Realizing wireless internet connectivity for all through B5G leading to 6G – Digital Inclusion: The Killer App for 6G

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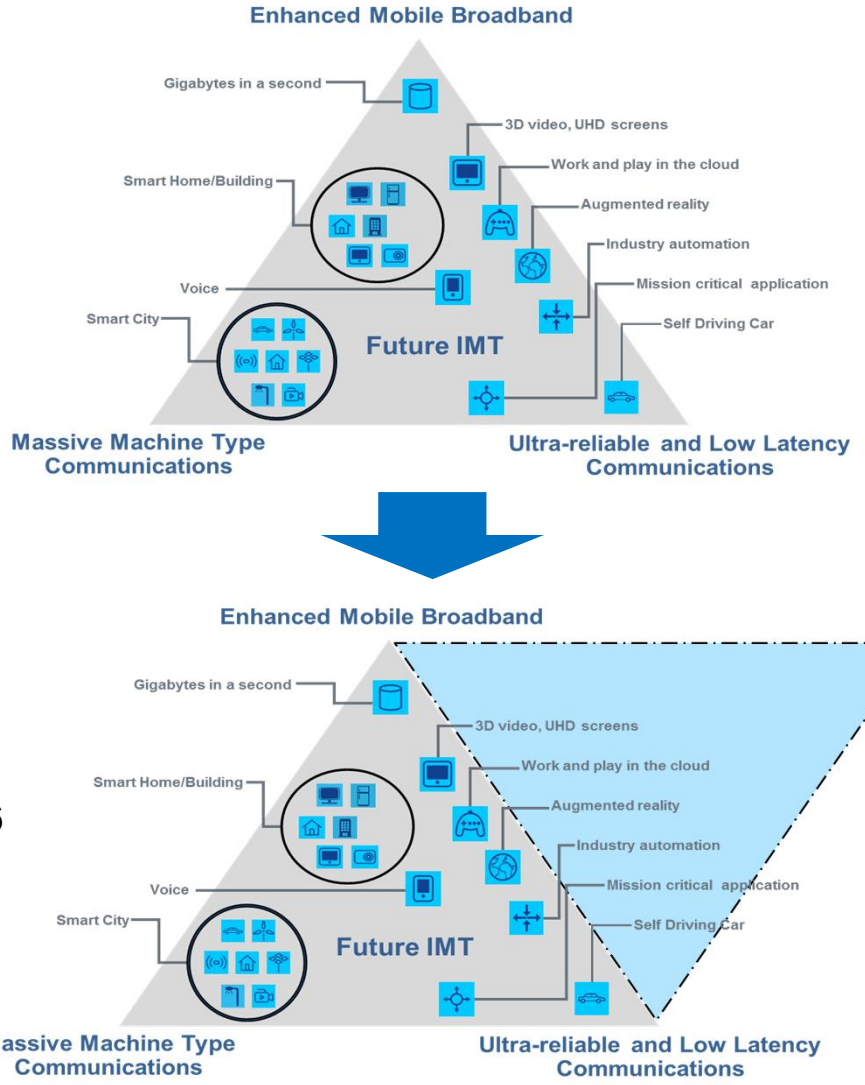
Motivation



