ERICSSON

CONTACT

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Milestone in Holland

Ericsson in the Netherlands passed a milestone recently in its 75-year history. Company president Haijo Pietersmaa signed an agreement covering a marketing alliance with PTT Telecom. 5

Broadband on track

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Ericsson changes side

In the future the roles in the telecom market will change. The border between supplier and operator will become increasingly indistinct. 8

Human factors

The technical committee for human factors is a ten-year-old institution within Ericsson. This cryptic name hides an operation aimed at making Ericsson systems and products more userfriendly. 13

The world is our market

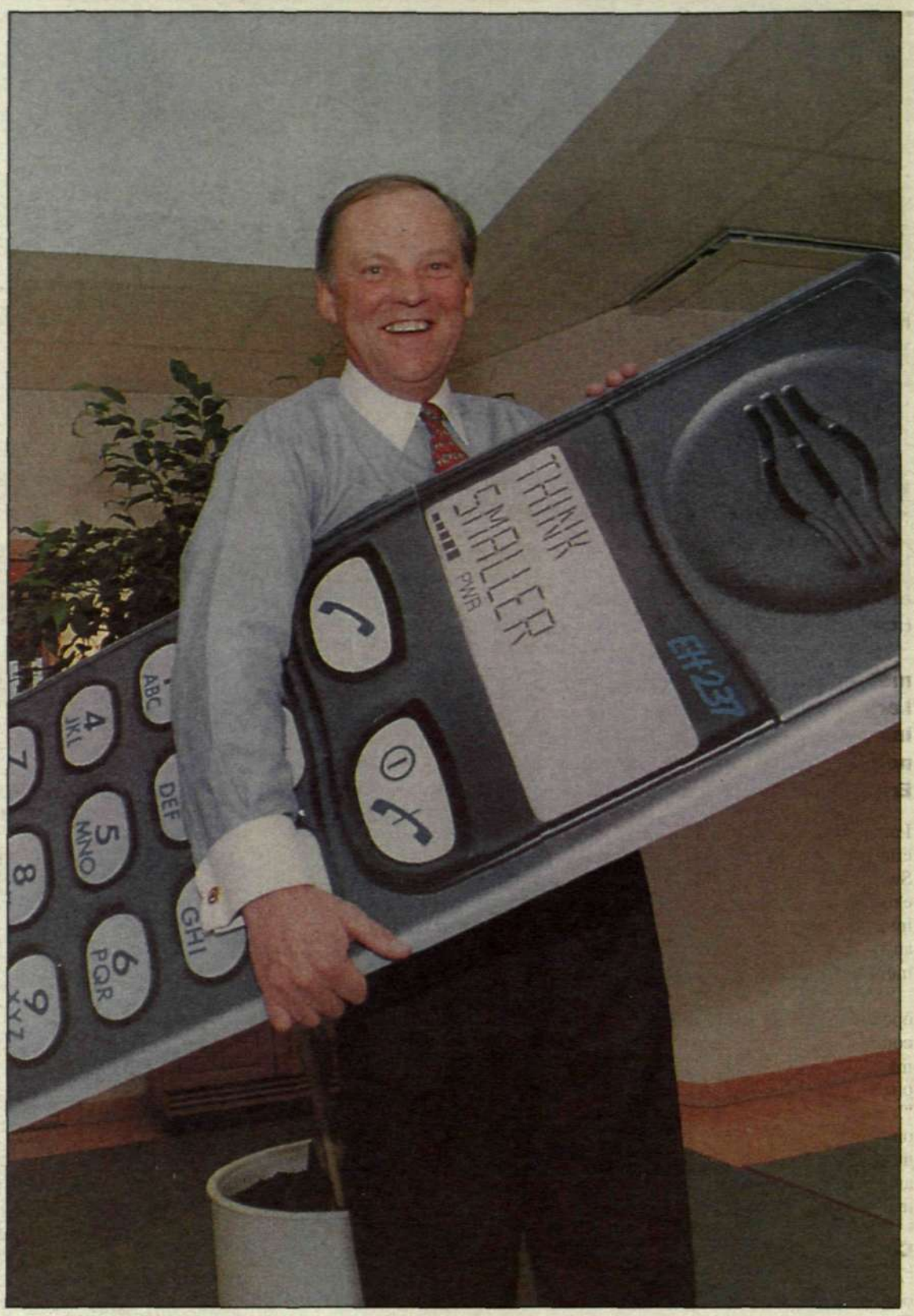
Ericsson has a global domestic market. AXE is installed in 111 countries. Ericsson mobile telephone systems are in 74 countries and the cordless telephone system Freeset in 27. No other telecom company has such an international presence. **Photo: Nora Good**

Ericsson's domestic market is the world. That the way it has been in recent years. No other company in the industry has such a strong international presence. A review of Ericsson business transactions during 1994 is a world tour. 24

Mobile success on a smaller scale

Ericsson's mobile phones on triumphant march around the world

Ericsson's mobile telephones are manufactured at three factories situated in Kumla and Linköping, in Sweden, and Lynchburg, Tennessee, in the U. S. All three plants are now being expanded to meet growing demand. After considerable success with its digital mobile telephones, Ericsson is now the third largest supplier in the world.



Johan Siberg has been in charge of Ericsson's mobile phone activities in slightly more than a year now. He can look back on a very successfull year. In 1994 production of mobile phones increased by 250 percent.

Johan Siberg is President of Ericsson Mobile Communications, with ultimate responsibility for Ericsson's mobile telephones. The that he heads represents one of Ericsson's most expansive business sectors today. The year 1994 was a very good year — sales doubled and production was up 250 percent.

Full capacity

The Group's three factories for production of mobile telephones in Kumla and Linköping, in Sweden, and Lynchburg, in the U.S., are operating at capacity.

The small pocket telephone for GSM, the GH 337 model, was the world's most popular GSM telephone last year. It was introduced on the market at just the right time, when there was a worlwide shortage of GSM telephones.

"That also put us in a favorable price bracket," explains Johan.

Group symbol

"Ericsson mobile telephones stand for quality, and we intend to make sure they continue to do that. Since we replaced the former Hot Line name with 'Ericsson', the small pocket telephones have become a distinctive feature and a symbol for the entire Ericsson organization. Worldwide market introduction of these telephones is now in progress under the Ericsson name".

"Our intention is to gain on the lead our major competitor Motorola captured with its good head start. They have concentrated on the Motorola name as a trademark for quite some time," he continues.

Time and money

"Time" and "cost" are focal terms for Johan Siberg. Being on time is important, both internally and in dealings with customers.

Ericsson's smallest pocket phone for GSM, the GH337, has been a tremendous success in 1994. This phone is also available in versions for most of the other mobile standards. It's weight is only about 200 grammes.

And teamwork is needed to be on time.

"To survive over the long term, it is also important to hold down costs," Johan states. "The mobile telephone market is highly exposed to competition and customers are sensitive to prices. Low costs are a must if we are to compete and survive."

In the past, Ericsson was criticized because it took too long for to develop new models. Improvements have been made on this point during recent years, according to Johan Siberg. Both development and commercialization of new models are much faster today.

"But we are still behind Motorola and Nokia when it comes to launching new products. We have focused on quality and volume, but we haven't packed enough punch into marketing activities. There will be a change," Johan promises.

Eventful

Johan Siberg was put in charge of mobile telephone operations in February last year. He has made many changes since then.

"We now have a global management group, which has found its particular form of cooperation. It has actually been easier to cooperate across the Atlantic than I thought it would be one year ago. And we have created a new region, Southeast Asia, with offices in Singapore.

Center in Lund

"We have also established a smaller headquarters, with marketing, purchasing and some product management here in Kista. We have a staff of about 20 people, which is just the right amount.

Lund, in southern Sweden, will be the center of technical development. Some development work will be started in Kista through cooperation started by the Mobile Telephone business area with the Mobile Data business area within the area of Radio Communications.

Large volumes

Large volumes are now being produced in the three factories. Production of mobile telephones have given the Lynchburg factory new life."

"This year, investments will be needed in all three units. During 1996, it is likely that the feasibility of a production plant in Southeast Asia will be studied."

New area

"We manufacture sophisticated consumer electronics and, although it is a new area for Ericsson, our operations affect other Group units. We buy circuit boards from the production plant in Kista, plastic from Ericsson Telecom's plant in Kristianstad and parts from Ericsson Components," explains Johan.

Challenges

Continued production increases, establishment in new markets and greater sales efforts will be just a few of this year's biggest challenges.

"These efforts will strengthen our competitiveness," Johan promises.

Text: Gunilla Tamm

'Information technology is moving Ericsson forward'

"Nothing that Ericsson has achieved in the past decade could have been possible without access to information technology. Information technology plays a role in how we work together and how we manage our international company, develop the products and meet our customers' demands."

This was the main message delivered by Lars Ramqvist at a seminar on information technology arranged by LM Ericsson Data recently.

Lars Ramqvist addressed a gathering of executives from Swedish industry. He spoke of experiences with what modern information technology can mean for a company today and tomorrow.

"Since Ericsson conducts operations in more than 100 countries, the first ingredient in my 'IT' recipe is to link up these operations," Lars Ramqvist said. "It must be possible for all persons in our organization to communicate effectively with one another – by voice telephone, e-mail, video and other channels."

Corporate Network

"At Ericsson we solved this with our own Corporate Network. This enables a development engineer in Dallas, America, to work on the same project together with colleagues in Stockholm and Melbourne, Australia. The network makes it possible for these engineers to enter the same product and document databases. In other words, we at Ericsson can exploit this fantastic productivity-enhancing capability by, for example, conducting a software project as an around-the-world relay race, 24 hours a day.

"We are now studying various alternative methods of refining this way of working and are, for example, introducing a global customer service network that enables our customers in all parts of the world to come into contact with a qualified help desk – not just an emergency service – at any time of the day or night."

Memo

"For Ericsson, electronic mail is an integral part of our corporate structure. It has had a decisive impact on how we run our company. Electronic mail enables our employees to work together, without having to concern themselves with geographic distance or time, while cutting across organizational borders within the company. It is thanks to electronic mail that we can live up to our customers' justifiable demands for speed, even on a global scale.

"It is also worth noting that the most sophisticated systems do not always provide the best results in terms of increased efficiency. We need look no further than our down-to-earth Memo system to find an appropriate example. I cannot imagine where Ericsson would be today without Memo. Every day, more than 100,000 messages are sent between Ericsson employees using Memo. No matter where you are in the world, you can log on to the system and the person who has sent you a message can find out whether or not you have read it."

Customer link

"Information technology does not only create opportunities for us at Ericsson to work more efficiently with each other. It also affects the way we work with our customers and our external partners," Lars Ramqvist continued

"In the future our corporate network will increasingly be used as a link to our customers. We will be able to send product documentation via networks and to maintain systems installed at our customers' via networks. For their part, our customers will be able to enter our product databases themselves and find the latest updates of our systems. If any fault should arise in an installation at our customers' premises, we will be able to correct the fault in real time via the network – from anywhere in the world."

Purchase orders on data

"Information Technology is also an effective tool in improving efficiency in our relations with suppliers and contractors. In 1995, we estimate that we will send and receive more than 800,000 EDI (Electronic Data Interchange) messages every day. These could be orders entered electronically directly into our suppliers' systems. This way of working means that we can save money by keeping our inventories low and at the same time we are gaining flexibility in our production," Ramqvist said.

At a seminar on information technology, arranged byLM Ericsson Data, Lars Ramqvist spoke on Ericsson's experiences of utilizing the possibilities offered within this field. Photo: Victor Lenson Brott

Multimedia

"One emerging technology I would like to point out and one that will enhance the concept of 'personal efficiency' is multimedia. In a multimedia society using the latest telecommunications technologies, companies can be located anywhere, giving people the option to move away from congested cities and still have the opportunity to perform a highly qualified professional job. Getting away from congested cities might not be much of a problem in Sweden, but it offers distinct advantages in the U.S. and in Asia.

"Only our own lack of imagination sets the limits for what can be done with multimedia. It is still hard to predict which applications will bring multimedia forward on a broader scale, how soon this will happen and to what extent. Therefore, companies such as Ericsson must be realistic and wise enough to be flexible and listen to the market.

"If the concept of multimedia is pushed too hard too soon there is always the risk of a backlash. However, it is my belief that multimedia is here to stay. Nothing can stop it. Just give it some time and you will find that multimedia will have a profound impact on personal efficiency in all corporations and also a profound impact on our private lives."

Lars-Göran Hedin

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Time to choose PCS-technology

TELE CLIPS

KJELL ERIKSSON

■ A magistrate's court has barred *Alcatel's* Chairman, Pierre Suard, from visiting the company's offices, pending a final ruling on corruption charges against him. Suard claims that the investigation is the result of a conspiracy against the Alcatel Group instigated by a foreign competitor.

■ After laying out a total of USD 7.7 billion to buy 99 *licenses for PCS*, the companies who emerged as the winners in the bid process now have to decide which system technology offers the best potential to yield return on their investments. The companies are expected to choose between PCS 1900, a TDMA technology based on GSM, and IS-95, a system based on CDMA technology and a high-frequency version of TDMA Digital AMPS called IS-54. The PCS-1900 seems to offer the most attractive prices for both systems and terminals. There is still no commercial production of CDMA systems.

■ The city of Frankfurt, Germany, has signed a contract with *MFS* for a fiber-optic network that will provide companies in the city with a new alternative for telecom services. The city will invest USD 10 million to build the network which, in the first phase, will be 10 km long. The Frankfurt network will enable banks to transmit voice and data traffic via MFS.

■ The *German* telecom market will be opened to all qualified competitors when Deutsche Telekom's monopoly is abolished in the beginning of 1998. Deutsche Telekom will be privatized next year, when shares valued at nearly SEK 70 billion will be offered for sale. The German telecom market is the third largest in the world, valued at more than SEK 300 billion in domestic revenues in 1992.

■ *France Telecom* will invest approximately FFR 1,000,000 in pilot services and projects involving the "electronic highway" during the next four years. About half of the planned investments are expected to be used to expand the fiber optic cable network.

■ *Deutsche Telekom* has bought a 25-percent holding in Satelindo, an Indonesian group with operations in satellite communications. Fifty percent of the holding may be sold to Cable & Wireless. With a population of 190 million and only three million telephone lines, Indonesia is the largest single market that has been opened to GSM systems.

Indonesia's 13,000 islands make it very expensive to build a fixed telephone network, so the Government has assigned high priority to the expansion of GSM.

■ *Nynex* wants to offer local telecom traffic or mobile services in 12-15 countries during the next 10 years. The company's strategy outside the U.S. is to build the networks from the ground up, as it is doing now in Asia, or invest in cable TV networks and other infrastructures that can be used for telecommunications.

Nynex employs the latter strategy in Europe. In the U.S., Nynex strives to be a leading player nationwide in conventional telecommunications and video entertainment.

■ With USD 25 billion in annual sales, *STET* of Italy is one of the largest companies in Europe now preparing for privatization. STET is probably the richest industrial group in Italy. Its telecommunications operations are expected to generate USD 6 billion in cash flow during the course of 1995.

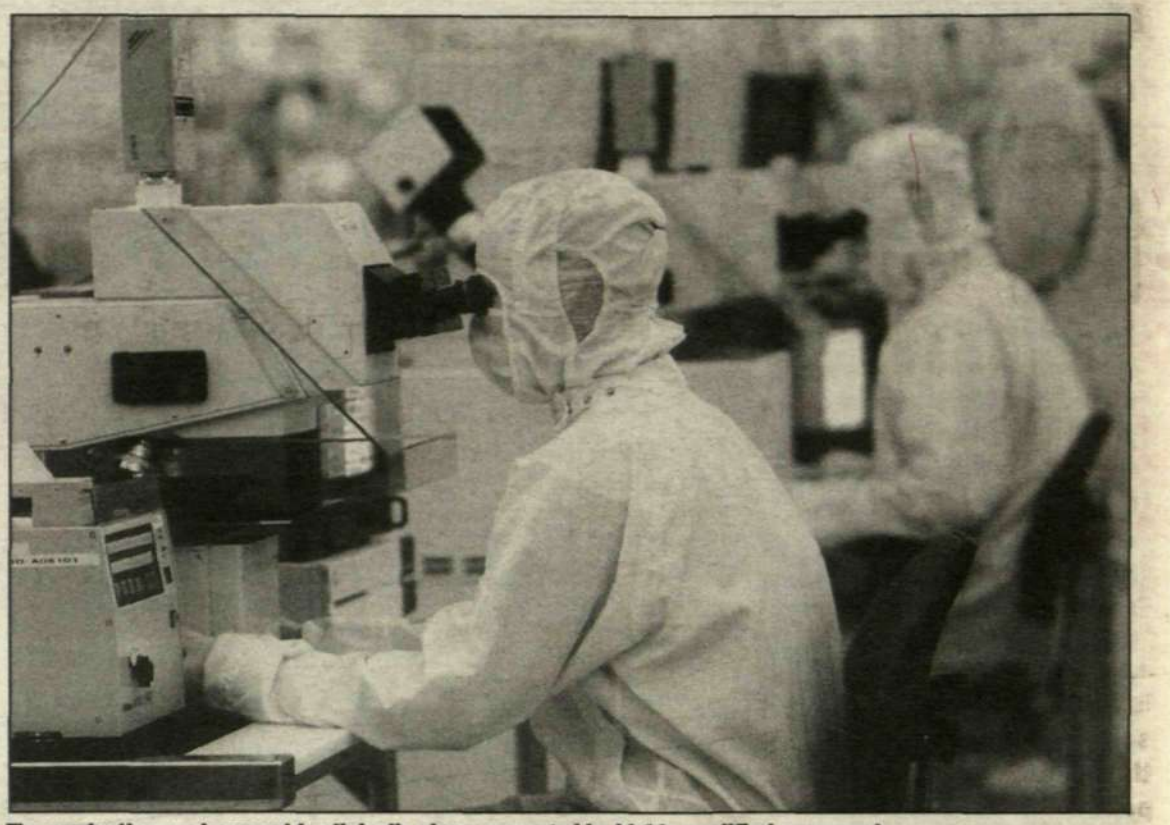
■ The potential market for mobile telephony in *France* is extremely large. Nevertheless, mobile telephony has had only limited success in the country to date, compared with Germany or Great Britain, for example. The number of subscribers increased from less than 500,000 in 1993 to 803,900 at year-end 1994.

■ *Comcast* has chosen *AT&T* to replace *Motorola* as its major supplier of mobile telephone equipment. AT&T's equipment is considered to be more flexible than Motorola's when it comes to offering new telecom services.

■ The number of European companies that have invested in *ISDN* communications doubled during 1994.

According to forecasts, the number of new ISDN affiliates in Europe will increase from 98,000 in 1992 to 580,000 in 1997. Strong growth is also expected for ATM technology.

A survey of 620 British companies showed that more than 200 had long-term intentions to invest in ATM communications. The first general application area will almost certainly be local telecom networks.



The production environment is clinically clean, managed by highly qualified personnel.

Poto: Victor Lenson Brott

Submicron project yields record wafers

Nine months after machine installation, Ericsson's new submicron plant is delivering wafers with yields (number of approved chips) on a world class level. After the first eight runs, the silicone wafers have yielded fault-free chips of up to 75 percent per disk. The good chips are 300 square mm in dimension and contain more than three million transistors.

The record-speed with which the plant was erected, the highly successful start of production and ongoing improvement in yield and quality provide Ericsson with a strong position in microelectronics.

And it's all happening at just the right time, as the market is starting to experience a shortage of components.

IB

New edition of "The Blue Book"

A new edition of Ericsson Corporate Policies is now being printed.

The new edition, which replaces the 1991 version of "The Blue Book," concentrates more on directives and regulations formulated by Group Management.

Ericsson Corporate Policies does not contain only policies. There are also presentations of Ericsson's corporate culture and principles governing the entire Ericsson organization.

"The book is intended as an important tool for the support of management personnel throughout the Group," explains Lennart Stadigh of Corporate Personnel and Organization. Lennart stresses the importance of circulating the book throughout the Group and making its contents known to employees.

Contents of the policy book will also be made available electronically.

Business area managers and company presidents will be sent registered copies of the new edition, with the urging to arrange ISO-type distribution within their respective areas of responsibility. They should also ensure that 1991 editions are recalled and destroyed.

Distribution will be handled by the printing department in Karlstad, Sweden. Orders should specify article number EN/LZG 403063/R1 and follow order routines established locally.

• NEWS FROM AROUND THE WORLD

■ LARGE CABLE ORDER

Ericsson has received a very large order for fiber optic and copper cable from a Philippine operator. The order is valued at SEK 740 million. It includes delivery and installation of cable for fixed telephone lines in central Manila and in Cebu.

The order was placed by Philippine Long Distance Telephone Company (PLDT), the largest telecom operator in the country.

When installation is completed in late 1996, PLDT will be able to connect 175,000 new subscribers to its network.

■ CHINESE PROVINCE ORDERS GSM

Another province of China has decided to invest in the GSM system. Liaoning Province has placed an order with Ericsson for the new system. The contract was signed with the Liaoning Post & Telecommunications Administration and is valued at USD 27 million. The network will be one of the largest GSM networks in China. Deliveries will begin this year.

■ CANADIAN PCS ORDER

Ericsson has signed a contract with Microcell 1-2-1 Inc. for the delivery of hardware, software and support services for a nationwide field test with PCS.

The test will be the first to be conducted in Canada for public PCS on the 2 GHz band. It will be based on Ericsson's new CMS40 system, which adheres to the global GSM standard. Deliveries will include base stations from the new RBS200 generation and a family of PCS telephones.

The contract calls for test equipment, but also includes planned expansion of the network for a total value of more than SEK 520 million. The expansion is dependent on Microcell's application for a PCS license from Industry Canada.

■ TELEPHONES FOR BOTH GSM AND DECT

Ericsson has reached an agreement with Telia for the delivery of 5,000 of the world's first combined GSM/DECT telephones. The order is part of a joint development project to evaluate the combination of GSM/-DECT technologies. The telephones will have the capabilities of GSM and DECT combined in one unit.

