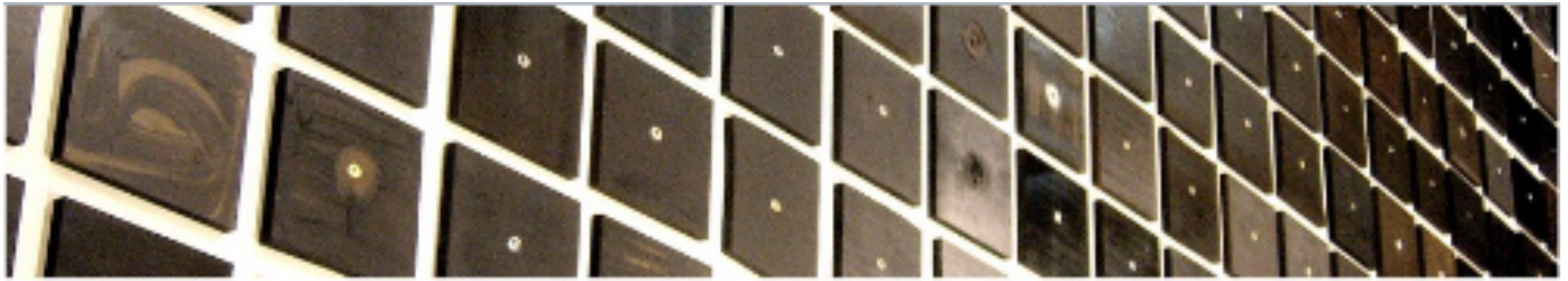


UiO : Universitetet i Oslo

Inside Telecom høstkonferansen / Gulltasten, 20Nov2018, Oslo

Seamless integration between mobile- and home network?

Josef Noll

Secretary General and Co-Founder at BasicInternet.org, Professor at UiO, Head of Research at Movation

Oslo Area, Norway | Telecommunications

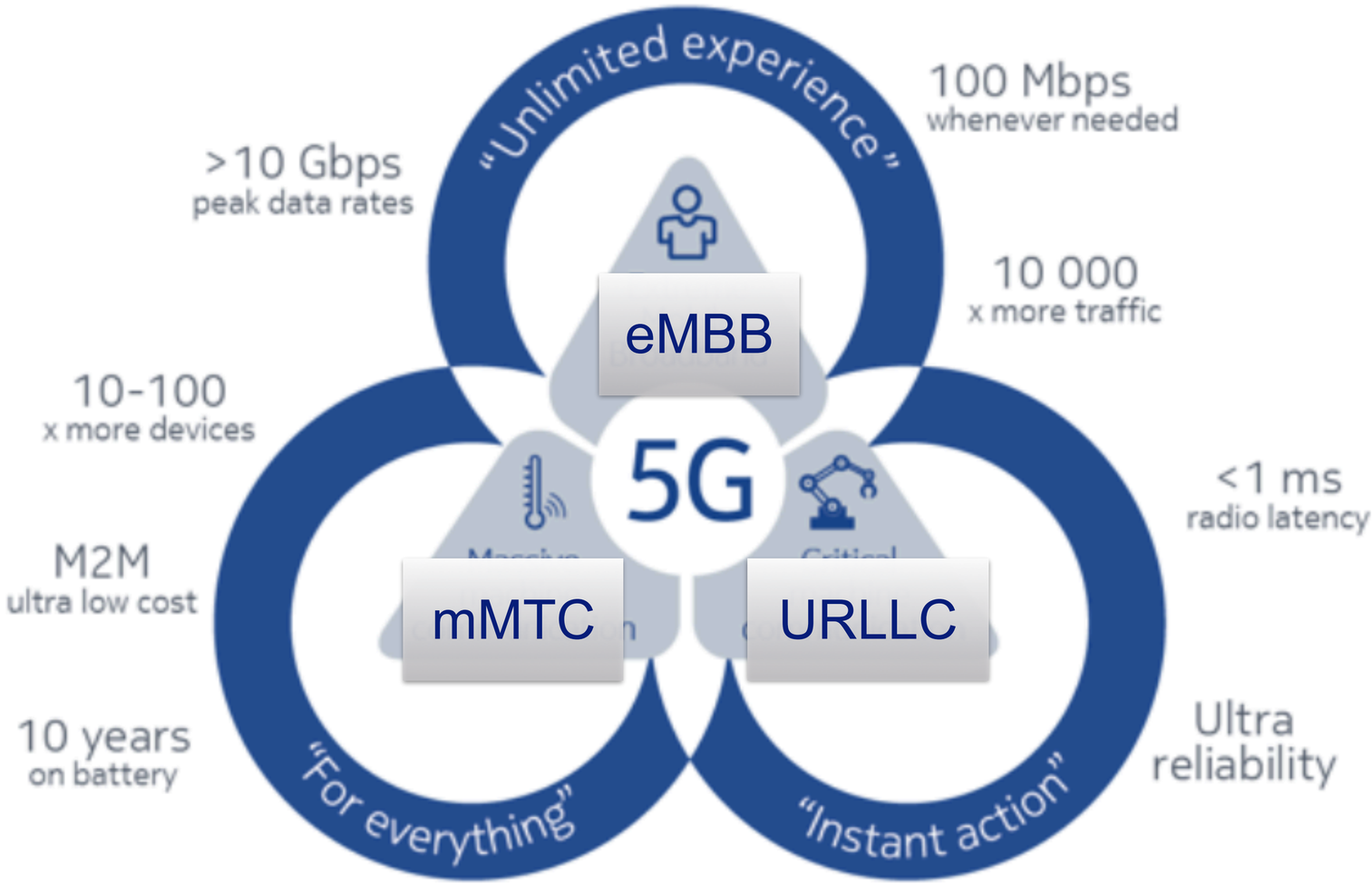
Current	Basic Internet Foundation, University Graduate Studies (UNIK), University of Oslo (UiO), Movation AS
Previous	MobileMonday, Telenor R&I, Telenor R&D

