MASSIVE IoT

Cellular networks already today provide the foundation for a very wide range of Internet of Things applications and machine-to-machine services. They cover 90 percent of the world's population today with over 230 million cellular M2M subscriptions.

The number of connected devices is growing but there are a number of factors that will influence mass market adoption of IoT on cellular. The three key challenges are: the cost of devices, device battery life and deep indoor coverage to reach down into basements for instance. Other factors such as quality of service and security are already strengths of cellular as I talked about in previous slide.

Cost is clearly a key enabler for large volume, mass market applications: cellular has to compete with other long range technologies where the cost of the devices can be below $5. The currently cost of a 2G device - of the order of about $4 to $10 - is competitive enough for a good range of applications, but the current cost of about up to $40 for LTE modules is too high for low margin, high volume needs.

Then - battery life is really important. A lot of IoT devices are battery powered – and in a lot of cases the cost of going out into the field to replace batteries just isn't viable. So long battery life is a key enabler and what's typically being asked for is battery durations of 10 years or more.

Lastly if we look at coverage. Coverage is especially important for indoor applications, to reach into places like basements, where lots of IoT devices (like smart meters) will end up being installed., as well as to reach remote outdoor locations for applications like agricultural monitoring.

5G PLUG-INS

To facilitate a rapid evolution of 5G access networks and the successful adoption of 5G services we have announced 5G Plug-Ins - software-driven innovations that bring essential 5G technology concepts to today's cellular networks.

The development of 5G is a perfect example of how development is now driven by new potential applications.

We are working with partners in many different industries, as well as universities and research centers, on use cases for 5G technology. This ensures that

we are developing the right technology for real-world applications and gives us the experience to help our customers understand how to accelerate innovation.

5G use cases will include faster and more robust high speed mobile broadband and video everywhere, a proliferation of connected sensors to support the IoT and everything from driverless buses to remote surgery to immersive augmented reality.

To enable this 5G future, mobile operators need to start evolving their networks to support new 5G technology concepts, while also investing in their LTE networks. LTE is expected to reach 4.3 billion subscriptions by 2021 and it will play a strong role in tomorrow's 5G networks. Ericsson will continue to innovate in LTE to improve network performance and efficiency with award-winning solutions like Gigabit LTE and Ericsson Lean Carrier.

At the same time, we're also making it easier for operators to evolve their networks for a 5G future with Ericsson 5G Plug-Ins. These are software-driven innovations that bring key 5G technology concepts to today's mobile networks. 5G Plug-Ins are based on many of the breakthrough capabilities developed in our award-winning 5G Radio Test Bed and 5G Radio Prototypes, already deployed in operator field trials.

The first series of 5G Plug-Ins include:

• **Massive MIMO Plug-In:** Improving both the user experience as well as the capacity and coverage of the mobile network, Massive MIMO combines MIMO with beamforming on advanced antennas.

• **Multi-User MIMO Plug-In:** Multi-User or MU-MIMO provides a better user experience, enhances network capacity and coverage, and reduces interference. MU-MIMO increases capacity by transmitting data to multiple user devices simultaneously using the same time and frequency resources with coordinated beamforming.

• **RAN Virtualization Plug-In:** RAN Virtualization improves network efficiency and performance by enabling Virtual Network Functions (VNF) to be centralized on a common platform supporting both 4G and 5G.

• **Intelligent Connectivity Plug-In:** Intelligent Connectivity increases the combined data throughput of 4G and 5G resources by enabling the network to robustly anchor and intelligently route data based on application requirements and network resource availability.

• **Latency Reduction Plug-In:** Latency reduction reduces time to content while enabling real-time communications for key 5G applications such as smart vehicles. By shortening access procedures and modifying the frame structure,

Latency Reduction enables instant network access and more frequent transmissions.

Forty percent of the world's mobile traffic is carried over Ericsson networks and we enable these networks to flexibly evolve based on user demand, new applications, and local market requirements. With 5G Plug-Ins, mobile operators can begin to trial and implement 5G technology as early as this year, and evolve to 5G at their own pace.

Ericsson 5G Plug-Ins are available for operator trials starting in 2016 and will be available for commercial networks starting in 2017.