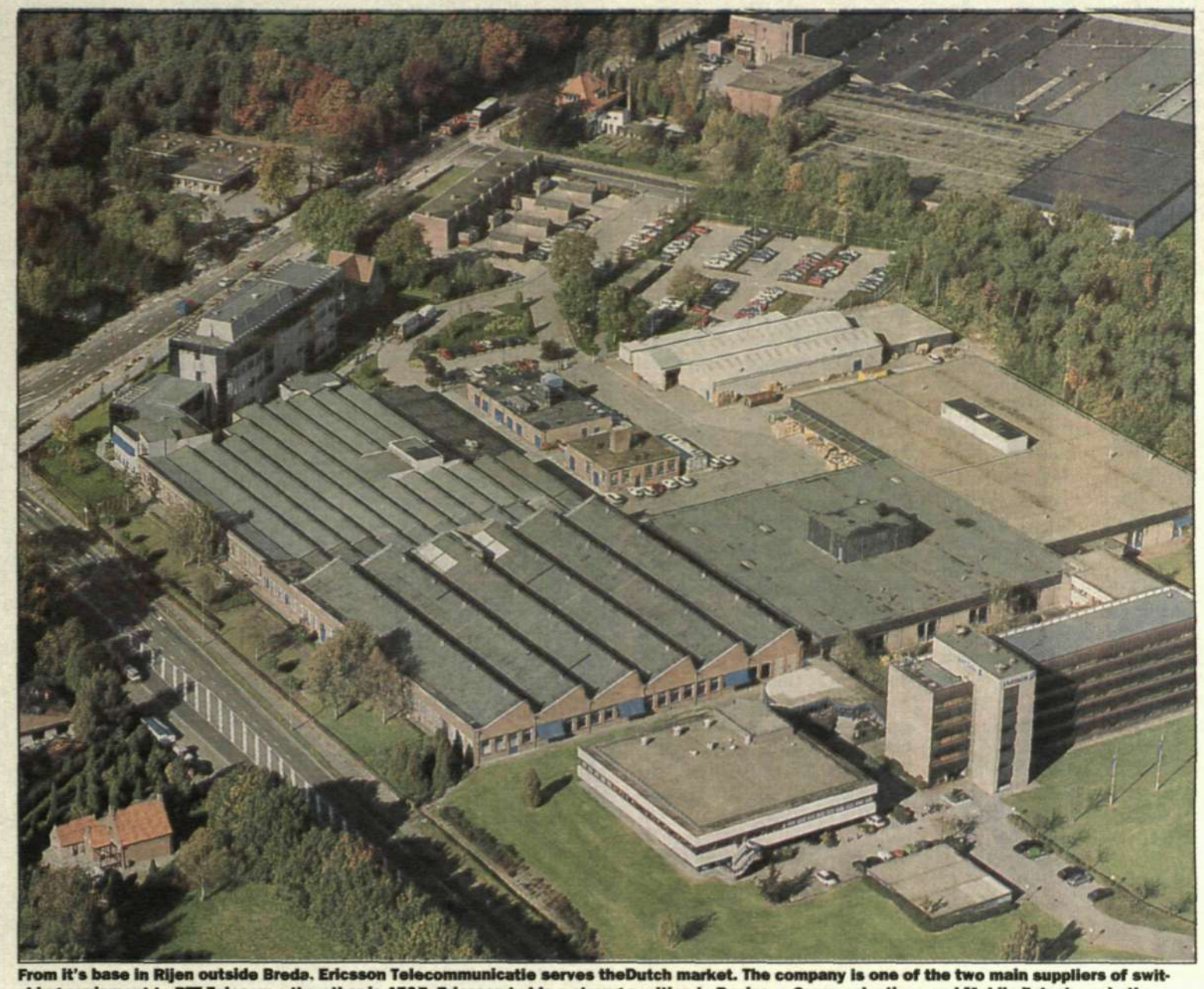
Trust paves the way for closer cooperation

Ericsson Telecomunicatie in the Netherlands has entered into a marketing alliance with the Dutch PTT. The two companies will jointly develop and market new telecommunications services. The agreement is a milestone in Ericsson's 75-year history in the country. It also points the way to new business opportunities for Ericsson as a whole.

Ericsson's second Conference on Joint Marketing was held the week of April 24 in Amsterdam. The Conference, which brought together participants from Ericsson companies as well as representatives of a number of tele-

Alliance with PTT in Netherlands caps relationship

com operators, was climaxed by a ceremony that came as a complete surprise to most of those in attendance. It occurred when Ericsson Telecommunicatie and PTT Telecom signed an agreement to form an alliance to market new telecommunications services. Johan Kooij, president of PTT Telecom Network Services, and Haijo Pietersmaa, the head of Ericsson's operations in Holland, signed the agreement Thursday evening, April 27.



From it's base in Rijen outside Breda. Ericsson Telecommunicatie serves theDutch market. The company is one of the two main suppliers of switching equipment to PTT Telecom – the other is AT&T .Ericsson holds a strong position in Business Communications and Mobile Telephony in the Netherlands.

Haijo Pietersmaa, left, and Johan Koij signed the Marketing Alliance agreement on Thursday evening, April 27.

Old era of "arrogance"

"Many of us in PTT grew up in the old 'arrogant' era, when we dictated the terms for what we wanted from our suppliers and thought that we knew best what we needed," Johan Kooij said in an interview with CONTACT..

"In those days," he notes, "we could be regarded as primarily a transport company that provided the infrastructure for telecommunications and data traffic, and we were protected from competition by comprehensive regulations."

The picture today is entirely different. The telecommunications market in Holland is undergoing enormous change. It has become a battlefield where we are facing such large international competitors as BellSouth, British Telecom, Deutsche Bundespost Telecom, and others.

"The winner in the battle for the market of the future will be the company or companies that best understand what customers are really demanding – and that can deliver it fastest and most efficiently. This is where we need help from an internationally experienced supplier like Ericsson."

Reliance on Ericsson

Johan Kooij sees the alliance of the two companies as clear evidence of the strengthening of relationships between Ericsson and PTT Telecom.

"We have indeed had problems with you in the past, and there are still many things we would like Ericsson to do better," he says, "but we have come to the conclusion that we are relying so much on Ericsson that we can venture into such close cooperation as this." Johan Kooij emphasizes repeatedly that reliability and trust constitute the basis for the new form of cooperation. In the future both parties will have a great deal of insight into the other's operations, and it will then be a matter of being able to rely on each other.

Sharing profits

"The purpose of our alliance is primarily to be able to offer new services in the market more rapidly," he says. "Through cooperation with Ericsson, we hope to be able to benefit from the Group's global experience and its knowledge of how new telecommunications services are developed and how they are performing in other markets. If we can thereby successfully develop the new services that the Dutch market wants, we will be able to share the profits!

"And if we should bet on the wrong services, two of us will be sharing the risks," Johan Kooij hastens to add.

Sharper focus

"The agreement with PTT is a major achievement for Ericsson in Holland," Haijo Pietersmaa stresses. "It gives a new boost to the process of change in the company today which is designed to create a sharper focus on the market."

"By working closely with PTT, we will be able to identify the demands the market is making on our products, and the opportunities that new services can offer both of us. And it is naturally attractive for Ericsson to have access to a larger segment of the "value chain," the revenues from each part of the process, from the decision to develop a new telecommunications service to the point where subscribers pay for it."

Milestone

Haijo Pietersmaa describes the alliance as a milestone in Ericsson's 75-year operations in the Dutch market.

"It strengthens our position and is a very positive signal to our organization," he points out. "Everyone can see that PTT Telecom really wants to develop its relationship with us as a supplier. This is a commitment on the part of our largest customer that will be extremely important for our operations here in Holland.

Text: Lars-Göran Hedin

Setting its sights on 1998

Ericsson's new ATM broadband approved for German network

Ericsson's most secret research project in recent years has passed a milestone. Following demanding tests, the new ATM-based broadband system, was approved officially in Germany on February 10. System experts at Ericsson and Telia had earlier been given a green light for the system. A comprehensive system review had been carried out in November.

Orjan Mattsson is happy to finally be able to talk about Ericsson's most secret project, the ATM-based broadband system.

Friday, February tenth, is a day that Örjan Mattsson and many of his associates at Ellemtel will not soon forget. On that day, following a period of long and nervous waiting, Deutsche Bundespost Telekom announced that Ericsson's ATM exchange in Wiesbaden had been approved during the comprehensive evaluation that took place during the winter. The broadband configuration of broadband thereby became a formally approved ATM product for use in public networks in Germany.

"Achieving our objective in the German field tests was a great relief for all of the hundreds of engineers who worked on the project," says Örjan Mattsson. He characterizes the approval in Germany as definite confirmation that Ericsson's broadband system really measures up to expectations.

"The basic development work is now completed and we are entering the next phase," he says. In this phase, the new system will emerge from the laboratory and be converted to a commercial product.

This product will be ready for volume deliveries in 1998, just when most observers today believe that the market will be receptive to ATM in large-scale public network applications.

Ten years in the making

"In 1998 ten years will have passed since the work of developing the broadband switch began. That may seem like a long time but we have learned from experience that it takes about a decade to develop a new telephone system. AXE 10, Ericsson's best-selling exchange today, was developed between 1969 and 1979. Many of our competitors' leading systems have taken just as long to become realities."

Secretiveness

Over the years, the broadband project has been carried out with a high degree of secrecy. This has naturally been necessary to keep competitors unaware of what Ericsson was working on. But this secrecy also had its negative side, especially for those who were involved in the project.

"Those who knew what we were working on, but who for reasons of secrecy lacked complete knowledge, built up great expectations. The vision of a completely new, revolutionary system was inflated and became a reality for many persons.

"Those who for various reasons felt threatened by the project had an opportunity to condemn it, while those who had excessively high expectations perhaps feel disappointed.

"And right in the middle of all this there were the hundreds of skilled engineers and technicians who were working all out on the project, but who felt frustrated because there could be no public appreciation or recognition of their efforts. Instead of being regarded as the heroes they really are, many felt that their colleagues throughout Ericsson were questioning their ability to complete the project on schedule. This is the downside of working at the cutting edge of technology."

Alternative technologies

The first phase of work on the broadband system – the so-called system studies – began in 1988. For three years up to 100 experts labored to find the best solution to the task assigned them, selection of the best possible technology for the broadband system.

When the contours of the new system began to emerge, phase two, the basic development work, began. As many as a thousand persons, half of them from Ellemtel, were involved. The remainder were borrowed from other Ericsson units or brought in as experts from consulting firms, or the like.

"For many, this work involved completely new experiences and, occasionally, sharp collisions with the special culture that flourishes in a large development project of this type," Örjan recalls. "The work demanded a great deal in terms of acquiring new knowledge and learning how to use completely new design tools that were developed parallel with the system.

New technologies

"To handle this very demanding assignment, we were forced to introduce a large number of new technologies, many of which we had to design ourselves. During the past year alone, Ellemtel applied for 47 patents covering completely new machinery, among other items.

"One of the key technologies is our new ATM switch, which was developed in association with Ericsson Components. At the time it was developed, this so-called Pipe Switch was the second-largest specially adapted electronic circuit ever designed in Europe. A new "STM" switch – the Uni Switch – was also designed. It is about to be incorporated in AXE 10, which has thus benefited from the results achieved by our technicians," Örjan points out.

The project was also revolutionary in the software sector, Örjan says. "This project is one of the very largest in the world in the field of object-oriented programming. DELOS, a completely new language for system design, was created. This program is believed to make the new system the most advanced in the world in the field of real-time-oriented telecommunications systems. DICOS, a new operating system was also designed, as well as a new graphics interface to deal with the new system.

"The demands on our new system were set so high that no operating system or handling tools known to exist earlier could meet them."

Review

Örjan Mattsson will soon leave his position as president of Ellemtel for a new job at Ericsson Raynet in the U.S. He leaves behind him many hectic years of work on the new system, and at a time when the project is entering its final phase.

"The approval by the Germans was not the only event that marked the end of phase two, the basic development work. Last autumn we brought together 100 of Ericsson's and Telia's systems experts for a very detailed review of the system. Their job was to find any remaining faults or weaknesses in the system.

Of course, there was a great deal that these people felt remained to be done. But the most important thing was that the experts were unanimous with respect to the potential of our new system. It has the potential that is required, and it is well suited for future new applications in telecommunications.

The so-called "target network" was also placed in operation last year. This is a test network in Sweden in which the system had already demonstrated that it could really handle many advanced applications.

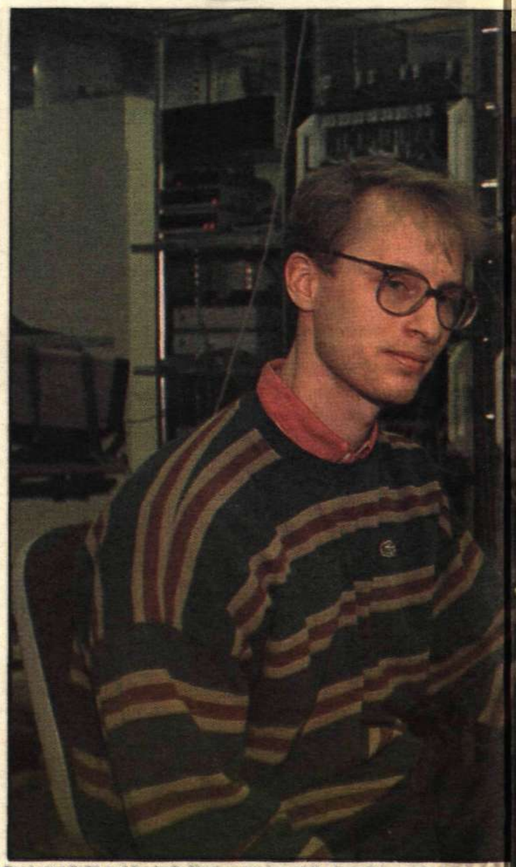
"And so the system today has been approved not only in Germany, but in Italy and Sweden as well."

Prescription for success

"Personally, I have absolute confidence in this system. It would surprise me if our competitors can offer the market anything better.

"I am convinced that under my successor, Gunnar M. Ericsson, we will develop products and applications that are absolutely world-class. The great strength of the system is that it shares AXE's most important prescription for success: flexibility and diversity!"

Lars-Göran Hedin



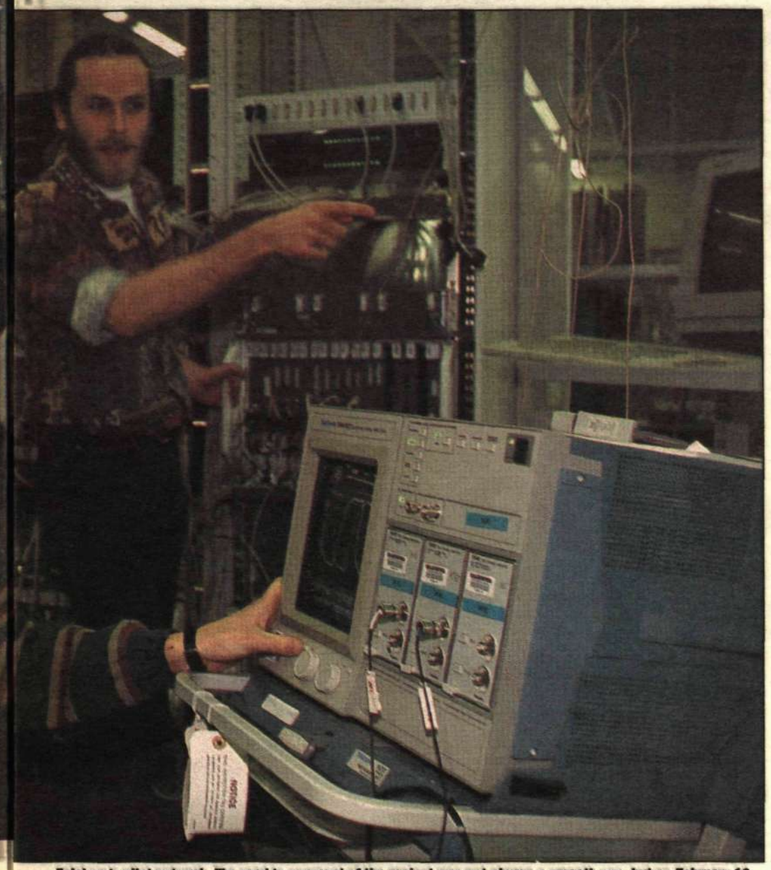
Per Lager (left) and Frederik Almgren are two of the technicians who helped to develop an efficient ATM system for Deutsche Bundespost

The Germa

When Ericsson was given the opportunity to supply ATM to Deutsche Bundespost Telekom (DBT), the product development people at Ellemtel found they had a very demanding customer "on their back." But that was just what they wanted. The job of making deliveries to Germany really speeded up their development program.

Ericsson's story as a supplier of ATM to DBT is a real thriller. Now that the Germans have approved the broadband exchange and placed it in commercial operation, there are many at Ellemtel and within Ericsson who are breathing a sigh of relief. The road to approval was not always a straight one. And it was lined with the tribulations of many technicians.

Per Lager, as a member of the group whose job it was to combine hardware and software in an efficient system, was one of those who were in the midst of the turmoil.



Telekom's pilot network. The road to approval of the project was not always a smooth one, but on February 10 word was received that the customer was pleased. Photo: Lars Åström

challenge: A first-rate thriller!

"I joined the project following the summer of 1993," he recalls. "At that time, there was no software for the German project, and no hardware either. We didn't have a clear picture of what would happen when deliveries of these components began to dribble in.

Delays

After several months of intensive preparations, the deliveries began to flow in. Some of the designs were delayed and it soon became clear that the promised delivery date for the ATM system, February 1, 1994, could not be kept.

"There were parts of the software that we didn't have a chance to complete in time."

At that stage it was decided to attempt to deliver a demonstration version of the system instead. Special design projects had to be started to by-pass the parts of the system that would not be utilized.

Following very hard work, the "demo" was ready for delivery on February 1. It was a scaled-down system but one in which certain basic functions could be performed. Test traffic could be handled in the exchange but it lacked operating and maintenance systems.

"The Germans asked about the starter button. It was perhaps then that we realized how far we were from having a finished system." Per says that it was not until then that he and his associates appreciated what the customer really wanted, a system that would also be able to function in commercial operations.

Rejected

In the beginning of June it was time for a full-scale delivery to DBT in Hamburg. Although the project was much more advanced than in February, a great deal still remained to be done at Ellemtel.

"After ten days we got the equipment back. The customer was not happy and thought that the system had not been checked out properly – which was true.

"Those of us who had worked so hard on the project were a little annoyed, of course, but we battled on. By that time we were all convinced of the strength of the basic concept, and we had corrected most of the problems.

A new chance

It was not only at Ellemtel that Ericsson's concept had taken hold. DBT's engineers also believed in the system and they gave the Swedes another chance. This time an exchange was to be delivered in Wiesbaden.

"We were much better prepared now. We knew what the Germans wanted and we were convinced that we could deliver," Per declares.

In February it became clear that things were going Ericsson's way this time.

"When the announcement was made on the tenth of the month, we were not especially surprised," Per says. "We had heard via the grapevine that the Germans were pleased this time."

L-G H

"Many people have commented on the unusual diagonal positioning of the microcircuits," Yvonne says. "It has no practical significance; we are going to change it in future versions."

Largest circuit: OK on first try

Yvonne Wiberg is a project manager at Ellemtel. She has been involved in a number of hardware-design projects for the new broadband system. She and her colleagues developed the largest silicon circuit designed by Ericsson up to now.

A total of 80 persons participated for two years in the A10C project to develop two switching circuits for the new ATM switch. The new circuits constitute the core elements in the next, much larger generation of switches.

"I became the manager of the A10C project in May 1992," Yvonne recalls. "I had been involved in the project since the previous December but the project had begun with a feasibility study conducted by Ellemtel engineers as early as 1991."

Worked immediately

The job of Yvonne and her associates was to design the two silicon circuits that constitute the "heart" of the ATM selector switch. Two very large and highly advanced circuits were involved, one containing just under one million transistors, and the other with two and half million.

"Örjan Mattsson likes to say that the large circuit was the largest designed in Europe during the past year," Yvonne notes. She and her colleagues thus have every reason to be proud, especially considering how well their design worked.

"The best thing was that both circuits functioned after the first round of designing," Yvonne says. "Normally, several rounds of design changes are required before constructions of this type really deliver what the designer had in mind."

The project was completed in April last year following delivery and delivery-test approval of the circuits.

Important cooperation

Yvonne prefers to share the honors for the successful design project.

"In addition to the people at Ellemtel who were involved in the project, we worked closely with people from outside the company.

A number of experts from the core unit for microelectronic systems technology at Ericsson Components were 'borrowed' for the project. Texas Instruments also participated in the design work and was later responsible for production of the circuits. Experts from Cadence, an American company that supplied the software programs for computer-assisted design (CAD), also played a key role.

Daily meetings

"It was stimulating to work with people from different fields and from different parts of the world. Naturally, there were times when it was a little difficult for us to understand each other, but I arranged daily meetings at which we reviewed the day's events and we were then able to clear up such things.

"We worked hard, very often far into the night, but we had fun together," Yvonne says. Since then she has heard members of the team speak of the project as their most pleasant experience at Ericsson.

Scattered

It is now nearly a year since the foreigners who participated in the project packed their belongings and returned home. Yvonne and the others at Ellemtel are continuing to work on other projects. The designers borrowed from Ericsson Components have new assignments in their own core unit.

Yvonne says she learned a great deal about project management. "There are things that I am now trying to apply in a new project where I am responsible for selector-switch development for the larger ATM switches. And we have begun to look ahead to the next generation of circuits for even larger switches. There's no end to development work in microelectronics."

L-G H

For nearly 120 years Ericsson has grown in its role as a leading supplier of telecommunications equipment. As one of the major players in the battle for the telecommunications market, the Company has learned how to perform on the international stage. But now it's time for a change. Nothing is what it used to be in the drama that will be played out during the next few years. Ericsson's fellow players – customers and competitors alike – are taking on new roles in a deregulated market.

Things aren't what they used to be

New roles impose new demands on Ericsson

The year 1994 was one of tremendous growth in mobile telephony. One reason for the strong growth is the fact that in most countries today mobile telephone service is being offered by a number of competing operators.

1994 was the 118th year of Ericsson's history. For more than a century the Company has been one of the leading suppliers in a market that has always experienced very dynamic growth.

Today we speak of the "information society," by which we mean that information technology will characterize both social life and private patterns of living in this new era in human history. Telecommunications and computer technologies are the most important individual technologies and they are now becoming increasingly difficult to distinguish from each other.

It is only since our computers have begun to be used as parts of unified systems that they have been able to fulfill the expectations of increases in productivity that have characterized our view of computer technology since its infancy. And being part of a system requires communication – locally and in a wider perspective. This is where telecommunications enter into the picture as the key technology that paved the way for the true breakthrough of computers.

Key technology

Telecommunications will be the key technology of the next decade. The interest shown in telecommunications companies in the world's stock markets supports this conclusion. Ericsson is an interna-tional supplier in this industry of the future.

Ericsson will be one of the handful of suppliers who will dominate the market in coming decades. The critical factor will be not only the Company's ability to meet the technical challenges that the future offers but, to an equally high degree, how successful Ericsson is in its relations with customers.

