Major drivers, requirements and technology proposals for LTE Rel-12 Onward

RWS-120019

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Outline

- 3GPP Release time frame
- Background & motivation
- Major Drivers, requirements and technology proposal
- Considerations on dense network deployments
- Mapping of activities to Rel-12 work and study items

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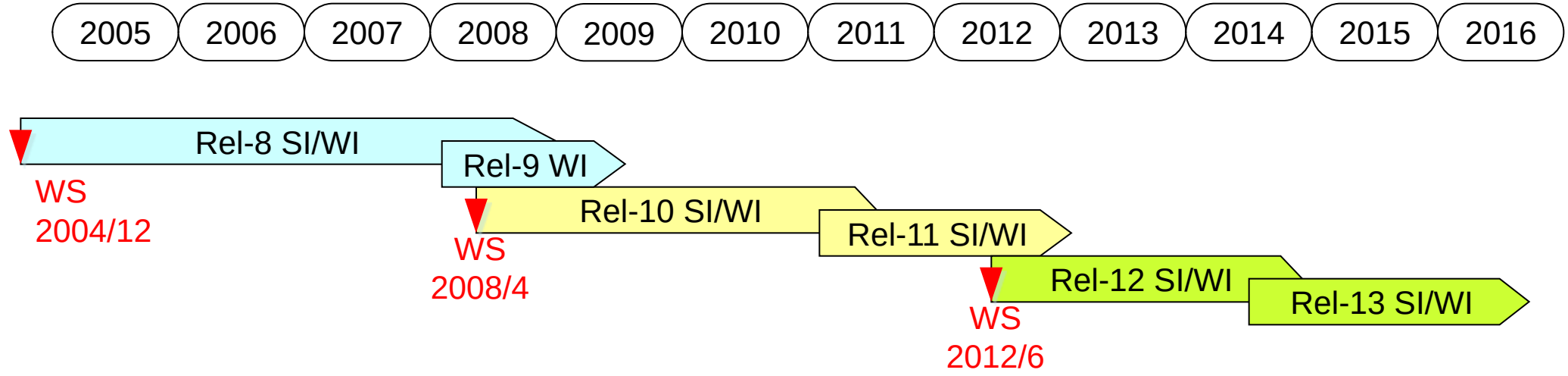
Release time frame

- We expect following time frame of the evolution of LTE



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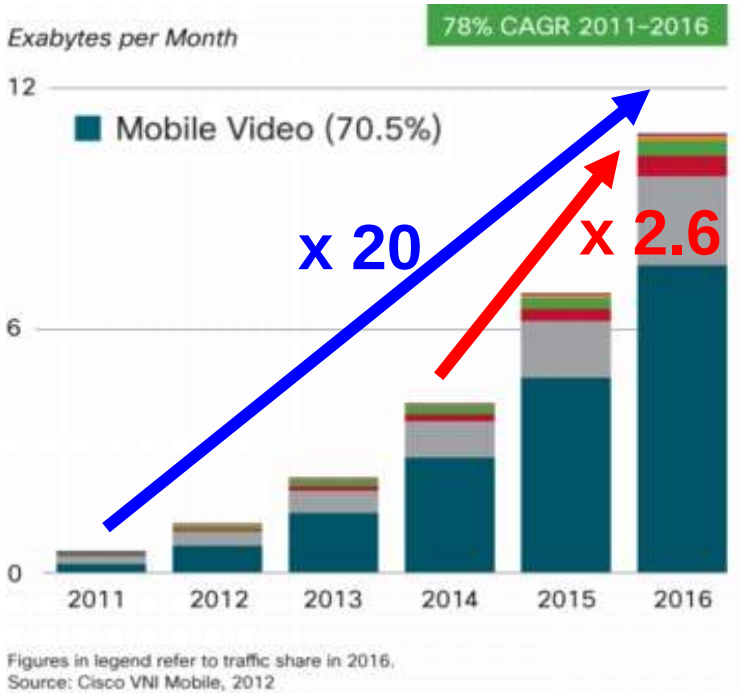
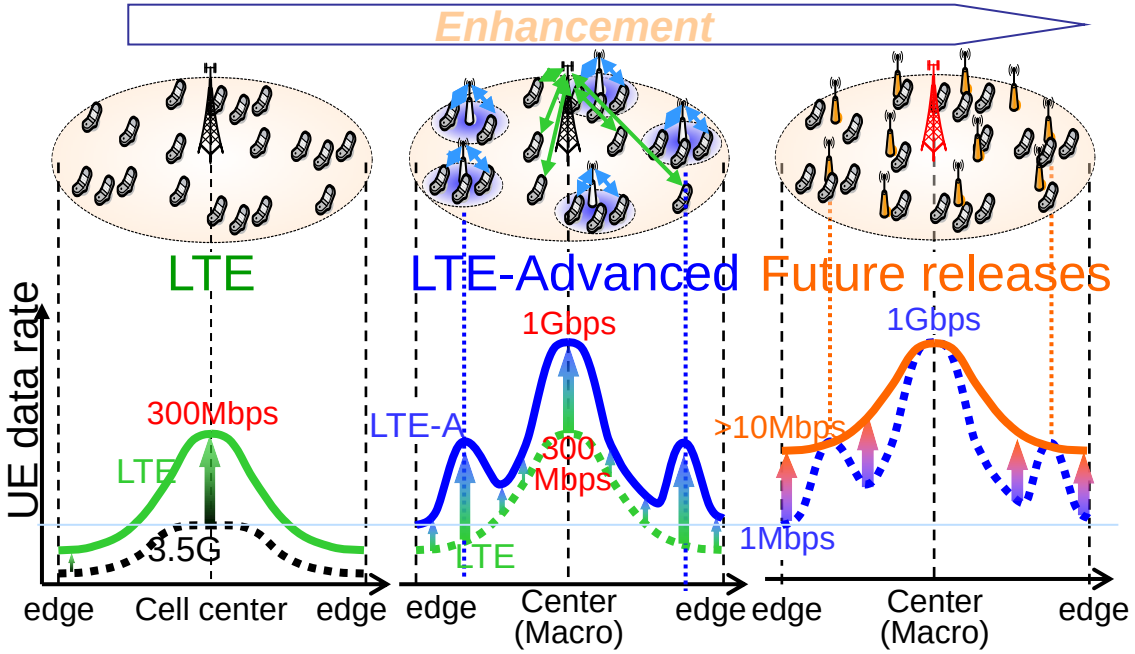
Background & motivation

