch with:
Håkan Fredriksson, tel +46-8-727 40 67,
e-mail: hakan.fredriksson@uab.ericsson.se
Åsa Holmer, tel +46-8-727 32 61,
e-mail: asa.holmer@uab.ericsson.se

We would like to have your application by November 6, 1997 at the latest. Please send the application to:

AXE Research and Development
Birgitta Friis
Box 1505
S-125 25 Älvsjö

Ericsson's 90,000 employees are active in more than 130 countries. Their combined expertise in fixed and mobile networks, mobile phones and infocom systems makes Ericsson the world-leading supplier in telecommunications. www.ericsson.se/SE/

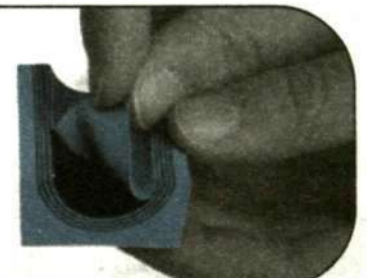
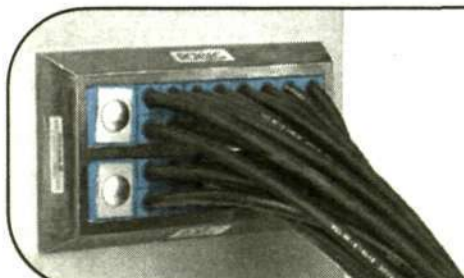
ERICSSON 



ROXSYSTEM

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contact

Ericsson, HF/LME/I, Room 811023, S-126 25 Stockholm, SWEDEN

Color and styling increasingly important

What will tomorrow's mobile phones look like? State-of-the-art services are making new demands on functionality – while consumers are placing greater emphasis on color and styling.

Ericsson Mobile Communications in Lund is cooperating with the Umeå University College of Design to encourage young industrial designers to look for new solutions.

Johan Ketwich was studying at the Umeå University College of Design, his degree project was an advanced mobile telephone, and this led to a summer job with Ericsson Mobile Communications in Lund. For the past two years, Johan has been working for Ericsson on product concepts and the design of new mobile phones and terminals.

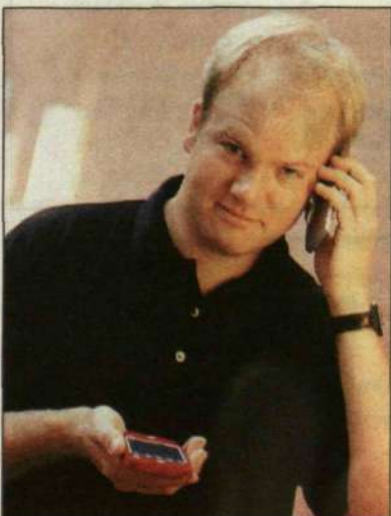
"I have been fascinated by this technology for some time, and I am interested in designing products so that it is easy to see how to use them," says Johan – and then demonstrates his degree project, a prototype personal communicator.

The communicator has detachable mobile telephone handset with a wireless link to the main unit. There is a large screen with touch controls with has functions such as e-mail, an electronic wallet and facilities for selecting callers you want to communicate with. "Autonomous agents" help users to obtain the information they want – for example the cheapest route for traveling between two cities.

Student advisor

"In functional terms it is hardly revolutionary, but this solution did attract some interest. But I wonder now why I made it so large (150 mm long) – I have since learned how to make things smaller," Johan says. Johan is currently advising new design students on Ericsson's behalf.

Cooperation with the Umeå Uni-



versity College of Design has continued in various projects since 1995.

"The aim is to create an interest in our products and the problems we face, and therefore we act as a sounding board for students, so that they can test out their ideas," says Bengt Stavenow, who is in charge of the user interface development in Lund.

"Students have been free to produce studies without being tied down by preconceived design ideas. There is broad scope for innovation. But this is not a question of design commissions and it has nothing to do with our product development operations," Bengt emphasizes.

Young industrial designers have produced new and sometimes very personal interpretations of the mobile phones of the future. The results range from simple handsets, with basic functions which are easy to understand, to sophisticated mobile video telephones in exciting new forms.

Johan van Ketwich developed a state-of-the-art mobile phone for his degree project at the Umeå University College of Design. This led to a job at Ericsson Mobile Communications in Lund.

Photo: LARS ÅSTRÖM

A mobile telephone with a microphone and handsfree headset built into the cover – one of many ideas produced at the Umeå University College of Design. Design: Sofie Sjöström.

"In the future, we will need a wide range of design ideas. Industrial design is not just a question of technical solutions. We need an overall grasp of our product range, and new solutions for graphic interfaces, animations and icons," Bengt Stavenow says. "That's where cooperation of this kind can give us useful experience."

NILS SUNDSTRÖM



Why not integrate a mobile phone into your gloves? Sven-Olof Persson was responsible for this idea.

end line

Now we're enhancing quality

Readers with sharp eyes or experience of printing technology may have noted an improvement in the technical quality of the previous issue of Contact. We have increased the "image definition" in the pictures and switched to paper of even higher quality. Obviously, we want to make Contact as attractive and easy to read as possible. We're not satisfied with second best, and we try to use the latest technologies – and maybe a little more.

Our printers have a good reputation in the business, but when I asked them to consider the feasibility of changes of this nature, they were a little doubtful at first. None of their other customers had proposed improvements on such a scale.

Afterwards, when everyone concerned could see that our efforts really had resulted in a better magazine, several of the printers thanked us for our stubbornness. They were grateful that Ericsson, in its customer role, had made such ambitious demands, thus challenging them to develop their professional skills even further. My response was, of course, that since I represented a company which was always demanding improvements, this was only in the line of duty.

By constantly raising our sights in our day-to-day operations, we can ensure that we will continue to be successful in the future.

Jan-Åke Kark is the first to participate in what I hope will be a long line of in-depth interviews with Ericsson senior executives. In the first section of this issue of Contact, he refers to extending frontiers. He believes that the best guarantee of satisfactory performance is a good working atmosphere, and I would be the first to second that. Read the interview, if you haven't already done so. Jan-Åke Kark, who is one of the company's latest shooting-stars, has a great many interesting things to say about the kind of management he wants to see. There is considerable room for improvement at Ericsson, but the good thing is that everyone seems to be aware of this.

People like Jan-Åke Kark make me feel even more confident that the day will come when Ericsson can really live up to its "wanted position" target for personnel – so that we will all feel committed to our work and are fully motivated, and that we regard our jobs as participation in a lifelong learning process.

We think that the way Contact is developing is exciting and we will be reporting on examples of the way Jan-Åke Kark and others are stirring up the old firm.

You have to make sure that your joints don't get stiff when you're nearly 125 years of age. You have to take on new blood and new ideas – new approaches, in other words.

Anyone who can tip us off about new initiatives of this kind is more than welcome to contact the editorial staff.



LARS-GÖRAN HEDIN

contact

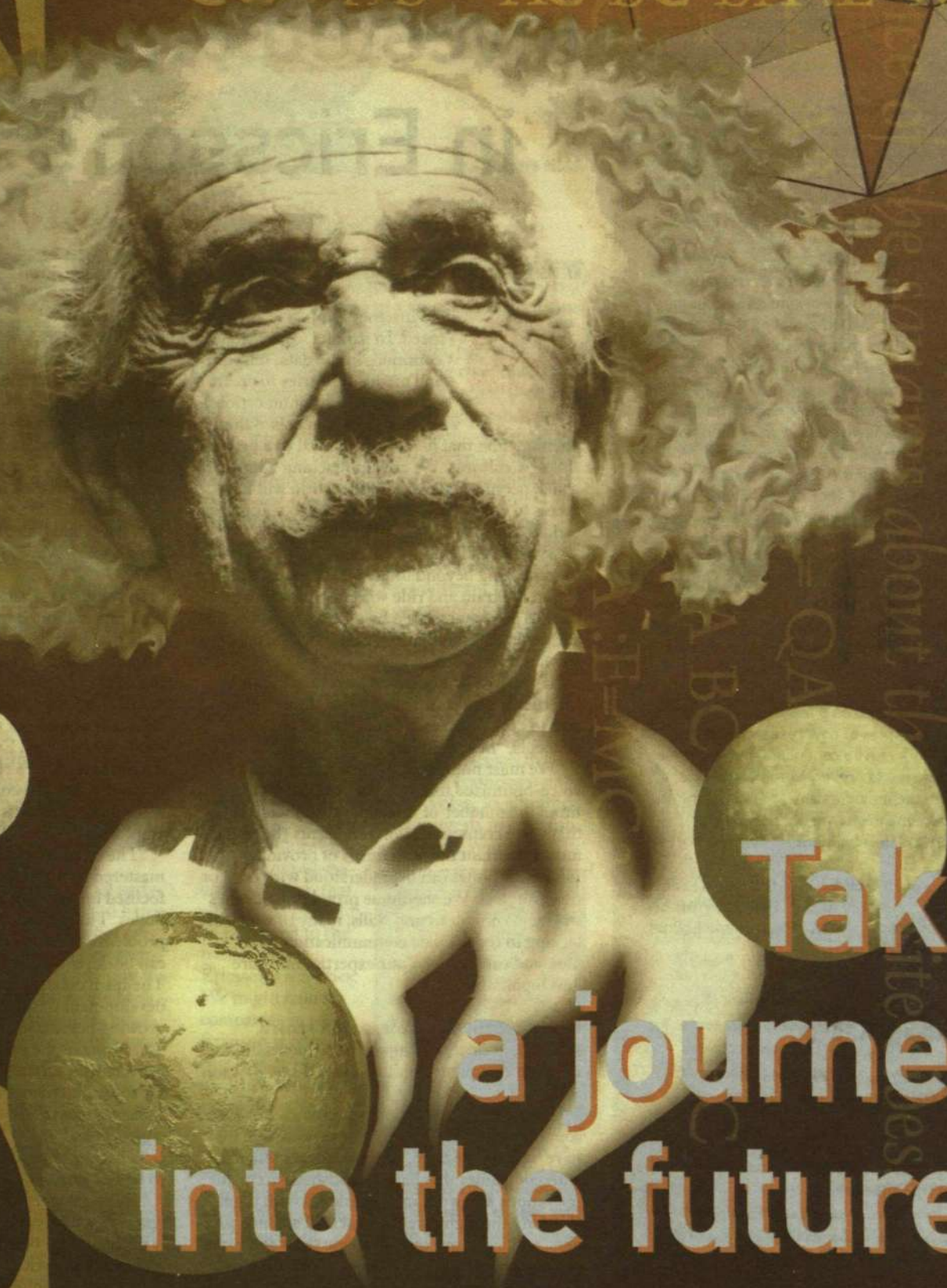
in depth

A THEME SUPPLEMENT
TO CONTACT NO. 15 1997

ACCB AB = ACPC AC = QA QC

BAAC BC = QB QA QB ; CA BA BC = QC

CCB AB = AC BC BA :E=MC²



Take
a journey
into the future!

Photo: PRESSENS BILD Montage: MIKAEL EKUND, ATELJESERVICE

Theme: Research and development in Ericsson

No time to rest once you reach the top

If the Alexander Graham Bell had not neglected to apply for a telephone patent in Sweden, Lars Magnus Ericsson and his wife, Hilda, would never have been able to start their telephone company, and the history of world telephony would be completely different.

Today, Ericsson's product portfolio is completely replaced about every other year. Research and development is a primary requisite for the work of all employees in Ericsson's worldwide organization, comprising more than 90,000 persons in more than 130 countries.

Worldwide coverage also characterizes Ericsson's Research and Development centers. What goes on there will have critical effects on our ability to achieve established goals as we approach the year 2000.

