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The bridge to possible

5G Core Evolution

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BRKSPM-2002

Agenda

- 5G Use Cases & Technology Enablers
- 5G Network Function Architecture
- 5G Deployment Models
- 5G Core Introduction and Migration from EPC
  - Subscriber Data Management, Policy, Charging Evolution and Migration Considerations
- Conclusion

There has been a lot of hype around 5G ... are we there yet?

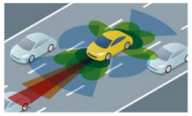
5G: New Uses Cases, New Requirements

Throughput

Latency

Densification

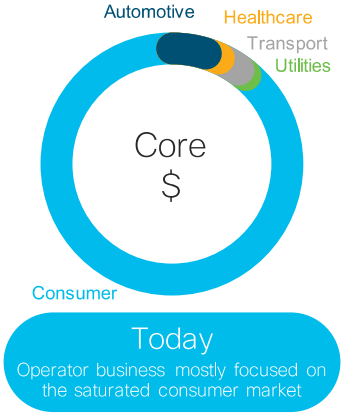
FWA
- 5G-Only
- No Mobility
- >4Gbps



V2X
- 4G/5G
- Ultra Reliable
- Low Latency

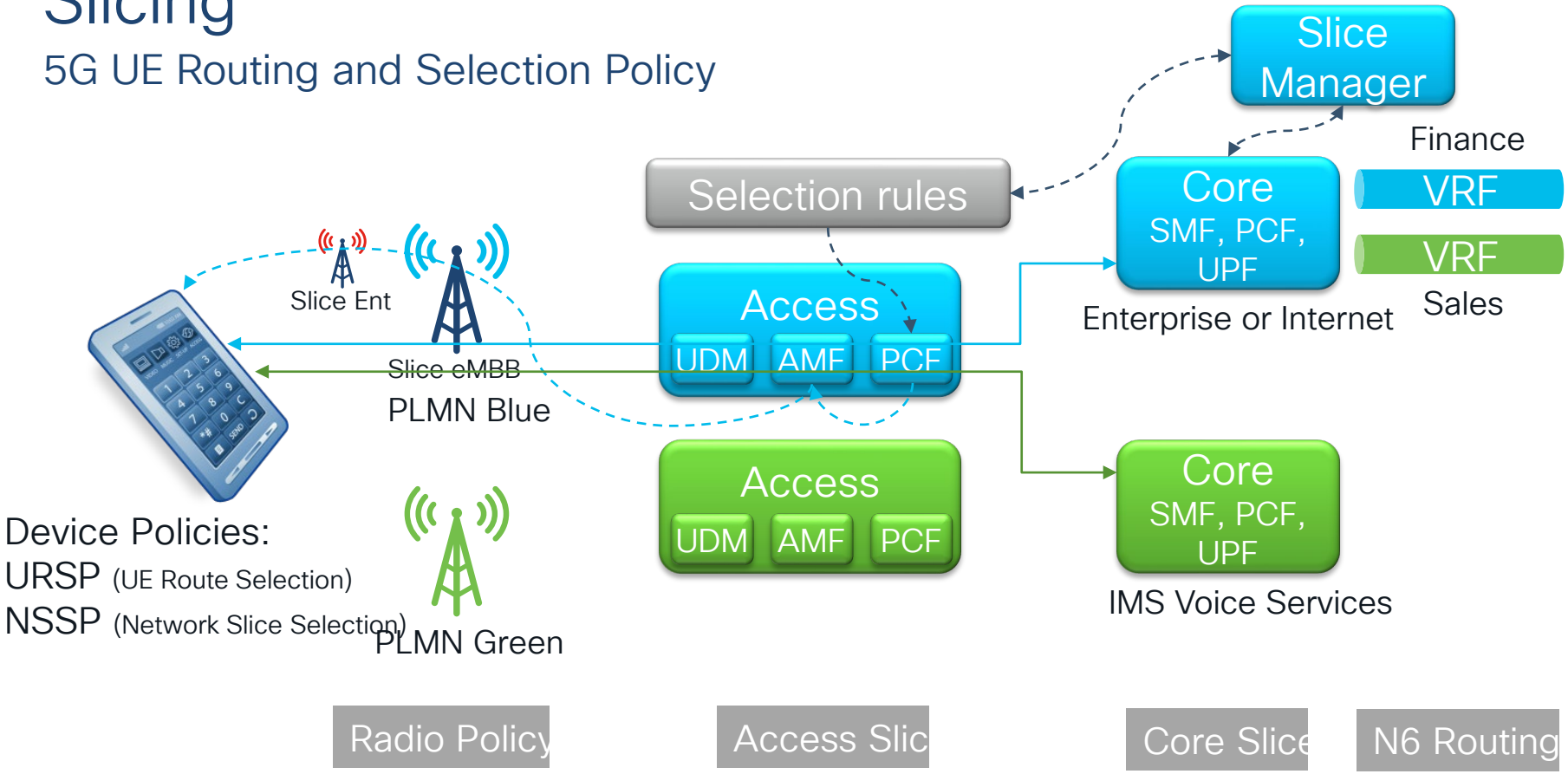
Mobile Internet
- 3G/4G/5G
- Mobility & voice
- 1-2 Gbps

