

HUAWEI PEOPLE



15 Huawei
Sweden
YEARS 2000-2015





Li Junwei (Wells) , Managing Director of Huawei Sweden

In many ways, 2015 has been a very exciting year for Huawei Sweden. After 15 years of steady growth, we are now enjoying a year of transformation.

Starting in 2000, we created our business in Sweden from scratch and built up trust among our customers and partners. All the challenges we faced have provided us with valuable lessons. Nowadays, we have 600 employees, cooperate with all local operators, and serve 90% of the Swedish market. Today we are known and acknowledged by an increasing number of the Swedish population.

While these changes have been significant, we haven't always had an easy journey. The milestones we have achieved today have only come after 15 years of hard work. I am very sincere when I say that it's our team that deserves most of the credit. Without their focused commitment on improving business success, and without their dedication to building a strong organization capable of making a difference, we would simply not be where we are today.

Our current transformation plan is by no means final. A task put forward by Huawei Sweden is to "build a better connected Sweden." We are deeply encouraged by the opportunities we see, and we have truly embraced our role as a catalyst for change. Sweden is a role model for ICT industry growth; Huawei has benefited greatly from this land of innovation, and we are committed to being a driving force for its sustainable future development.

We are proud of the good work that is behind us, and eagerly await the work that is yet to come. I truly believe that our hard working and outstanding people, and the energy generated from their enthusiasm, will help us chart out the road forward.

A handwritten signature in black ink, appearing to read "Li Junwei".

HUAWEI PEOPLE

Issue 259

August 30, 2015

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Mikael Lindström was Sweden's Ambassador to China between 2006 and 2010. He has degrees in law and economics and many years of experience in the Swedish diplomatic system. His early career was in Brussels, Paris, Washington DC and Geneva. Later he was sent to Asia. Before his assignment in China he was ambassador to Indonesia and to Japan. Today he works as a senior advisor to Huawei Sweden.

I can't remember when I first heard about Huawei. Suddenly it was there in the background, growing in my awareness and starting to impress me as one of the good stories coming out of China. Then, when I was asked to join Huawei as a senior advisor I didn't hesitate for long. My whole career as a diplomat has been about building bridges and fostering understanding between foreign nations and peoples and my own country Sweden. The opportunity to continue doing so after leaving the Foreign Service was attractive.

As I see it Huawei represents the economic and industrial path that China is seeking for itself in to the future. One that is built on private enterprise, on consumers, on innovation and on branding. Huawei and a few others like it are in the vanguard of China's economic development.

Huawei soon impressed me as a company that is not set in its ways and that continuously seeks input from others. How many really large companies regularly has the entire executive board and senior management spend considerable time with a group of foreign advisors? Participating in Huawei's International Advisory Council has offered fascinating opportunities to hear from the top about concerns and visions for the future, as well as to give an outside perspective on issues confronting us.

There was good logic that made us come to Sweden 15 years ago. Sweden is a country that continuously is ranked among the foremost in the world when it comes to innovation. The Swedish people are early adopters of new technologies and Sweden was a leader in developing the standards that were crucial for mobile telephony to become a reality. When Huawei opened its first R&D center outside China it made perfect sense to do so in a place where advanced telecom sector knowhow was present, infrastructure was excellent and foreign investors were welcome.

Since then we have grown, benefiting greatly from the input of local engineers and scientists and at the same time through our sales contributing to the continuous development of the Swedish market. I often tell people how we very early sold a million internet modems ("dongles") to the Swedish operator Telia Sonera, thus playing a small part in making Swedes among the most computer savvy and connected in the world. The same can be said about our sale here of the world's first commercially operating 4G system.

Today we are an established and respected part of the local market place. Awareness among the general public is rising fast thanks to our new consumer products. We have built excellent relations with the government, with universities, with non-governmental actors such as the Royal Academy of Engineering Sciences and with the important labor market organisations. Our program that invites tech students from leading universities to China and our headquarters in Shenzhen started a year ago and is clearly a success.

I look with great confidence on our future development!



Success through Customer-Centricity

--Our journey of developing a business partnership with TeliaSonera

By Hong Fangming/President of TeliaSonera Key Account

Back in May 2012 I landed in Stockholm to take over as President of the TeliaSonera (TS) Key Account. However, I was faced with overwhelming challenges from day one. Our business in the Eurasian market was very risky back then – the potentially re-opened door for TS Eurasia risked being shut due to a cancelled software project and the unexpected withdrawal from an electronic terminal tender.

I had to spend months resolving the issues. But at the same time, I began contemplating a strategy for further developing the business with TeliaSonera. How could I leverage Huawei's previous success in LTE?

The first milestone for Huawei and TeliaSonera was signing the world's first LTE contract for Netcom (TS Norway) in 2009. Following the landmark collaboration, we also modernized its legacy network with SingleRAN solution in 2011. Today, Netcom is still one of the Group's star OpCos and continues to yield outstanding performance.

After taking over, I first identified various best practices, including compliance with local cultures and principles, contractual spirit, planning, and fact-based action, as the foundation for establishing a sustainable business relationship. I also considered organizational relationship an important pillar in the Nordic cultural landscape. Next, we organized a CEO summit in late 2012 between Mr. Ren and the then CEO of TS. Things then started getting back on track.

Following the summit, we began tapping into the rapidly growing wireless business. We were awarded a series of tenders to swap out competitors' wireless networks in Nepal and Georgia in 2014 and 2015 respectively. We also expect to expand our presence in Kazakhstan and Azerbaijan in the near future.

In addition to the development in Eurasia, we also gained momentum in the Nordic on Wireless. We are building 1600+ sites in Finland, and achieved stable capacity expansion in Lithuania. Moreover, our market share in Netcom increased to more than 90%. New technologies such as LTE-A and 4.5G have been and will be deployed to further promote the TeliaSonera brand.

We invested tremendous efforts on IP products back in 2012 in line with TeliaSonera's FTTx strategy. We never expected the now remarkable "Purplenet" (IP Core and RAN) to be won, but it was. In 2014 we also achieved landslide victories in Mobile Backhaul and FTTx switch in Sweden on top of MBH success in Eurasia.

In 2015, we were selected as the sole DWDM provider in Sweden, and were awarded IPRAN swaps in Nepal and Lithuania. Our year-on-year sales are expected to grow at around 30% in 2015, a similar level compared to 2014.

As TeliaSonera outlined in its 2018 strategy, it aims to transform the network, marketing and IT to be more efficient while excelling in adjacent services. Huawei, as TS's strategic partner, must undergo its own transformation to better adapt to future trend. Therefore, we are establishing a Joint Innovation Center where we together with TS identify key areas for innovation and invest resources, starting from B2B.

Through years of the team's hard work, the business has been growing along with expanding product presence and tightened customer relationship. It is our belief that efforts will be rewarded if we adhered to customer-centric values. We are honored and humbled to continue the efforts to ensure TeliaSonera's business success in the era of the digital economy.

Full Speed Ahead

By Markus Mejegård/Sweden Managed Services Business

Working within Huawei

I have always liked challenges and I do enjoy situations where you need to work hard and fight to reach the goal. With this somewhere in mind I saw Huawei as an interesting and exciting company when I at my previous work met Huawei as a customer. There seemed to be a spirit in Huawei of never seeing any problems but rather taking on

challenges with full customer attention and innovative solutions. And I understood that there probably also was a great deal of hard work done within the organization.

So when joining Huawei I already had a perception of what to expect and that Huawei most likely would suit me as an exciting company offering challenges in an inspiring multi culture environment.

And I was right!

After 45 minutes on my first working day at Huawei I had already attended a project meeting and received the first project action points for me to handle! And since that day it has been full speed ahead.

I have now almost two years of experience from working within Huawei and my expectations have been met; Huawei is really an exciting company and I am offered lots of challenges to take on together with fantastic colleagues. And my view on Huawei as a multi-culture has for sure been acknowledged. I have had the pleasure to work with colleagues from China (of course), Romania, UK, Poland, Hungary, USA, Portugal, Australia, etc. Which I believe is a real strength for the organization. All different backgrounds and experiences make a creative and in many cases unbeatable sum.

My Huawei projects

I was recruited to the Managed Services Delivery department and started working for the 3GIS and Telenor Managed Services projects as manager for Field Services and Site Management. After about nine months the common organization for the two projects were split and I have since then for the last year mainly been working with the Telenor Managed Services project. Which is not only a large project covering many disciplines, like Back Office, Field Operations, Implementations, etc, for both Fixed and Mobile Network, but has also shown to be quite complex to coordinate and deliver.

Experiences and lessons learned

Throughout my time with Huawei I have learnt that there are some different views on what the best way for progress is; The Chinese way is often “act now”, meaning you take a decision of direction and you go that direction at full speed! Until it’s found that the best direction is probably another. Then a new decision I made to go that direction. Full speed! Until it’s found that the best direction is probably another... While the Swedish way is more “think, and then act”, meaning you spend long time thinking and considering different

options before a decision of direction is taken. But then which strategy is the best? Probably none. Or both. I think the fine part and big advantage with Huawei is that you actually have the different views represented in the organization, and can balance between them!

Progress

I have found that many of the “problems” that occurs in the projects are originating from differences in expectations from Huawei side and from customer side. In the project I have been in, the best progress has been reached when we have sat down with the customer and had a deep and very concrete discussion about what should be delivered within the specific area and how it should be delivered. This has sometimes been quite hard discussions but after a common understanding has been reached the project or sub-project has run much smoother with a more comfortable situation for the Huawei project team and with a much happier customer.

Conclusions

I believe the success of a project delivery is very much about getting to understand the customer’s needs and expectation. And that it is very important to spend time on this both in a bidding phase and throughout a project. When this understanding has been reached it will be easy to understand what Huawei can deliver to the customer and how to best deliver that. Leading to an optimized delivery and a satisfied customer.

My main conclusion from my almost two years with Huawei and Managed Services is that: Managed Services is all about people! Which means that the most valuable asset in a Managed Services project is the staff! In the projects I have been involved in I have had the privilege to work with many inspiring Huawei people who are really competent (in many various areas) and committed to doing a good work!

And this, together with a well-developed team work, I’m sure is the main factor for a successful Managed Services project!

Humble Attitude

By Oscar Thunstrom/Sales Director of Sweden Device Business

Huawei Technologies to me

I joined Huawei Consumer (Terminal) in early 2009 and have been working here ever since. One of my main experiences so far as a Huawei employee has been a cultural learning curve, not only within Huawei as a company but also towards the Chinese culture. Huawei is a very international company and we are present in so many countries. Therefore, as an employee, you have many colleagues all over the world with different nationalities, but it still remains very Chinese in many ways. For instance; our office gets influenced by Chinese holidays such as Spring Festival, Mid-Autumn Festival etc. I've tried a lot of fantastic Chinese food, I've learned a lot about China and its culture just because different Chinese colleagues come from different parts of China. At work many times I receive information and documentation written in Chinese. These are just some simple examples.