One of the most important factors, according to Bernt Ericsson, Vice President, Research and Technology, is to never rest on your laurels. When a product reaches its peak, that's the ideal time to start working on something new, something customers need that's one step ahead of the competition.

Another critical factor is the ability to work on a small scale in a company as large as Ericsson, providing employees with an overview that allows them to work together with few interruptions in the work flow.

Terminals in Lund, WasaLab in Finland, the Computer Science Laboratory in Älvsjö and Research Triangle Park in North Carolina are successful examples of Ericsson's theory.

In this theme supplement, Contact takes you to Lund, Mölndal and Stockholm in Sweden and to Finland and the U.S. We do not try to present a complete picture of Ericsson's research and development – that would be impossible in a 16-page supplement, or even 116 pages, for that matter.

We have focused on a few interesting, inspirational examples of how research and development work can be conducted, however. We have also tried to present some of the most important technologies and probed the minds of key persons in charge of Ericsson's research and development.

INGER BJÖRKLIND BENGSSON
AND BRITT-MARIE WIHDÉN
Contact Theme Editors

contact in depth

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Ericsson will invest more than SEK 22 billion in research and development this year. We also know that competition in the global communications market is in a class by itself – unmatched by any other industry. How does Ericsson defend and maintain its positions in the face of such razor-sharp competition and how will our Research and Development programs successfully lead us into the 21st Century?

SEK 22 billion invested annually in Ericsson's future

BY: INGER BJÖRKLIND BENGSSON AND BRITT-MARIE WIHDÉN



The Internet Express is gaining speed. In parallel, convergence continues in the data, telecom and media industries to create a sector the telecommunications world calls infocom, a budding phenomenon that heralds the arrival of a new age and new cultures. We are approaching a future in which people in all parts of the world will have access to voice, data, image and video communications, in brief, the age of multimedia.

"When we talk about infocom, we're referring to something beyond today's Internet. In order to get on the train and ride with it, Ericsson will have to be characterized by efficiency, innovation and renewal," says Bernt Ericsson, Vice President, Research and Technology.

"It's easy to be fascinated by future trends in Internet applications, but it's extremely important to take a serious approach to all visionary concepts," he continues.

"We must not forget, however, that today's voice-optimized telecom networks serve many times the number of Internet subscribers, and that voice communication represents the single most important mode in terms of providing information that can be understood with little or no confusion. We should be proud of Ericsson's strategic know-how and skills, many of which are lacking in today's data communications companies, and capitalize on our expertise in future development work."

HOWEVER, THE TRANSFORMATION FROM A successful telecom company to a successful infocom company won't be easy, Bernt Ericsson adds.

"Partnerships are the only alternative for Ericsson to conduct business in new areas where we have 'missed the train.' We must enter alliances with companies that have established successful operations and work in cooperation with them. Working through carefully selected alliance partners, and using our own strategic skills and experience to participate actively in the broad range of world standardization forums, Ericsson has the ability to create a future based on more than dic-

tates handed down by Cisco and other companies."

Ericsson products are highly dependent on sophisticated microelectronics. As a result, our products must be improved and upgraded continuously to capitalize on their own success, a theory propounded in Moore's Law (Gordon Moore is one of the founders of Intel), which claims the potential of modern technology doubles every 18 months. Speed, accordingly, must permeate all phases of Ericsson's operations.

"We can achieve speed by working in teams that are as small as possible and with minimal hand-overs," Mr. Ericsson continues.

"HISTORICALLY, ERICSSON DEVELOPED SYSTEMS with rather limited human resources. Few people were involved in construction, and every one was a highly skilled specialist with broad understanding of the entire telecom structure. We had a 'small company approach' in those days, and I believe it was one of the main reasons for Ericsson's early success. Even the first generation of AXE was built by a relatively small number of engineers, but the complexity has multiplied since then, necessitating a greater number of employees."

"The complexity of modern technology can be mastered only through determined efforts focused on network architecture and constituent nodes. The approach helps to overcome overall problems, breaking them down into sections that can be developed individually by small teams. The team concept is particularly important in the development of software, which has assumed a growing percentage of total investment costs. That's one of the reasons why I have such high expectations on the relatively new research unit for software architecture."

But how would you describe your ideal research organization?

"That depends on the role management assigns to its research groups," says Mr. Ericsson.

"Close geographic proximity between research groups and development organizations is probably the best formula to provide today's business units with new knowledge. It facilitates continuous supplies of new generations of products related to different spheres of busi-



Illustration: JAN OLSSON

ness. The part played by research in this scenario is primarily to replenish technological supplies and road maps, or development plans, in the field of technology. Close cooperation with the development organization is a basic prerequisite for fast and effective transfers of new knowledge."

"Conversely, if the objective is to create something new that will eventually compete with today's products, the research should be isolated from Ericsson's present business units."

"That's an old truth that can be illustrated by how Ericsson developed its digital switching technology. Some of the world's most prominent experts in analog switching networks were working in Sweden. For this reason, a decision was made to concentrate new research efforts at Ericsson's subsidiary in Australia – far removed from Stockholm. The decision was a prerequisite to winning the important Saudi contract in 1977, which Ericsson secured in cooperation with Philips."

ERICSSON'S RESEARCHERS COOPERATE TODAY WITH universities, colleges and other companies to generate added inspiration in research work relative to Ericsson and its business operations and to find inspiration for new products and solutions. Is this an ideal model for the future?

"I have a vision that all researchers in all parts of the world working in areas of interest to Ericsson should work for us. Since our focus lies primarily in recognizing the potential of new technologies, it is extremely important to identify the world's leading research groups and to establish relations with them. We need a dominant external presence to meet our goals, to communicate our visions and to convince skilled young researchers to join Ericsson."

Our brand name and trademarks play an important role in this context. Ericsson is a highly reputable player in the telecom world, and many researchers believe it's interesting and exciting to cooperate with Ericsson.

The greatest challenge, however, and the source of greatest potential, lies in identifying and satisfying various user groups, even the communication needs of individual users. In parallel with the gradual demise of operator monopolies, the battle

for telecom users has become extremely intense.

"We need to know more about the end-users than the operators do to gain general acceptance as an attractive supplier that telecom customers want to work with. In my vision, we should excel as the best source for identifying companies and other organizations that conduct research in their respective sectors. Working in cooperation with them, we should strive to develop communication solutions and, whenever necessary, integrate communications in their products, enabling them to stay one step ahead of their competitors. Regardless of which country the leading customer calls home, our global presence provides a unique opportunity for close cooperation."

"The approach requires a different form of research focused mainly on identifying and testing new business concepts. The activities are generally referred to as 'Business Innovation.'"

"WasaLab in Finland, where researchers work in basically the same premises as customers, is a prime example of these new groups. A new CyberLab is also being developed in California. And in Gothenburg, EBILITS (Ericsson Business Innovation Lab Intelligent Traffic System) is working in cooperation with Volvo, local traffic authorities, Telia and other interests to establish safer and more effective transport systems."

"It is not self-evident, however, that all creativity should be restricted to the framework of Ericsson's activities. We might launch companies in which Ericsson is only a part owner and allow the employees to own the companies they work for, or make ownership interests available to others. Innovative growth companies will emerge as a stronger force in the future." ■



Photo: ANDERS ANJOU

"Our corporate values include 'perseverance'. For research that means we must have a long-term perspective. But, in our fast changing world, another value – curiosity – is also appropriate" says Bernt Ericsson, Vice President, Research and Technology.

18,000 persons working with Research and Development

Ericsson conducts research and development operations at Research and Development centers in all parts of the world. More than 18,000 employees in 23 countries work in Ericsson Research and Development facilities.

Research and Development centers are situated in: Australia, Austria, Brazil, Canada, China, Croatia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Mexico, the Netherlands, Singapore, Spain, Sweden, Switzerland, and the U.K. and U.S.

Through its R&D centers, Ericsson conducts worldwide programs of cooperation with international universities and colleges, for example, Stanford and MIT in the U.S. and Tokyo University. Ericsson is also an active participant in about 20 EU research projects, including Acts, Esprit, Telematics and Brite Euram. The company is involved in 16 other EU projects through partly owned companies, such as MET in France, Intracom in Greece and others.

Cooperation partnerships in specific areas of technology whereby both parties avail themselves of each other's skills and expertise in long-term planning represents another important area of R&D. Ericsson works with Texas Instruments in the field of microelectronics, for example, with Rational in software development and several other companies that include Hewlett-Packard and Marconi.

Ericsson is also involved in several standardization forums in which traditional organizations like ETSI and ITU will be replaced by highly specialized ad hoc standardization forums, for example IETF and the ATM Forum.

Overall coordination of Ericsson's R&D activities is managed by a number of advisory bodies that include Ericsson System Council (ESC), Ericsson Technology Council (ETC) and Ericsson Microelectronics Council (EMEC).

Key technologies for Ericsson

Key areas of Ericsson technology include the following: an understanding of end-users, low-cost implementation, silicon integration, software technologies, high-volume production, accessing techniques (radio, copper, fiber), switching (ATM, routers), radio networks, voice, data and video communications, transmission quality and reliability.

Intranet access routes to Ericsson's R&D operations

- CORPORATE TECHNOLOGY:
<http://www.lme.ericsson.se/LMEDT/>
- RADIO SYSTEMS AND TECHNOLOGY:
<http://www-rcur.ericsson.se/>
- MOBILE PHONES AND TERMINALS:
<http://ldpcwww.ericsson.se/develop/R&Dglob.htm>
- INFOCOM:
<http://cubt.extu.ericsson.se/>
- ERICSSON UTVECKLINGS AB:
<http://uabweb.uab.ericsson.se/>
- ERICSSON HEWLETT-PACKARD:
<http://www-ehpt.ericsson.se/>
- EU RESEARCH COOPERATION:
<http://www.lme.ericsson.se/lmedtr/r&t/dtrt.htm>
- ERICSSON STANDARDIZATION:
<http://krus.lme.ericsson.se>

"As a researcher, you never know where you're headed," says Joe Armstrong, an Ericsson research staff member. "The way I see it, the difference between research and development is this: in research work, you know nothing about the result, while in development work, you have a defined goal. You know where you're headed. Research, however, presents its own questions, and provides its own answers."

