

**3GPP SA2 #121**  
**Hangzhou, P.R.China, 15-19 May 2017**  
**Agenda item: 7.1**

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**S2-173043**

# 5G IoT next steps in 3GPP

**Source: Qualcomm Inc.**

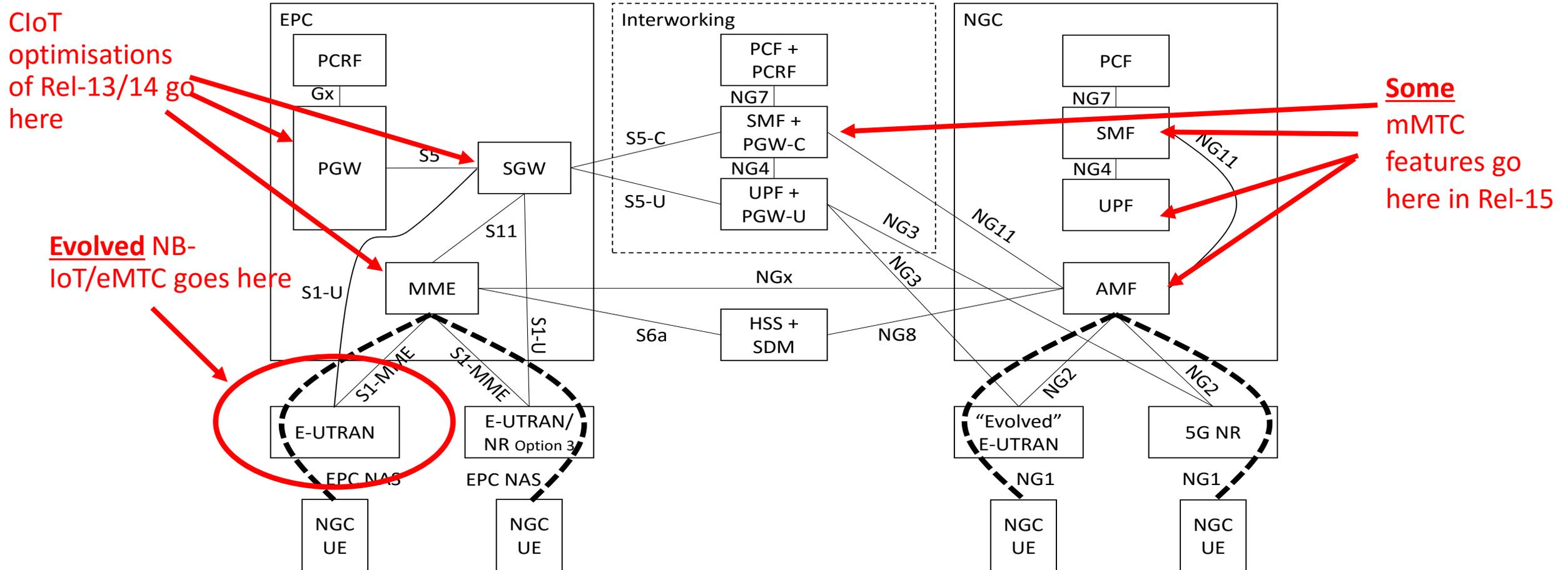
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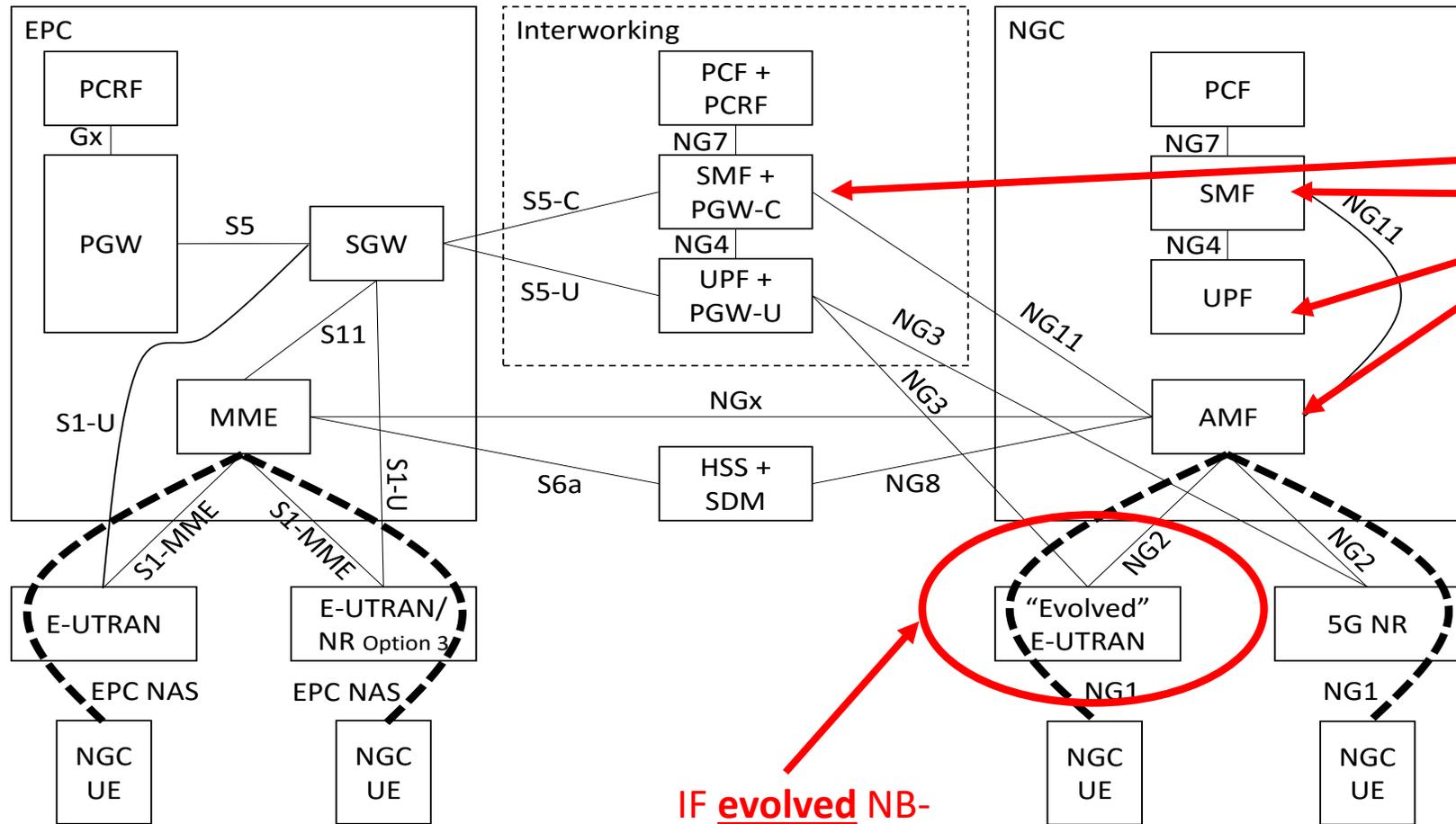
# Background

