3GPP TSG RAN Workshop on Release 12 and onwards
Ljubljana, Slovenia, June 11-12, 2012

RWS-120016

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Requirements and Technical Considerations for RAN Rel.12 & Onwards

June 11-12, 2012

Fujitsu Ltd.

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Requirements

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Observations

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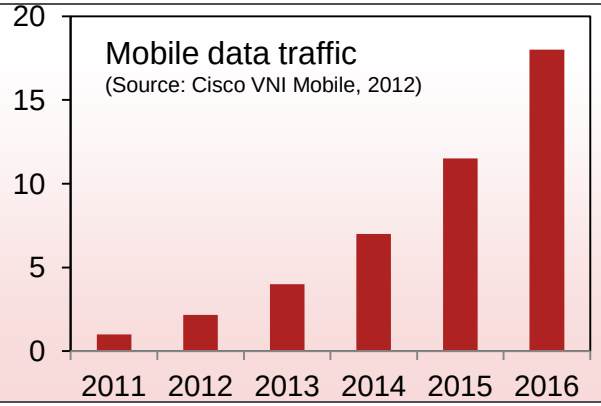
Mobile data traffic

- Global exponential mobile data traffic increase
  Growth rate: ≈2x per year => ≈1000x in 10 years
- More devices, higher bit rates, always active
- Localized traffic: 70-80% in indoor/hotspot
- Larger variety of traffic types e.g. Video, MTC



User experience

- Consistent QoS over a wider coverage area

Spectrum

- Current spectrum below 3GHz is becoming progressively congested
- Utilization of wider BW will be necessary to obtain higher throughput
- Additional spectrum assignment for IMT will be discussed in WRC-2015

Energy efficiency

- Energy costs of the network will become a larger portion of OPEX
- Improved energy efficiency will reduce environmental impact

Cost efficiency

- Minimise CAPEX/OPEX while supporting 1000x traffic increase

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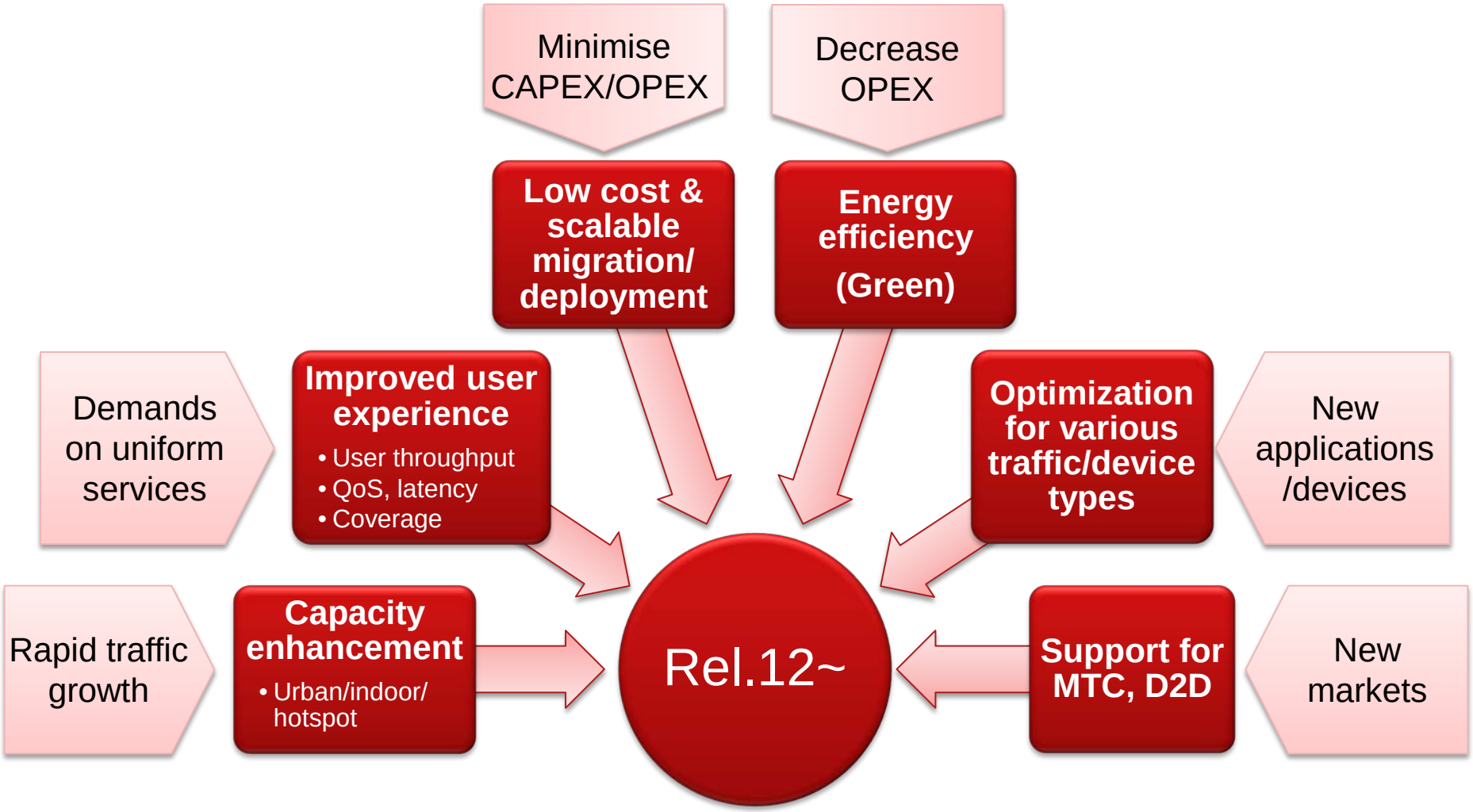
Future Requirements for RAN



