

The background of the slide features a collage of orange and light orange shapes. These include several arrows of varying sizes pointing in different directions, as well as stylized house icons. The shapes are layered and overlap, creating a dynamic and abstract pattern behind the text.

# patient@home

**Secure and Reliable ICT Systems for Telemedicine Applications**

**Lars Dittmann, Technical University of Denmark**

# Integrating Health&Care in the future Intelligent home

- Our future home will be connected to an extend that is hard to understand (and accept !?)
- Telemedical application is one of many new things to be integrated into the future connected home and living environment.
- Other applications relates to for example climate control (temperature, humidity, dust, chemicals etc.)
- Many parameters can/will be recorded for cognitive control of the home (and can be store and used for research purposed in order to understand impact and relevance).

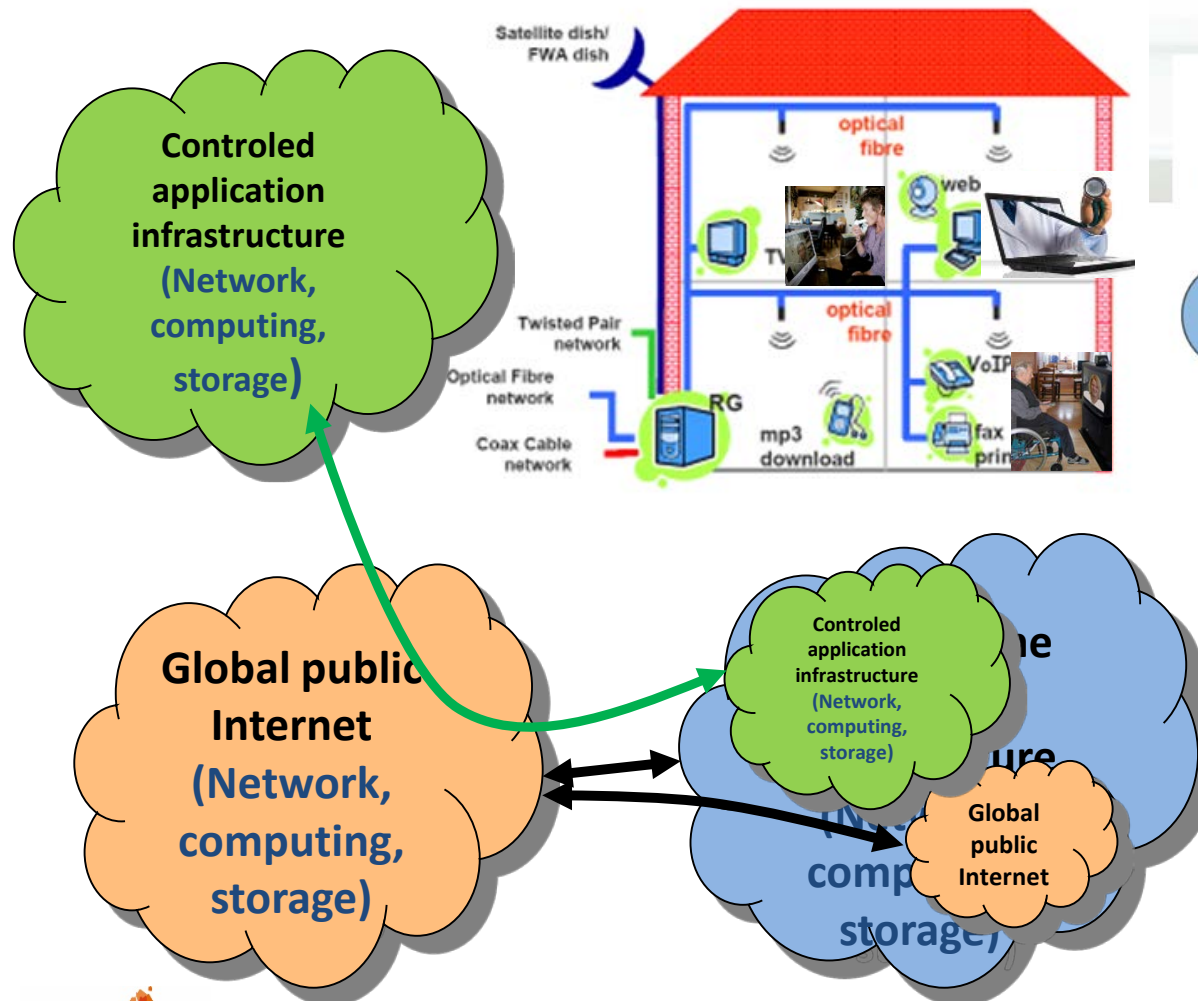


# eHealth - eLiving

- Telemedicine – a strategic goal for Denmark and Europe (with significant investment).
  - 1/3 less beds in future hospitals – more people being treated @home.
  - Ensure reliable communication and home network infrastructure.
  - Current Internet is NOT good enough for eHealth – due to reliability/availability/security
  - Ehealth should enabling benefit for both patients/elderly people and society.



# Home ICT – a private and a public part



## Telemedicin

Omkring 70% af ressourcerne i sundhedssystemet bruges på kroniske sygdomme. Her kan en del af opgaverne løses med telemedicin til fordel for alle parter.

## Tryk behandling i eget hjem

Med telemedicin kan behandler og patient mødes over internettet. Det kan spare mange ressourcer – uden at spare på den faglige kvalitet. Og patienten kan tage modansvar for behandlingen.

