



# NEXT STEPS, NEW OPPORTUNITIES

Aalto Internet Forum

5G – what do we all have to know?

19.10.2021

Marko Lepola, Telia Global Business





# WE ARE TELIA

We're on a mission to reinvent better connected living through our digital connectivity, our digital experiences, and our digital infrastructure



# COUNTRYWIDE FROM HANKO TO NUORGAM

99 %

networks coverage

200 000 000 €

annual investments in Finland



1855

Venäjän keisarikunnan Lennätinlaitos



1917

Suomen valtion Lennätinlaitos



1927

Posti- ja lennätinlaitos



1981

Posti- ja telailaitos



1990

Valtion posti- ja teleliikelaitos



1994

Telecom Finland Oy



1998

Sonera Oyj



2002  
TeliaSonera Oyj



2011-2017  
TeliaSonera Oyj

Hanko and Nuorgam are the southernmost and northernmost towns in Finland.





# BUILDING OUR MOBILE FUTURE



5G network  
in almost  
140 cities in  
Finland



5G partner  
Finnish  
Nokia



Frequencies  
700 MHz,  
3,5 GHz,  
26 GHz



Internet of  
Things:  
LTE-M and  
NB-IOT  
networks  
nationwide



3G network  
sunset in  
2023





# CONNECTING AND ENTERTAINING CONSUMERS

TELIA DOT  
TELIA RECYCLED  
SMART WIFI  
FIXED WIRELESS ACCESS

Forerunner digital mobile plans, smart home connections and responsible devices



C MORE

The most entertaining TV content (sports, Finnish drama, international content)



ASSEMBLY

Excitement for sports and esports fans through owned rights



# DIGITALIZATION PARTNER OF CHOICE FOR ENTERPRISES



ICT services with premium connectivity and Europe's most modern open Data Center located in Helsinki



ICT market leader in Finland through orchestrating partner services



From local to global enterprises, we aim to be the most relevant ICT hub in the Nordics



# 5G NOW



Already 3 million people can access Telia's 5G in more than 140 cities



Suomen Yhteisverkko – shared network with DNA – buildup of 5G has started



5G boosts also the 4G network



Customer Experience





European  
Commission

A EUROPEAN INDUSTRIAL STRATEGY

# A new Industrial Strategy for a globally competitive, green and digital Europe

March 2020

#EUIndustrialStrategy





# TELIA'S INDUSTRY VIEW

**SHIFT IN  
INDUSTRY  
NEEDS**

**TECHNOLOGY  
SHIFT IN  
CONNECTIVITY**

**TECHNOLOGY  
SHIFT IN  
COMPUTE**





# TELIA'S INDUSTRY VIEW

## INDUSTRY NEEDS

- EXTREMELY COMPLEX INDUSTRIAL SYSTEMS
- SUSTAINABILITY & CIRCULAR ECONOMY
- LEVEL OF AUTOMATION & INTELLIGENCE
- HIGHLY INTEGRATED SUPPLY CHAINS
- TOO BIG DATA
- DATA ANALYTICS AS COMPETITIVE NECESSITY
- NEW DIGITAL WORKFORCE

TECHNOLOGY  
SHIFT IN  
CONNECTIVITY

TECHNOLOGY  
SHIFT IN  
COMPUTE





# TELIA'S INDUSTRY VIEW

## INDUSTRY NEEDS

## SHIFT IN CONNECTIVITY

- WIFI TO MOBILE TECHNOLOGY
- BEST EFFORT VS COMMITTED PERFORMANCE
- 3GPP REL 16 CONTENT
- SUPPORT ULTRA-HIGH RELIABILITY AND LOW-LATENCY COMMUNICATIONS (URLLC)
- NETWORK SLICING
- POSITIONING SERVICES
- TSN TIME SYNCHRONIZATION