Robotics/VR
- 5G & Limited Mobility
- High Data Rate
- Very Low Latency



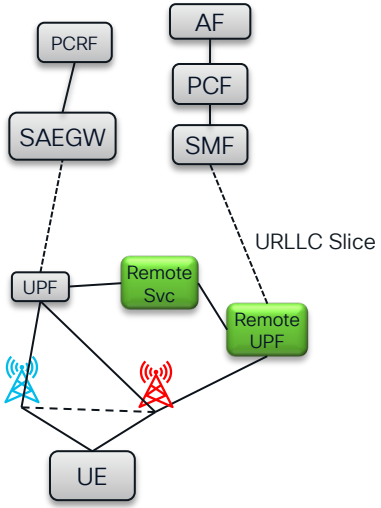
Slicing

5G UE Routing and Selection Policy



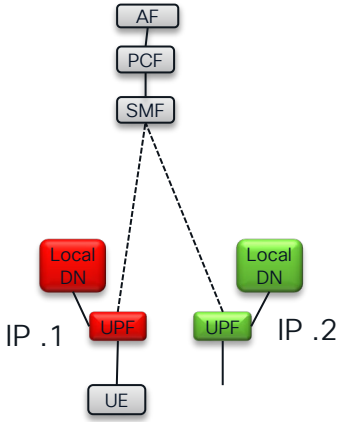
Edge access 5G core tool kit

URLLC Slice



Partially Possible with NSA

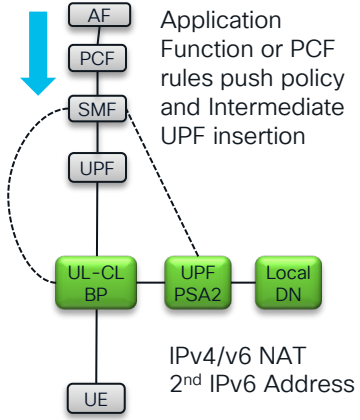
SSC modes 2,3



Session and Service Continuity

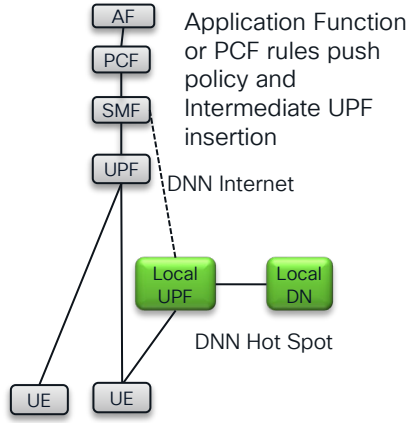
- Break then Re-make
- Make before Break