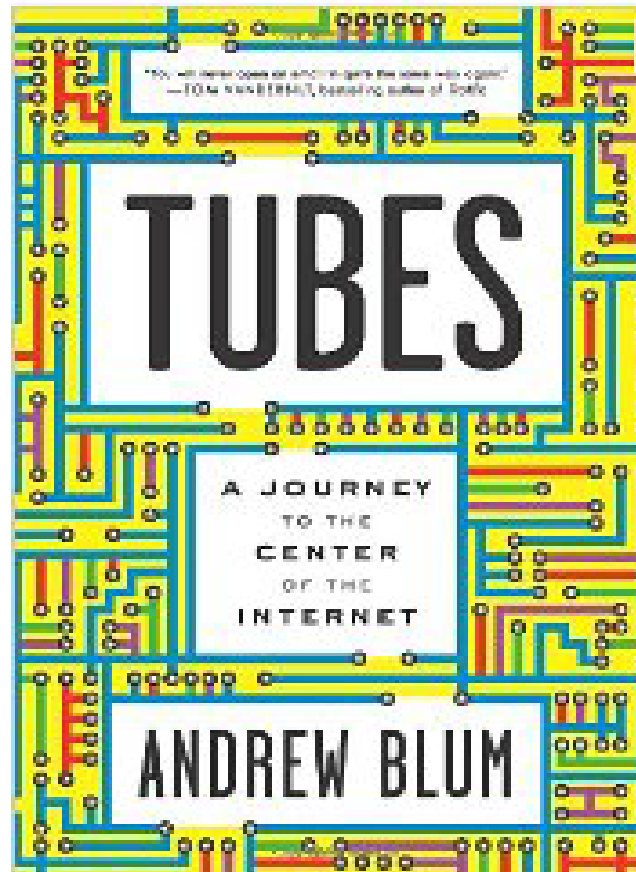
TDC Telemedicin forbinder borgere og sundhedssystemet med softwareløsninger, der er nemme at bruge for alle parter. Abonnementet kan skræddersys til den specifikke opgave med et effektivt flow fra bestilling til færdig installation. Og I har hele vejen adgang til specialiseret service i vores Telemedicinsk Support Center.