## TECHNOLOGY SHIFT IN COMPUTE





# TELIA'S INDUSTRY VIEW

**INDUSTRY  
NEEDS**

**SHIFT IN  
CONNECTIVITY**

**SHIFT IN  
COMPUTE**

- **CLOUD NATIVE PARADIGM & BUSINESS MODELS**
- **NEW EDGE PARADIGM**
- **AI AND MACHINE LEARNING**
- **GPU OPTIMIZATION – AR&VR**
- **DATA MODELS FOR EVERYTHING**
- **PLATFORM AND ECOSYSTEM PLAY**





# TELIA'S INDUSTRY VIEW

**INDUSTRY  
NEEDS**

**SHIFT IN  
CONNECTIVITY**

**SHIFT IN  
COMPUTE**





**VTT** beyond the obvious

# Sustainable Industry X – a Cognitive Manufacturing Vision

Authors: Mikael Wahlström, Stefan Walter, Tuisku Salonen, Hanna Lammi, Eetu Heikkilä, Hei Hölaakoski

1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>
Mechanisation, water power, steam power	Mass production, assembly line, electricity	Computer and automation	Cyber-Physical System	Coworking

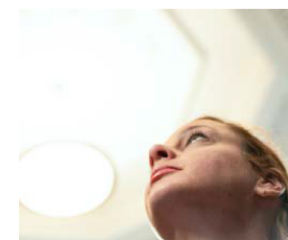


The manufacturing industry must be able to attract talented employees. In order to achieve this, there is the need to provide a sense of excitement and professional meaningfulness for the workers.

Through the developments above, new business-models emerge: with digital and data-based capabilities, manufacturing companies will be able to sell more services instead of only physical products. A good example is services surrounding predictive maintenance, i.e. techniques that help determine the condition of equipment, machines, production lines and infrastructure in operation in order to estimate when maintenance should be performed. This transformation is called **from products to services thinking**. Its exact characteristics are a matter of creativity, with a wide range of possibilities. However, this thinking involves companies providing comprehensive turnkey solutions for customer needs: rather than producing and selling a product to the customer, the aim is to understand what the customer needs and to fulfil these needs. This means that given products may be cared for over their entire lifetime, including their installation, maintenance and, if suitable, their reuse, recycling or remanufacturing – in line with the circular economy strategy.

Overall, the vision involves the following three transformations:

With digital and data-based capabilities, manufacturing companies will be able to sell more services instead of only physical products. This transformation is called **from products to services thinking**.



**Sustainable Industry X**

- Renewal of production
- Open manufacturing networks and supply chains
- From products to services thinking





# TELIA COMPANY AMBITIONS FOR 5G

ENHANCED MOBILE BROADBAND, GIGABIT SPEEDS, HUGE CAPACITY (EMBB)

5G phase 1  
3.5GHz  
+NSA 5G  
2019->

Strengthen  
existing services

Fixed wireless  
access



Gigabytes in a second



360/4K/8K live video

5G phase 2  
26GHz  
+ 5G SA  
2021->

Create new  
services

eHealth



SMART FACTORY



Xreality for work and play



Mobile robotics

Sensors



Smart city



Autonomous vehicles,  
Remote control



Remote surgery

MASSIVE IOT  
HIGH DENSITY, LOW ENERGY (MTC)

