5G vision and roadmap to key standards

Telefónica viewpoint

Brussels, April 20th, 2016

01 Our main objectives for 5G

Main Telefónica's expectations for 5G

1. **Better way of supporting current mobile services** (lower cost, improved performance, improved experience continuity,…)
2. **Support of new services** that cannot be provided with 4G technologies (ultra low latency, massive Internet of Things (IoT) services, ultra high reliability services,…)
3. **Capacity to personalize services for specific applications** (vertical industrial applications, safety,…)

What are the main standardization and regulatory decisions that need to be taken to make this feasible?

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Is lack of capacity a driver for 5G?

Not yet

- We are continuously monitoring the evolution of the traffic demand and trying to assess **when and where we may reach the capacity limit of LTE**, considering two options:
  - Firstly, if we **do nothing** (keeping the same number of sites and sectors, with the current configuration)
  - Secondly, if we **implement preventive actions** (acquisition of new spectrum, higher level of sectorization, deployment of small cell layer, introduction of new features to enhance LTE spectral efficiency,…)
- So far, we **do not consider that lack of capacity is one of the main drivers for pushing for an early introduction of 5G**
  - 60-80% of the sites can survive to the most optimistic growth scenarios
  - Less than 2-4% of the sites may not be able to cope with the demand growth during the busy hour even if standard corrective actions are undertaken, but can be addressed with **ad-hoc solutions**
- However, there are many factors that may **change the current perspective** (traffic growth in the uplink due to applications like Periscope, higher video consumption,…)

02 › What we need to do (soon)

Short term actions for Telefónica

Getting 5G right

- **Liaising with vertical industries, governments and other stakeholder groups** in order to identify and develop mutually beneficial business cases that may require or benefit from the deployment of 5G networks.
- **Getting the requirements for different 5G use cases right**, so they really reflect the performance and functionalities required for the potential users of the services.
- **Cooperating with other operators and vendors in order to avoid fragmentation** in the standardization process.
- **Ensuring the support of network slicing**, so the network can be customized for the support of specific applications in selected geographical areas.
- **Identifying those 5G technological components** that may help to bring **economic efficiencies** to mobile networks (beyond the expected technical enhancements).

European projects are one of the main instruments we have to progress in these areas

Fostering an open innovation ecosystem is another one (e.g., 5TONIC)

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Our position in standardization

5G Standardization

- Standardization efforts for 5G are already underway within the **ITU-R**, where a timeline and process for IMT-2020 has been established.
- **3GPP** has recently launched the standardization efforts for 5G and is considered to be one of the **primary standard bodies** to submit candidate technology for IMT-2020 consideration.
- But there are players (like Verizon and some Asian operators) that **plan to commercialize 5G services** even before the technology is standardized

Is 3GPP being too slow (or to fast) in its plans to standardize 5G? Can we expect other 5G proposals that may be competitive with the one from 3GPP?

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New 5G Radio Interface - NR

- Most of the proposed modifications are defined towards achieving **three main objectives**:
  - Increase the **spectral efficiency**, mainly by relaxing orthogonality requirements
  - Allow for the **support of billions of MTC devices** accessing the network
  - **Reducing the latency** in order to support the requirements of the ultra reliable communications use case
- There are features that may be **incorporated to LTE** to support some of these objectives, e.g., a shorter TTI
- It is not clear to us whether a **unified air interface** for all frequency bands is a good option (but we hope so)
- So far we have not seen any proposal that we may consider **differential or a major leap forward**

Use of high frequency bands

- The use of high frequency bands represents a huge opportunity but also a **significant technical challenge**
- At this point in time, we are not sure that there is a solution that is **ready to become commercial** in the medium term
  - High frequency bands require **beamforming** to overcome larger path loss
  - But analogue and hybrid beamforming solutions may be **suboptimal**
- On the other hand, the potential **combination of self-back/fronthauling and the access using same RAT** may help to have a low cost solution for the required densification of the network
- Clarification in terms of the **spectrum to be used** is a major requirement

5G Network Architecture

Risk of missing an opportunity

- Main objectives in the definition of the new architecture are:
  - Support of the **requirements** (functional, performance, scalability,…) coming from the different 5G use cases foreseen
  - Support of **network slicing** as a way of introducing and supporting new services
- It seems clear that 5G will incorporate **NFV, SDN and MEC new architectural frameworks** in order to achieve this objectives
- We would consider a **missing opportunity** if 5G network architecture becomes just a **virtualized LTE EPC**
  - E.g., is the way that mobility is supported the optimal one, considering the new features 5G is expected to support, like massive MIMO? Or is the network architecture the optimal one for the support of V2V communications?

Spectrum for 5G

Adequate regulation is mandatory to foster investment

- We need to identify the **suitable high frequency spectrum** for 5G in the ITU Radio Regulations
  - It is necessary to ensure that the candidate bands that have been proposed for discussion at WRC-19 will be sufficient to meet the broad range of **requirements of the various 5G use cases** and deployment scenarios
  - Having access to the amount of spectrum that may allow to support some of 5G use cases will require to look for it in **high frequency bands (30-100 GHz)**
- We need to define the **mechanisms to co-exist** with other users of some of the candidate bands, like satellites, fixed links, PMSE, license exempt devices or Radio Astronomy

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Conclusions

Main conclusions

- **We need to get the 5G requirements right.** There is a risk that 5G specifications end up with features that no one will use or that will not pay for themselves.
- **So far, we have not identified a new radio technology that may constitute a major leap forward in terms of spectral efficiency.** There, however, significant improvements in terms of addressing some of the weak points that actual technologies present.
- ***Sofwarization* of the network represents a huge opportunity that we may partially miss if we rush to having standards ready very soon.**

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