

Sollentuna Energi: A Broadband Pioneer

Sollentuna Energi: A broadband pioneer

Sollentuna Kommun provides an attractive environment for several thousands of residents as well as it hosts a significant amount of small and medium sized businesses. In 1999, the local electricity company, Sollentuna Energi began installing ducts and optical fiber alongside power cables to provide Broadband Internet access for the residential and business segment.

The main aim of Sollentuna Energi was to be able to reach as many customers as possible in a cost efficient way. End user subscription charges, which today is 195 SEK per month, in addition to a start up fee between 400-550 SEK, was an important consideration in the choice of technology and fiber installation method.

Today (May 2002), fiber passes 12,000 homes and around 4500 customers are connected with high speed Internet services.

What is the role of Sollentuna Energi?

Sollentuna Energi owns the access network and dark fiber. Internet connectivity is provided by a number of service providers. Among them are Telenordia, Tele 2 and Tiscali which pays an access charge to Sollentuna Energi for each connected subscriber. The investment was funded by Sollentuna Energi, which is also responsible for profit and loss. The services offered are Internet access: 10 Mbit/s or 100 Mbit/s, music downloading, dedicated Internet and LAN access to the business segment and video services like Video on Demand and broadcasted TV. The company also plans to offers Voice over IP and alarm services.

What is the overall architecture?

Currently the network backbone consists of four central switches connecting over single-mode fiber to 366 access nodes housed in power transformer stations or electricity rooms in multi tenant buildings. The main nodes consist of Extreme Black Diamond and Summit Layer 3 switches. The subscriber traffic is cross connected in an optical distribution frame.

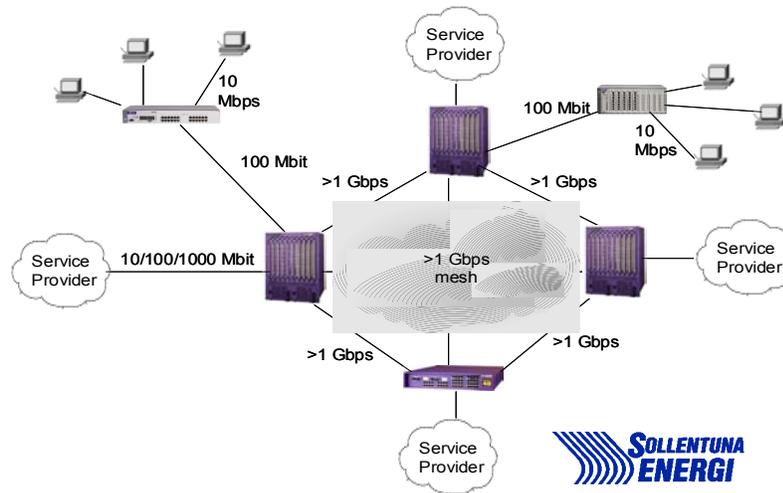


Figure 1: Sollentuna Network Architecture

The Sollentuna network is service provider neutral. VLAN (Virtual Local Area Network) technique is used in order to provide different services from multiple ISPs (Internet Service Provider). Each ISP is connected via a VLAN structure in which they provide their service.

Each service node, where the ISPs Internet Service Providers keep their equipment is housed in a separate and secure building. This means that the ISPs can have access at any time to perform maintenance and upgrades on the equipment.

The network management system is located centrally together with the management system for the electricity network. Sollentuna Energi is responsible for the physical infrastructure, with different priority settings. Alarm messages are automatically send via SMS to the field staff.



Figure 2: Alarm Message received via SMS

Installation Procedures

Multi-tenant buildings

Sollentuna Energi has prepared around 9000 apartments with Ethernet over copper (Category 5). The cable (Cat 5) installation cost is approximately 1600 SEK per apartment. This work is outsourced to a local company. The real-estate owner carry the cost. It costs 16 125 SEK (including VAT) to connect a building.

A typical apartment house contains between 25 to 100 apartments. The building has typically a separate room for electricity that is suitable for rack installed switching equipment. Field engineers patch subscribers to a free switchport. When the switching resources are filled up, the company installs a new switch. This is routine work, scheduled once a week. The uplink to the central node goes over single mode fiber via opto-electrical converters.

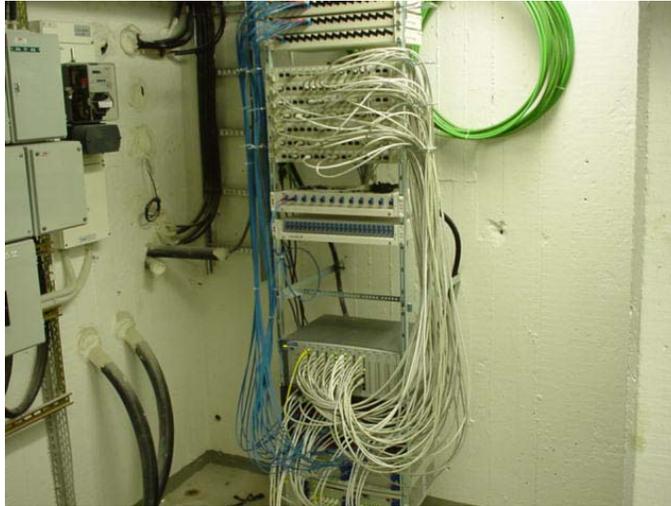


Figure 3: Rack installed switching equipment in a multi tenant building

Single Family Homes

Sollentuna Energi has in May 2002 laid fiber to 1700 houses and prepared for swift installation of additional subscribers by a network of microducts. They use an Ericsson developed system, called Ribbonet for incremental installation of fibers by air blowing.