5G:
20-100 M Users in 2021 ($75 M revenue), 1.1 to 2.6 B in 2025

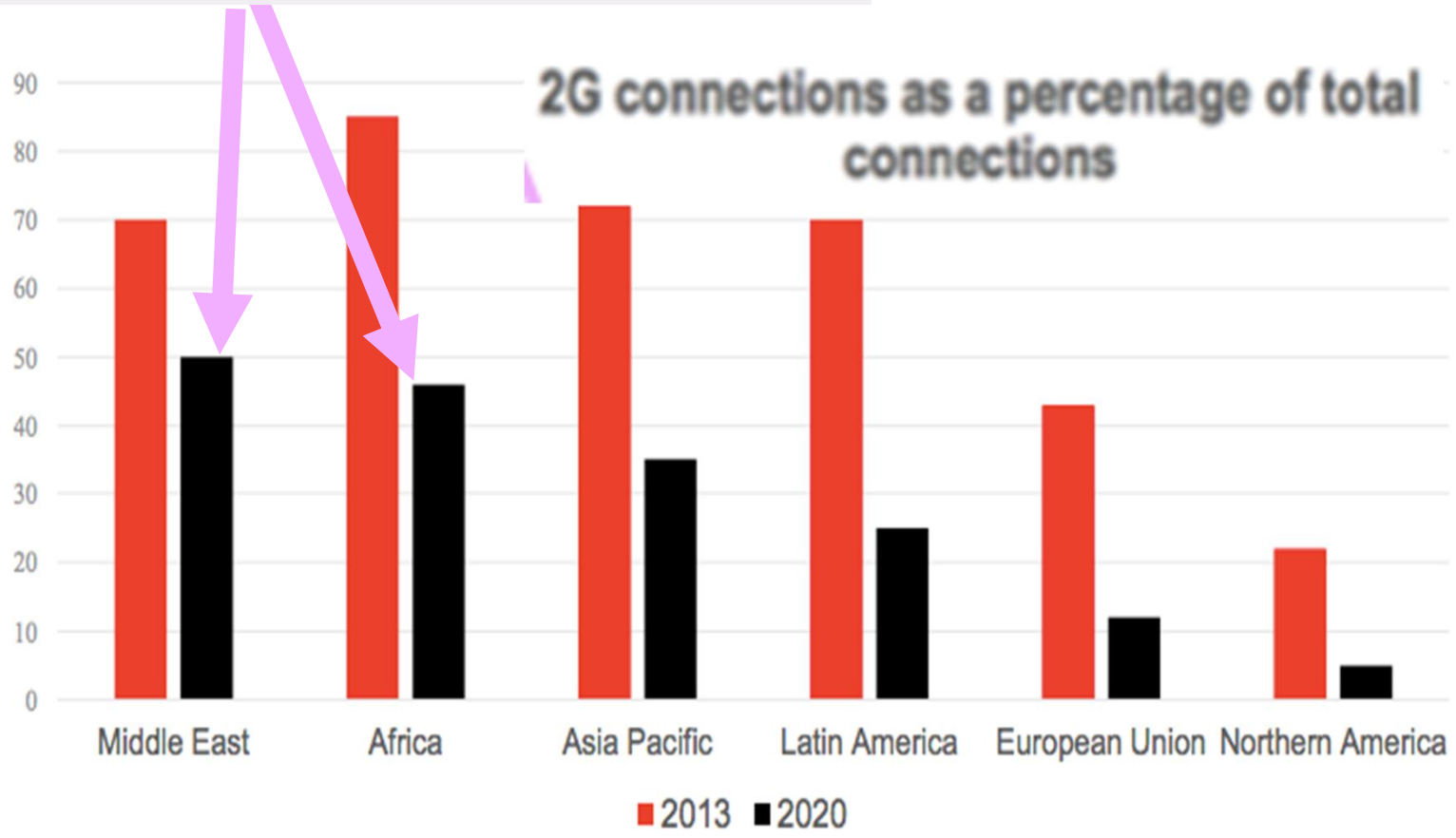
Connectivity for All

(Low mobility, off-grid, low cost, Local content, usable HCI and usable authentication/security)

50% (~ 3.8B people) of world population (7.7B) today (2019) do not have internet connectivity.

B5G and 6G are presented with a tremendous opportunity!!

~50% 2G in 2020


2G connections as a percentage of total connections
90
80
70
60
50
40
30
20
10
0
Middle East
Africa
Asia Pacific
Latin America
European Union
Northern America
2013
2020

[redacted]

SUSTAINABLE DEVELOPMENT GOALS

And what about IoT?

FREEDOM OF EXPRESSION

We can't reach the U.N. goals for sustainable development without the internet

22 JUNE 2017 | 11:40 AM

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It's become common wisdom that the United Nations' ambitious "Global Goals for Sustainable Development" aren't just for the U.N., or even governments, to implement. Launched in September 2015, the 17 goals and 169 targets are "a series of ambitious targets to end extreme poverty and tackle climate change for everyone by 2030" (hence the alternative moniker, the "2030 Agenda for Sustainable Development").

Replacing the more arcane "Millennium Development Goals," these Sustainable Development Goals (SDGs) are everyone's goals, crowd-sourced to completion and promoted by companies and civil society alike. (Cue the hip, auto-playing video on the website.)

Smartly, the goals, especially Goal 17, emphasize that **access to technology underpins every one of these commitments** to the eradication of extreme poverty.

However, not all connectivity is the same, nor yields the same benefits to societies in terms of economic, social, or cultural development. As we told the International Telecommunication Union (ITU), only **stable, secure, and open access** to broadband internet will ensure success for the U.N. SDGs. That's something civil society and our partners will continue to make clear, and we'll need to work in legislatures to get the point across, not simply at aid and development banks.

To reach the SDGs, we need civil and political advocacy

Traditionally, information and communications technology (ICTs) have not been a major recipient of aid funding. That's one reason this crucial technology is "under-represented" in the SDGs and appears in only four of the 169 targets. It's assumed that telecommunications will take care of itself, having been largely deregulated and privatized in the 1980s and 1990s. Yet **more than half the world's population is not using the internet**, a statistic showing the failure of local, national, and global governance, with economic, political, and moral implications

PETER MICEK
@lawyerpants

FREEDOM OF EXPRESSION | GLOBAL | #ITU4SDG | #KEEPITON | CONNECTIVITY | ITU | SDG | SUSTAINABLE DEVELOPMENT GOALS | UNITED NATIONS

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https://www.accessnow.org/cant-reach-u-n-goals-sustainable-development-without-internet/