Adaptation and the way to do things in other ways that I was used to has been part of my every day experience. It's great to see that things can be done in other ways and sometimes with better result. Over these years I have worked hard and the team has struggled a lot. We've

lost some business but also won big and significant projects too. I'm very happy to both see and also contribute to the growth of the Swedish Huawei office business and result. The whole Huawei team has grown with many more colleagues, functions, processes and lately we also started a new era in Sweden by moving the whole office to a new fresh building. What makes it exciting and fun for me to go to work is the fact that things happen all the time in Huawei. It's an environment where I have the chance to frequently meet new people and colleagues who either come to meet with customers or work in a project for a limited time. Another thing that amazes me and also helps in the business is the strong and powerful R&D we have. To me they are a true part of the Huawei DNA but also a fantastic muscle creating all these products and solutions. Also I love the "no-fear-attitude" to work with the latest technology which many times can be so difficult as there are no references. I love the telecom industry which moves very fast and the competition is very tough, but with such great toolbox that we have from the company to face and help the customers, as well as the end users, it's nothing but an honor to challenge the industry.



Project, technology and customer understanding

Telia Sonera, which is one of the biggest operators in the Nordics and the biggest in Sweden, was the first to launch a commercial LTE network in the world back in 2009. Due to their aggressive roll out and marketing of LTE, Huawei could strengthen its partnership together with Telia Sonera as we provided many different terminals with their technical requirements such as USB-modems, Mobile Wifi, CPE, handsets and tablets. Personally I was heavily involved pushing and promoting our LTE mobile wifi solution which at the

time was relatively new and immature in our market, but today it has become their main focus product within the whole Telia Sonera MBB portfolio. In the Nordics there is a huge internet usage both from the fixed network but also from the mobile. We spent a lot of time together with the customer customizing the product in order to make it as simple to use as possible. Telia Sonera really strived for having a product that was so simple to use that everyone in the easiest way could connect to internet without having to ask for support nor read long user guides. The final result was great, not only did we manage to sell a lot of these products but Telia Sonera could also see the huge drop of customer support calls which was a great cost saving for them. A true win-win-win project for Huawei, Telia Sonera and the end users.

Working attitude

While working at Huawei I've always tried to be as open minded as possible towards colleagues and also learn to go with the flow of the company. Working in such a big company I think it's important to understand that we all need to try our best to follow the working processes and procedure. Not doing that and

going your own way can be tempting some times to do things quicker or simpler for the time being, but most likely it will not work on the long run. Also the commutation within the company and among colleagues is worth spending some extra time on. I always try my best to be as clear and easy to understand as possible just to avoid misunderstandings. Some colleagues who come from China in the beginning of their career have very limited level of English and therefore misunderstandings can easily occur. This can have negative consequences both in internal meetings and perhaps even worse if meeting with customers. I've always tried to find ways to do summaries and handshake so I can make sure that we all understand and that we're all on the same page.

Networking inside and outside

In my work it's important to both understand the customer needs and also what Huawei can do to fulfill it. I need to have the 2-way communication from the customer into Huawei, and from Huawei back to the customer. Our business opportunities and projects rely on many people in order to be realized. I need to follow

up on internal colleagues as well as the customers and sometimes push them a bit. In order to develop yourself I think it's very much about expanding your own network, inside Huawei and also inside the customer. Who are the key persons and how can they help you achieve what you need?

Global winning spirit

As a general recommendation to every colleague I would say try your best to be open minded. Be ready, open and prepared to meet new colleagues, working processes and procedures. Huawei is a very international company with branch offices and employees all over the world, yet it remains quite Chinese and therefore lots of its heritage comes from China. I think there's endless potential in this company with so many devoted colleagues who always try their best to help and support. I never cease to be amazed and impressed by the endless fighting spirit, the fantastic great will of helping and solving difficult situations and of course finding new business opportunities. That's why I think the company slogan "MAKE IT POSSIBLE" really applies to the company spirit and mission.



In the beginning of 2013 Huawei won a Managed Services contract “Tesla” with Telenor Sweden. The scope taken over by Huawei in this outsourcing deal was complex - spanning the entire scale from advanced multi-vendor support and planning services, to low-end and low-cost field and installation services. The Telenor network is also complex, covering as well fixed/broadband networks as 2G/3G/4G mobile networks over the whole of Sweden. It is a multi-vendor network containing a large variety of platforms and systems.

In the back office/system support operations, staff was transferred from Telenor to Huawei together with the contract. In the planning, field services, and implementation areas we however had to start with a blank sheet, as there was no staff transferred from Telenor. These functions had previously been operated by another vendor, under an earlier outsourcing contract.

From the contract signing date, we had less than 6 months to get the operations fully up and running. A very challenging task, to say the least...

Live Core Values through Tesla

By Dan Olsberg/Program Director for the Telenor Managed Services Delivery



Team-work making the impossible possible

The Tesla project started off well, with a relatively smooth transfer of the back office/system support operations during the spring 2013, and by June 1st the back office operations was successfully transferred to Huawei.

In the field operations, planning, and implementation areas, where we started from scratch, we hurried and scurried to get something together for the launch date in September 2013. How could we get all this together in such a short time? Had we taken on more than we could cope with?

In the summer 2013, an intensive period started with recruitment activities, negotiations with potential partners and sub-contractors, setting up support systems etc. We desperately needed delivery resources in all areas, and we needed to cover the whole of Sweden for the field and implementation services!

After a hard and dedicated effort, more than 20 field service and implementation sub-contractors in different areas and parts of Sweden

were signed up.

In parallel we were trying to recruit key resources to fill up important management roles, high-level experienced engineers for the planning and implementation coordination functions etc. We needed in total more than 50 experienced staff and managers. People wise Sweden is a small country with only 9 million people, and to find this number of experienced and highly specialized people in a short time is not easy.

In a strong team effort led by the local Service & Delivery Department, supported by the HR function and CEE region, we somehow managed to get together the resources we needed. A few experienced managers were successfully recruited and on-boarded, complemented with a variety of new employees, temporary staff, consultants, and MS resources provided by the CEE region.

Through a fantastic team-work we had managed to make the seemingly impossible task possible. We had a team in place for service commencement date!

Dedication in the face of defeat

When the launch date for the field and implementation services operations came in September 2013 we thought we were more or less ready. But little did we know that we were going to be hit with a virtual “tsunami” of work! Not only did we have to cope with the everyday flow of tickets and work orders from the network, but Telenor’s previous outsource partner also left behind a backlog of tickets and cases that had to be managed. Obviously new to the network as we were, with an organization that had not yet been tested, and with more than 20 new sub-contractors to steer and guide, it felt like we hit a brick wall.

The next 3 months was a nightmare for all staff and managers involved in the delivery, struggling to clear the backlog, struggling with internal administration, struggling with support systems that were not yet fine-tuned, battling with resource shortages and sub-contractor issues. Concerns and escalations from Telenor management, although understandable under the circumstances, added to the stress and press.

But through the constant pressure the organization worked hard and hung in there bravely. By February 2014 we had managed to get the backlog somewhat under control and our Service Level Agreement fulfillment were moving in the right direction. Focus programs together with Telenor, with well-defined improvement activities, slowly started to pay off.

By May 2014 we had reached a point where we were meeting most SLAs, and Telenor management agreed to downgrade the project from an “escalated” state. With perseverance and dedication we had managed to turn around a very difficult situation, avoid defeat, and get control of the delivery!

Continuous Improvement

Understanding that just getting our noses over the water was not good enough, in the spring 2014 we started up various improvement and transformation activities.

We engaged our logistics and field services partners in a new RFQ, with the ambition to re-structure the partner setup in a more optimal way, reducing the number of sub-contractors, improving and clarifying contract terms, and reducing overall costs. The RFQ and following sub-contractor negotiations were successful and we managed to meet our defined objectives. We now had a much better structure, which resulted in better cost efficiency for Huawei, and better overall situation for the sub-contractors.

In parallel with adjusting the partner setup we made a strong effort in replacing consultants and temporary staff in the planning and coordination area with own employees.

In the end of 2014 we successfully launched a new transmission planning center in Karlskoga, 250 km west of Stockholm. In parallel we also agreed on a joint plan with the Romania GNOC, where they would build up support capacity for Tesla both in the transmission planning and back office/system support areas.

What have we learnt - and how we go forward

Entering into the Managed Services business has not come without difficulties. The Sweden organization has grown very quickly as a result of the MS success, and a lot of local Swedish staff has joined the company in a short time. We need to be humble to the challenges for non-Chinese staff to understand Huawei’s culture and internal processes and procedures, as well as for Huawei to understand the local employees’ expectations and work culture. This will take a bit more time to settle.

But we have proven that with team-work and dedication even the biggest challenges can be overcome. The perseverance and willingness to “walk the extra mile” has been a key to success in the Tesla project.

Going forward we will continue to apply a “customer first” attitude, with an ambition to work closely with Telenor Sweden and to jointly identify new areas for development.

In the next phase we aim to move beyond satisfying Telenor itself – we want to ensure that our efforts are also seen by Telenor’s end-customers i.e. all the private and corporate customers in Sweden that have put their trust in Telenor as their service provider. As such, we hope to lift the perspective from just operations and network quality, and expand the relationship into service quality and customer experience.

To summarize, the Tesla delivery project team has done an excellent work in turning the project around from a difficult start into a stable delivery. I am proud to have been working with this excellent team over the last 18 months!

A Hard-Won Success

--The story of Hi3G wireless project delivery in Sweden in 2015

By Cheng Zongze/Technical Management Officer of Sweden Network Technical Services



As a leading Swedish operator, Hi3G Access AB (Hi3G) has rolled out the best mobile networks – including mobile broadband data networks – in Sweden for five consecutive years. Prior to 2012, Huawei failed to win any bids from Hi3G. However, this changed in late 2012 when Huawei secured a project from 3G Infrastructure Services AB, a joint venture between Telenor and Hi3G. The customer was highly satisfied with Huawei's delivery; however, we did not stop there.

On March 30, 2015, Huawei and Hi3G signed a strategic cooperation agreement covering wireless and core networks, raising their partnership to a new level. In early April, Huawei started to implement the wireless project, and the deadline is fast approaching. However, the project has

proven to be much more difficult than expected. Each small moment on this journey remains fresh in our minds.

