Configuration Enhancements for 5G as TSN Bridge

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Ericsson Research 2020-09-23

References

[1] 3GPP TS 23.501, "System architecture for the 5G System (5GS)"

[2] 3GPP TS 23.502, "Procedures for the 5G System (5GS)"

[3] 3GPP TS 23.503, "Policy and charging control framework for the 5G System (5GS)"

[4] 3GPP Liaison Statement S2-2003508, "TSN support in 3GPP Release-16" (5G) (802.1 response)

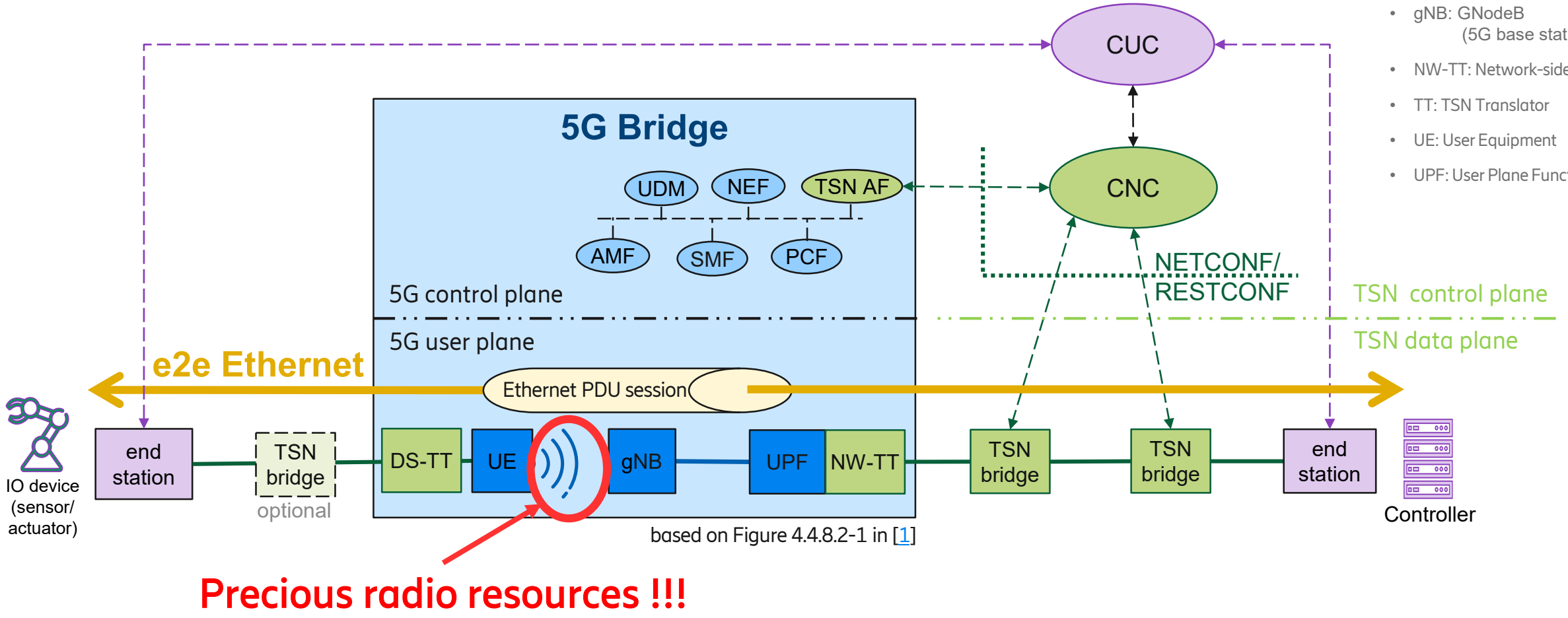
[5] 3GPP TS 23.501 Change Request "PSFP clarifications including IEEE LS response on TSN support"

[6] Solution #21 in 3GPP TR 23.700-20 V0.5.0, "Study on enhanced support of Industrial Internet of Things (IIoT) in the 5G System (5GS) (Release 17)" (Solution #21 approved at SA WG2 Meeting #S2-140e)

[7] "5G-TSN integration meets networking requirements for industrial automation"