- Smartphones, tablets will drive the mobile data traffic increase
  - By a factor of ~ 20 from 2011 until 2016, and more expected in 2020.
  - By a factor of ~ 2.6 from 2014 until 2016
- Increase of medium/high data rate coverage area
  - Achieving a universal user experience especially for (full) HD video requiring net data rates of ~ 1-3 Mbps





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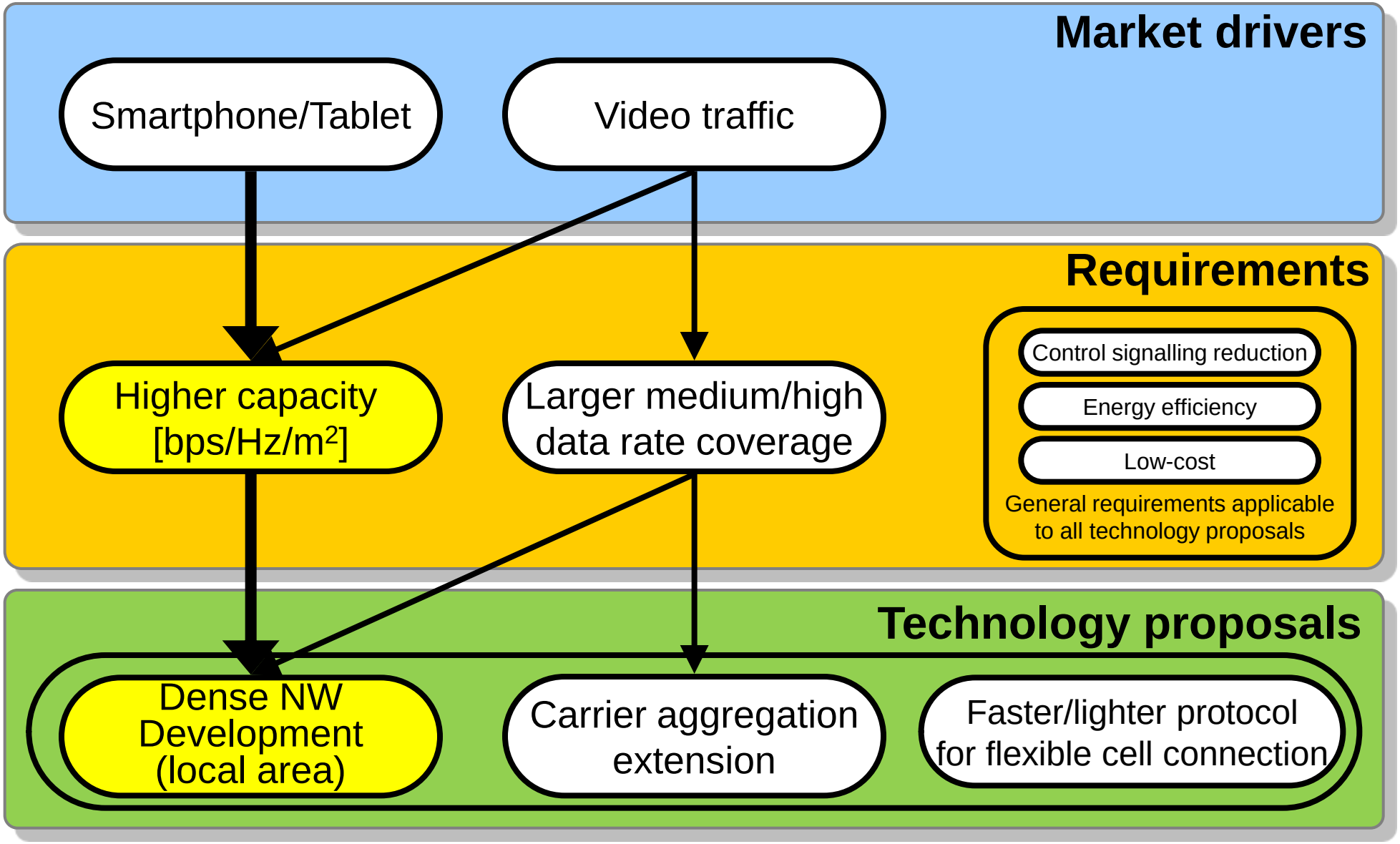
Major drivers, requirements and technology proposals



