A NETWORK FOR THE FUTURE
VISIONS FOR FUTURE COMMUNICATIONS SUMMIT
LISBON, 23-24 OCTOBER 2017

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Director – Data/IT Standardization
OUTLINE

› 5G Vision
  Traffic Volume
  Mobile Technologies
  Devices
  Use Cases

› New Technologies in the Architecture

› Issues around Technology
OVER ONE MILLION NEW MOBILE INTERNET USERS ADDED EVERY DAY

4G WILL BE THE DOMINANT ACCESS TECHNOLOGY GLOBALLY BY 2018

TOTAL MOBILE DATA TRAFFIC GREW BY 70% BETWEEN Q1 2016 AND Q1 2017

VOLTE SUBSCRIPTIONS TO REACH 4.6 BILLION BY 2022 – 90% OF ALL LTE SUBS

THERE WILL BE HALF A BILLION 5G SUBSCRIPTIONS GLOBALLY BY 2022
SMARTPHONE GROWTH CONTINUES

Source: Ericsson Mobility Report, June 2017

• Total mobile data traffic will increase 8 times – exceeding 70 EB/month in 2022
• Smartphone traffic will increase 9 times – reaching 66 EB/month in 2022
• In 2022, video will account for around 75% of mobile data traffic
SUBSCRIPTIONS BY TECHNOLOGY

Mobile subscriptions by technology (billion)

- LTE
- WCDMA/HSPA
- GSM/EDGE-only
- TD-SCDMA
- CDMA-only
- Other

5G subscriptions will exceed half a billion by the end of 2022

Source: Ericsson Mobility Report, June 2017

Figure note: IoT connections and Fixed Wireless Access (FWA) subscriptions are not included in the above graph.
Towards an IoT-dominated World

Source: Ericsson Mobility Report, June 2017

Connected devices (billions)

<table>
<thead>
<tr>
<th>Year</th>
<th>Wide-area IoT</th>
<th>Short-range IoT</th>
<th>PC/laptop/tablet</th>
<th>Mobile phones</th>
<th>Fixed phones</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>0.4 billion</td>
<td>5.2 billion</td>
<td>1.6 billion</td>
<td>7.3 billion</td>
<td>1.4 billion</td>
</tr>
<tr>
<td>2022</td>
<td>2.1 billion</td>
<td>15.5 billion</td>
<td>1.7 billion</td>
<td>8.6 billion</td>
<td>1.3 billion</td>
</tr>
</tbody>
</table>

CAGR:
- Wide-area IoT: 30%
- Short-range IoT: 20%
- PC/laptop/tablet: 0%
- Mobile phones: 3%
- Fixed phones: 0%

Source: Ericsson Mobility Report, June 2017
Ubiquitous Mobility
8.9B subscriptions
6.8B smartphones
80% LTE coverage

Pervasive Data
8X Mobile Data Traffic
~75% Video
90% MBB subscriptions

Connected Things
29B Connected Devices
550M 5G Subscriptions

1G
Foundation of Mobile Telephony
70-80's

2G
Mobile Telephony for Everyone
80-90's

3G
Foundation of Mobile Broadband
90-00's

4G
Future of Mobile Broadband
00-10's

5G
Industries beyond Smartphones
10-20's

Source: Ericsson Mobility Report, Nov 2016
5G IS USE CASE DRIVEN

Massive MTC
- SMART AGRICULTURE
- LOGISTICS
- SMART METER
- FLEET MANAGEMENT
- TRACKING
- LOW COST, LOW ENERGY
- SMALL DATA VOLUMES
- MASSIVE NUMBERS

Critical MTC
- TRAFFIC SAFETY & CONTROL
- INDUSTRIAL APPLICATION & CONTROL
- REMOTE MANUFACTURING
- REMOTE TRAINING
- REMOTE SURGERY
- ULTRA RELIABLE
- VERY LOW LATENCY
- VERY HIGH AVAILABILITY

Enhanced mobile broadband
- ENTERPRISE
- HOME
- VENUES
- MOBILE/WIRELESS/FIXED
- SMARTPHONES
- NON-SIM DEVICES
- VR/AR
- BROADCASTING
- 4K/8K UHD