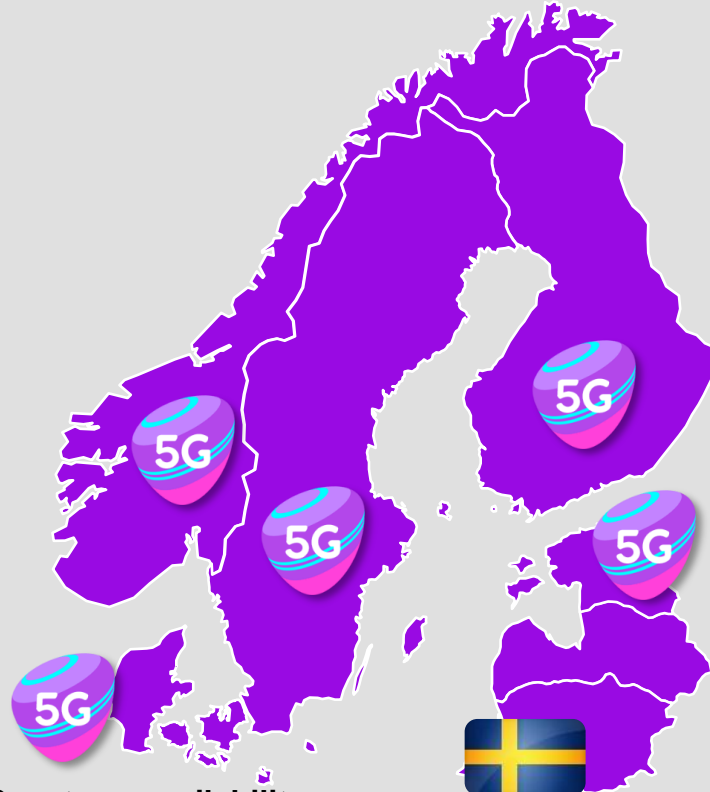
ULTRA-RELIABLE.  
LOW LATENCY COMM.  
(URLLC)