UL CL/BP



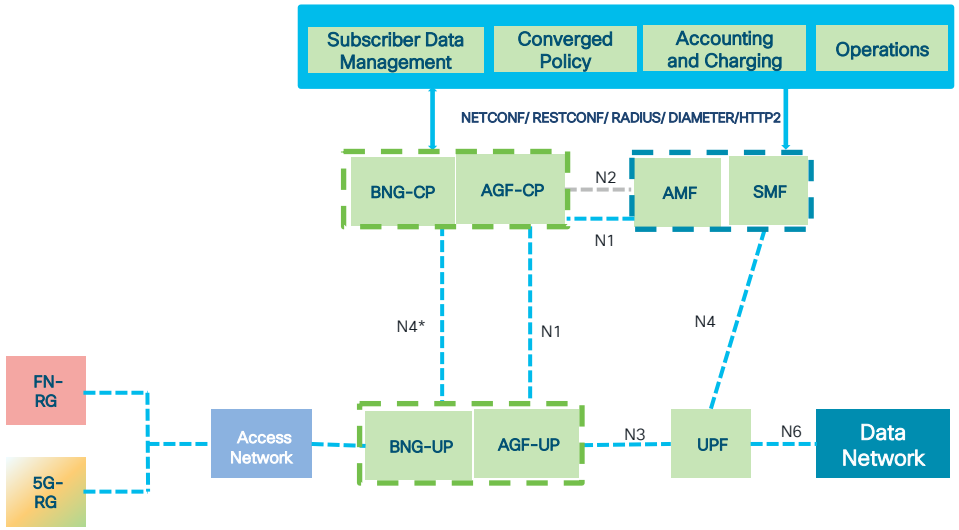
- Uplink Classifiers (ACL)
- Branching Point (IPv6 Multi homing)