Basic

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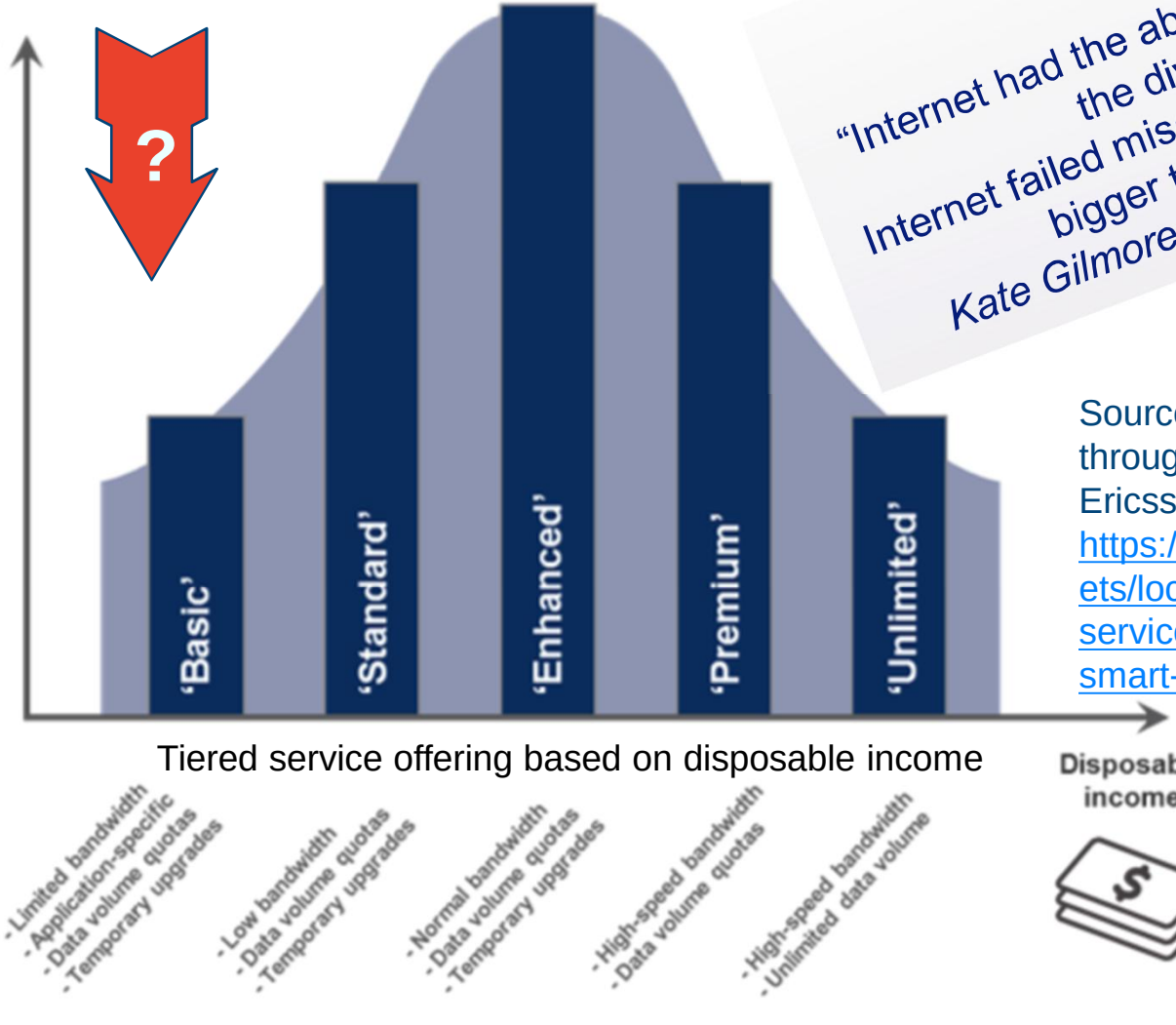
Wireless solutions are critical to sustainable development

