Orchestrating a brighter world NEC

5G RAN Architecture & Radio Technologies, Time Plan

3GPP RAN workshop on 5G **RWS-150018**

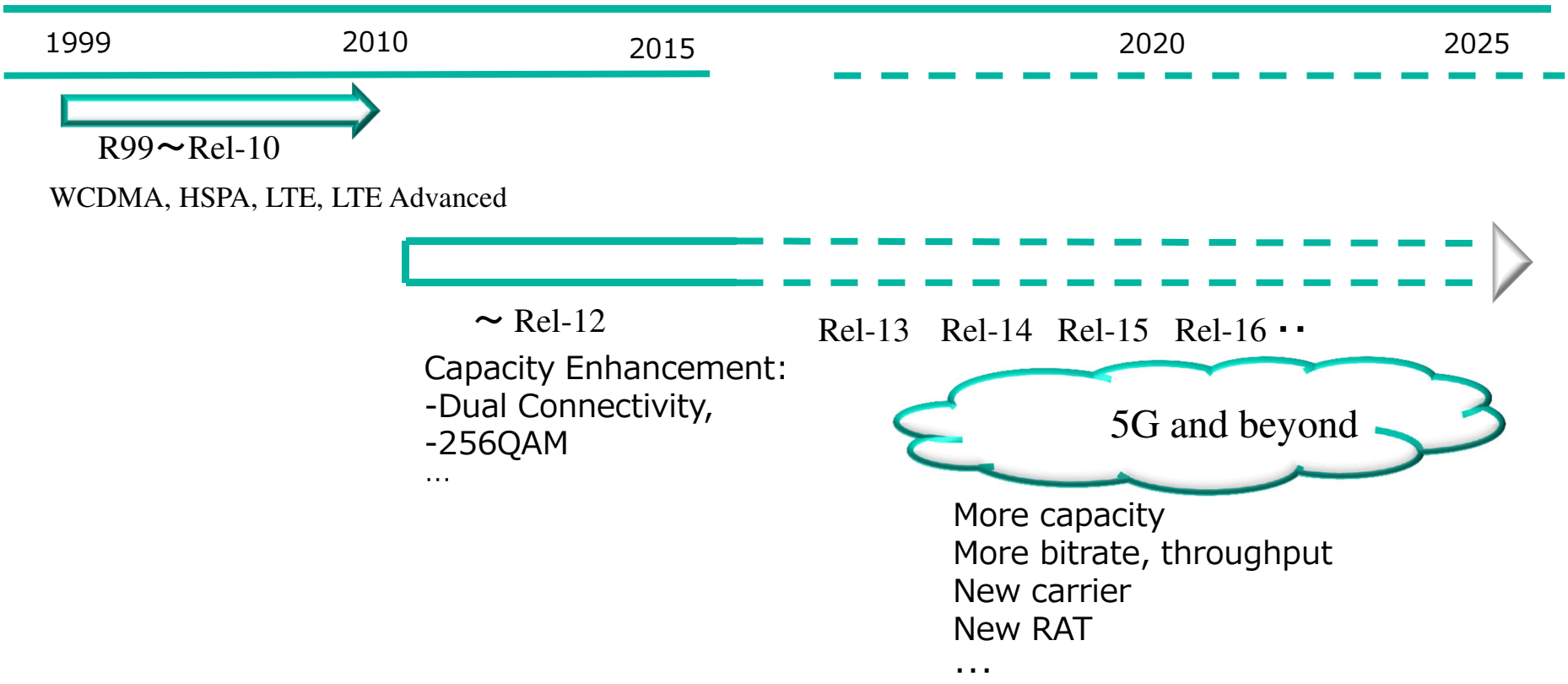
Phoenix, USA, Sep. 17 - 18, 2015

NEC

Content

- Use cases and Requirements
- RAN Architecture
- Release Schedule
- Technologies, Functions, Features