## Mismatch between CloT optimisations and mMTC functionalities



# Background

In order for NB-IoT/eMTC to be part of NG-RAN, CloT optimisations need to be supported in 5GC



# Background

- Substantial recent E-UTRAN/EPC evolution for IOT (particularly Rel-13/Rel-14):
  - RAN: eMTC and NB-IoT.
  - SA: Cellular IOT (Rel-13) and CIOT\_ext (Rel-14):
    - E.g. CP optimizations, UP optimizations, non-IP data, SCEF, reliable communication via SCEF, etc...
    - EPC CIoT features apply (with little differences) to NB-IoT and WB-E-UTRAN (eMTC).
- RAN agreement for 5G:
  - Use NB-IoT and eMTC as baseline for 5G submission to ITU.
  - See RAN working agreements in RP-162560, RP-170836 (NB-IoT), RP-170732 (eMTC).
- On one hand:
  - There needs to be a natural evolution of CIOT in EPC.
  - At least to support the evolution of NB-IoT and eMTC.
  - Also, some operators have shown interest in leveraging the newly standardized technology (e.g. NB-IoT + EPC/CIOT)
    - Interest to evolve NB-IoT/EPC to cover the “5G IOT” requirements (confirmed in RAN).
    - It would be useful to study which (and how) 5G service requirements can be supported by EPC.
- On the other hand:
  - The 5G CN should also support IOT:
    - Enable the possibility to connect WB-E-UTRAN/eMTC and NB-IoT to 5G CN.
    - Meet the 5G requirements for IOT as defined by SA1, and support in the CN of the RAN requirements.
    - Also, a new CN that provides less features than the existing one is less attractive.

# Qualcomm proposal

- As a standards body, 3GPP should provide full flexibility to operators to evolve their network deployments while providing valuable IoT services.
- **Ultimate goal:**
  - **Both EPC and 5G CN have support for CIoT.**
  - Best of both worlds
    - Operators choosing to deploy NB-IoT/eMTC with EPC/CIoT can leverage their deployment for IOT through natural evolution of EPC, and meet the 5G requirements.
    - Operators that want to migrate to 5G CN to have standardized solutions to provide IoT service via their 5G CN deployment.
- **Timeline:**
  - Both EPC enhancements for IOT and 5G CN Cellular IOT can be studied in Rel-15.
  - Normative work for 5G CN to be completed by Rel-16.
  - EPC enhancements for IOT to be completed by Rel-16.

# Discussion in SA2#120

- Some companies preferred to not “mix” EPC and 5GC enhancements in the same SID
- General preference to not enhance EPC to support mMTC SMARTER requirements
- No conclusion on approach to CloT for 5G CN:
  - Some companies prefer to transport CloT functionality in EPC to 5G CN as starting point.
  - Some companies prefer to start the work for CloT in 5GC “from scratch” i.e. not transport CIOT features to 5GC

# How long will it take approx. if we start CIoT from scratch in 5GC?

- The Rel-13/14 CloT and CloT\_ext, along with features used for C-IoT (AESE, MONTE, GROUPE, eDRX) took **2 years and 9m** (20 SA2 meetings) to complete and approx. **88 SA2 meeting sessions**

	Sessions	Meetings	Period
CloT_ext total	11	5	
CloT total	43.5	12	
Rel-13 IoT others	34	10	
CloT + CloT_ext	54.5	13	
Total	88.5	20	2y 9m