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Potential Technologies and Roadmap

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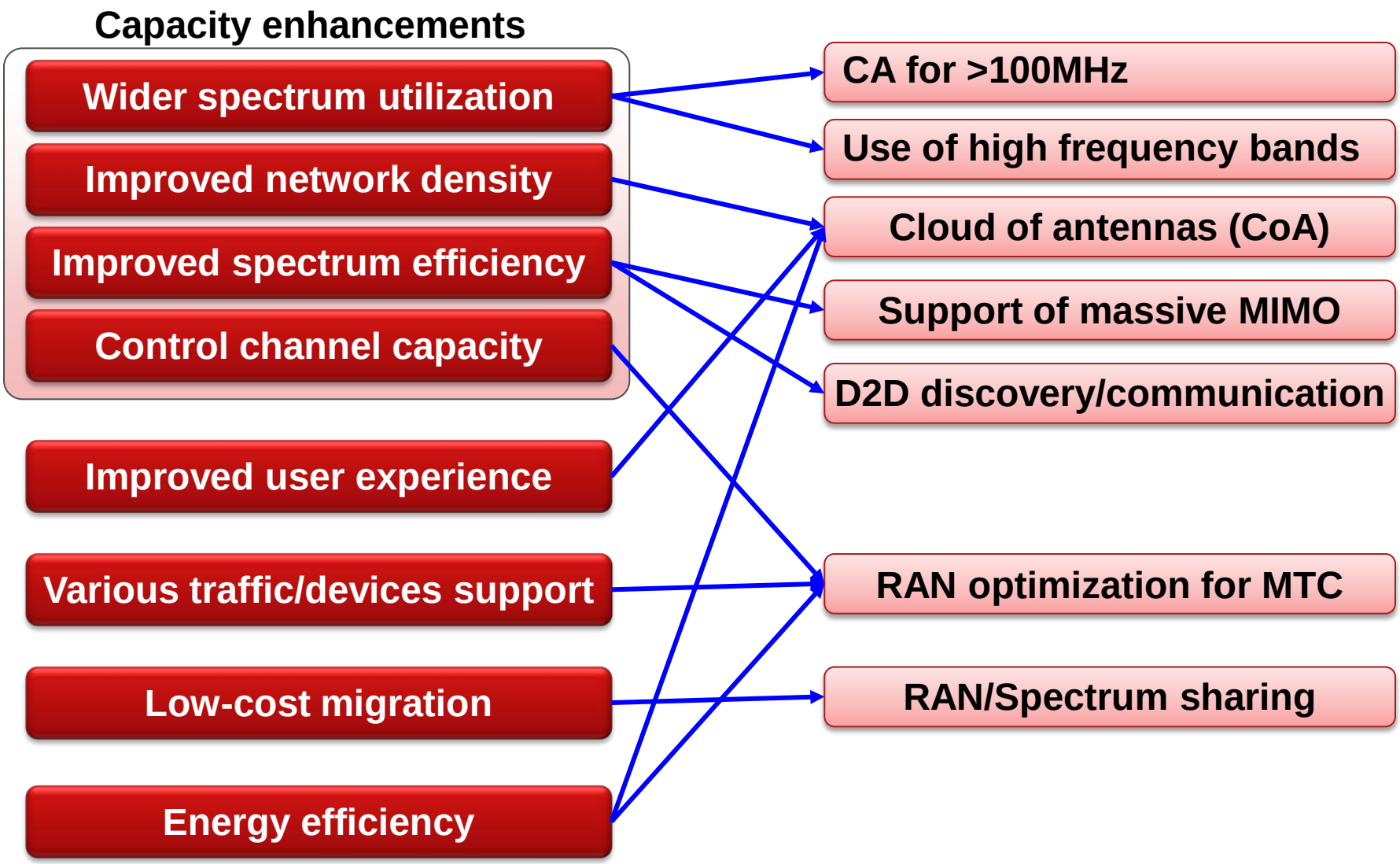
Potential Technologies