# TELIA 5G MARKET STATUS 2021

Commercial 5G networks deployed in Finland, Sweden, Norway, Estonia and Denmark

5G roaming launched between Finland, Sweden and Norway



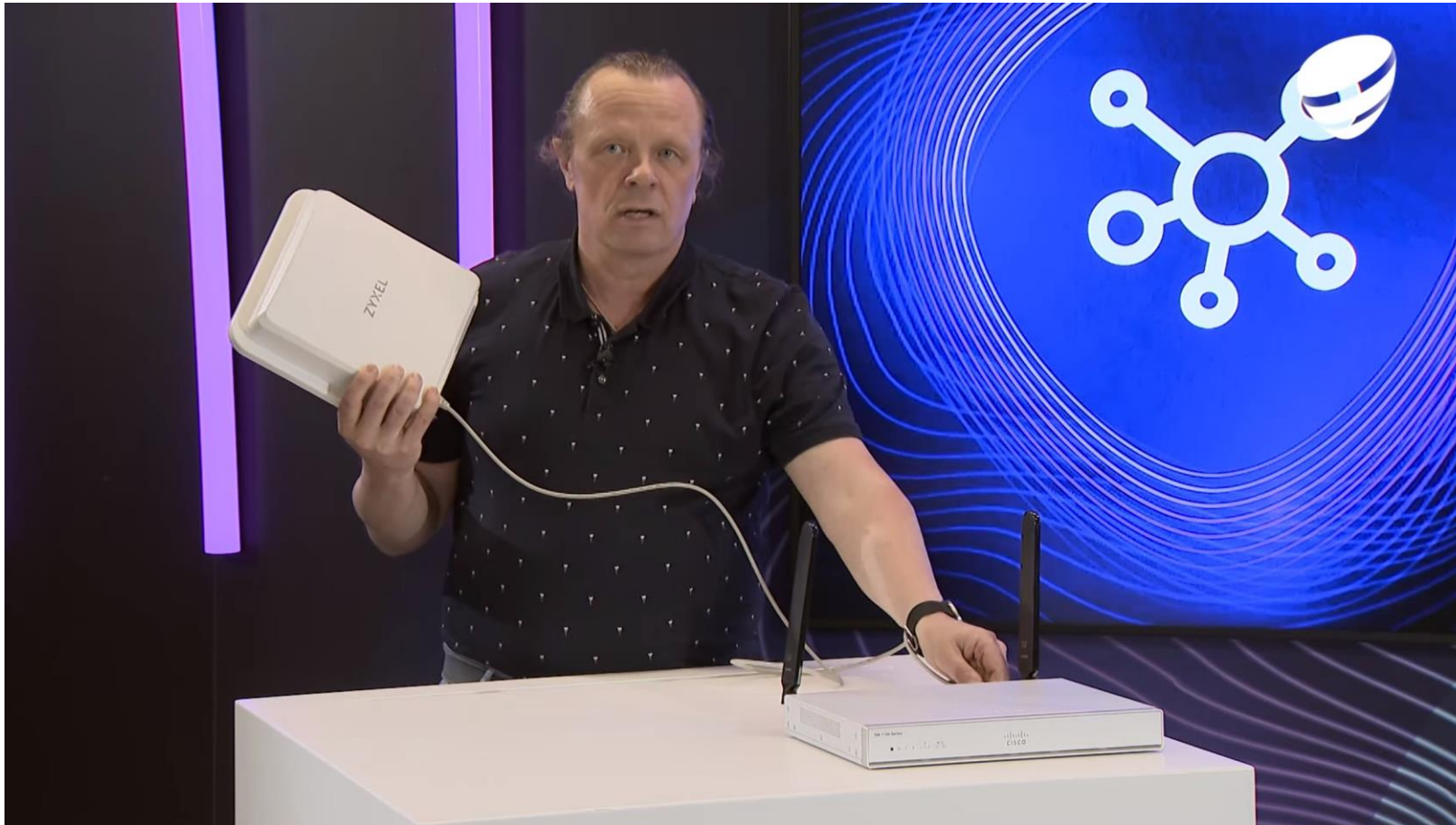
Spectrum availability

	Sweden	Norway	Finland	Denmark	Estonia	Latvia
700 MHz	✓	✓	✓	✓	2021	2021
3.4 -3.8 GHz	✓ 3.5-3.62 GHz Jan 2021	✓ 3.5 GHz partly allocated, full allocation 2021/2022	✓ 3.5 GHz 2018	✓	LTE bands used	2021
>24 GHz	26-28 GHz 2025-2026	26 GHz 2021	✓ 26 GHz 2020	26 GHz 2021	N/A	N/A
Private	3,7-3,8 GHz 2021 24,25-25,1 GHz 2021		✓ 2.6 GHz 2019 24.25–25.1 GHz			

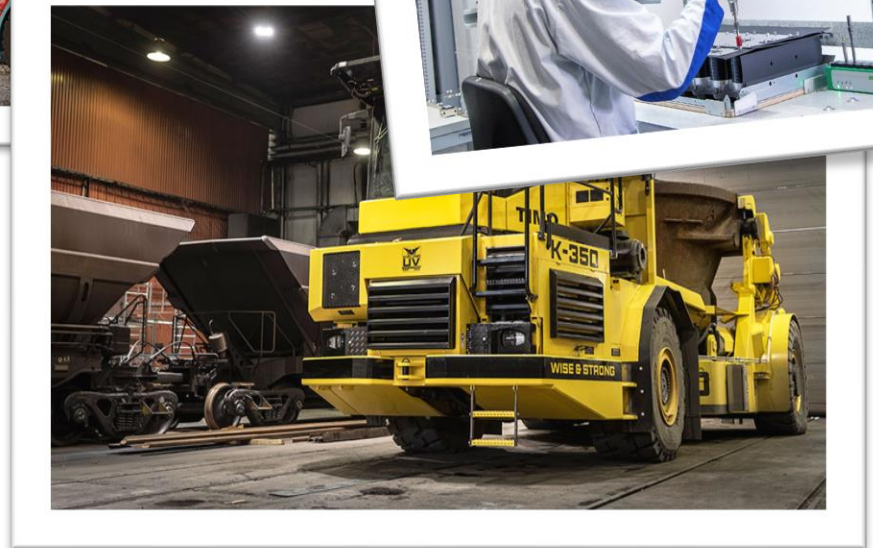
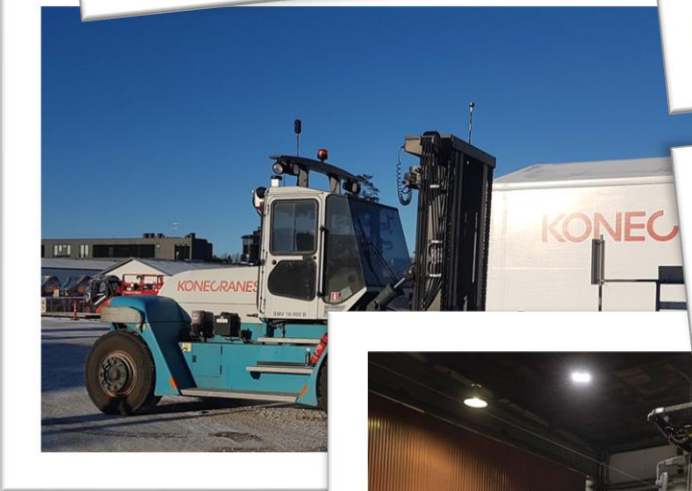