Early involvement: we cannot be too careful

As data services have long been the key in Hi3G's mobile networks, user experience with data services has remained our top priority. During the bidding process, the topic we discussed most was data service solutions. These solutions must accelerate access to data services, properly distribute network resources, and balance traffic between different network layers. To some, it may seem easy to meet these requirements. However, that was not the case as it involved multi-vendor interoperability, as well as network and product evolution. After winning the bid, Huawei developed products and solutions aligned with

customer needs, and ran a successful interoperability test (IOT). Moreover, Huawei prepared contingency plans for possible risks. This helped us manage expectations and customize solutions in advance.

In terms of project implementation, Hi3G required new vendors to provide equipment that was interoperable with existing vendors', which was a daunting task for vendors. To address such difficulties, we started to work with Hi3G in the bidding phase to identify and analyze potential risks with multi-vendor interoperability.

This experience has taught me that we can better translate technologies and practices into real benefits only by applying our best practices in the early stages and managing project risks before they become a problem.

Project design: working hard day and night

When discussing acceptance test cases, Hi3G showed an interest in 180 3G features and 170 4G features, all of which should be covered in the test cases. According to our experience, over 1,000 test cases were required to test 350 features. This means that the customer would be testing our equipment extremely carefully, really putting it under the microscope. As the time for the first call was fixed, we felt that it was impossible to finish so many tests in just one month.

Soon we overcame our fears. During the project meetings, we classified these 350 features based on maturity, date of first commercial use, and the availability of the test environment. Based on our previous experience, we first discussed the priority of feature tests. Then we classified these features based on their service category, prioritized them, and developed daily and weekly plans, thus ensuring that our efforts were well directed.

To resolve the problem, we merged the wireless engineering team and network optimization team, with the former focusing on feature test cases while the latter focusing on features. They worked closely and held four workshops per week, each lasting five to six hours. After each workshop, they would be busy preparing for the next one. Tired as they were, they remained passionate.

The lesson we learned from this project is this: We can remove any obstacle if we just put our minds to it.

No haircut until the first call

Executives from Huawei and Hi3G determined that the first call would be made on May 18. In the early stage of the project, the technical director Ye Maohua pledged that he

would not get a haircut until the first call was made.

Huawei applied its latest hardware and software in the project. To adapt these solutions to customer needs, we met with experts and customers in the daytime and searched online at night, making up for the time difference. In addition, we often discussed issues with R&D teams, which was normal during the project delivery. Later, we learned to ask more specific questions relating to networks – the team became increasingly capable and worked more closely with the customer.

In terms of interoperability, cooperation from the customer's transmission team during the wireless network migration was the most important part. However, the transmission team was always the busiest during network restructuring. To adapt to their schedule and address transmission problems in time, Ye Maohua had to work through meal times.

On April 29, one month after we signed the contract, we made the first call in the Hi3G wireless project. As it turned out, we hit the target 19 days in advance, leaving us more time for subsequent tests. Tired and happy, we failed to fight back our tears. Ye Maohua worked so hard that he did in fact grow out his hair.

Commercializing our equipment for the first time: as smart as ever

Radio network controller (RNC) commercialization was extremely difficult. First, it required interoperability of four wireless network vendors and two core networks. Second, it involved two mobility strategies, one for multi-operator core networks (MOCNs) and the other for non-MOCN networks. Third, it involved very complex

scenarios because there were 170 test cases for function and service interoperability.

To address these concerns, Huawei set up a war room in its customer's office. This helped enhance communication and mutual understanding to develop feasible plans for RNC interoperability. The project team convened weekly meetings to solve problems and ensure that stakeholder at all levels would work as one team for one goal. In addition, the team made summaries on interoperability every day.

One case in point was Wang Jian, an expert in wireless network optimization. After delivering Network Performance Management (NPM) services in Iceland, he started to work on this project, ensuring RNC interoperability. He stayed in the lab all day, using massive volumes of data to verify the interoperation plans. This addressed Hi3G's concerns and eventually won its trust. Finally, our equipment successfully interoperated with other vendors', greatly increasing customer satisfaction.

Practice and theory are very different in most cases, and network optimization is no exception. We must study algorithms and protocols, and can only leverage the value of knowledge by applying it and continuously raising it.

In every project, we follow the same approach – we set a goal and realize it through hard work so we can reap the harvest. Huawei survived the long, dark, and freezing winters in Sweden, and has kept expanding its business for 15 years. As a result, we achieved great things and increased our reputation. However, we will not stop there.

Huawei, a Global Company to Admire

By Jan Åke Ekström/Business Consultant and Senior Advisor



Jan Ekström, has very long experience from leading Management positions within Telecom, IT and Electronic Security Business, both in Sweden and internationally.

He has been responsible for the Enterprise Customer Business within Telia, CEO of Telia IT Services (Managed Services), VP Unisource (Business Development) and CEO of TeleLarm (Electronic Security) and Managing Director for Colt Telecom in Sweden. He has also been President of IZP Technologies North Europe Region within the Media Business.

I have now been involved in Huawei for more than 11 years in Sweden and Nordic/Baltic countries.

It started with a project where I was partner and CEO in a company planning to bid for the 450MHz license in Sweden. That was my first contact with Huawei. I met with Huawei to see if they could supply equipment for the network. We did not get the license.

Leagan Ling being responsible for Huawei in Nordic countries at that time asked me to join Huawei instead. My background at that time was a long history in Telia. There I had been responsible for Enterprise Customers including being responsible for building up Unisource. Unisource was aimed to support global Enterprise customers in their international telecommunication. Telia build Unisource together with KPN in Holland (PTT Telecom at that time), Swisscom, Telefonica and AT&T. In Telia I also had served as CEO for Telia IT-Service and also Group CEO for TeleLarm, a global electronic security company. I left Telia after we failed to merge Telia and Telenor.

After I left Telia beginning of 2000 I worked as consultant for many global companies. My work for Huawei is on consultant basis on part-time. In the beginning I was involved in all operators in Nordic countries but lately it is focused on TeliaSonera. In the beginning I spend most of my time for Huawei, today it is less. At that time two of the biggest Telco vendors

were based in Sweden and Finland. The competitive situation was more than tough to enter the market in Nordic countries.

About Huawei we were not well-known at that time. Of course not amongst the public, but also amongst Telco people the knowledge about Huawei was limited. That's perhaps easy to forget today. At that time Huawei already was a big company with around 32000 employees worldwide. And today if I have the right information we are 170,000+ employees. I still remember my first customer meeting, which was with EVP Kenneth Karlberg at TeliaSonera and his team. I asked them how much they already knew about Huawei. That was not much so please give us the full story.

So the big issue was how to approach the market in this part of the world. We knew it was already going well for Huawei in many other countries. When talking to responsible people on customer side they often said "no way can you deliver core network to us". So we had to think about which strategy we should use to start business with Nordic operators. At that stage we saw a start of "data communication services" and knew that Huawei had in-stick modems for computers. So we decided to go for that to start with. Small business but still a business. Of course we were bidding on other projects also. Later Huawei introduced dongles and then the real success came. The Data communication market had started

to grow. Huawei's dongles had good price but most of all a very high quality. So Huawei got more or less monopoly on dongles to all operators in Nordic and Baltic countries. And it became big volumes since the market was growing very fast.

One small curiosity I remember from that time was when one operator wanted to have pink dongles since they profiled themselves with pink color. The first answer from China was that it was not possible, we don't have pink color. But of course that was fixed at the end and everybody was happy.

Huawei was not at that time known by ordinary people. We know it is very different today. Probably it helped that everybody had a Huawei dongle to make the brand name known. Today everybody has heard about Huawei and it is a well-known brand name. But at that time we didn't believe we could sell Huawei branded mobile phones. So we tried to sell Mobile phones branded with operators' names. The first to do that was Chess in Norway. Today people also in Nordic countries buy Huawei Mobile phones in ordinary phone shops.

In the market situation we were in, the most important thing was to build trust and confidence amongst Telco Operator's Management. An often mentioned question from operators was how will you build up Service and Support in Nordic & Baltic countries? This was of course a long term effort, but very important. Today operators regard Huawei service and support as at least equal to others. Another way to build confidence was to take customers to HQ in Shenzhen, China. I have seen many important Managers being a bit suspicious to Huawei and how they changed opinion after a visit to

Huawei. There they could see what was behind the small organization in Sweden.

The big break throw was when Huawei was elected to do a 4G pilot for TeliaSonera. They selected two vendors for that, one for Stockholm and one for Oslo. We of course had wanted to have Stockholm, but politically it did not seem possible. When the two pilots started Huawei could deliver what had been promised for Oslo in speed and functions. Another vendor at that time had problems to meet requirements when the project started in Stockholm. At that time they were behind Huawei in development of 4G. The successful pilot opened up business not only with Netcom in Norway (TeliaSonera's subsidiary in Norway), but also with other operators e.g. Net4Mobility which is Telenor and Tele2 Network JV in Sweden.

When I started for Huawei we were just a handful people in Marketing and Sales organization. We

had no office in Oslo or Helsinki. In Copenhagen we had one person on consultant basis. Today Huawei are established in all Nordic and Baltic countries.

What I also have admired during my time with Huawei is all the skilled and intelligent Chinese colleagues. Being a fairly senior person I have appreciated my Chinese colleagues respect for people who has different experience, also the energy that Chinese colleagues showed when we needed to work extra to respond on a request. There were never any discussion about "I don't have time..."

When I left Telia year 2000 I had never heard about Huawei. It took another 2-3 years until I realized there were such a company coming up and challenging the established vendors. It has been 10+ years of interesting work and also admiration to see the growth of Huawei coming from below and becoming the biggest Telco vendor in the world.



First delegation from TeliaSonera visiting China in January 2006. In the middle former Managing Director Huawei Nordic Leagan Ling and Erik Hallberg today CEO TeliaSonera Eurasia



Experiencing Transformation

By Wang Xu/Sweden General Manager's Office

Stockholm, the capital of Sweden located on the southeast coast of the country, is known not only for hosting the annual Nobel Prize ceremonies, but also as an important international city. Huawei Sweden just started her Nordic journey from here 15 years ago.

In the summer 2007, I knocked at her door and realized my first critical transformation from a graduate to an employee. Initially, there were few employees in the Representative Office, lack of supporting departments and structured local processes running with limited businesses. I believe at that time she was really struggling hard to survive just as I did. But neither of us gave up moving forward.

With years of dedicated work, we finally won the 1st LTE project in 2010 by a number of cutting-edge technologies, most of which were first time

commercial released. And since then, Huawei Sweden started her business booms in the Nordic region. And almost the same year, LTC (lead to cash process) transformation began deploying globally. I seized the opportunity without any hesitation to archive the second transformation in my career—being the first ones working on LTC transformation deployment in Sweden.