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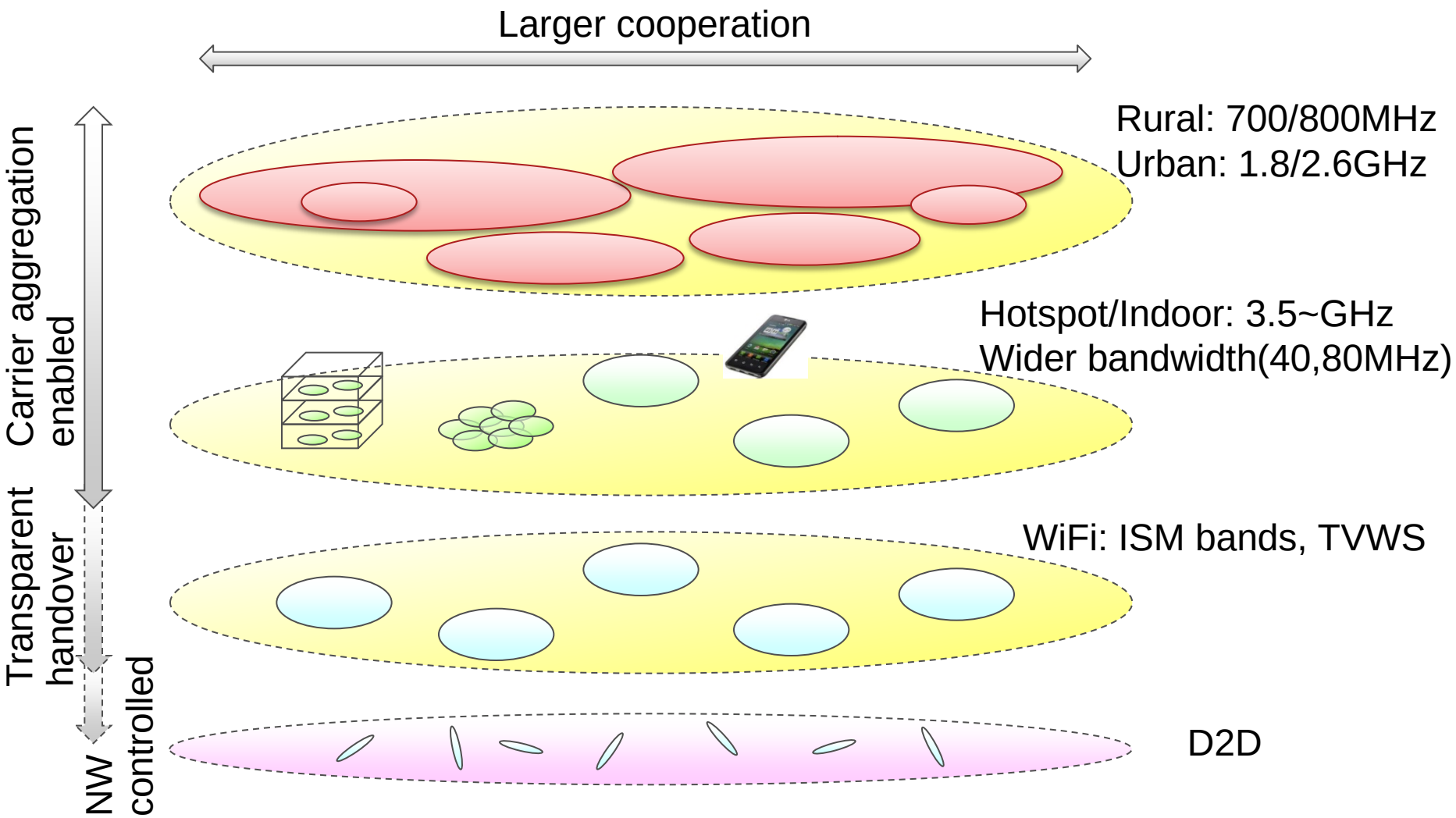
Multi-layer HetNet Deployments