Sustainability targets set by UN for 2030

Telecom view on digital inclusion

Addressable Market

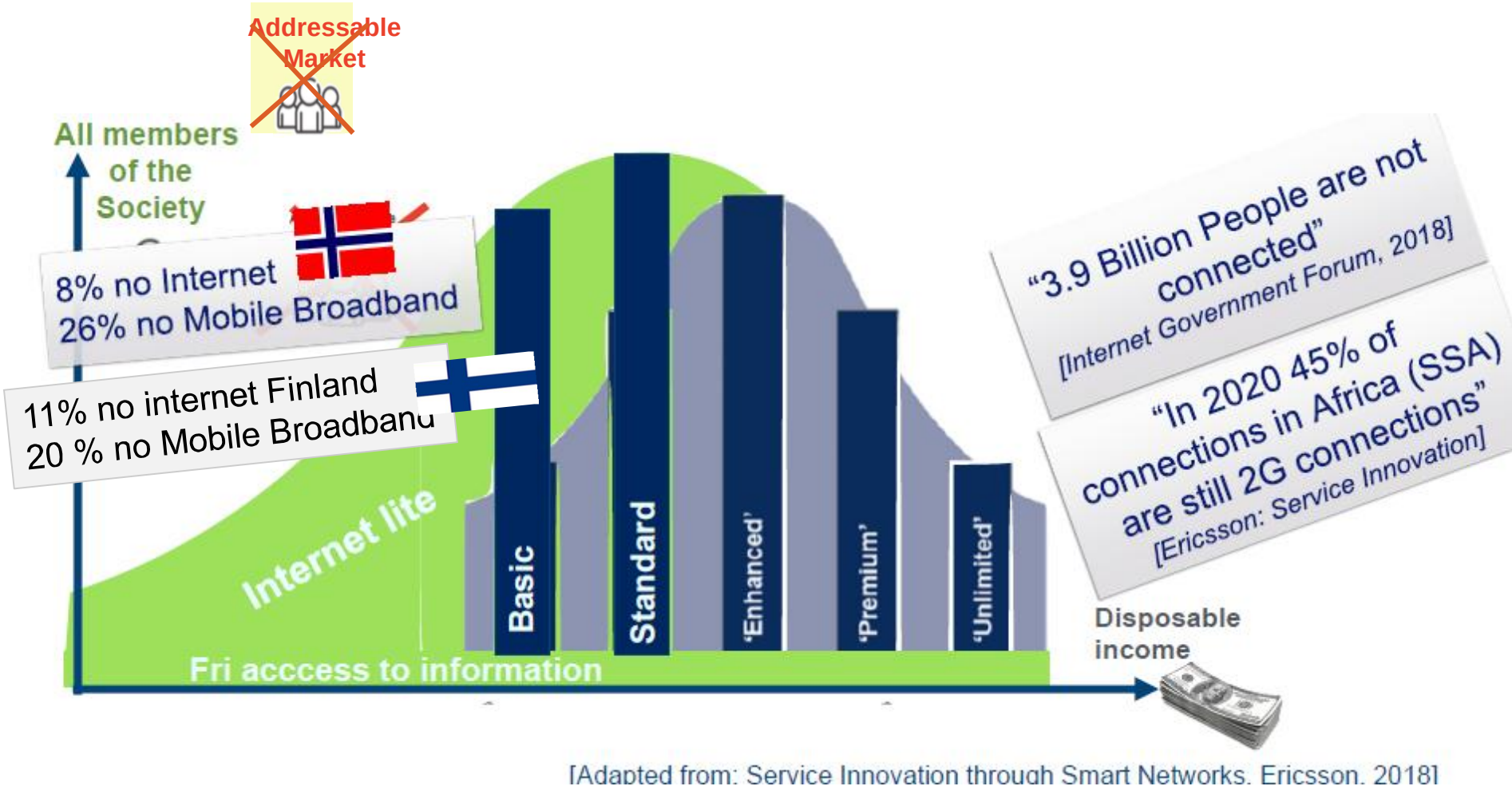


#5Gfor All?

"Internet had the ability to dismantle the divide. Internet failed miserably, the divide is bigger than ever."
Kate Gilmore, Human Rights, UNO

Source: Service Innovation through Smart Networks, Ericsson, https://www.ericsson.com/assets/local/networks/documents/service-innovation-through-smart-networks.pdf

6G (#5GforAll) for digital inclusion



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

Why ~3.5 B people still not on the (mobile) internet

1) Capacity to absorb digital technologies
   - Literacy, HCI, Complexity – authentication, security, navigation, Fear of technology

2) Technology
   - Off-grid, Coverage, Throughput, Content in local languages and relevant services, Scalability

3) Business/Economic
   - Expensive smart phones, Expensive and confusing data plans, Voice still meets most daily needs, Government support, innovative business models

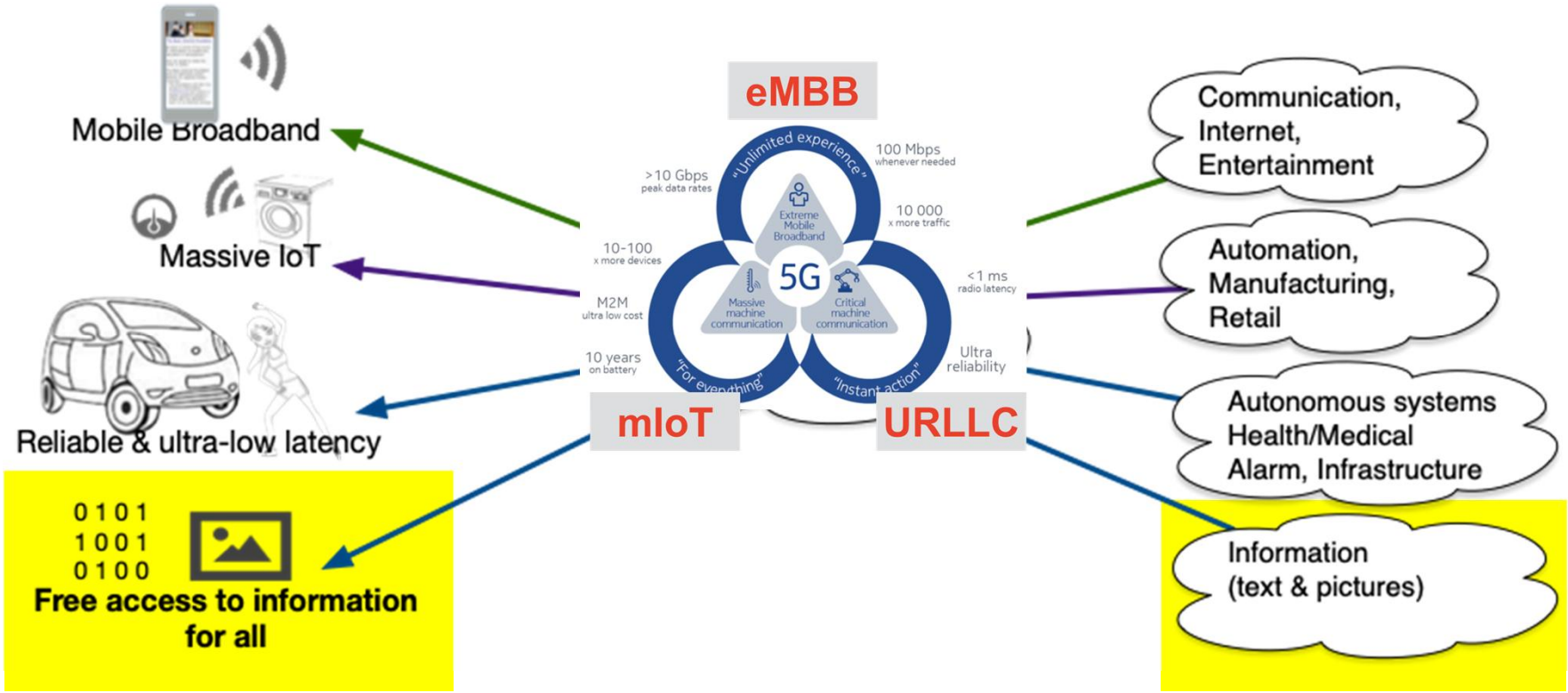
Why 3.5B people still not on the (mobile) internet (Solutions)