We were really facing lots of challenges at the beginning: in terms of external business, we were growing faster and faster but still lacking end-to-end customer-facing process; internally we were missing the unified customer interface, unclear and/or overlapping roles and responsibilities with low operational efficiency; there were many data systems but without good integration between them, and so forth. (All of them are now called pain points by us.) We had

a very tiny deployment team at that time to cover quite a large territory. Transformation sometimes is to challenge people's work habit even their ways of thinking, which I think is the most hard and painful part. Luckily, we got great resources and supports from Headquarters and the Region, to lay a solid groundwork in our initial phase.

On September 5th 2011, Sweden launched iSales system in Nordic, which made our sales process into a preliminary standardized and systemic era. In the following two years, we started being in charge of training and conducting iSales upgrade version test; enhancing MO (manage opportunity), MCE (manage contract execution) process operation and management; self-deploying ML (manage lead) process, to deepen and consolidate the transformation. In early 2014,

our team started growing and meanwhile we realized that transformation shouldn't be confined in only one department but from all related business departments, and finally it benefits the business departments. Backbones from different departments were selected and trained as "golden seeds" so that they could involve in the work, and through the practices in transformation they will blossom and grow to be our most solid foundation. From 2014 till present, we have over 20 golden seeds together with us successfully deploying LTC adoption, LTC S2S3, CICS (Country Planning-Coordination-Scheduling) and CIAG (Consistency of Inventory Accounts and Goods) projects.

To summarize our experiences and feelings over transformation, I think they might be:

Define unified target and value

The target and value of transformation should come from and benefit to business, with which to prevent us from doing useless work or going into a dead end.

Wisely "copy" successful solutions and experiences

There are so many great experiences from other countries

globally, no matter successful or failed, copy (learn) wisely not directly.

Team dedication and passion

Dedicated team work can always beat difficulties, but without passion, the team is more like a train with low-powered engine. Cheer up the team, they'll surprise you!

Make rules and respect it

Rules and regulations are released to insure process implemented by proper roles in proper ways. Respect and follow them, instead of leaving it unpractical. That's the most effective way to work.

Operational excellence

Transformation is not a one-off campaign; long-term operation is more critical for achieving final target. Next we'll put more efforts in operational excellence to consolidate current accomplishment and to establish a continuous optimization cycle to keep improving.

Looking back to our transformation journey, although it is painful, those pains make us who we are now.

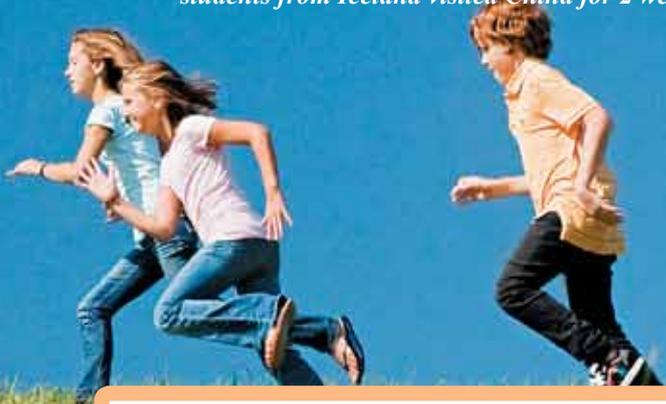
We were TOP2 in regional LTC racing competition in 2012; Regional Quality& Process Improvement Awards for two consecutive years 2013 and 2014; Transformation brings benefit to office internal operational efficiency, internal control, and customer satisfaction and so on; plenty of cases and experiences are outputted and promoted by our members. I'm so glad to witness and be part of those honors and more grateful is what I'm learning, and who I'm working with.

2015 is the 15th anniversary of Huawei Sweden, and the eighth year I work in Huawei; I would keep growing with her and share this encouragement with all my workmates- holding our initiative, and we'll achieve our goals. Whenever anyone has a chance to visit here, I'll treat you not only a cruise to Stockholm archipelagoes, a visit to those historical buildings in old town, or the famous Wasa Museum, but to show you a walk around a red brick building in the Kista forest, that's where we Huawei Sweden began.

Seeds for the Future

By George Zhang & Sun Ye

Huawei has remained committed to the Digital Agenda of Sweden, which is helping to foster the next generation of ICT talent. In February 2014, Huawei initiated a three-year long educational program, "Telekomtalang" in cooperation with leading Swedish technical universities. Every year, this program gives 10 top students the opportunity to visit China and gain cultural and professional experience. The program aims to encourage more young people to pursue careers in the ICT industry. This year, 10 students from Sweden and 2 students from Iceland visited China for 2 weeks in late July and early August.



If you had told me four months ago that this summer I would be able to speak some Chinese, program a 3G/4G network and climb the Great Wall of China – I would have said there's not a chance.

But Huawei gave us that chance.

Huawei organized this trip in a faultless way and took very good care of us so we could have a clear focus on studying both telecommunication and Chinese language for these two weeks.

Along with that we were taken for amazing sight seeing trips and made close Nordic friends for a life.

I really can't thank Huawei enough for introducing me to it's wonderful home country and culture and showing us a fraction of theirs large well managed business.

Kristín Helga Magnúsdóttir



I have never before visited China and did not know what I had to expect. But from this wonderful trip with Huawei have I got experiences that can't be found anywhere else. This trip has been a tremendous opportunity where I've had the chance to be part of the

Chinese culture, see the astonishing historical landmarks, learn the Chinese language and get a professional introduction in IOT from Huawei employees.

I have got new friends from all over the world that is a part of the big Huawei family and experiences I will never forget.

This trip showed me that Huawei are keen on getting young professionals into the organization with new ideas and visions for improving and helping people's everyday life and creating the next big thing.

Oscar Axelsson



The time we have spent here in China has been very enjoyable and even though I've lived here before, I've learnt a lot of new things. Our teachers were always very passionate about their subjects and we got to mix theoretical knowledge with hands-on skills. I'm grateful that I got the opportunity to be a part of this trip since it has given me valuable insight into the business world of China and forge connections with so many talented people. I look forward to seeing how far Huawei will go in the future. Thanks to the people of Huawei and our guides and teachers for this very valuable experience!

Rebecca Ahlstrand



The Huawei Seeds of the Future Program has in many ways been a dream come true for me. It enabled me to make my first trip to China, where I got to practice my shaky Mandarin, and made some wonderful friends from all over the world. I think it's great that Huawei shows they really do put the people first.

Ludvig



My stay at Huawei has been incredibly fun and educational. It was interesting to learn more about Huawei, the Chinese language and culture. I'm impressed over how Huawei has grown from being a small company to one of the top 500 in just 28 years. The teachers we had during the training were passionate about their subjects and that was quite an inspiration. China is more than what meets the eye, they have a unique culture and so much to see and learn if you just keep your eyes open. I'm really looking forward to see where Huawei will be in the future.

Nadia Röning



The Huawei Seeds for the Future program has really given me a valuable experience in the Chinese culture, language and ICT business. I'm very grateful that I was given the opportunity to be a part of this program. These two weeks in China has made me a bit more experienced, open-minded and dedicated for my future career in the ICT business.

I have met people from all over the world, eaten things I could never imagine I would eat and learned a language that was totally foreign for me. I have had an amazing time in China and I will definitely come back in the future and also continue practice my Chinese. I'm so thankful that I got to see how Huawei works and after this I'm sure I will continue study ICT and work in the business in the future.

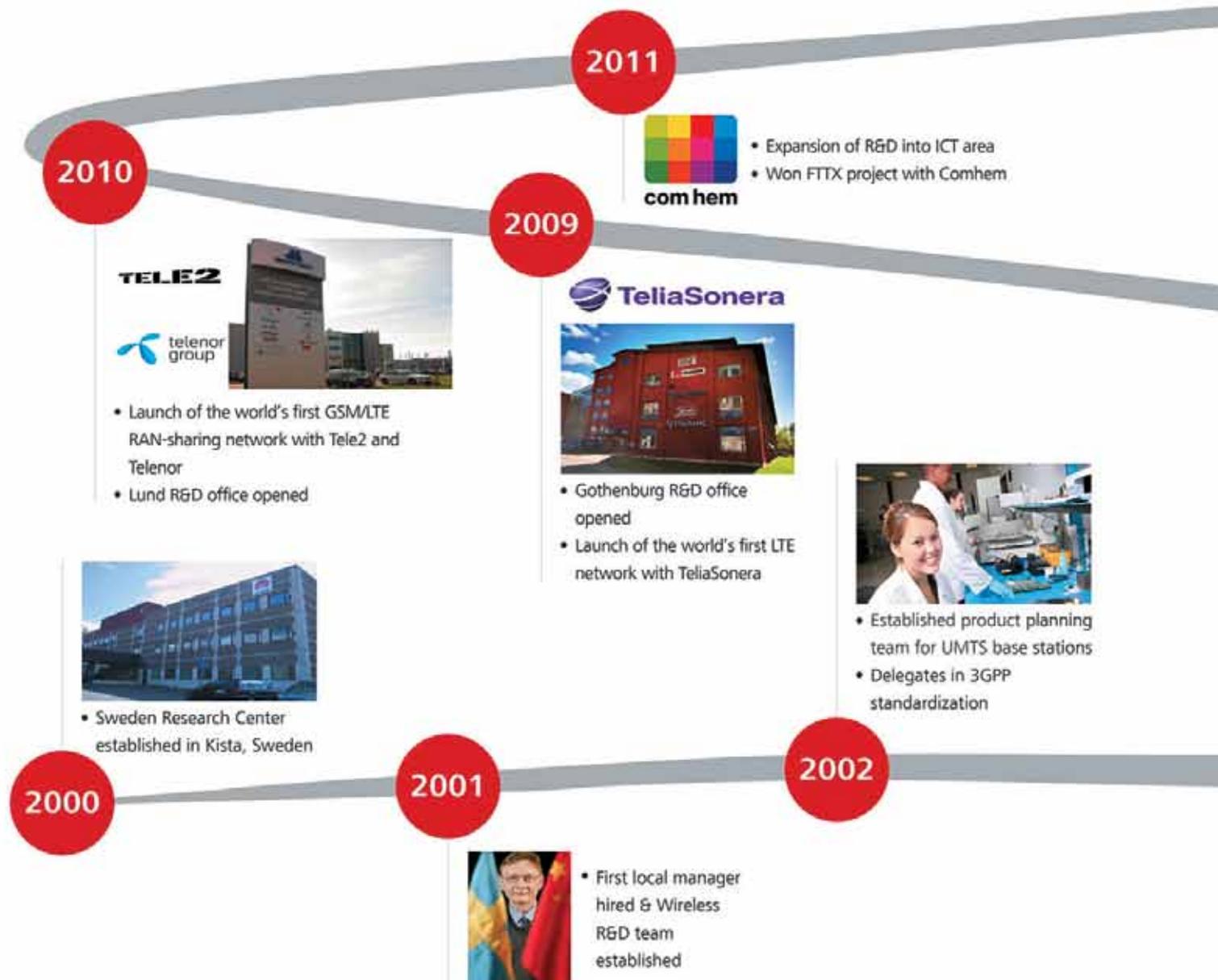
Sofia Rönqvist

Huawei Sweden 15 Years

Building a Better Connected Sweden

Huawei, a leading global information and communications technology (ICT) solutions provider serving 45 of the world's top 50 telecom operators, entered Sweden in 2000 by establishing Huawei's first R&D center in Europe. In 2003, Nordic sales office was established.