Probing the mind of an Ericsson engineer

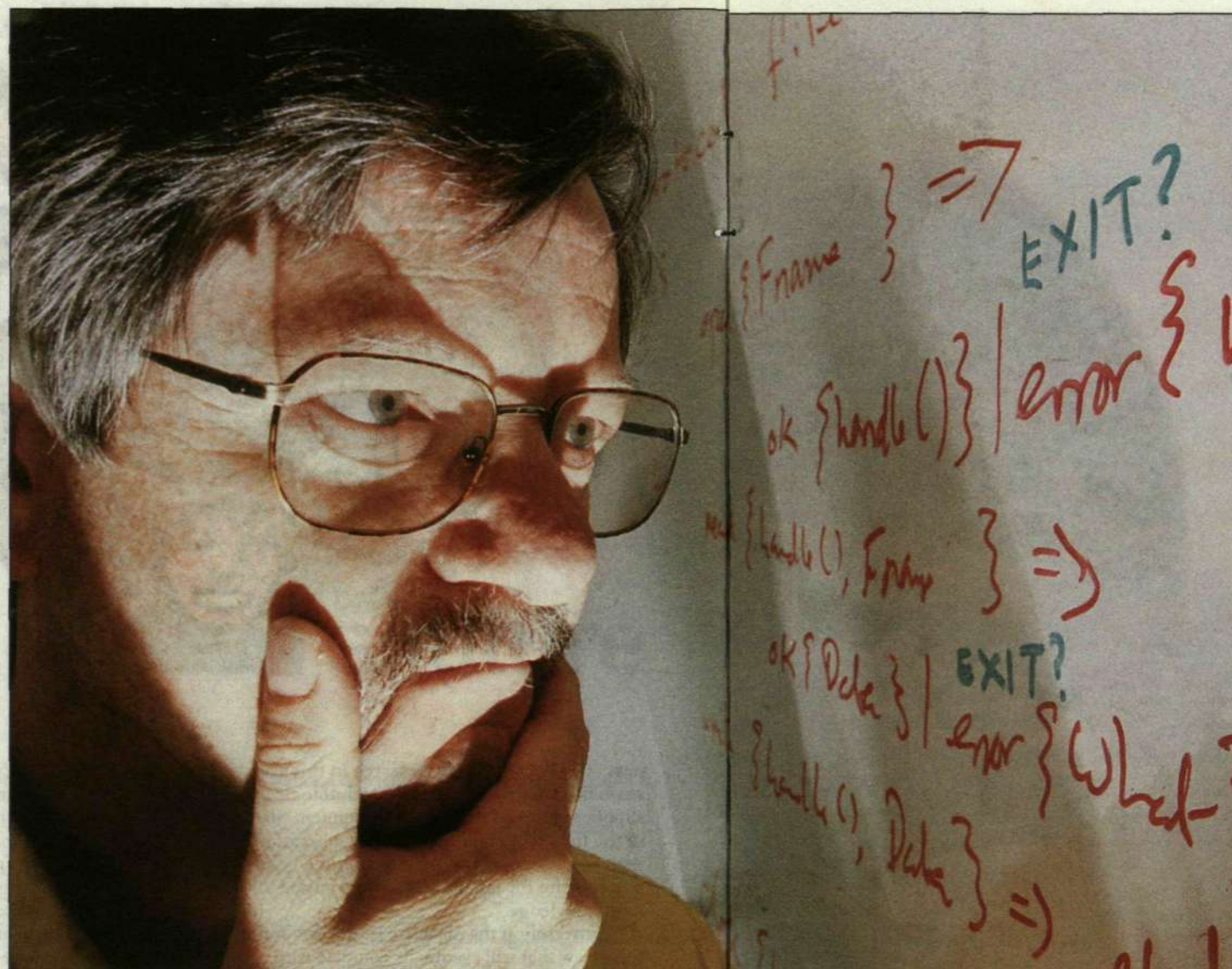


Photo: PETER NORDAHL

BY KARI MALMSTRÖM

We're in Älvsjö, south of Stockholm. Ericsson has facilities almost everywhere, but the building we're in is situated off the beaten track in the midst of a residential area. Outside, children play at a nearby day-care center. We're on our way to the Computer Science Laboratory, the only one of its kind in Ericsson. Joe Armstrong works here with 15 other persons. They all work with software research studies.

The atmosphere is quiet and harmonious, with a sense of creativity ready to erupt just under the surface. The computer screen in Joe Armstrong's office is its only source of artificial light. He is hacking about. Suddenly, a co-worker sticks his head in the door and shouts excitedly: "It works, it actually works." Joe congratulates his colleague. He is earnest and genuinely pleased. I get the feeling that everybody is involved in everybody else's job, that activities here are based on a form of individualized teamwork. Joe Armstrong confirms my suspicions.

"It really is a pleasure to work here. We live in an environment where we actually coordinate, cooperate and influence each other. A large part of our research is conducted around the coffee table. Morning coffee breaks often continue for hours. Somebody might dash away now and then to test an idea, and come back after a while to let the rest of us know if it worked."

In this soil, the first seeds were

planted that eventually became the programming language known as Erlang. Its name may be interpreted to mean "Ericsson language," but it's also regarded by some as a reference to Erlang, the noted Danish mathematician. Whatever the reference, Erlang is a bona fide Ericsson creation, one that originated as a minor brainstorm Joe Armstrong had sometime in the mid-1980s.

"That's our standard mode of operations; we sit around and hack, experimenting and seeking our way in new directions. If something doesn't work — which is par for the course — we try something else, another approach. But sometimes, a concept bears fruit and we don't get blindsided on the way. After a while, other people want to get involved and contribute. Soon, nobody remembers who did what."

Erlang emerged along a similar path. Although it was Joe Armstrong who started the process, the final result is attributed to teamwork. Joe Armstrong also credits his environment and colleagues for his achievements.

"As a programmer, you are accustomed to people not understanding what you're trying to

accomplish. And that's the most fantastic aspect of this job — we have an entire crew of people who strive toward the same end, as zealous in their work as I am," Joe Armstrong continues.

PROGRAMMING LANGUAGES ARE USED TO WRITE programs that provide computers, large and small, with the instructions they need to perform their tasks. Basic, Pascal, C++, Java and HTML are examples of programming languages. Then why do we need another language, Erlang?

"No single language answers the needs of all applications, and none was particularly well-suited for Ericsson's purposes. Erlang was designed to provide maximum simplicity in writing programs for telecom products," he explains.

Yes, of course. That's simple enough for Joe Armstrong, but for lay people it remains a mystery.

"I agree, we deal in a form of black magic," Joe Armstrong says with a smile, "but it's all based on mathematics and logic, which allows us to test our way to final results. If something in the design doesn't perform satisfactorily, we take it out."

"The main problem with all software products, in fact, is involved in writing programs that work. By tradition, everything in the world of telecommunications has to function satisfactorily; you cannot 'turn off' a telecom network. Correcting malfunctions and shortcomings may be likened to brain surgery performed on a conscious person. We try to write programs incapable of making

errors, and we have to start with programming languages that do not make mistakes."

"Complexity is the most difficult element to control. Unfortunately, software systems are not scalable. We can conduct experiments with small programs, but the results are not applicable in large programs."

"A word processing program, for example, is small and 'fits into' a single PC."

TO ILLUSTRATE HIS POINT, JOE ARMSTRONG LEANS forward and puts his arms around the screen on his desk.

"Take a system like the world wide web! It has thousands, tens of thousands of users, interactivity and enormous complexity. By principle, it's more difficult to avoid faults. This applies to all distributed systems, and telecom networks in particular," he explains.

Erlang has passed the research stage and is now in the process of commercial industrialization by OTP, a recently detached business unit with offices one floor below the Computer Science Laboratory in Älvsjö. Vulnerability has been reduced by splitting the organization into two separate units. It's not feasible to have a product so critical to overall operations that everything would grind to a halt if a key person got hit by a bus, as Joe Armstrong so delicately describes the situation.

Despite the move to cover its back, there is little doubt this crew is not "your basic run-of-the-mill" congregation of workers. The skills and expertise of the Computer Science Laboratory are unique, as well as the personalities of its staff. Not just anybody becomes a software researcher.

Ericsson Utvecklings AB building the future AXE

"Continued development of the AXE system's hardware platform is one of Ericsson's most important ongoing projects," says Göran Ekman, Manager of Ericsson Utvecklings AB's project and order department. "It involves introducing new technology, reducing power consumption, fewer constituent products and improved system efficiency," he continues.

Göran Ekman is responsible for the company's overall development of the AXE system's hardware platform.

About 1,000 persons are working on the project now being conducted at the company's units in Stockholm and Östersund. Seven local design centers in various parts of the world are also working on the project.

The project was started early in 1996, with Göran Ekman at the helm since its inception. When we interviewed Mr. Ekman about the project, which call for strong awareness of its time plan and focus on high-quality performance standards.

"We have made determined efforts to concentrate strongly on efficient implementation of subordinate projects. As we approach our objective, all constituent components must blend with each other to create an optimized overall result."

At this point, Ericsson Utvecklings AB and other Ericsson units will embellish the project

with several standard and market-adapted functions. When development on the new exchange is finished, it will be equipped to transmit voice as well as data and video communications via fixed and mobile networks.

"In this development project, extreme importance has been attached to efficient functioning of the AXE system's hardware platform and its competitive power in terms of pricing," says Gunnar M. Eriksson, President of Ericsson Utvecklings AB.

"Research and development efforts to date have lived up to our expectations and vision," he continues, "but we cannot afford to rest on our laurels."

But the question arises: How far can we go in efforts to reduce the dimensions of hardware? Is there a limit at which everything becomes so small that gains are restricted by technology itself?

"That's a long way off," says Göran Ekman.

Research has shown that development work can continue to pursue the same objectives for at least another 10 years.

Göran Ekman is adamant in his conviction that smaller hardware dimensions yield tangible benefits for manufacturers and customers alike.

"In the past, telephone exchanges were as big as small buildings. Today, the entire hardware platform for an AXE system would fit into an airplane passenger seat," he concludes.

LARS-ERIK WRETLAD

Erlang and OTP — Ericsson's pathway into open systems

Current development trends in telecommunications are characterized by increased use of Open Systems, with more software and standardized interface features. New trends are the result of growing convergence between the worlds of data and telecommunications. Erlang and OTP offer Ericsson pathways into the new world.

Open Telecom Platform (OTP) is the system platform for construction of software products that will be used in many of Ericsson's future products, including the ATM switch. OTP is an open platform comprising a library of modules that can be used in various combinations. The open character of OTP also facilitates different computers and operating systems. The platform is based primarily on Erlang, a programming language that Ericsson's Computer Science Laboratory began to develop more than 10 years ago. Among many other features, OTP offers a distributed database, interface with operating and maintenance systems and support for development of robust distributed systems.

"Our original objective was to enhance the programming efficiency of telecom systems, with particular emphasis on Erlang's capacity to create significantly more compact programs, in comparison with other languages," explains Mike Williams, manager of the OTP product unit.

"Erlang combines the results of university research projects with experience from industrial projects, but the programming language serves

mainly as a prime example of old-fashioned engineering science. Because of its extensive development period, Erlang has gained in maturity, accommodating tests in a large number of prototype projects," says Joe Armstrong, a researcher at the Computer Science Laboratory in Älvsjö and one of the brains behind Erlang.

Erlang is unique in that it represents the first functional programming language used for industrial development of large, complex control systems. Included among many other important properties is Erlang's capacity for easily managing concurrency, a basic prerequisite for any telecom system's ability to control any processes and devices simultaneously. The Mobility Server from Ericsson Business Communications was the first large system based on Erlang and OTP.

Erlang Systems, a unit of Ericsson Software Technology, has been assigned corporate responsibility to spread the Erlang programming language outside Ericsson. Universities and colleges represent one of several major target groups.

"Our greatest challenge is to sell Erlang in the U.S. If we succeed, a global market will open," says Lennart Öhman and Törbjörn Keisu, the men responsible for external marketing and sales of Erlang.

From their very humble start by a small group of researchers, commercial operations concentrated on Erlang and OTP have grown considerably. Approximately 1,000 Ericsson programmers have attended basic Erlang programming courses.

LOTTA MUTH

Aiming at total accessibility

With mobile phones of the future, all parts of the world will be accessible: from an elk hunt stand in Sweden to a boat somewhere in the Atlantic Ocean. At home, your mobile phone will switch automatically to the fixed network. You will also be able to connect easily and efficiently to the Internet and data networks via your mobile telephone.

The scenarios above are sketched by Nils Rydbeck, Vice President of Ericsson's global research and development in the field of mobile phones.

BY ANNELI KRANTZ

With more than 20 years experience working with Ericsson, Nils Rydbeck has directed the company's mobile telephone research and development for the past 12 years. His job includes the role of visionary and conveyor of the overall message to his colleagues in Research and Development. Nils Rydbeck is a leader and source of inspiration, a man who protects the interests of his talented Research and Development personnel and makes sure their ideas are brought to fruition in production lines and telecom shops and stores. Nils Rydbeck has strong confidence in his engineers.

