글로벌 ICT 표준 컨퍼런스 2023

Global ICT Standards Conference 2023

Exploring 3GPP Standardization

3GPP RAN1 Status and Overview

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TTA IITP KEA kista ETRI

01. What is RAN1?

(RAN1: TSG Radio Access Network Working Group 1)

- **RAN1 is responsible for specification of the physical layer of the radio Interfaces for UE, Evolved UTRAN, NG-RAN, and beyond. The work in RAN1 includes especially:**
  - Specification of physical channels and modulation
  - Specification of physical layer multiplexing, channel coding and error detection
  - Specification of physical layer procedures (both control and data)
  - Specification of definition of measurements and their provision by the physical layer to the upper layers

- **RAN1 also specifies handling of physical layer related UE capabilities and parameters used in device tests.**

02. 5G-Advanced Release 18

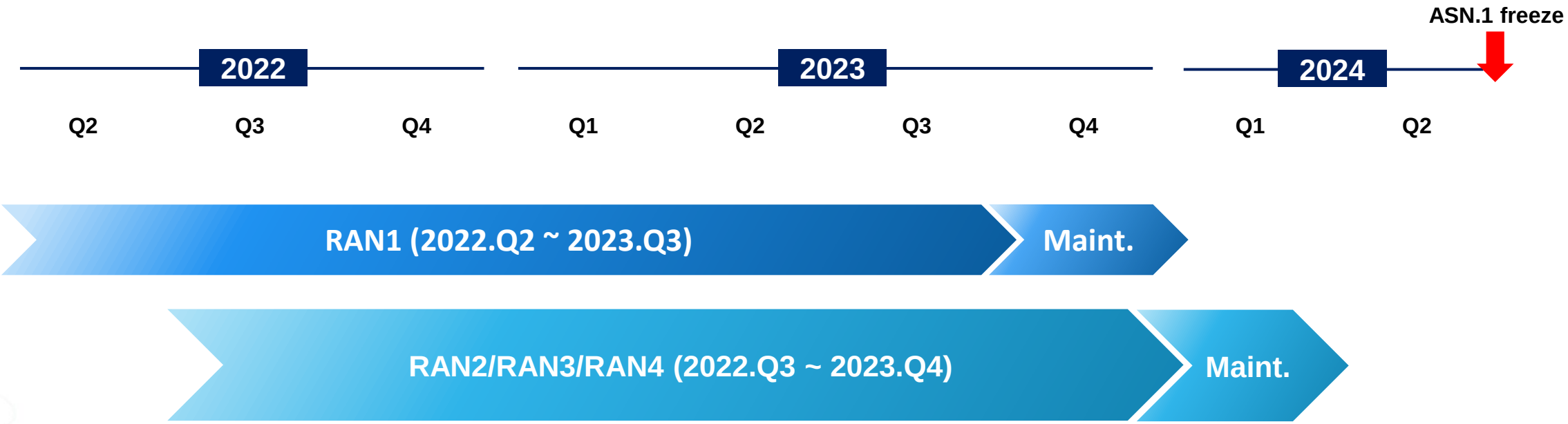
- **5G-Advanced is the second phase of 5G evolution targeting the following**

Enhanced performance and capability	Better support for new applications and terminal types	Bridge towards 6G