Shown 247 times since 2014



# The Internet is not a given thing – but often taken for granted

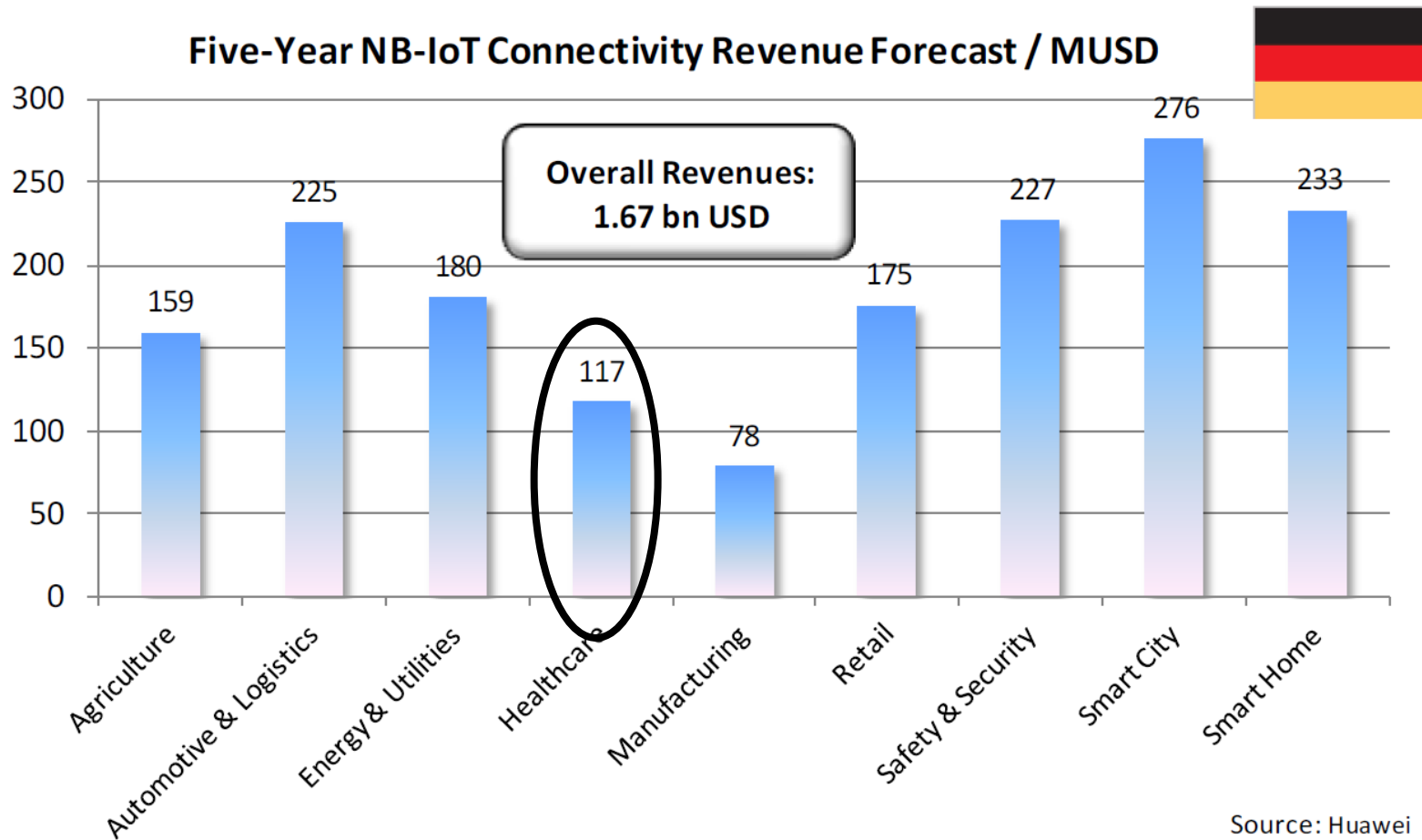


# eHealth a part of a larger transformation of the Internet?

- Internet of Things – new services on the existing infrastructure or a new infrastructure as well?
- IoT – challenge: volume or type of application?



# IoT is many things





# Are we on track?

## Landsby uden mobildækning – og så kom ministeren på besøg

AF JOHNNY K. OLESEN – UDGIVET D. 9. NOVEMBER 2017 - 11:18  
KATEGORI: NYHEDER

### Den lille landsby Javngyde nær Ry har elendig mobildækning, og nu skal ministeren med egne øjne se på sagen.

Den lille landsby Javngyde nær Ry har i årevis oplevet store problemer med mobildækningen. Problemerne er så alvorlige, i den lille landsby, at ambulancer ikke kan kommunikere med hospitalet i Skejby. Ifølge TV 2 Østjylland bliver ambulancer simpelthen nødt til at køre op til en bakketop for at kunne ringe til hospitalet.

I andre situationer har folk været nødsaget til at bruge fastnettelefoner ved alarmopkald til 112, og vagtlægerne har en chauffør holdende tre kilometer fra landsbyen for at kunne modtage nødopkald fra patienter.

Nu er dækningsproblemet så landet på ministerens bord. Ministeren for Energi-, Forsynings- og Klimaministeriet, Lars Christian Lilleholt (V), besøgte i mandags selv landsbyen for at se på problemerne. Det skriver TV 2 Østjylland

#### – Unik kommunal teleaftale fjerner mobilhul i en lille by

Landsbyen ligger i et hul mellem høje bakker og høje træer, hvilket betyder, at radiosignaler fra de nærliggende mobilmaster har overordentligt svært ved at nå frem. Ministeren udtrykte forståelse for problemerne med mobildækning, og til TV 2 Østjylland udtalte han:

– "Mobiltelefonen er så vigtigt et omdrejningspunkt i vores tilværelse. Derfor er forholdene i Javngyde uacceptable".



Navne Blogs OPS Social Sundhed Skole Ledelse Kultur Samsk  
POLITIK VELFÆRD LEDELSE INFRASTRUKTUR BÆREDYGTIGHED



### Pilotprojekt åbner ladeport for skandaler om sundhedsdata

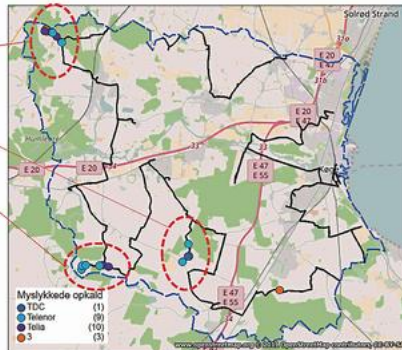
Blogindlæg Thomas Birk Kristiansen 31.07.17 af Thomas Birk Kristiansen 3

INFRASTRUKTUR

## Tale-opkaldstest - Resultaterne

### Tre problematiske områder:

- Lammestrup, Nordvest
- Nyvang, Sydvest
- Lidemark, Syd



### Derfor har danske kommuner elendig datasikkerhed: Kompetencerne forsvandt for 10 år siden

Danske kommuner bryder igen og igen persondataloven ved ikke at kontrollere sikkerheden hos deres databehandlere. Og der er en god grund til, at datasikkerheden halter, mener højtplaceret programleder i KL.

31. januar 2018 kl. 14.16



ADAM  
FRIBO  
Sikkerhedsjournalist

it-jobbank Overvejer du at skifte job? Klik her

Det er efterhånden en kendt sag, at danske kommuner har problemer med datasikkerheden.