1) Capacity to absorb digital technologies
   - Literacy, HCI, Complexity – authentication, security, navigation, Fear of technology
   - ü Education, online learning and skills development, Voice & video (and gesture) based HCI, Auto customization

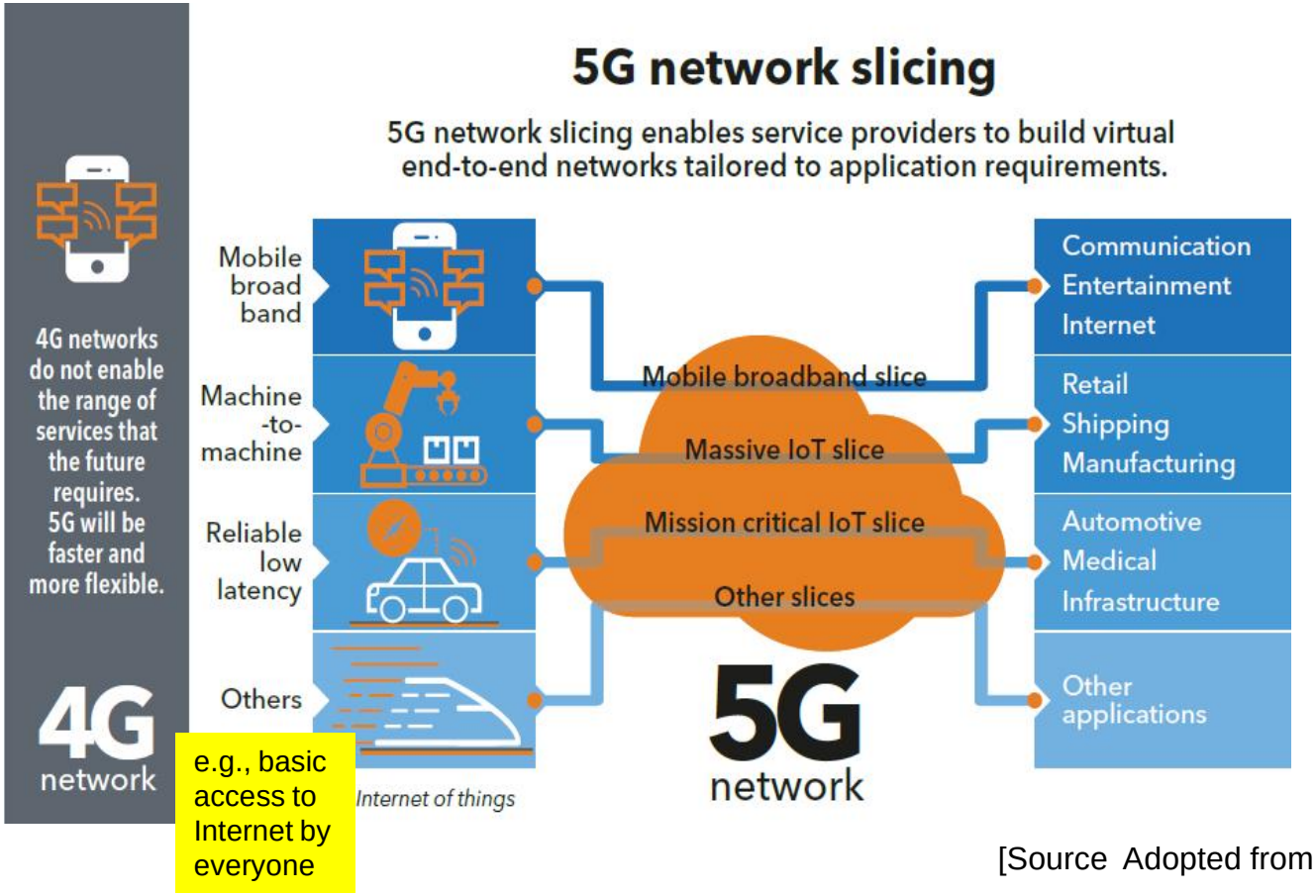
2) Technology
   - Off-grid, Coverage, Throughput, Content in local languages and relevant services, Scalability
   - ü Solar/wind, Macro and micro cells, Integrated terrestrial (TVWS)/Satellite/ backhaul, Crowd sourcing, mesh networks, Aggressive use of cloud and virtualization

3) Economic
   - Expensive smart phones, Expensive and confusing data plans, voice still meets most daily needs, Government support, innovative business models
   - ü Downward price trend under $85 (large 2nd hand market), Regulations, Push for barter and shared business models, Micro-operator eco-system mandated by the government, Replace USOF

5G network slicing for Free Access to Information for All



- ü 10 minute of video = 10 months of text and images [Opera Software]
- ü Free access to Internet consumes only ~2.5% of bandwidth
- ü Replace Universal Service Obligation Fund by mandated access to “Internet Lite”