"We conduct sophisticated research programs on an international level. And we have the best engineers working in research and development. I hasten to add, however, that we also respect the competition."

The interface between people and technology is a critical element separating success from failure. A telephone is much more than a machine.

"Telephony fulfills a fundamental human requirement in modern society. Man has a basic desire and need to speak with other people, simply and regardless of the distance that separates them. The human voice, which conveys feelings and a sense of nearness, is and will continue to be the world's most important mode of communications," Mr. Rydbeck explains.

The importance of voice communications, as described by Nils Rydbeck, has been a major force behind the dynamic growth of Ericsson Mobile Phones. We live artificial lives today, far removed from family and friends. The telephone, both conventional and mobile, helps us stay in touch with each other.

"Every employee of the Mobile Phones and Terminals business area is working toward realization of a vision expressed as follows: 'Freedom for people in all parts of the world to communicate simply and effectively with whomever they wish, whenever they wish.'"

NILS RYDBECK ALSO TALKS ABOUT THE NEXT generation of mobile telephones, which he says will feature universal coverage. When the next generation of GSM and D-AMPS telephones lose coverage outdoors, they will seek contact with a satellite.

In the home, mobile telephones will be transferred to the fixed networks, like today's systems that transfer mobile phones to a GSM network when you leave the house. Small children will have their own easy-to-operate terminals with

safety features linked to home computers. Adolescents will be able to call and surf on their mobile telephones.

Ideally, mobile telephones will make connections to data networks quickly and simply. Broadband systems of the future will be geared specifically to meet the need for efficient connections. Systems now being researched and approaching the development phase include GSM++/D-AMPS++ and W-CDMA (Wideband Code Division Multiple Access).

"The importance of multiple band and multiple mode telephones is growing rapidly. The telephones can be used interchangeably in different systems or by changing frequency bands within the same system. The first of these pioneering new telephones is now on sale in the American market. It combines AMPS/D-AMPS 800 MHz and D-AMPS 1900 MHz."

A second model based on GSM (USA) and AMPS will be launched soon, probably followed by a world telephone with GSM (Europe) and GSM (USA).

The market is screaming for multiple-mode functions, which involve cross-fertilization of the two systems. The new technology process used by Ericsson's Mobile Phones and Terminals business area provides ample scope for continued expansion of a growing number of functions.

MOST OF THE CHANGES ARE TAKING PLACE IN technical functions, but not solely for the sake of change itself. Engineers are working hard, therefore, to include build-in features like GPS (The Global Positioning System used to navigate via satellite) in the chip. One example of many user advantages is the motorist whose car breaks down. The customer simply calls roadside or any other emergency service number, and the rescue center automatically locates the driver and his/her car. "Ericsson telephones will never focus on gimmicks or games," Nils Rydbeck continues. Most of the company's energy will be concentrated on useful functions and features to enhance user-friendliness.

New development is not just a matter of connecting telephones to computers, the Internet and other such well-defined functions, however. Ericsson also wants to "teach" the telephone's built-in computer and microchips to prolong the lives of its batteries and to improve voice quality and software services.

Several studies have shown, however, that only a handful of customers avail themselves of sophisticated new telephone features.

"Most people want to communicate - talk to other people," Nils Rydbeck says. "But there is a



Photos: BILDHuset Montage; LEIF SUNDBERG; ATELJÉSERVICE

group of sophisticated users out there, and we also want to satisfy their demands."

Tougher competition and shorter product life cycles have increased the importance of branding. Research and development workers have now been brought into efforts focused on the establishment of a strong brand.

"It is the single most important factor for survival," Mr. Rydbeck states strongly. He carefully monitors all customer surveys and opinion polls.

"We have to listen and react to what customers want today, and try to figure out what they might want tomorrow."

NILS RYDBECK AND HIS COLLEAGUES IN RESEARCH and development meet regularly to discuss future strategies. Cooperation programs have also been established with Customer Care and engineers working in Ericsson's production plants.

"Coordinated efforts comprise the key to successful mass production of mobile telephones," he adds.

He is also receptive to concerns expressed by the general public regarding health risks and electromagnetic fields. Ericsson is carefully watching the results of ongoing research and product development projects, in parallel with studies of alternative products for people who

don't want their telephones to touch their ears.

Accessory equipment is already available on the market for 'hands-free' telephony. Nevertheless, it's not totally outside the realm of possibility that Ericsson will eventually develop a telephone that will not have to be held next to the user's head. It would, however, be prompted by many reasons other than health risks. One possibility might be a wireless ear and microphone unit inserted in the ear, with a loudspeaker in the telephone similar to police radio communications, or listening device with a cord similar to today's telephone receiver. These futuristic telephones would enable users to conduct conversations while they are walking and carrying their cases, while they jog and drive their cars. It would enhance traffic safety, provide greater comfort, allow more parties to listen and talk, and it would be good for people concerned about radio signals.

Research has a position of prominence in Mobile Phones and Terminals. Nils Rydbeck underlines the need for more resources allocated to basic research, however, particularly as new products are launched at shorter time intervals.

Finally, I asked, how small can telephones become?

"There is no limit," replied Nils Rydbeck. ■

World's research elite meet in Triangle Park

Research Triangle Park, an American center of technological expertise in North Carolina, is one of the world's leading research parks. Approximately 100 companies from all parts of the world are gathered in the park and Ericsson, quite naturally, is one of them.

Ericsson has more than 1,100 employees from all over the world working today in Research Triangle Park. Most are engaged in research and development focused on mobile telephones. And the majority comprise the world's elite in their respective areas of Research and Development. The number of Ericsson Research and Development staff is increasing constantly, more rapidly, in fact, than efforts to build new premises. Despite the warm climate of North Carolina, an aura likened to Santa's workshop characterizes Research and Development work in mobile telephony. Everybody is extremely enthusiastic, and nothing is considered impossible.

"The overall research climate here is very stimulating. Ericsson understands the importance of research and development. As a result, we don't have to constantly justify our existence, and we can enjoy the benefits of working in one of the world's 'hottest' fields of technology," says David Koilpillai, manager of an Ericsson research group in Triangle Park.

Most employees work with various research and development programs concentrated on mobile telephony, but about 100 persons also work with development of business exchanges. Some activities focused on mobile systems are also conducted in the park.

APART FROM THE EUROPEAN SYSTEM STANDARDS, almost all research into mobile telephones is concentrated at RTP, including development of new models and technology. Many of Ericsson's ongoing projects still carry the stamp of confidentiality, but there is also a broad range of overt activity, including efforts to develop satellite telephones. In 1999, a regional satellite system will be placed in commercial operation over Asia, and Ericsson is expected to have completed development of telephones that will be no larger than today's conventional mobile telephones, but with the capacity to switch automatically back and forth between GSM networks and the satellite system.

"When our satellite telephone is finished, it will probably be the smallest phone on the market," says Richard Weiss, project manager in cooperation with Göran Nordin and Torbjörn Sölve.

"The technique is not unlike GSM, but the major stumbling block is the signal, which is much weaker and takes time to travel back and forth between the satellite and earth. There will be a slight time lag. Tests on the prototype have also been complicated, since we still don't have a satellite to use in test operations," says Torbjörn Sölve.

In parallel with satellite telephony, other research and development programs are concentrated on more sophisticated computer services and position determination systems, including GPS (Global Positioning System).

The opportunity to work with spearhead technology projects that will not be commercialized

for another three to five years is a driving force for many people working in Research Triangle Park.

"Researchers here at Ericsson's facility work in very close cooperation with designers and engineers. The interaction helps to get products on the market quickly. I believe the extent of our cooperation is a feature unique in Ericsson's Research and Development programs," David Koilpillai continues.

Many of Ericsson's research and development workers are also extremely satisfied with its flat organization, in which prestige is completely lacking. Several employees mentioned the spirit of Nils Rydbeck, which pervades throughout the entire organization. It was Mr. Rydbeck who established Ericsson's presence in the North Carolina research park. Today, Nils Rydbeck is Vice President for research in the Ericsson's Mobile Phones and Terminals business area.

"It's EXTREMELY UNUSUAL FOR HIGH-ECHELON corporate executives to be as technologically skilled as Nils Rydbeck, and to maintain strong and close contacts with Research and Development employees," says David Koilpillai.

Ericsson's operations in Research Triangle Park offer several advantages.

"The park has a cosmopolitan air. Despite its close proximity to several large cities, the park abounds in well-educated persons from all parts of the world. An aura of youth and vitality prevails. I really believe everybody here wakes up every morning anxious to go to work. The mood is extremely positive. Resignations are few and far between," Mr. Koilpillai continues.

Sandeep Chennakeshu manages Ericsson's mobile telephone research unit in the U.S. He cites many advantages from localizing the activities in North Carolina.

"The U.S. has always been a melting pot. People from all parts of the world come here to study. The very broad cross-section of available candidates enables us to recruit highly skilled people to work in our American Research and Development operations. The choice of Research Triangle Park was based partly on its proximity to major universities and our cooperation with them. It's also easy to recruit qualified personnel, since the region offers a highly attractive life style and excellent recreational facilities," concludes Sandeep Chennakeshu.

It's a two-hour drive to the Atlantic coast and the Appalachian Mountains are only just over three hours from Raleigh.

PATRIK LINDÉN

Ericsson is working on the development of satellite telephones that will switch back and forth between GSM networks and satellite systems. A regional satellite system will be placed in commercial operation over Asia in 1999.

Photo: PATRIK LINDÉN



"A position of world leadership carries with it certain demands on being the first company to launch products, and the ability to be first, in turn, requires our participation in establishing standards, which – as the cycle continues – puts demands on comprehensive and sophisticated research with a strong sense for future market trends." This summary was provided by Jan Uddenfeldt, Vice President, Technology, Mobile Systems, as he described the research model that has given Ericsson a dominant position in mobile telephony over the past two decades.

Strong feel for the future

BY: LARS CEDERQUIST

Press releases from Ericsson often contain standard phrases, such as "Ericsson is the world leader in mobile telephony with 40 percent..." which have become virtually self-evident for Ericsson employees. It may be easy to forget that a leadership position has to be recaptured constantly.

Briefly, the history behind the standard phrases was Ericsson Radio's pioneering efforts to establish the first analog standard for mobile telephony. The Nordic Mobile Telephone System (NMT) was introduced on the market in 1981. Ericsson was also a major force behind the GSM standard for digital mobile telephony and was quick to introduce new products in 1991, setting the stage for its GSM market dominance.

Today, we hear a lot of talk about third generation mobile telephony, with transmission speeds up to 2 Mbps and the capacity to meet Internet, video and multimedia requirements. TCP/IP, the Internet protocol, has created a global network accessible to all. Current developments in mobile telephony and Internet applications are racing neck-and-neck, and the most logical step is to combine them in one area called mobile multimedia. The target date looks like 2001, and the race is on!

Ericsson has also made considerable progress in mobile multimedia, with a test system developed in cooperation with NTT of Japan. What is the secret behind Ericsson's repeated success?

"WE HAVE A GOOD BALANCE BETWEEN RESEARCH and development," says Jan Uddenfeldt. "Naturally, we employ highly qualified researchers, but of equal importance are the methods and traditions we use to transfer and pursue research work in product development. Our researchers are not stuck in ivory towers; they follow a concept through the entire process, right to the business unit that will eventually develop the system."

Ongoing development of third generation mobile telephony serves as a good example of Jan Uddenfeldt's theories on Research and Development. The groundwork was laid as early as 1989

in the form of a research program called Race, within the EU, which focused on opportunities to create a mobile system with greater bandwidth to transmit more information over the network. Ericsson played an active role in Race standardization work and later conducted Codit, a follow-up project based on Wideband Code Division Multiple Access (W-CDMA), the new radio access method that works with codes instead of time slots used in today's GSM, D-AMPS and other digital systems.