3GPP



5G Use cases and Requirements

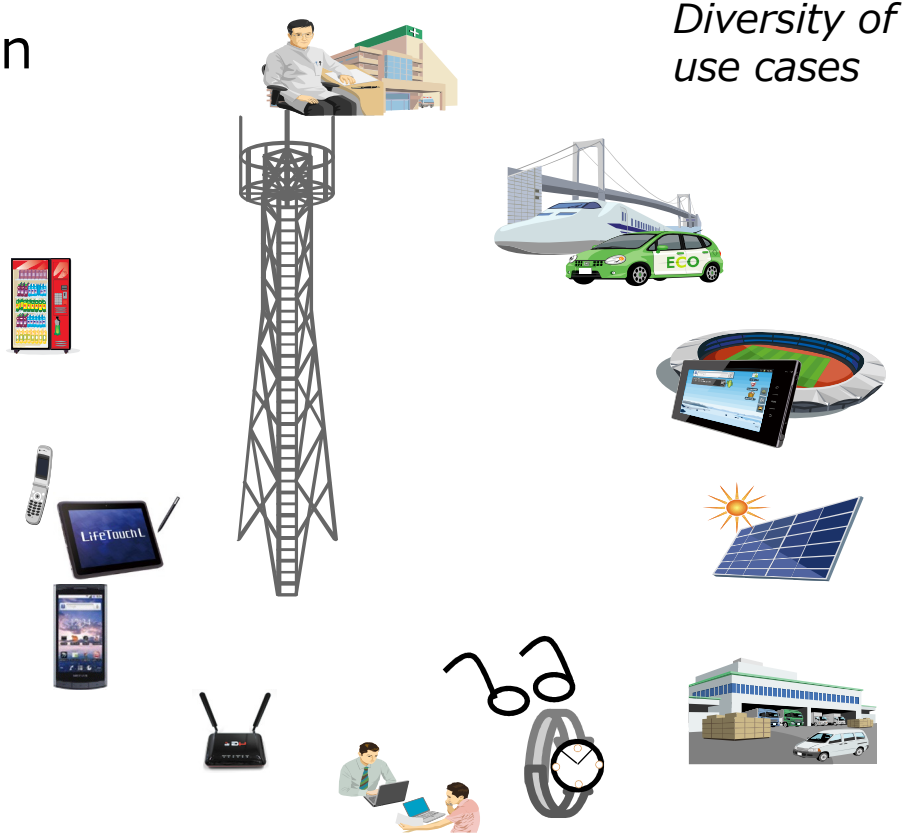
Use Cases : Social Value Creation

- Mission Critical
  - Public Safety, Medical care, Vehicle
- Mobile Broadband
  - Entertainment
- Massive number of devices (IoT)
  - Logistics
- ・ ・ ・ ・

More capacity, More user bitrate (1Gbps),
More energy efficiency,
Lower latency.