Sweden has been and remains a strategically important market for Huawei. Today Huawei Sweden employs over 600 people at 7 offices in Sweden (3 R&D offices, 4 Sales & Services offices), with a staff localization rate of more than 75%. It creates more than 2000 indirect job opportunities among partners. Huawei's products and solutions are serving around 90% of the Swedish population. Huawei has trained 2000+ local technical engineers and has close cooperation with 20+ local partners.



2015



- Moved to new office in Isafjordsgatan 34
- Signed Hi3G wireless and core project
- R&D expanded to 7 offices and 450+ employees in Nordic.
- The first year of 5G standardization



2014



- Won N4M expansion project
- Won IP Only on FTTX project
- Hosted the first "European Professor Forum"

2013

3GIS

- Expanded managed service business for fixed and mobile networks with Telenor

2012



- Won UMTS and managed services business with Hi3G and Telenor
- Finland R&D Center opened
- Ireland R&D Center opened

2008



- Established a product planning team for handsets in R&D

2007



- Increased investments and grew into more extensive portfolio

2006



- Expansion of R&D into new technologies, such as LTE

2005

- First contract with local operator on UMTS modem/data card



2003



- Nordic Sales office established in Kista

2004



- First major customer in the Nordics, Swedish Banverket



Zhou Xin (Eric),
President of Sweden Research Center

A 15-year-old boy means maturity and steadiness for a child, but ignorance and hesitation for an old man. Sweden R&D Center (HWSE) has experienced 15 years, what have we learnt, what challenges will we meet in the future? I try to summarize some thoughts based on 15 years working experience in Huawei and 4 years as an expatriate.

Why are oversea experts contributing more to Huawei than before? I believe there are three key factors from Huawei -- trust from high management, innovation process and enough resources. Local team has chances to convey technical views to high management directly, which facilitates the investment into some areas that were blocked by middle-level management easily because of "infeasible". We are encouraged by top level, like Rotating CEO Eric Xu and many DU managers that we should stick to our technical direction which we do believe. Of course, this belief comes from our comprehensive judgment of value combining from customer, competition and Huawei itself.

Experience is a valuable and scary thing. We could make deeper investigation and discovery based on our 20 or 30 years working experience. But experience could also prevent us from learning new things, including technologies and management processes. Huawei achieve top1 vendor through 28 years hard work and innovation, on both technology and process. Making the impossible possible will always be our "task". Always keeping mind and eyes open, especially more to outside, is really important for us.

Help HQ to wake up, till awakened. Each success in HWSE history is absolutely a complicated and tough story. We should interpret our ideas to HQ team in a variety of ways, including technical, management, in English, in Chinese, formally and informally. The final stage would be working together with HQ teams to implement our solutions into final products. It is not just giving a presentation or one document, but a long-way communication. It will not be seen as a contribution that we say, "Hey guys, I said this in my slides three years ago." There was one "old K" in HWSE several years ago; he spent 8 years on preaching "feature-function" (FF) design method, from team to team in different departments. It finally changed the design flow and methodology in product design. Experts are those who clarify their ideas and try every means to turn their ideas into final results.

How to combine local practice and Huawei experience? One good thing between these two aspects is, their targets are the same, encouraging local teams to make continuous contributions and ensuring the growth of both individuals and teams. There exist a few processes that we think not so locally practical. But it won't help if we just resist and say NO. Rather, we need to know the background and intention of the policy, and to find a way, maybe a middle solution. One famous philosophy in Sweden is "lagom", a bit similar with "middle way" in Chinese culture and "Huidu" in Huawei. Huawei is a big company with 170,000 people, but with willingness to learn and change. It relies on our wisdom together from local people and expatriates.

We have witnessed Huawei's transition from a follower to a market leader through these 15 years. We need do more to help Huawei become a true industrial leader. The mission and requirement for HWSE in the future are different from those of the last 15 years. HWSE will grow up from a teenage boy to an adult. I do believe, that in 15 more years, every local employee, consultant, and expatriate will have no regrets and be proud of having been working here!

A handwritten signature in black ink, appearing to be 'Eric Xu'.

HUAWEI PEOPLE

Issue 259

August 30, 2015

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Build a Better Connected World



Dr. Hong Zhou received his PhD degree in Electronic Engineering from Fudan University, China in 1997. From 1997 to 2012, Dr. Zhou was the President of Huawei Shanghai Research Center and the vice President of Wireless Product Line, responsible for the research, standardization and development of wireless products. Since 2012, he has been the President of Huawei Central Hardware & Engineering Institute, and since 2014, he has also been the President of European Research Institute. He is currently responsible for the Huawei general research activities in Europe and the research in hardware and engineering technologies.

Around Midsummer Festival in 2002, I went on a business trip to Northern Europe for the first time. I was immediately caught by this fairytale place, especially the time-honored exquisite buildings in Stockholm and Helsinki, and the lush Oak trees around the City Hall and Drottningholm. However, what impressed me most was the local people's insistence on high-standard products, for example, the safe and reliable Volvo cars, practical and well-made IKEA furniture, compact and reliable Ericsson base stations, world-famous Nokia phones, and professional Suunto sports watches. These products have taken Northern Europe to the forefront of the industry.

At the KTH Royal Institute of Technology and the University of Oulu, I visited many cutting-edge labs. Numerous R&D institutes for world-class enterprises and top local engineering companies are based in Helsinki and Kista science parks. With leading basic research and engineering technologies, a highly efficient innovation ecosystem, and a pool of quality-minded tech experts, Northern Europe has attracted many companies from all over the world.

Over the past decade, Huawei's Sweden Research Center, which is one of the key engineering R&D centers in Huawei, has achieved outstanding results. It has proposed numerous advanced wireless technologies, which have been adopted into 3G and 4G standards. It has helped advance solutions including the distributed base station and SingleRAN, and also taken the lead in solving problems for the wireless industry to smoothly evolve from traditional 2G networks to 3G and 4G. In doing so, the research center has contributed greatly to developing global mobile broadband.

During the evolution process, the Sweden Research Center has spearheaded the R&D of many engineering technologies such as the new base station platform, high-performance baseband algorithm, high-efficiency broadband power amplification architecture, and high-density and high-reliability power supply and heat dissipation solution. Each of these technologies plays a positive role in promoting Huawei's wireless technology and in driving the progress of the global wireless industry.

As new technologies such as mobile broadband, the Internet of Things (IoT), Big Data, and cloud computing continue to evolve over the next decade, wireless communications technology will face greater challenges. It must not only provide users with a superior high-definition media experience, but also enable all industries to go digital and get smart. Against this backdrop, I hope experts in the Sweden Research Center will continue to work closely with the industry and academia to explore how to achieve higher spectrum efficiency, cost-effective and energy-efficient solutions, and more flexible service deployment models. These efforts will enable us to create greater value, make new contributions to the research, standardization, and industrialization of 5G, and build a Better Connected World.

Huawei Fellow, Dr. Branislav M. Popovic

1 Foundation of Huawei's presence in 3GPP (2002):

Branislav initiated Huawei's presence in 3GPP by presenting a few Huawei's contributions at the 3GPP WG1 meeting in January 2002, as the first Huawei's delegate ever in 3GPP.

From that meeting on, until the end of 2007, when the main part of LTE Release 8 has been finished, Huawei's contributions to 3GPP WG1 have been mostly created and presented by Branislav and his group.

2 First Huawei's success in 3GPP (2003-2004):

During 2003 and 2004 Branislav and his group have been involved in the 3GPP OFDM Feasibility Study, which was the initial step in developing LTE standard. Two of their solutions have been adopted in the technical report (TR 25.892) of this study, as the key outcomes of this study, with later impact to LTE standard.

What makes this success particularly significant is the fact that it was achieved in spite of the strong competition and opposition from the strongest companies in 3GPP at that time, being in that way the first endorsement of Huawei's impact to 3GPP.

3 Development of the first version of LTE standard – Release 8 (2005-2008):

Branislav and his group have invented and promoted a large number of essential patents for LTE Release 8, which was a success that has laid foundation for extended presence and leadership position that Huawei enjoys today.

4 LTE standard – Release 10 (2009-2011):

In this period Branislav and his group invented and promoted a significant number of essential IPRs in LTE Release 10, and further strengthened Huawei's position in 3GPP, which lead to the election of one member of Branislav's group (Dr. Mattias Wennström) as the rapporteur of "Uplink MIMO" work item in 3GPP RAN1.

This was the first time in Huawei's history that Huawei has obtained such prominent position in a standardization body, which quickly promoted Huawei's leadership in 3GPP.

5 5G research (2008-2015):

In parallel with 3GPP research and standardization, Branislav and his group have already in 2008 laid foundation for 5G research in Huawei, by studying low-density-spread transmission schemes, and publishing related research results in a paper presented at IEEE Globecom 2009 conference.

This work was foundation and motivation for development of a number of Huawei' 5G solutions in recent years.



Dr. Branislav M. Popovic is a Huawei Fellow, and the Head of Research and Standardization at Huawei Technologies Sweden.

Dr. Branislav M. Popovic joined Huawei in 2001, as one of Huawei's first employees overseas. Prior to Huawei, he had been at a number of senior research positions in other leading companies and research institutes. He pioneered research and standardization activities at Huawei, particularly in the areas of radio transmission technologies and 3GPP TSG RAN WG1 standardization. He and his group were involved in the development of LTE wireless standard since its beginning in 2003.

Dr. Branislav M. Popovic is an often cited expert for signal design and efficient signal processing architectures in spread spectrum, OFDM and radar systems. He is the author or co-author of numerous patents and academic publications.