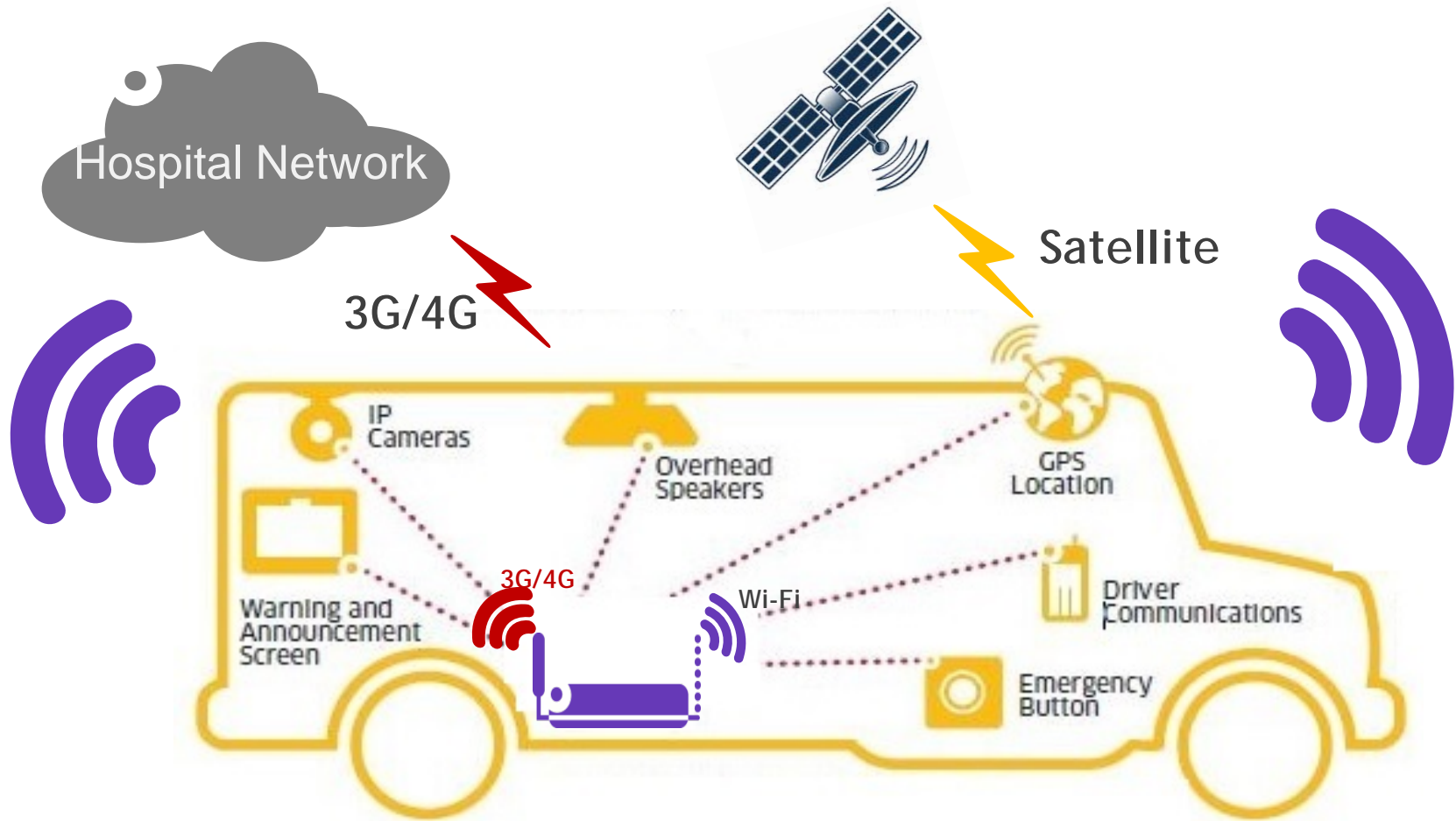
Særligt ondt gør det på et enkelt punkt - nemlig