Flexibility :
-Resource dimension usage
-Site Deployment

Diversity of use cases

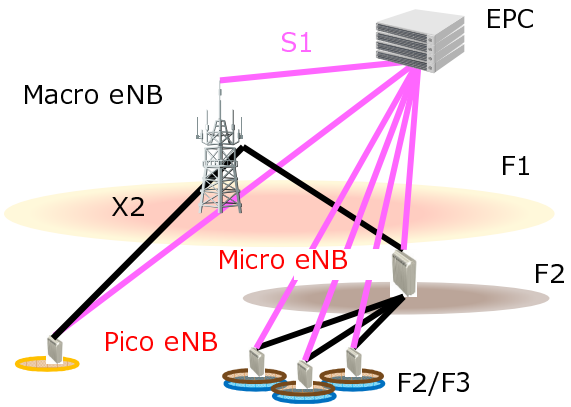


RAN Architecture

RAN Architecture

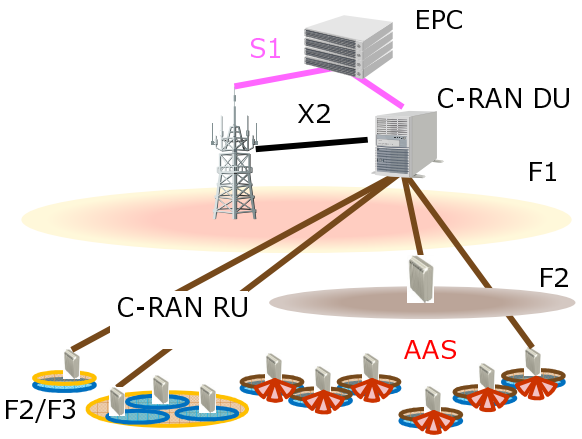
～ Rel-13

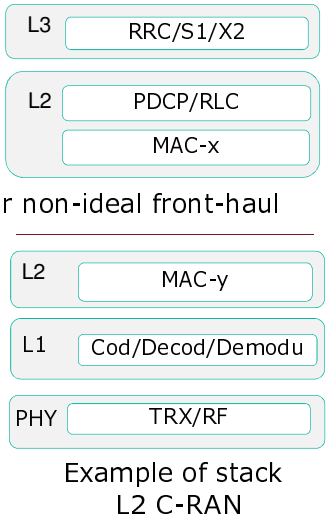
Adaptive to dense traffic



～ Rel-15 and beyond

Adaptation to the diversity usage





Example of stack
L2 C-RAN

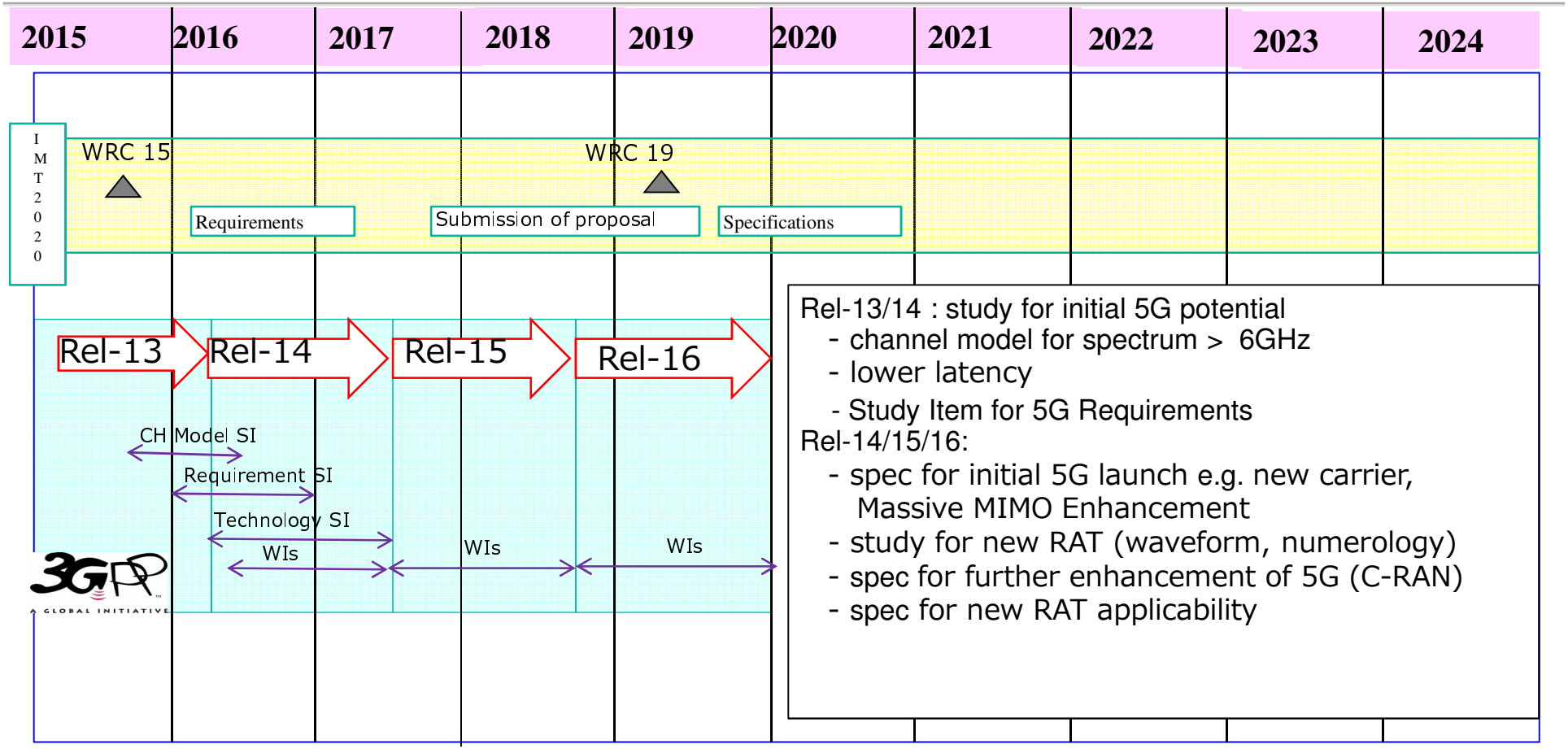
High density of eNB

- HetNet, Interference Coordination
- Dual Connectivity

Flexibility and Cell Virtualization

- New Carrier
- Low Latency access
- Massive MIMO
- New Waveform