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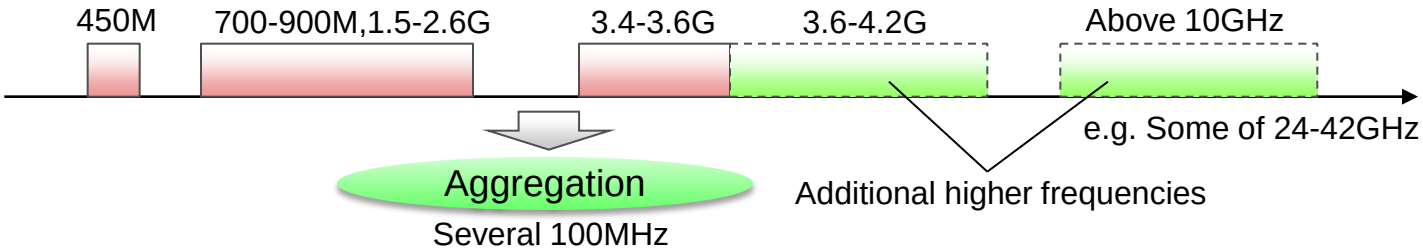
Wider Spectrum Utilization

- Wider bandwidth via carrier aggregation
  - CA concept can be reused to obtain 100+ MHz bandwidth
  - Higher bit rates and more efficient multiplexing
  - New spectrum above 3.6GHz is suitable for local area access supporting low mobility with high throughput



- Optimisations for higher frequency bands
  - Targeting small cell deployments (e.g. Hotspot/Indoor)
  - Possible RAN enhancements:
    - Support of wider bandwidth CC (e.g. 40,80MHz)
    - Support of TDD-mode CCs aggregated with FDD-mode CCs
    - Some modulation parameters (e.g. CP length) can be optimized
    - Use of NCT as SCell / Standalone PCell
- Other possibilities for spectrum extension
  - Spectrum sharing in licensed bands
  - Cooperation with other RATs (e.g. WiFi, TVWS)

