Telia and 6G

RSPG “6G strategic vision” hearing
September 27, 2024

Niclas Löwendahl
Spectrum Director
Telia Company

Telia Company

Mobile, Fixed and TV provider in Nordics and Baltics

- Telia launched world's first commercial 4G network in 2009
- 5G coverage above 95% in footprint (highest in the region)
- Aims to have 99.9% 5G coverage by 2025
- 5G SA to be implemented in 2025, first launches already in 2022
- Telia plans to switch off 3G in 2021-2025 and 2G in 2025-2029, depending on country

SEK 89 billion
in revenue 2023

~18,000
talented employees

~26 million
subscribers across the Nordic/Baltic region

170 years
of connecting people and businesses

"Our ambition is to create a Better Telia for our customers, employees, owners and the societies of the Nordics and Baltics"

Telia Company’s 6G view

- With our advanced customer base, we aim to continue to be in the forefront also with 6G
  - 6G will come more as an evolution than a revolution - “6G is same as 5G - but better”
- Smooth transition towards 6G is important – one key feature is Dynamic Spectrum Sharing
  - Will allow efficient spectrum utilization with gradual implementation of 6G
  - New spectrum band(s) can be deployed for both 5G and 6G dynamically – based on customer demands
- New spectrum with wide bandwidth is needed to meet both 6G and capacity demand
  - We anticipate a need of around 200 MHz contiguous mid-band spectrum per operator
- Implementation of 5G SA (and later 6G) will enable “verticals” to make use of public networks
  - Some customers say: “we want our own 5G” - until they try to deploy it
  - Using slicing within public 5G network, they can benefit from latest technology, multiple frequency bands, and frequent upgrades and can also use own core if preferred
  - Telia recognizes a need for dedicated local spectrum – but demand is limited

6G and Spectrum

- It is of outmost importance that the upper 6 GHz band (6425 – 7125 MHz) is made available for macro IMT networks – without undue power limitations
  - For sustainability and economical viability, existing site grid must be possible to use
  - Cellular networks must be able to serve also indoors – around 80% of mobile traffic is indoor originated
  - Reduced power would mean reduced performance both indoors and outdoors
  - Ongoing studies on sharing “IMT + WiFi” does not look promising – will, if implemented, lead to inefficiencies, lower customer experiences for both services, and/or higher costs of service/equipment

- Traffic in mobile networks continue to increase with ~20-25% annually
  - The increase in traffic 2024 (vs. 2023) will be more than the total traffic in 2019
  - Trend towards “unlimited subscriptions” and high uptake in FWA push data increase even further

- The upper 6 GHz band seems to be the only remaining mid-band option in Europe
  - New bands to be discussed in WRC-27 are challenging for Europe (possibly except 7125 – 7250 MHz)

- As provider of both Mobile and Fixed solutions (including end-user WiFi) we see the demand for “WiFi-spectrum” covered for foreseeable future with the recent addition of Lower 6 GHz (5945 – 6425 MHz)