A Rock in the Stream

By Urban Fagerstedt/Vice President R&D of Huawei Sweden

In December of 2006 I made my first contact with Huawei, I was then a consultant looking for an assignment. After a brief interview with Lars Bondelind I was invited to give a presentation to a group of people, PLR's (product line representatives, president and some local experts. I was giving my view on how a competitor had managed to become and stay a leader in Wireless. After the presentation I had brief talk with the office president Wang Guolin, while smoking, and went home to celebrate Christmas.

The New Year started, January and February passed with no contact from Huawei, I started to think this was a lost opportunity. Then suddenly mid March I received a phone call, was I interested to come by tomorrow. I did and a short term contract, 3 months, was arranged. This was the

start.

15 March 2007 I report for duty with Huawei, it quickly becomes obvious that I am to take the role of Vice President for the office. I am told that for some time the office have been struggling, growth is small, and several employees have left. We are now some 40 people in the office of which 18 are employees. The first thing we do is to bring on a new HR person Carina Höglund in the following years we will be busy recruiting and we are doing well. The word is spreading among professionals and is also supported by some media interest caused by me joining Huawei.

Today 8 years later I am asked to write a story about what I have achieved in my time with Huawei. That is not an easy question you could say nothing, because I have made no designs have not studied new technologies or components. Then again if we look at Huawei Sweden R&D centre we are now established on three sites in Sweden, we have offices in Ireland and Finland and at the end of this year we expect to be more than 500 people. I proposed establishing in Gothenburg therefore I can claim some part in Massive Mimo and Cobra development. With former colleagues we started up activities in Ireland with Nopsar Ltd leading to establishment of R&D offices in Dublin and Cork. Over the course of these years I have been in discussions with many Chinese leaders and experts, the range of topics is wide, examples are hardware quality improvement, supply chains cost, documentation systems, strategies for

how to build resources in new sites, and many more. From all of these meetings one impression dominates, all these guys are young, attentive and keen. They listen to what you say, try to understand and do the best they can with what you say.

So why is the headline "A Rock in the Stream"? Well I have been in my position now for eight years having served with four presidents (not many in US can make that claim), and I do not know how many PLR's. They have all gone on to further their careers in Huawei. Now when I meet new expats I can tell them I worked with their boss. Interestingly this very often the case when we contact local companies and professionals, they have often worked with me before.

But the true rock in the stream is Huawei Sweden R&D centre, what I say above is true for many of our local experts. They have seen young Chinese colleagues come and go, with these they have shared their knowledge and provided base for further progress. Often happy to meet again when in new roles our expats return for visits or new assignments.

As for myself I have grown older and perhaps slightly wiser, and one day I might fully understand Huawei.



A Focus on Innovation

By Anders Sandell/Senior Director Wireless R&D

At Huawei Sweden R&D we always put innovation first. The last couple of years the Swedish Research Center has produced a number of innovative ideas that have been recognized by HQ and constituting the base for future product development.

One example is the idea of using Multi-User MIMO (Multiple Input Multiple Output) antenna system technology to significantly increase the capacity and reduce the total energy consumption of LTE mobile telephony networks. This technology is not new, since it has been used in radar and space applications for many years. One enabling factor is the ever increasing performance and price reduction of the electronic components, making it business viable. But that is not enough. It also requires some head-strong engineers with a firm belief that it would be possible, and that any known (and unknown) problems would be possible to overcome! With that mindset as an engineer, problems are rather seen as opportunities. If there were no problems to solve, there would not be any need for engineers.

Another example is the Soft Baseband architecture that the

Swedish Research Center has been working on for a number of years. To replace “hard” accelerators with a soft implementation to achieve a much more flexible solution has been a challenge, both from a technical perspective but also since it is a new and disruptive step in reducing the hardware content in favor of softer solutions for the benefits of the customers and our own future business.

So, what does it take to keep the focus on innovation and establish a creative environment?

The starting point is to think “Outside the box” and challenge the traditional! Completely new and game changing ideas are much more likely to be disruptive and not to be found “within the box”. Do not give up due to comments like “we have tried it before, and it did not work then” or “it seems too difficult”! Explore the unknown, and go outside your comfort zone. Be brave and dare to take risks! There are no guarantees that an idea will fly, i.e. be a success from a business perspective, but unless you explore it, and many more ideas, you will never find the one that is.

You have to have perseverance. Good ideas are often “growing” over time. Ideas are maturing, from



exploring the idea and learning about how it would work or perform, but also from sharing it with others. Sometimes the original idea will not be considered good enough when exploring it, but instead spin-off ideas are generated which might have higher business viability.

Most important though is how the creative people (the Innovators) are managed. Focus on the people! Give them enough freedom to explore their ideas and trust that they will deliver! And most importantly, set targets that are promoting innovations and new ideas.

Good Leadership is the key to Innovation! This is what we call “Innovating the Swedish way”!

A Truly Exciting Experience

By Lars Bondelind/Ex-VP R&D of Huawei Sweden



It's really amazing that Huawei Technologies Sweden is 15 years old.

Scouting troops were sent out to Europe from Huawei 1999-2000. The aim was to plant seeds for Huawei wireless R&D and sales organizations in Europe.

The group scouting for a site to establish an R&D center, worked with the assumption that they would find people competent in wireless technology in the places where competition was fierce.

An office had to be rented, and the scouts came to find an office in Kista. Very suitably situated in Kista, and it was already a hot-pot of small companies working with computing and wireless technology. The scouting troop now set out to hunt for a local management team, primarily a Swedish R&D manager and also an HR manager, and found Lars, Tommy and Berit who were all contracted to start.

The marketing agency created a very bold recruiting campaign and for sure we made people curious and made them smile a bit.

The advertisement clarifies the wishes from the Chinese management. Focus should be on a new 3G radio base station (RBS). There was one realized already in Huawei China, but it was also clear that there was not enough experience to put such a complex design into mass production.

We had initial luck in finding highly qualified people in radio interface algorithms and radio resource management algorithms. We also had luck in finding people researching high efficiency radio power amplifiers and radio node systems design. From these the first teams were established. Groups were formed based on specialists among the first people from China together

with the newly hired.

The Swedish engineering work method was very much top-down, and several of the newly hired staff were people with excellent overview and understanding of the interaction between the RBS system components. The strict top-down approach and the role division between engineers having responsibility for overall internal system design and interfaces on one hand, and the implementation design engineers, was not so much established in China. So when we announced several of the newly hired as "system engineers", the management in China asked: "Why do you need so many system engineers? We only have five"!!!

Huawei management paid a lot of interest to the new Swedish office and Mr. Ren Zhengfei personally visited us several times. We were also used as a marketing tool and very soon had visits from senior managers both from China Telecom and other telecom companies.

Work was very intense and differences in habits and interaction were experienced daily by our Swedish employees. Not only that all the technical documents were in Chinese, which none of us Swedes could read, but also that habits were different and discussions sometimes became embarrassing when a Swedish engineer might say "You are completely wrong" as part of a technical discussion. The expected way was rather to say something like "This could be done in a different way".

As part of developing the work and organization, we went to both Shanghai and Shenzhen many times and sometimes in quite large groups. This also meant that many of us having joined Huawei Sweden during the first years have had a first-hand view on the amazing development not only of Huawei (that was around 20,000 people when we joined) but of China.

In summary I must say that all of us having participated in the start up of Huawei Sweden have been part of the fast and revolutionary development of telecom industry that Huawei contributed to, and we all had a truly exciting experience!

A Product in **T**ime

By Mats Blumenberg/Head of Sweden
Wireless Product Management



It all started seven years ago. At that time 4G was in the planning stages and most people in the industry thought 4G would first be deployed in North America. This is because CDMA operators would potentially need to quickly migrate to 4G in order to compete with WCDMA.

That all changed when one of the Nordic operators announced that they were to be the first in the world with 4G and that they wanted to launch in 2009. Other Northern European operators followed suit. As part of the European product management, we were consequently asked by headquarters to take the lead on 4G product management.

We attended a lot of customer meetings. Our potential customers listened politely to our presentations, but would they seriously consider us?

At this time a technology shift was silently going on in the background. New breakthroughs in linearization enabled the building of

wideband radios. Huawei had started to build wideband radios using the latest technology that made it possible to design a power efficient, low cost radio that could also support 2G, 3G and 4G in the same radio. This was nothing less than a revolution. This was the perfect product for migration to 4G. It was also the perfect product to enter new markets. In fact these radios were so good that it made sense for the operators to replace all the existing equipment just because of the savings on power and floor space. Then these radios could gracefully migrate to 4G as people bought more and more 4G phones.

So here was Huawei, with a product that could do 2G, 3G and 4G, years ahead of the competition at a time when 4G is introduced. But

would the customers trust us? Would they dare to put their future in our hands?

The rest is history. During the following years most of the mobile network equipment in the world was swapped for wideband radios that could evolve into 4G. This migration is still going on as people buy more and more 4G phones. Huawei grew from a big company into a huge one within a couple of years, at least partly because of this successful shift to 4G. From this other requirements emerged, new bands, re-farming functionality, multi-standard baseband, etc.

And the definition of 5G is just around the corner.

Our Success Story Will Continue

By Zhongmin Deng/Wireless Baseband Line Manager and System Architect



Zhongmin Deng joined Huawei Sweden in April 2001, and since then has worked with baseband research for 3G and 4G, such as key technology studies, requirements and baseband architecture.

He has been involved in every generation of baseband ASICs for the wireless basestation products.

His main focuses are algorithm parallelism, pooling of processing resources, soft baseband and architecture for 5G.

Baseband was the first department in the organization when Huawei established the R&D center in Sweden in the year 2000. Right after the start I decided to focus on in-house design for our wireless baseband, the very central of it was the ASIC architecture. The strategy we have embraced even today, has brought Huawei wireless a huge success over the past 15 years.

After several years of hard work, we made tremendous improvement on the NodeB products (WCDMA Base Station). We also held out the 'Huawei Winter' in 2002. But for Huawei, the market was hard to work up because we were new in this business and were many years behind the leading vendors. So we were in desperate need of features that would help us overtake the competition.

First Full-fledged HSDPA in the Market

Then there was a window of opportunity for Huawei as the HSDPA standard took shape in 2003, it was a fundamentally new standard, designed for data instead of voice.

The wireless management decided to develop a new ASIC for HSDPA, the Huawei Sweden Baseband took on this task, and the project kicked off in early 2004.

The Baseband team consisted of only five people (Marcus Kahn, Pontus Andre, Mats Johansson, Jorgen Neckman and I), and we were facing many challenges, such as the complicated ASIC development process, a new standard with new air interface and new technologies such as HARQ, 16QAM, long distance to Hisilicon in Shanghai. Despite all the difficulties, we managed to complete

each delivery on time. In order to smoothly integrate the Swedish design and HQ design which took care of traditional WCDMA R99, Marcus and I traveled to Shanghai for a month to work together with HQ engineers.