Possible time line for 5G

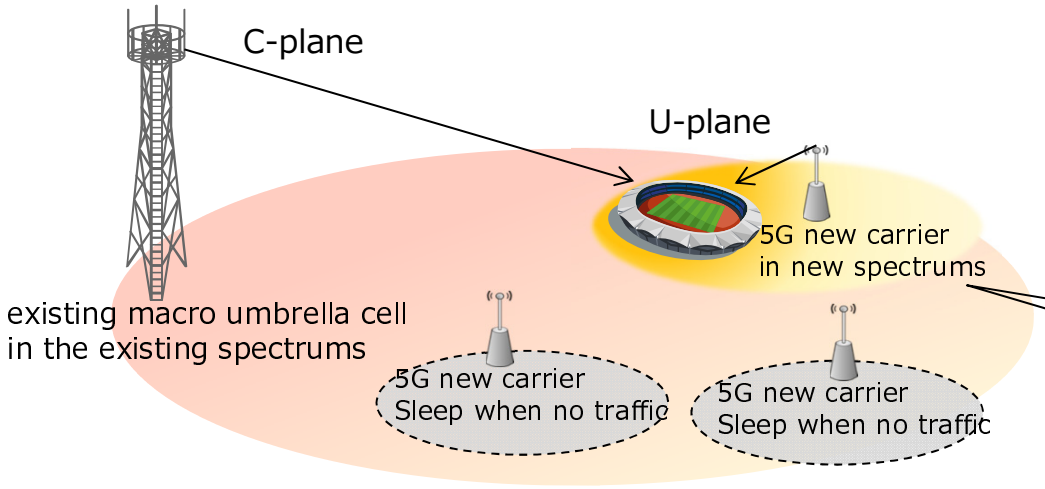


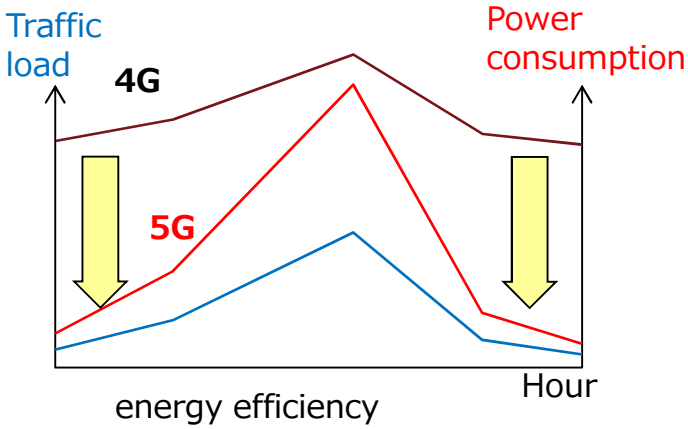
Technologies, Functions, Features

New Carrier

New carrier:

- For capacity boosting, for efficient use of radio resource in dense HetNet deployment
- For high energy efficiency, “send only when needed”
- For less overheads





- Macro-assisted access
- Minimize cell-specific signals/channels
- Transmits user data only

5G will be applied to leverage 4G investment

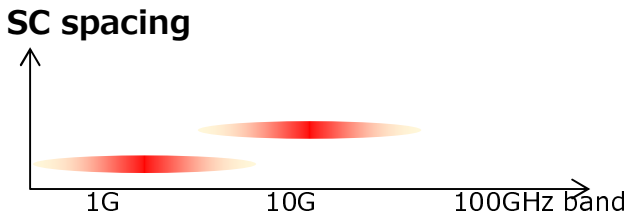
Waveform / Numerology

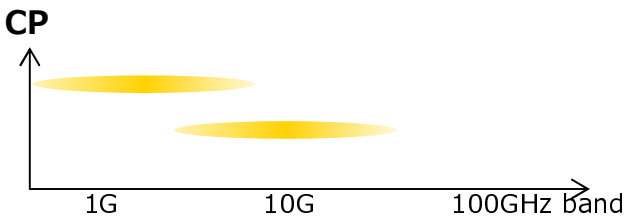
New Waveform:

- OFDM
  - For high spectral efficiency
  - For high commonality with LTE & high compatibility with MIMO

Numerology tuning :

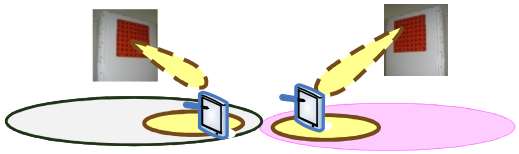
- For supporting a wide range of spectrums
  - Subcarrier-spacing should be tuned to combat Doppler shift and phase noise
  - Cyclic prefix should be tuned to keep high spectral efficiency
  - Optimizing DMRS Structure
- For scalable system bandwidth



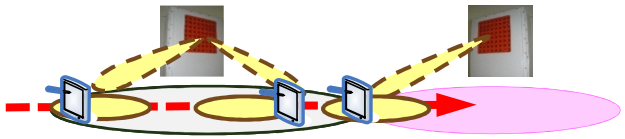


Enhancement of Massive MIMO

- Massive MIMO:
  - (For spectrum efficiency) To enhance spectral efficiency via exploring degree of freedom in spatial domain
  - (For coverage extension) To extend cell coverage via beamforming gain
- For Example
  - Intra-eNB CoMP with Massive MIMO
  - Mobility control with 3D beamforming
  - Inter-eNB Coordination
    - Improved cell coverage flexibility with 3D beamforming



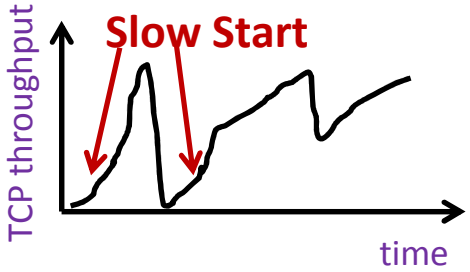
Inter-cell interference coordination, Intra eNB CoMP

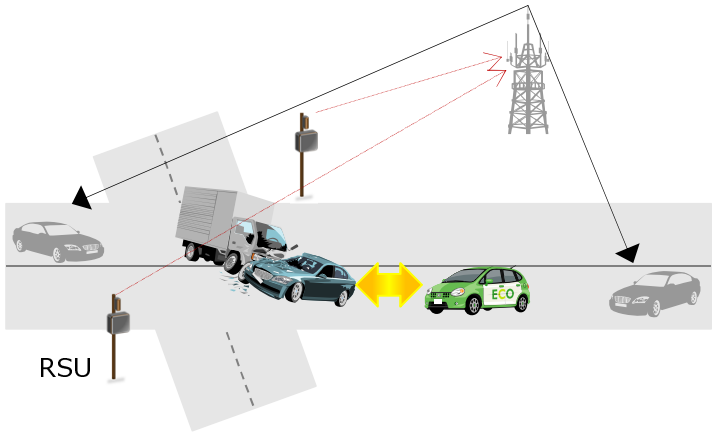


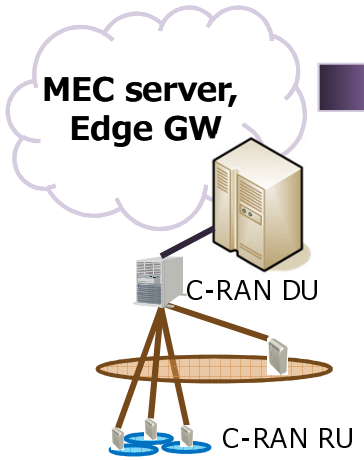
Mobility Control with beamforming, CoMP

Latency Reduction for Critical Services

- Fast UL access, TTI shortening
  - For latency reduction (1-5ms radio) to achieve better QoE in current services
  - Expected work in Rel-14
- Communication without going through the CN, e.g. V2X, MEC*1
  - For further latency reduction to enable NEW services (e.g. SMARTER in SA1)
    - Local and real-time communications need more intelligence at edge of mobile network







Enables future services

- *Virtual reality*
- *Remote health care, diagnosis*
- *Tactile internet*
- *…*

*1: Mobile Edge Computing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