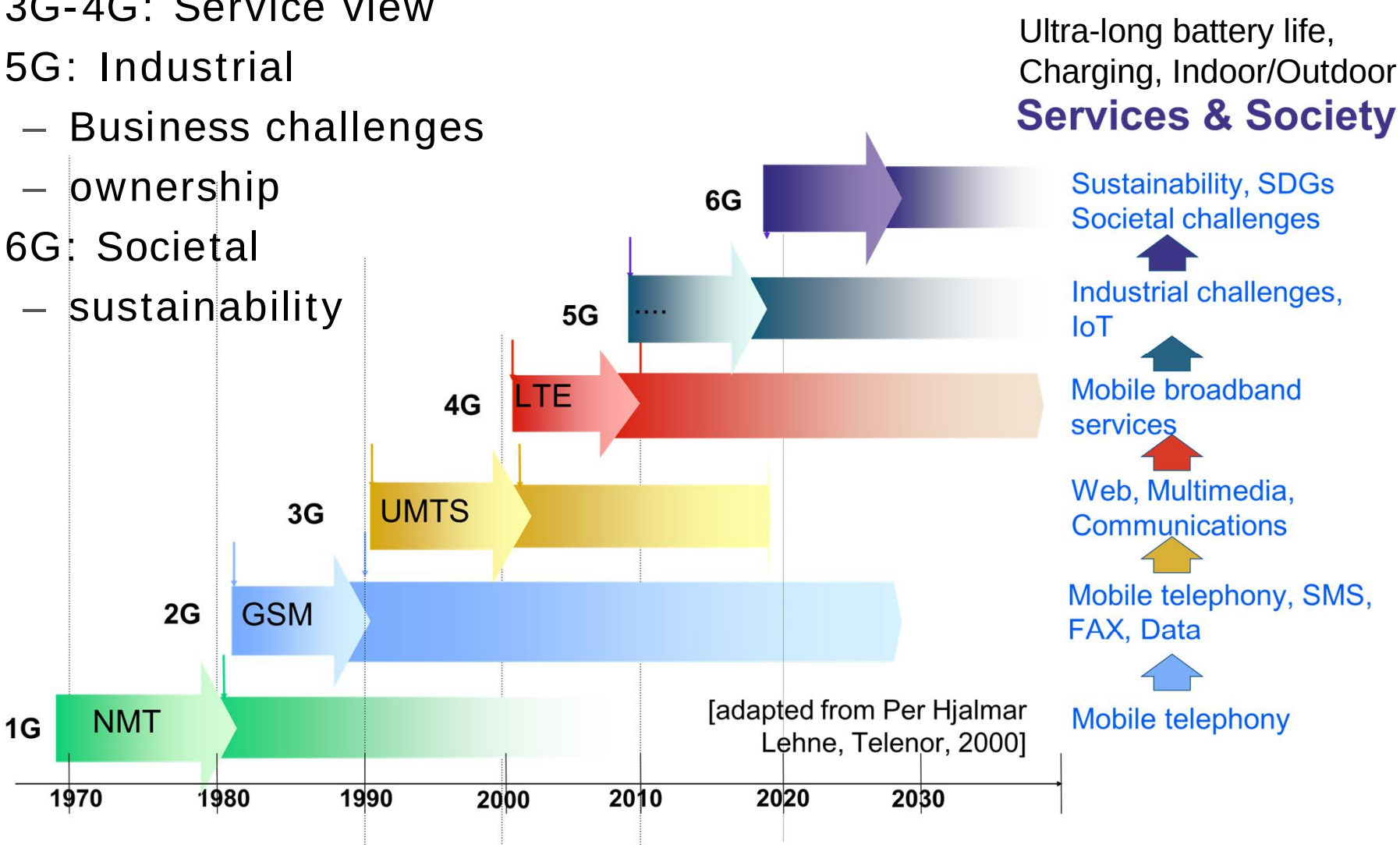
e.g., basic access to Internet by everyone

[Source Adopted from sdx Central]

6G: Digitisation of the Society

- 1G-3G: Speed, flexibility
- 3G-4G: Service view
- 5G: Industrial
  - Business challenges
  - ownership
- 6G: Societal
  - sustainability

Sustainability: Killer app for 6G



In dollars and cents

- Rural segment of world population consists of 43%, median average age 35 years 50% of those in age group over 35 not tech savvy not touched by Internet => 825 M TAM (total available market)
- With 50% Internet adoption, directly impacted population 414M users
- With $3 per month per user for premium content, potential revenue opportunity $1.25B per month or $14.9B per year
- Not including additional significant revenues from users migrating to full internet service plans!!

Some backhaul costs

- VSAT station: Average $500
- Satellite bandwidth cost about $100 per Mbps per month
- Microwave backhaul cost about $135 per 4 Mbps per month

Recognition of the need to bridge the digital divide

- IEEE Future Network Initiative in Connecting the Unconnected (CTU)
- NGMN Alliance launch of new project on Extreme Long Range Communications for Deep Rural Coverage
- 6G Flagship project at University of Oulu with partners

Grand societal challenges that have been over looked

- How to solve backhauling in remote areas?
- How remote area networks are financed?
- How about emerging economies, and developing countries?
- Spectrum regulation in remote areas should be handled differently
- How to rapidly transform networking by leveraging IT and cloud to lower cost and increase flexibility & scalability.