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Considerations
on
dense NW deployment (local area)

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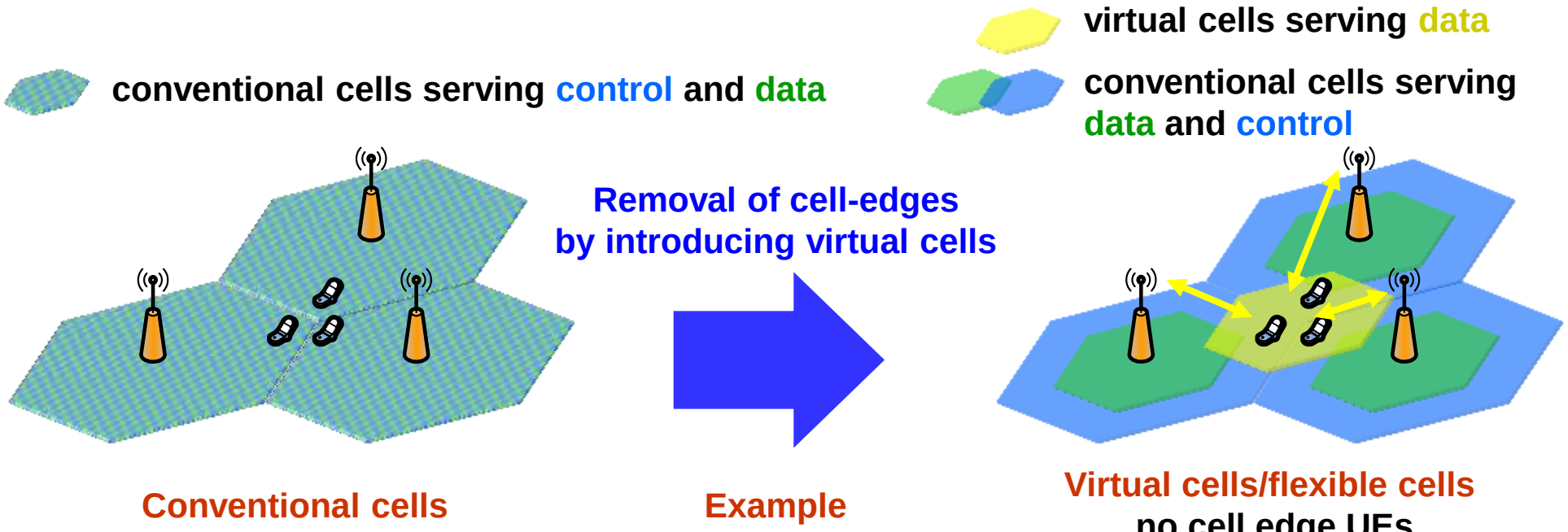
Improvement of user fairness especially in dense NW