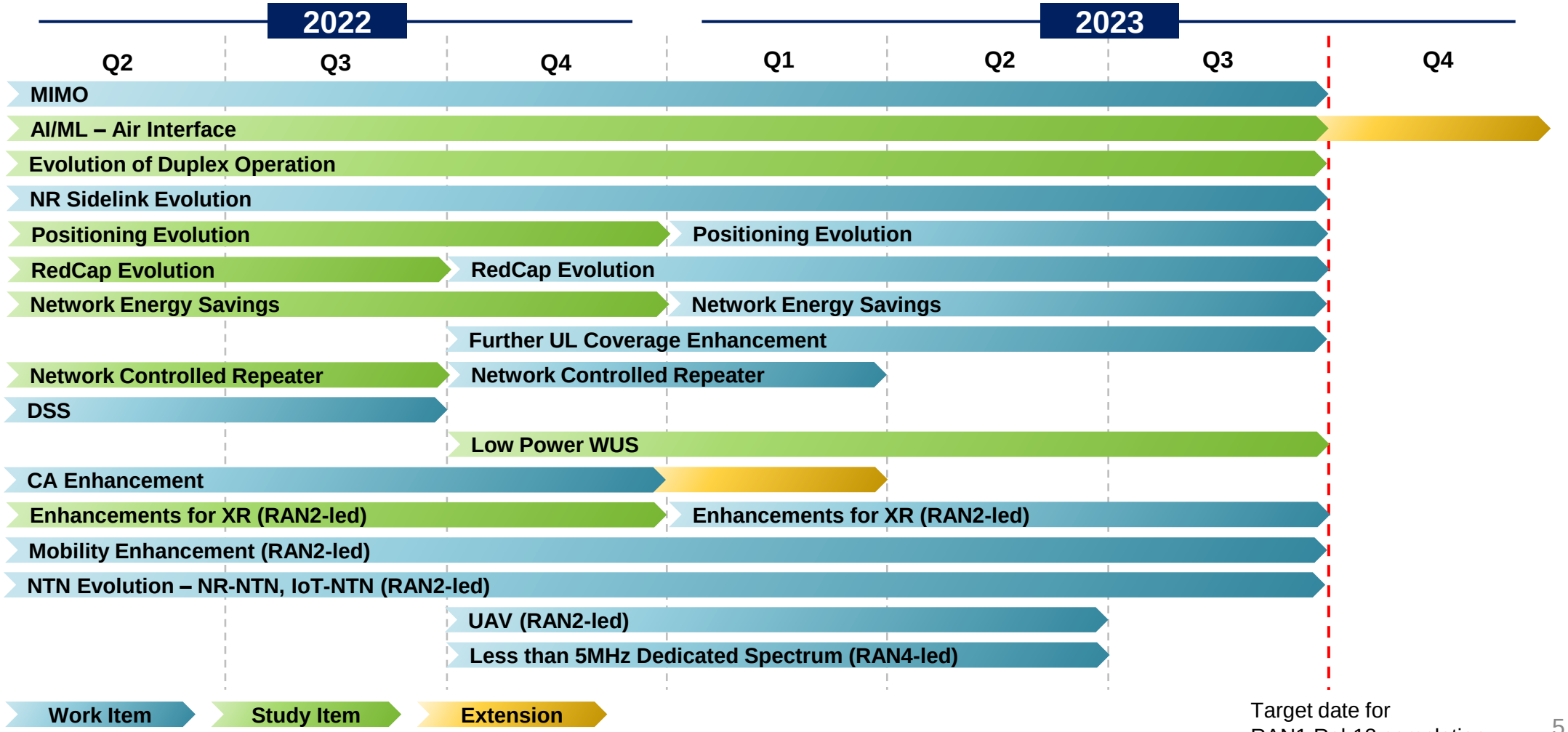
- **5G-Advanced Rel-18 - RAN1 aspects**
  - Included 14 work items and 8 study items over a period of 18 months
  - Generated about 5 GB of emails over the RAN1 reflector (>20,000 emails)
  - Involved >600 technical experts per meeting and >10,000 technical contributions per year
  - 8 RAN1 meetings in total – 3 electronic meetings and 5 face-to-face meetings

02. 5G-Advanced Release 18 – Schedule

- Rel-18 started in 2022.Q2 and is planned to be completed in 2024.Q2 (ASN.1)
- RAN1 kicked off the Rel-18 discussions followed 3 months later by the other WGs



02. 5G Advanced Release 18 – RAN1 Scope



Target date for
RAN1 Rel-18 completion

03. AI/ML for NR Air Interface

(Artificial Intelligence / Machine Learning)

- **Can we augment NR air interface with features to enable improved support of AI/ML based algorithms?**

- **Three target use cases were selected for Rel-18 study item**

CSI feedback enhancement	Beam management enhancement	Positioning accuracy enhancement
CSI overhead reduction, improved accuracy, prediction	Beam prediction in time/spatial domain for overhead and latency reduction, beam selection accuracy improvement	Improved positioning accuracy even in non-line-of-sight conditions