Announce



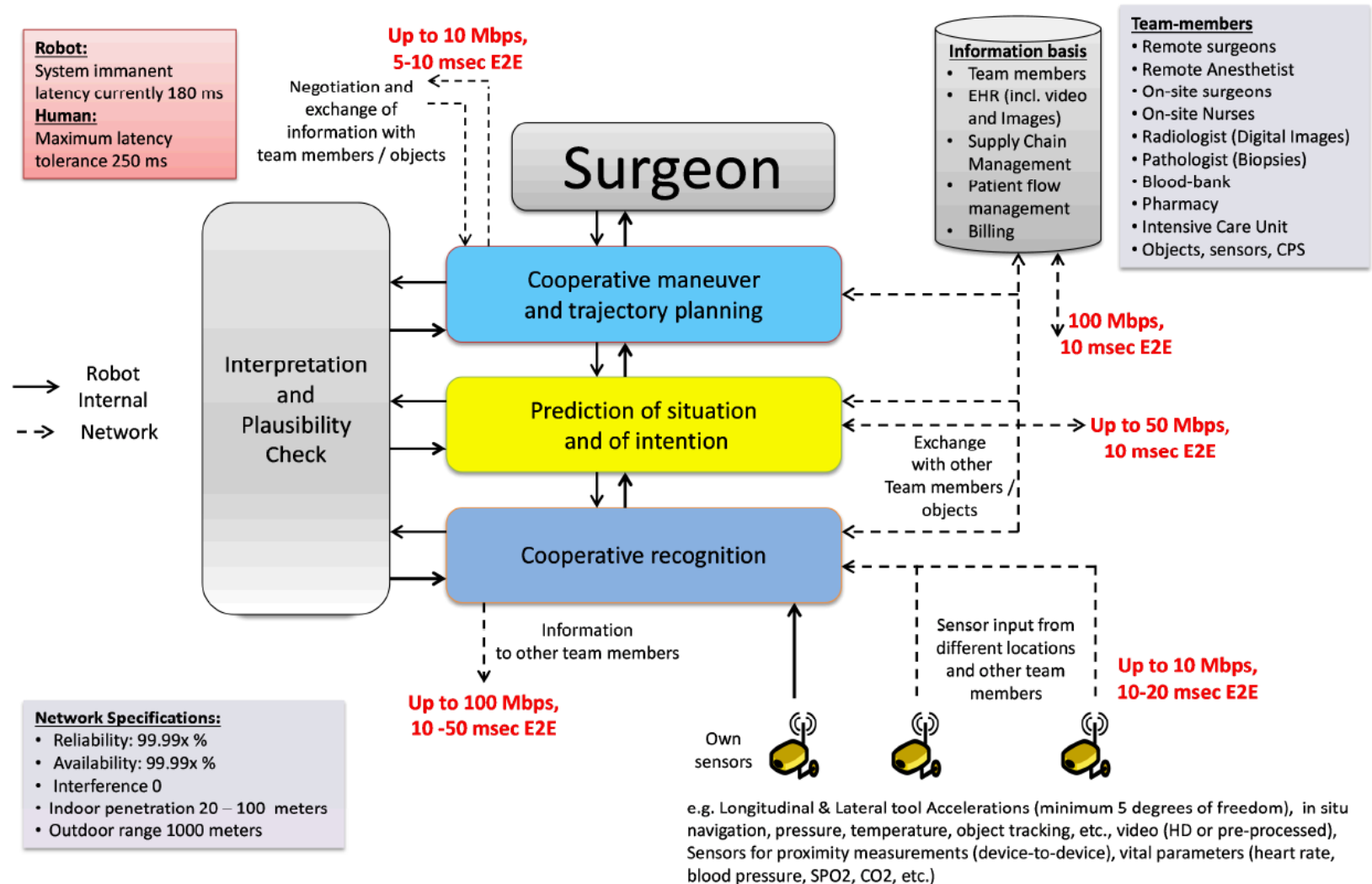


# We are on track .. but still not fully @home



Connected Ambulance as extended Clinic or Hospital

# .....a far far away from demanding real-time applications



# Security issues

- Data is highly sensitive and can be misused – cryptography can/might prevent unauthorized persons (or algorithms) to access data.
- Network attacks can prevent authorized person to access data (at time needed or at all)
- Data availability is also a data security issues.
- Data location is a security issues as it is changing the possibility and legal issues regarding access to data.



# Potential misuse of data

## Sweden scrambles to tighten data security as scandal claims two ministers

Six state agencies being checked after leak of sensitive data potentially including information on people in witness protection

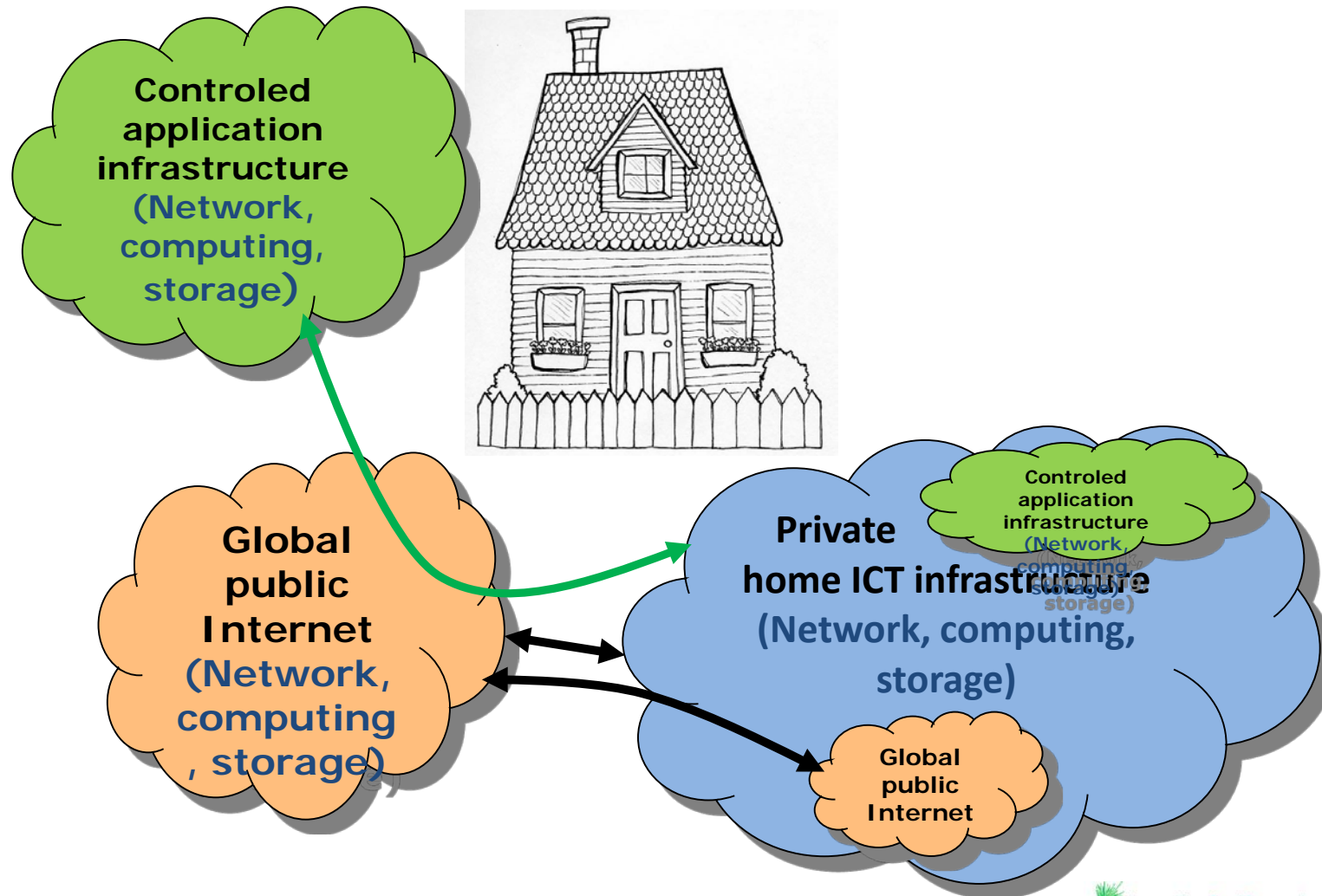


**i** Interior minister Anders Ygeman faces the media as he comments on his resignation. Photograph: Ari Luostarinen/AFP/Getty Images