Outlook

- 5G Networks - and integrated access to the home
  - Industry (secured wireless, Industry 4.0)
  - Consumer (IoT, Entertainment)
  - Individuals and Societies (…)
- The indoor challenge & Security, Privacy, Trust
  - The mobile dilemma
  - Novel applications
  - Application specific routing
- Addressing the Digital Divide
  - Societal Gap

5G expectations

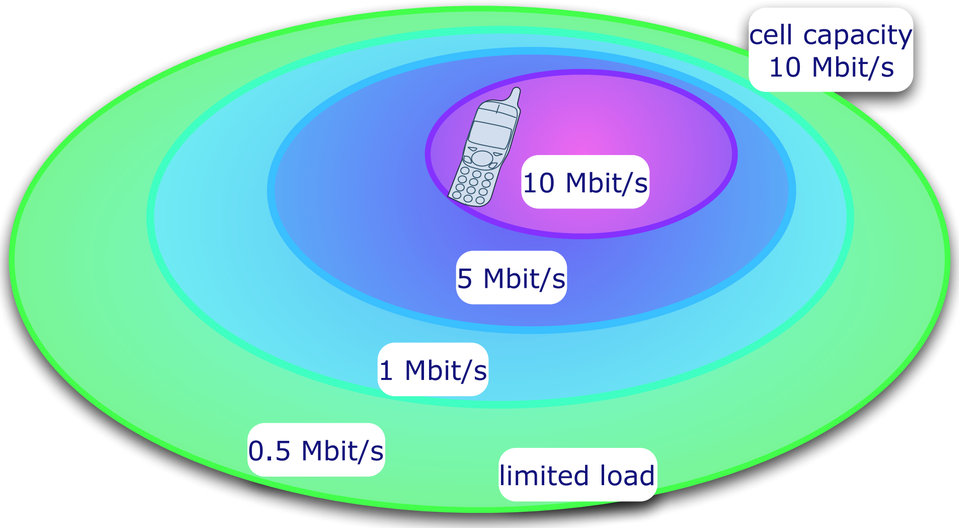
- Extreme mobile broadband (eM
  - 10 Gb/s peak
  - 100 Mb/s whenever needed
- Massive Machine Communicati
- Critical machine communicatior



[source: Nokia https://networks.nokia.com/5g/get-ready]

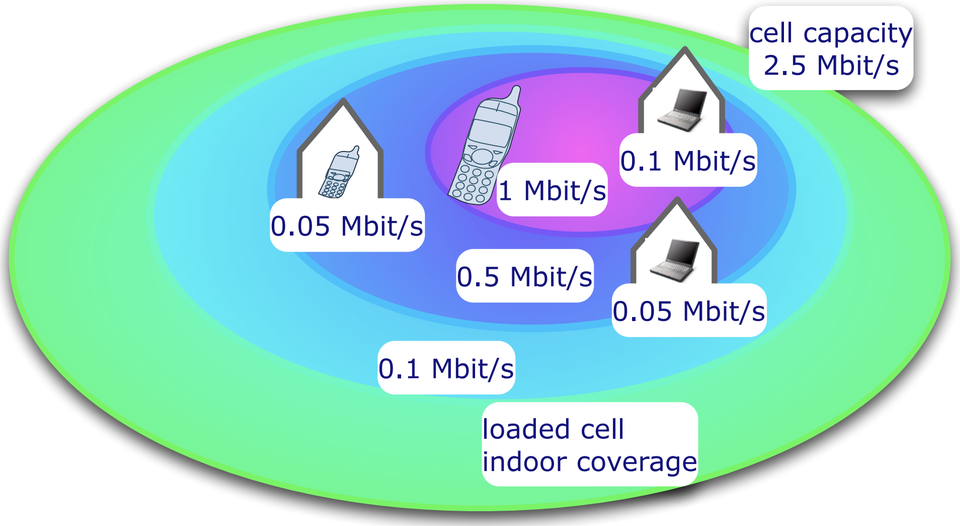
5G access: radio and business dilemma

- The radio dilemma
  - ➡ outdoor to indoor



“coverage cell”

- The business dilemma
  - ➡ 5G access is expensive (range)
  - ➡ changing access means loosing revenue

