

The importance of optical networks for mobile systems

Stefan Melin

Lead Network Architect optical networks

2025 September

Leading telecom & ICT provider – connecting millions across the Nordics and Baltics.

Subscriber base of 25 million



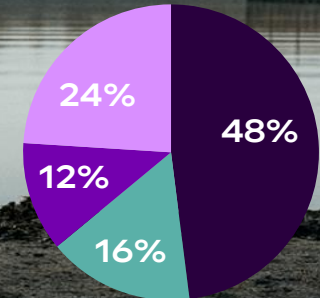
>170 years

of connecting people and businesses



Mobile subscriptions

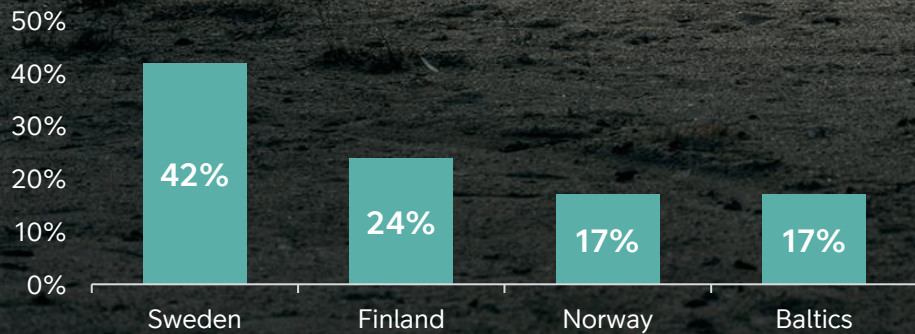
Share of Group Q2 2025



■ Sweden ■ Finland ■ Norway ■ Baltics

TV subscriptions

Share of Group Q2 2025



Broadband subscriptions

Share of Group Q2 2025



Subs. in millions	Q2 2025
Mobile	19.2
Broadband	3.2
TV	2.7
Total	24.9

The importance of optical networks for mobile systems

- The optical networks carry the mobile traffic:
 - Locally to support backhaul, mid-haul, fronthaul.
 - Regional and interregional mobile core network.
- For mobile systems, the optical networks must provide competitive performance :
 - High availability.
 - Reliability.
 - Accurate clock synchronization.
 - Security.
 - Low Latency.



- Building blocks of the optical networks:
 - Optical systems.
 - Terminals/modems
 - ROADMs
 - Amplifiers
 - ...
 - Sites.
 - Power.
 - Cooling.
 - Optical Distribution Frames.
 - ...
- **Optical fibre.**
 - Trenches
 - Ducts.
 - Splices.
 - ODF, Optical Distribution Frames
 - ...



Optical fibre – Investments

Deployment and network planning:

- The optical fibre infrastructure requires long term planning.
- Large investments made in new fibre deployments and replacing poor fibre.
- Today deployed fibre, the Standard Single Mode fibre (G.652), has matured over the years. Life expectance of current produced fibres >25 years. Up to 40 years?
 - Fibre with poor performance is replaced.
 - The large cost to deploy new fibres on new stretches is mainly for excavation.
- The deployment of new fibre stretches is based on available space in the geography.
 - Permits and legal disputes must be processed.
- Latency is depending on fibre location in geography. Straight line deployment - shorter latency, almost never achievable.

⇒ **Deployment of new fibre has to be a secure long-term investment.**



Optical fibre – Life cycle management and Service assurance

Once the fibre has been deployed it must rely on proven and cost-efficient methods for:

- Monitoring, trouble shooting and quality control.
- Repairing, ODF(Optical Distribution Field), splices, maintaining physical diversity, etc.

=> Well functioning procedures and organisations for Service assurance and Life cycle management is a must for reliability and availability.



Limitations with current optical transmission networks

— Operator objective:

- Provide customer services as expected.
- Cost.
- Support.
- Technical specification: Bps(Bits per second), latency, reliability, availability, redundancy...

— Constantly improving the services.

- Optical systems.
- Sites, power cooling.
- Optical fibre.

— Less cost per bps is expected over time.

— Important parameters for reducing costs:

- As few NEs as possible. Maximize distance between system and terminals.
- bits/s per wavelength.
- Spectral efficiency, how many bits/s per optical spectrum.

— How can we improve?

- New optical amplifiers types.
 - Less noise, wider optical spectrum.

Or

- New optical fibre types.
 - More optimal spectrum.
 - Less attenuation.
 - Less latency.
 - Less impairments in general.

=> HCF 🤖



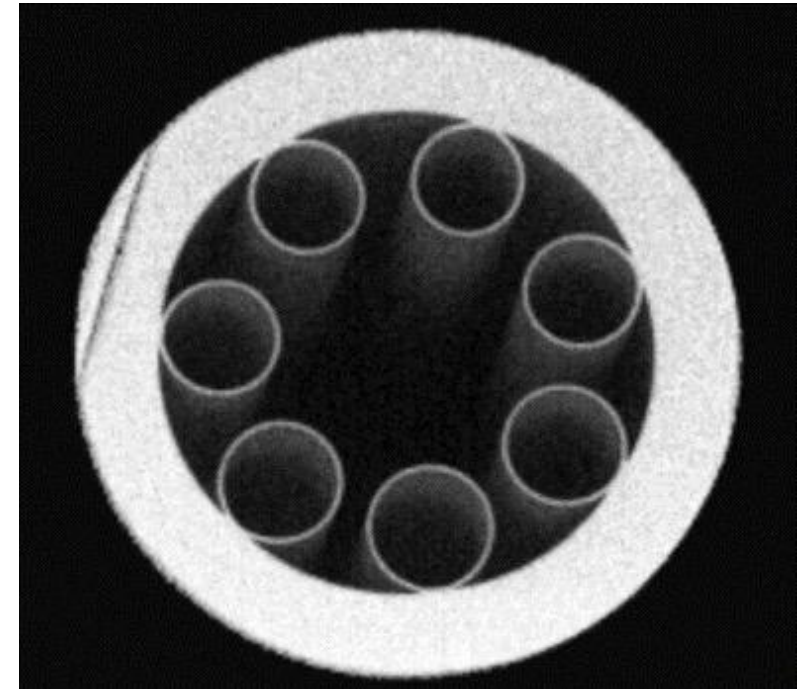
Hollow Core Fibre - an opportunity

- Performance of deployed technology is closing in on physical limitations as we know them now.
- The HCF will with its performance offer opportunity to archive better optimization than today.
 - Reduce latency.
 - Extend reach.
 - Increase capacity.
- With HCF we will enable new way of building our telco networks to support 6G:
 - Cell site aggregation networks – Larger areas can be covered - more efficient coordination
 - Regional and interregional optical/DWDM networks – more capacity per fibre and/or less costly network
- The way forward with HCF:
 - The way of working for network planning, deployment and life cycle management must be proven.
 - There is compliance between existing network elements and HCF, we can use the same equipment for start.
 - On large scale the new fibre will be used to replace old, poor fibre and new deployments.
 - **Standardization!**

- ⇒ HCF is a very intriguing opportunity.
- ⇒ We need to keep pushing the research and development to achieve acceptance and breakthrough in deployment.

Use cases/opportunities for:

1. Mobile networks.
2. Aggregations networks.
3. Regional networks.
4. Interregional networks.



Thank you for listening