# TELIA – FUTURE OF ICT EVENT











[Telian 5G luo turvallisuutta Bolidenin tehtailla](#) | [Artikkeli](#) | [Artikkelit](#) | [Telia yrityksille](#)









# ΕΚΟΒΟΤ

The evolution of agriculture









**BUSINESS  
FINLAND**

**MALL  
OF  
TRIPLA**

 **TRIPLA**  
ORIGINAL BY SOKOS HOTELS

**Dimalog**

Digitized  
manufacturing  
& logistics.



Haaga-Helia



**Fiige**

**FAFA'S**

**HAN  
KO  
SUSHI**

**PANCHO VILLA**

**KONE**

  
**SECURITAS**

**VTT**

beyond  
the obvious







VTT has kicked off the “Multi-purpose Service Robotics as Operator Business” (MURO) project with the following companies providing mobile robotics solutions, related software and B2B services: Avertas Robotics, Dimalog, GIM Robotics, K. Hartwall, KONE, Navitec Systems, Solteq, Telia and Trombia Technologies. The aim of the co-innovation project funded by Business Finland is to radically renew the service robotics business and to boost Finnish companies' exports with MURO solutions developed in cooperation with the participating companies.

The MURO project aims to change the way service robots are sold, acquired and applied. According to the long-term vision of the consortium, service robots will be in shared use between several customer companies operating on the same premises, such as shopping malls, hotel/office complexes, industrial buildings, factories or mass transport hubs like airports. A novel business model enables customers to purchase MURO-enabled services from a third-party operator with one-stop shop principle related to, for example, material handling, cleaning, security surveillance, inspection, maintenance and customer service.

Multi-purpose robots, which are able to carry out a wider set of tasks compared to single-purpose robots, enable higher utilization rate and satisfactory return of investment for customers. R&D conducted in the project include topics such as robotic manipulation, motion control, simultaneous localization and mapping (SLAM), 3D capture and measurements, data utilization and visualization, and fleet management of heterogeneous MURO fleets. Hardware and software related R&D are combined in a fruitful way with customer, business, service and UX research perspectives in order to ensure successful commercialization of the developed solutions in the future.

The MURO project creates both “technology push” and “market pull”. It helps the fragmented robotics business field to grow and Finnish companies to reach global markets together. The MURO operator business model ensures that the robots are always technically reliable, safe and user friendly. It will increase credibility, trust and social acceptance towards mobile service robots operating in various fields of society.

The MURO project is a two-year project ongoing until 30 March, 2023. The total budget of the co-innovation project is app. EUR 4.9 million.

Stay tuned for more information and news on the developments in autumn 2021!