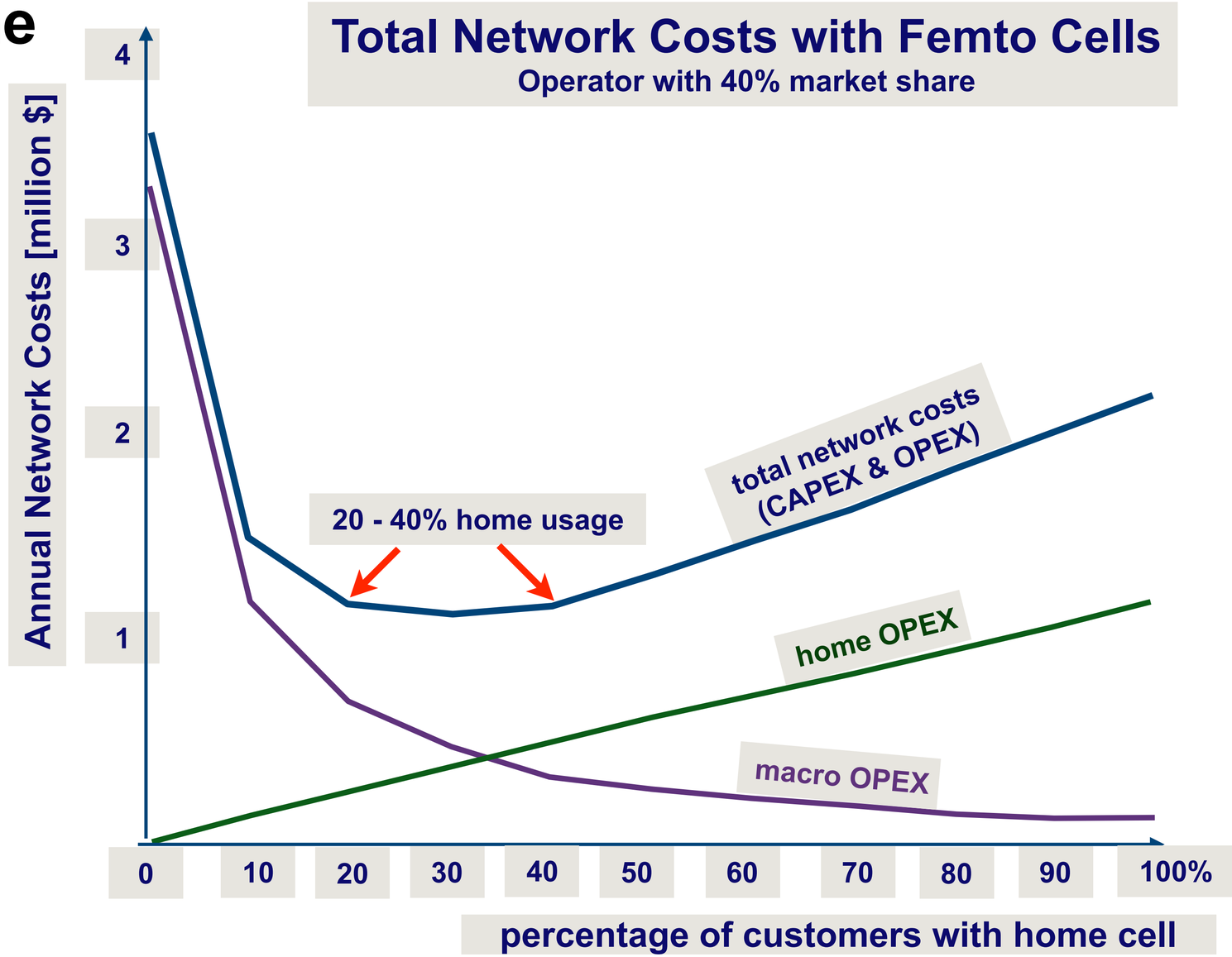


“70-80% indoor usage”

[Original drawings: Jørgen Grinnes, Telenor, **2010**]

Business perspective of home cells (femto cells)

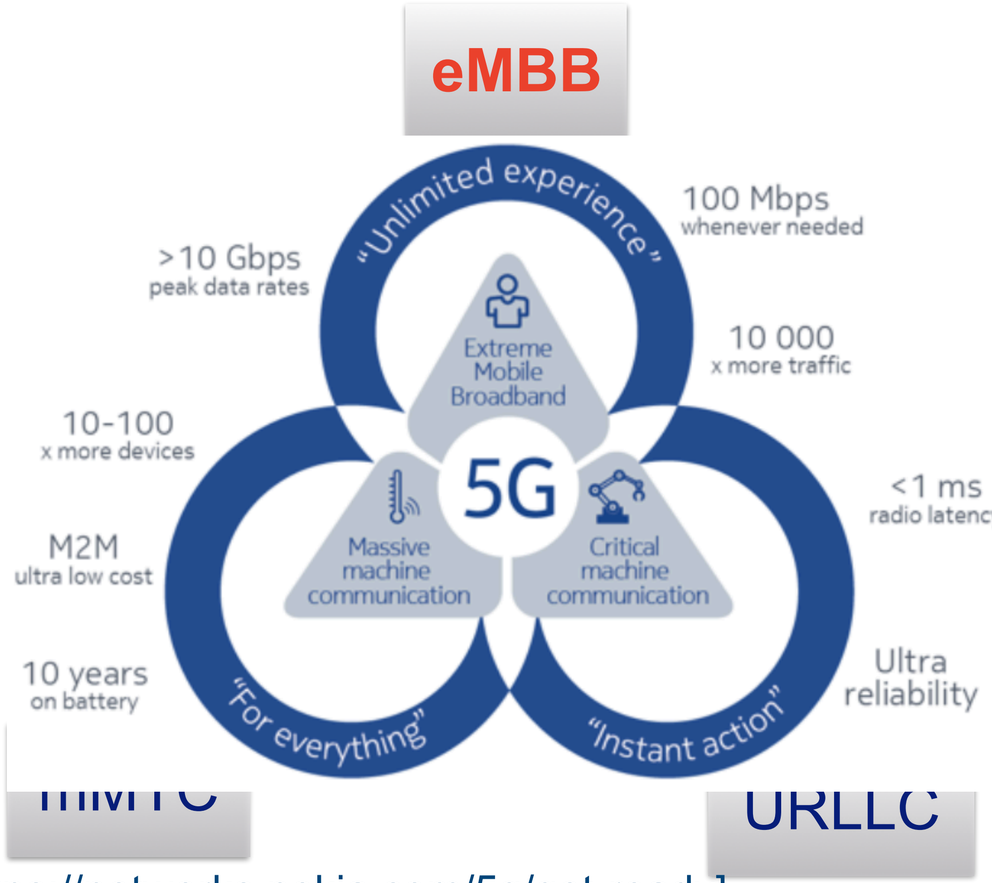
- Calculations
  - ~60% cost reduction when 10-60% home access
  - flat optimum with 20-40% home access
- Interference
  - re-use of 2.6 GHz
- Design error
  - each operator own femto