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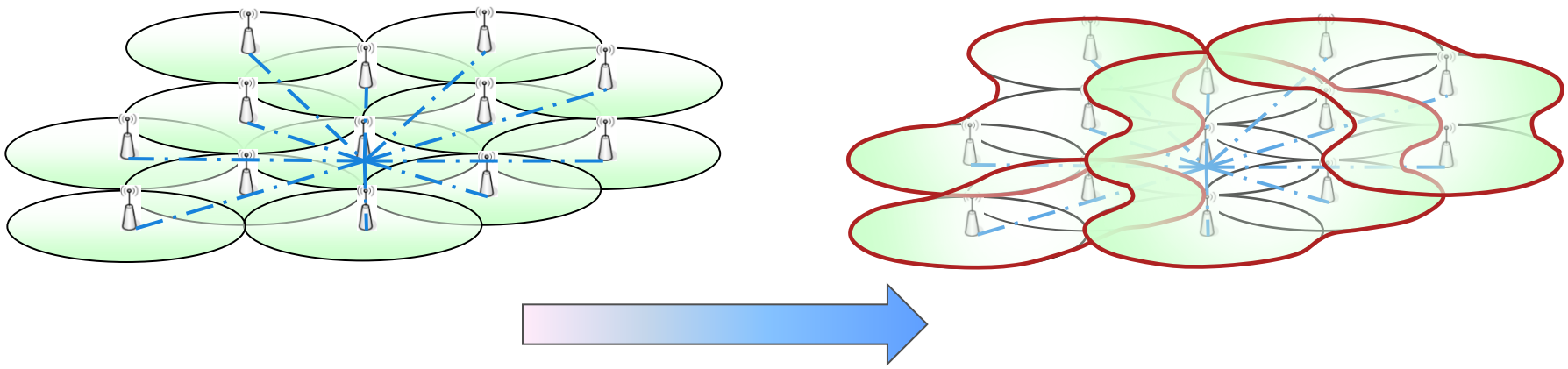
Cloud of Antennas (CoA) Concept

- Co-operation across a dense network of geographically distributed transmission points
- Evolution beyond C-RAN to a soft RAN/fluid RAN
  - User-centric virtual cells