03. AI/ML for NR Air Interface

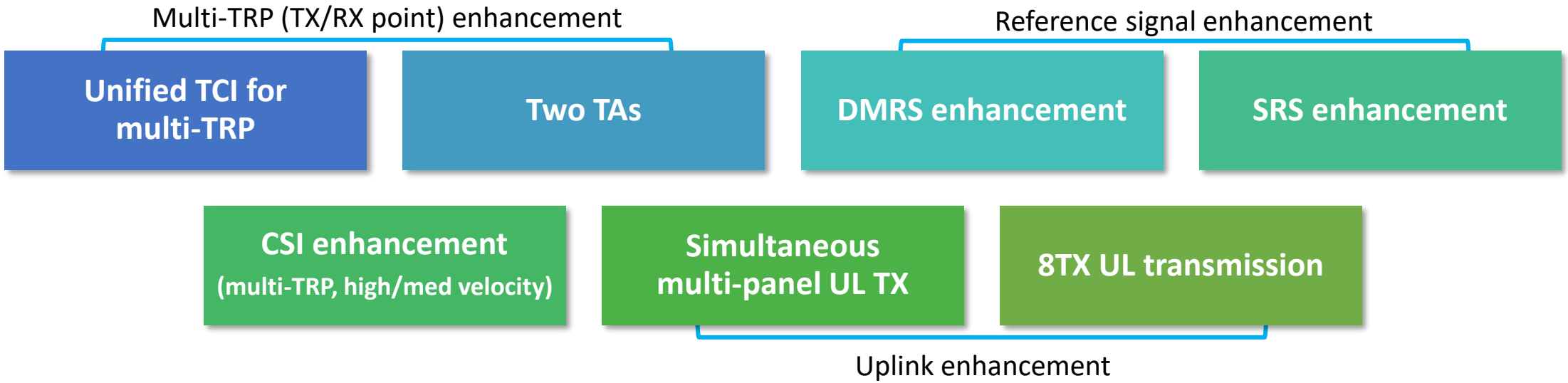
(Artificial Intelligence / Machine Learning)

- **Rel-18 study item on focused on**
  - AI/ML framework investigation (AI/ML model generation, inference operation, collaboration between UE and gNB, lifecycle management, dataset, etc)
  - Evaluation on performance benefits of AI/ML based algorithms
  - Assessment of potential specification impact
- **RAN1 completion target date for the Rel-18 study item has been shifted by a quarter**
  - To ensure a proper study and good level of common understanding on one of the most important fundamental technologies that could impact 5G-Advanced and 6G
  - Initially targeted for completion by 2023.Q3 → now targeted for completion by 2023.Q4
- **Discussions are under way for potential normative work in Rel-19**

04. NR MIMO Evolution for Downlink and Uplink

(MIMO: Multiple Input Multiple Output)

- **Rel-18 work item addresses issues observed during deployments/developments while providing new features for future evolutions in NR multi-antenna technology**

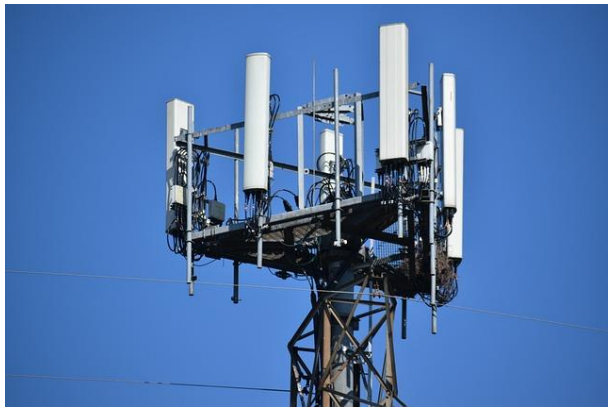


- **Discussions are under way for additional normative work in Rel-19 to further enhance NR MIMO**

05. Network Energy Savings

Mobile Net Zero
State of the Industry on Climate Action 2023
GSMA

- **Energy cost takes up to 40% of an operator's OPEX**
  - Radio access network represents >80% of an operator's energy consumption



Radio access network (87%)

Core network & data center (12%)

Other operations (1%)