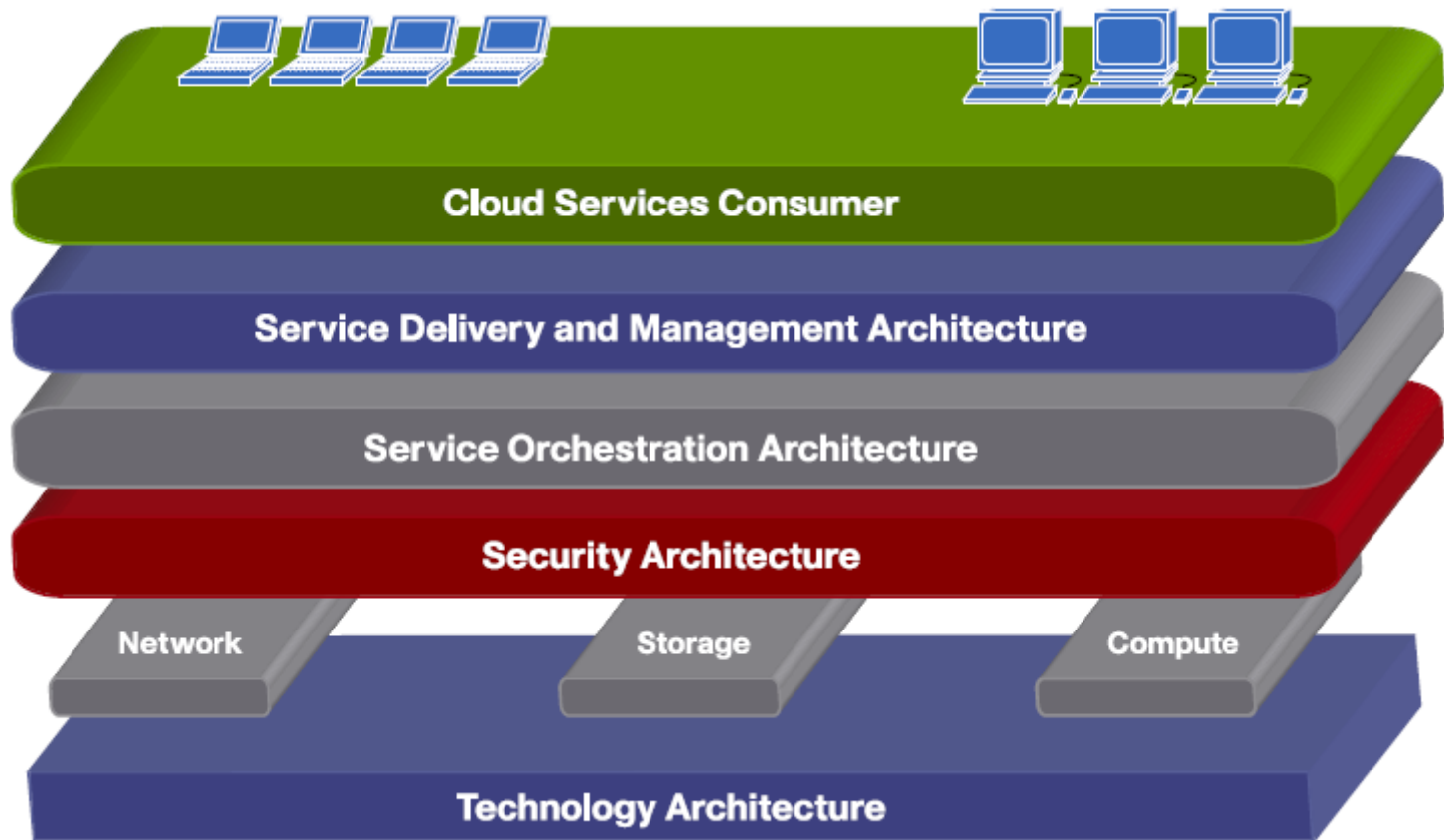
Sweden's government has sought urgent assurances on data security from national agencies including the health, education and pensions services after a huge leak of private and sensitive information that has cost two ministers their jobs.