In Sept 2004, the full HSDPA design was delivered to HQ. Well, according to Hisilicon, the only problem with our design was that they could not find any bugs (it was against conventional wisdom which prompted them to put more effort and resources into finding bugs but it was still in vain). Then the ASIC for HSDPA become the first ASIC by Huawei to achieve GA with only one tape-out, saving both time and money (each tape-out costs several million SEK (Swedish currency) and three months of work).

Huawei became the first vendor to provide full-fledged HSDPA, ahead of other vendors by more than one year. From then on the success story of Huawei WCDMA started.

Success

Soft Baseband, from “PK” to collaboration

It was of tradition that Huawei design hardware accelerators in the ASIC, further boosted by the success of WCDMA. When the new LTE standard was developed, it was quite natural for HQ to go with the traditional way of design, i.e. hardware accelerator for all functions.

However, LTE was designed with one thing in mind, which was to provide wireless Internet, a new world which we are yet to understand even after 25 years of its birth.

We felt that the best way to support LTE was to provide flexible design. And luckily we found competence in Sweden that had experience in Tensilica DSP core, which could be customized for LTE Baseband processing. This formed the basis for our LTE BB ASIC design.

So in the beginning of 2009, the race began. The Huawei Sweden Baseband team came with fully soft architecture, counter-proposed by hardware accelerator based architecture from HQ. But the deadlock had to be broken, otherwise we were going nowhere and LTE product line was in urgent need of ASIC in order to meet market demands.

The key was communication, we realized that we had to motivate our solution; we had to show it would work; we had to simulate. A Chinese expat, Wang Jibin was taking

the crucial role in communication with HQ; he helped to remove most of the misunderstanding. Willing to compromise from both sides (and also by intervention of wireless management), the Swedish Baseband team and HQ agreed on an architecture which was soft to large extend: dubbed Huawei’s first Soft Baseband.

It has been proved that the softness in baseband is very key to market success of our LTE products since it adapts to new requirements and algorithms, while the flashpoint of debate during the architecture pre-study, i.e. should MIMO functionality be soft or hard, has finally got his market verdict, the soft MIMO was good since there was no UL MIMO demands in the network

Multi-mode Baseband ASIC

To support GSM, WCDMA and LTE in the same ASIC was not trivial. The technologies were different; the requirements were different; the software was different; but the hardware had to be the same. No compromise was allowed for the specification for each standard, because this ASIC would be the lifeline of GSM product, WCDMA product and LTE product. This task was again put on Huawei Sweden’s Baseband team in 2010.

As a matter of fact, we have made several attempts to design multimode baseband architecture earlier. We tried to align WCDMA algorithms with LTE algorithms; we tried to design multimode accelerators; but all attempts failed. Then, a competitor announced that

they planned to release base station products with multi-mode ASIC in two years. We were facing a mounting pressure to solve multimode problem for the next generation ASIC.

This time we decided to focus on reuse of memory resources instead of reuse of computation resources. This required very detailed knowledge about hardware accelerator design by Hisilicon where memory was tightly coupled with computation. So a joint team was set up consisting of people from both Hisilicon and Swedish baseband. After 6 months of intensive work, we successfully created a baseband subsystem that separated the memory from the computation, such as a high degree of sharing was possible between WCDMA and LTE. Based on this design, the multimode ASIC was released in 2013 and became an immediate success in the market, in Swedish words, säljer som smör (sell like hotcakes).

An interesting episode of the story was, for the competitor who first declared multimode ASIC, it has turned out that their multi-mode product only supports GSM and LTE, not WCDMA. While Huawei’s multimode ASIC supports all the three standards with full specifications.

Over the past 15 years at Huawei Sweden, I’ve been with developments of seven generations of wireless baseband products, and witnessed the tremendous growth of Huawei Wireless. We have helped to make our products competitive, the organization mature, and the cooperation with HQ fruitful. Now there is a new challenge on the horizon, i.e. 5G. We at Huawei Sweden baseband are more than ready to take it on because we have prepared for it for four years.

Our success story will continue.

Mikko Terho is currently working in Huawei Technologies Oy in Finland as R&D Site Manger for Finnish R&D and as CTO for Terminal OS in Huawei Technologies, Central Software Institute in China. Finland R&D works on Mobile Software, Consumer Product Security and 5G Technologies.



Dedicated to 5G

By Mikko Terho

European 5G Terminal Design Center is in Finland.

Huawei R&D center in Finland is established 2012 and we report to Sweden R&D and corresponding business teams in HQ. Design Center in Helsinki Finland is focused in technologies related to Terminals and we have good position as the only team in Europe focusing on 5G terminal development. My team is on coffee table discussing our unified vision for 5G terminal and Huawei R&D in Finland.

5G terminals to be used by consumers and industries

5G development is a journey in innovation and learning where one thing is clear: we build products and do the research necessary to derive benefits to our customer and consumers. However, the current consumer is still distant from the 5G engineering and research effort taking place at this point of time. Engineer knows the agreed design goals of 5G and the current vertical buzzwords, like Internet-of Things (IoT), Intelligent Grid, Smart City and Smart Traffic. Use cases for

standardization follow the needs of industry verticals defined by above mentioned “buzzwords” and parameters picked up from traditional telecommunication standards such as latency, capacity, transmission speed, mobility support, reliability and density of links.

5G technical goals

The latency target in RAN is 1ms, which is a ten-fold improvement over current LTE RAN access time. The commercial value of this target is improved real time communication and the possibility to open new industry segments for wireless communication, such as industrial and electrical control networks. The latency requirements in control networks are below the current latency and performance of current wireless standards. Achieving low latency opens up new vertical markets in smart grid and real-time control. For a consumer the short latency means much better gaming experience and also the introduction of new services like augmented reality and real-time telepresence.

High transmission speed with peak rate of 100/10 Gbit/s (indoor/outdoor) for consumer terminals

is higher than current peak rate in most fixed corporate networks using Ethernet technologies. High peak rates are important to reach low latency in a high-capacity multiuser system that also needs to support, for example, several 3D 8K video streams. In 5G, even the most demanding virtual reality, augmented reality, gaming and real time videoconferencing solutions are working with photorealistic image quality.

Mobility support of 5G is targeted to work at speeds of 500km/h, so we can say that finally 5G works everywhere in bullet trains, fast moving vehicles and urban cities outdoor and indoor. New 5G-quality vehicular & outdoor services in cities need a lot of capacity. Our team has estimated that we have to achieve the point traffic density of the network urban underlay of 1Tbit/km².

Innovations to achieve 5G goals

Two significant findings came out from this discussion. Firstly, we have to move radio management functions away from the terminal device (UE). In original GSM, the current LTE set-up and in the

WLAN, the UE is measuring the signal strengths of base station pilot transmissions. These measurement results are periodically transmitted to the network and radio resource and mobility management is based on UE measurements. Similarly, there are many other “keep-alive” functions in other levels of the UE software. A better, more power-efficient approach for UE is to move all this type of functionality away from the consumer device in order to lower stand-by power consumption. So the principle we are now following in our development work is that the UE sends the pilot - we call them beacons - and the network measures. This is suitable for dense 5G networks, not necessarily so for a macro-cellular deployment. Apparently multiple base stations hear the beacon signal from the UE, allowing channel estimation to be performed. Next the network computes the transmission signal directed for the UE and sends the IP-packets using MIMO techniques. The same beacons from the mobile device allow the network to calculate the user position and predict it. This allows the mobility management to be proactive, not reactive as in current GSM and LTE-networks. This is a key for good 5G mobility performance.

The predictive mobility management scheme allows also very accurate positioning of the user devices at very small power consumption in the device. The latency and peak rates already lead to a design where the handset location needs to be known in a few meters radius, if 5G communication throughput and latency are to be met. Our research indicates that we could have a positioning system with ten centimeter accuracy indoors and meter range outdoors, if such capability is required for the consumers and IoT. It is possible to develop 5G as ubiquitous LBS solution, both indoor and outdoor, without additional investment. This opens new business opportunities for all parties investing in 5G networks and our studies show that quality is LBS service is better than the current solutions provided by the OTT operators.

Finland is an excellent place for 5G terminal research

By following the goals set for the 5G standard work and applying our above mentioned principles we are very excited on our road ahead.

We have multidiscipline R&D team in Finland and the local ecosystem is supporting us nicely. In Finland the universities Aalto in Espoo, University of Oulu and Tampere University of Technology have a long history supporting mobile communication research and basic studies on many areas related to mobile terminal development. Scandinavian telecommunication manufactures and operators have a long tradition in co-operating with universities. In Finland we have multiple small teams that cover various technologies for the terminal. This is beneficial for our 5G terminal research. The active participation into the 5G RAN research and standardization benefits 5G terminal developments.

I can say that, we are the only team in Europe, with the capability to work locally on end-to-end solutions for 5G consumer products. Thanks to Huawei R&D investments in Europe we believe that this work will be in the hands of the consumer early next decade.





Innovating Research, Technology and Customer Engagement

--The story of our expanded Design Center in Ireland

By Dr. Xu Kanlie/Head of the Ireland Design Center

The story of the Ireland research team started in 2010 sponsored by the SingleOSS Development Unit in Athlone and in 2012 Global Technical Services sponsored a Research team in Cork. I follow the footsteps of the earlier leaders who lead these teams, the following story tells the next step in that journey.

Open Roads to a Better Connected World

In 2014, our Ireland Design Center was set up, sponsored by Sweden Institute 2012 Labs dedicated to end to end research in ICT Operations including Technology, Architecture, Solution, Use Case, Business Model and Ecosystem. Huawei's ICT Operations vision is enabled by "ROADS". "ROADS" encompasses five fundamental characteristics of the ultimate user experiences in a fully connected world: Real-time, On-demand, All-online, DIY and Social.

Innovating the customer engagement model with business scenario driven use cases is key to demonstrate this ultimate user experience and provide direction to the steps we can take with customers to realize this journey.

At Mobile World Congress 2014, Eric Xu, Roating CEO set this direction for the expanded Ireland Design Center. "The center will provide operation software business and technology leadership to drive the vision for the company, driven by future business models and related key Internet technology developments. The center will invest in key portfolio and technology research for the future. The center will drive innovation centers with lead customers and guide the end to end operations architecture for the company."

Our Ireland Design Center position in Huawei is to support key global priorities.