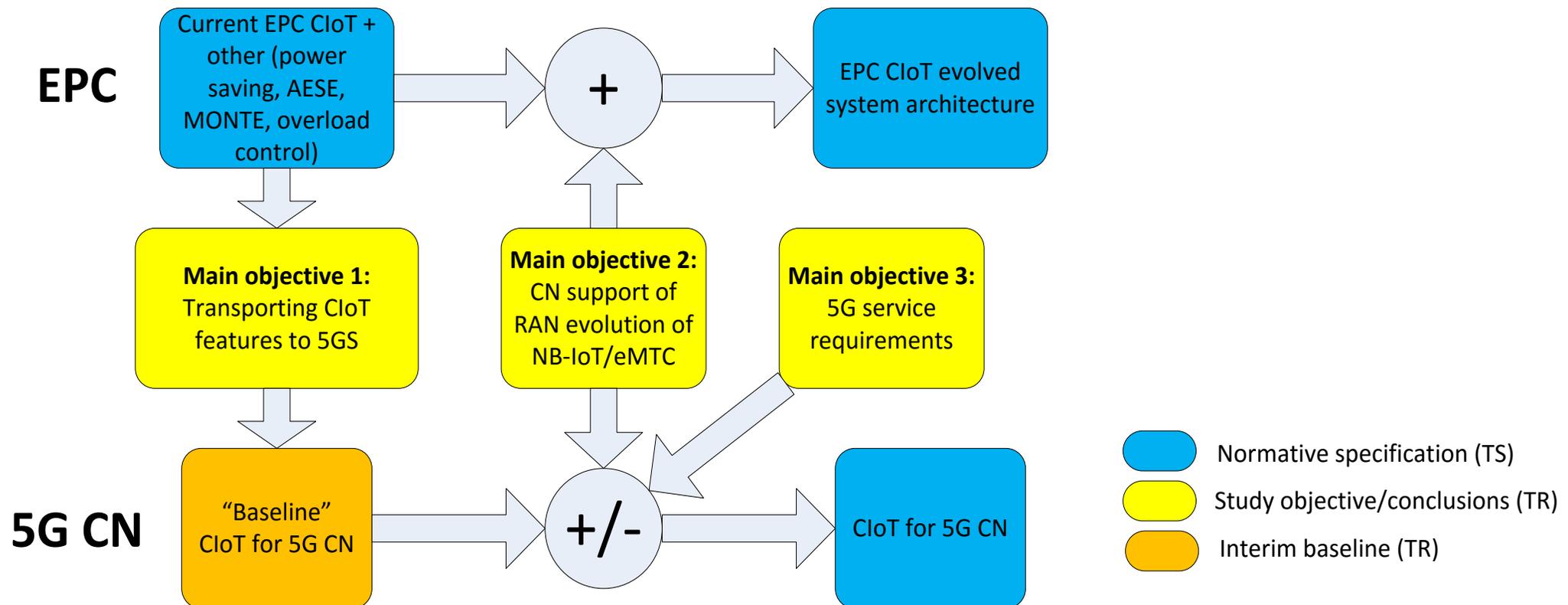
- This excludes functionality supported in EPC from Rel-10 onwards i.e. work on power saving (PSM), overload control, device triggering, etc.
- **Observation:** If we are to study support for CloT on 5GS “from scratch” (clean slate) it will take years and a heavy load in sessions per peeting to achieve the same/similar functionality as EPC.
  - Extremely tasking in terms of resources while important recent 3GPP achievements for IoT go to waste.

# Proposal to achieve the support of CloT in both EPC and 5GC

- Only one SID: Transport CloT to 5CN + study further enhancements for EPC/5G CN together
- **Main Objective 1: Transporting CloT features to 5G CN.**
  - **Quick study** on transporting all CloT features to 5G CN to achieve “Rel-14 parity” with EPC.
  - Meant to be used as baseline for final system solution.
- **Main Objective 2: RAN evolution of NB-IoT and eMTC (as in RP-170732 and RP-170852)**
  - System Architecture requirements caused by RAN evolution are common for EPC and 5G CN.
  - At least:
    - Improved inter-RAT mobility between NB-IoT and WB-E-UTRAN (eMTC) allowing RAN impacts
    - System architecture impacts of early data transmission.
    - Power consumption/latency gain RAN goal requires data to be available for DL transmission with low delay.
    - System architecture impacts of improved access/load control in idle mode e.g. CE-level based access barring (see RP-170732).
    - System architecture impacts of UE differentiation (see RP-170836)
    - System architecture impacts for support of efficient transition between CE mode and non-CE (see RP-170732)
- **Main Objective 3: 5G System enhancements to meet 5G service requirements (based on TS 22.261).**
  - Study gaps of current CloT solution with respect IoT requirements for 5G.
  - Study enhancements **ONLY** for 5G CN.