Share



## Suomalaiset yritykset vauhdittavat globaaleja mobiilipalvelujen robottimarkkinoita innovaatioekosysteemillä, jonka puitteissa kehitetään monikäyttöisiä robottiratkaisuja ja uudenlainen operaattoriliiketoimintamalli

VTT on käynnistänyt MURO-nimellä tunnetun hankkeen (Multi-purpose Service Robotics as Operator Business eli vapaasti käännettynä "monikäyttöinen palvelurobotiikka operaattoriliiketoimintana). Hankkeessa ovat mukana seuraavat liikkuvia robotiikkaratkaisuja, ohjelmistoja ja B2B-palveluita tarjoavat yritykset: Avertas Robotics, Dimalog, GIM Robotics, K. Hartwall, KONE, Navitec Systems, Solteq, Telia ja Trombia Technologies.

Business Finlandin rahoittaman yhteisen innovaatioprojektin tavoitteena on uudistaa radikaalisti robotiikka-alan liiketoimintaa ja edistää suomalaisten yritysten vientiä MURO-kokonaisratkaisulla, jotka on kehitetty yhteistyössä hankkeeseen osallistuvien yritysten kanssa.

MURO-hankkeen tavoitteena on muuttaa palvelurobottien myynnin, hankinnan ja käytön tapoja. Yhte liittymän pitkän aikavälin vision mukaan palvelurobotit ovat yhteiskäytössä useiden samoissa tiloissa toimivien asiakasyritysten kesken esimerkiksi hybridirakennuksessa, tehtaalla tai lentoasemalla. Uudenlaisen liiketoimintamallin ansiosta asiakkaat voivat ostaa MURO-palveluja kolmannelta osapuolelta, jonka yhden palveluluukun periaate liittyy esimerkiksi materiaalin käsittelyyn, siivoukseen, turvavalvontaan, tarkastuksiin ja huoltoon sekä asiakaspalveluun. Monikäyttöiset robotit, jotka pystyvät suorittamaan laajempaa tehtävänkuvaa kuin vain yhteen tehtävään suunnitellut robotit, mahdollistavat paremman käyttöasteen ja takaisinmaksuajan asiakkaille.

Hankkeessa tutkitaan ja kehitetään mm. monikäyttörobottien toteuttamaa ympäristön havainnointia ja mallinnusta, MURO-robottilaivueiden ohjausta ja autonomista navigointia, tavaroiden manipulaatiota ja voimanhallintaa sekä datan hyödyntämistä robottien toiminnassa ja uusien palvelujen kehittämisessä. Robotteihin ja ohjelmistoihin liittyvä tutkimus- ja kehitystyö yhdistetään tuloksekkaasti asiakas-, liiketoiminta-, palvelu- ja UX-tutkimusnäkökulmiin, jotta kehitettyjen ratkaisujen kaupallistaminen onnistuu jatkossa.

MURO-hanke auttaa pirstaleista robotiikan liiketoiminta-alaa kasvamaan sekä suomalaisia yrityksiä saavuttamaan maailmanlaajuiset markkinat yhdessä. MURO-hankkeen operaattoripohjainen liiketoimintamalli varmistaa, että robotit ovat aina teknisesti luotettavia, turvallisia ja käyttäjätavallisia. Tämä kaikki lisää uskottavuutta, luottamusta ja sosiaalista hyväksyntää yhteiskunnan eri aloilla toimivia palvelurobotteja kohtaan.

Kaksivuotinen MURO-hanke on käynnissä 30.3.2023 saakka. Yhteisen innovaatiohankkeen kokonaisbudjetti on noin 4,9 miljoonaa euroa.

Seuraa tiedotteitamme ja uutisia syksyn 2021 kehityksestä!

