INTERNET OF THINGS: CHALLENGES AND OPPORTUNITIES

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THE NETWORKED SOCIETY IS MOVING TOWARDS ITS NEXT STAGE - IOT

Internet for humans, i.e. websites, e-mail, messaging, blogs etc.

Internet of Things – Devices and applications communicating and sharing information
IOT ENHANCES ALL ASPECTS OF SOCIETY

Smart infrastructure
- Smart grids
- Smart roads
- Smart water distribution

Efficient transport
- Connected busses
- Connected cars
- Connected emergency services

24/7/365 monitoring
- Air quality measurement
- Vibration and structural integrity monitoring
- Precipitation tracking

Connected manufacturing
- Proactive maintenance
- Flow optimization
- Remote operation

Healthier nations
- Improved diagnostics
- Improved homecare
- Accelerated recovery

Home automation
- Smart security
- Remote climate control
- Utilities consumption optimization
IoT creates value in four key areas:

- **Operational efficiency**: will increase by automating manual processes.
- **New business models**: will emerge when turning from a product to a service company.
- **Consumer experiences**: IoT will enable new ways to reach end customers. Consumers will benefit from new service experiences.
- **Sustainability**: A smarter, more connected world, will allow for sustainable business practices, leading to a better world.
Connected Devices in 2021

- **28 Billion**
- **8.7 Billion** Mobile Phones
- **4.2 Billion** PC/Tablet/Laptop/Fixed Phones
- **15.3 Billion** M2M/IoT Devices

**Machine to Machine**

A device... that captures an event... transmits it over a network... to an application... that translate it into meaningful information

**Internet of Things**

Bringing together the people, process, data & things to make networked connections more relevant turning information to actions

*Source: Ericsson Mobility Report November 2015*
IOT – TRANSFORMING INDUSTRIES AND SOCIETIES

15 BILLION

IOT CONNECTED DEVICES IN 2021

CONNECTIVITY
NEW DEMANDS FROM IOT

Consumer IoT devices (Cellular and non-Cellular)

Industries IoT devices (Cellular and non-Cellular)
KEY IOT REQUIREMENTS

- MASSIVE NUMBER OF CONNECTIONS
- DIVERSE USE CASE REQUIREMENTS
- COST, BATTERY LIFE AND COVERAGE

KEY IO T REQUIREMENTS
### Technology Landscape 3GPP Release 13

#### Coverage
- **EC-GSM**
  - Further optimization of GPRS devices
  - Lower Memory, etc
- **LTE M**
  - Evolution Beyond Cat 1/0
- **LTE LITE**
  - Evolution Beyond Cat M
- **NB-IoT**
  - Low

#### Battery
- **Low

#### Device Complexity
- **EC-GSM**
  - RBS 2000/6000 MM Mode
- **LTE M**
  - RBS 6000 MM Mode
- **LTE LITE**
  - RBS 6000 MM Mode
- **NB-IoT**
  - New Rollout

#### No Hardware or Co-ex
- **EC-GSM**
  - GSM
  - WCDMA
  - LTE
- **LTE M**
  - RBS 6000 MM Mode
- **LTE LITE**
  - RBS 6000 MM Mode
- **NB-IoT**
  - Standalone

#### Support
- **EC-GSM**
  - Multiplexed with GSM Traffic
  - High Capacity
- **LTE M**
  - Multiplexed High Capacity
- **LTE LITE**
  - Standalone High Capacity
- **NB-IoT**
  - High Capacity

#### Enhance Security
- **EC-GSM**
  - Integrity protection
- **LTE M**
  - Optimized for IOT traffic profiles
- **LTE LITE**
  - Optimizations Pending

#### Select Core Network Interface
- **LTE M**
  - S1
  - 1.4MHz
- **LTE LITE**
  - S1
  - In-Band & Standalone
- **NB-IoT**
  - UnDecided

#### Spectrum
- **EC-GSM**
  - System: <1MHz
  - Channel: 200KHz
- **LTE M**
  - System: 1.8MHz
- **LTE LITE**
  - System: 200KHz
- **NB-IoT**
  - System: 200KHz
  - Standalone

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**NB-IoT**
- New Rollout
- High Capacity
- Ongoing Leverage GSM work
- UnDecided
- 200KHz Standalone

**LTE LITE**
- High Capacity
- Standalone
- Ongoing Leverage GSM work
- UnDecided
- 200KHz Standalone

**LTE M**
- High Capacity
- Multiplexed High Capacity
- 1.4MHz

**EC-GSM**
- High Capacity
- Integrity protection
- Multiplexed with GSM Traffic
- 200KHz Devices/Cell

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**NB-IoT**
- Low
- Standalone
- New Rollout
- High Capacity
- Ongoing Leverage GSM work
- UnDecided
- 200KHz Standalone

**LTE LITE**
- High Capacity
- Standalone
- Ongoing Leverage GSM work
- UnDecided
- 200KHz Standalone

**LTE M**
- High Capacity
- Multiplexed High Capacity
- 1.4MHz

**EC-GSM**
- High Capacity
- Integrity protection
- Multiplexed with GSM Traffic
- 50K Devices/Cell

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**EC-GSM**
- Further optimization of GPRS devices
- Lower Memory, etc

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**LTE M**
- Evolution Beyond Cat 1/0

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**LTE LITE**
- Evolution Beyond Cat M

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**NB-IoT**
- Low
- Standalone
- New Rollout

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**LTE M**
- Evolution Beyond Cat 1/0

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**LTE LITE**
- Evolution Beyond Cat M