ngmn
the engine of broadband wireless innovation

PRESS RELEASE

NGMN Alliance launches new projects to boost 5G success

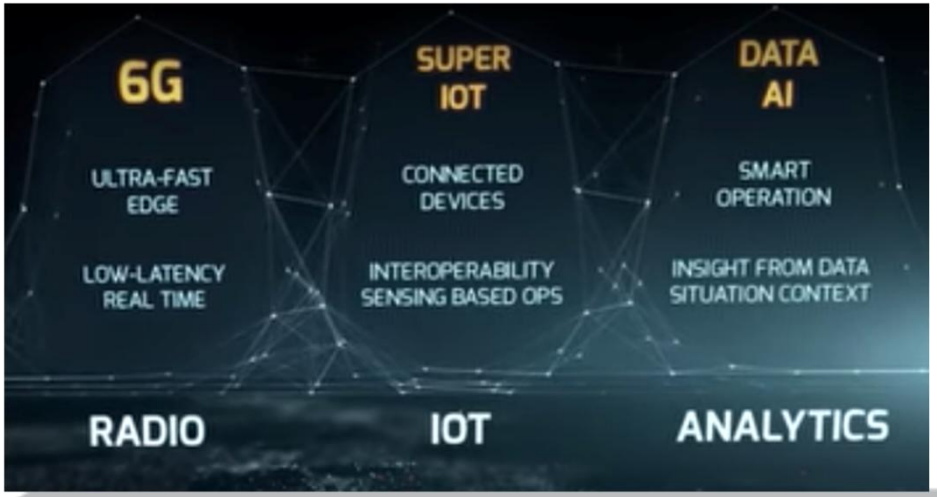
Updates on first 5G deployment experiences, further technology development and new business models to be shared at the NGMN Industry Conference in Vancouver, November 6-8, 2018

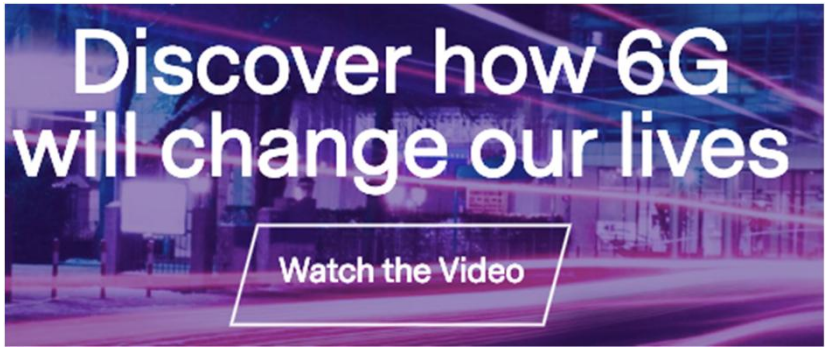
Frankfurt, GERMANY, June 18, 2018 – Next Generation Mobile Networks (NGMN) has confirmed the launch of four new key projects to support the development and deployment of 5G networks.

The projects – **"Spectrum and deployment efficiencies", "Ultra Reliable Low Latency Communication (URLLC) requirements for vertical industries", "RAN convergence"** and **"Extreme long-range communications for deep rural coverage"** – have been highlighted as crucial development areas to further optimise and guide the telecoms industry towards the successful deployment of 5G beyond 2018.

https://www.oulu.fi/6gflagship/

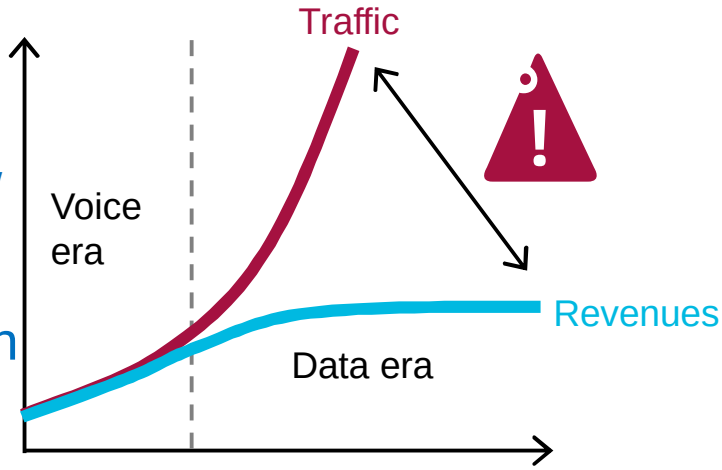
- Academy of Finland (AKA) sonsored project in Finland
  - 251 M€ funded (2018 – 2016)
- Goals
  - Support industry in ushering of the 6G
  - Develop the fundamental technologies needed to enable 6G
  - Speed up digitalization in society
  - Focus on Sustainable Development



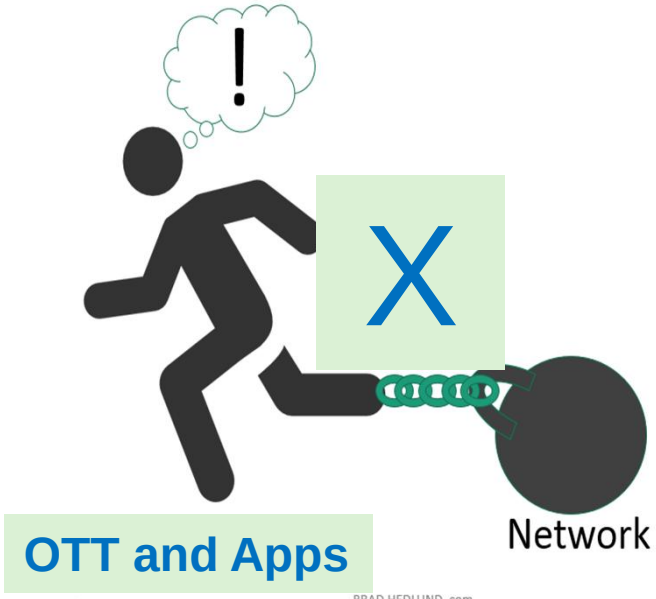


Who would be Responsible for Success or Failure (5G leading to 6G)