  - Dynamic geographical re-use of resources
  - CoMP for data and control signals
  - Centralised co-ordination
  - Flexible allocation of processing capacity



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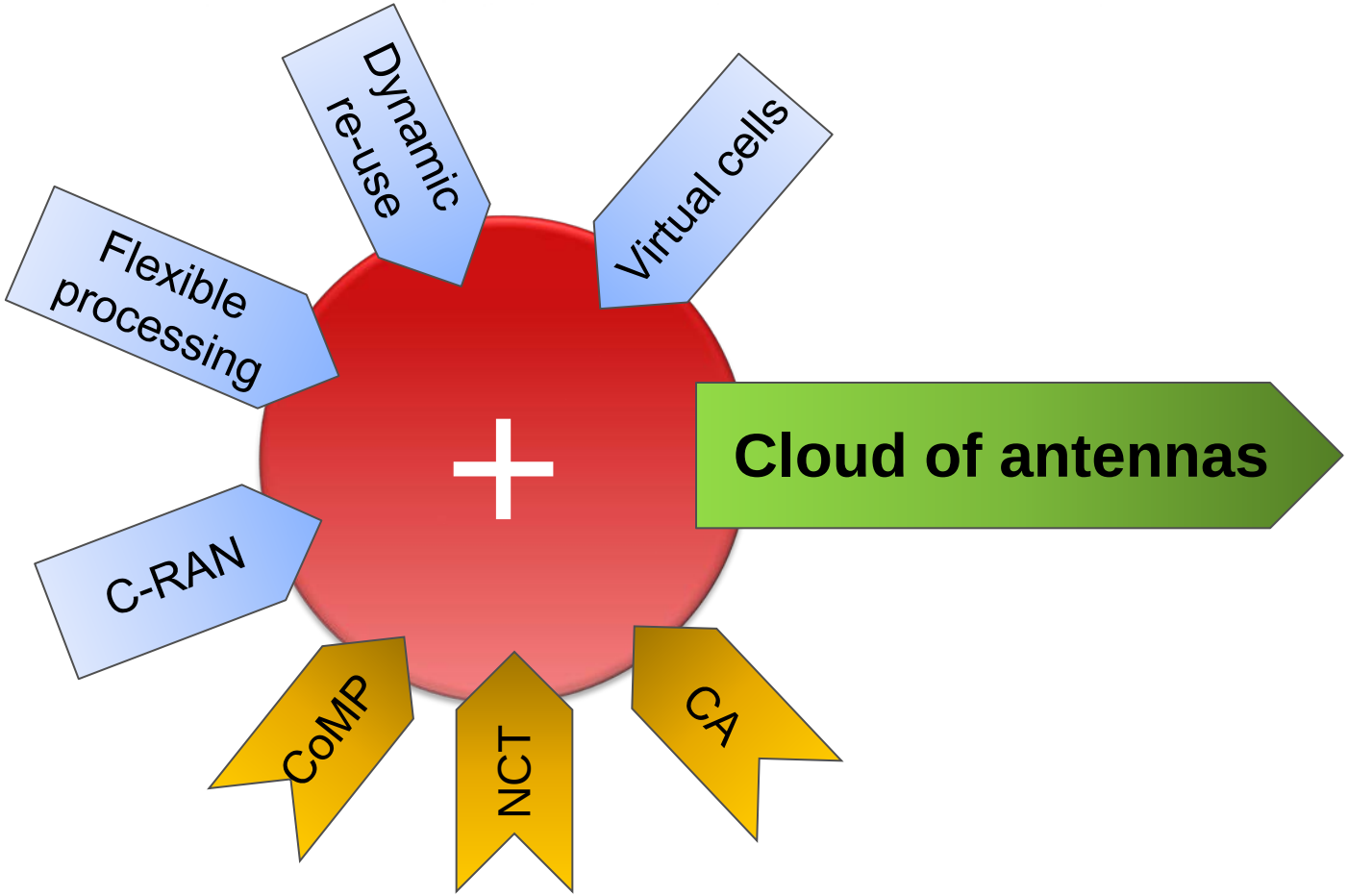
Cloud of Antennas (CoA) Evolution



