3GPP TSG RAN Rel-18 workshop
Electronic Meeting, June 28 - July 2, 2021

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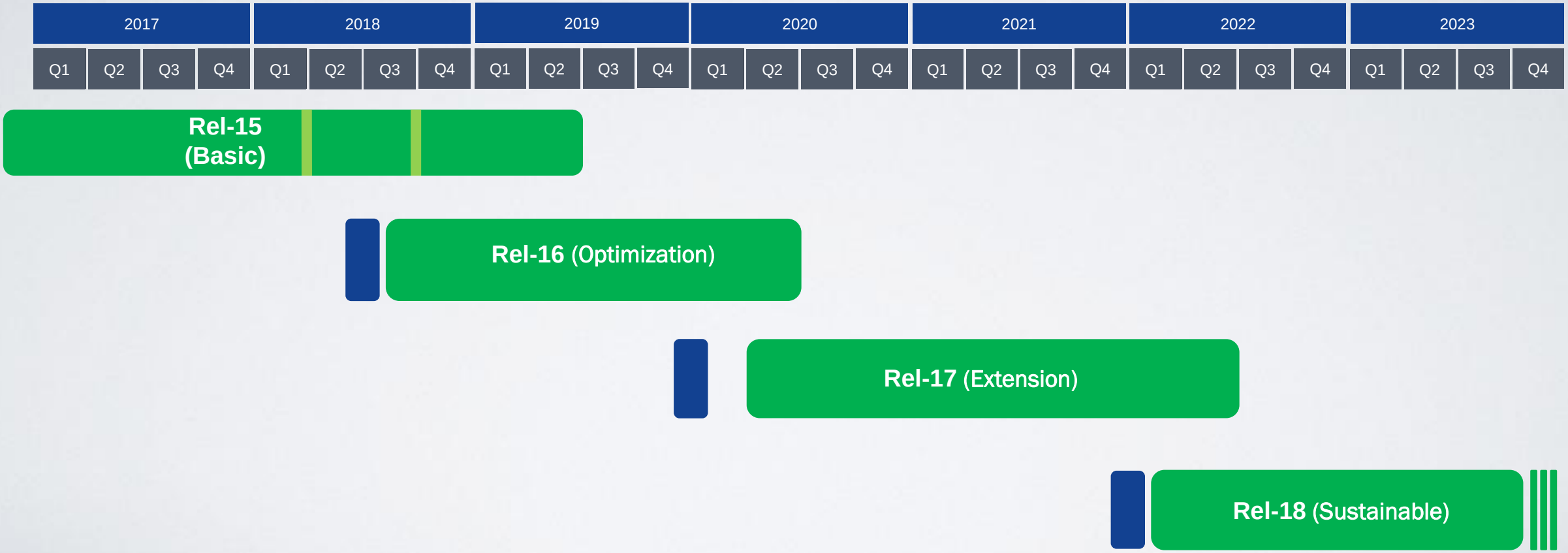
CMCC views on Rel-18 eMBB-driven Functional Evolution

Agenda Item: 4.1
Source: CMCC

R18 EVOLUTION: 5G ADVANCED



R18 Evolution	
eMBB	Frequency combination based elastic cell, MBS enhancement, SON/MDT further enhancement, Air-to-ground (ATG) , Home Base Station (HBS), Smart repeater
Non-eMBB	URLLC through dual UEs, RSU-like network node, Inter-UE handover for the same user, Further enhancement of RAN slicing, Requirements from automotive industry
Cross-Functionalities	Full duplex, UE aggregation, Network energy saving, AI/ML enabled RAN

Outline

- Frequency combination based elastic cell
- MBS enhancement
- SON/MDT further enhancement
- Air-to-ground (ATG)
- Home Base Station (HBS)
- Smart repeater

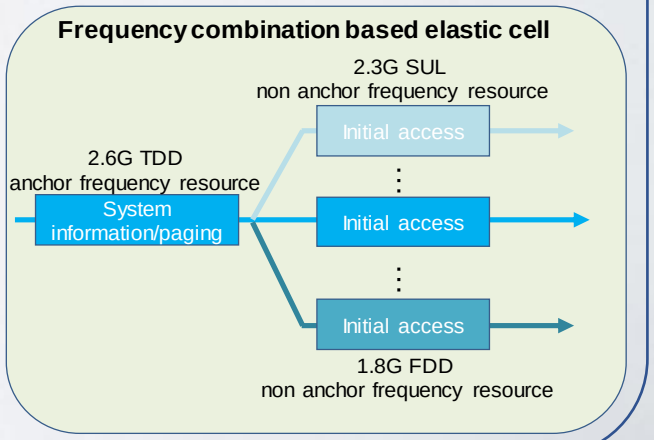
Frequency combination based elastic cell