New supplier role

The telecom operators of the future will be entirely different from the customers with whom Ericsson has dealt for more than a century since it was founded. At the same time, the supplier role is being recast. It will be much more multifaceted and complex than it has been. Tomorrow's customer will not be satisfied to merely purchase equipment and services from its supplier, but will demand much closer cooperation.

Throughout the world today the companies that want to participate in the most lucrative portion of the telecommunications market – the sale of services to corporate and private customers – are mobilizing. These companies are now jostling for the best possible positions in a market that, instead of being a monopoly, is characterized by open and free competition. There are many different types of operators, with different concepts of how they will be able to establish strong positions in different markets.

Different types of operators

The type of operator who still dominates the market in most countries is the "traditional" telecom operator. Many of them are formerly monopoly administrations or companies. Many of the traditional operators are now learning what it is like to be threatened by newcomers in their domestic markets. These are operators who joined the inter-national competition when the market for tele- communications was opened up in various countries.

A completely new type of operator, is the company that has developed new ways to tackle the market.

Companies that are already operating specialized telecommunications networks are now venturing outside their industries. An additional category of new operators consists of companies that have strong positions in other fields and which are now getting into telecommunications. A number of them are doing so based on experience in network construction in a totally different industry.

Different strategies

The experience of these different categories of operators in telecommunications varies widely and they have, in many respects, totally different views of their role in the industry. This means that Ericsson has to develop completely different sales strategies for the various groups. And that a great deal of work is required to document and analyze the supplier resources that best meet the demands of customers in each category.

Many "new" companies are now focusing on becoming telecom operators. The Swedish State Rail Administration, which is leasing its new fiber optic network to Tele 2, among others, is a good example of a company without previous experience in telecommunications that now wants a share of the future market.

Information technology is creating new opportunities for people. "Remote" work is something we will see a lot more of in the future. But this trend would have been completely impossible without telecommunications.

When Bengt Bohlin, president of LM Ericsson Data, accepted the Swedish Quality Award last year, the event was one of several major "quality victories" for Ericsson in 1994. The focus on TQM is helping the Company to adapt to its new roles in the market.

Regardless of the category of operator with which Ericsson has to deal, the Company has to determine what each one requires in order to succeed in its efforts to sell its services to end-users and present these services in a manner that inspires confidence. Ericsson has unique marketing know-how upon which to base this planning.

Once the requirements have been established, it is a matter of having the capability to develop attractive solutions that not only meet technical requirements but which are also attractive financially – both for the customer and Ericsson.

Being a successful supplier of telecommuni-cations equipment requires more than the development of systems and products that suit a single category of operator; it often requires alternative approaches that cover many of the categories.

Change in supplier role

The characteristics and attitudes of customers are not the only things that will be different in the telecommunications market of the future. Ericsson will also have to adopt many different roles in its dealings with different categories of customers. When its customers' focus has shifted toward introducing and selling new services to end-users, these customers will need more support from a supplier. A clear pattern is already emerging in which telecom operators of all types want closer cooperation with suppliers. This pattern differs from the one that was foreseen when the industry began to be deregulated.

Less "remote"

In deregulated markets such as Australia and Sweden, the "distance" between operator and supplier has shrunk. The operators have faced such tough demands to make new services available in the marketplace that they have turned to their suppliers to obtain their help in various forms in developing – and in some cases even marketing – the new services.

In Australia, Telecom Australia turned to Ericsson, its principal supplier in the exchange sector, and offered a completely new type of cooperation. Ericsson is now sharing with Telecom its knowledge of how various new telecommunications services have succeeded in other markets, is modifying the services Telecom wants to promote in the Australian market, and is then helping to market the services to end-users.

Partnership

The example of Ericsson and Telecom Australia is one of a number that illustrates how a supplier-customer relationship of many years' standing is now deepening and becoming a partnership that is strategically important for both parties. There are similar examples of closer relationships in other parts of the world. BT, PTT Netherlands, Telefónica and Telia are all large customers who today prefer to speak of Ericsson as more of a partner than merely a supplier.

Among the new operators in the telecommunications arena, there is at least an equally great need to develop close cooperation with suppliers who, like Ericsson, can offer total solutions for network construction and assist in providing advanced services for networks.

MFS Communications Inc. has been one of the most successful companies in the American market in recent years. Ericsson, which has been deeply involved in the planning of MFS' expansion from the start, is now providing substantial operating support in various ways in areas of the world where networks have been established.

Open market for mobile

No segment of telecommunications is as deregulated as mobile telephony. It is also the area in which most of the new operators are to be found. The latter are often constellations of companies – not infrequently banks without previous experience in the industry and telecommunications operators who are active internationally.

Ericsson's success in mobile telephony is due in large part to the fact that it has succeeded in developing partnerships with such international operators. The cooperation with McCaw/LIN, Cable & Wireless and Vodafone illustrates how a partnership is initially established in one market, becomes closer there, and is then extended to embrace the operator's activity in new markets.

Ericsson can offer these operators its knowledge of the market or markets in which they are interested. There are a number of companies that can build mobile telephone networks but none has the breadth of international experience Ericsson commands.

Important limits

The ability to offer customers financial solutions has become increasingly important in recent years. Like its competitors, Ericsson is also actively engaged in developing this aspect of its marketing. But it differs from most of its competitors in one important respect. Ericsson does not offer to acquire a stake in a network as part of its marketing strategy. There are customers that assign responsibility for network operations to Ericsson – but that is where Ericsson draws the line. Its strategy is clear: Ericsson must not become a competitor to telecom operators.

International concentration

Another example of how the role of the supplier is changing in the dynamic telecommunications industry is the partly new pattern that is beginning to emerge in the market for international traffic. Here, there is a sharp decrease in the number of players in the market. This is occurring because the major players are forming a handful of powerful alliances.

It began with Unisource, an operator who offers companies with international activities an opportunity to purchase the solution to their telecommunications needs in many countries from a single location. The concept has proved to be successful. During the year Unisource also formed a new company, Uniworld, in association with AT&T.

A year or so ago BT purchased an interest in MCI, the second-largest company offering international telecommunications traffic in the United States.

This trend offers attractive opportunities for Ericsson. The owners of Unisource include some of the Company's most important customers. BT is also an important partner that has built up its international network with AXE exchanges. It seems rather natural for such companies to continue their cooperation when they enter markets that are new to them.

In process of change

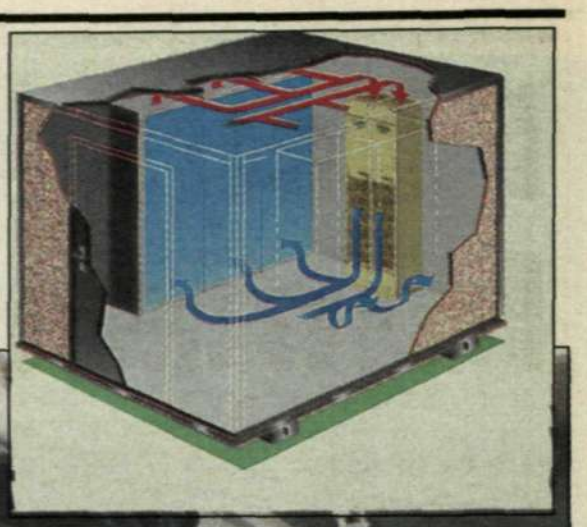
Deregulation is creating opportunities for many new operators to become established. At the same time, it is highly likely that a small number of large operators will control an increasingly greater portion of the market. The big challenge for Ericsson as a supplier is to establish the best possible relationships with operators in different categories, and to maintain these relationships over the long term.

The winners in the battle for the telecommunications market will be the companies that have the best relationships with the large operators, suppliers that have demonstrated that they can provide operators with the new products and services that end-users are demanding. They will be the suppliers that have best been able to handle the new roles that the telecommunications market of the future will assign them.

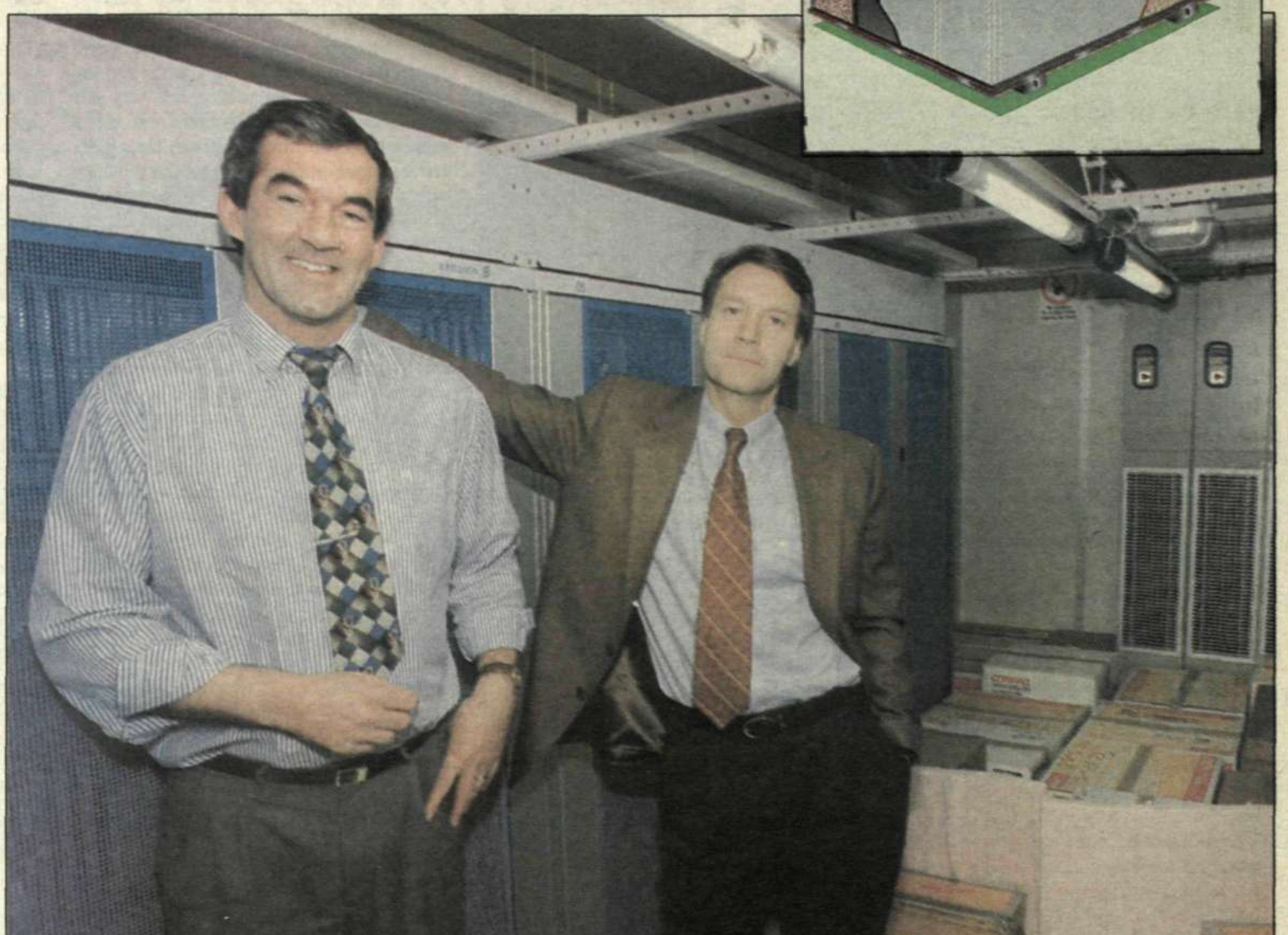
This is one of the reasons why Ericsson has concentrated so hard on Total Quality Management (TQM) in recent years. In TQM, "focus on the customer" is the key concept and continuous improvement is the guiding principle underlying Ericsson's performance.

The national and international quality awards that were won during 1994 are solid evidence that Ericsson is well equipped to handle the new roles that lie ahead. As the market changes and grows, Ericsson will change and grow with it. ■

New cooling method is a hot news item



A new range of cooling products for radio base stations, with unique properties and broad market potential, has been developed by Ericsson Components. The technical solution is actually revolutionary and will be protected by several world patents.



"The system is self-regulatory in that cold air is sucked into radio equipment in the amounts required for adequate cooling," explains Anders Ryberg (left), seen here with Lars Andersson of Ericsson Radio Systems. The small illustration above shows the principle of the cooling unit. Air is taken in at the top, cooled and then "gushes" out at floor level. **Photo: Anders Anjou**

Telecool Aero is the name of a new series of products developed by Ericsson in close cooperation Radio Systems, a customer. The new product is expected to be a big seller.

"We expect sales to take off this year in Europe, Asia and Latin America. These are strategic volume products that will also be introduced to external customers, including competitors," says Anders Ryberg, development manager for cooling products in Ericsson's Energy Systems business unit.

Telecool Aero – a future big seller

The cooling system department has delivered turn key cooling systems in the past to internal customers, and the department has functioned for years as a cooling expertise center for all Ericsson business units.

The new product series is a refinement of an older and smaller cooling system for containers, but with much higher performance levels.

"We have three world patents for these market-adapted products," says Anders Ryberg.

Rapid installation

The cooling units are adapted to Ericsson Radio Systems' newly developed Swesite radio base stations. A Swesite station consists of radio equipment and other components in containers that are installed in Sweden and then shipped to different parts of world.

On site, installation requires only a day and half, after which the station is ready for radio communications. In principle, the only things that have to be done are to raise the mast and connect the power.

Ericsson Components received the specifications just over a year ago.

The specs were studied for about two months, followed by technical development at a supplier's facility in Europe. The products are manufactured in Italy, at a factory not far from Venice.

"As a customer, Radio Systems was involved in an exemplary manner, productive and helpful. To a large extent, it is to their credit that the project was such a success," says Anders Ryberg.

Modular cooling

Telecool Aero contains several types of units available in different versions and capacities. One installation may consist of 3.5 and 7.0 kilowatt modules with or without free cooling or a back-up module for cooling in the event of network failure.

Several different modules can be combined in one base station. For example, a station may have three modules of 3.5 kilowatts each. The radio equipment generates minimum effect and heat when traffic is low, for instance in the middle of the night. One module might be sufficient during such periods. On the other hand, at lunch time, maximum capacity may be needed to handle peak traffic.

Adaptable

Increases in temperatures are often intensified by sunshine. One of the three modules serves as the master unit. It starts first and senses when it needs additional cooling assistance. Then the second module starts automatically, which means that 7 kilowatts of capacity is being used. In the same way, the third module starts automatically when needed.

"This means that you don't have to blast away with 10-12 kilowatts at once, but rather are able to adapt output to actual needs," explains Lars Andersson of Radio Systems. The different modules take turns being the master unit through a random function. This feature provides equal operating time for all cooling units.

Considering the size of the cooling unit, the free cooling principle is unique. It is intended primarily for European and North American climate conditions, where it is often cold. Compressors are not used for cooling purposes. Instead, the cool air already in the atmosphere is used in heat exchange systems. The method saves a great deal of energy and operational reliability is high.

What is unique is the principle whereby air is supplied. Normally, air is sucked into the bottom of the unit and then emitted as cool air in the container. Telecool Aero does the exact opposite. It takes in warm air at the top and cools it in the unit. The cool air then gushes out at floor level. This is called displacement cooling, which is adapted to laws of nature, since warm air rises and cool air sinks.

"The system is self-regulatory in that the cool air is automatically sucked into the radio equipment in the amounts needed for proper cooling," says Anders.

Back-up

In the past, network failure could cause some serious problems. Telecool Aero has a back-up module to avoid such problems. The unit consists of a water tank and an alternator. When the cooling unit is operating normally, it puts aside part of its cooling capacity to cool down the water tank so it is always cold. In this way, it is possible to have complete cooling with the help of battery power for two hours.

"We have used the technique with a back-up water tank for many years," Anders Ryberg says. "What is new is the concept of cooling water and air at the same time. That is one part of the product series for which we have sought patent protection."

The products have been tested for all possible climates and environments. They have been exposed to temperatures ranging from – 50° C to 55° C and to extremely dry as well as extremely humid conditions. They have been exposed to shocks and vibrations to simulate transports, and even earthquakes. The tests were conducted around the clock for periods of one week in a climate chamber. One week corresponds to about five years of actual operations in a given climate.

"So far, we have delivered 170 cooling units to Radio Systems. They have set up demonstration systems in different parts of the world," says Berth Erlandsson, marketing manager for cooling systems in the Energy Systems Division.

"We know there is considerable interest," states Lars Andersson of Radio Systems. "In the immediate future, we plan to order another 50-60 systems for future deliveries."

The commercial breakthrough will come when Ericsson Components receives an order for hundreds of units from a single country. Present estimates indicate that Ericsson will deliver 400 – 600 units this year. Next year sales are expected to increase further.

"Initially, we are talking primarily about customers within Ericsson, but next year we will turn our attention to external customers," says Berth Erlandsson. "We are positive that Telecool Aero will be a highly successful product."

Måns Widman
Edited by:
Inger Björklind Bengtsson

Focus on more human technology

"A hallmark of Ericsson products should be that they are easy to use," says Thomas Backström, responsible for Ericsson's Human Factor issues, that is, matters dealing with the man-machine interface. This an area that is increasingly gaining importance and shifting toward software issues rather than terminal screens and keyboards.

A number of measures should lead to technology being adapted to man. "The hallmark of Ericsson products should be that they are easy to use," says Thomas Backström. Photo: Karl-Evert Eklund

Today there are strong indications that user issues are moving toward a long sought resolution and that in a growing number of areas in Ericsson it is becoming apparent that money spent wisely in the short term pays greater dividends long term. There is now a more open attitude and a better base for actions than previously.

Deregulation, with new network operators who lack a telephony background and who place heavy demands on simple interfaces, play a key role in this trend.

In order to respond better to the changing world, the Human Factors Committee dealing with user-friendliness is being reorganized.

New organization

The Technical Committee for Human Factors, which has existed for 10 years, is no longer organized within the corporate staff functions, as was previously the case when the unit was part of the Technical Council. Recently, all technical committees were moved out into the line organization, and the Committee was transferred to Ericsson-Hewlett Packard.

"Our committee deals with matters on a corporate scale, but we do not carry out any direct operations in the line organization," explains Thomas Backström, who is now heading the committee.

"The Ericsson-Hewlett Packard company will commit time and money, but the condition is that all the other business areas also contribute resources. We will then function as hub unit to which everyone can turn with their questions."

Currently, there are a number of people dealing with Human Factors at Ericsson. They are spread throughout the business areas, often working alone or in a small group.

500 hours a year

The aim is that responsible Human Factors personnel each be allocated 500 hours a year for joint projects and cooperation across the business areas. This time corresponds to about a half-time job, compared with 100 hours available today. Previously, the Technical Committee for Human Factors has functioned as a network for information distribution, but will now work more actively on a project basis.

It is not necessary that the same person commit these 500 hours, but they can be divided within the unit among other persons, depending on the character of the project.

Thomas Backström appears to be very optimistic. He has received approval from most of the business areas and is now prepared to start activities in concrete projects.

Ericsson profile

The next step is to identify the common points of interest among the business areas. Radio Communication and Business Networks, for example, have partly overlapping "skill profiles," while Ericsson-Hewlett Packard's graphic user interface for operation and maintenance systems are recurring items in certain projects at Ericsson Radio Systems, etc.

"In many cases, you can identify joint projects so that the product can attain an "Ericsson profile," says Thomas Backström.

The aim during 1995 is to organize the network, to determine methodologies and to develop training material and integrate "usability" in development models and through active efforts in actual projects create an Ericsson profile – primarily in the design of the graphic user interface, so that symbols and expressions become uniform throughout Ericsson.

One thought is to identify the smallest common denominator for a product so that it can be provided the "Ericsson stamp."

Methodology

Those working with Human Factors are now meeting regularly, but in the future these meeting will gain another character.

The group, which is spread throughout Ericsson, will instead function as a "virtual organization" which coordinates certain matters. The Human Factors Committee is to first identify a number of projects and then each member selects the projects for which they want support and more resources to implement. A work group is then formed, reinforcement called in, etc. To ensure maximum effect, it is important that the Human Factors issue is consider early in a project.

Cooperation

"That the user is finally becoming the center of attention, is confirmed by the fact that several networks are in operation within Ericsson, such as the network that Yvonne Törjék from Ericsson Infocom is establishing which was described in Contact 2/1995.

"This is not disadvantageous," says Thomas. "On the contrary, but it is important that we cooperate when our projects address similar issues."

The core element in Human Factors Engineering is that it is used in all product design to achieve user-friendly products and , particularly, that the product is designed with the idea of how and by whom it is going to be used.

"User-friendliness and low operating costs are very strong sales arguments," concludes Thomas Backström.

Lars Cederquist

Human Factors Committee

Thomas Backström	Ericsson Telecom
Hans Brandtberg	Ericsson Microwave Systems
Lena Ewert	Ericsson Microwave Systems
Lena Coggman	EricssonHewlett Packard
Nils-Erik Gustafsson	Ellemtel
Arja Vainio-Larsson	Ericsson Radio Systems
Bruno von Niman	Ericsson Business Networks
Olle Larsson	Ericsson Business Networks

Full control over installation

When a mobile telephone system involves the installation of thousands of base station -sites and other equipment, and each site requires 20 - 30 different activities, powerful tools are need to plan and control the progress of the installation work. PIRS is just the tool. It was a great success in Germany and is now available in a Windows version.

Installation of a large mobile telephone system may involve hundreds of activities at several thousand sites. Most of these activities are carried out rapidly.

A large installation is also a particularly lively project, where plans are constantly changing, due to delays, etc. Many steps are interdependent, deliveries must be coordinated and at short notice be routed to the site that is most suitable for installation.

Accordingly, a good planning and control system is a necessity.

Efficient

"Our computer-based PIRS system (Project Implementation Reporting System) has proven to be very efficient," says Matz Andersson, responsible for implementation at Ericsson Radio Systems. PIRS structures and standardized reporting.

PIRS is best suited for major customer projects where similar work is to be carried out at many sites.

PIRS was first used in the United Arab Emirates in 1988, but the real breakthrough came in May 1991 when work began on the GSM network for Mannesmann in Germany.

PIRS is hierarchical, adapted to the organizations of the customer and installer.

The planning and reporting in PIRS is based on the current status of the various activities at each site or link.

Reliable

"The customers rely completely on our reports," says Matz Andersson. "Initially, they wanted to check our information, but when it was consistently correct, they quit checking."

PIRS clearly identifies the bottlenecks. It can detect that work required only six days to complete, but it took ten days before the papers were signed.

Curves, diagrams and results can easily be created to support planning and discussions with the customer.

LC

New standard connects Europe's police

A counterpart to mobile telephony's GSM is now under development for the private mobile radio systems used by police and fire departments. Tetra, an all-European standard, will make it possible to connect the private mobile radio networks of different countries in a cost-efficient and flexible system.