WHEN THE CODIT PROJECT WAS COMPLETED, Ericsson started to develop its own complete test system based on earlier research in W-CDMA and the ATM transmission method used in transport networks. This was another field of study, in addition to video coding and other functions, in which Ericsson researchers played an active role in standardization efforts. A new research center was established in Nürnberg, Germany and, working in cooperation with the Mobile Systems business area's research unit, a Wideband Testbed (WBTB) system was developed in a relatively short time. The system includes a super-sophisticated test vehicle used to demonstrate 144 kbps transmissions of video, Internet and voice over a 5 MHz channel. The test vehicle is a good example of Ericsson's strategy to show visitors and customers actual demonstrations, clearly illustrating how the technology works. Observers in the vehicle are able to watch a graphic display that monitors the quality of the image coding and transmission.

Ericsson's WBTB system generated considerable interest and, when the DoCoMo Mobile Division of NTT announced its intention to enter the ongoing international standardization project through construction of a multimedia system for the 2 GHz band, the Japanese operator chose Ericsson and other telecom companies to develop its test system. Ericsson has transferred research findings and the majority of its research personnel from the WBTB project to a separate unit in the development organization, which is now working on development of products for the W-CDMA system.

But what will happen after development of the

third generation system? The average span between new generations seems to be about 10 years. (It takes time to develop technology and realize a return on investment.) Research in digital mobile telephony started in the late 1970s, followed by initial third generation studies in the late 1980s. Based on past history, Ericsson should be starting now to research systems that will be used beyond the year 2000.

"That is correct," Jan Uddenfeldt agrees. "We based our studies of third generation systems on the need for high-speed data transmissions, focusing on techniques with the capacity to operate at 2 Mbps. We are now looking at even greater bandwidth, perhaps up to 20 Mbps, and the potential for private persons to communicate via electronic mail, to access various forms of information and news in text form or voice readings, the concept of literally having your office in your pocket. We also foresee integrated mobile and fixed networks. All new services of the future, however, must be easy to use, and our job is to develop techniques that will enhance user friendliness and simplicity." ■



Photo: PRESSENS BILD Montage; LEIF SUNDBERG, ATELJESERVICE

The adaptable base station

■ A base station that can be "loaded" with software for different mobile telephone standards. Of course it sounds too good to be true, but the adaptable base station could become a reality in about three years. That's the goal for approximately 100 Ericsson employees working in various Mobile Systems business units to develop a "generic" base station, and a so-called multi-standard radio.

"We're working on the cutting edge of modern technology and, using new technology, it's now possible to produce a generic base station," says Rolf Ranvert, Head of Generic Radio Network Products, a unit of Ericsson Radio Systems.

According to Mr. Ranvert, multistandard radio is not a totally accurate name for the new concept. He regards it as a software-based multicarrier radio, which he considers a more accurate description.

Today's base stations have one radio, consisting of a transmitter and a receiver per carrier

channel, while a multicarrier radio will have a single radio per sector. Increasing amounts of information are included in today's base station software, which makes it easier to produce generic hardware as the "shell" of base stations and use different software packages for different mobile telephone standards.

A wide range of base stations is now available for the three system standards. A generic base station would drastically reduce the number of variations, making production cheaper and simpler.

Rolf Ranvert cites the automotive industry as a good example of how fewer building blocks can be used to derive gains from their similarities. It's not just a matter of simpler and cheaper production, however; generic products also allow companies to maximize their utilization of development resources, a factor of growing importance in view of the shortage of radio technicians in mobile telephony. GUNILLA TAMM

A global power center

Research units of Ericsson's Mobile Systems business area stretch from Tokyo in the east to Montreal in the west. The network of research units represents an organizational power center that supplies substantial parts of Ericsson with basic information about future products.

The core units for research work conducted by Mobile Systems are one of the powerful engines that propel Ericsson's development work. The units lay the groundwork for virtually all future mobile systems, antennas, wireless Internet solutions and other key elements. A few hundred men and women, including a growing percentage of researchers with doctorates, are distributed throughout Ericsson's worldwide research network.

For organizational purposes, the research units comprise a functional matrix. The core unit is situated in Stockholm, a center for skills and expertise in all fields of research. Other offices have specialized research pursuits in the following areas: Tokyo, radio access; Aachen, Internet research projects; Nürnberg, radio access and voice coding; Montreal, networks and Raleigh, coordinated mobile telephone development. In Sweden, the Mölndal unit is focused on antennas, and voice and image coding research concentrated in Luleå, and radio network research in Linköping. In addition, several design centers transform research findings into new products. At the start of a new project, all expertise is utilized, regardless of geographic distances.

"The size and depth of our department is increasing constantly," says Erik Örnulf, manager of the research unit. "Expansion is a basic necessity. It's essential that we have access to the best research personnel in order to defend and maintain our leadership position."

Close cooperation with universities, colleges and customers offers a means to secure Ericsson's position in the front line and gain greater insights into future market trends and conditions.

The core units conduct applied research, with the ultimate objective that all efforts will lead to development of new products.

"Smart base station antennas that point the signal like a spotlight on each mobile telephone and provide the mobile network with much greater capacity comprise one of the 'hottest' subjects for world research institutes today," says Ulf Forssén, chief of research in antenna systems and wave propagation.

Ericsson Microwave in Mölndal and a separate research team of 10 persons are now conducting a project in close cooperation with Mannesmann Mobilfunk, a German operator and Ericsson customer.

"It's our job to look into the future, but we sort of overslept on the Internet," admits Steinar Dahlin, who works on development of wireless Internet applications.

Ericsson is now in the process of making lost ground, with particular emphasis on comprehensive development of Internet programs by Mobile Systems. The basic program tool is called Internet testbed, established like an island outside Ericsson's otherwise heavily guarded network, Ericsson Corporate Network.

Naturally, a large number of other research projects are also in progress, ranging from image and video coding for mobile multimedia to voice coding, signal processing and microelectronics. In addition, the core research unit of Ericsson's Mobile Systems business area is an active member of EU's fourth framework program.



Montage: MIKAEL EKLUND, ATELJÉSERVICE

BY: JOHAN LUNDBERG

Focus on the forces driving demand

"The Internet is not a technology. It's a social phenomenon!" Lars-Erik Eriksson, Vice President, Technology, of the Infocom Systems business area, has some interesting perspectives on the Internet explosion.

"How did the Internet actually achieve such powerful impact on the general public a few years ago? Why was the breakthrough made at that time? What role did the media play, and what was the importance of computer skills in the Internet's overnight popularity? Which technology provided the key? It's important that we conduct more research into such questions and other phenomena to achieve greater success in the infocom world of the future," he continues.

Research by Infocom Systems is not restricted to studies of new technologies and new techniques, continued development of the AXE system, access solutions or wave length division multiplexing.

TODAY, RESEARCH ALSO INCLUDES CONCERTED efforts to learn more about people and their behavior. How does a consumer-driven market actually function and what are the main factors that influence market trends? How do we – you and I, in our capacities as private and professional persons – behave as consumers and users of communication services, and how might we be expected to behave in the future? What network services do we want and what demands will we – as private persons and companies – place on telecom market players? Are low communication charges more important than high quality, for example?

"The list of questions is long, and represents a very important area of research in Ericsson's future product development efforts. It's essential that we improve our analytical skills and understanding of end-user demands and preferences. Improvements in these areas will enable us to make priorities in our development work, to concentrate on the right systems and solutions, and introduce them at the right time, when the market wants them. Continued dialogs comprise another basic requirement to explore business opportunities with traditional customers and new players," explains Lars-Erik Eriksson.

For traditional telecom suppliers, this type of knowledge was not particularly important in the past. For many years, before market deregulation, demand was influenced largely by the dictates and needs of monopolistic operators that exercised strong control over product development. As more countries have opened their communication markets to free competition, however, the number of telecom market players has

increased, changing market conditions dramatically.

"It's extremely expensive to develop products and conduct any form of marketing or sales tests. Perhaps we could do that in the past, but not now. Today, it's essential to have a clear picture of end-user preferences and demands in all product development work," Mr. Eriksson continues.

INFOCOM SYSTEMS' APPLIED RESEARCH IN MORE humanistic specialties is still limited in scope.

"We don't have any major studies in progress at this time, but some research is being conducted in outside laboratories, Media Lab in Stockholm and Consumer Lab in Lund, for example. We are also establishing a new laboratory in Menlo Park, near San Francisco, which I think will become the core unit for Ericsson research programs into key elements that drive market demand," he explains.

In the years ahead, more such laboratories will be needed worldwide.

"Markets are different. What holds true in one country or region does not necessarily apply in another," Mr. Eriksson says.

The Internet, in both a technical and social perspective, is a major area of research at Infocom Systems. How will the global network develop in the future?

"It's essential that we are prepared for the future," Lars-Erik Eriksson continues.

"The Internet is interesting because it provides rapid access to information. However, while information is an attraction, the driving force behind interest in the Internet is the ability to communicate with other people."

COMMUNICATIONS VIA THE INTERNET ARE STILL basically regarded as a form of data transmission. Already, however, some people have access to telephony via the Net. And "people in the know" claim the majority of future telecom traffic will be transmitted over the Internet. The fact that voice quality – at the present time, at least – is clearly inferior to the quality of speech transmitted over fixed networks seems to be of minor importance.

"You can make comparisons with mobile telephony, an area in which users are willing to pay more for the service despite inferior sound quality. Why, you ask? Because cellular phones provide mobility – a highly valuable feature for most users. The Internet offers accessibility to large amounts of information and the capacity to communicate simultaneously with a large number of people. And perhaps consumers are prepared to pay the price if suppliers can also deliver telephone services," concludes Lars-Erik Eriksson.

Broadband access at home – soon a reality

As this article is published, in the autumn of 1997, potential for broadband access in private homes is small, even for highly motivated consumers. Changes are afoot, however.

Toward year-end, Ericsson will make its first deliveries of solutions based on ANx – a generic system platform for broadband multiservice networks.

"Several technical challenges remain unresolved; we're dealing with a very new technology to be marketed on a large scale. Further cost reductions are a key factor in making the system a viable investment for operators," says Per-Olof Sjöberg, manager of Ericsson's ANx operations.

Mr. Sjöberg believes ANx offers Ericsson a flexible, robust, fundamental system that can be upgraded for several years into the 21st Century. Regardless of subscriber access modes – copper, coaxial, fiber optical or radio solutions – the platform will be equipped to process various types of information from different sources and integrate them with each other.

"The system platform will provide much more than rapid Internet access," Per-Olof

Sjöberg continues. "We work extensively with a combination of moving pictures and the Internet, and Internet via TV, so users will not need a computer to surf the Net.

"We are also looking into a completely different service area. Traditional telecom operators with copper networks have not been able to transmit video, but the new ADSL technology allows them to offer cable TV via copper networks. The technology is creating a completely new competitive arena.

So how many people will have access to broadband in private homes by the year 2000? Most telecom experts and analysts agree the answer lies in costs. However, it will still be the operators, not consumers, who dictate the choices. Expansion will take place geographically, when established telecom and cable TV operators decide to invest in certain regions.

Nobody knows the answer, however. Deregulation and competition, super-sophisticated technologies and expanded service will all become important parameters of particular interest to new players trying to penetrate the market for broadband access. The players can only be sure that there are jokers in the deck.

KARI MALMSTRÖM

It started with Alfa

About 10 engineers in the Alfa Laboratory at Kungens Kurva south of Stockholm are now testing future broadband access solutions for the public market. Alfa stands for Application Laboratory Future Access.