[source: H. Claussen, 2007]

5G - eMBB analysis and conclusions

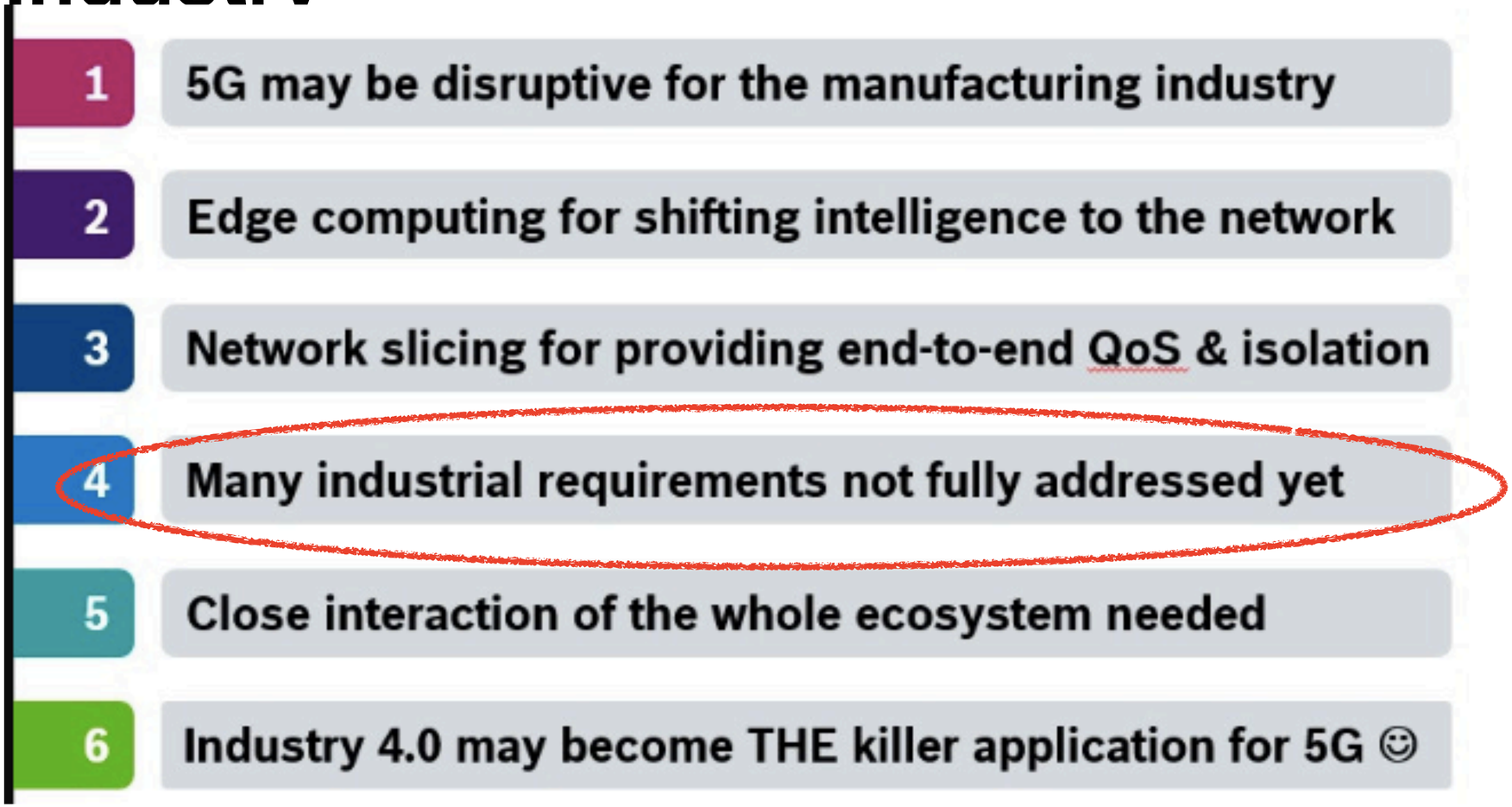
- Extreme mobile broadband (eMBB)
  - ➡ needs 10-60% of traffic to be taken by indoor
  - ➡ Return on investment
-



[source: Nokia https://networks.nokia.com/5g/get-ready]

5G Networks for Industrv

- Core demand
- Edge intelligence
  - ➡ Edge/fog computing
- End-to-end QoS and isolation
  - ➡ network slicing
  - ➡ heterogeneity(?)