The new Europe is working toward the standardization of private mobile radio networks. EU's telecom group ETSI (European Telecommunications Standards Institute), with 300 members from 30 countries, has been working for the past few years on a new standard called Tetra, Trans-European Trunked Radio.

Tetra will guarantee that equipment from different suppliers installed in different networks shall function compatibly. Radio interfaces between mobile terminals and the systems' base stations are being standardized, as well as interfaces to operator equipment, to different mobile radio networks, the fixed network, the ISDN network, etc.

Tetra also specifies a number of services the system can offer.

Illustration: Leif Sundberg

The need for greater cooperation between police forces of different countries in the new Europe has been a driving force behind the development of common European standards for mobile radio systems.

Trunked

Tetra will be a mobile, digital and trunked system. Trunked means that the user is queued to await assignment of the first, most suitable free channel. All channels are monitored via a digital control channel, which selects the first available channel.

The system provides highly efficient utilization of frequency channels. In a trunked system, priorities can also be assigned to certain services and calls, which guarantees that the network is never blocked in the event of emergencies.

The driving force behind Tetra is the need to improve utilization of a limited frequency band, to realize financial savings by allowing more users to share the network, to derive operational advantages when several (police, fire department, rescue) departments are involved in a large field operation and, as mentioned earlier, the "Europeanization" of police work conducted through Europol, for example.

Main services

The Tetra standard stipulates that voice and data should be able to be transmitted on the same network. It is both cheaper and simpler to have one common terminal.

In addition, it should be possible to make individual and group calls.

It will also be possible to encrypt calls and connections will be made very rapidly (within 300 milliseconds). Different emergency vehicles will be able to communicate with the network and with each other, without going through the network. Tetra will also make it possible to roam between different networks and keep a channel open so that everybody can listen to everybody else.

In addition to the basic services a series of supplemental services will be available, so that Tetra may be likened to a tool box, from which the user can take whatever tools he needs. Supplemental services may include the formation of temporary groups or, perhaps, the operator can break in by turning on a mobile radio to listen if he/she suspects a crime has been committed.

TDMA

It has been decided that Tetra will be based on the TDMA technique for radio transmission. TDMA, which stands for Time Division Multiple Access, is an accessing technique used today in all digital, mobile telephone systems (GSM, D-AMPS, PDC) and the cellular office telephone system DECT. It is based on the distribution of the system's frequency channels into a number of recurring time slots, for example, in GSM, eight slots for every frame of 200 KHz. It has also been decided that Tetra will have four time slots per 25 KHz channel, in which every slot will transmit for 15 milliseconds.

As opposed to the old FDMA technique (Frequency Division Multiple Access), in which every call was made, and transmitted continuously, on one carrier frequency, TDMA permits transmission of voice and data communications on the same channel by assigning additional time slots as needed. In this way, users can transmit and received on the same channel (full duplex), or both speak and transmit data simultaneously. For police, this may be a photograph or a description or the like.

Sophisticated

Many technical questions have been resolved for the Tetra standard. For example, the digitalization of voice traffic, which requires a Codec to handle the much more difficult sound conditions that may arise in police communications, compared with regular mobile telephony.

One problem, however, is frequency allocation. At present, it seems likely that the 380-400 Mhz frequency band will be used as the first common European band.

Tetra is also working with the development of algorithms for encrypting radio interfaces.

The standardization proposal is now in the hands of member countries for comments and consideration. The core standards will be voted on this October, and then forwarded to ETSI.

Fully developed EDACS

The question as to which system will fulfill Tetra standards is still open. For Ericsson, however, development work will continue on EDACS (Enhanced Digital Access Communications System).

Today's version of EDACS is a sophisticated trunked, mobile radio system that already has many of the functions specified by Tetra 25.

In 1996, an upgraded EDACS system, based on the TDMA technique, will be introduced. Its capacity will be doubled by assigning two calls to each channel. In 1998, according to present plans, a complete Tetra 25 system will be ready.

EDACS systems have already been sold to about 250 customers in all parts of the world and serve in many places as the common network for police and fire departments, ambulance corps, customs, rescue services and other public service authorities.

Lars Cederquist

Cross-connecting was demonstrated in operation for the first time at Ellemtel in Alvsjö for Multi-Wave Length Transport Network, MWTN, a project within RACE for an optical telenet in Europe.
Photo: Anders Anjou

At the speed of light toward broadband

A unique demonstrator, the world's first realized optical cross-connect in an experimental network, is now being demonstrated in the Stockholm Gigabit Network, SGN, – a nearly 140-kilometer-long experimental network linking several research centers in Stockholm.

One goal of the European RACE program was to lay the foundation in 1995 for a European broadband network with total pan-European coverage. The first optical cross-connect is now being tested in Stockholm within an experiment known as the Stockholm Gigabit Network, SGN.

The cross-connect serves as a platform for advanced optical technology in a system environment and has been developed under the auspices of the Multi-Wavelength Transport Network, MWTN. BT is leading the project, with Ellemtel as subproject leader for system demonstration, and Ericsson's research center, the Fiber Optic Research Center, is a subproject leader for the component design.

The first demonstrator was assembled in a laboratory environment at BT for testing. Then it was upgraded with new technology, including Ericsson's indium-phosphide switch. The research platform was unveiled for project leaders from throughout Europe at a demonstration at Ellemtel last autumn.

In addition to Ericsson, participants in the MWTN Projects are Telia, BT Laboratories, the University of Essex in the U.K., University of Paderborn in Germany, Ericsson Telecommunicazioni, CLEST, Italtel and Pirelli Cavi, Italy and Telecom CNET of France.

"The purpose of the demonstrator is to test and demonstrate the principle. This gives us the possibility to test spearhead technologies in a network environment, while at the same time we can prove new system solutions," says Olof Sahlén, Ericsson Components, who is leading the technology activities within the project.

Important step

Two optical cross-connect nodes were used at the demonstration in Stockholm. These provide four independent wavelength channels and bit speeds of up to 2.5 gigabits per second. A new simplified node (ADD/DROP multiplexor) is just now being installed in the network.

The main node was assembled by Ellemtel in Älvsjö. The other two nodes are installed at Ericsson Components in Kista and in Telia's research lab in Haninge. Telia's node will be used to study the degree of upgrading in the system with additional wavelength channels.

Two engineers from Pirelli in Milan review their contribution, an acusto-opticcal adjustable filter delivered by their company.

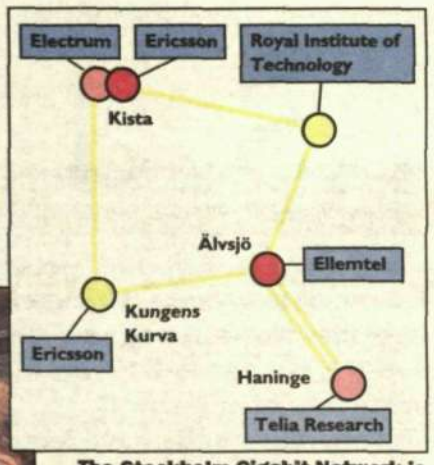
The research demonstrator is considered by Ericsson and Telia as an important step toward flexible and transparent optical networks, where the transmission capacity can be controlled based on different requirements without the optical signals having to be transformed into electrical signals.

The project began in 1992 and will be concluded in 1995. Ericsson and Ellemtel have contributed the network, and developed a control system and system architecture. Ellemtel and Ericsson Infocom have been the first in the world to develop a control system with optical network elements, for example, optical cross-connecting,

Gained experience

"We have gained experience and expertise in this project in new optical technologies in network applications and systems, At the same time, we test new system solutions and functions with this technology," according to Sonny Jackson, Ellemtel, responsible for the system operations of the project.

Ericsson Components has developed many of the optoelectronic components used in the demonstrator – particularly optical space-compression matrices, optical filters and laser diodes with adjustable wavelengths. Circuit designs, rack program and software has also been developed, and work carried out with network and transmission modulation.



The Stockholm Gigabit Network is a nearly 140-kilometer-long experimental network linking several research centers in Stockholm. This Swedish research network, for high-speed data transfer will eventually provide us with picture phones, video-on-demand and music and home-shopping and...

Stronger position

The integrated broadband network within RACE should provide the European telecommunications industry a stronger position and give the net operators the possibility to develop networks and services in cross-border cooperation. Companies and organizations within the EU are demanding a planned and synchronized introduction of broadband services.

Inger Björklind Bengtsson
Photo: Anders Anjou

Freeset telephones are the key to the flexible office. A station for charging the telephones and storage of the personal drawer files greets visitors when the enter the office reception area. With the cordless telephone, employees can roam throughout the offices and work wherever it suits them best and is never locked into a certain location.
Photos: Konny Domnauer

A telephone and drawer file as a workplace

The flexible office provides new business opportunities

The flexible office of Ericsson Business Networks is now well lived in. For nearly one and a half years now, Network Engineering's units have been preparing bids and conducting business in the office complex.

The office was formally opened with pomp and ceremony and heavy media coverage in December 1993. Articles appeared in the daily and trade press as well as in Contact. The jungle telephone has obviously taken care of the rest. Apparently, there is a heavy demand and a growing market for innovation with the aid of technology.

"We've attracted a lot of attention from various directions, in and outside Sweden. Groups on study visits flow through the office in a steady stream. Organizations and companies that have heard about our office of the future contact us and what to know more. The brochure produced for the opening has become a 'best seller' in Swedish and English," relates Tommy Hall, whose duties include responsibility for the Flexoffice's information and IT matters.

Ever since the guidelines were drawn up nearly three years ago, Tommy has been working with implementing and following up on the Flexoffice concept. Tommy guides the visitors around the office and serves as an external ambassador for the flexible office. On request from interested parties, he'll make a visit and talk about the project.

Both pluses and minuses

"One of the goals with the new work method was to shorten the time required for a new employee to start working and become self-sufficient. Traditionally, this normally requires 12 to 18 months and costs about SEK 1,500,000. Here, we've shown that full productivity can be achieved in six months.

This was confirmed by the follow-up and evaluation conducted by the Karolinska Hospital and the University of Stockholm after the office had been open for one year. The study describes both pluses and minuses and provides important indications about what could perhaps be changed and improved in the Flexoffice.

Changeable 'owls'

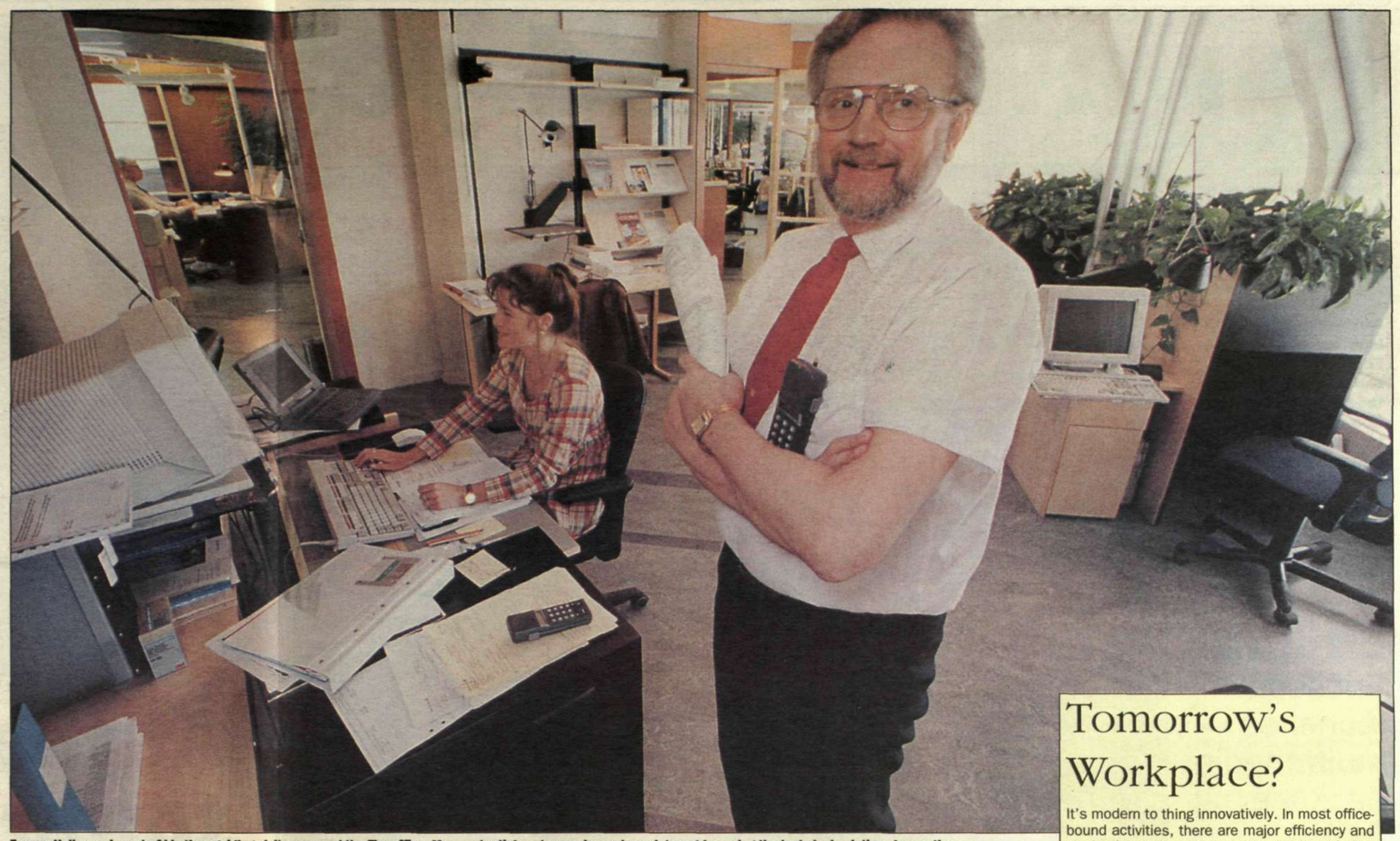
According to Tommy, a lot of effort was spent motivating and getting those with a lot of Ericsson years behind them involved prior to implementing the Flexoffice model. Perhaps it was felt that these "old owls" were less willing to accept change than their younger colleagues, but the evaluation and daily operations showed that this was far from the case.

"A person who has a professional network and is confident and secure in this knowledge, sees possibilities with the new work method. A solution that works is respected by the experienced. Instead, the employees fresh out of college and first out on the job can have problems. It takes time to establish a career identity and build a network. Even though this process is facilitated by a flexible work environment, that does mean it takes care of itself. Support is needed from supervisors and fellow employees," Tommy says.

Hard to find space

An important aim with the Flexoffice was to maximize use of the premises, so that more employees can work more effectively in less space than in the traditional office cells. Adapting the amount of work material, primarily paper, to the available space has not been fully possible. The evaluation indicates that the collapsible drawer file which opens into a desk has not been very successful. The basic idea was worth pursuing, but the furniture is perceived as uncomfortable and impractical by many employees. Preparing a bid requires lots of paper and the documentation often floods over onto extra tables. Overall, the office is perceived as crowded with no filing space.

"The lack of space is a minus and a plus," according to Tommy Hall. "Its a minus in the final phases of preparing a major bid which involves a lot of paper, but a plus in terms of filing and storage. It's incredibly easy to collect a lot of paper. You have to have a push – outside pressure – in order to change this behavior."



Tommy Hall spends part of his time guiding visitors around the Flexoffice. Many potential customers have shown interest in seeing the technical solutions in practice.

Things get pretty crowded when the paper flow begins to pile up. More table space is a big wish for many.

An office environment with thousands of possibilities. In a corner of the cafeteria, in a temporary project room – throughout the office, fellow employees are accessible, to one another and to the customer via the Freeset telephone.

A solemn promise

"Before we moved into these premises we cleaned house. Two boxes per person were allowed to be transferred into the new office, the rest was filed in the basement. Those of us who managed the project had to make a solemn promise that we could retrieve material from the basement in 30 minutes when required. So far, we've only has to keep this promise twice. Few request or miss the material that were cleaned out.

The open landscape office also has its good and problematic sides. It is easy to collect the various project bids. Often, the same person is juggling several projects simultaneously and it works much better that the 'project' has a fixed location, not the persons involved. Sometimes, however, it is difficult to work undisturbed in the constant hum and buzz.

"It takes time for changes and to start thinking differently. We do face situations when we are in the final throes of preparing a major bid and the entire office is like a beehive, with people running around and paper piling to the ceiling and someone who is not involved in this specific project is trying to read some heavy material. Then you have to remind people that its perfectly OK for them to take their papers and go home and work there instead," relates Tommy.

Easy to get information

"At the same time, the continuous buzz of information is one of the single largest gains with this type of work method. All types of information is assimilated without trouble and bureaucracy.

"There is always someone around who can answer questions. The new employees, in particular, view this as an advantage. Moreover, the skills library, which part of the Flexoffice concept, is available to everyone. Reference literature, handbooks and much more is collected in the library, which is open to everyone. Much of the 'information bank' is stored on data.

"It's important to update know-how about the technical aids available," says Tommy. "You can't just assume that a new employee can handle a certain computer program. When we started up we implemented a 'driver's license' for the office – with courses provided by Ericsson Data. Everyone was provided a change to try out the programs and system that were available. Since then there has been a lost of new things, particularly Internet."

Works in the long term

There are only five persons left of the original group that began working in the new office in 1993. Many of the employees transferred to new assignments in other Network Engineering units, in Sweden and abroad. The basic idea of the Flexoffice has functioned well, despite the changes. However, in this context, Tommy raises a warning flag.

"It's one thing to implement new methods in an operations with existing personnel who participate in the process of change. But it is difficult to make things work long term if the personnel turnover is too high. We've not always had the time to give new recruits that full picture and the background that we work in this fashion."

Provides business opportunities

The Flexoffice in Sundbyberg is just one of many pioneer projects aimed at developing new work methods within Ericsson. Just now a flexible office is being completed with Ericsson Telecom in the Alvsjö plant's old offices. Freeset telephones and a landscape office layout are also two key ingredients in this office. Flexoffice projects are also under way at Ericsson Radio in Kista.

Now Ericsson must capitalize on its own experience in its business activities. Ericsson's total offering of communications solutions can be combined and customized for small and large organizations, to facilitate remote locations, satellite offices and working from a distance, in a wide range of industries and environments.

Karl Malmström

Tomorrow's Workplace?

It's modern to thing innovatively. In most office-bound activities, there are major efficiency and productivity gains within reach with the aid of information technology. New work methods can save space. Few premises have such a low utilization rate as offices.

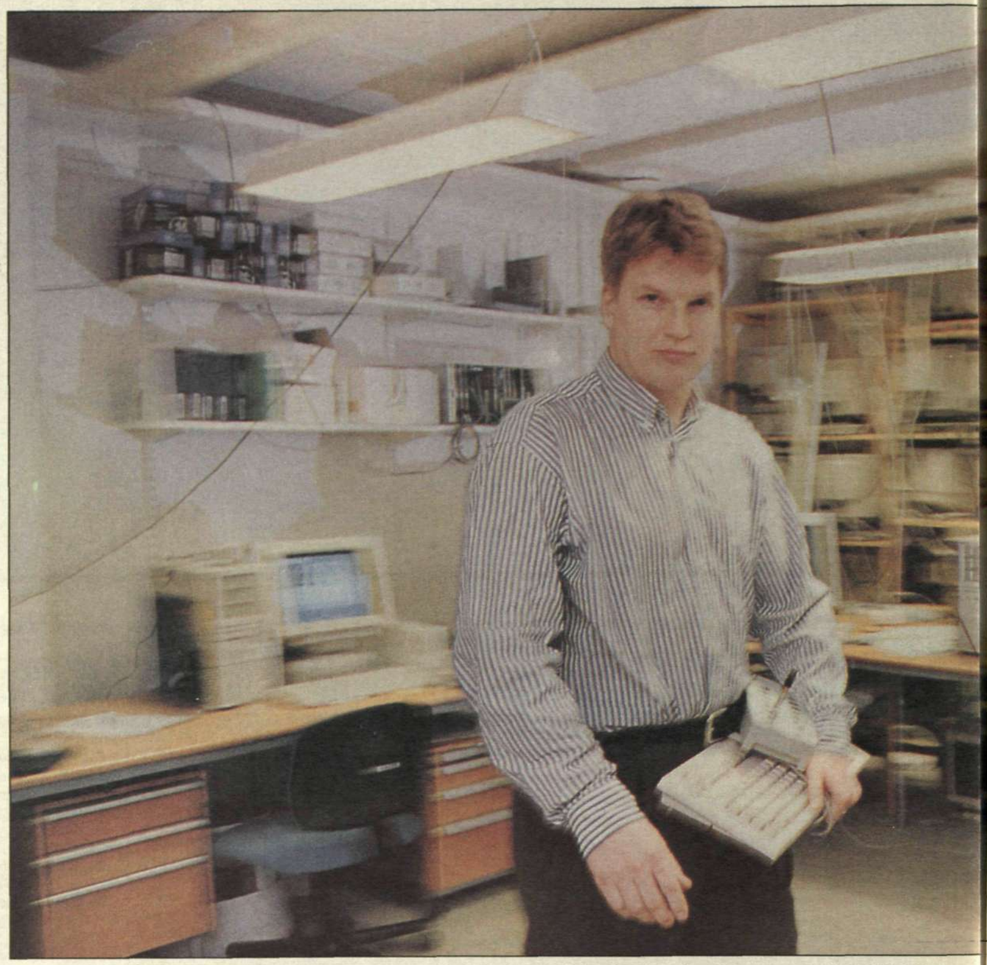
According to an American investigation, Bruce Lloyd's study, carried out at the end of the 1980s, the average utilization rate is only 5 percent, or 19 days a year.

Believe it or not – just count with an eight-hour work day, five days a week and take into account vacations, holidays and other absences, the equation works – 346 days a year, office space stands empty!

