DEMAND 2020

Devices & Consumers
Applications & Industry
Service Providers
Network
INDUSTRY TRANSFORMATION

Traditional Industries  
Digitize & Mobilize  
Transformed Industries

Operators & Network

Devices

Applications
BUILDING 5G

One Network – Multiple Industries
Platform for 50 Billion
Open Innovation

Global developments
Global standard

Industry Journey

Milestones every year
Research & Development
5G System View

Technology Evolution
EVOLUTION TOWARDS 2020

- **1000x** Mobile Data Volumes
- **10x-100x** Connected Devices
- **5x** Lower Latency
- **10x-100x** End-user Data Rates
- **10x** Battery Life for Low Power Devices

Source: METIS
WHAT 5G WILL PROVIDE

- Multi domain performance
- Energy Performance
- Global standard
- Foundation for efficient industries and society
- Massive machine type of communications
- Mass market personalized TV
- Critical machine type of communications
FLEXIBILITY AND ROBUSTNESS

**FLEXIBILITY**
- Open
- Mobile
- Programmable
- Agile
- Sustainable

**ROBUSTNESS**
- Scalable
- Secure
- Reliable
- Standardized
ERICSSON DRIVES 5G TO BECOME A GLOBAL STANDARD
ONE NETWORK – MULTIPLE INDUSTRIES

A common network platform with dynamic and secure Network Slices
5G Network Evolution to Meet Expectations

- Management & Orchestration
- Applications
- Cloud Infrastructure
- IP Infrastructure
- Radio Access
- Sustainability
- Security

Scope for 5G
5G RADIO ACCESS & SPECTRUM

Evolution of LTE
- Backwards compatible

New radio-access technology

Interworking

Overall 5G solution

Existing spectrum

New spectrum

1 GHz 3 GHz 10 GHz 30 GHz 100 GHz

Spectrum flexibility

Flexible duplex
- FDD and TDD
- Dynamic TDD
- Full Duplex

Dedicated Licensed Spectrum
- Complimented with spectrum sharing
- Unlicensed
- Shared licensed

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OSS/BSS: ENABLING THE AGILE OPERATOR

- **Monetization of Digital Services**
- **Management and Orchestration of NFV/SDN/Cloud**
- **Analytics and Customer Experience Management**

**Key Metrics**
- <1 HOUR: Automated fulfilment for complex services
- <5 MINUTES: Automated fault correlation
- 60% FEWER: Manual touch-points for 2/3 of all orders
- 11.5 MILLION: B2B transactions managed per day
- 14K: SERVICES OFFERED

**ERICSSON RANKED FIRST WORLDWIDE**
- OSS
- BSS
- NMS
- Service Enablement
- Related services
LTE EVOLUTION LEADS TO 5G

› LTE Advanced
› LTE Broadcast
› Latency reductions
› License Assisted Access and Unlicensed Spectrum
› Multi-antenna enhancements
› Device to Device
› Massive MTC enhancements
MACHINE TYPE COMMUNICATION

Massive MTC
Low cost
Low energy
Small data volumes
Massive numbers
Long ranges

Critical MTC
Ultra reliable
Very low latency
Very high availability
The extremely low latency of LTE and 5G enables new possibilities for M2M applications.
5G JOURNEY IN THE INDUSTRY

Builds on LTE and previous experiences

Global efforts for a global standard in 2020

Challenging 5G system requirements

Open platform for industry ecosystem to leverage
5G USE CASES
BROADBAND EXPERIENCE EVERYWHERE, ANYTIME

SMART VEHICLES, TRANSPORT & INFRASTRUCTURE

MEDIA EVERYWHERE

CRITICAL CONTROL OF REMOTE DEVICES

INTERACTION HUMAN-IOT

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USE CASE 1
BROADBAND EXPERIENCE EVERYWHERE, ANYTIME
BROADBAND EXPERIENCE EVERYWHERE, ANYTIME

SUB-USE CASES
- Broadband access in crowded areas
- Broadband access in public transport
- Event platform

BENEFITS
- Maximizes customer experience in both indoor & outdoor connectivity
- High QoS broadband even in challenging network conditions