[Source: Andreas Mueller, Bosch, 2018]

SCOTT-project.eu

largest security project in EU

58 partners from 12 countries

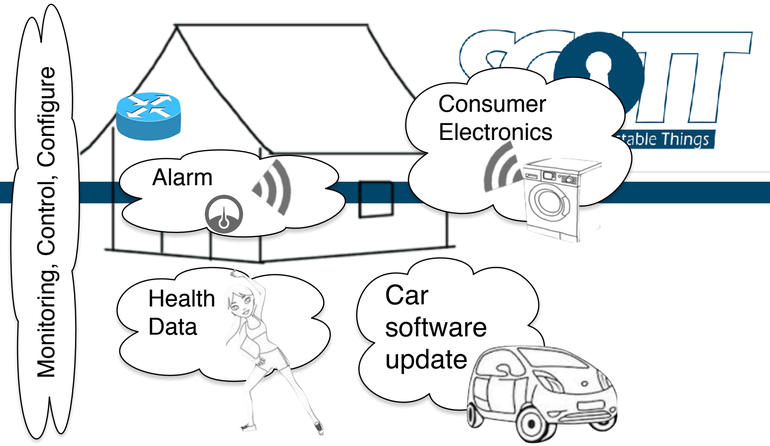
80 M€ budget
35 M€ EU&national

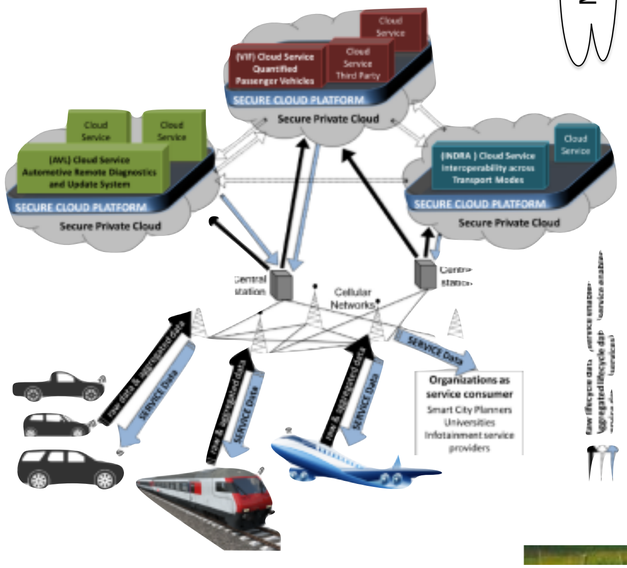
Secured Connected Trustable Things (SCOTT)

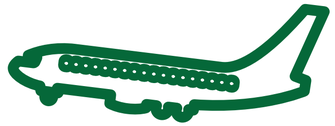
- 15 industry-driven Use Cases (TRL 6-7)
- 40 Technology Building Blocks
- 25 Demonstrators
- 5 Domains: Automotive, Aeronautics, Home/Building, Rail, Healthcare, - truly “cross-disciplinary”
- 2017 – 2020 (started in May 2017)

High-level vision for each domain

- Home/Infrastructures: Cost-efficient monitoring and management for trusted services
- Mobile: Configurable networks providing reliable services
- Automotive: Security architecture for accident-free transport
- Rail: Highly flexible train composition
- Aeronautics: Security-Safety