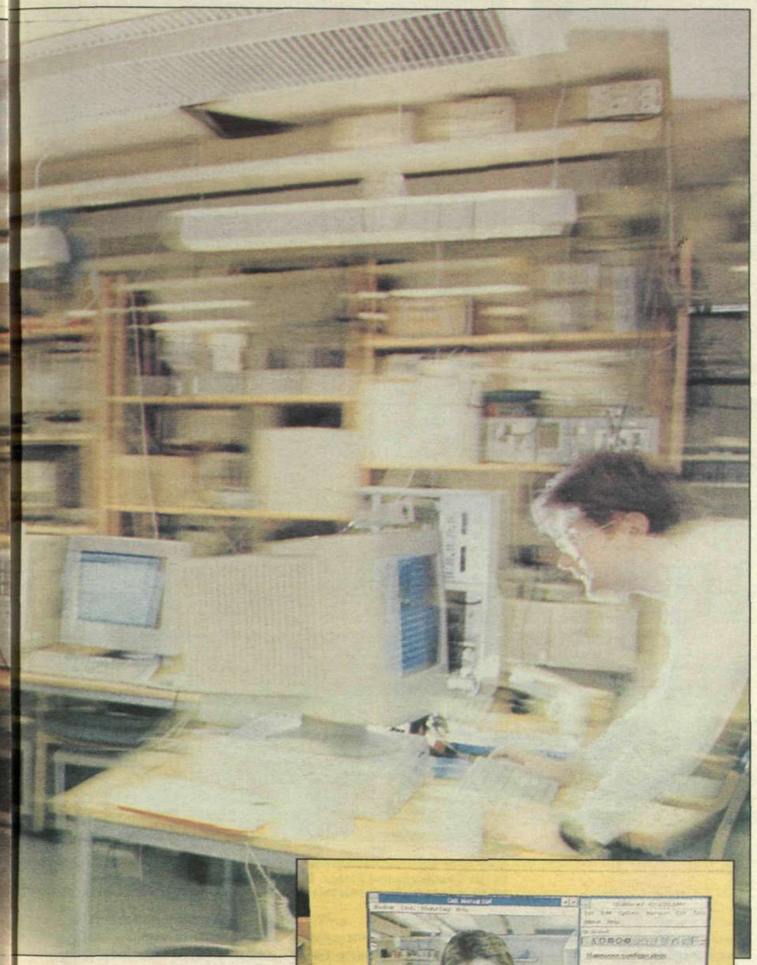
There is every reason to consider how large these premises have to be and how they can best be used.

Far away and yet so close

Under the name Consono Networked Interpersonal Multimedia, Ericsson is now introducing several products and complete packages for multimedia users. Multimedia Workgroup Node for the IsoEthernet standard is Ericsson's trump card and places the Group in the front line. The solution offers reliable, high-quality broadband transmission of voice, data and images.



Hans Strandberg with keyboard in hand makes his way to a multimedia station. With the help of IsoEthernet, real time communications with high image quality has become a reality. Only our imaginations limit possible areas of application.



This is what a multimedia screen looks like. Hans is seated in front of his, but where is the camera man? In the same room, or another city? The beauty is that it doesn't matter. Regardless of distance, image quality and immediacy are guaranteed.

Ericsson launches multi media package

When it comes to communications between people, the old adage, much wants more, stands true. Users are becoming increasingly sophisticated and networks more complex, while people still run around to each other with diskettes and accessory equipment is connected to individual users without ever being integrated into a network. When fellow workers are at a meeting or on a business trip, their fax machines and pocket telephones never stop ringing.

All in one

"Our multimedia solutions for company networks allow for the geographical dispersion of people who nevertheless work together. It may be a matter of a couple of stories in the same building, different buildings, sites, cities, countries or continents," says Hans Strandberg, who works on the production management staff for multimedia and broadband solutions in the Business Communications Division of Ericsson Business Networks. "We are now concentrating on establishing the concept of Networked Interpersonal Multimedia (NIM).

An important ingredient of NIM is "real time," which means we should be able to communicate immediately, here and now, transmitting images and data with the same ease we have become accustomed to for decades in using the telephone.

Gathering all media under one roof creates opportunities to increase coordination and job efficiency. It also clears the way for more flexible forms of work and new work methods.

Multimedia doctor

"In the medical and health care sector, there are many concrete areas of application in which multimedia communications, with perfect picture quality and in real time, can be an extremely important resource," Hans Strandberg says, and points to President Clinton's ambitious health care program in the U.S. as one example of a growing market.

"The Clinton reform would increase by a factor of 15 the number of Americans who now have access to health care. Hospitals and other health care institutions are not dimensioned for this type of increase. Small, local health care centers connected to large hospitals might be the solution. Several projects are now in progress in the United States to develop these possibilities.

The specialists will remain at the hospitals and be consulted with the help of multimedia. Image transmissions will provide the specialists with pictures of injuries or symptoms of disease. Based on these, the specialist will be able to make positive diagnoses and decisions regarding treatment or transfer to a large hospital. In parallel and integrated with image communications, doctors, patients and specialists can speak with each other and have access to the patient's medical records.

"Ericsson Business Networks is participating in a European project that has applied for financial assistance from the EU to develop 'telemedicine'," Hans continues. The project encompasses hospitals in Sweden, Ireland, England, Greece, Portugal and the Netherlands.

Shorten distances

Care for the elderly is another interesting area in health care and nursing. Service homes and nursing homes can be connected directly to hospitals, allowing problems to be solved via multimedia consultations. Medical resources and accessibility might actually increase, even though the number of persons involved is constant or less than today. Technology shortens distances and creates greater nearness. In fact, it is only our imaginations that limit the new areas of application that might be developed in society's social sectors by broadband multimedia.

The "Nintendo Generation" is a concept sometimes used to describe today's children and teenagers. They have grown up with video games and home computers, and are already accustomed to the multimedia age. The hesitation to accept new concepts, which can be detected in many people just a little older, might very well be followed by burning enthusiasm and demand as the younger generation makes its way onto the labor market.

The telephone revolutionized communications between people in its time and is still to this day obviously a very helpful instrument for everybody. The next step is to accept immediate image transmissions, a completely new dimension that is just waiting for more areas of application.

Training and industry

This type of thinking is hardly new in the educational training sector. Education from a distance and in decentralized forms has long traditions, and the area represents a large and expansive market for Ericsson's multimedia products and programs.

Other interesting target groups are different types of industries. Multinational companies often have large areas of activity spread throughout all parts of the world. These companies can benefit from their geographical dispersion. Different time zones on different continents make it possible to conduct business around the clock. Greater communications efficiency leads to increased opportunities to derive maximum utilization of resources.

"One example is found in the automotive industry. A project team began development work on a joint project, at the same time, and then worked in parallel in Sweden, the U.S. and Australia," says Hans Strandberg. "Travel, accommodations and premises were needed to gather the team for meetings when they checked and confirmed their progress during the course of the project. Multimedia in real time could be an effective complement to such interim meetings."

By meeting the market with new communications solutions at an early stage, Ericsson can provide for society's new needs and demands. The infrastructure that can be built by "electronic highways" can reduce some of the pressure on our conventional network of roadways. Of course, for example, mobile telephones provide opportunities to make better use of the time we are stuck in traffic jams, but it would be preferable to avoid traffic jams all together.

Technology can contribute to less personal travel requirements, while increasing the flow of information and personal accessibility. Environmental aspects represent driving forces for increased utilization of information technologies.

Regardless of where multimedia finds its areas of application, naturally it can never replace physical contact and togetherness among human beings. And that is not the intention. Technology serves mankind by creating more efficient work methods, something which in the long run will gives us all more freedom and more time, especially more time to spend with each other.

Text: Kari Malmström
Photo: Konny Domnauer

Students in a satellite classroom take an active part in the learning process. The teacher's instructions are shown in perfect clarity as they are formulated, even though several miles separate the classrooms. If you want to ask a question, just raise your hand.

Technique based on established solutions

The integration of voice and data has made rapid strides during recent years. Different interfaces, products and applications have captured the market. The integration of image transmission, however, has been a problem.

In image communications, a large amount of data is transported with a minimum of delay. Truly high-quality images require the use of broadband, that is, connections with higher capacities than are found in today's conventional networks. Reliability in real time requires that delays are minimal and consistent, that is equal at all times on both the transmission and receiving ends.

Ethernet + ISDN

IsoEthernet meets both requirements, and is based on two well-established standards, Ethernet and ISDN.

Ethernet is the totally dominant data network standard, with more than 40 million installed nodes worldwide. The combination of Ethernet and ISDN creates new opportunities.

ISDN is a well-developed standard that is used throughout Europe. The various operators naturally want value for their invested money, and they welcome new applications.

IsoEthernet has been developed by a commission working under the auspices of IEEE, the American standardization organization. National Semiconductor, one of the world's leading suppliers of chips, has spearheaded the work and now owns the IsoEthernet trademark. A number of other companies, including Ericsson Business Networks, have been part of the commission.

Multimedia package

Multimedia Workgroup Node, Ericsson's complete solution, consists of a network hub supported by a unit for IsoEthernet, a server for basic telephony and network control as well as equipment for the user's multimedia station, which consists of a PC with peripheral equipment that includes network adapters, a video camera, a coding unit for image transmission, headphones and a microphone.

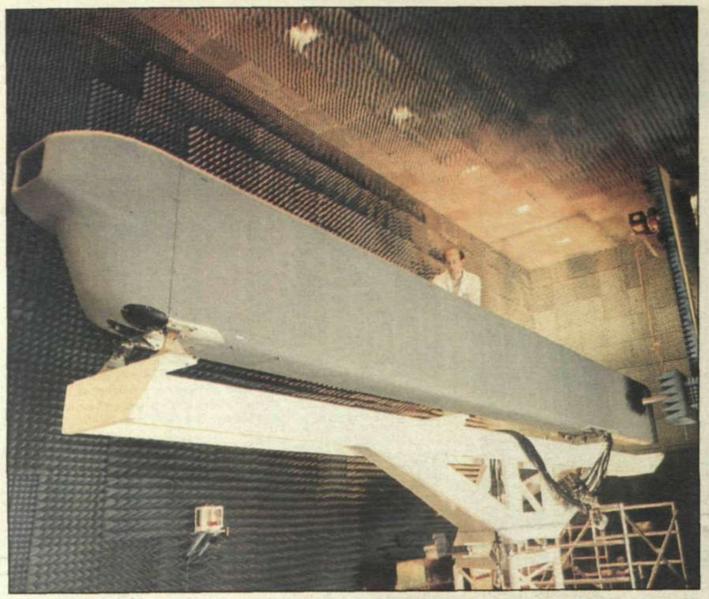
A maximum of 12 users can be connected to a multimedia hub in a local network. If the group wishes to communicate with other local networks over a Wide Area Network (WAN), a gateway is needed to distribute ISDN traffic. The server then manages and coordinates all communications, both internal and external.

Investment in future

"One or several multimedia groups can co-exist without causing any problems with the normal Ethernet network in a LAN. As in the past, multimedia users have access to complete information exchange with other networks. A customer who invests in our multimedia solution does not have to scrap earlier investments," Hans Strandberg explains.

"Neither do you lock yourself into a technology that risks becoming outdated. The products will also be adapted for use with ATM, when that day arrives. Isochronous Ethernet can do today what ATM is going to do tomorrow. Most analysts agree that ATM is the technique of the future, but there is still no common standard and some developmental work remains. The delay, which we must have control over in real time communications, is still a problem.

Consono Networked Interpersonal Multimedia will be marketed by Ericsson Business Networks, partly through Ericsson's traditional sales channels, such as local companies. In addition, these complete solutions, ready for immediate use, should also be well adapted for indirect sales.



The antenna box is mounted on the top of the airplane. It has a sandwich construction and is made of strong, light-weight material that permits the passage of impulses from the transmitters. The entire antenna weighs just over 900 kilos and is cooled by an air intake in the front and channels that pass through all transmitter/receiver units.

Erieye – a watchful eye in the sky

Ericsson's airborne reconnaissance radar system, Erieye, has been sold to the Swedish Armed Forces. The system is mounted on the top of small propeller planes like this Saab 340. Many attempts were made by the armed forces to simplify airborne reconnaissance radar before they decided to mount the antenna on top of the aircraft. There have been versions in which the radar was hung from the plane's torso, under a helicopter (expensive), and mounted on the wings of aircraft so that the radar was recessed in a revolving cargo area (unstable) and others.

Erieye, Ericsson's airborne reconnaissance radar that has been sold to the Swedish national defense, is a unique solution with significant economic advantages. As opposed to the rotating antennas used traditionally in airborne reconnaissance radar systems, Erieye works with a fixed control antenna mounted on top of the plane. The radar beam is pointed electronically by a method that optimizes the use of radar energy. The solution has made it possible for much smaller and cheaper airplanes to carry the radar system. As a result, even smaller countries can create the resources needed to effectively protect their air space.

The value of airborne reconnaissance radar is undeniable. Even as far back as WWII, the American Navy suffered many painful experiences of how difficult it is to detect low-flying enemy fighter planes from the surface of the sea. Because of the earth's curved shape, the radar horizon is only 20-30 kilometers away.

With airborne radar, however, planes flying at 10,000 meters displace the radar horizon to a distance of about 400 kilometers. The system's sensitivity is able to detect even small objects, such as cruise missiles, from long distances – 100-150 kilometers. These can be decisive margins.

Good view

Airborne reconnaissance radar provides a very good view of surrounding air space and, combined with fixed radar, is very important strategically.

Ericsson's airborne radar, Erieye, is the result of an order from the Swedish Air Force in the mid-1980s. The system may be characterized as a new step in technical development and is even referred to as the next generation of airborne reconnaissance radar.

Low costs

"The Defense Materiel Administration (FMV) of Sweden wanted an airborne radar system to meet all demands on high technical performance in terms of detecting and monitoring airborne targets and targets at sea, but, above all, a radar system that would cost much less than existing systems," says Gunnar Högberg, manager of the Erieye project office.

The solution was to develop a system that could be borne by small aircraft. Airplanes represent a major part of airborne radar system costs. It is a big advantage to be able to use conventional civilian planes, which not only cost less to buy but also incur lower service, maintenance and airport costs (and can land on short battlefield landing strips).

Fixed mounting

In the established American AWACS and Hawkeye systems, with the characteristic mushroom-like constructions on top of the plane, the entire mushroom – rotodome — rotates with the built-in antenna. Erieye has a long, narrow antenna mounted longitudinally on top of the plane, which provides simpler and cheaper installation and reduces air resistance. The system still covers a radius of 360 degrees, 180 degrees on both sides, but its best performance area is within 150 degrees abeam on both sides of the plane's flight direction.

The eight-meter antenna housing, i.e. its supporting and protective structure, is made of a strong, light-weight fiber-reinforced material, and the active antenna weighs no more than just over 900 kilos. The radar-positioning part of the antenna consists of a line of 192 transmitter/receiver modules in the middle of the structure, surrounded on each side by and connected to antenna elements. The latter are vertical wave guides, die-cut grooves from aluminum equipped with covers and a number of slits. The slits are designed to transmit or receive radar signals in the form of beams (lobes) in electronically controlled, optional directions.

The radar operates in the S-band, 3-4 Ghz. Using the Doppler technique, mobile objects can be distinguished and land and sea echoes filtered out.

The modules operate optionally on either side of the antenna. In a typical case, the plane patrols back and forth along a border, searching alternately to the right and left.

The radar frequency varies at short time intervals, partly to prevent intentional disturbances of the signals.

Point in any direction

Existing rotodome systems have a fixed scanning speed. Conversely, a radar system with a phase-control antenna can quickly point the beam in any direction with optimal flexibility.

"The direction of the beam is determined by the phase difference set by the control system between the vertical wave guides with slits which, combined with one line, comprise one flat antenna side," explains Sten Ahlbom of the Erieye project office.

"Demands on precision are so high that the antenna must be perfectly flat, with deviations of less than half a millimeter along the entire surface of its eight-meter length. The electronic phase control also has to be meticulously calibrated at frequent intervals to make sure the antenna lobes always have the exact appearance that is required.

(The lobes are aimed according to the Huygen principle, whereby every point in a wave surge can emit elementary waves in all directions. These waves multiply to form new wave surges. By varying signal phases from the different transmitters, the lobes can be formed and aimed quickly.)

Intelligent tracking

When the airplane is patrolling, the radar lobes scan the search sector in, for example, about 10 seconds. However, as soon as an object is detected, the system's intelligence is activated – a function called Adaptive Radar Control (ARC).

When the radar determines that the object is of interest, the lobes immediately jump back to the direction in question with intensified illumination before continuing the systematic sounding of the search sector. In cases involving objects that maneuver rapidly, the radar lobes return to the target over and over again to secure tracking and eliminate any risk of losing the object. If several objects of interest are detected at the same time, the search is concentrated on them, while less interesting directions are "skimmed over." Everything is designed to save radar energy and direct optimal power at the target.

The radar system is capable of tracking several hundred objects simultaneously before the system is saturated. The operator can prioritize which sectors or targets he wants to emphasize.

Control center

Erieye is not just an airborne radar system, but rather a complete system for the coordination of military and civilian control systems.

Erieye is used mainly in two ways. The plane is either a completely independent reconnaissance and control unit, with a control center on board (3-5 operators compared with nearly 20 for AWACS), or the system reports via a data link to a fixed control center on the ground. In the latter case, there are no operators on board and the radar function is controlled by commands from the control center. (In Sweden, reconnaissance radar missions are controlled from a military control center, StriC).

Early detection

The control center (fixed or airborne) maintains radio contact with its own fighter planes, and other forces, which stand ready for the order to take off and confront the alien object in the sky. The fighter planes fly for as long as possible using the information they receive from the control center and, to avoid disclosing his own whereabouts, the pilot will not turn on his own radar on until he localizes the target when he prepares to fire his missiles.

In future aerial combat, traditional "dog fights" will be avoided. The pilot who can fire off his missiles without actually seeing the enemy has the best chance of winning the battle.

Complete system

The Erieye concept is based largely on existing technologies but its application represents a unique design.

"We were the first to use electronically phase-controlled antennas for airborne reconnaissance radar, although there are similar solutions now," says Gunnar Högberg. "No other company, however, can offer a solution with such powerful radar mounted on such small aircraft."

The terminology surrounding Erieye is as follows:

The Swedish Air Force's name for the radar is PS 890, while FSR 890 (airborne reconnaissance radar) is the name of the radar mounted on aircraft.

The complete system, which Ericsson intends to sell in export markets, is called Erieye Mission System and includes PS 890 as the reconnaissance radar in a control system with an open computer architecture for interfacing with other complementary systems. Mission System encompasses the actual radar system as well as other equipment in the form of operator equipment, data links and other radio systems, navigational systems, recognition systems (friend or foe), signal reconnaissance systems and other features.

On order

The Defense Materiel Administration (FMV) of Sweden has ordered six Erieye radar systems from Ericsson. FMV recently took delivery of the first Saab 340 and the radar equipment will be mounted on the aircraft in May.

The systems on order will be delivered during the period from 1996-1999.

In closing, it can be noted that Erieye is also suitable for civil air purposes, for example in combating narcotics smuggling and in rescue operations.

Text: Lars Cederquist

VACANCIES AT ERICSSON

This is a selection of vacancies within the Ericsson corporation. They are published in the electronic News system, which is being updated once a week. For further information about advertising here, contact Birgitta Michels at Ericsson Events, HF/LME/A. Phone +46 871928 14.

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You should have a university degree in economics and/or engineering and a few years experience from work with Ericsson product administrative systems.

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ORDER COORDINATOR

You will be responsible from the acceptance of an order to successful delivery. This will include purchasing, coordination with external and internal people. S/W licence handling and shipment coordination. The products we handle are complex computerproducts tocustomers on the world market customers on the world m arket.

Your capability to work with many different contacts in an flexible environment with the goal to complete a successful delivlery is more important than long experience.

Contact: Mats Jonsson, +33 76624528 or Inger Agdahl, personnel, 08-7194761.

MARKETING

Ericsson Telecom AB, CU Basic Systems, Syst.Management, Västberga

COMMUNICATOR/ INFORMATION OFFICER

Our mission is to supply Ericsson with an AXE 10 platform and a future-proof system architecture. The tasks that this position involves include authorizing newsletters and brochures as well as presentation and promotion material, writing articles to spread information about Systemware and the systems management operation, developing new distribution channels for Systemware and developing information services that support cooperation between design centres within Ericsson as well as with other interested organisations. We work in a UNIX environment. Our workstations are outfitted with Framemaker for text and pictures and e-mail for communication over the Internet.

The person we seek should be fully familiar with the computer not only as a tool and a medium for creating text and graphics but as a means of communicating. If you have experience with Xmosaic or Netscape, it will be considered a merit. You should also be interested in – and preferably experienced in – writing technical information either as a journalist or as an information officer.

Contact: Åke Forsberg, 08-7195745, Memo ETXT.ETXAAF.

Ericsson Radio Systems AB, Marketing Support, Kista

AREA MANAGER – BUSINESS SUPPORT SYSTEMS

Within Ericsson Radio Systems a unit have been established to adress the Business Support Systems area. This unit has the responsibility to spearhead the Business Support Systems area, develop a portfolio of products and services, provide marketing support, establish and manage partnerships, select and certify products and other associated tasks. By addressing this area, Ericsson Radio Systems will offer new and existing operators servcies and products that will strengthen their competitivity and reduce Time To Market of new services, making Ericsson Radio Systems' total offering more competitive. You will be working in an informal organisation of highly motivated people, with excellent opportunities for personal development. The primary tasks are marketing support to local companies, marketing of concepts, services and products offerings developed together with Partners, responding to proposals, negotiations, and closing of contracts and partner management.

We are now seeking individuals with a track record in marketing and sales of Professional Services and integrated Systems and Solutions with emphasis on either Cellular Telecommunications or Information Systems. Such experience may have been acquired from positions either in the Software or System Integration or Telecommunications business. The successful candidate must be a highly motivated self starter with good interpersonal and communication skills, with a strong committment to personal performance. A strength would onviously be experience from Business Support Systems for Telcos.

Contact: Gunnar Borg, 08-4044400 or Lars Sandström, 08-7641387. Appl. to KI/ERA/LZ/HS Towa Raak.

Ericsson Telecom AB, BU Broadband Network Systems, Kungens Kurva

COMPETITOR ANALYST – PL MANAGEMENT SYSTEMS

Business Planning within Product Line Network Management is responsible for defining the overall direction of the Product Line, in accordance with the BU BNS business plan. This includes positioning relative to our competitors. We are looking for a Competitor Analyst who shall actively gather, analyse and structure intelligence on on our competitors. This information shall be distributed to concerned parties within the product line. The information shall cover competitors offerings, pricing policies, marketing activities and customer relations. The Competitor Analyst is responsible for providing monthly intelligence reports and quarterly overall analyses of the competitive situation.

The Competitor Analyst has the authority to initiate studies of competitors technical solutions. Contacts with many Ericsson units must be created and maintained.

Qualified applicants should have an academic degree within economics or engineering, the ability to absorb relevant facts from vast sources of information, be analytical and sceptical and have good communication skills.

Contact: Johan Bergendahl, 08-7193118 or 070-5936632, Memo ETXT.ETXJEBE.

HUMAN RESOURCES

Ericsson Hewlett-Packard Telecommunications AB, Västberga

HUMAN RESOURCE MANAGER

You will be responsible for developing and managing work in all areas within the Human Resources. We focus on competence development, management training, recruitment & induction, policy/salary/benefits. The HS Function is divided between Stockholm and Mölndal. Today there are totally three permanent and two temporary employees.