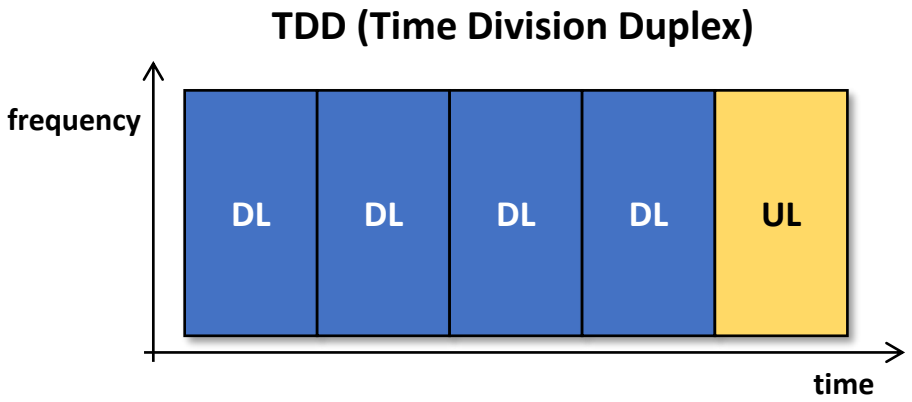
05. Network Energy Savings

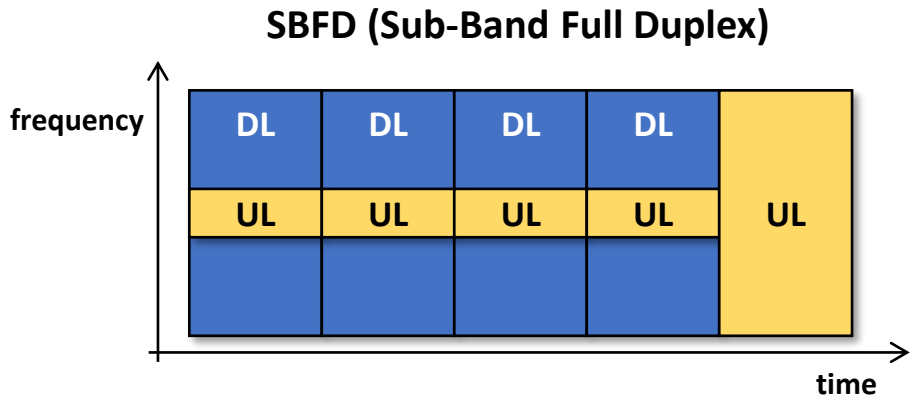
- **Rel-18 study item focused on**
  - Development of a network power consumption model
  - Extensive evaluation on various network energy savings techniques
- **Rel-18 work item specified**
  - Spatial and power domain techniques
  - Enhancements on cell DTX/DRX mechanism

- **Discussions are under way for additional normative work in Rel-19 to further expand the network energy savings gains**

06. Evolution of NR Duplex Operation

- **Rel-18 study item focused on the study of enhanced duplex schemes that could overcome the limited uplink coverage in conventional TDD networks**
  - SBFD and dynamic TDD were evaluated in terms of performance, feasibility, and coexistence impact



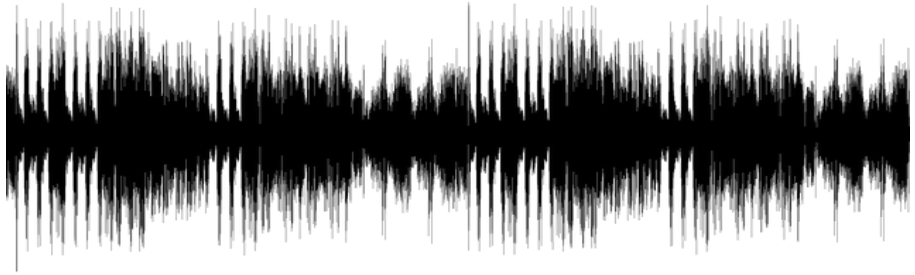


- **Discussions are under way for potential normative work in Rel-19**

07. Low Power Wake Up Signal (LP-WUS)

- **Rel-18 study item focused on the study of a new signal design (incl. waveform) that is used in conjunction to existing NR signals for reduced receiver power consumption**

Existing NR waveform



- Larger bandwidth
- Requires complex receiver and
- Requires higher receiver power consumption

LP-WUS waveform

- Smaller bandwidth
- Requires simpler receiver
- Requires lower receiver power consumption

- **Discussions are under way for potential normative work in Rel-19**

08. eXtended Reality (XR) Enhancements for NR

- **XR requires a combination of high data rate and low latency**

- Acceptable XR experience requires frame rates of at least 60fps and 2K resolution per eye
- Immersive XR experience requires frame rates of 90 or even 120fps and resolutions up to 8K per eye

https://www.3gpp.org/technologies/xr-nr

- **Rel-18 study item focused on evaluation for capacity & power saving techniques**
- **Rel-18 work item addressed uplink capacity issues during XR operation**

- **Discussions are under way for possible additional normative work on XR in Rel-19**

09. Non-Terrestrial Networks (NTN) Enhancements

- **Rel-17 introduced RAN1 specifications support of NTN for NR, eMTC, and NB-IoT**
  - Critical features to address frequency and time synchronization issues relevant only to NTN
- **Rel-18 enhanced the support for NTN in the following key areas**

For NR	For eMTC/NB-IoT
Coverage enhancement	**Disabling of HARQ feedback**
Network verified UE location	**Improved GNSS operations**

- **Discussions are under way for possibly additional normative work on NTN in Rel-19**

Thank you

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