Motivations

- Flexibly utilize scattered carries with small bandwidth, e.g. too narrow to carrier SSB.
- Efficiently utilize the spectrums re-farmed from LTE, no need to carrier system information since no legacy NR UEs served.
- Reduce cell management overhead while keeping flexible access carrier selection, …

Potential solution and objectives

- Multiple frequency resources configured in single cell
  - Different frequency resources, regardless of intra-band, or inter-band, can be configured in a cell, named **frequency combination based Elastic Cell**
  - System information can be broadcast only on one frequency resource(anchor frequency resource) , non anchor frequency resources can be used for initial access and data transmission by UE
    - Extension of SUL scheme as a universal solution for multiple carrier operation
      - Regular TDD/FDD carriers can be configured as additional access frequency resources
  - UE can only monitor paging on anchor frequency resource while the access frequency resources are selective to the UE
  - Reuse legacy CA behavior or BWP framework for connected operation
- Potential study objectives
  - Study mechanisms for supporting configuring multiple consecutive or non-consecutive frequency resources in a cell;
  - Study mechanism for supporting idle/inactive state for frequency combination based elastic cell, e.g., cell selection/reselection, paging, initial access;
  - Study possible enhancement of connected state for flexible multiple frequency resource operation



MBS enhancement

Motivations

- Further to improve spectrum efficiency and reliability for UEs in RRC_CONNECTED state;
- Expand multicast service and multiple MCCHs for UEs in RRC_IDLE/INACTIVE states;
- Support of SFN, Free to Air, 100% resource allocation for MBS.

Objectives

- Specify enhancement for broadcast/multicast service for UEs in RRC_CONNECTED state [RAN1, RAN2]:
  - Specify group scheduling mechanism enhancement to further improve spectrum efficiency, e.g., beam management for multicast service, especially for FR2, carrier aggregation for multicast service, dynamic HARQ process management/share between broadcast/multicast service and unicast service [RAN1, RAN2];
  - Specify reliability improvement enhancement, e.g., HARQ-ACK feedback enhancement, CSI measurement/report enhancement for multicast service, support of ARQ in Layer 2 for PTM [RAN1, RAN2];
  - Other Rel-17 leftovers.
- Specify enhancement for broadcast/multicast service for UEs in RRC_IDLE/INACTIVE states [RAN2, RAN1, RAN3]:
  - Support of multicast service for UEs in RRC_IDLE/INACIVE states [RAN2, RAN1, RAN3];
  - Specify the multiple MCCHs for broadcast service per cell [RAN2, RAN1].
- Specify enhancement to expand deployment scenarios for broadcast/multicast service for UEs in RRC_ IDLE/INACIVE/CONNECTED states [RAN1, RAN2, RAN3]:
  - Standardised support of SFN over multiple cells above gNB-DU level [RAN1, RAN2, RAN3];
  - Support of Free-to-Air/receive only mode [RAN2];
  - Support of up to 100% resource allocation to broadcast/multicast service [RAN1, RAN2].
- Specify UE power saving and battery lifetime enhancement for UEs in RRC_ IDLE/INACIVE/CONNECTED states [RAN1, RAN2]:
  - Specify power saving techniques with power saving signal/channel in triggering UE adaptation to the DRX operation for broadcast/multicast service [RAN1, RAN2].