You need to have long experience of personnel management and management development. You must be able to manage rapid change and have perspective. It is desirable that you have experience from multi-cultural environment.

Contact: Mark Broms, 08-7192472, Memo EHSMARK. or Kjerstin Ljungqvist, personnel, 031-6726061, EHSKLT.

PLANNING

Ericsson Telecom AB, BU Broadband Network Systems

SEGMENT PLANNER – PL MANAGEMENT SYSTEMS

The Business Planning unit is responsible for defining the overall direction of PL Management Systems in line with BU BNS Business Plan. Identification and description of different customer segment and assist product management in product definitions for different segments. Together with solutions management define "type" solutionsaddressing different segments. Area of responsibilities will be to define different market segments and describe these with respect to business opportunities and need for management solutions. Internal and external interfaces will be marketing channels, product and

Qualified applicants should have a degree in MBA, good knowledge in telecommunication and telecommunication development, be an entrepreneur and have the ability to shift perspectives.

Contact: Johan Bergendahl, 08-7193118 or 070-5936632, Memo ETXT.ETXJEBE.

PRODUCT MANAGEMENT

Ericsson Telecom AB, CU Basic Systems, TN

PRODUCT MANAGER

to the Resource Module Platsform (RMP) area. A completely new application software architecture is being introduced in which RMP plays a fundamental role. You will have the full responsibility for keeping a product portfolio that is competitive and profitable throughout its life cycle. This includes frequent contacts with the BUs within BX, BR and MLCs throughout the world, end customers and also with the product provisioning organization.

A sound knowledge of the AXE-10 system combined with a business and customer orientation are of utmost importance.

Contact: Agne Jönsson, 08-7195089, Memo ETXT.ETX-AJN or Mats Bjerlöv, personnel, 08-7199675, ETXT.ETX-BJEL.

STRATEGIC PRODUCT MANAGERS PCS 1900, CMS40 NMS

The GSM based CMS40 system is expected to become one of the main cellular systems in North America, Canada and possibly South America. The new strategic product management unit LX/J within RMOG is responsible to convert market demands into product requirements towards R&D units. The new NMS section is responsible for all products within this area such as OSS, SOG, BGW plus future business support products. You will be working with drivingthe market requirements towards the design organization, provide product strategy and plans and develope our product portfolio. You will be in contact with our local product managers, design organizations and our market.

You have at least M.Sc. degree or equivalent and have a few years experience from system & design or product management or marketing. Knowledge from mobile telephony and specifically any of the areas TMOS, OSS, O&M or TMN is considered as very qualifying. You are analytical, open minded and have good written and oral communication skills, especially in English.

Contact: Michael Eslamian, 08-7571329, Memo ERAMRI or Erik Thorén, personnel, 08-4044959, ERAERTH.

Ericsson Mobile Communications AB, Kista

PRODUCT MANAGER RADIO MODEM S/W

The emerging field of Mobile Data creates opportunities for new and exciting data communications solutions. Wireless E-mail and mobile computing are examples of already existing applications. We are looking for a person to be responsible for Mobitex Radio Modem connectivity and S/W products. This includes handling of S/W releases, and implementing and further develop our terminal connectivity strategy. You will be working together with internal and external development centers and partners as well as our local sales companies.

Desired qualifications are university level degree in Engineering or computer Science, and experience with data communications design or implementation including PC and LAN. Fluency in English is a requirement.

Contact: Jan Nordgren, 08-7572435, Memo ECSNORD eller Kristina Johnsson, 08-7571449, ECSKRIJ.

PROJECTS

Ericsson Radio Systems AB, Kista

PROJECT MANAGEMENT, SYSTEM UPGRADE SALES AND DEVELOPMENT

RMOA has several new software packages with new functionality in deployment or development. We have nearly 60 customers outside US, who rely on good support from us to be competitive and grow. It is essential that all operators use the latest software for the efficiency of our support and for our revenues. A new project has been formed to sell and

deploy this system upgrade and ensure that the next software package will be used by our customer. The project has responsibility for sales material, sales support and deployment activities. The new S/W contains new features and contributes to improved In-Service- Performance.

We are looking for two new project managers to the system upgrade project. You should have international experience, several years of experience with MSC, be able to explain our system clearly and convincing both internally and externally and be a driving force for this international project.

Contact: Håkan Jonasson, 08-7572842. Appl. to KI/ERA/AH Enberg, Memo ERAKEG.

Ericsson Telecom AB, TN

FMp4 ISDN-E TEST LOCAL SUBPROJECT LEADER

The work involves planning and implementing both TSs and TIs for SFT and FT. Together with the sub-project leader and unit managers you are to estimate the resource needs and the time plan for all activities. Information flow is also an important activity, both meetings with managers, team leaders & testers and written reports.

Having knowledge and experience within ISDN/IUS and AM/HLPLEX are merits, but above all you should have the personnel skills to lead this task.

Contact: Ann-Caroline Lundberg, 08-7194077, Memo ETXT.ETXACK.

Ericsson Radio Systems AB, Kista

PROJECT MANAGERS FOR PCS NORTH AMERICA

PCS, Personal Communication Services, is a new emerging market for Ericsson in North America. Licenses have been auctioned to companies or consortia s who want to compete with existing operators. Ericsson has already signed contracts for supply of GSM-based PCS-systems to USA and Canada and we are in a very good position to receive more orders. Thus we need to expand our organisations both in USA and Sweden with more Project Managers.

1. If you are a Customer Project Manager with GSM-experience and want to work in North America, please contact the undersigned for more information.
2. To the Swedish organisation ERA/LJ/P Customer Order Management we also need Project Managers to fulfil all obligations from Sweden in the North American customer projects. As Project Manager in Sweden you will participate during offerings and contract negotiations with input to the implementation plans.

When a contract then is signed, you will take responsibility for fulfilment of all obligations from Sweden (material deliveries, resource) and work in close co-operation with the Customer Project Organisation in USA or Canada to achieve the project goals. We belive you have a technical background, have experience from project implementations or logistics, can take own initiatives and like to work in a co-operating team. You also need to be fluent in English, verbally and in writing.

Contact: Thomas Knutsson, 08-7572539, Memo ERATKO. Appl. and CV to KI/ERA/LFH Landén, personnel, 08-7572242.

TECHNOLOGY

Ericsson Telecom AB, TN

TECHNICAL CO-ORDINATOR BM-3

As technical co-ordinator in MB-3 from TG-3 to PRB you will actively work with support/control of design including introduction of new/changed functionality. You will also have an excellent opportunity to support the markets, product management and industrialisation people with technical knowledge in introducing the very advanced Transgate-3 product on the market.

You are system engineer interested in a broader perspective of things, or a persons with good technical knowledge in general interested in exploring the world of system development.

Contact: Hubert Przybysz, 08-7196154, Memo ETXT.ETXHPP, Per Öberg, 08-7195412, ETXT.ETXPOEB or Susanne borg, 08-7196575, ETXT.ETXUBO.

Ericsson Telecom, CU Basic Systems, Östersund

1. SOFTWARE DESIGNER/PROGRAMMER
2. MULTIMEDIA DEVELOPER
3. PROJECT MGR/MULTIMEDIA DEVELOPER

within the areas of Multimedia and WWW. Our section develops products within the area of IT (Information Technology) in Ericsson. In Östersund, we develop On-line documentation and Technology-based training for advanced electronic equipment and software. Our task is to make the technology comprehensible, clear and accessible to our users. Our channels are multimedia, computer-based training and WWW.

The software Designer/Programmer should have a thorough knowledge and experience of PC and/or UNIX software development.For all three positions: A Good command in English, outgoing and flexible, possess a healthy curiosity and like new challenges. Experience of graphical design and pedagogic experience is also a merit.

Contact: Magnus Jonsson, 063-157838, Memo ETXT.ETXPMJ. Appl. to ÖS/ETX/TX/FD Jonsson.

Ericsson Telecom AB, TN

A FEW GOOD MEN/WOMEN

wanted for Systems Management, GPLM-Network Intelligence (NI). We are looking for a few people interested in working in the challenging area of NI, where we have a few different positions open in the area of "general systems management", "project systems management" and "development portfolio co-ordination". You will work with general system and network issues for NI, both in projects and in non projects activities. You will be able to combine technical tasks with "management and coordination activities" to various extent which will give you an excellent opportunity to gain competence in several fields. The majority of the work is carried out in close cooperation with the technical expertise at NI design centres, other systems management functions as well as with product management for NI.

You are a system engineer, or similar, interested in working with total solutions. Experience in IN, General network issues ("narrowband", broadband or mobile) and knowledge in various system platforms are considered as merits.

Contact: Anders Blomgren 08-7190473, Memo ETXT.ETXASB, Kjell Persson, 08-7191767, ETXT.ETXKPW or Susanne Borg, 08-7196575, ETXT.ETXSUBO.

Ericsson Mobile Comunications AB, Kista

EDACS ENGINEER AFTER MARKET

After successful implementation of several EDACS Private Radio Systems, we now need an experianced radio technican to participate in field service both with support and direct service at our customers locations. Product and applications training will take place in Lynchburg. The position is based in Kista but the engineer is required to travel extensively within Europe, Middle East and Africa. You need to be creative and have initative. A good command in written and spoken English is a must. Your formal background is probably some degree in Engineering.
Contact: Lars Molin, +46 8 7641482, Memo ECSLMO or Kristina Johnsson, personnel, +46 8 7571449, ECSKRIJ.

Ericsson Components AB, Kista

DIGITAL SEMICUSTOM ASIC-DESIGNERS

We are looking for fresh MScEE, microelectronics, to a one year very focussed education aiming at Digital Semicustom ASIC design. After the education you will be a member of our design team for Digital Semicustom ASIC at MEST and you will be working within different development projects. MEST is a Corporate Core Unit working towards all of Ericsson mainly within ASIC design, OPTO and micro interconnect.

We believe that you are a person who like to work in teams and that you recognize the importance of communicating your knowledge and your experiences. The education starts 950828 with a four month theoretical part and is followed by an eight month project assignment starting 960115.

Contact: Björn Wiklund, 08-7574135, Memo EKABWI, Fax 08-7574326 or Christer Karlsson, personnel, 08-7574991, EKACHK.

Ericsson Radio Systems AB, Kista

JOIN THE PRIME PROJECT

A competence centra responsible for developing of mobile applications in new technology is established in Kista. Within the unit lays the responsibility of the first commercial products, HLR/AUC for CME 20 in AXE-N technology. We are a new unit working with Integration and Certification of these applications and are looking for engineers in

1. Configuration Management and

2. Integration testing & Certification.

1. This area includes a lot of challenges since the whole environment has to be built. The work involves release, change and version management, coordination towqards design projects, assembling of Test Beds and to see that the adequate environment exists. An advantage is if you have knowledge in the UNIX, buildsupport and C++.

2. The integration test and certification will be carried out in simulated and target environment. You will work with specification of test cases in TTCN to be executed for different phases in the development process. The work will be done in close cooperation with the design department. You have experience in testing and trouble shooting in the CME area. It is an advantage if you have worked with AXE-N.

Contact: Lena Furehed, Memo ERALEFU, Thomas Friberg, ERATHOF or Ann-Charlotte Sturesdotter, personnel, ERAASTU.

Ericsson Radio Systems AB, Kista

CMS 88 SYSTEM CHARACTERISTICS – MEASUREMENTS

The RMOA system unit in Kista is responsible for CMS 88 system characteristics. Examples of characteristics are network capacity, processor load, speech quality, delay time and link throughput. The work comprises investigations, simulations and calculations as well as collecting feedback from test systems and commercial operation.

We are looking for a system engineer with a special interest in measurements. The work includes travelling, mainly to North America. A suitable background could be system engineer or tester. Experience from AXE or cellular is a requirement.

Contact: Anders Söderlund, 08-7570454 or Osborn Hogevik, 08-7573379. Appl. to KI/ERA/AH Britt Bosrup, personnel, Memo ERARMOAA.

Ericsson Hewlett-Packard Telecommunicaltons AB, Västberga

S/W INTEGRATION ENGINEER

This position is responsible for defining the technical specifications of the product in accordance with the order, making the procedures to install and test the final S/W configuration at the Interation Center and for supporting the Integration Center. He/she needs to perform this mission, to put in place processes with suppliers/ partners who are part of the solution and set/check quality objectives of the deliveries.

Contact: Jean-Pierre Dinet, +33 76624527 or Inger Agdahl, personnel, 08-7194761.

Ericsson Telecom AB, BU Broadband Network Systems, Kungens Kurva

PRODUCT ENGINEERING – PL MANAGEMENT SYSTEMS

The Product Management Unit within Product Line Management Systems is responsible for the product portfolio within the unit. The main work will be to participate in the product definition work. Participation in the technical studies is necessary for guiding the product definition work. You will also support marketing units in technical presentations, discussions and answering of specification. You will be expected to understand the business ideas behind a particular product and its definition, contribute in all product related activities and to maintain knowledge about product facts. This also includes giving technical support to market activities. You will be responsible for the contacts towards design units, with third party suppliers, with marketing channels and customers. Participation in informal networks related to network Management within BU BNS.

Qualified applicants should have MS degree, be senior engineer with five years of experience in telecommunications and/or information technology, ability to work with minimum of supervision and take own initiatives within defined responsibility area, ability to function in networks and good presentation skills.

Contact: Johan Bergendahl, 08-7193119 or 070-5936632, Memo ETXT.ETXJEBE.

Ericsson Telecom AB, BU Broadband Network Systems, Kungens Kurva

SOLUTIONS MANAGER – PL MANAGEMENT SYSTEMS

Co-operation with Marketing and other Product Lines to pro-actively define combinations of right products, into solutions and services. Definition of solutions to fulfil the needs to identified segments, requirements to product management and ordering of complementary functionality. Interfaces internally and externally: (PL) Network Technology Planning and Product Management, (BU) Marketing, provisionintg, operations and product lines, LC/MLC and partners.

Qualified applicants should have the ability to function in networks, an overall view of the organisation and good communication skills.

Contact: Johan Bergendahl, 08-7193118, Memo ETXT.ETXJEBE.

EP Consulting Group, Business Area Design, Karlskrona

AXE10 DESIGNERS/TESTERS

We are a 100 % Ericsson Consultant Company residenced in Karlskrona, a city in the southern part of Sweden. Our AXE 10 design organisation is facing a very interesting future, such as the full responsibility for design/maintenance of the NMT 450/900 mobile telephony system as well as the most common AXE 10 integrated traffic load generators.

Our OPM function needs an experienced AXE 10 designer. OPM takes care of various technical studies and have the full responsibility for pre-studies and requirements handling towards the Product Line and Mobile Operators. The maintenace team needs an experienced trouble shooter. We are today maintaining Phase 60/61. In September we will take responsibility for Phase 65 and next year we will take care of Phase 69 after FOA in Q2/96. Our design-team needs an experienced designer and a testleader. We will in May start execution phase, NMT/PH69. To the Testtools-Tecnical Coordinator/Product Responsibility area we are searching for an experienced AXE10 designer/tester. We are running a 20 kmhr testtool project towardsFMp4 and are product responsible for TLS products and BASEMU.Other products we are working with are SUB-SIM and TTCN.

You will work with advanced technology in a growing young organization. Close to work and several opportunities to leisure time along the Baltic or in the province which are called "The Garden of Sweden", in short "QUALITY OF LIFE" for you and your family.

Contact: Klas Nyström, 0455-543890, ECN 8644389, Memo EPK.EPKNYS, Annika Karlsson, 0455-54908, ECN 8644908, EPK.EPKKAR or Rickard Liden, 0455-54990, ECN 8644990, EPK.EPKRL.

INTERNATIONAL

Ericsson Telecom AB, CU Basic Systems, Västberga

SYSTEMS ENGINEERS FOR NETWORK ARCHITECTURE

Our section is part of the Systems Management department and operates within Network Development, Operation & Maintenance and Network Synchronisation. Team NetworkDevelopment evaluates Networ k Architecures, concepts and scenarios. It also works within the area of Networking & Call Control and evaluates methods for Network Specification. Team Network Synchronisation acts as competence center and team Operation & Maintenance issues on a network level, with focus on AXE 10, TMN and new areas, such as TINA. Among our tasts are e.g. prestudies, system requirement specifications, standardisation, reviews and development of systemware. We cooperate with most BA/BU/MLCs and are an active participant of the global Systems Managemnt Network (SMN).

Contact: Josef Flodell, 08-7194198, Memo ETXT.ETXJFLO, Måns Ulfsparre, 08-7198243, ETXT.ETXUSPA, Erkki Heinonen, 08-7192751, ETXT.ETXEHE or Theo Kanter, 08-6811247, ETXCT.ETXKAN.

Ericsson (China) Company Ltd, Beijing, China

OPERATIONS MANAGER – REGION NORTH

As Operations Manager you are responsible to manage and develop the Operations organization within the region with the objective to achieve customer satisfaction in project implementation. A key responsibility is to ensure that local staff are trained and developped in the various disciplines required for Operations.

The successful candidate shall have minimum eight years experience from an Operations environment and at least two years experience from a Management position at same level, good leadership and negotiations skills. You will be offered minimum one year assignment with family or on single status.

Contact: Bernt Hult, Memo ETC.ETCBEH or Magnus Ask, personnel, 08-7197481, LME.LMEMASK. Appl. to HF/LME/DK Ask.

Nanjing Ericsson Communication Co Ltd, Nanjing, China

PURCHASING MANAGER

ENC is a Joint Venture Company between Ericsson and a local Chinese partner. The Company is responsible for Ericsson activities in central China. You will be responsible to build up and develop a function for local procurement.

You shall have experience in the area of switching and electronic equipment as well as knowledge and experience in purshasing routines and setting up supply agreements with external customers. You shall have international experience and good command in English, written as well as spoken. A key responsibility is training and development of local staff, so you shall be a good leader and communicator. You will be offered minimum one year assignment in the Jiangsu province.

Contact: Hans Bertil Pålsson, Memo ETC.ENCSHBP or Magnus Ask, personnel, 08-7197481, LMEMASK. Appl. to HF/LME/DK Ask.

Ericsson (China) Company Ltd, Beijing, China

ENGINEERING MANAGER – OPERATIONS REGION NORTH

Our new organization in China consists of four regions. The regional offices are responsible for all Ericsson s business in respective geographical area. You will organize, manage and develop the Engineering department so it fulfils the markets engineering needs in terms of delivery precision and quality. You shall develop methods and documentation to ensure uninterrupted implementations. A key responsibility is training and development of local staff.

The successful candidate shall have excellent knowledge of engineering routines and methods as well as good knowledge of all other processes in the order flow. You shall have around five years experience from a similar position. Minimum one year assignment with family or on single status.

Contact: Bernt Hult, Memo ETCBEH or Magnus Ask, personnel, 08-7197481, LMEMASK. App. to HF/LME/DK Ask.

Ericsson (China) Company Ltd, Beijing, China

LOGISTICS MANAGER – OPERATIONS REGION NORTH

Our new organization in China consists of four regions. Th regional offices are responsible for all Ericsson s business in respective geographical area. You will organize, manage and develop the Logistics department and secure optimal flow of materials for the projects to enable a timely execution and uninterrupted progress. You will also be responsible for all local procurement as well as training and development of local staff.

The successful candidate shall have excellent knowledge of logistics routines and methods as well as good knowledge of all other processes in the order flow. You shall have around five years experience from a similar position. You will be offered minimum one year assignment with family or on single status.

Contact: Bernt Hult, Memo ETC.ETCBEH or Magnus Ask, personnel, 08- 7197481, LMEMASK. Appl. to HF/LME/DK Ask.

EP Consulting Group, Ronneby

CONSULTANTS – METHODOLOGY SUPPORT FOR SOFTWARE REUSE

EP Consulting Group in Sweden is made up of consultants in the field of telecommunication and information technology. The company is divided into the three business areas Design, Business and Networks. We work primarily with development and handling of complex software systems, methods for design of generic and reusable IT-systems and customer adapted training. EP Consulting Group has approximately 400 employees. Right now we need to hire a number of new employees. Our headquarter is located in Karlskrona but we also have offices in Ronneby, Hässleholm and a subsidiary in Lund. EP Frameworks in Ronneby is a unit within EP Consulting Group. We work with methods for effective software reuse. The methods are developed internally and in European research projects. System development is specialised according to object-oriented techniques and use state-of-the art methods and development tools. Reusability is made possible by general design within an object-oriented framework. Thus, the parts

common to a product family or range of applications can be used in various implementations. We take a holistic approach to our work which means that we work with all parts of the process: project management, organisation, quality control and coordination as well as specification, design and implementation. Today we coordinate a project within Ericsson called Reuse Support Project to spread and market knowledge and ideas about reuse within Ericsson. We can offer you an interesting job in a very successful company. We work both in Swweden and abroad and the job will include travelling. Our businesschanges continuous ly and therefore you need to be able to cope with changes.

We are around fifteen consultants today and we need to expand. You are a Master of Engineering or a System Analyst in computer science, have experience from software development and want to improve the methods used in software development. Then contact us immediately.

Contact: Magnus Nilsson, +46 457 775 00. Appl to EP Framework, Att. Nilsson, Soft Center, S-372 25 Ronneby, Sweden.

Ericsson Corporation, Moscow

BZ MANAGER

During 1994 Ericsson has started a company in Russia, Ericsson Corporation (ECR) with Yngve Reding as a manager. We work on the Russian market with PBX sales as well as major complex projects.

The new BZ manager should have a genuin Ericsson background, preferably with experience from several business areas. Experience from working abroad is very important. Knowledge of the local conditions is a great benefit. Important qualities are ability to develop and lead an organization of sales, installationand service. You should beinterested in, in the long run, learnin g Russian and the experience demands says that you are over 40 years old.

Contact: Svante Axling, 08-4220368, Memo EBCSAX or Jan Lagerborg, personnel, 08-4220370, EBCJGLA.

Ericsson Communications Canada, Techn. Assistance Centre, Montreal

APZ SUPPORT ENGINEER

The job involves technical support for USA and Canada within the APZ field. we require a self motivated person, with in depth knowledge of trouble shooting methods as well as the ability to perform technical investigations into all aspects of APZ SW/HW problems in the CP/RP/EMRP. You must have proven ability in Test System, CPT and System Stoppage Handling. It will be necessary to Handle ongoing Trouble Reports, therefore knowledge of MHs would be an advantage. The position will take the form of a Two year Long Term contract and will be based in Montreal, although some travel will be required as well as pager rotation and interwork with other Support groups within EMC.

It is essential that the candidate be fluent in english. You possess the above characteristics and have the ability to communicate with tact and diplomacy.

Contact: Adrian Gilli, Memo LMCADGI or Christian Giroux, LMCCGIR.