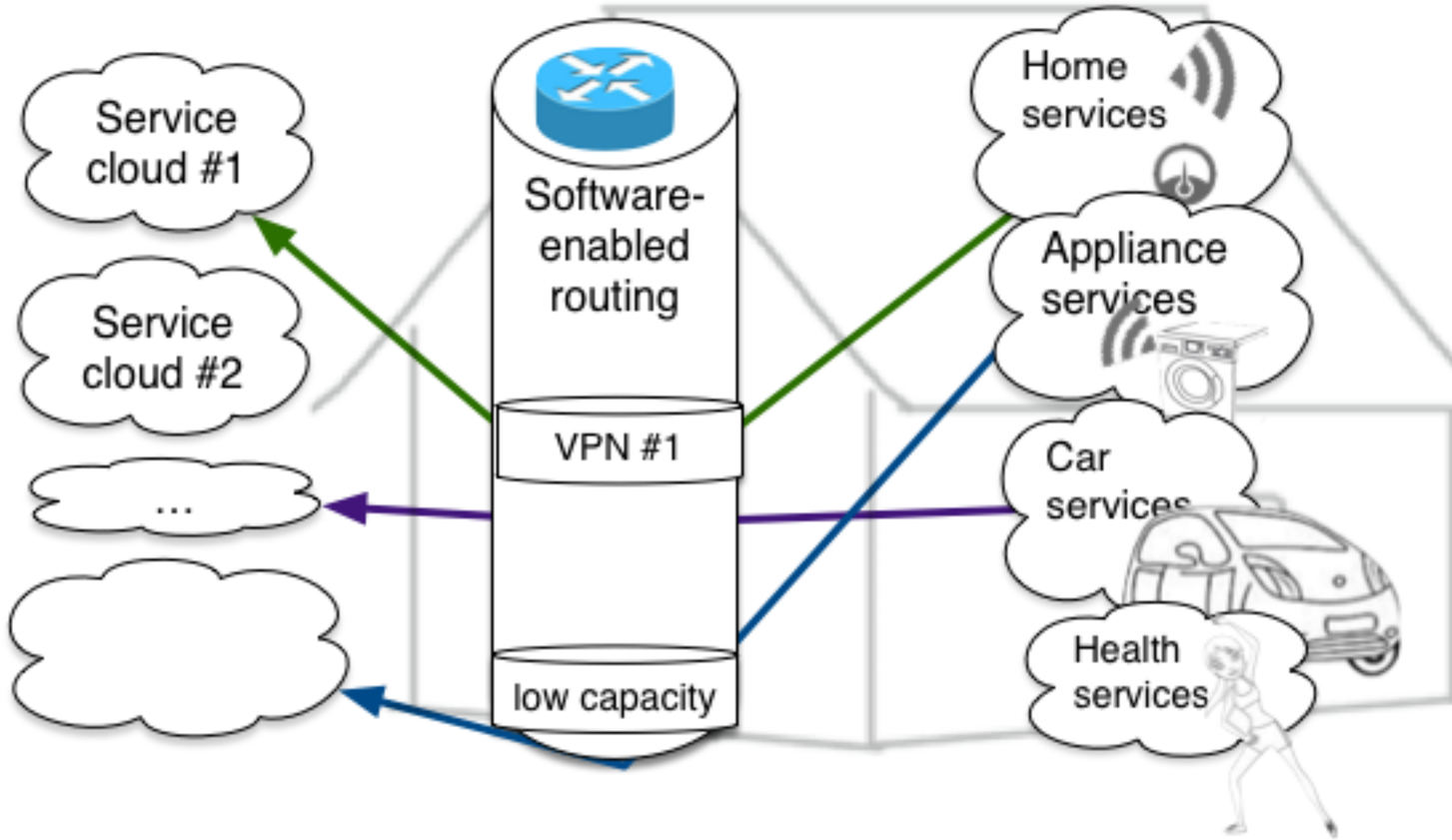




SCOTT-project.eu

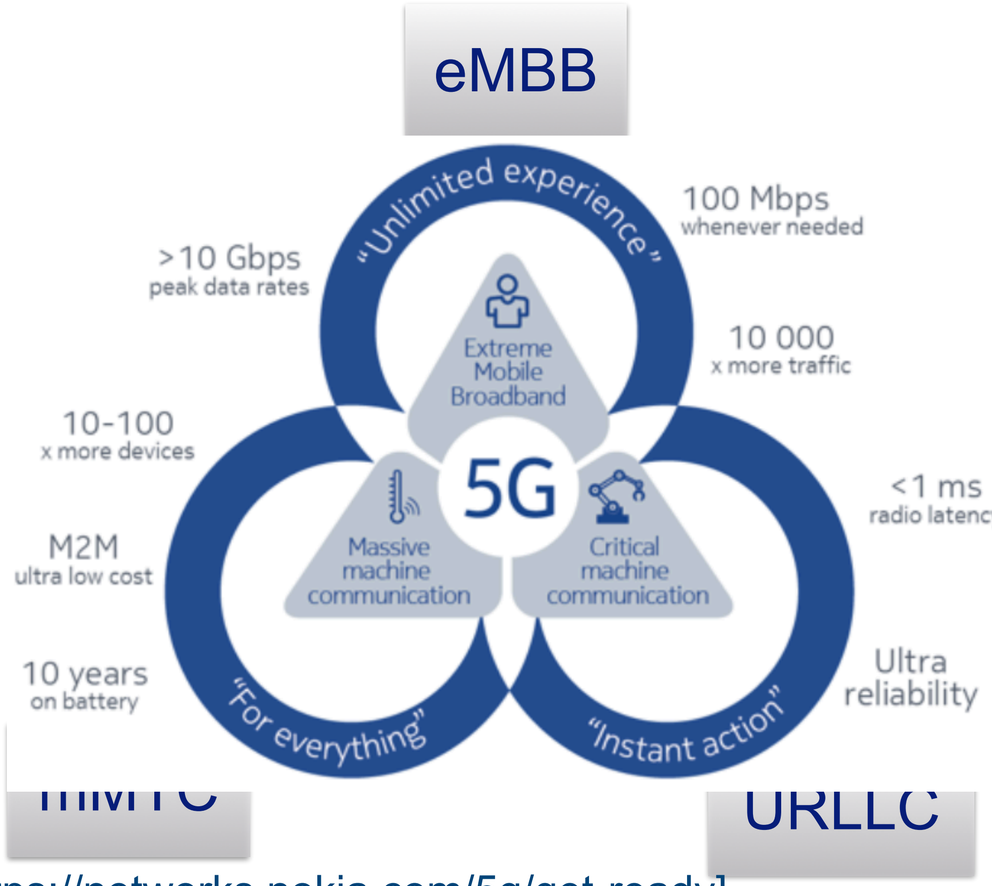
Future Services - home domain requirements

- Future Service demands
  - Energy, health, security
  - *require*
- Cost-efficient monitoring and management for trusted services
  - Wireless management
  - Security monitoring
  - Service harmonisation (5G@home)



5G - analysis and conclusions

- Extreme mobile broadband (eMBB)
  - ➡ needs 10-60% of traffic to be taken by indoor
  - ➡ Return on investment
- Massive Machine Communications (mMTC)
  - ➡ eSIM as authenticator
  - ➡ co-existance: Wifi/ZigBee/BLE and NB-IoT
- Critical machine communications (URLLC)
  - own networks/network slices