The company connects individual houses with single mode fiber. A household pay 16 125 SEK for a pair of single mode fibers coming to the home and a converter with a RJ45 outlet. The Swedish Government subsidizes broadband installations over 8000 SEK, meaning that the effective cost for the subscriber becomes 12 000 SEK. The monthly subscription charge is the same as for the multi tenant buildings. The house owner also needs to dig the trench for the last drop connectivity in the ground of his premises. Sollentuna Energi provides the plastic duct free of charge.

Sollentuna Energi has together with a consultancy company developed a low cost micro trenching technique, where a 12mm wide and 40-50 mm deep groove is trenched in the asphalt pavement of the road.



Figure 4: Micro trenching on the pavement

In such a groove up to 3 microducts are placed on top of each other. Afterwards the groove is filled with warm asphalt. If required, a number of parallel grooves can be trenched. When the number of subscribers has reached its peak, this shallow installation can, if required, be replaced with a deeper installed cable in the traditional way.



Figure 5: Fiber grooves on the pavement

Sollentuna Energi has about 50 km of microducts installed. To branch off microduct, the company uses a method based on vulcanized rubber tape. They also use street cabinets as splice- and flexibility points. They claim that they so far have not had any major maintenance problems for instance due to moisture or cable cuts. The following picture shows a typical micro duct coming from one plastic tube in which fiber is blown using a patented fiber blowing technique called Ribbonet from Ericsson. Twelve fibers can be blown up to 1 km distance.

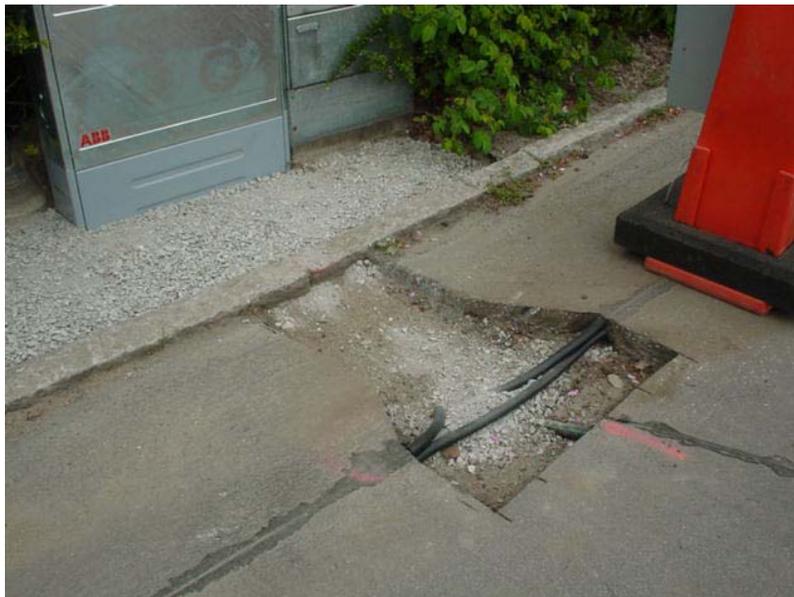


Figure 6 : Microduct containing air blown fiber

When a subscriber has signed up for broadband Internet access, Sollentuna Energi blows in fiber to the home, e.g. incremental fiber installation. The fiber is blown from an electricity transformer station. One such station normally covers 100-200 houses, meaning that the number of connected houses corresponds to the number of electricity customers.

Home Installation

The home connection consists normally of one or several electrical RJ45 jacks. In case of fiber, an opto-electrical conversion unit is installed, where the optical signal is converted to an electrical signal and terminated in the RJ-45 jack.

The customer can connect his computer directly to the jack or use a Digital Residential Gateway (DRG) supplied by Ericsson. This gateway enables home networking and IP telephony using ordinary analogue telephones.



Figure 7: Home installation with Digital Residential Gateway

There are also a selected number of customers that are using Ericsson's set-top-box for TV and streaming video services. Here the consumer can select a number of channels as well as video on demand.



Figure 8: Set-top-box connected to the TV set for TV and video services

Ericsson's contribution

Ericsson provided the bulk of the fiber plant, fiber blowing system, switching equipment, opto-electrical converters, video and TV node and consulting services. In addition, Ericsson integrated the components. The network is also a test site for new multimedia services of other vendors. Parts of the solution were re-used and constitute now Ericsson's Fiber Ethernet Home & Business Access solution.

Conclusion

The Sollentuna fiber broadband network is a switched Ethernet network, providing end to end Ethernet connectivity. The initial strategy, an operator independent network, low cost fiber deployment and low end user subscriber charges has proved to be successful. The company installs the switching equipment according to the expected growth rate of the subscriber base. Low cost layer 2 Ethernet switches with category 5 cabling are used for multi-tenant building and single mode fiber is used to connect single family homes.

The fiber deployment method has mainly been guided by a low cost and fast expansion strategy. When a sufficient subscriber base has been met, Sollentuna Energi will develop the network further. The company has needed to put little marketing effort to promote its services. The news has spread around the neighborhood and its satisfied customers are its best advertisers.



Ericsson is shaping the future of Mobile and Broadband Internet communications through its continuous technology leadership. Providing innovative solutions in more than 140 countries, Ericsson is helping to create the most powerful communication companies in the world.