Opportunity Areas
- Security
- Sustainability
- Mobility
- Capacity
- Coverage

Target Users
- Generic mobile users
- Network operators
- Event venue
- Olympic games
### TECHNOLOGY ENABLERS

<table>
<thead>
<tr>
<th>ENABLERS</th>
<th>5G radio access</th>
<th>5G core network</th>
<th>5G management &amp; orchestration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High-data rates, High volumes, High mobility, Spectrum efficiency, Maximize capacity</td>
<td>QoS support for e.g. emergency/safety related communication. Aggregated data rates are targeted. Roundtrip latency significantly reduced to be in the 1 ms range</td>
<td>Congestion handling per subscriber/service or based on usage. Dynamic allocation of resources according to traffic variation. Reduce load on transport links and central processing units.</td>
</tr>
</tbody>
</table>

**BROADBAND EXPERIENCE EVERYWHERE, ANYTIME**

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USE CASE 2

SMART VEHICLES, TRANSPORT AND INFRASTRUCTURE
SMART VEHICLES
TRANSPORT & INFRASTRUCTURE

BENEFITS
Focused on massive machine type communication.

Opportunity Areas
› Sustainability
› Security
› Mobility
› Deployment
› Scalability

Target Users
› Automotive
› Infrastructures
› Transport companies
› Administration/governments

SUB-USE CASES
Smart infrastructures
Connected bus-stops
Connected trucks
Connected cars

We can consider sensors embedded in roads, railways and airfields to communicate each other and/or with smart vehicles.
## TECHNOLOGY ENABLERS

<table>
<thead>
<tr>
<th>ENABLERS</th>
<th>Description</th>
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</table>
| **5G radio access** | Massive density  
Device energy consumption  
Device cost  
Significantly reduced signalling overhead compared to today.  
Soft-SIM or no-SIM operation for (at least) sensor type devices. |
| **5G core network** | Integrate public infrastructure network within network slices  
Support for pub/sub message oriented communication. |
| **5G management & orchestration** | Orchestration of a big amount of data and input interfaces.  
Common view for all the utility/infrastructures suppliers.  
Define different user profiles to access the same network. |

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**SMART VEHICLES**  
**TRANSPORT & INFRASTRUCTURE**
USE CASE 3

MEDIA EVERYWHERE
**Media Everywhere**

**SUB-USE CASES**
- Live TV at scale
- On-demand anything
- Mobile for In-home TV
- Accelerating emerging markets

**BENEFITS**
- **Ultimate** video quality anywhere – 4K, 8K, HDR, HFR
- Enables industry **transformation** to all IP
- Meeting **consumer demands** for TV on their terms

**Opportunity Areas**
- Broadcast/Multicast
- Shift to all media consumption on consumers terms
- 5G for TV for in-home screens and devices
- Enabling media vision for ‘mobile first’ markets

**Target Users**
- Consumers
- Pay TV Operators
- Broadcasters
- New content owners and aggregators
- OTT providers
TECHNOLOGY ENABLERS

5G Radio
- Improved beam forming
- Massive MIMO
- Carrier aggregation
- New high frequency spectrum

Service agility
- Cloud based flexible deployment of media services
- Hybrid

5G management & orchestration
- Flexible and dynamic deployment of media services
- Network slices all optimized media delivery and managed services enabling enhanced business models, performance, and consumer experiences

MEDIA EVERYWHERE
USE CASE 4

CRITICAL CONTROL OF REMOTE DEVICES
CRITICAL CONTROL OF REMOTE DEVICES

SUB-USE CASES
- Remote control of heavy machineries
- Factory automation
- Real-time monitoring of plant / process conditions
- Smart grids
- Remote surgery

BENEFITS
- Controlling heavy machinery remotely to lower risks in hazardous environments
- Increase efficiency and reduce costs. Replace communication bus with wireless links

