

DNA network platform – built for growth

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Capital
Markets
Day 2017



DNA networks – built for growth

- Guarantee excellent customer experience in all services
- Cost efficient capacity management in all network layers
- Readiness to adopt and implement next generation 5G technologies



The foundation for high-quality customer experience

Highly redundant core network architecture

- Secure and scalable IP-Core supporting access speeds up to 1Gbps
- First operator in Finland to complete IPv6 services in fixed, mobile and cable networks. → IoT ready core network
- 5 core Data Centres provides IT infra-services for B2B-, IT- and Telco-functions

Secure and scalable backbone networks

- ~26 000 km fiber-network of which 90% is fully owned, with remaining part in IRU
- Robust and redundant IP-backbone, with service availability of 99.999%, covering all major cities in Finland, providing 100GE scalability up to 1,2 Tbps

Regional metro and access networks

- Fully secured and redundant 10GE metro-ethernet IP-networks are built on own local fibre-infrastructure in 7 cities and surroundings
- Provides access-connections for both mobile base station backhaul and fixed broadband access (FTTx & HFC)

Nationwide Fiber Backbone



State-of-the-art HFC-network and DVB-T2 antenna TV network

Largest cable footprint in Finland

- ~850k homes passed by across Finland
- 1 Gbit/s commercially available in entire network
- Lower capex with distributed HFC-network architecture
- E-DOCSIS3.0 network, with roadmap for speeds up to 10Gbps

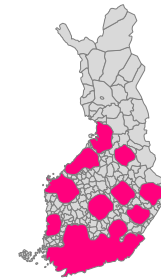
Innovative terrestrial TV network

- Nationwide Digital Terrestrial TV network (covers ~85% of households)
 - DVB-T2 standard / VHF frequency band
 - Built on DNA's mobile network infrastructure
- 3 multiplexes allows DNA to transmit 45 channels in SD or 15 in HD
- HEVC compression can double the multiplex capacity within 3-5 years

HFC network available in 7 out of 10 largest cities

City	Population (000s)	DNA HFC Presence
Helsinki	631	
Espoo	270	
Tampere	225	
Vantaa	215	
Oulu	199	
Turku	186	
Jyväskylä	138	
Lahti	119	
Kuopio	112	
Kouvola	86	

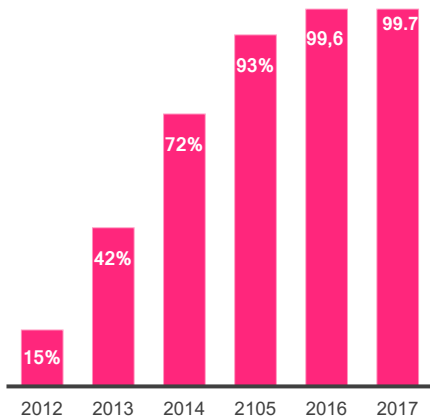
DNA DTT network coverage



# of MUX	3
# of SD channels	45
# of HD channels	15
Household Coverage	85%
Transmission Technology	DVB-T2

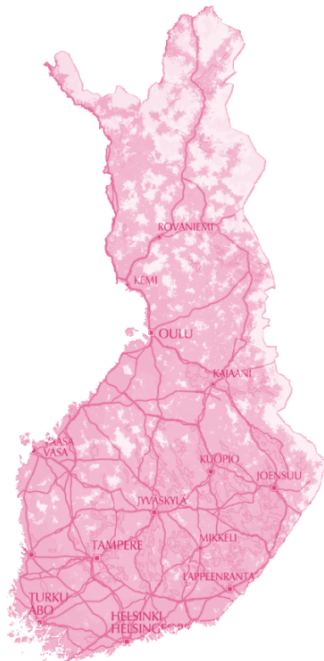
Mobile network coverage completed

4G population coverage reaching 100%



- Rapid rollout with latest MSR-radio technology completed for 4G, 3G and 2G
- New equipment – provides higher quality at lower operational cost
- Population coverage reaching 100%

4G network coverage in September 2017



SYV - Joint operations network



- Better coverage area for mobile broadband and voice services, **50% increase in BTS sites**
- Higher broadband transfer speeds and better service quality, **combined spectrum licenses**
- **Considerable cost and capex savings**

Strong mobile network performance

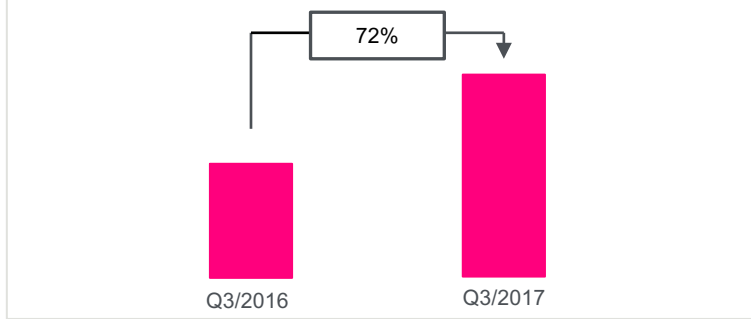
Highest traffic volumes in the world – still growing

- Mobile broadband average 16GB per subscriber in Q3 2017, highest in the world
- Main volume driver is OTT-video, IPTV-services (SD -> HD -> UHD) and cloud-based b2b-services
- Mobile broadband gaining share as home broadband solution