LADN

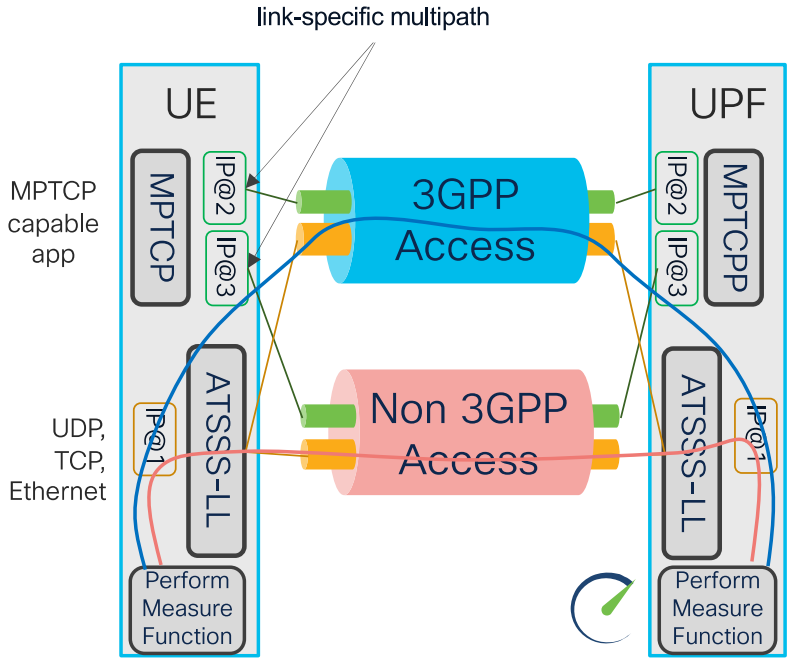


Local Access Data Network
Area based DNN

Fixed Wireless Access Convergence



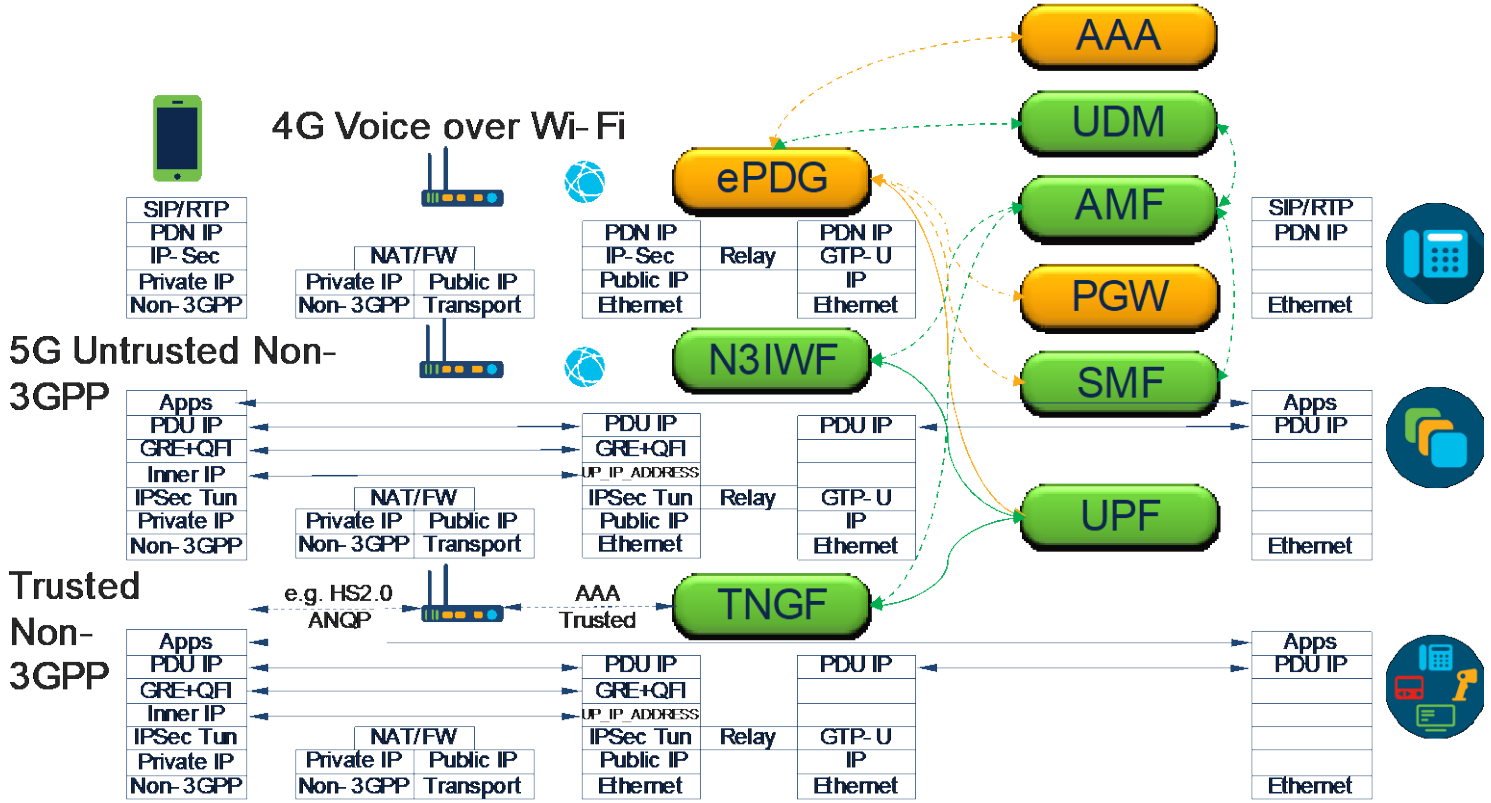
Subscriber Management Convergence



Simultaneous Access Technologies

Convergence

Wi-Fi Access Options



Programmable NFs with full network automation key to supporting 5G Use Cases

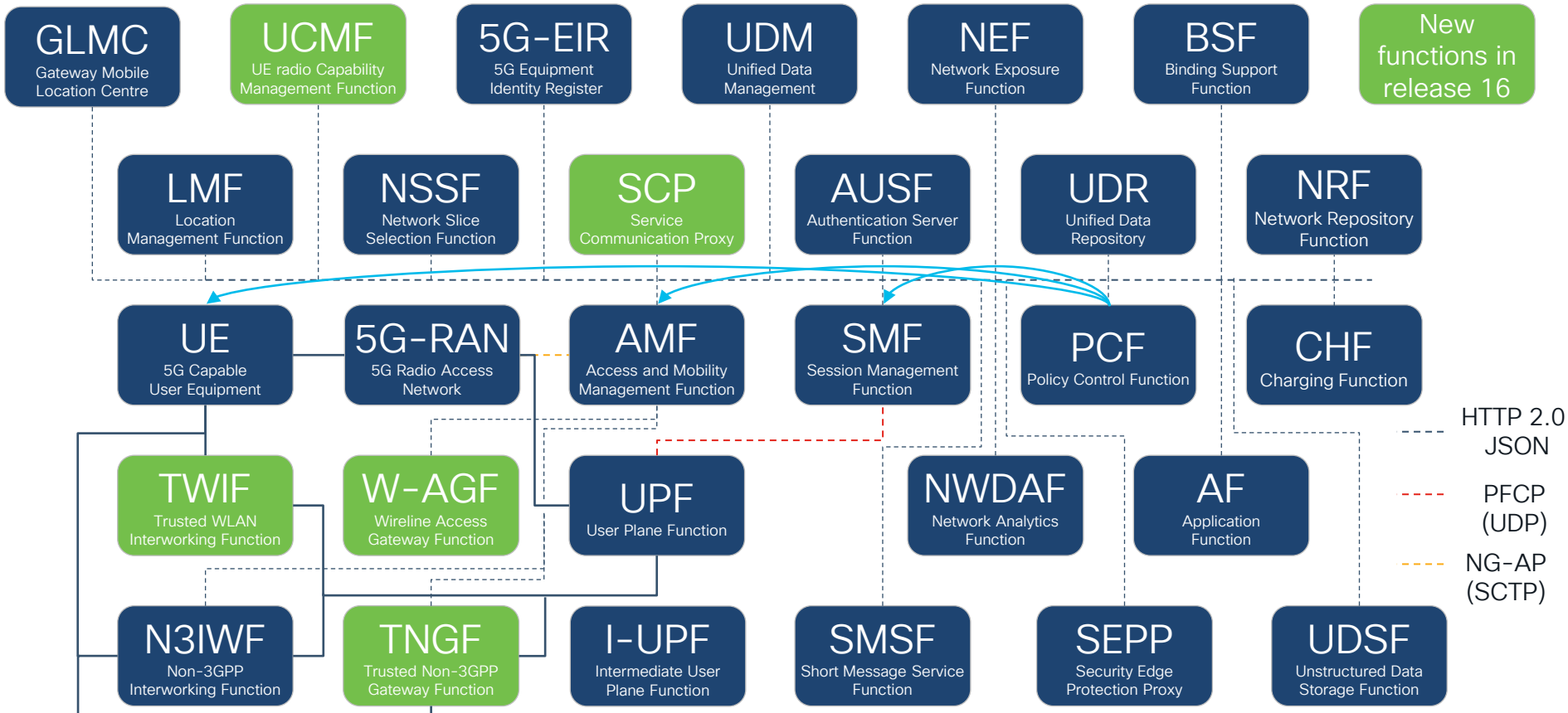
- Modular and extensible Service Based Architecture
  - Web-scale model
- Plug & Play connectivity framework between NFs
- End-to-end orchestration and assurance

“Mobility is 25 years old; we need a mobile network that can be run by millennials”

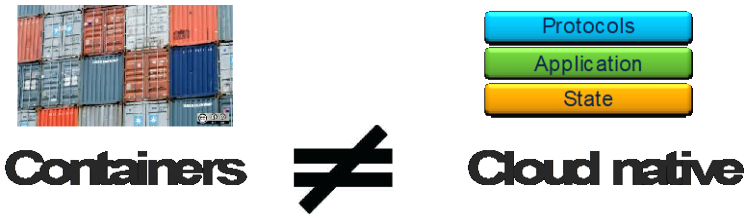
Network Director

Tier 1 Provider

5GC Network Function Overview

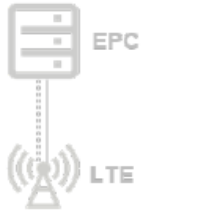


5G Core Architecture



- Cloud-native is a philosophy for architecting applications
- Kubernetes was designed for generic application workloads
  - Network applications have unique requirements for performance, connectivity, scale and redundancy