- Reduce cost of network rollout – less planning & smaller sites to rent
- Reduced inter-transmission point interference on control and data channels
- Fluid, flexible assignment of capacity to areas where needed
- Minimising OPEX using centralized processing

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Support of Massive MIMO Technology

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- Adding new cell sites for network capacity boosting is becoming more difficult
- Therefore deploy antenna arrays with a large number of small active antennas at cell sites
  - Improved spectrum efficiency by higher order MU-MIMO
  - Simple installation to existing cell sites with additional antennas
  - Dramatically reduced uplink and downlink transmit power to support green communications and to reduce OPEX
- Possible RAN enhancements
  - Study on antenna array deployment, channel model and uplink power efficiency
  - 3D precoding and CSI feedback scheme with the assumption of new propagation characteristics and power efficiency, both for TDD and FDD
  - Synchronization, reference signal design

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Diverse Applications & New Businesses

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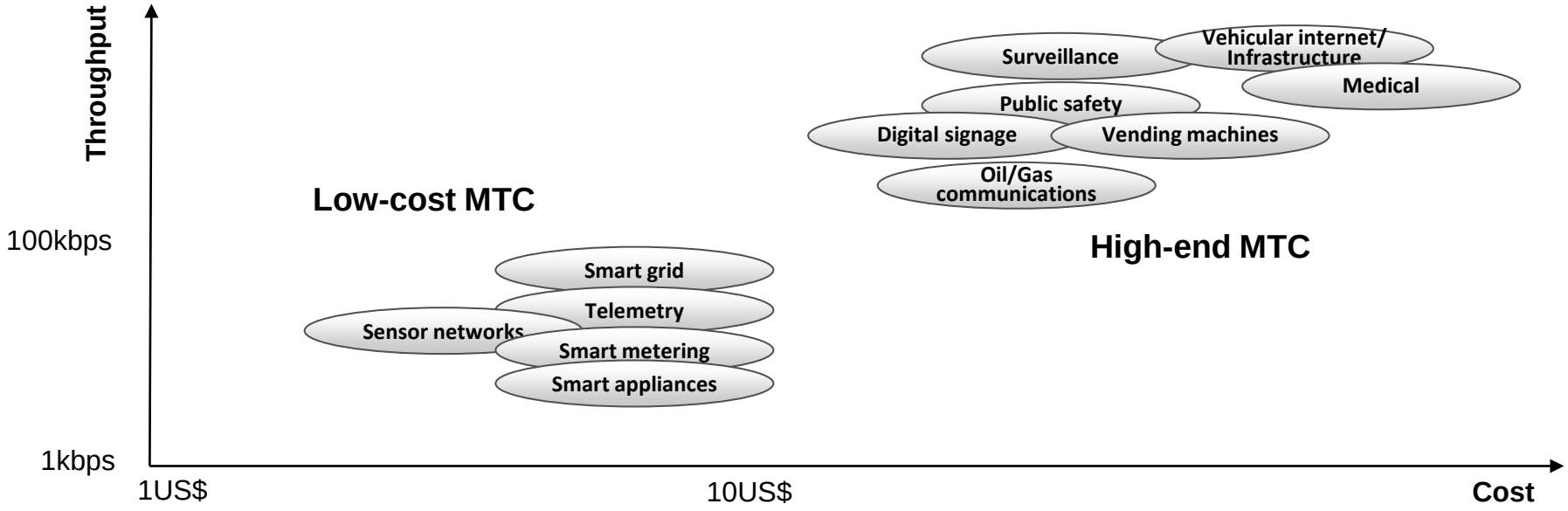
- Diverse applications
  - MTC (Wide area sensor networks, SmartGrid, Health care, ITS, Household appliances), Small-world (Social) networking, Public protection, Disaster relief application, etc.
- Wireless MTC
  - Wireless MTC services are expected to grow significantly during the following 5 years and LTE should be the main revenue growth vehicle



- Low-cost MTC
  - Low-cost, Massive device roll-out, Small packet, Best effort
- High-end MTC
  - High bandwidth, Higher QoS/SLA(reliability, robustness, latency), Low/moderate volumes

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RAN optimizations for MTC

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- For low-end MTC
  - Narrow BW implementation of UL/DL control channels
  - Efficient access/ idle-mode control for a large number of devices (e.g. Group-based access control)
  - Small data transmission with less overhead
  - DRX optimization
  - Femtocell & relay station optimization for MTC traffic aggregation

- For high-end MTC
  - Real-time traffic support targeting higher reliability (e.g. for medical, vehicular apps)
  - RAT diversity

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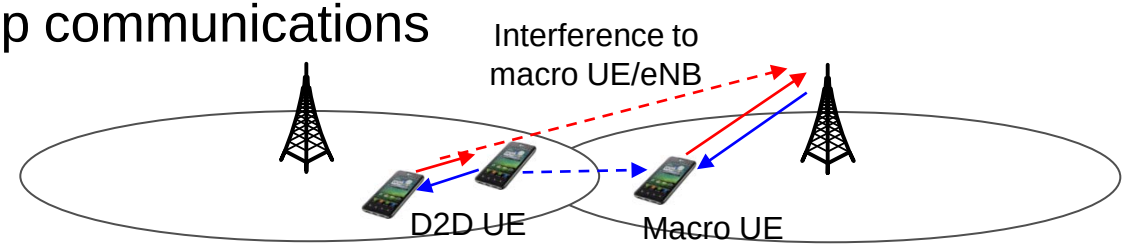
D2D Discovery/Communication

- Enables new services e.g. social networking, proxi-based business, public safely, home networking
- User likely to see higher throughput with less TX power and shorter delay
- Better reuse of spectrum by proper handling of interference
- Network-assisted operation can improve the spectrum usage. However, rudimentary but crucial services in case of emergency should be supported without network assistance

- Possible RAN enhancements
  - Support both of network-assisted & standalone D2D communications
  - Mitigation of intra-D2D interference and inter cellular-D2D interference when both communications are operated in a same channel
  - Service and peer discovery scheme
  - D2D cooperative/multi-hop communications