- *Telco OS Innovation Center, focusing on the challenge in enabling the transformation of ICT Transformation, new processes and business design*
- *Service Provider Operation Lab, focusing on business model and ecosystems*
- *Global Technology Service Competence Center, focusing on customer experience management, network planning and optimization and key technologies.*

In 2015 the center is successfully engaged with our European customers and is part of

multiple joint innovation activities in the areas of Public Cloud, Open Digital, CEM & Best Network and Location Analytics insights. We will be expanding in the future with long term research partnership with the European Research H2020 and industry and open source communities, e.g. tmForum, OpenStack, 3GPP and ETSI.

The Telco OS Innovation Center in Dublin opens in July 2015. This new center will host customers and partners where we can support deep dive business, ecosystem and roadmap workshops, helping to bridge our global innovation team with our European customers and partners.

Expanding the Huawei Team to match these positions required an expansion of the research team, a new Service Provider Operation Lab and an expansion of the Global Technical Services team.

Ireland DC secured approval for a new office in Dublin to host an Innovation Experience Center in the heart of Dublin's Silicon Docks co-

located with the Internet leaders, e.g. Google, Twitter, Facebook and Amazon etc.

In total the team has doubled in 2014 from 30 to 60+ senior experts and is on track to grow to 100+ in 2015.

Bringing in new talents with Business, Cloud, and IT skills demands an expanded search in new areas. Some of the new talents in the team that have joined in the last year support our strategic customer engagements and research.

If you feel you can help us innovate and are ready for an exciting journey with a great global team, please contact us and also recommend the center to your friends.

We are building an Open, Internet and Collaboration culture that will enable us to present the Huawei Technologies as an enabler for the Better Connected World with a “Cead Mile Failte”, the Irish tradition to extend a “Hundred, Thousand Welcomes”.



Ireland Design Center, experts in Dublin, Cork and Athlone, December 2014



1st Ireland Design Center meeting with executive sponsors, December 2014

Stay Cool, Stay Safe

Interview with Dr. Tsoi Vadim, by George Zhang & Luo Yao



Huawei Sweden “Cool Pilots”



Vadim Tsoi is a level-8 expert at Huawei, and is the leader of the Swedish Cooling Team. He has a PhD in Heat and Mass transfer from Moscow Bauman State Technical University and an MSc in Electrical engineering. He has 33 years of experience in the field of Thermal management and 15 years of experience in the Telecom cooling area. He has currently worked at Huawei for seven years.

When and how did you start to work at Huawei Sweden?

When I had the opportunity to join Huawei Sweden in 2008, the Swedish cooling team only consisted of a newly employed Chinese cooling engineer, Mr. Peng Feng. At the time Mr. Peng was overloaded with a number of difficult cooling problems. I was therefore directly welcomed on board and quickly began working on high-priority projects. This is how my Huawei story began; I was the only locally employed cooling expert and was tasked with developing a strong cooling team to solve existing and future cooling challenges in the wireless telecom domain, as well as creating a cooling roadmap for the next generation products.

Could you please give us some examples of the most valuable technical achievements that come from you and your cooling team?

One early cooling challenge was an R&D study on capacity enhancement for the HERT (Huawei Enhanced Radio Technology) outdoor cabinet cooling system. It was well known that an increase in radio capacity is followed by an increase in heat load. Our target was to double the cooling capacity within the same limited volume without increasing cost, energy consumption, or weight of the cooling unit. It seemed like Mission Impossible, but our small Swedish team, with support from the Huawei China team, solved it in just a short time. The result was a new generation of HERT cabinets with the highest heat density and cooling capacity on the market, using innovative and environmentally friendly cooling technologies. At the same time, our cooling team was growing step by step as we welcomed new talented coworkers from Huawei China as well as Sweden and other European countries.

Another remarkable example of our team's achievements was the HERT BBU (Baseband Unit) platform. Again, our cooling team, through a unique combination of experience and product knowledge, did it: we doubled the cooling capacity for the same BBU unit and brought Huawei flagship product, which insured our leading position in the market. On March 20th 2015, the Huawei wireless department celebrated three million BBU units produced and shipped between 2007 and 2014! Our entire team was very proud of the company's success. We were a part of Huawei's strategically important product development and did our best to support the resolution of BBU cooling challenges.

Cooling improvements have had a significant influence on the industry. Proposals made by our team have led to a paradigm shift in RRU (Remote Radio Unit) cooling approaches, which can now increase NCC (Natural Convection Cooling) by up to 30% in "blade" and up to 100% using new cooling technologies. Modular platforms, also called RXU, may result in significant cost reductions and make Huawei's own DBTS (Distributed Base Transceiver Station) more attractive in the market. I was also awarded a Huawei Gold Medal award for excellent achievements in the electronics cooling field, which is a high recognition of our whole cooling team.

What task was most challenging during your years at Huawei?

I can now say that my most difficult challenge was building up such a strong, multicultural and open minded cooling team, where people with different skills and experiences could support each other, share knowledge and experiences, and be consistently prepared to meet any cooling challenge. It has also been very hard to say goodbye to colleagues and expatriate specialists from China who worked with us in Sweden for 2-3 years. The colleagues always supported us, shared excellent thermal management skills and product experience, and provided an important link to the team in China. During my seven years at Huawei Sweden, I have had the opportunity to work with nine high level and ambitious cooling engineers and senior specialists. One of our traditions has been to present our Chinese colleagues with a yellow and blue Swedish t-shirt before their return to China. We often joke that there will soon be enough for a Swedish football team at Huawei's Shanghai and Shenzhen offices! We are always happy to share our knowledge and experience with our Chinese colleagues. Our Engineering competence centre manager Bo Lundblad often says: "We lose one friend in Sweden but gain a new friend in China!" Working at such a dynamic and rapidly growing company like Huawei is not always a walk in the park. There are both happy times, as well as very difficult situations that require hard work, dedication, continuous improvement, openness, and initiative. Working in the international environment at Huawei

Sweden, one can immediately understand the meaning and importance of the Huawei core values "Integrity" and "Team work"!

What has been most important for you in your work as Team leader?

I think the most important things have been skill transfers and building a professional network in the Electronics Cooling domain:

In 2009, our team proposed and organized the first-ever Huawei electronic cooling technology Global Workshop in Stockholm. The main idea was to bring together representatives from leading universities, suppliers and telecom operators to discuss cooling challenges to get feedback from customers. Through this, we aimed to determine the most important market trends and focus on customer expectations to promote skill transfers between cooling specialists worldwide.

Since 2009, a rotating workshop has been organized at least once a year in different Huawei R&D Centers worldwide. This year Huawei is planning to organize the 7th workshop in Santa Clara, USA. This is highly appreciated from all participants and we plan to continue in the future.



An Intriguing Start

By Ulrik Imberg/RF Group Line Manager & Senior RF Specialist

The first office building when Atelier Telecom was registered



It started as a curiosity. I remember that sometime early this millennium I saw them for the first time in Kista; the Chinese guys. At that time I worked for a small microwave company and we noticed them when they passed outside our office windows every day the same time in a small tightly packed group, four or five of them or so. You could set the watch after those guys. They were on their way to have lunch at the nowadays famous 88 restaurant. After a while we found out that they came from a small, recently established, Telecom Company that we had never

heard of, Atelier Telecom. Little did I understand that Atelier Telecom AB would become Huawei Sweden Technologies AB, and that I ten years later would work for them; it was simply unimaginable.

I guess those times were quite hard. The big community of expatriates we have now, didn't exist. They were quite few and the 88 didn't really exist either. I don't remember what the restaurant's name was at that time, but I remember what we called it – “The Greasing Pit”. We ate there sometimes and I must say, not only have China invested in excellent Swedish Telecom competence; it has also lifted the quality of our food, if not generally, at least in some places. Those must have been hard times indeed.

The telecom crisis came and went away, the small microwave company survived on civilian radar sensors and wideband high-performance oscillators for military

applications. The Chinese guys didn't go away; their numbers slowly and gradually increased. Where did they come from? Were they here to stay? Any small Swedish kid “knows” that if you dig a deep enough pit you come to China. Did they come through “The Pit”? We were joking of course; they were as exotic to us in Kista as I'm sure we and Kista were to them. Today Huawei is firmly established in Sweden and all over the world in many places. And there are many Chinese guys and girls working also for other companies in Kista. China and Huawei have become a natural part of the Telecommunication world.

And where did it all start; the first step out of China? It started here, 15 years ago in Kista in Sweden; under the radar with Atelier Telecom, with a couple of guys eating lunch synchronously at “The Pit”. Amazing! Ten years from now I will look back on my time with Huawei as a unique experience, I'm sure!



We Are Ready

By Mats Högberg/BTS System Line Manager

In the fall of 2011 something happened in Sweden. A paradigm shift seed was sown for Macro Base Station evolution by reusing the idea from the space communication with a large beam forming antenna array with many transceivers. Of course every experienced BTS system engineer knows that this is not possible. More than four transceivers on a BTS consume a lot of power and baseband processing with a potential cost increase more than the gain in performance. 48 transceivers closely mounted in an antenna array cannot be possible! It makes no sense! Or, would it? This was also the comment we got from Mr. Zhou Hong at a meeting in Shanghai late November 2011, when Mats Andersson presented the charter material for the 48T48R massive MIMO project that would result in a 10x capacity gain using a

large array with 48 RF transceivers that were simpler than those found in mobile phone devices. The project members were standing at the back of the conference room and felt despair. Then something happened! Mats Andersson replied to Zhou Hong, “It’s not a lot of risks; it’s a lot of opportunities!” The reaction from Zhou Hong was immediate, a short laugh, and then he said “Ok you’ll get one year to show the performance potential. Project approved!”

The start of the Massive MIMO paradigm shift was a fact!

The following year Huawei Sweden developed the Massive MIMO concepts and in June 2013 the technology was accepted as a future important key technology. In 2014 it has been shown that the capacity gain is at least a factor of five, and the additional cost, compared to a traditional base station with two transceivers and a sector antenna,

is well below a factor of two. This is realized with an extreme integration of the radio into one RF module and antenna advanced antenna technology. Another key is the “soft” base band architecture that is based on many small general purpose processors and a few large Huawei accelerators which is a perfect platform for supporting today’s massive MIMO algorithms and the new potential of new feature and application that the massive MIMO technology enables.

The Massive MIMO concept will allow for a much more energy efficient use of the available resources (spectrum, power, etc) making it a perfect alternative for future green evolution of the radio network!

Now it’s time to prepare for the introduction of a network paradigm shift with Massive MIMO base stations. We are ready - is the rest of the world ready?

HUAWEI PEOPLE



15 YEARS
Huawei
Sweden
2000-2015