In adjacent premises, another team is working on ANx development. Cooperation between the two units, and cross-fertilization of their skills and expertise, provides Ericsson with strong capabilities in the field of broadband access – a huge market in the offing.

"Research efforts in the Alfa Lab are not focused on new technologies, but takes place in the next phase. Our primary objective is to determine the limitations of new technologies in real applications and to find new methods we can use in tandem with cost efficiency," says Mattias Gustafsson, director of operations at the Alfa Lab.

The laboratory is a regular stop in various customer visits to Ericsson facilities in Stockholm. Visitors are able to see demonstration units, prototypes and test installations in operation and review past history in a small stand called "the museum." Customers often express their particular appreciation of visits to the Alfa Lab. Representatives of a cable TV operator, for example, were pleasantly surprised to find equipment they were familiar with, according to Mr. Gustafsson, but they didn't expect to find Ericsson working in the same area.

The Alfa Lab was established in the early 1990s, with initial efforts focused on FTTH (fiber to the home), defined as optical fiber drawn right into subscriber facilities.

The concept was not marketable at that time, however.

Times have changed, and the real boom in the

request for broadband came with dynamic Internet growth. Several important advances had also been made in the technology sector. ADSL, or "supercharged copper," created new broadband opportunities for operators with copper networks. And cable TV operators that already have broadband coaxial networks also see new business potential.

Ericsson was also quick to recognize new areas of business opportunity. The ANx project was started nearly two years ago. A substantial percentage of the Alfa Lab's research work has since been linked with ANx. Considerable efforts have been focused on developing intelligent, economical methods to use the technique. Although the feasibility of probing forward is much greater in a laboratory environment, the ultimate objective is to produce results that can be applied with an appreciable degree of cost efficiency. And last, but not least, is the pressure applied by customers – via operators – from the price-sensitive mass market.

Daring to choose is a critical element. "We have to make basic simplifications, use fewer and simpler interfaces, accepting the fact that we cannot be involved in everything. Our objective is to help Ericsson offer the best – and most economical – solutions for broadband access through different transport media," Mattias Gustafsson concludes.

The Alfa Lab is continuing its efforts to enter the future. The next technique for broadband access is VDSL. Compared with ADSL transmission speeds of 8 mbt/s, the new technique will perform at 25. The ANx platform is being used in Bravo, a new demonstration unit that features both VDSL and new fiber solutions.

KARI MALMSTRÖM

Ericsson's network of research centers is a forum for worldwide cooperation with international colleges and universities, in parallel with the Company's participation in a large number of EU projects. Cooperation with institutes of higher learning is based on a give-and-take approach in which all parties draw on each other as sources of inspiration for industrial research and development of new products and solutions. It often opens doors to participation in other projects, for example Research and Development projects conducted by EU.

One foot in Ericsson and the other in the academic world

BY: INGER BJÖRKLIND BENGTSSON

Ericsson's contacts with the research world are distributed throughout all parts of the world. A relatively new concept in the research program, which involves a system of association with adjunct professors at various universities, has generated highly favorable results. The professors are Ericsson researchers who have chosen to work in academic capacities at least 20 percent of their working time, when they direct graduate students in thesis studies at colleges and universities.

The rest of their time is devoted to a variety of selected research and development projects at Ericsson, often conducted in cooperation with other companies or universities.

Andrej Litwin, a researcher in the Microelectronics Research Center of Ericsson Components, is studying nanometer structures as part of the Nanometer Structure Consortium organized by the Swedish National Board for Technical and Industrial Development (Nutek) and the Natural Sciences Research Council's materials consortium. Andrej Litwin is also an adjunct professor of Solid State Physics at the University of Lund, which is the base of Nanometer Structure Consortium activities.

NANOMETER RESEARCH IS FOCUSED on the development of electronics with dimensions measured in nanometers – one billionth of a millimeter – where the smallest structures measure about 10 nm, corresponding to a thickness of 20 to 30 atoms. Dimensions dealt with by silicon technologies now applied at Kista's most modern plant are in the range of 0.5–0.35 µm, or less than one half of one-thousandth of a millimeter.

"The program of cooperation with colleges and universities offers opportunities to familiarize ourselves more comprehensively with research trends that might affect Ericsson and our business operations," Prof. Litwin explains. "Research studies conducted by the Nanometer Structure Consortium are extremely advanced, and it might be several years before they assume industrial relevance."

Efforts to monitor cutting-edge research by reading articles in scientific journals and magazines, for example, cannot possibly provide the same results as working actively with the issues. Articles simply do not reflect the full spectrum of reality in a research project, with all tangential traces of good and poor research results," the professor continues.

AMONG OTHER PURSUITS, THE Nanometer Structure Consortium conducts research to study the growth of nerves in combination with electronics and how their connection with nano-scale chemical sensors might have long-term effects on the interplay between electronics and living organisms. Studies of various links between medicine and electronics involves micromechanic structures.

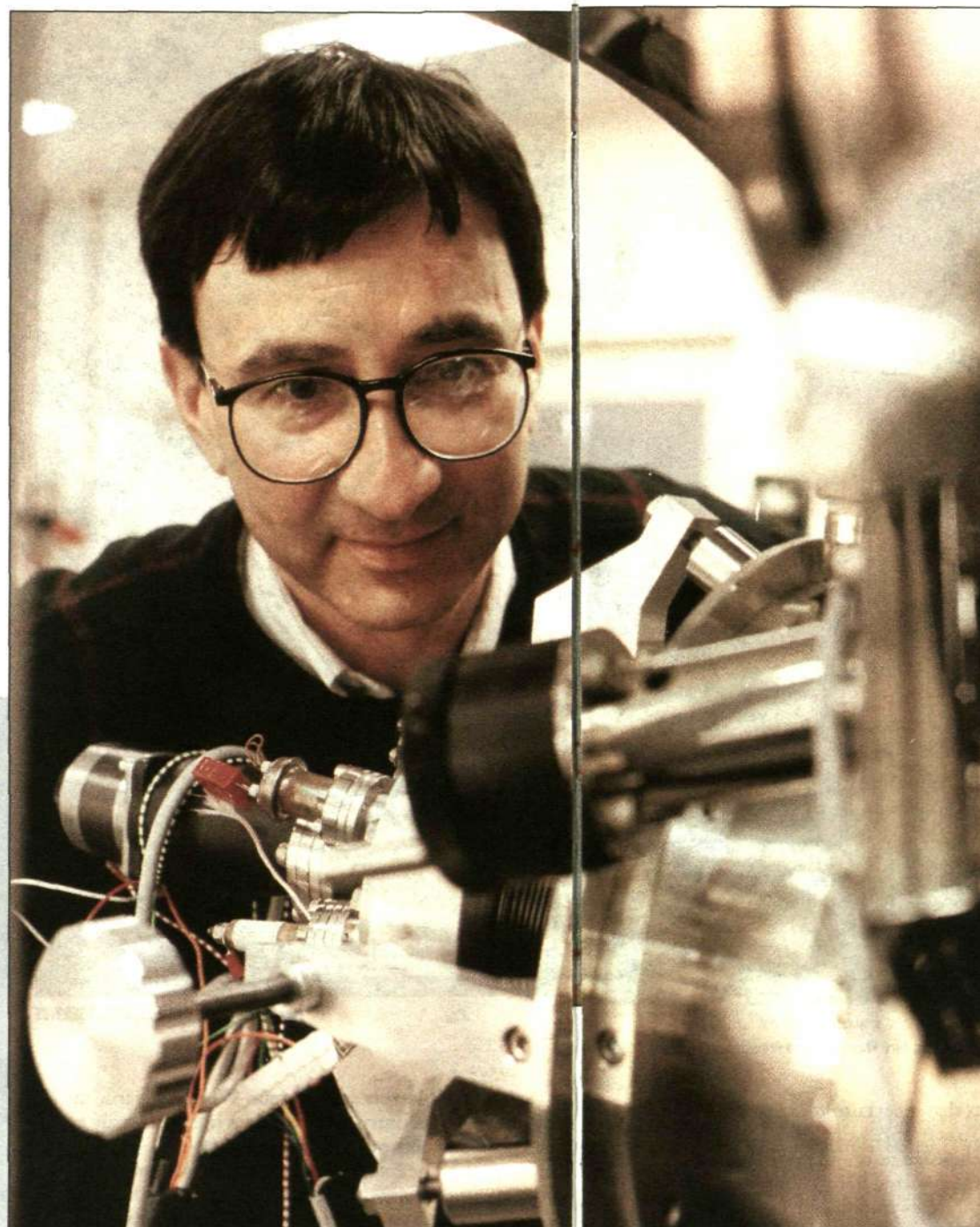
In the future, results of these studies might be reflected in optimal communications, whereby a surgically implanted communication circuit will understand what we mean and connect us to the electronic world or other people, a form of synthetic telepathy.

"Man is living proof that electronics can be reduced to molecular dimensions. The human nerve system is nothing less than electronics on a different scale – molecules," explains Andrej Litwin, thereby providing an indication of today's research pursuits.

This type of nearly frightening

Andrej Litwin's roles as adjunct professor, or researcher, with one foot in Ericsson and one in the world of academia, complement each other very well. The research world is closely associated with his primary interests, but his work at Ericsson deals more with applied research than university pursuits. Within the Strategic Foundation's graduate school, Andrej represents the nanometer consortium in the area of high-speed electronics.

Photo: BJÖRN NILSSON



futuristic research is not the focal point of current work conducted by Prof. Litwin, who concentrates on other projects related to electronics.

"All researchers have to learn a methodology for how work should be conducted when they don't have a clue about end-results that will eventually be discovered. We learn how to deal with uncertainties, which some people like and others dislike. I prefer the uncertainty in a way," he says.

"The general impression of an academic environment characterized by highly specialized and focused doctoral students is completely wrong. They work with everything, build their own equipment, write their own computer programs, study theory and conduct experiments. In other words, a broad range of training not available in the organized formats in private industry," he continues.

A major difference between master and graduate engineering studies lies in finding established solutions in the former and encountering questions to which nobody has

answers in the latter field of study.

Qualifications of researchers include a broad range of comprehensive skills to help them understand what other researchers are trying to achieve or teach. They should also offer special skills of their own to share with others. It's a two-way street based on a reciprocal give-and-take approach.

"THE MOST SUCCESSFUL RESEARCHERS have a very broad range of expertise. Comprehensive skills and knowledge are needed to reach the top, and the progress achieved in a researcher's career is always attributable to the breadth of his/her knowledge, skills and ability to understand different angles," Prof. Litwin says.

"There is an element of risk in overspecialization, particularly if researchers work in an area in the same company, since they will soon become isolated in niche categories that are difficult to discuss with others," he explains.

In the nanometer consortium, Andrej Litwin represents both

industrial and academic interests.

The primary point of Ericsson's interest is the university's role as an educator of skilled persons. Its participation in the consortium has opened doors to other collaborative projects that may provide valuable results in a long-term perspective. For example, Ericsson is taking part in Charge, an Esprit project conducted by EU that has provided Prof. Litwin with excellent insights. The project is based on long-term research to radically reduce the number of active components in microcircuits. The work is focused on understanding and controlling, producing and evaluating prototypes with single-electron components made by manipulating nanostructures. The basic principle is focused on development of electronic circuits in which individual electrons will represent the binary ones and zeros.

The Nanometer Structure Consortium recently established affiliations in Japan, now handled by Takashi Ishii, one of Prof. Litwin's colleagues in Lund.

Joint EU project predicts future mobile requirements

How will mobile communication systems of the future be used and what services will they offer users? On the Move, an EU project in which Ericsson has an important role, is designed to answer these and other questions.