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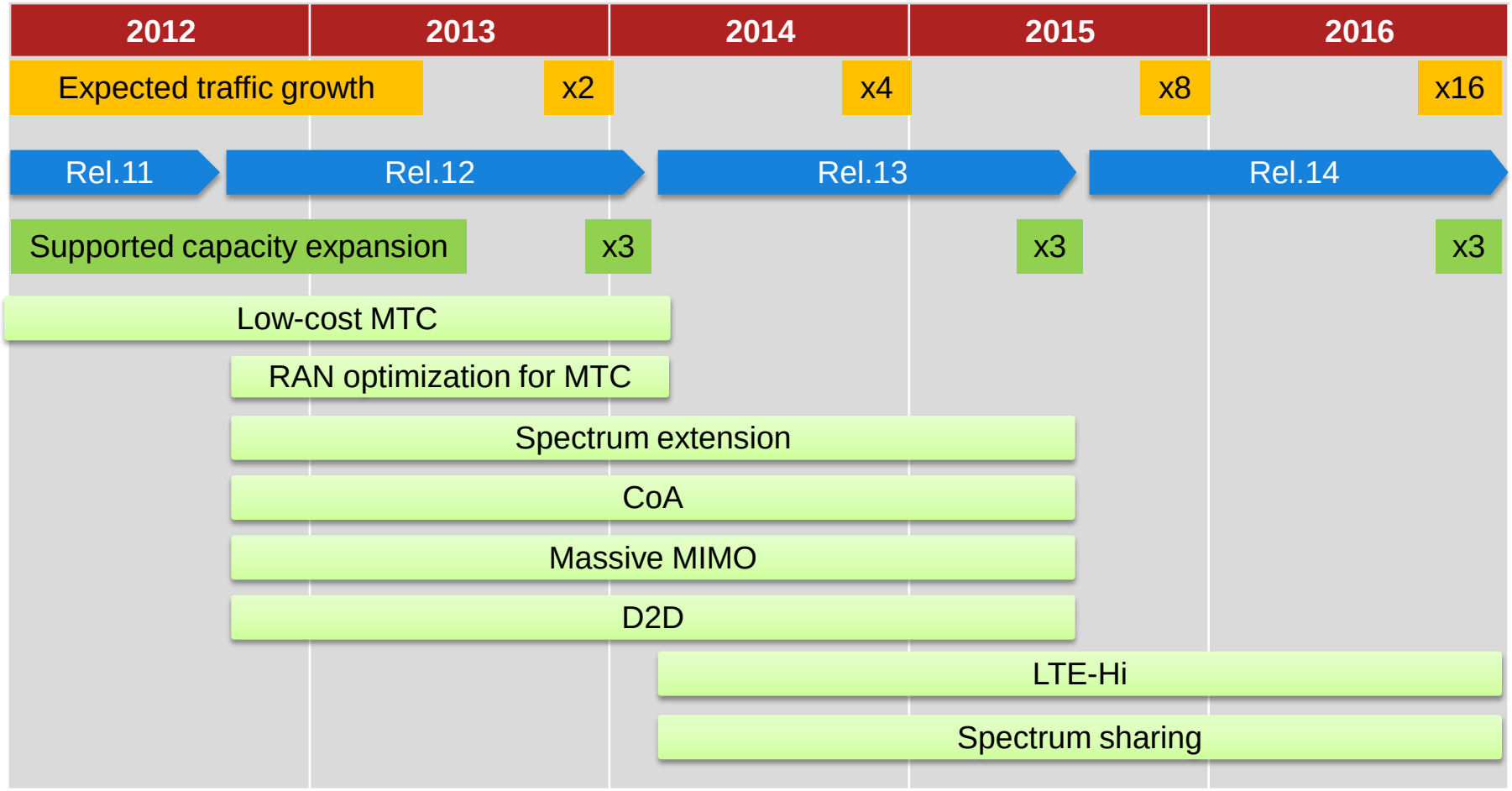
RAN Standardisation Roadmap

- Evolutionary approach towards 2020
- Prioritization should be considered



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