# CloT evolution objective/outcome chart

- EPC:
  - Conclusions from Main objective 2 provides added functionality to EPC CloT
- 5G CN:
  - Main objective 1 provides a “baseline” for 5G CN at study phase / TR level.
  - Conclusions from Main objectives 2/3 provide a “delta” to baseline CloT for 5G CN



# Benefits of this approach

- Leverages recent knowledge/discussions/conclusions accumulated through multiple releases in the field of IoT.
  - 5G CN feature parity with Rel-14 CloT/EPC can be achieved with relatively minor effort, compared to an open ended discussion which could make 5G CN not get fully up to speed with EPC for IOT, even in Rel-16 timeframe.
- Study on gaps of CloT with respect to 5G IoT requirements is not repeated:
  - No duplicated effort on an already tight schedule.
  - No risk of having incompatible conclusions in separate studies (and therefore no risk of not reaching feature parity for IoT between EPC and 5G CN).

# Example on “CloT Transporting to 5G CN” effort: SCEF

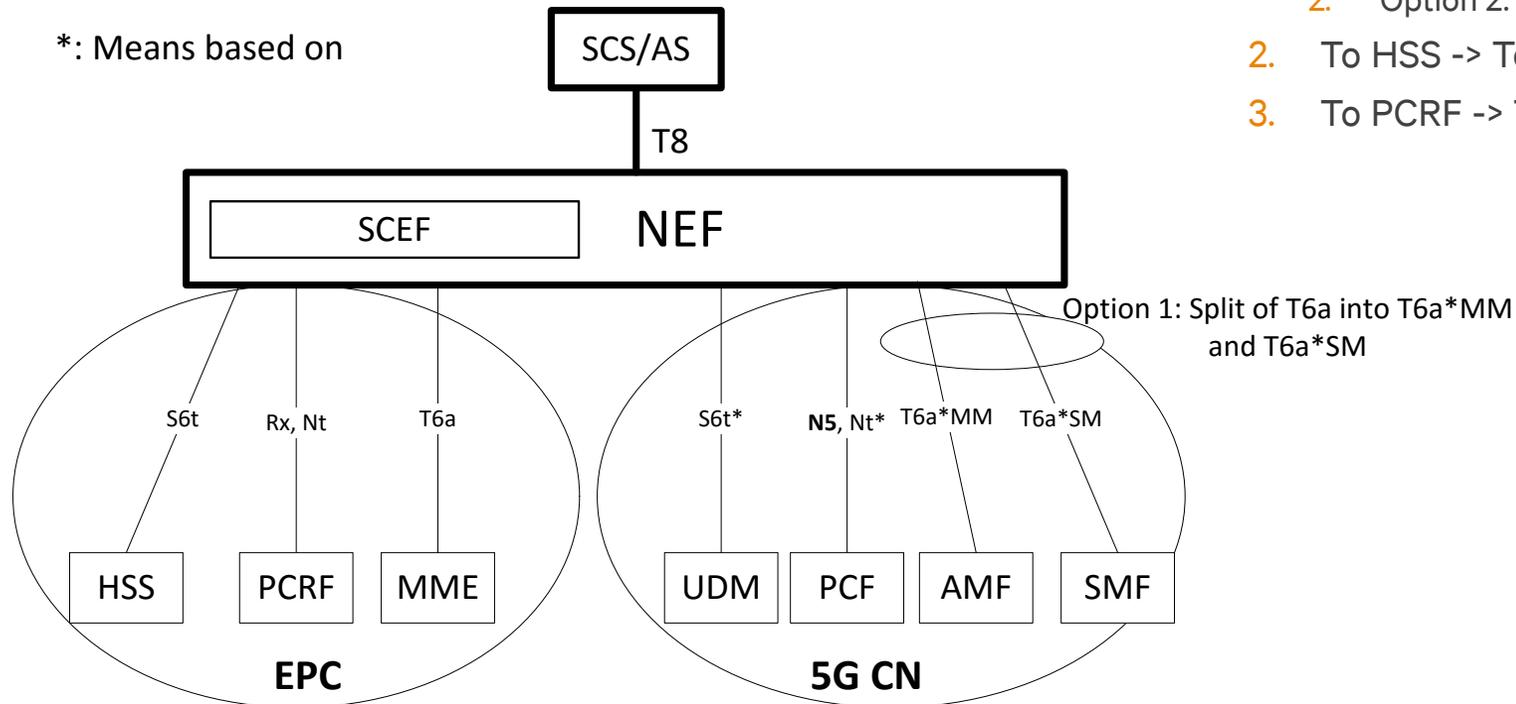
- Goal:

1. Maintain service parity when possible.
2. Adapt architecture/procedures to 5G CN.

- Achieved by:

1. Same SCEF northbound interface (S8) for EPC and 5G CN.
2. Adapt southbound interface:
  1. To MME:
    1. Option1: Split to AMF and SMF
    2. Option 2: Only to AMF
  2. To HSS -> To UDM
  3. To PCRF -> To PCF

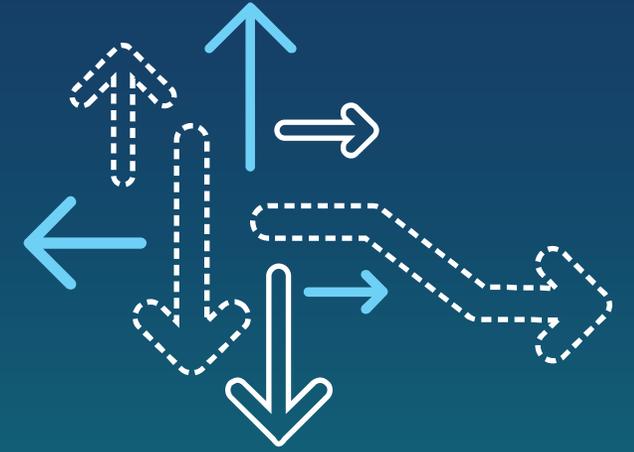
\*: Means based on



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# Annex

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# Rel-13/Rel-14 – CloT related SIDs/WIDs load

		Rel-14			Rel-13											
		CloT_ext (maint)	CloT_ext	FS_CloT_ext	CloT(maint)	CloT	CloT drafting	FS_AE_CloT	eDRX	FS_eDRX	HLCom	FS_HLCom	GROUPE	MONTE	AESE	MTC drafting
	Total	1	4	6	15.5	8	5	15	6	2.5	1	3.5	6	6.5	6.5	2
<a href="#">2017-02-13</a>	SA2#119	1														
	SA2#118BIS															
	SA2#118		2	1.5	1											
	SA2#117		2	2.5	1											
	SA2#116BIS			1	2											
	SA2#116			1	3											
	SA2#115				2.5											
	SA2#114				6											
	SA2#113AH					5										
	SA2#113					3	1									
	SA2#112						2	4	2							
	SA2#111						1	4	1							
	SA2#110AH							4								
	SA2#110						1	3	3		1					
	SA2#109									1.5		0.5	0.5	1	1	
	SA2#108									1		1	1	1	1	1
	SA2#107											0.5	1.5	1.5	1.5	1
	SA2#106											1	1	1	1	
	SA2#105											0.5	0.5	1	1	
	SA2#104												1	0.5	0.5	
<a href="#">2014-05-19</a>	SA2#103												0.5	0.5	0.5	

# Rel-12 IoT related load

## MTCe\_UEPCOP & MTCe\_SDDTE

- Total of 22 sessions between UEPCOP (power saving) and SDDTE (small data and device triggering)

	Rel-12		
	MTCe_UEPCOP	MTCe_SDDTE	CN assistance
Total	8	14	1
SA2#102			1
SA2#101			
SA2#100	2	1	
SA2#99	1	1	
SA2#98	1	2	
SA2#97	1	2	
SA2#96	0	3	
SA2#95	1	2	
SA2#94	1	1	
SA2#93	1	1	
SA2#92	0	1	

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# Thank you

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