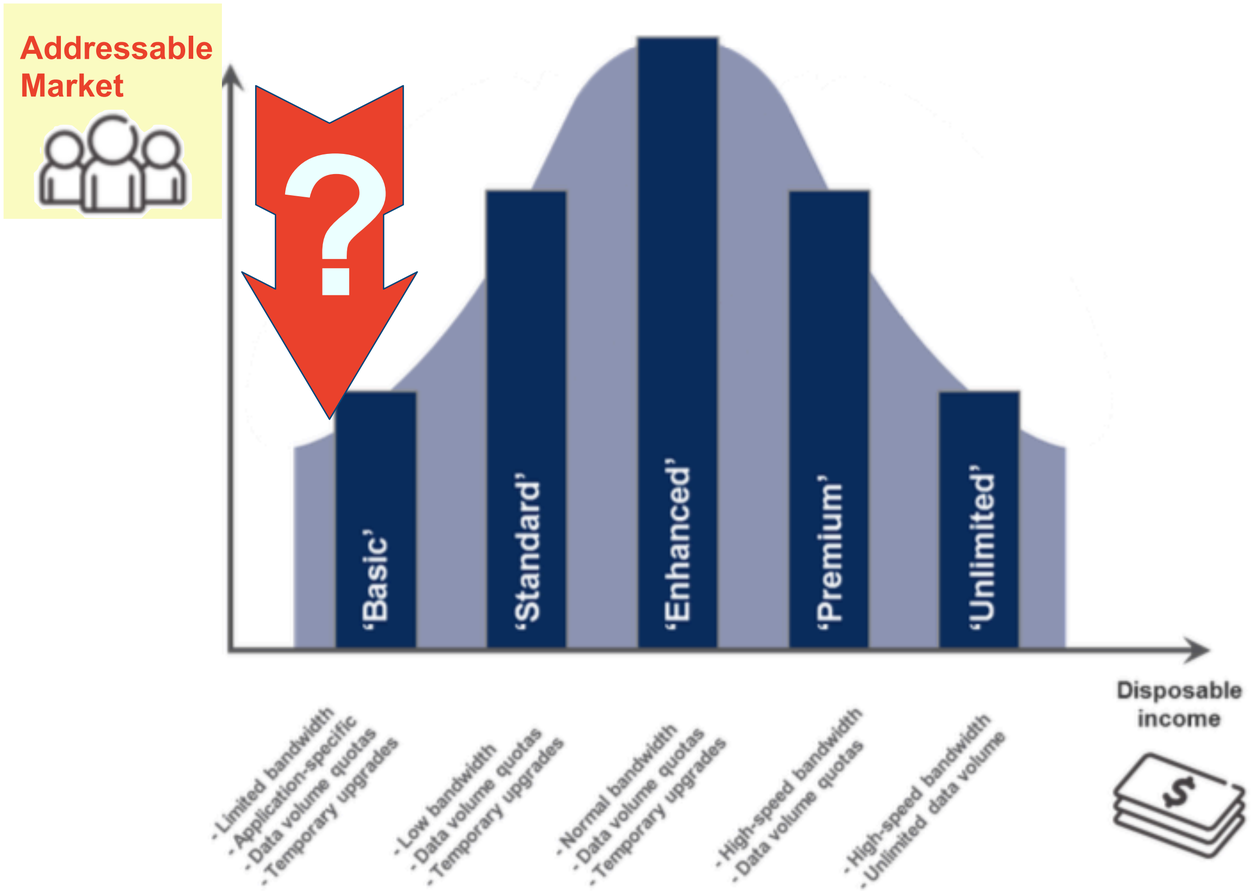


[source: Nokia https://networks.nokia.com/5g/get-ready]