Global Response Center, Ericsson Customer Services, Australia &Holland

AXE 10 SPECIALISTS SUPPORT ENGINEERS

This is a demanding and rewarding post involving Technical Support within the APZ area. We require in depth knowledge of trouble shooting on AXE 10, Emergency support, and the ability to fault find and solve problems in CP, RP, EMRP areas.

You will be supporting other Ericsson Field Support centers, & so must have the confidence and experience to meet this challange with high quality results. You will have a positive attitude to change, and a desire to improve the quality of the products and processes used in the GRC.

You will have excellent personal skills in handling customers and other Ericsson organisations, and be self reliant and highly motivated.

Contact: Andreas Luiga, Memo EPA.EPAADL, Dave Eales, ETM.ETMDES or Karin Hamberg, ETXT.ETXKAON.

Ericsson (China) Company Ltd, China

REGIONAL FINANCIAL CONTROLLERS

Our new organization in China consists of four regions. The regional offices are responsible for all Ericsson s business in respective geographical area. We are now building up the Regional Organizations and need to recruit Regional Financial Controllers who will report directly to respective Regional Manager (who are Executive Vice Presidents of ETC). We have vacant positions in Beijing, Shanghai and Guangzhou. You will be responsible for all financial activities in the region such as budgets, estimates, forecasts, accounting, prepration of financial reports and business controlling and for cost- and cash management within the region. You will liase with the Financial function at ETC in Beijing and work closely with them in development of supporting systems and implementation of ISO 9001. A key responsibility is to ensure that local financial staff employed in the region are getting adequate training and development.

The persons we look for shall have extensive working experience in the field of accounting and financial controlling. Knowledge in FIRE reporting is a merit. You must be able to work independently, take own initiative and have good communciation skills on all level in a complex organization in China consisting of central functions in Beijing, a regional organization and Joint Venture companies. You will be offered minimum one year assignment with family or on single status.

Contact: Hans Falenius, Memo ETC.ETCHANS or Magnus Ask, personnel, 08-7197481, LME.LMEMASK.Appl. to HF/LME/DK Ask.

Dalian Ericsson Communication Company Ltd, Dalian, China

HUMAN RESOURCES/ ADMINISTRATION MANAGER

DEC is a Joint Venture Company between Ericsson and a local Chinese partner. The Company is located in Dalian in the Liaoning province in Northern China. As HR/Admin Manager you will report directly to the President of DEC and you will be responsible to build up an Administration/- Human Resources function in the Company. A key task is to employ, train and develop local personnel who can take over the responsibility for the Admin/HR function when your assignment is completed. You will also develop and implement HR policies and Administrative routines and systems, following guidelines set by ETC (The Major Local Company in China).

You must have experience from an Human Resources Management position. Knowledge of administrative routines and systems as well as good command of the English language are other important qualifications. You must be a good leader and communicator and have a sincere interest in training and development of other people. You will be offered a 6 – 12 months assignment.

Contact: Bernt Söderström, Memo ETC.ETCBIS or Magnus Ask, personnel, 08-7197481, LME.LMEMASK. Appl. to HF/LME/DK Ask.

EP Consulting Group, Business Area Design, Karlskrona

AXE10 DESIGNERS/TESTERS

We are a 100 % Ericsson Consultant Company residenced in Karlskrona, a city in the southern part of Sweden. Our AXE 10 design organisation is facing a very interesting future, such as the full responsibility for design/maintenance of the NMT 450/900 mobile telephony system as well as the most common AXE 10 integrated traffic load generators. Our OPM function needs an experienced AXE 10 designer. OPM takes care of various technical studies and have the full responsibility for pre-studies and requirements handling towards the Product Line and Mobile Operators. The maintenace team needs an experienced trouble shooter. We are today maintaining Phase 60/61. In September we will take responsibility for Phase 65 and next year we will take care of Phase 69 after FOA in Q2/96. Our designteam needs an experienced designer and a testleader. We will in May start execution phase, NMT/PH69. To the Testtools-Tecnical Coordinator/Product Responsibility area we are searching for an experienced AXE10 designer/tester. We are running a 20 kmhr testtool project towardsFMp4 and are product responsible for TLS products and BASEMU.Other products we are working with are SUBSIM and TTCN.

You will work with advanced technology in a growing young organization. Close to work and several opportunities to leisure time along the Baltic or in the province which are called "The Garden of Sweden", in short "QUALITY OF LIFE" for you and your family.

Contact: Klas Nyström, 0455-543890, ECN 8644389, Memo EPK.EPKNYS, Annika Karlsson, 0455-54908, ECN 8644908, EPK.EPKKAR or Rickard Liden, 0455-54990, ECN 8644990, EPK.EPKRL.

Ericsson (China) Company Ltd, Guangzhou, China

SENIOR MARKETING MANAGER BX

The Chinese telecommunications market is dynamic and growing fast. The rate of growth has attracted all major telecom suppliers to deploy important resourses to secure a share of the more than 100 million fixed lines planned for installations by the end of the decade. Ericsson (China) Company Ltd is building up resources to meet this demand. We now need to recruit a Senior Marketing Manager who will be based at our Branch Office in Guangzhou and with marketing responsibilities for BX products and services in the Southern part of China.

You will be responsible for preparation of customer offers and related discussions, both technical and commercial, as well as independently finalize agreements in accordance with given instructions. You will also prepare technical proposals for solutions networks and reach agreements with the customer.

You shall ideally be 35 – 40 years old and have a number of years experience of above tasks within the Ericsson Organization. You shall have competence in marketing, knowledge of Ericsson products, good command of the English language and be open to new cultures. You will be offered minimum one year assignment.

Contact: Anders Larsson, Memo ETC.ETCLARA or Magnus Ask, 08-7197481, LME.LMEMASK. Appl. to HF/LME/DK Ask.

Ericsson Australia Pty. Ltd, Melbourne, Australia

AMPS/DAMPS SUPPORT/ VERIFICATION ENGINEER

Several vacancies exist at EPA for AMPS/DAMPS Mobile Support Engineers. We are responsible for verification, integration deployment and supportof all AMPS/D-AMPS networks in the rapidly expanding Asia/Pacific region, including the largest contiguous AMPS network in the world.

We are looking for self-motivated, experienced and customer focussed personnel who are willing to participate in the development of our team, aiming to be the centre of excellence in the region. Applicants must also possess at least three years software test, support or design experience with highly developed fault fixing abilities, excellent AXE and Mobile systems knowledge, excellent verbal and written communication skills and be in a position to start almost immediately.

Contact: Michael Pease, +61 3 3011880, Memo EPAMJP or Connie Malligeorgos, +61 3 3011864, EPACMM.

Ericsson Ltd, Burgess Hill, United Kingdom

SOURCE SYSTEM MANAGER

This vacancy involves responsibility for Source System Handling for the UK Source Systems , AXE10.

You will need
- a minimum of 4 years AXE10 development experience
- proven experience of AXE10 development processes
- knowledge of AM based development
- a structured and methodical approach
- all round communication skills
- to be able to travel frequently
- the advantage of management experience

This will give you the ability to be primarily responsible for ensuring the UK systems development is in line with Globally established architecture principles.

This position is available immediately.

Contact: Paul Langley (memo ETL.ETLPDLY , email etlpdly-Öetlxd20) or Tim Bentley (memo ETL.ETLTJBY).

Ericsson Hewlett-Packard Telecommunications AB, Stockholm/Mölndal

R&D MANAGER

You will be responsible for managing an efficient development organisation including system/architecture and project management. This unit is new and most of the staff comes from a large product development organisation. 30% of the staff comes from a functional unit which today includes customer related installa- tions and system integrations activities. About 20% of project hours are sold as certification services to ETX and partly ERA. You will be reporting directly to our President. The unit is geographically devided between Stockholm and Mölndal.

You need to have good track record of design management. International assignment will be a merit. You need experience from telecom products and software products and a good under- standing of customer operator processes. You need to be very resultoriented and have proven communication and leadership skills. You have to be able to manage rapid change, and company growth. You need als to be outstanding in building teams and competence development.

Contact: Mark Broms, 08-7192474, Memo EHSMARK or Anette Oké-Brådman, personnel, 08-7198287, EHSAOKE.

Ericsson Telecom AB, CU Basic Systems, Västberga

SYSTEMS ENGINEERS FOR NETWORK ARCHITECTURE

Our section is part of the Systems Management department and operates within Network Development, Operation & Maintenance and Network Synchronisation. Team NetworkDevelopment evaluates Networ k Architecures, concepts and scenarios. It also works within the area of Networking & Call Control and evaluates methods for Network Specification.

Team Network Synchronisation acts as competence center and team Operation & Maintenance issues on a network level, with focus on AXE 10, TMN and new areas, such as TINA. Among our tasts are e.g. prestudies, system requirement specifications, standardisation, reviews and development of systemware. We cooperate with most BA/BU/MLCs and are an active participant of the global Systems Managemnt Network (SMN).

Contact: Josef Flodell, 08-7194198, Memo ETXT.ETXJFLO, Måns Ulfsparre, 08-7198243, ETXT.ETXUSPA, Erkki Heinonen, 08-7192751, ETXT.ETXEHE or Theo Kanter, 08-6811247, ETXCT.ETXKAN.

Ascom Hasler AG, Berne, Switzerland

AXE SERVICE AS & TEST

In the Services AS&Test unit there are sveral open positions:

TEST CONFIGURATION MANAGEMENT ENGINEER for assistance in a TCM group. This is maintaining the test channels we have for maintenance of our current application systems (Transit/base BM2.0, Local/base FMp1/FMp3, IN/base IN2.4). All of our testchannels are equipped with APZ 212. In addition we have a project starting with adding Generic Functional Protocol to the base FMp3.

Required are proven 2 years experience in TCM (Program Production, PLEXView Data Base Handling, Dump Assembly, Exchange Data, Dump Handling, Correction Handling, Handling of SP/APZ).

TROUBLE SHHOTER FOR IN SERVICE PROBLEMS of our ISDN application system with ca. 120 exchanges in service (Local FMp1/APZ 212, Transit BM2.0/APZ 212). Later in 1995 there will be also Local/FMp3 and IN/IN2.4 systems. The job is solving problems reported by our customer (Swiss PTT) in live exchanges, especially System restarts, hanging devices, EMRPD/EMRP restarts.

Required are proven good knowledge of APZ and APT, especially ISDN, with at least 3 years experience in trouble shooting and problem solving.

Contact: Ljutic Zvonko, + 41319991623 (Mobile:++41893002903) Memo EXTR.XHALJUT.

Nanjing Ericsson Communication Co Ltd, Nanjing, China

PURCHASING MANAGER

ENC is a Joint Venture Company between Ericsson and a local Chinese partner. The Company is responsible for Ericsson activities in central China. You will be responsible to build up and develop a function for local procurement.

You shall have experience in the area of switching and electronic equipment as well as knowledge and experience in purshasing routines and setting up supply agreements with external customers. You shall have international experience and good command in English, written as well as spoken. A key responsibility is training and development of local staff, so you shall be a good leader and communicator. You will be offered minimum one year assignment in the Jiangsu province.

Contact: Hans Bertil Pålsson, Memo ETC.ENCSHBP or Magnus Ask, personnel, 08-7197481, LMEMASK. Appl. to HF/LME/DK Ask.

Ericsson Ltd, Cellular Systems & Special Networks Div. Guildford

PRODUCT ENGINEERS – NPN AND PCN

Product management at ETL/R works towards cellular operators such as Vodafone & Mercury. We are also having a growing involvement in providing the product management needs of the New Public Operators (NPN) for the UK. These operators have been established as a result of the ongoing liberalisation of the UK market and are active in such diverse areas as international reselling, competitive access provision and cable TV. We currently have several openings to work in NPN Product Management. You should have at least 5 years experience from a system design, operational product management or product manage- ment area. In addition you should have solid experience in AXE and one or more of the following areas: IN, transmission, access, switching, broadband and TMOS.

In addition we are also looking for individuals to work towards customers Mercury & Vodafone on the cellular side (PCN). You have at least 5 years experience from a system design, OPM or product management area. In addition you should have solid experience in AXE from one of the cellular product lines CME20, CMS88 and CMS30,preferably CME20. Both radio or switching competencies are required.

Contact: Helen Edmonds, personnel, Memo ETLHNES. Senior Personnel Officer at Guildford MEMO ID ETL.ETLHNES

Ericsson's 75,000 employees are active in more than 100 countries. Their expertise in switching, radio and networking makes Ericsson a world leader in telecommunications.

This statement, which is included in all Group press releases, is no exaggeration. A glance at the 1994 Annual Report confirms its validity. The yearly Group Review presents the impressive list of all of the Group's most important orders during the past year.

Around the world on two pages

There was a striking upturn in investments in telecommunications in 1994. The driving force was the continuing very strong growth in mobile telephony, and the market for wired telecommunications networks also recovered following the relatively low rate of activity in recent years.

The most important factor, apart from the generally improved economic conditions in most of Ericsson's key markets, was the activity in the wake of widespread deregulation measures or in anticipation of such measures. New operators who have entered the telecommunications market are now consolidating their positions, while many large traditional operators are accelerating their investments in order to create the strongest possible positions when their markets are deregulated within a few years.

Here are all of Ericsson's most important business transactions in 1994

Europe

■ In October, Ram *Belgium* also selected the Mobitex system for the mobile data network that RAM Mobile Data is building in the country. RAM had earlier chosen Mobitex for networks in the United States, Great Britain and the Netherlands.

In August, Belgacom placed an order for an ERMES personal paging system.

■ Early in the year Tele *Danmark* chose Ericsson to supply the nationwide personal paging network based on the ERMES standard that is to be installed in Denmark.

■ In July, Ericsson's licensee in *Greece,* Intracom, received a contract valued at sek 680 million over a two-year period from OTE, the Greek telecom operator.

■ In April, PTT *Netherlands* showed its continuing confidence in Ericsson as a system supplier. The Company will deliver AXE equipment amounting to sek 800 million over the next few years.

■ Moscow Cellular Communication (MCC) in *Russia* placed an order with Ericsson covering expansion of MCC's NMT450i system with new software, base stations and switching equipment.

In January, an oil and gas combine in the Siberian city of Nizhnevartovsk awarded a contract, valued at sek 160 million, for a private telecommunications network.

■ In November, Telefónica in *Spain* signed a framework agreement with Ericsson covering deliveries of AXE during the next few years. The contract is worth more than sek 4 billion.

■ In May, Cellnet in *Great Britain*, a company owned by British Telecom (BT), ordered GSM equipment costing sek 110 million.

During the year, Mercury One-2-One, which operates Great Britain's first personal communications network, ordered additional equipment valued at sek 1.6 billion from Ericsson.

In December, Vodafone placed a contract calling for the delivery of GSM equipment and trunk switches. The equipment will enable Vodafone to increase the capacity of its British network to 700,000 subscribers.

The British Broadcasting Corporation (BBC) ordered MD110 equipment to expand its corporate communications network by 3,000 lines. This contract marked the high point of very successful sales efforts in March, when 23,000 lines of MD110 equipment were sold in Great Britain.

Eurobell, a new telecom network operator in Great Britain, awarded a contract for AXE, MD110 and other equipment to be used in a new network serving 240,000 subscribers in southern Devon.

■ Telia Mobitel in *Sweden* ordered equipment with which to build an intelligent network for mobile telephony. The order comprises three AXE exchanges.

During the year the Swedish Defense Materiel Administration placed an order for land-based equipment for the Swedish Air Force's new TARAS radio communications system.

In March, Telia signed a contract for the largest private data communications network to date in Sweden. The order, placed on behalf of AB Trav och Galopp (ATG), is worth sek 300 million.

■ In September, Gesellschaft für Datenfunk mbH (GfD) in *Germany,* selected Ericsson to supply the mobile data network for which the consortium had received an operator's license earlier in the year. With this contract, Mobitex captured another important market in Europe.

■ Contracts were signed during the year with a number of the new operators of local telephone companies in *Hungary.* In February, a contract valued at sek 300 million was also received from HTC, the Government telecommunications operator in Hungary. The contract was the largest to date for Ericsson in Hungary.

In March, Matav, another Hungarian operator, ordered a RAS1000 system at a cost of sek 110 million. The system will be used to connect subscribers in the Budapest area to the wired telecommunications network by means of radio technology.

North America

■ MFS Communications Company Inc. and Ericsson in the *United States* signed a global purchasing agreement. Under terms of the agreement, MFS will buy AXE equipment and services costing more than sek 2.2 billion from Ericsson during the next four to five years. MFS is planning to expand its network to cover 75 cities in many parts of the world.

In March, in the Dallas-Fort Worth area, Ericsson implemented the world's largest single system replacement for Microtel, a subsidiary of McCaw Cellular/LIN Broadcasting.

Latin America

■ A contract valued at sek 275 million for AXE equipment was signed with Telecom *Argentina* in March.

■ In *Brazil,* in March, Companhia Paulista de Força e Luz (CPFL) placed a sek 235 million order for an EDACS system.

■ The *Colombian* long-distance operator, Empresa Nacional de Telecomunicaciones (TELECOM) ordered AXE equipment for trunk exchange applications and intelligent networks. The contract was worth sek 144 million during 1994.

■ Teléfonos del Noroeste (Telnor) in *Mexico* awarded Ericsson a contract, in the amount of sek 135 million, to supply and install AXE and SDH equipment.

■ In *Peru,* Ericsson received an order worth sek 350 million from Telefónica Peru to deliver AXE equipment.

Asia

■ In *Bahrain* in March, Bahrain Telecommunications Company (Batelco) ordered a nationwide GSM network that will have a capacity for 15,000 subscribers.

■ Digitel, in the *Philippines,* in December awarded a contract for a complete telecommunications network for the island of Luzon. The contract is valued at sek 790 million.

■ SmarTone Mobile Communication Ltd., the operator in *Hong Kong*, ordered GSM equipment valued at sek 140 million to expand its network.

■ In March the Department of Telecommunications in *India* awarded Ericsson a contract covering 100,000 lines of AXE.

Bharti Cellular Ltd. became the first company in India to sign a contract for a mobile telephone network. The network, of the GSM type, is to be supplied by Ericsson and will initially have a capacity of 25,000 subscribers in the state of Delhi.

■ In *Japan,* Digital Tu-Ka Kyushu became the fourth operator in that country to order a digital mobile telephone system from Ericsson. The contract, signed in September, is worth sek 630 million.

Kansai Digital Phone, in Osaka, awarded a contract valued at sek 500 million to expand the company's mobile network. The flow of subscribers to mobile telephone systems delivered by Ericsson has been very high since the systems were placed in service early in 1994.

■ In *China,* 1994 was a year of continuing favorable growth for Ericsson. Three large framework agreements were signed with telecom operators in the provinces of Guandong, Sichuan and Liaoning. The agreements cover deliveries totaling sek 6 billion.

In the beginning of the year Guandong Mobile Communications Corporation (GMCC) awarded Ericsson a contract for continuing expansion of the company's mobile telephone network based on the TACS standard. In May, the same operator also ordered a GSM system from Ericsson and in December it signed a contract to expand this network to be able to serve 100,000 subscribers. GMCC will also operate a personal paging system covering four regions in southern China.

■ In *Laos,* Lao Shinawatra Telecom Co. Ltd. signed a contract in May covering delivery of a GSM network.

■ In *Lebanon,* in September, F.T.M.L., a mobile telephone operator and the Lebanese Ministry of Telecommunications jointly placed an order for a nationwide GSM network with an initial capacity for 30,000 subscribers.

Earlier in the year the Ministry awarded Ericsson a contract worth sek 1.2 billion for a major network construction project.

■ In *Malaysia,* Cellular Communications Network Sdn Bhd (CELCOM) placed an order worth sek 600 million for radio base stations and AXE exchanges.

In August Telekom Malaysia. placed an order for an RAS1000 system at a cost of sek 620 million.

Syarikat Telefon Wireless Sdn Bhd (STW) awarded a contract in September covering the supply and installation of a wire-line cellular network based on AMPS/D-AMPS standards. The network will be used to connect subscribers throughout Malaysia to the wired telecommunications network by means of radio technology. In all, Ericsson's deliveries are expected to amount to sek 3.2 billion.

■ In *Taiwan,* the National Police Administration (NPA) placed an order in June for an EDACS land mobile radio system costing sek 840 million. The contract is believed to be the largest in the world up to now for a system of this type.

■ In *Thailand,* Advanced Info Services Ltd. (AIS) designated Ericsson's Thai company as the principal supplier of GSM equipment. In August this customer also signed a contract, valued at sek 175 million, covering expansion of its NMT 900 network

■ In *Singapore,* ST Mobile Data placed an order in June for a Mobitex network that will cover the entire country. This order represented a breakthrough for Mobitex in Asia.

■ At the end of the year *Sri Lanka* Telecom ordered a turnkey telecommunications network costing sek 650 million. The contract was the largest to date for a telecommunications project in Sri Lanka.

■ During the year a number of orders were received from *Vietnam* Posts and Telecommunications, which is now using AXE equipment at all levels of Vietnam's telecommunications: for international, trunk and local traffic.

Australia

■ In April, Telecom *Australia* announced that the next generation of its network operating and monitoring systems will be based on Ericsson's TMOS technology. The order placed at that time was worth sek 290 million.

Telecom Australia continued to expand its analog and digital networks during the year. Contracts signed with Ericsson covered deliveries totaling sek 612 million. Ericsson, which is the sole supplier of AMPS equipment, accounted for 90 percent of deliveries to Telecom Australia's GSM network in 1994.

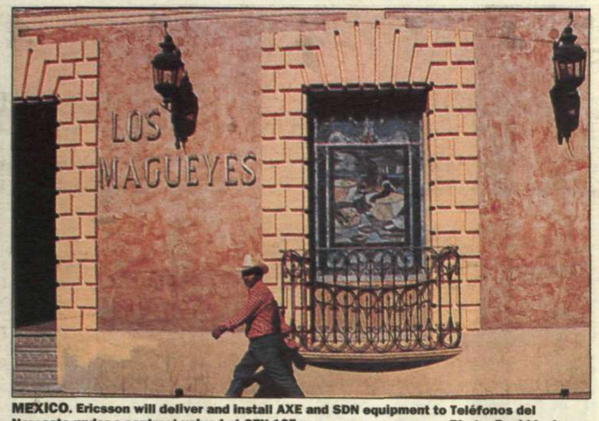
Africa

■ Mobile Telephone Networks (MTN) in *South Africa* signed a contract for GSM equipment in January. The contract covered delivery and installation of GSM equipment for MTN's entire national mobile network that was started up during the year. With the contract, South Africa was added to the long list of markets for Ericsson's AXE exchanges.

■ In *Zimbabwe,* the Post and Telecommunication Corporation awarded Ericsson a contract, worth sek 240 million, to supply and install an AXE system.