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## USE CASE EVOLUTION

<table>
<thead>
<tr>
<th>Enhanced Mobile Broadband</th>
<th>Current</th>
<th>On the road to 5G</th>
<th>5G experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screens everywhere</td>
<td>New tools</td>
<td>Immersive experience</td>
<td></td>
</tr>
<tr>
<td>Automotive</td>
<td>On demand information</td>
<td>Real-time information vehicle to vehicle</td>
<td>Autonomous control</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Process automation</td>
<td>Flow management and remote supervision</td>
<td>Cloud robotics and remote control</td>
</tr>
<tr>
<td>Metering and smart grid</td>
<td>Resource management and automation</td>
<td>Machine intelligence and real-time control</td>
<td></td>
</tr>
<tr>
<td>Healthcare</td>
<td>Connected doctors and patients</td>
<td>Monitoring and medication e-care</td>
<td>Remote operations</td>
</tr>
</tbody>
</table>

### Technologies

- Multi-standard network
- Cat-M1/NB-IoT
- Cloud optimized functions
- VNF orchestration
- Gigabit LTE (TDD, FDD, LAA)
- Massive MIMO
- Network Slicing
- Dynamic service orchestration
- Predictive analytics
- 5G NR
- Virtualized RAN
- Federated network slicing
- Distributed Cloud
- Real time machine learning/AI

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5G USE CASES

- BROADBAND AND MEDIA EVERYWHERE
- SENSORS EVERYWHERE
- SMART VEHICLES, TRANSPORT
- INFRASTRUCTURE, MONITOR AND CONTROL
- CRITICAL CONTROL OF REMOTE DEVICES
- INTERACTION HUMAN-IOT
5G SUCCESS FACTORS

› 5G System – Openness and horizontal network end to end
  *(5G is cloud/core, control, access and devices/sensors)*

› Global ecosystem – Multiple use cases with one global eco-system
  *(Leveraging the scale of 4G/LTE)*

› 5G enabling new business – Operators driving growth in IoT, media and industry transformation
  *(New capabilities for digitalization and mobilization)*

› The Network platform - Relevance to other industries
  *(Speed is essential to position networks in the global web environment)*

› Industry alignment - Standardization and open source approach
  *(A broader set of use cases requires cross industry collaboration)*
ONE ARCHITECTURE MULTIPLE INDUSTRIES

Energy Performance

5G

Programmable IP, Cloud Technologies, Full Mobility, Data & Analytics, Automation

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5G RADIO ACCESS

LTE Evolution

Tight interworking

“NR”
No compatibility constraints
5G SPECTRUM

**Low Band**
- 600/700 MHz

**Mid Band**
- 3.1–4.2 GHz
- 4.4–4.99 GHz

**High Band**
- 20 GHz
- 30 GHz
- 100 GHz

- 600/700 MHz
- 3.1–4.2 GHz
- 4.4–4.99 GHz
- 26/28 GHz
- 38/42 GHz
- 2018-2019
- ~2020
- >2020
ONE ARCHITECTURE MULTIPLE INDUSTRIES

<table>
<thead>
<tr>
<th>Devices / Local NW</th>
<th>Access sites</th>
<th>Distributed sites</th>
<th>National sites</th>
<th>Global sites</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Management &amp; Monetization</td>
<td>Application Cloud</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Network Slices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile</td>
<td></td>
<td>Access, Mobility, Network applications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed</td>
<td></td>
<td>Cloud Infrastructure</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Transport</td>
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</tbody>
</table>

- Energy Performance
- Security

Programmable IP, Cloud Technologies, Full Mobility, Data & Analytics, Automation

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PATHS TO OUR DIGITAL FUTURE

2017 Global Internet Report
STRUCTURE OF THE REPORT

› Drivers of Change

The six key forces that will have a profound impact on the future of the Internet in the years to come.

› Areas of Impact

The three critical features related to the future Internet, upon which the Drivers will have a decisive impact.
Drivers of Change

› Technological, economic, regulatory, security and network related challenges for the future Internet.

› In all cases, the implications of one Driver are inextricably tied to another.