SON/MDT further enhancement

Motivations

- RAN Optimization via data collection has the remarkable benefits, e.g., reduce CAPEX & OPEX of operators significantly, enhance the user experience and enable efficient network planning and optimization
- A Rel-17 WI for SON/MDT enhancement is on-going.
- During the Rel-17 WID drafting phase, optimization of some Rel-16 features via SON/MDT was not included in Rel-17 WI due to the TU constrains.
- Some Rel-17 new features could also benefits from data collection.
- Further enhancement of SON/MDT in NR in Rel-18 is necessary

Objectives

- Rel-17 leftovers (pending on progress of Rel-17)
- Optimization of some Rel-16 features enabled by SON/MDT, but has not been covered by Rel-17 WI, e.g., IAB, NPN, V2X
- Optimization of Rel-17 new features enabled by SON/MDT, e.g., MR-DC (CPAC), SDT, Redcap, MBS

Air-to-ground (ATG)

Objectives

ATG scenarios and RF requirements

Specify features to core specifications of RF requirements for coexistence between ATG and IMT terrestrial network [RAN4]

- Identify key characteristics where it is absolutely necessary to differentiate ATG BS and UEs from ground based BS and UEs
  - Aim to reuse existing requirements for BS and UE where possible.
- Study and specify the framework how ATG core requirements are defined.
  - This includes identifying whether the requirements are captured within the existing specifications or new specifications are created.
  - Determine whether conducted, OTA or both types of requirement are required for both the BS and UE
- Identify the FR1 potential band(s) to be used as example for ATG
- Perform FR1 co-existence evaluation for ATG network (e.g. ACLR, ACS)
- Specify new UE/BS type(s) for ATG network if necessary
  - Taking into account identified differences between ATG and ground based systems
- Specify RF requirements for ATG UE/BS
  - Considering the results of co-existence simulations in terms of impact on emissions and RX requirements, cell sizes and link budgets, technology capabilities, likely BS and UE architectures and other relevant aspects.
- Specify test procedures for ATG BS conformance testing
  - Determine at an early phase whether conducted, OTA or both types of testing are needed

RRM/Demod requirements

Indentify and specify RRM/Demod requirements for ATG, taking into account the decisions/outcome of Rel-17 NTN work item.

- RRM core requirements for ATG UE. [RAN4]
- RRM performance requirements and test cases for ATG UE type. [RAN4]
- Demodulation performance requirements and test cases for ATG UE/BS. [RAN4]

Home Base Station (HBS)

Motivations

- Considering that Wide Area BS and indoor power distribution system in some scenarios cannot meet the coverage of 5G network deployment, the home base station (HBS) can be utilized to enhance indoor coverage without requiring high base station output power. The application of Home Base Station for NR is a cost-effective solution in some scenarios.
- However, the existing NR BS class does not specify the RF requirements of HBS. In order to meet the increasing popularity of large capacity and high reliability of data services and indoor deep coverage deployment applications, the intention of this Work Item is to introduce HBS and specify related RF specifications in Rel-18.
- **It is proposed to specify RF requirements for NR FR1 supporting Home Baste Station (HBS) in R18. The Work Item is to develop a new feature to enable HBS application in home scenarios for NR FR1.**

Objectives

- The core objectives of the work item is to specify the necessary features to support NR deployment for Home Base Station (HBS) application in Rel-18.
- Specify features to core specifications of RF requirements for Home BS [RAN4]
  - Identify the frequency range (FR1) and operating bands to be used for HBS
  - Identify key characteristics where it is absolutely necessary to introduce HBS
  - Perform FR1 co-existence evaluation for HBS network (e.g. ACLR, ACS)
  - Specify new BS type(s) for HBS if necessary
  - Specify RF requirements for HBS in TS 38.104 and TS 37.104
  - Specify HBS conformance testing

Smart Repeater

Motivations

- RF repeaters have been used in 2G, 3G and 4G deployments to supplement the coverage. They constitute the simplest and most cost-effective way to improve network coverage.
- A Rel-17 WI for NR repeaters is on-going. Only RF requirements are included in Rel-17 WID.
- In order to support dynamic TDD, multi-beam operation and so on, some additional information can be considered to enable a more intelligent amplify-and-forward operation for NR smart repeaters

Objectives

Assess the following candidate side control information to intelligently apply amplify-and-forward operation for NR repeaters [RAN1, RAN4]

- Timing information to support dynamic TDD, i.e., slot and symbol UL/DL configuration
- Transmitter and receiver spatial information, i.e., beam information
- Bandwidth information, i.e. configurable repeater bandwidth
- Others are not precluded.

Specify RF requirements for NR repeaters [RAN4]

- Pending on progress of Rel-17.
- Specify necessary RF requirements considering the side control information.

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THANK YOU !