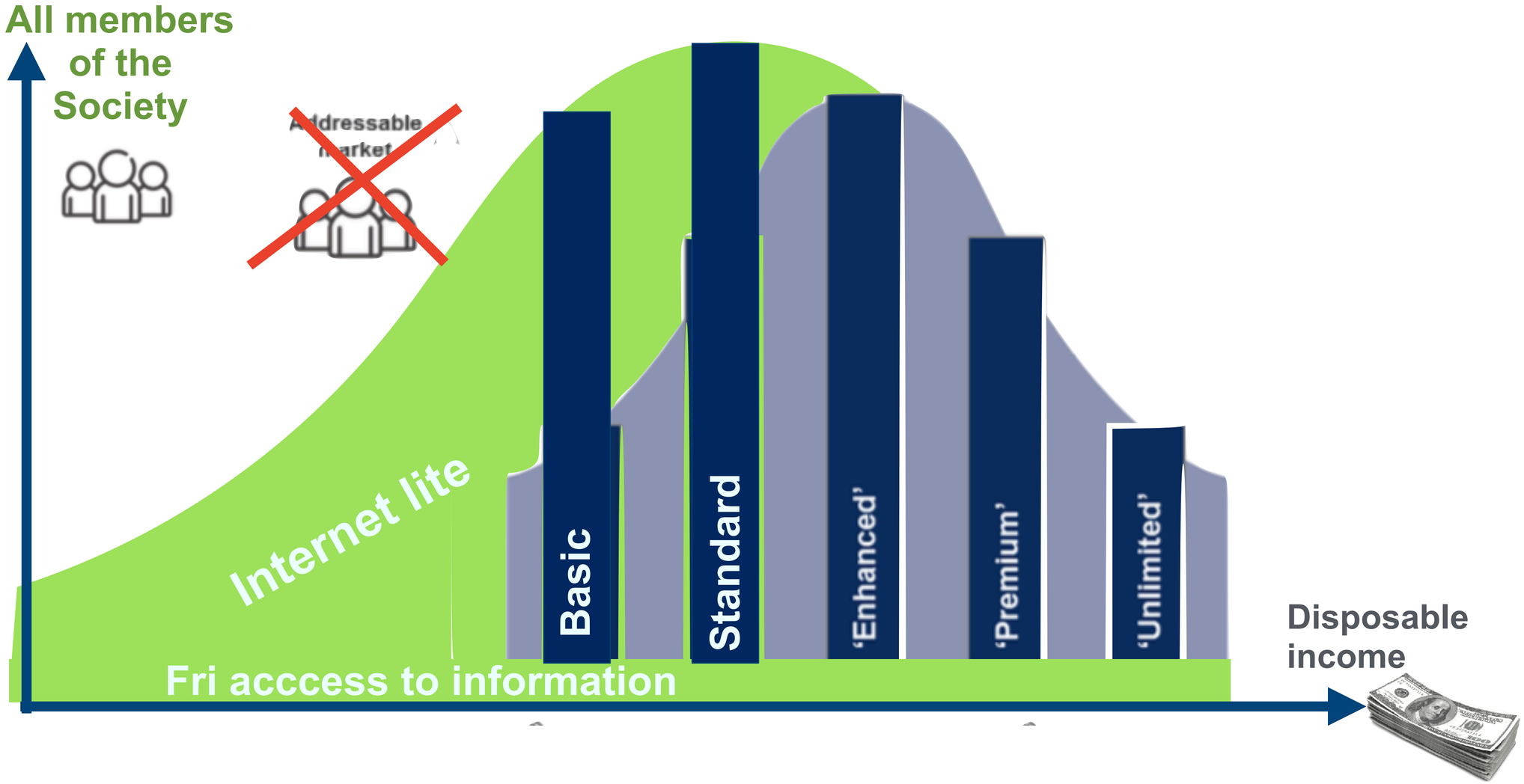
5G business & digital inclusion

- 5G for digital inclusion?
  - ➡ cost of network, services
  - ➡ IoT, digitisation, automation
  - ➡ “the divide is bigger than ever”

[Source: Service Innovation through Smart Networks, Ericsson, 2018]



6G (#5GforAll) for digital inclusion

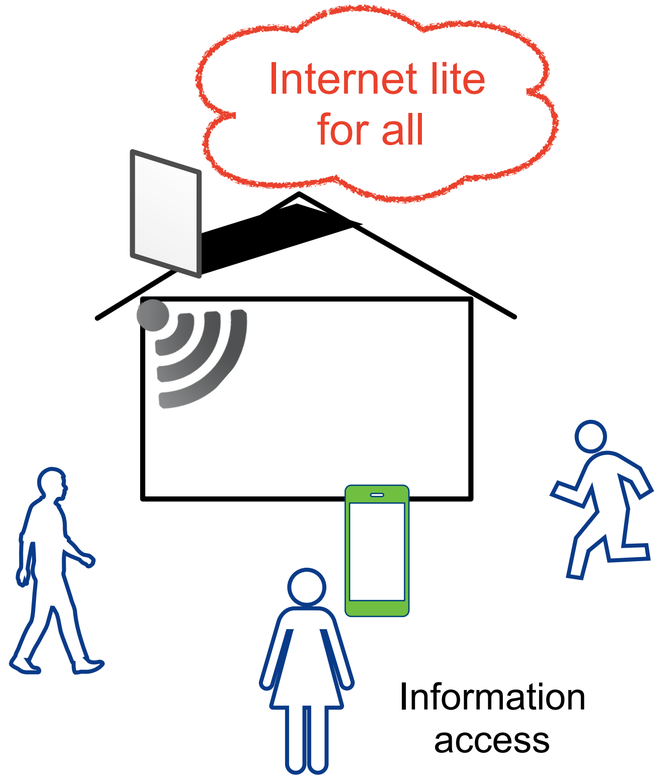


[Adapted from: Service Innovation through Smart Networks, Ericsson, 2018]

Home Domain for Digital Inclusion

- The digital Divide
  - 10x increase in Mobile Broadband (2013-2019) [1]
    - Netflix, YouTube, Hulu
  - 26% of NO-subscribers don't have MB [2]
  - 8% (400.000) in Norway not connected to the Internet [3]

- Home access for digital inclusion
  - "Internet lite for all"
    - Free access to information everywhere
    - Preemium access to broadband



[1] Service Innovation through Smart Networks, Ericsson, 2018
[2] Det norske ekommarkedet 2017, NKOM.no, 2018
[3] "Sauebonden som aldri…", aftenposten.no, 7Okt2018

Conclusions:
Seamless Integration of Mobile and Home Network

- Extreme mobile broadband (eMBB)
  - ➡ needs 10-60% of traffic to be taken by indoor
- Massive Machine Communications (mMTC)
  - ➡ eSIM as authenticator
  - ➡ co-existance: Wifi/ZigBee/BLE and NB-Io
- Critical machine communications (URLLC)
  - ➡ own networks/network slicesInternet lite for all
- Digital Inclusion through Home Networks
  - ➡ **Internet lite for all** - the freemium model for access

Basis for an inclusive and innovative society