- Regulator
  - Timely and Cost Effective Spectrum Allocation to serve the entire society
    - Example of 2G to 3G then and 4G to 5G now
  - Introduction of "Effective" Privacy, Security and Information Protection Policies essential for ethical introduction of Business Models otherwise possible with available technologies
    - Ref Data Analytics in IoT etc



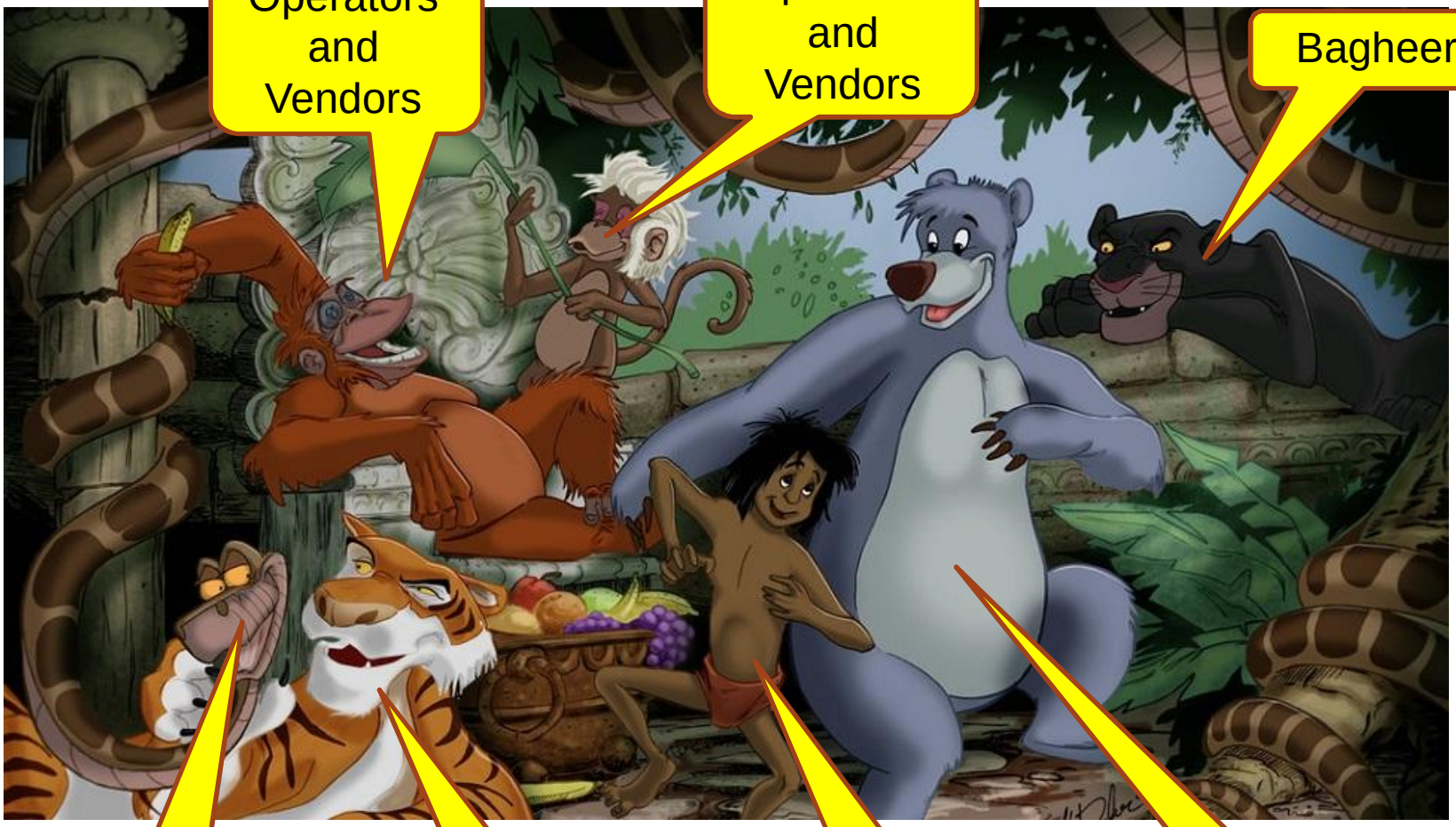
- "Fair Trade" Practices and Industry Convergence
  - Telecom Operators, OTT Application Providers, Content Providers
  - Cost effective allocation of telecom network resources for Vertical Market Business



“The last time I was connected by wire was at birth - not again!

- Mobile development
  - From Network development
  - To Societal Empowerment
- Sustainability and Responsibility in 6G
- Trust, Privacy, Security, and net-neutrality
  - Facebooks Free Basics
  - “We have been colonised once…”

Conclusions: Back to the “Jungle Book” inspired by Rudyard Kipling “Mowgli” stories



Thank you!