# Where do we move the data – the "Cloud"

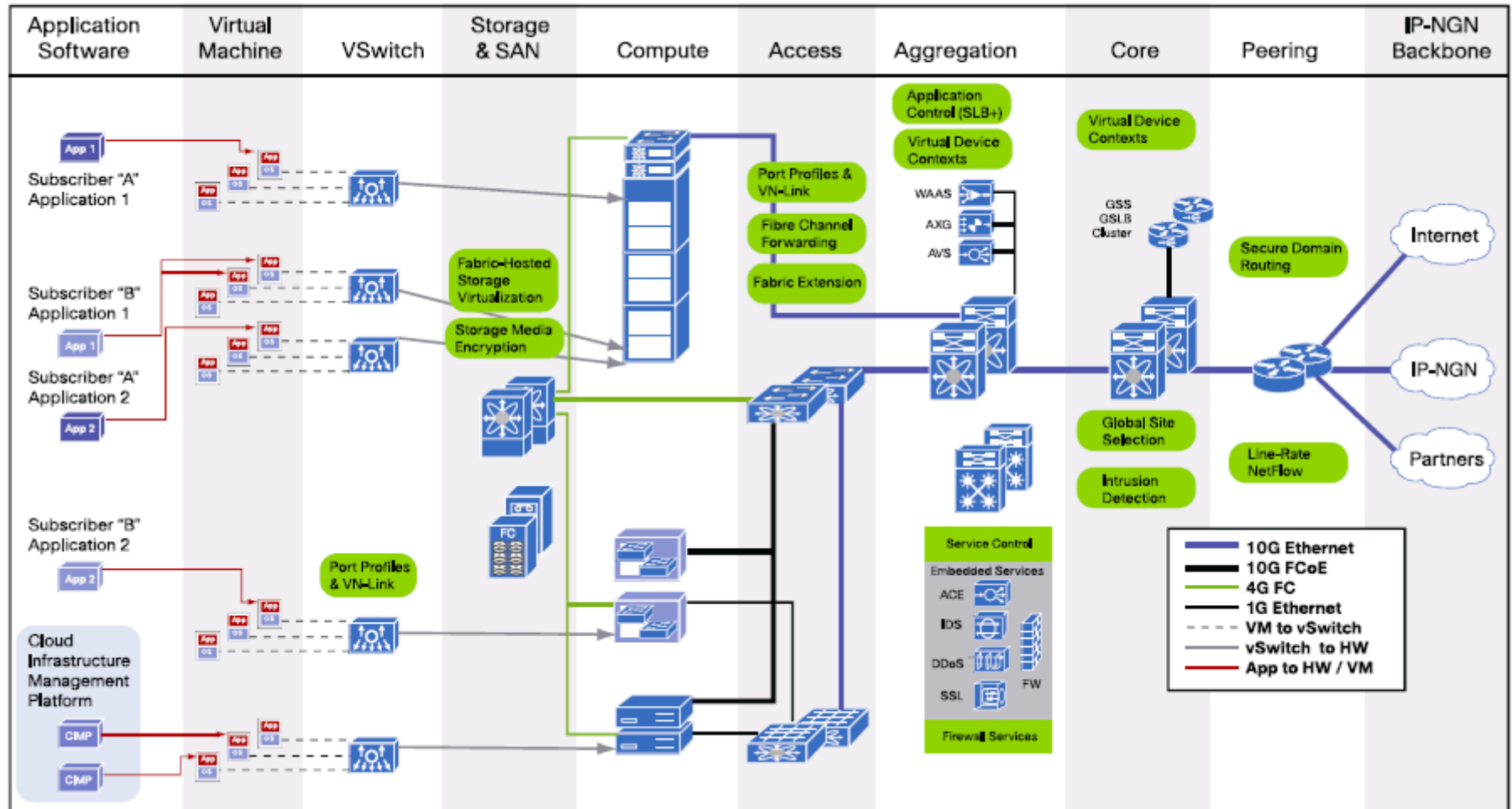


# Cloud – a technology not a “place”

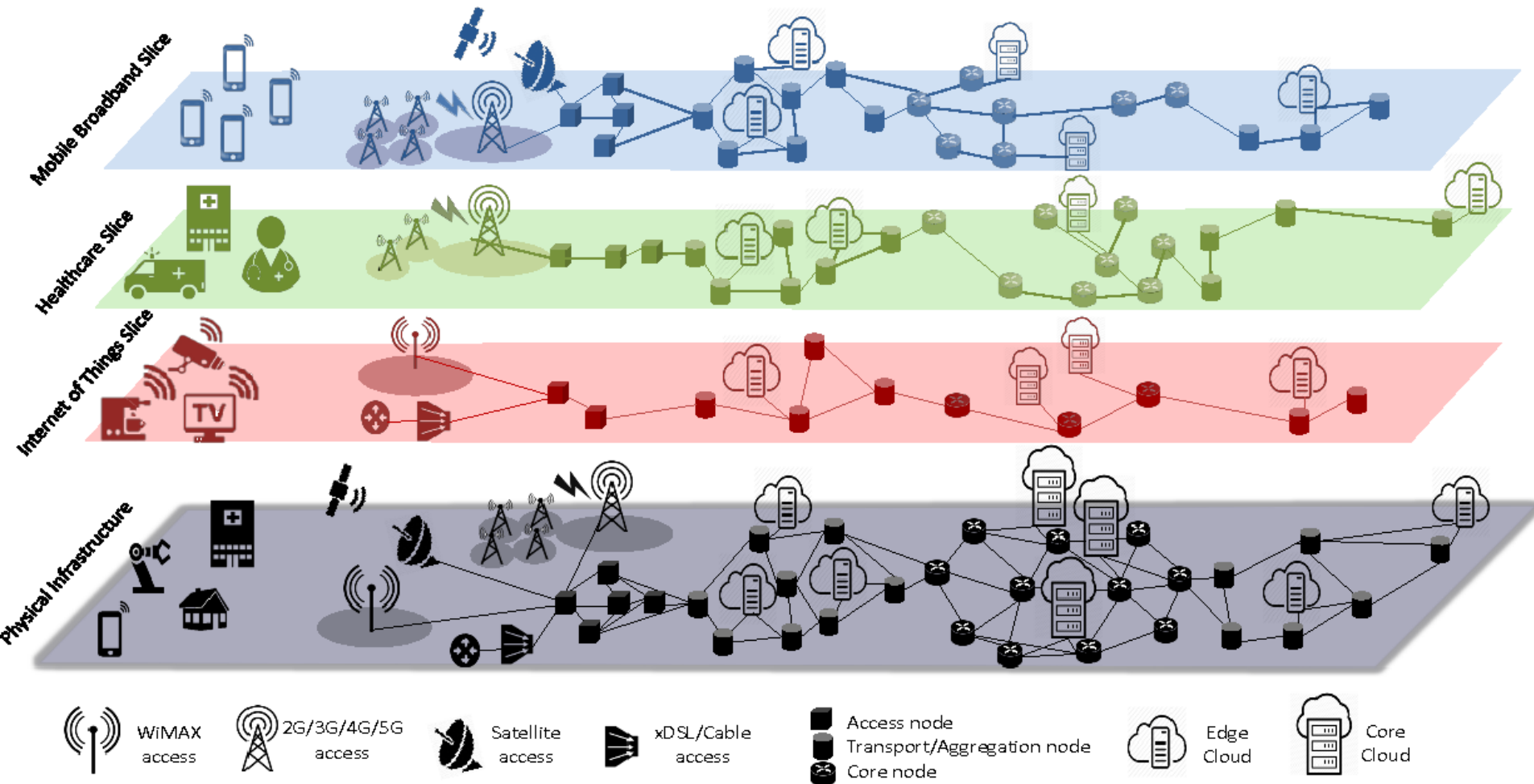




# Data flow and service structure

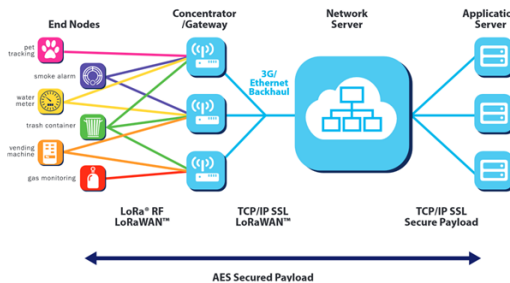
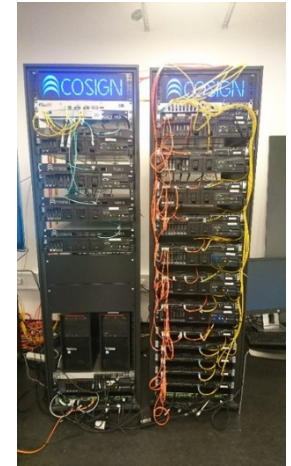


# 5G slicing – a possible approach for a generic solution (cost efficient ??)

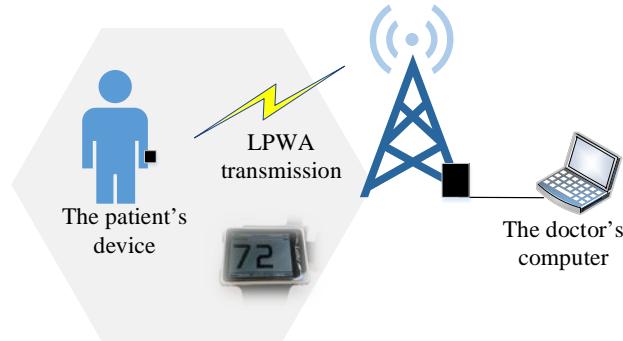


# Main achievement in PATH

- Build prototype backend system with focus on low latency datamanagement
- Focus on integration health data and data from selfmonitoring activities.
- Build, validated and compared several wireless front-end system (SigFox, LoRaWAN, nbLTE) – with respect to cost, coverage, reliability.
- Validated combined system for secure communication and high availability
- Worked on various protocols design concepts and introduced machine learning in data validation
- AND – enhanced awareness of problems (not about the cost)



# Next step (one of many) - IoT4Life



- Project partners:
  - Leikr LCmVeloci IVS
  - DTU Fotonik
  - TDC Group Denmark
  - Huawei Finland
- October 2017 – September 2020
- Co-funded by Innovation Fund Denmark through the Eureka Turbo framework with 7,5 mio DKK



## Vision:

Develop and extend the use of Narrow Band LTE IoT (NB-IoT) in the public, private and industrial sector in the Nordic regions; and to develop and commercialize a platform based on NB-IoT.

# Conclusion

- Current internet is primarily an entertainment platform – suited for some gadgets, but not critical IoT applications.
- IoT and eHealth will require much higher availability and security to become useful for critical applications in e.g. healthcare and other similar areas.
- IoT and eHealth is not so much about high bandwidth/capacity as now – the quality of the Internet of Things will have to be measured differently than today.
- Services and infrastructure needs to more tightly integrated.
- Network elements will become service elements (e.g. basestations and accesspoint will also become a part of data and processing services)
- Trusted service management a must!!
- Generic platforms (open?) are essential – possible?  
5G slicing approach promise solution, but needs validation. Significant investment needed!! (estimated 1200 Billion DKr/year investment in R&D worldwide for the coming years to reach goal)