Photo: Per-Erik Friberg

LEBANON. Ericsson has been awarded a network construction contract valued at SEK 1.2 billion, plus an order for a nationwide GSM cellular network.



MEXICO. Ericsson will deliver and install AXE and SDN equipment to Teléfonos del Noroeste under a contract valued at SEK 135 m. Photo: David Isaksson

SOUTH AFRICA. Ericsson is delivering and installing GSM equipment for Mobile Telephone Network's national network that was started this year. South Africa thus becomes the latest in the long line of countries where AXE exchanges have been ordered. Photo: Ulf Berglund

MALAYSIA. Ericsson is celebrating successes in a number of areas. The order from Syarikat Telefon Wireless Sdn Bhd for a stationary cellular network based on AMPS/D-AMPS standards is estimated to be worth SEK 3.2 billion. Ericsson also won large contracts for radio base stations, AXE exchanges and transport network products, among other equipment. Photo: Toivo Steen

The Finland ferry boats play an important role for Finnish cable imports from Ericsson Cables in Falun, Sweden. Rapid delivery is made possible thanks to the ferries. After a number of difficult years, Finland's future looks bright and its close proximity to the Baltic states and Russia is a strong asset. Photo: Max Ström

A dawning market

A sharp upswing in Finland's economy and new investments have provided Ericsson's cable company, Viikinkikaapeli Oy, with new life. The Baltic states, St. Petersburg and Murmansk have opened new doors, and the unbeatable mode of transport across the Gulf of Finland – the Finland ferry boats – are playing a leading role in cable imports.

As early as 1986, Viikinkikaapeli Oy in Esbo, Finland, started to buy cable from Ericsson Cables in Falun, Sweden. Ericsson acquired the Finnish company in 1992 in order to strengthen Ericsson Cables' market position in the Nordic countries.

"We have sold cable through Viikinkikaapeli since 1986, and we wanted to secure our contacts over the long term when the owners of Viikinkikaapeli, the Iskanius and Tarkkonen families, indicated they wanted to sell the company," says Janne Sjödin, President of Ericsson Cables.

From recession to upswing

"The future looks very bright today, particularly in view of the sharp upswing in the Finnish economy and operations related to construction."

"In 1992, Finland was mired in its deepest economic recession since WWII. We had to work hard to correct certain situations in the company, but we were able to turn the company around even before the latest upswing in Finland's economy," says Kalervo Ulander, President of Viikinkikaapeli.

Viikinkikaapeli has 30 employees, nine of whom work in marketing, eight in administration and 13 in the warehouse and materials handling. More than half the employees have worked for the company for more than 10 years.

"That's a sign they like their jobs. Key personnel stayed on through the lean years. That means a lot to the company. Everybody wants to know how we succeeded. There are only 30 of us, but we have the support of our families, so really about 120 people are involved. Morale is excellent, and we believe firmly in Viikinkikaapeli's future," emphasizes Kalervo.

Finland ferry boats invaluable

Viikinkikaapeli buys cable and electrical installation materials from Ericsson Cables in Falun. Trucks leave the loading dock in Falun at 2:30 p.m. The goods are in Finland at 5:30 a.m. the following morning and are unloaded at Viikinkikaapeli in Esbo at 9:30 a.m. Rapid delivery is made possible by the excellent transportation facilities between Sweden and Helsinki – the Finland ferry boats.

"Morale is excellent," says Kalervo Ulander, President of Viikinkikaapeli Oy.

Growth in Baltic states

Viikinkikaapeli's market stretches over all of Finland, from Lappland, Rovaniemi, Uleåborg and Karlebyn in the north to northern Karelia, Kotka and the Esbo region outside Helsinki in the south.

The Baltic states represent a growing market for many Finnish companies. Entire societies are being rebuilt and require large amounts of electrical equipment and cable.

"It is an interesting market area. Our network of contacts is expanding, based primarily in Tallinn and Riga, the capital cities of Estonia and Latvia, respectively. The distance from Helsinki to Tallinn is only 80 kilometers and takes about an hour and a half on the ferry. There are strong similarities between Finnish and languages of the Baltic states, several TV channels broadcast in more than one of the countries," Kalervo continues.

Many Finnish companies are concentrating on creating forms of cooperation with Russia, a bear of a market that is waking up.

"St. Petersburg has a population of eight million, and in Murmansk, north of the 1,000-kilometer border separating Finland and Russia, there is not one electrical wholesaler. The potential in these two cities is enormous, even if the market is slightly unstable," Kalervo says.

Competition

Finland has had a strong and efficient domestic cable production industry. Nokia dominates the Finnish market for cable. In the wholesale sector, there are several large companies, including SLO, Onninen, ABB and Asea Skandia.

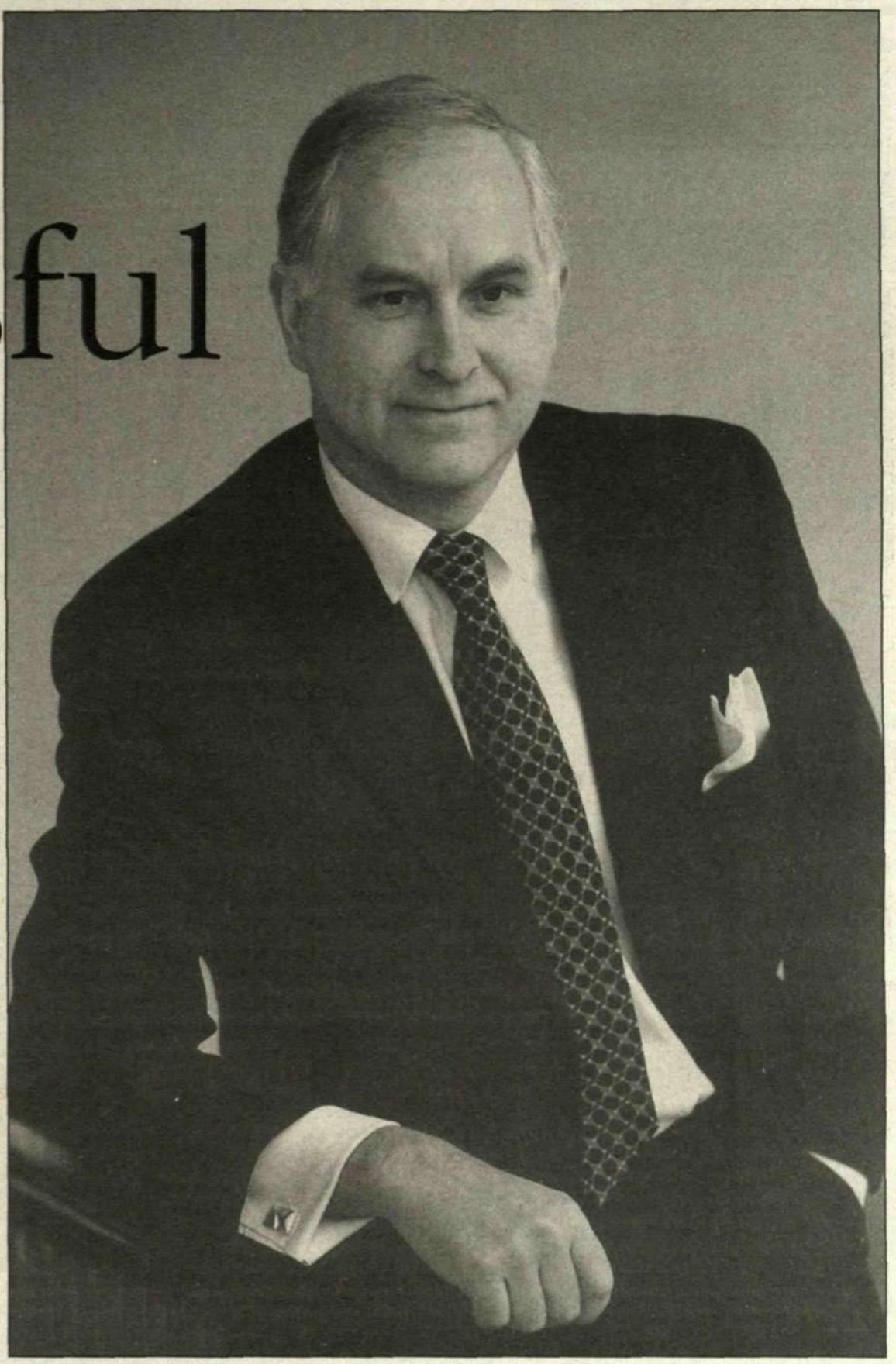
Despite tough competition, the little company called Viikinkikaapeli has excellent qualities and good cable products, which are holding their own on Ericsson's market to the east.

Inger Björklind Bengtsson

A truly successful year

As pointed earlier in Contact, 1994 was a very good year for Ericsson. The Annual Report for the past year has now been published. As usual, Lars Ramqvist summarizes activities during the past year.

Lars Ramqvist's address to the shareholders



In the 1994 Annual Report, Lars Ramqvist summarizes his impressions of Ericsson's performance during 1994. He points out that intensive investments in techniques and marketing during recent years have already begun to bear fruit. **Photo: Victor Lenson Brott**

"With an increase in order bookings for the thirteenth consecutive quarter, a rise in net sales of 30 percent and a profit increase of more than 80 percent, 1994 was truly a successful business year for Ericsson. It is stimulating to be able to report that our strong technical and market investments have now also provided a return in the short term. Without these investments, Ericsson would be a significantly less successful company today. More than 60 percent of net sales are attributable to products which did not exist on the market three years ago.

Strong position

As a result of the investments in technical development, we are maintaining as well as strengthening our position as a world leader in mobile telephone systems. Our systems are now installed in 74 countries and are being used by more than 20 million subscribers.

During the year, we continued to deliver analog mobile telephone systems, in increasing volumes, worldwide. Deliveries of GSM and D-AMPS digital systems also increased strongly. We were also successful in the delivery of our first digital mobile telephone system based on the Japanese standard to Tokyo, Osaka and Nagoya. In total, this means that we hold slightly more than 40 percent of the world market. Ericsson's market share for digitals systems is even higher.

Our share of the market for mobile telephones also rose sharply, following a nearly two-fold rise in net sales. Ericsson now supplies advanced telephones for both analog and digital systems. We also deliver dual-mode telephones in the U.S. which can be used in analog and digital systems.

For our total mobile telephone operations, 1994 was a record year. Sales rose 73 percent, and the profit increase was very strong. Despite the addition of an increasing number of competitors in this market, we continue to increase our market shares.

Freeset breakthrough

During 1994 we also experienced a major breakthrough for our advanced cordless system for business communications with the lightweight Freeset pocket telephone. More than 3,500 systems were sold in Europe, which means that we are clearly the market leader in this area as well.

In public telecommunications, we continued our major investments in the areas of transport networks (SDH), access networks, ATM broadband, as well as operating and support systems. We strengthened our technology and market positions in the access network area through establishing with Raychem Corporation the jointly owned company Ericsson Raynet in the U.S.

Development of the base system, which comprises the larger and more complex ATM switches, is carried out by Ellemtel, the company owned jointly by Ericsson and Telia. Perhaps it should be noted that Telia's financial contribution during 1994 to Ellemtel is approximately one percent of Ericsson's total technical development.

AXE is largest

We also posted a record year for the AXE system with 13.5 million lines delivered. I am particularly proud to report that AXE is the world's best selling telecom system. AXE is now in 111 countries, with 94 million lines installed or on order.

Business for transport and access network products is increasing, as well as for operating and support systems. We have also supplied and received customer approval for a number of test systems featuring the new ATM technology for public network applications from telecom operators in Italy, Germany, France and Sweden.

We are continuing to strengthen our market positions through cooperation with other companies. Accordingly, in addition to the aforementioned Ericsson Raynet, we have purchased the remaining shares outstanding in the German company Ericsson Fuba Telecom GmbH.

We have also established joint ventures for digital GSM mobile telephone systems in China, with the China National Posts and Telecommunications Industry Corporation.

Consequently, Ericsson has six joint-venture companies in China.

Quality success

During 1994 we also scored a true breakthrough in our quality efforts. Ericsson S.A. in Spain received one of the three European Quality Prizes awarded and LM Ericsson A/S, Ericsson Telecommunicatie B.V. and LM Ericsson Data AB received the national Quality Award in Denmark, the Netherlands and Sweden, respectively. It is very satisfying and encouraging to have received these awards, because quality is prerequisite to be able to maintain our customers trust.

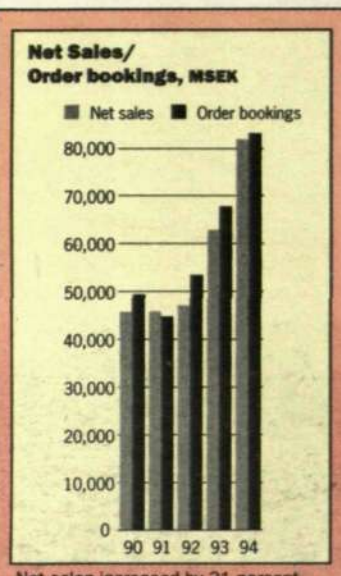
I am aware that our competitors are also continually improving their operations. At the same time, I know that within Ericsson we will con-tinue with even more perseverance to sharply improve the price/performance of our products, and that we will continue to focus on further improving our customer relations.

Based on our recognized high quality, our continuing investments in technical development and markets, as well as the favorable order bookings during 1994, it is my opinion that our operations and profit level will continue to develop favorly during 1995."

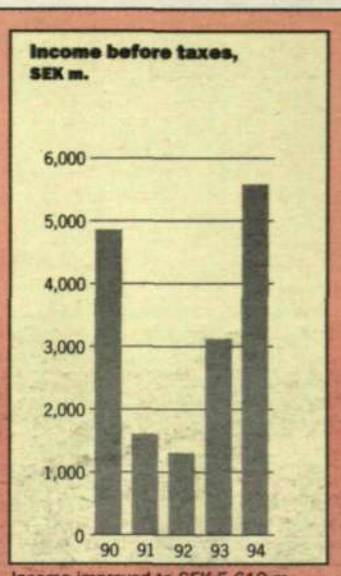
Lars Ramqvist

CONTACT

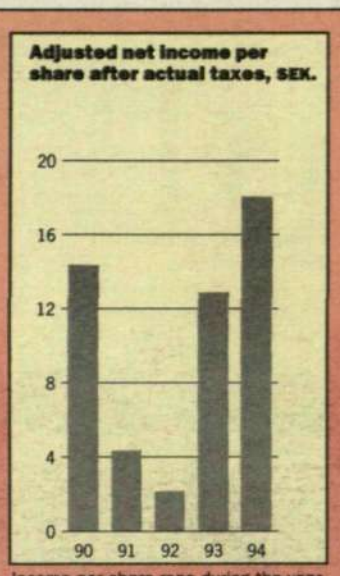
Ericsson, HF/LME/A, Room 811051, S-126 25 Stockholm



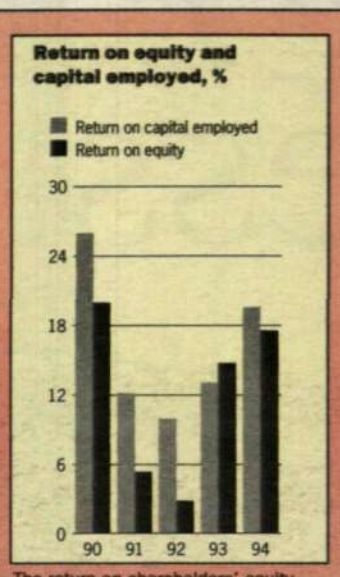
Net sales increased by 31 percent during the year and order bookings by 24 percent.



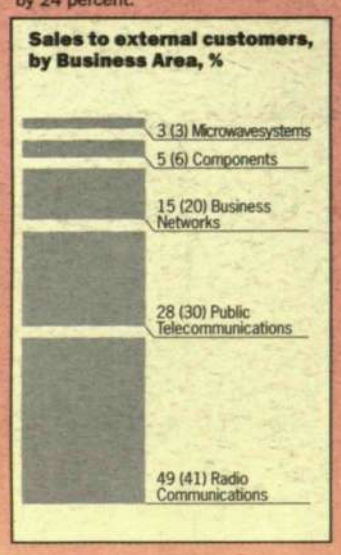
Income improved to SEK 5,610 m. in 1994, an increase of 81 percent compared with 1993.



Income per share rose during the year to SEK 17.89, an increase of 40 percent compared with 1993.



The return on shareholders' equity increased to 17.7 and return on capital employed to 18.2 percent.



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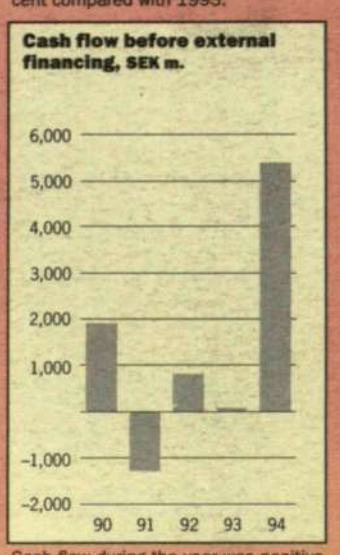
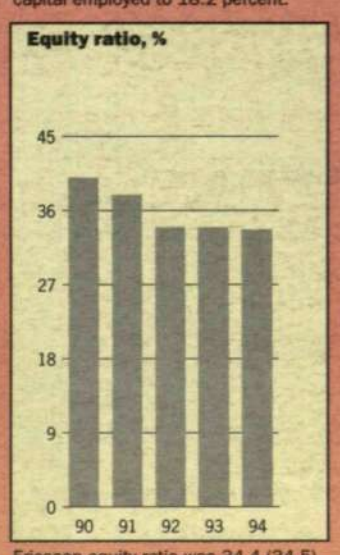


Cash flow during the year was positive SEK 5,340 m.



Ericsson equity ratio was 34.4 (34.5) percent.

Note: ( ) Indicates last year.

Youthful 119-year-old

Allow us to present LM Ericsson – now best known under its surname – a surprisingly vital 119-year-old that shows no signs of ceasing to grow and which is actually becoming stronger over the years.

Below, based on the "Ericsson in brief" section of the 1994 Annual Report, is a summary showing where the Company stands today.

Ericsson is an international leader in telecommunications. It is recognized for its advanced systems and products for wired and mobile telecommunications in public and private networks.

The share capital of the Parent Company at Dec 31, 1994 was sek 2,172,291,180, represented by 217,229,118 shares, each with a par value of sek 10. Shareholders outside Sweden own approximately 47 percent of the shares. Foreign ownership of shares increased significantly during the year.

Expenditures for research and development (R&D) in 1994 amounted to sek 13,407 million, equal to 16 percent of net sales. Total technical expenses in 1994, including costs for adapting products to local markets, amounted to sek 16,412 million, equal to 20 percent of net sales.

Ericsson's production resources are distributed globally among some 40 units, most of them in Sweden and other European countries. Ericsson's product portfolio covers all types of telecommunications equipment, including:

- AXE – Digital telephone switches for wired and mobile networks.
- ETNA – Transport networks.
- TMOS – Operating support system for telecommunications networks.
- Radio base stations for analog and digital mobile telephone systems.
- Mobile telephones.
- Mobitex – System and equipment for mobile data communications.
- Consono – Digital systems for business communication, cordless and wire-line networks.
- Eripax – Data network products.
- Eripower – Power systems for telecommunications equipment, computers, etc.
- Mini-Link – Microwave links.

During 1994, 10.7 million local AXE lines and 2.8 million transit lines were installed. This represented an increase compared with the preceding year. The AXE system is now in 111 countries, with 81.4 million having been installed and an additional 12.5 million lines on order.

Ericsson's mobile telephone systems serve 22 million subscribers in 74 countries. Ericsson, with more than 40 percent of the analog systems and even more of digital systems, continues to be the world leader in this field. Ericsson's mobile telephones also have a strong position in the market.

Installations of the MD110 business communications system, which is part of the Consono product family, now total 8.5 million lines. During 1994, 1.3 million lines were ordered. This means that MD110 keeps its strong position in the market.

The Consono family of business communications products also includes the Freeset cordless telephone system. During the year, this system began being sold on a commercially large scale. A total of 3,500 Freeset systems were sold in 27 countries. This means that the Freeset system has a market share of 50 percent of the available market.

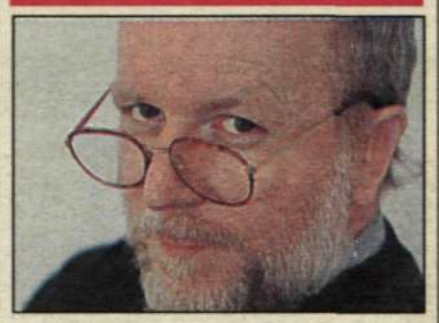
ERICSSON 1994 IN SHORT

	1994	1993	Percent Change
	MSEK	MSEK	
Net sales	**82 554**	62 954	31
Order bookings	**84 140**	67 693	24
Order backlog at year-end	**45 671**	45 296	1
Income before taxes	**5 610**	3 108	81
Adjusted net income per share after current and defferred taxes and after full conversion	**17,89**	12,80	40
Dividend per share	**5,50***	4,50	22

* For 1994 proposed by the Board of Directors

END LINE

LARS-GÖRAN HEDIN



Preserve our history!

Development in telecommunications is very rapid. So fast, in fact, that many cannot stay abreast. Just think about the technological development that has taken place in telecommunications during the past 10 years.

During the nearly 120 years that Ericsson has been in business, our industry has developed from almost nothing to one of the most important. The telephone has become virtually indispensable for hundreds of millions of people.

In the midst of this explosive development, 120 years of human brilliance and skillful business-mindedness built up our company. Have you ever thought about what we have actually done with the memories from this epoch of mankind's history?

A few weeks ago, I was at a meeting with a few other Ericsson employees and one of the topics of discussion was, what does Ericsson do with its memories. A rather alarming picture emerged. The truth is that nobody seems to have a clear view of how we should manage our past. How should we preserve our heritage for posterity?

Ericsson celebrated its 100th anniversary in 1976. Considerable efforts were devoted to documenting the first 100 years of "Ericssoniana." Precious little has been done since.

When Ericsson prepares for its 150th or 200th anniversary, I am convinced that colleagues of the future will wonder what we actually did in the 1980s and 90s. Were we so busy that we completely forgot to update the archives? Perhaps copies of Contact will be the only remaining source of information on "Our first 200 years."

Still, a company as big as Ericsson really should be able to afford to document its history, making sure what happens today is not forgotten tomorrow.

I know that many other companies have realized the importance of a central function for historical archives, with resources to document and preserve. In my opinion, a company active in the field of information cannot afford to lag behind on this point.

We should preserve our history. If for no other reason, we can always learn from our experiences.