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**NB-IoT**
- Low
- Standalone
- New Rollout
3GPP COVERS ALL THE NEEDS

- **$40** Multimode cat 4
- **$20-$30** cat 4
- **$15** cat 1
- **$10-$15** cat 0
- **$5** cat 1
- **$5** cat 0
- **$5** cat M
- **$5-$10** cat M
- **< $5** cat NB-IoT

**LTE**
**GSM**
**LPWAN**

- Reduced Device Cost
- Improved Coverage
- Improved Battery Life

Significantly reduced device complexity, functionality and capability, thus cost.
USE CASE DIVERSITY

TRANSPORT & LOGISTICS
- Fleet Management
- Goods tracking

AGRICULTURE
- Climate-Agriculture monitoring
- Live stock tracking

ENVIRONMENT
- Flood monitoring & alert
- Environmental monitoring (Water, air, noise, etc)

INDUSTRIAL
- Process monitoring & Control
- Maintenance monitoring

UTILITIES
- Smart metering
- Smart grid management

SMART CITIES
- Smart parking
- Smart bicycles
- Waste management
- City lighting

SMART BUILDINGS
- Smoke detectors
- Alarm systems
- Home automation

CONSUMERS
- Wearables
- Kids/Elderly tracker
- Medical monitoring

MASSIVE IOT

COST
PERFORMANCE
BATTERY LIFE
COVERAGE
BI-DIRECTIONAL DATA
SECURITY
RELIABILITY & QoS

TRANSPORT & LOGISTICS: Goods tracking
SMART CITIES: Smart bicycles
INDUSTRIAL: Process monitoring & Control
SMART BUILDINGS: Home automation
CELLULAR LPWA SERVES MUCH MORE

MODULE COST/PERFORMANCE

- LTE-M CAT1 (PSM + eDRX)
  - INDUSTRIAL PROCESS MONITORING & CONTROL
  - VOICE SERVICES CONNECTED ELEVATORS

- EC-GSM (EC + PSM + eDRX)
  - SMART GRID
  - WEARABLES, KIDS/PET TRACKING
  - VEHICLE TRACKING

- NB-IOT (EC + PSM + eDRX)
  - SMART CITY, SMART BUILDING
  - SMART METERING
  - ASSET TRACKING

- Unlicensed LPWA
  - SMART AGRICULTURE, ENVIRONMENT
  - SMART GRID
  - SMART CITY, SMART BUILDING
  - SMART METERING
  - ASSET TRACKING

- COVERAGE / BATTERY
  - 10 km
  - 10+ years

- COVERAGES
  - <$5
  - <$10
  - 1 Mbps
  - 10 Mbps

- USE CASE DIVERSITY
  - SMART CITY
  - SMART BUILDING
  - SMART METERING
  - SMART AGRICULTURE, ENVIRONMENT
  - SMART GRID
  - SMART CITY, SMART BUILDING
  - SMART METERING
  - ASSET TRACKING

Diversifying IoT Launch Presentation | Commercial in confidence | © Ericsson AB 2015 | 2015-12-18 | Page 8
OPERATOR TRANSFORMATION STARTS NOW

Most Telcos are still here

M2M
CONNECTED

COOPERATING

AUTOMATED

IoT

Means new:
Eco-
systems
Business
Models
Business
Processes

When Mass IoT becomes reality

Where are you today?

Most Telcos are still here

Operator transformation starts now

When Mass IoT becomes reality

Means new:
Eco-
systems
Business
Models
Business
Processes

Where are you today?
WHERE IS THE MONEY FOR TELCOS?

Vertical Applications & Services
- Limited Data plans
- Wholesale Provider

Service Enablement
- Flexible Pricing, SLA, Self-service
- Connectivity Provider
- Telco Reseller

Connectivity
- Joint Go-to-market
- Powered By Telco
- Vertical Service Provider

Application Service Providers
- 6-9%
- 9-12%
- 10-20%
- 60-65%
- 100%
- Direct Go-to-market

White Labeling Technology
- To service Providers

Application Service Providers
- Share of overall revenue
- 6-9%
- 9-12%
- 10-20%
- 60-65%
- 100%

Flexible Pricing, SLA, Self-service
- Limited Data plans
- Wholesale Provider

Connectivity Provider
- Flexible Pricing, SLA, Self-service
- Connectivity Provider

Telco Reseller
- Joint Go-to-market
- Powered By Telco

Powered By Telco
- Vertical Service Provider
IOT VALUE CHAIN

Chipset
- Qualcomm
- Sequans
- Intel
- Samsung

Embedded Cellular Module
- Sierra Wireless
- Telit
- Gemalto

Device Makers
- Bosch
- Continental
- Digita

Connectivity Management Platform
- Activation of devices
- Monitoring of usage
- Subscription management
- Billing of connectivity

Network Connectivity
- MNO’s core value proposition
- MVNO:s
- Aggregators

Application Enablement Platform
- Application development platform
- Utilize data from device

Application Services
- System Integration
- Hosting
- Development
- Industry Specific Solutions

Partnerships
- Device Connectivity Platform
- 3GPP connectivity
- Core networks
- OSS/BSS

- Service Delivery Platform
- System integration services
CHALLENGES IN IOT

- Security
- Data Quality
- Interoperability
- Open Data
- Connectivity
- Privacy
- Information Management
Main regulatory issues

- Regulatory framework
- Scarce resources (spectrum & numbers)
- Competition issues: vertical integration & lock-in
- International roaming
- Applicability of consumer protection tools (portability)
- Privacy & security of the networks