Advanced Communication Technologies & Service, Acts, is a comprehensive European communications program that includes EU's On the Move project. Started in the autumn of 1995, the project will extend over a three-year period. In addition to Ericsson's participation through Ericsson Radio Systems and Ericsson Eurolab Deutschland, 13 other organizations representing telecom suppliers, the computer and publishing industries, telecom operators and research institutions are taking part in the project. Among the participants are Siemens, IBM, BT, Deutsche Telecom MobilNet, Bonniers and Sweden's Royal School of Technology. More than 40 researchers are working with On the Move.

"The group working with On the Move represents a strong cross-section that covers all areas of the project," says Frank Reichert, a member of the Mobile Systems core research unit. Mr. Reichert was pro-

ject manager from its inception until last autumn, when he was succeeded by Eckhard Geulen of Ericsson Eurolab in Aachen. In its initial stages, development work on the project was divided equally between researchers in Kista and Aachen, but Eurolab has since taken over 90 percent of Ericsson's research work.

"IN SIMPLE TERMS, THE PROJECT IS designed to study how end-users will avail themselves of multimedia applications in UMTS, the Universal Mobile Telecommunication System of the future," explains Frank Reichert. "Applications may include facilities in a miniature computer, for example, that users carry to access information about the nearest subway station when they are in Paris. The information is retrieved from a server that determines the position of users at all times and provides information in the format you select, allowing users to choose a display screen, a mobile system and the language of choice. Ericsson is working on software development, with the objective of producing a standardized interface of support functions for mobile applications."

Field tests now in progress with GSM and Wireless LAN involve

the 30 participants in Sweden and Germany.

Yuri Ismailov, a member of Mobile Systems' core research unit, is working on the project. Like Frank Reichert, he believes work on EU projects is extremely educational. The experience has contributed to his own development, expanding his technological skills and know-how, while also enhancing his personal development. Working in cooperation with technicians from other countries and industrial sectors has been inspirational.

"We're all working toward the same objective. The work climate is open and there is no competition between participants," both men agree.

"On the Move will enhance the development of persons participating in various aspects of the project, but it will also contribute to Ericsson's own development as a corporation. It confirms the Company is headed in the right direction as regards pursuits in mobile communication. Also, as a result of Ericsson's participation, my research unit has embarked on several new projects that probably would not have been started without inspiration from On the Move," concludes Frank Reichert.

GUNILLA TAMM

Ericsson and Chalmers developing intelligent antennas of the future

Antennas of the future will be more intelligent than today's. Propagated signals will be concentrated where they are needed, reducing total energy consumption. Also, when less energy is used, total radiation from for example mobile telephones, radio base stations and radars is also reduced.

Energy, defined as radio waves, from an intelligent antenna system is concentrated and aimed like a flashlight beam, as opposed to a conventional antenna that emits radiant light similar to that of a light bulb or stationary spotlight. Intelligent antennas, accordingly, will make dramatic reductions in power consumption by radar, mobile telephones and base stations, thus contributing to improved environmental conditions.

Intelligent antennas contain both recognition and logic functions that enable them to analyze their surroundings and perform their functions without causing unnecessary environmental disturbances.

"If a radar system contains an intelligent antenna, it will be able to

analyze and recognize different objects, classify degrees of risk and apply capacity accordingly. Antenna systems mounted in mobile telephone systems will learn when and where energy requirements peak during different periods of the day," says Ingmar Karlsson, program manager of the research project at Ericsson Microwave Systems.

RESEARCH IN INTELLIGENT ANTENNA systems will benefit from Ericsson's many years of experience in radar technology. The company has developed several electrically controlled antennas, which also work with focused radiation, but not the independence of intelligent antenna systems. Examples include the new generation of nose cone radar in the Gripen aircraft and the antenna in Erieye, Ericsson's airborne radar surveillance system. A test platform for active antennas is one of the Company's most sophisticated mobile telephony projects.

The objective of research studies focused on intelligent antenna systems is to spread intelligence to all system components – to coordinate the antenna and microwave units of

subsystems with signal and data processing functions. The concept creates potential for self-learning systems that become more valuable the more they are used. Ericsson Microwave Systems is drawing on all of its core skills in the quest to develop intelligent antenna systems, including microwave techniques, high-speed electronics, signal processing and antenna technologies.

"Higher frequencies are one of the most important objectives in mobile telephony today," Ingmar Karlsson continues. "Air waves are starting to get crowded. Today our antennas are used in systems with capacities up to 1900 MHz, but we will reach much higher frequencies in the future. Ericsson's radar expertise will be a valuable asset."

The research project was started in June, and the first prototype is expected to be ready for testing in three-five years. Three specialized engineers from Ericsson Microwave Systems and four doctoral students comprise the core research unit.

Ericsson will contribute SEK 25 million over a five-year period to help finance the research project.

BRITT-MARIE WIRDEN

Every year, Ericsson Mobile Communications in Lund introduces eight to ten new mobile telephones. Market demands are high – products not only have to be smaller every year and contain more functions, they also have to be cheaper. Road maps, defined as carefully formulated development plans, and sharp focus on customer preferences help Ericsson employees in Lund meet tough market demands.

Road maps show the way to success

BY: NICLAS HENNINGSSON

Ericsson Mobile Communications in Lund develops mobile telephones for most of the world's standards. Operations were started in 1983 in an old barracks building at Ideon, a research village near the University of Lund, where a small team of dedicated employees produced Ericsson's first mobile telephone. Today, about 460 men and women are engaged in research and development activities in Lund and, from humble beginnings in the early 1980s, the activities have grown into one of Ericsson's most important areas of operation.

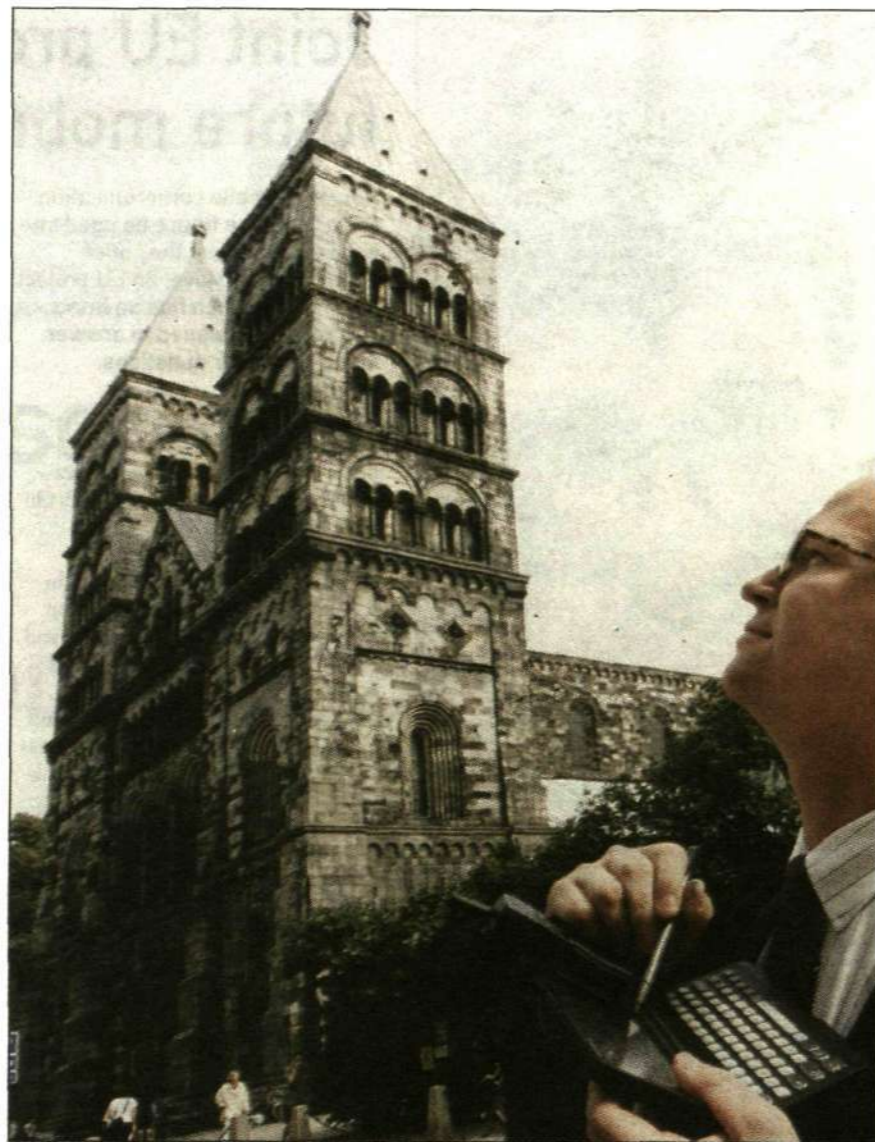
The market places tough demands on mobile telephone suppliers. Successful players introduce new models at a fairly rapid pace, with at least one new telephone model launched annually for every standard, and their awareness of future customer preferences has to

remain acute. The dynamic rate of development necessitates simultaneous development of several models, and price levels for telephones are subject to constant pressure.

Stringent demands are placed on the organization to secure its marketing success. Ericsson Mobile Communications in Lund uses carefully formulated development plans called road maps to support its development work.

THE OVERALL PRODUCT ROAD MAP extends about four years into the future, and contains predetermined junctures at which new telephones should be introduced on the market, new model designs, their functions and other key elements.

The road map is based on comprehensive discussions and analyses of user aspects and current trends in mobile telephony. How will people communicate with each other in the future? What equipment will they prefer to use in combination with their telephones? The road map addresses these and other questions. "We envision telephones of the



"We envision telephones of the future based on progressive studies and analyses of our competitors and brainstorming sessions focused on various user aspects," says Tord Wingren, Vice President of

future based on progressive studies and analyses of our competitors and brainstorming sessions focused on various user aspects," says Tord Wingren, Vice President of Mobile Phones and Terminals business area's research and development activities in Europe.

"THE DILEMMA WE FACE LIES IN virtually endless opportunities presented by future technical development. But the only successful companies will be the ones with know-how, companies that understand how to utilize their resources effectively to create user-friendly prod-

ucts that meet customer demands."

To stay abreast of all the comprehensive tests and market surveys involving new telephones, techniques employed by the Company have to be carefully formulated at least one year before telephones are introduced on the market. The road map, accordingly, is subdivided into another road map for technology to support technical development work. The subordinate plan stipulates which components need to be produced for the various telephones and when development has to be completed. The technology road map, in turn,



Mobile Phones and Terminals business area's research and development activities in Europe. Photo: ANNA REHNBERG, KAMERAREPORTAGE

is divided into road maps for chips, software, power supplies and other considerations.

"The concept of working with established road maps at different levels facilitates control of our development work," Tord Wingren continues. "It makes timing and coordination of different functions easier to control. To secure the success of a road map as an effective tool, it should be pursued in a disciplined fashion, especially stages of the plan scheduled one to two years before new products are ready for market launch."

Continued awareness of new mar-

ket demands and technical solutions cannot be overlooked, however.

"Preferences and needs of future customers should form the foundation of all development work. To secure the success of products, design work has to be controlled by different end-user scenarios," Tord Wingren explains.

"We have a relatively small research and development organization in comparison with many of our competitors," he concludes, "but Ericsson's sharp focus on customer values and user-friendliness has made strong contributions to our success."

understanding market segmentation," Jan Lindoff continues, also emphasizing the importance of customer viewpoints and opinions at a very early stage in the process.

Work on specifications and programming is conducted in parallel based on an "automatic map." Central system functions, the most important elements, are structured first and supplementary functions are added during "the journey."