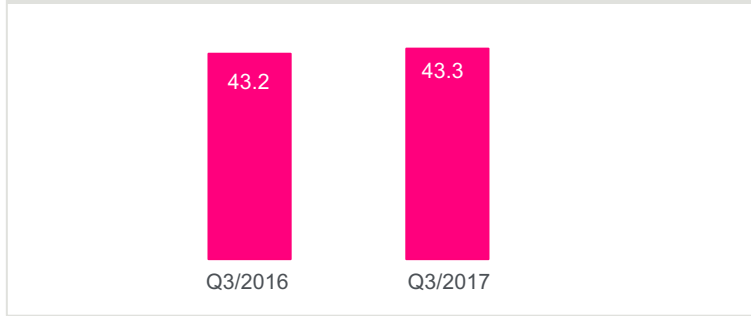
Capacity Management driven by Customer Experience

- Mobile broadband service quality supported by capacity investments, mainly CA radio carrier additions
- Optimal network capacity investments based on network analytics
- Efficient procurement and optimised network build process

Mobile 4G broadband volume continue to grow



Average Mobile broadband throughput (Mb/s)

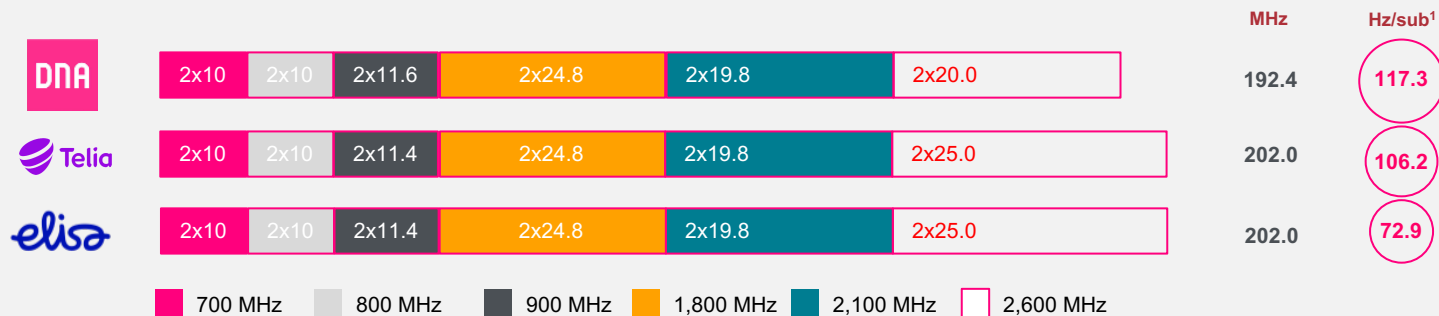


DNA has a favourable spectrum position

Mobile spectrum overview

Spectrum band	700 MHz 2x10 MHz	800 MHz 2x10 MHz	900 MHz 2x11.6 MHz	1,800 MHz 2x24.8 MHz	2,100 MHz 2x19.8 MHz	2,600 MHz 2x20 MHz
Technology	LTE / 5G	LTE	GSM, UMTS	LTE	UMTS -> LTE	LTE
Purpose	Capacity / Coverage	Coverage	Coverage	Coverage	Capacity	Capacity
Expiry date	Dec-2033	Dec-2033	Mar-2019	Mar-2019	Mar-2019	Dec-2029

- Based on Finnish law expiring mobile licences cannot be re-auctioned
- Licences for 5G on 3,5 GHz and 26 GHz frequency blocks, to be granted by Ficora



Notes

1. Calculated based on operator's respective spectrum divided by number of total mobile subscriptions (Q3/2017) of the respective operators, multiplied by mobile penetration in Finland as of 2016.

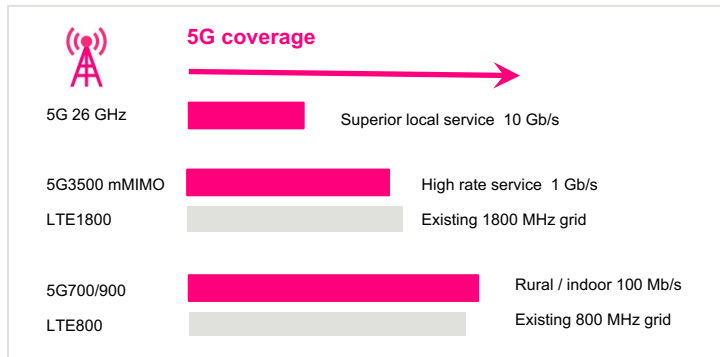
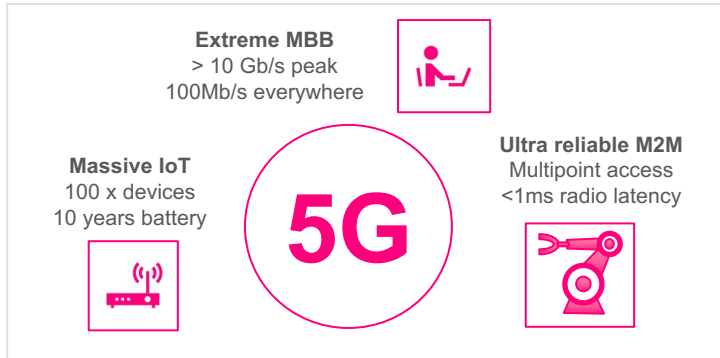
5G to complete the mobile services

The road to 5G

- Release 15 in mid 2018 3GPP, covers 5G enhanced mobile broadband and 5G-core (EPC) functionalities
- Release-16 completes the 5G-functionality and is commercially available 2020 onwards
- First production environment 5G-trials in Finland 2018
- Estimated 5G go-live in Finland in H1/2019

Technology requirements

- Existing network infrastructure is supporting major part of 5G rollout
- New antenna technology, higher frequency spectrum for more bandwidth and lower frequencies for good coverage
- Flexible network architecture to fulfil enhanced and diverse service requirements and innovation.



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