Opportunity Areas
- Safety
- Sustainability
- Mobility
- Data
- Legal

Target Users
- Manufacturing
- Mines
- Healthcare
## TECHNOLOGY ENABLERS

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<tr>
<td><strong>5G radio access</strong></td>
<td>Enhanced radio connections for accessibility and retainability. Estimate and report about achieved reliability of a connection. High node/service availability at least 99.999% node availability. Uplink for high quality video.</td>
</tr>
<tr>
<td><strong>5G core network</strong></td>
<td>QoS functions to “guarantee” deadlines match. 99.9% accessibility and retainability for comm. services.</td>
</tr>
<tr>
<td><strong>5G management &amp; orchestration</strong></td>
<td>Improve response time for diagnostic questions. Meet real-time constraints. Estimate and report about achieved reliability of a connection. The system shall be able to estimate and report about the achieved reliability of a connection (per user, per service).</td>
</tr>
</tbody>
</table>
USE CASE 5
INTERACTION HUMAN - IOT
**Interaction**

**Human - IOT**

**BENEFITS**

- Fills a gap between humans and IoT.
- Context awareness is the main difference from M2M.

**SUB-USE CASES**

- Immersive augmented reality
- Immersive gaming
- Surveillance
- Tactile internet
- Smart biker-helmets
- Child monitoring
- Smart houses
- Smart shipping/post

**Opportunity Areas**

- Non Intrusiveness
- Privacy
- Real-time
- Sustainability
- Mobility

**Target Users**

- Public safety
- Fitness
- Health care
- Family life, everyday life
5G radio access

Many of the things are already provided by LTE. This is the LTE evolution effect and 5G will improve performance and make things more flexible.

5G core network

Integrate environment network within network slices
Support for pub/sub message oriented communication.

5G management & orchestration

Achieve a data management system that can address device heterogeneity. Support for different departments/users.
5G RADIO TEST BED

ERICSSON HITS 5GBPS IN 5G TRIAL

UN 02 JULY 2014.

Ericsson has demonstrated download speeds of 5GBps on the 15GHz band, as it becomes the latest vendor to test 5G technology.

The Sweden-based company said it used a new radio interface and advanced Multiple-Input Multiple-Output (MIMO) technology as part of the trial, which was witnessed by executives from NTT DOCOMO and SK Telecom.

Ericsson is developing new technology for 5G, including new antenna types with wider bandwidths, higher frequencies and shorter transmission times. It is also building new radio base stations with bespoke baseband and radio units.

Other priorities for 5G were placing small cells within hetnets, examining new frequency bands and coming up with new ways of delivering high speed, high capacity backhaul, according to the
5G RADIO TEST BED PHASES

**Phase 1**
2014-2015
- 400 MHz BW
- 15 GHz band
- 5+ Gbps peak rate
- Flexible duplex
- 4 stream MIMO
- Multi-site deployments
- Distributed MIMO

**Phase 2**
2015-2016
- Next generation test bed hardware
- Implementation and testing of multiple 5G technology components

**Phase 3**
2017+
- Complete trial network
- Form factor for pre-commercial trials
Ericsson Research demonstrated remote control of real life, full size Excavators at MWC2015. See the video:

Ericsson Research demonstrated how 5G mobile cloud robotics will revolutionize industry at CTIA 2015.

See the video:

http://www.ericsson.com/news/150910-how-5g-mobile-cloud-robotics-will-revolutionize-industry_244069645_c
“5G FOR SWEDEN” - PROGRAM

**PURPOSE OF PROGRAM**
- Strengthen competiveness of Swedish industry
- Apply ICT in Industrial processes, products & services
- Leverage current and 5G mobile networks

**PROGRAM FOCUS**
- Industry pilots
- Innovation projects
- Establish research community in ICT

**EXAMPLE OF OUTCOME**
- Enabling remote control of equipment in hazardous environments
- Provide ultra reliable and low latency for remote control center and process automation

**PARTNERS**
- SAAB
- Scania
- Volvo
- TeliaSonera
- Vinnova
- RISE
- SICS
- KTH
- LiTH
- LTH
- Chalmers
DRIVING THE 5G EVOLUTION

World leading research together with industry and academia

Global efforts for a global standard 2020

Technology Leadership in all 5G domains

Track record in digitalization of industries

We will make it work. As always.
To know more about our 5G visit http://www.ericsson.com/spotlight/5G