- Flexible C/U-plane operation with multiple low power nodes
  - Separate management of cell splitting for control and data
  - Separate management of orthogonal access for control and data
- Location of “cell edge” can be dynamically controlled by NW
  - Using UE specific configuration like DM-RS, scrambling sequence
  - Flexible allocation of orthogonal/non-orthogonal resources for different UE locations



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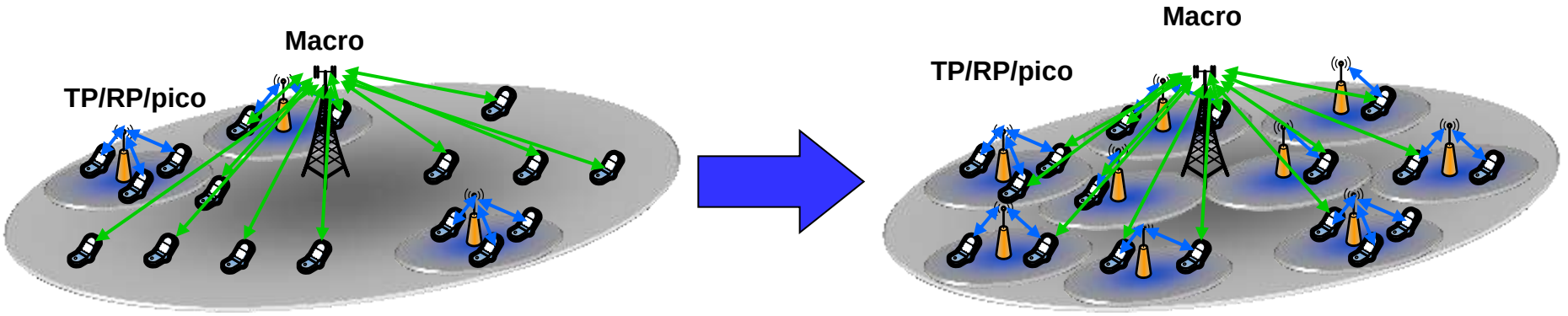
Improvement of capacity per area in dense NW (1)

- Deploying more smaller/lower power nodes
  - Coordination of higher number of transmission/reception points (TP/RP) and/or pico nodes
  - Both intra/inter-frequency TP/RP/pico deployment to be considered
  - Both intra/inter eNB to be considered



- Problem
  - More and frequent handover procedures
    1) Increased RRC control signalling
    2) Increased control signalling within RAN as well as to/from core NW
    3) Efficient TP/RP/pico detection

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Improvement of capacity per area in dense NW (2)

1) Avoidance of problem “Increased RRC control signalling”
   - Additional faster/lighter protocol for flexible cell connection
   - More efficient support of CoMP scenario 4 like deployment
     - UEs connect to macro eNB cell from mobility management perspective
     - User data (including L1/L2 control signalling) is transmitted/received from the nearest node(s)

2) Avoidance of problem “Increased control signalling within RAN as well as to/from core NW”
   - Multiple access points (eNBs/TPs) behave as single eNB from EPC perspective

3) Efficient TP/RP/pico detection
   - NW assisted detection with potentially new signal

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Interaction of CA and dense NW (1)

- Use of NCT (New Carrier Types) in dense NW is a key solution for the capacity enhancements
  - Optimization for limited range of scenarios
    - Low UE speed
    - Small cell sizes
  - DMRS-based
    - Removing CRS allows more flexible cell splitting including more dynamic behaviour
    - Allows to identify more than 504 TP/RP/Cells
  - Potentially only network based mobility
  - Focus on roughly synchronization (for example ~30μs)

- Use of backward compatible carrier
  - Universal scenario support including high speed and large cell sizes
  - Further CRS-based optimization
  - Idle/UE based mobility support