[Suomalaiset yritykset vauhdittavat globaaleja mobiilipalvelujen robottimarkkinoita innovaatioekosysteemillä, jonka puitteissa kehitetään monikäyttöisiä robottiratkaisuja ja uudenlainen operaattoriliiketoimintamalli | VTT \(vttresearch.com\)](#)



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# INNOVATION CYCLE 1: MALL OF TRIPLA

- Multipurpose use cases
  - Indoor logistics and deliveries
  - Guidance and hospitality
  - Safety
  - Facility services and management
  - Footfall analytics
- Key considerations
  - Safety
  - Privacy and data protection
  - Marketing and publicity
  - Robotics platform

















## Ny milstolpe på Zinkgruvan Minings automationsresa

På ett upplyst kontor ovan jord sitter produktionsborrhare Joakim Lindblad och styr en av Zinkgruvans borrhargar i simbasierien. Genom kontorsfönstret, i gardinerna skymtar han ett snöigt industriområde. I korridoren utanför kontoret står en kaffemaskin och i de andra kontoren runt omkring jobbar flera tekniker. Men borrhargen han styr står 650 meter under jord.

Just nu pågår ett test med tele-remote, det vill säga fjärrstyrning, av en borrharg via Zinkgruvan Minings egna 4G-mobilnät (LTE-nät) Och försöket går så bra så man kan säga sig för att borra en hel pall.

– Det är jättespännande att vara med på det här försöket, säger Joakim.

### Först i världen

Det är även spännande att lägga märke till att Zinkgruvan Mining är först i världen med att fjärrstyra en av Epirocs borrhargar under jord mot just ett LTE-nät.



Nokia ja Telia hakevat

# 5G-KASVUA KAIVOKSESTA









Agnico Eagle Finland Oy will implement a new private 5G network at the Kittilä mine in collaboration with Telia and its partners Digita and Nokia. It is believed to be the first 5G network built in an underground mine, becoming one of the first examples of the novel 5G technology implemented in production use.





# TELIA COMPANY AMBITIONS FOR 5G

ENHANCED MOBILE BROADBAND, GIGABIT SPEEDS



Strengthen existing services



Gigabytes in a second



360/4K/8K live video



Fixed wireless access

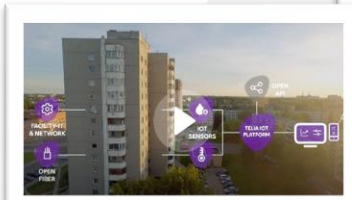


Create new services



Xreality for work and

eHealth



SMART FACTORY

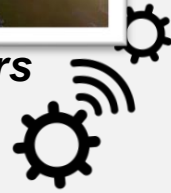


Mobile robotics



Smart city

Sensors



Autonomous vehicles  
Remote control



5G



Remote surgery



MASSIVE IOT  
HIGH DENSITY, LOW ENERGY (MTC)



ULTRA-RELIABLE.  
LOW LATENCY COMM.  
(URLLC)





# NEXT STEPS, NEW OPPORTUNITIES







Telicia





5G fra Telia gjør at denne fergen kan seile uten kaptein | Telia

<https://youtu.be/FuWedx0oLX4>



Drones in Construction - Remote Site Inspection over 5G Network (flytnow.com)

Her inspiserer dronen bygget med livestream over 5G-nettet | Telia

<https://youtu.be/LzyuQ7vD5Zg>



Øyafestivalen tar i bruk 5G fra Telia | Telia Norge

<https://youtu.be/A5eJ6gih9MY>



Nordic Prime Ministers unite to prioritize 5G and digitalization – Ericsson

<https://youtu.be/qKE2ZUqmGzE>



Telia, Ericsson and Volvo CE launch Sweden's first 5G network for industries - Telia Company

<https://youtu.be/SdC7UtIjQFk>



5G-powered self-driving electric bus propels Stockholm into the future - Telia Company

<https://youtu.be/ldDcNxQnsC0>





# ABOUT TELIA COMPANY

 Based in **NORDIC & BALTIC** countries

 **20 800** employees

 Almost **500 000** shareholders

 One of the biggest **TV COMPANIES**  
in the Nordics

 World's largest network **BACKBONE**

Rounded figures from 2020.

Telia Carrier owns one of the most extensive fiber networks running around the world.