The entrepreneurial spirit and work methods of Ericsson's "Small Company Approach" are similar to the principles employed today by many highly successful companies in the computer

industry. In addition to speed and flexibility, the approach sheds stronger light on individual work efforts, providing employees with a greater sense of involvement and development potential.

"The new culture represents a revolutionary change in Ericsson's mode of operations. The former, process-oriented philosophy is no longer viable in the face of today's demands on software development: the change was also needed to attract new employees," explains Jorma Mobrin, Vice President, Systems and Product Development.

"Our concentration on the Small

WasaLab – doing what others talk about doing

When Mika Niskanen conducts his research work, he deals with short-term perspectives and reality. Research and development doesn't always have to involve abstract concepts and unbending theory. WasaLab in Finland develops services and products for existing technologies. Its personnel share office premises with a customer, working closely with subscribers to develop concepts implemented quickly to provide practical new realities.

"Our mode of operations places certain demands on people to not be afraid to roll up their sleeves and start working immediately to see if their concepts can be put into practice. It's probably easier and more enjoyable to talk about technologies that remain several years in the future, allowing staff personnel to bide their time before starting," says Mika Hyvönen, manager of Ericsson's WasaLab in Finland.

It could be said that WasaLab researches business opportunities rather than technology. Owned exclusively by Ericsson in Finland, WasaLab has six employees. The laboratory works in close cooperation with Vasa Läns Telefon Ab, one of 46 local operators in the Finnish telecom market.

"WE WORK IN THE SAME BUILDING where Vasa Läns Telefon Ab has one of its telecommunication exchanges installed. We're surrounded by all the technology and personnel we need. Instead of booking meetings, we walk over to the telecom people and ask them what they need, or test the viability of an idea. We may be likened to their product development staff," explains Mika Niskanen, manager of five projects at WasaLab.

The cooperation is based on the operator's network and "actual" subscribers, which are placed at the disposal of WasaLab. Ericsson, in turn, offers the operator its expertise and new technology.

Company Approach should be regarded as a complement to the improvement program Ericsson System Software Initiative (ESSI). We are now developing a system concept and architecture to facilitate delegation of responsibility to small-scale operations," Mr. Mobrin continues.

The work method does not mean, however, everybody can concentrate on their own spheres of business interest without any coordination. The concept is highly dependent on cooperation with partners, with no development work conducted unilaterally.



Mika Niskanen and Mika Hyvönen pictured above by one of Vasa's old telephone switches. Ericsson's WasaLab shares premises with Vasa Läns Telefon Ab.

"The entire program is based on Vasa Läns Telefon Ab's pioneering spirit, which allows us to enter the operator's facility to ask questions and conduct tests. In return, I think the operator also learns a great deal from us," says Mika Hyvönen.

A concrete example of WasaLab's research cooperation is Ericsson's new AXE Access Server, whereby the telephone exchange is able to differentiate between Internet traffic and conventional phone calls.

Working in cooperation with the University of Wasa, the operator and more than 70 students and teachers, WasaLab has conducted practical tests on the new AXE Access Server.

Ericsson and Vasa Läns Telefon Ab are able to test new techniques, but perhaps most importantly, they work with reliable statistics and user data compiled under real traffic conditions. The information is used to improve pricing effectiveness and as basic documentation for other services.

An AXE switch contains very large amounts of information used only to connect calls. By working in close cooperation with an operator, WasaLab is able to test its ideas under practical operating conditions, listening to operator views and observing first-hand how greater benefits can be derived from the AXE system, with particular emphasis on ways and means for both parties to make more money. If improvements can be made based on existing techniques, so much the better.

WasaLab's continued existence depends on its cooperation with Vasa Läns Telefon AB. Ericsson also hopes to establish closer cooperation with the University of Wasa.

New small company approach

Increased competition and open system solutions are placing new demands on Ericsson's software development. A new culture is emerging in various parts of the com-

pany, as a result, characterized by the spirit of a small company working in close proximity to customers and faster product development.

The new culture is based on a work model called Small Company Approach (or Small in Large). It's objective is to eliminate disadvantages of large corporations by dividing the organization into smaller units and allowing employees to develop with the small company's overall approach.

One of the pilot projects designed to test the new culture's viability is now being conducted by the General Packet Radio Services (GPRS) product area

of Ericsson's Mobile Systems business area.

GPRS is a form of packet-switched data in GSM systems that within the next few years, will provide mobile telephone users with better access to electronic mail services as well as Internet and intranet access, for example. More effective utilization of mobile network infrastructures will also be made possible by GPRS.

"We are the unit responsible for systems, development, products and market support," says Jan Lindoff, manager of the GPRS project, which employees about 100 persons in Kista and Gothenburg in Sweden.

Arendal in Norway and Aachen in Germany.

The work is conducted by cross-functional teams comprising employees with special skills and know-how in different areas. Technicians study customer needs, and marketing personnel study various areas of technology.

The mode of operations has generated highly valuable dialogues with several large corporations. Our small organization is able to produce an overall view of everything from standardization and network dimensioning to questions about the next technological generation and assistance in

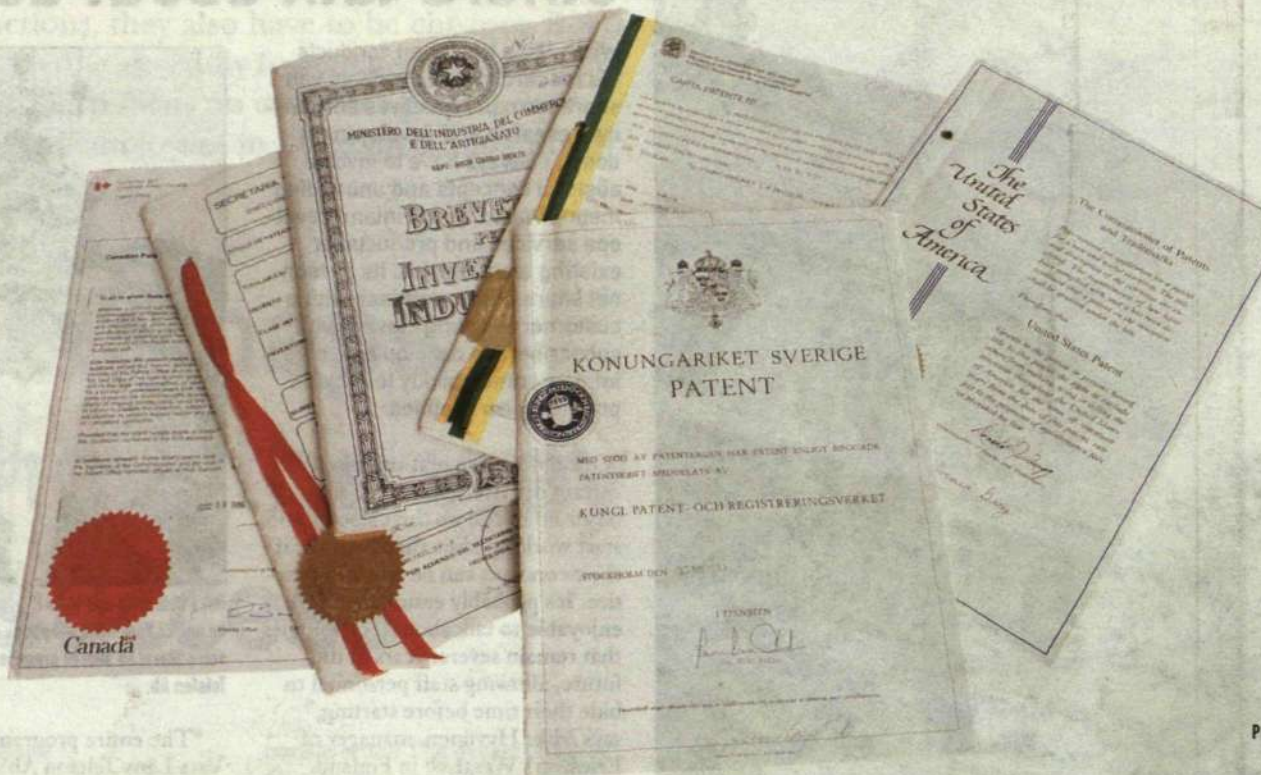


Photo: THORD ANDERSSON

A weapon in telecom industry's balance of terror

Research, development, pioneering discoveries – or an ingenious little improvement, observing the self-evident in a different light. All of the above can lead to new Ericsson patents. Protecting developments and discoveries under patent is tantamount to creating a competitive weapon of critical strategic importance to Ericsson's business operations.

Patent protection in its role as a competitive weapon is a relatively new concept. For many years, "gentlemen's agreements" were commonplace in the telecom industry. Like most of its major competitors, Ericsson's policy was to seek patent protection only for key inventions, rather than assuming more of a pro-active approach to patents. Know-how and expertise, the unique attributes, were built into the products.

"The Battle of GSM" erupted in the late 1980s and triggered the start of a new era, however. Ericsson was a major force in standardization work that led to finalized GSM standards. However, during the standardization process, some companies applied for patents to protect some innovations necessary for the GSM system standard.

"As a result, we are still paying royalties on large portions of GSM equipment delivered by Ericsson, among other effects," says Göran Nordlundh, responsible for intellectual property rights at the Mobile Systems business area. "One of the main reasons we need patents is to exchange patent licenses with our major competitors."

"Patents have become a form of trench warfare. The company with the most powerful arsenal of aggressive weapons will emerge as the victor. The most advisable course of action is to try

and establish a balance of terror," Mr. Nordlundh continues.

Ericsson was quick to change its tactics. Intensive efforts were made to secure some 20 patents included in the requirements for the D-AMPS IS 136 standard.

Today, the company has a strong patent portfolio that is continuously augmented by additional protection. In 1996, nearly 900 patent applications were filed, more than 20 times the number filed eight years ago.

In parallel with the growing number of finalized standards, patent issues are assuming much greater importance. Standardization, intended to simplify and "open" may seem to conflict with the restrictive nature of patent protection. Standardization organizations in all parts of the world, however, simply must accept the fact that certain technologies are patented.

"In all cases in which Ericsson places its technology at the disposal of others for standardization purposes, it's imperative that we seek patent protection," Göran Nordlundh says emphatically, "which should be done before we submit standardization proposals."

STANDARDS ALSO PROVIDE A MEANS TO MONITOR the market and protect companies against patent infringement. If a standard description is worded as "this is how you do it," readers only have to compare the wording with patent requirements. For the recently finalized CDMA American standard, for example, Ericsson was forced to take legal action to assert patent rights granted when the technology was new, before the standardization process. Lars Ramqvist, Ericsson's CEO, and the company's entire management staff have

assumed a very assertive approach to patent issues.

"It is the responsibility of every Ericsson company and business unit that develops new technology to seek patent protection for all innovations. Patent protection is our only license to operate with complete freedom, marketing our products where and when we choose," explains Mr. Nordlundh. "We also have an excellent support organization that includes patent engineers who take part in development projects, absorb new ideas and serve as a bridge between the inventors and Ericsson personnel who file patent applications."

Total costs are estimated between SEK 500,000 and SEK 1 million for the duration of a patent. That's a fairly modest amount of money compared with costs incurred to disclose, and thereby relinquish the rights to, an invention that some other company might patent.

"EVERY DOLLAR OR KRONA ERICSSON PAYS IN royalties cuts into our profits, and the money goes straight into the pockets of a competitor," Mr. Nordlundh says.

The reverse equation also holds true, of course. The message is loud and clear: apply for patent protection, and file on time!

"Nothing should ever be considered too small or simple for patent protection. On the contrary, seemingly minor inventions often become the most important for business purposes," concludes Göran Nordlundh.

KARI MALMSTRÖM

Need a patent?

Go to: <http://patent.ericsson.se/org/org.htm>