Non-Terrestrial Networks

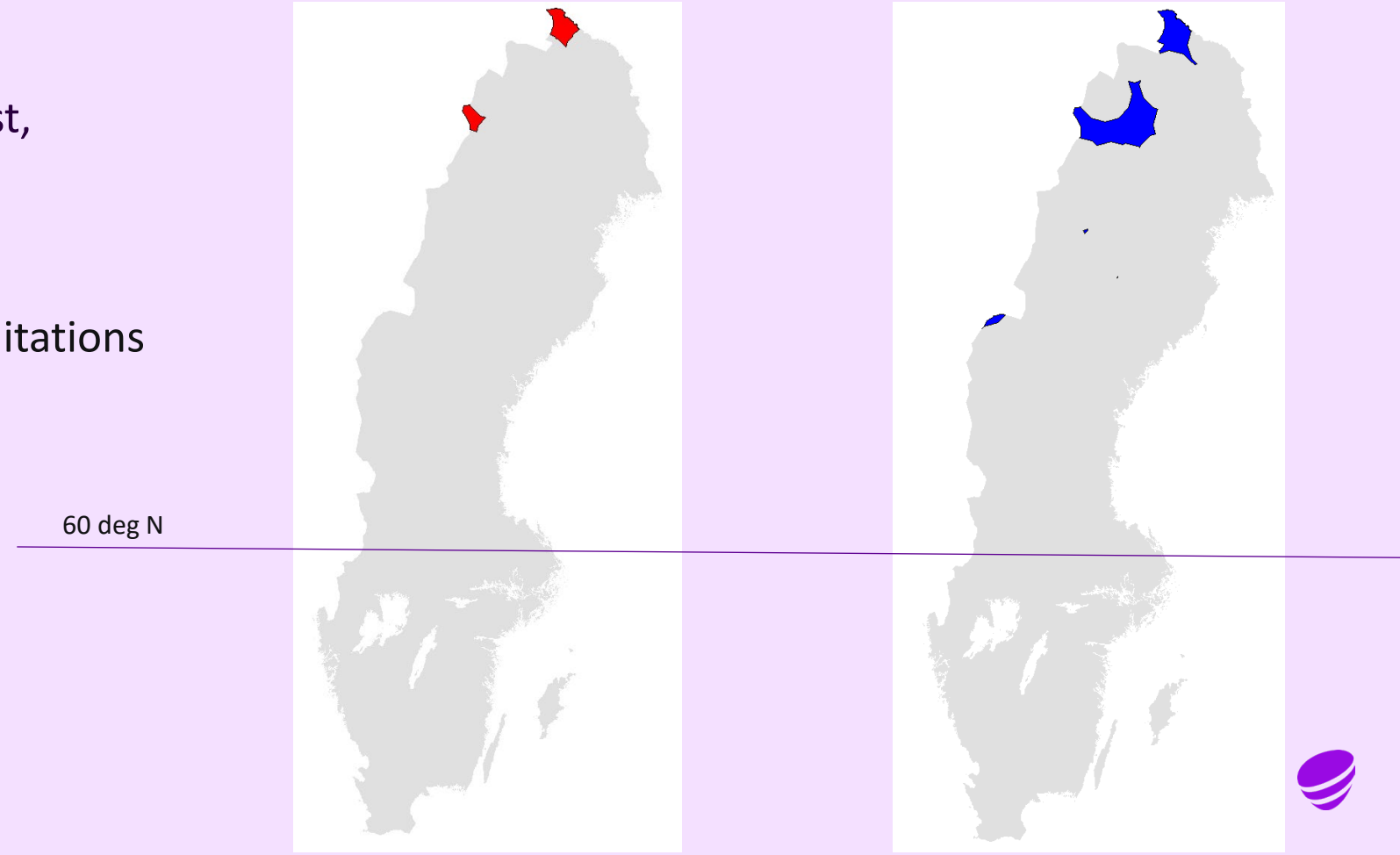
- Telia recognizes the benefit of “100% coverage”
  - Satellite NTN: For our footprint it is important that the satellites also cover >60 deg North
  - Other NTN (e.g. HIBS, UAV): Interesting concepts e.g. for possible temporary needs
- In our footprint the terrestrial mobile coverage is already very good, and we don’t see an imminent need to complement it with NTN solutions.
- For satellite-based NTN, the use of existing satellite bands should be considered
- If NTN is implemented in IMT bands, it is important that terrestrial mobile services are protected, and that their future development is secured
  - Important to consider the networks in neighboring countries, and in adjacent channels
  - Satellite service should be secondary to mobile service - and limited to complementing terrestrial IMT network coverage using partnerships and agreements with mobile operators that hold the licenses
- Spectral efficiency is important to consider when allocating and using terrestrial spectrum for NTN

Example: D2D possibility to complement coverage in Sweden

- If 50 km separation distance is assumed from terrestrial base stations, this is how the situation looks like in Sweden.

- Areas in Sweden with >50 km to nearest,
  - Any base station
  - 1800 MHz base station

- This does not consider cross-border limitations



Conclusions

— Telia as leading operator in Nordics and Baltics is investing heavily in 5G and 5G SA and in due time 6G

— It is of outmost importance that the Upper 6 GHz band is made available for macro IMT, as there are few other options to efficiently meet 6G and capacity development.

— Most “vertical” use cases can be solved within the public 5G (and later 6G) networks

— NTN could be useful to reach “100% coverage” but in our markets the current coverage makes business case limited