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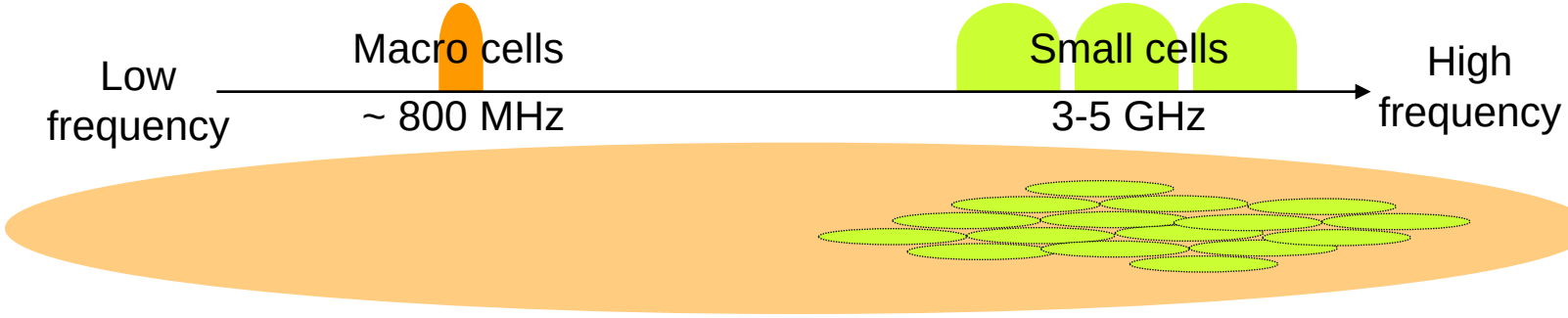
Interaction of CA and dense NW (2)

- Large/mid size cells with low/mid frequencies (e.g. 0.8/2 GHz)
  - Containing following information
    - Information of several neighbouring cells (frequency, bandwidth, MIB/SIBs)
    - Common control signalling
  - Handling mobility management
    - Reduces core-network interaction
    - Provides best trade-off between paging load and TA updates
    - Monitored by UEs in idle mode / dormant state and UEs at high speed
      - Reduces required tracking area updates and handovers
      - Quick transition to ON_duration with best “cell” usage
- Small cells with high carrier frequencies (e.g. 3.4 GHz)
  - New carrier types (optimized for data)



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Mapping to Rel-12 Work/Study Items

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Faster/lighter protocol for flexible cell connection

- Following scenarios to be optimized
  - CoMP scenario 4 (fibre based)
  - NCT CA deployments
    - Macro cells with conventional carrier
    - dense pico cells with NCT
  - Optimize for small cells and low speed UEs

- Flexible cell operation
  - Based on CSI-RS and/or new reference signals
  - Dynamic “cell boundary” definition taking into account UE / traffic distribution and QoS
    - Has been initiated in Rel-11 CoMP

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CoMP/ICIC enhancement WI

- Downlink
  - Multi-user assumption than single user assumption
  - Further improvement for inter-eNB (X2 based) CoMP/ICIC
    - Impact on X2 and RRC signalling
    - Possible CSI feedback enhancement for high latency backhaul

- Uplink
  - Adaptation to flexible C/U-plane operation with virtual cells, especially for Power control, SRS and RACH.

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E-PDCCH enhancement WI

- E-PDCCH Rel-11 remaining topics need to be completed

- Multiplexing of E-PDCCH may be discussed
  - Further packing efficiency of E-PDCCH for PRB level ICIC coordination
  - Enhancement of cell splitting gain for dense NW deployment
    - Support of UE specific scrambling sequence and antenna ports
      - Necessity of the enhancement depends Rel-11 E-PDCCH design

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Carrier aggregation enhancement WI

- CA between FDD and TDD
  - Important especially when higher frequency is used as TDD
  - Need investigation on L1/2 control aspects
    - Scheduling, HARQ feedback, etc.
    - Reuse of some Rel-11 TDD schemes for different DL/UL configuration

- Improve PCell control shortage
  - L1/L2 control signalling carried on PCell may be congested in dense NW with large number of SCells.
    - e.g. PUCCH, PDCCH (cross carrier scheduling, group TPC command, RACH response)

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MTC + eDDA WI

- Latency and/or overhead reduction
  - RACH less transmission for latency reduction
  - Efficient small data communication, e.g.
    - during RRC_idle for MTC devices
    - during RRC_connected for smartphones / tablets

- UE power saving
  - Smart-phone / tablet-type traffic
  - MTC-type traffic

- Low-cost MTC devices
  - Based on Rel-11 SI

- MTC scenarios to be considered
  - Co-existence of low-cost MTC UEs with non-MTC UEs
  - Dedicated MTC carrier scenarios
  - Optimization of low power consumption states
  - Achieve large coverage for low-cost devices

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Thank you !

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