5G Appears as TSN Bridge

- As per [1], 5G behaves seamlessly towards CNC as IEEE 802.1Q bridge



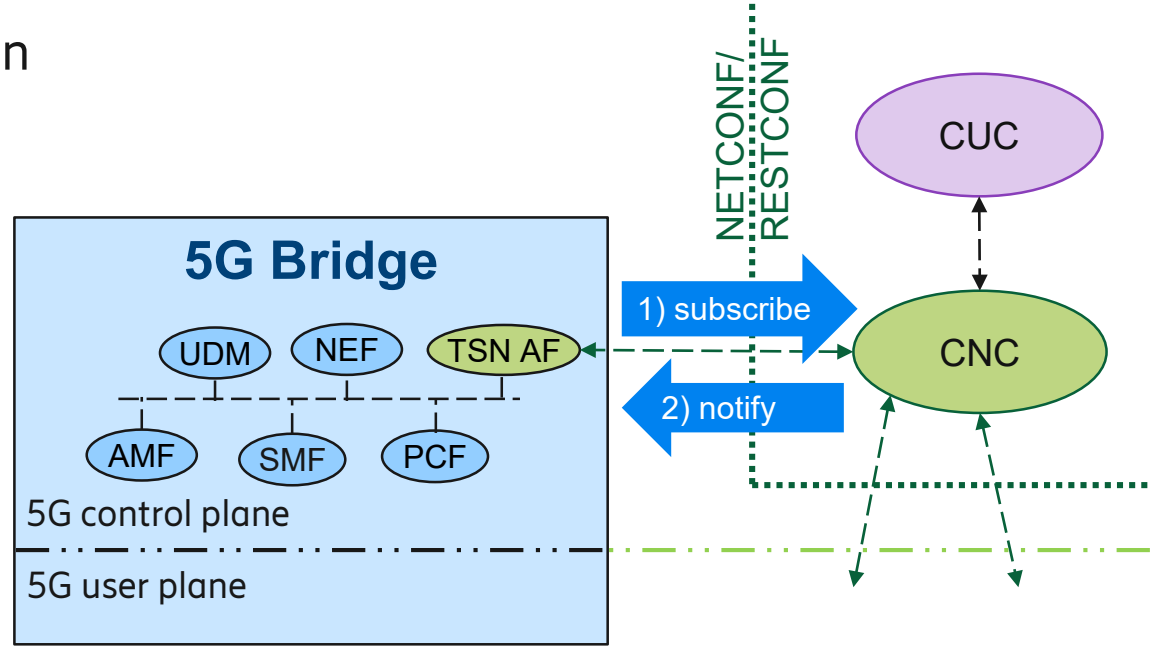
- AF: Application Function
- DS-TT: Device-Side TT
- gNB: GNodeB (5G base station)
- NW-TT: Network-side TT
- TT: TSN Translator
- UE: User Equipment
- UPF: User Plane Function

3GPP Release-16 Reverse Engineering

- Stream information is needed for radio resource management and optimizations
- CNC does not provide all information, e.g., Stream traffic specification
- ➔ 3GPP Release-16 applies reverse engineering
- For instance, Annex I.1 "Determination of traffic pattern information" in [1]:
  - *Periodicity* from: PSFPAdminCycleTime, PSFPAdminControlList, timeIntervalValues
  - *Burst Arrival time* from: PSFPAdminBaseTime, timeIntervalValues, PSFPgateStatesValue
  - *Burst Size* from: PSFPAdminControlList, IntervalOctetMax, timeIntervalValue
  - *Maximum Flow Bitrate* from: timeIntervalValue, PSFPAdminCycleTime
- **Reverse engineering has its problems; e.g., some information is not available at all, some are incidental**
- **Missing information, e.g.:**
  - **Stream characteristics if PSFP is on aggregate or not used**
  - **Mapping of PSFP information to ingress port** (local information (e.g., local configuration) used [5])

Solution Proposal [6]

- Conceptually:
  1) 5G bridge subscribes to CNC for Stream information
  2) CNC notifies 5G bridge about Stream information
- Practically:
  - All can be encoded in YANG (like 802.1Qcc)
  - No new protocol
  - "subscribe" can be a Boolean flag
  - Example information to be provided by the CNC:
    - Stream ID
    - Ingress port number
    - Egress port number(s)
    - PCP
    - Periodicity
    - Burst Arrival Time
    - Burst Size



Summary

- Radio resource management is crucial in 5G
- 5G would benefit a lot if CNC provides Stream information to the 5G bridge
- Simple solution
  - YANG only
- Significant gain

- Generic use of the proposed solution
  - Can be useful for the establishment of inter-domain communication in case of multiple TSN domains

Thank You!