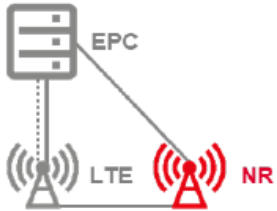
5G Deployment Models



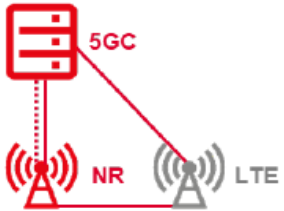
Standalone LTE under EPC (option 1)

Standalone NR under 5GC (option 2).

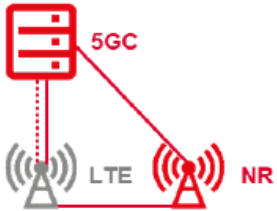
Standalone LTE under 5GC (option 5)



Non-standalone LTE and NR under EPC (option 3)



Non-standalone NR and LTE under 5GC (option 4).



Non-standalone LTE and NR under 5GC (option 7)

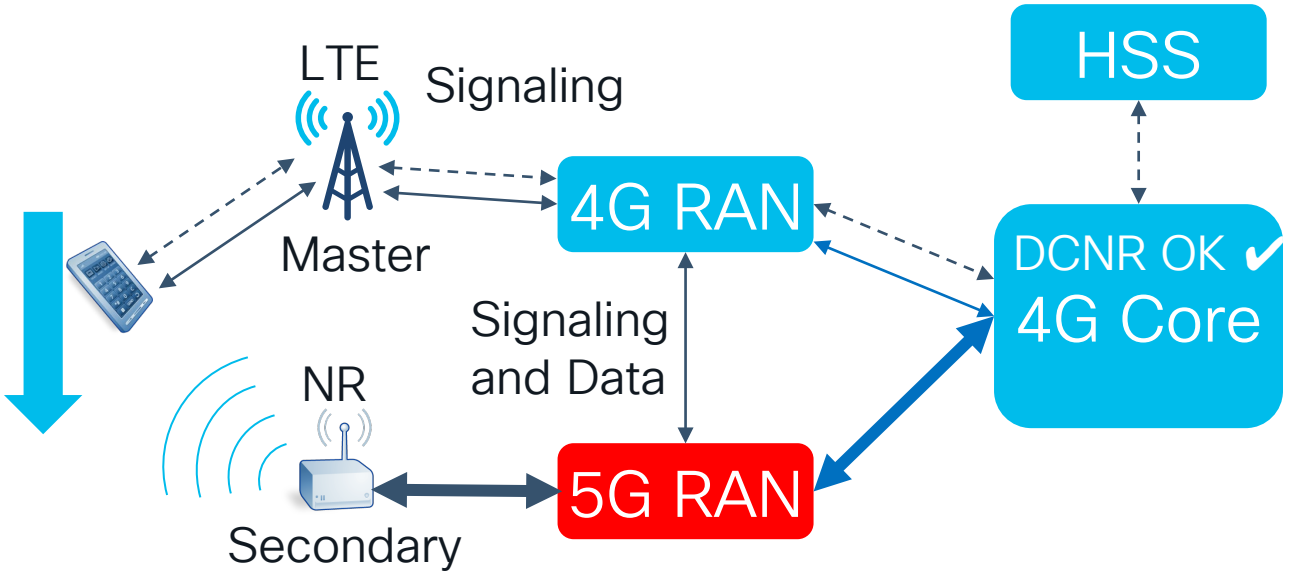
Source: GSMA

Non-Stand Alone = 5G with 4G EPC Help

NSA capable UE attaches and is allowed to use NSA

UE moves, sees good 5G Signal and tells eNB

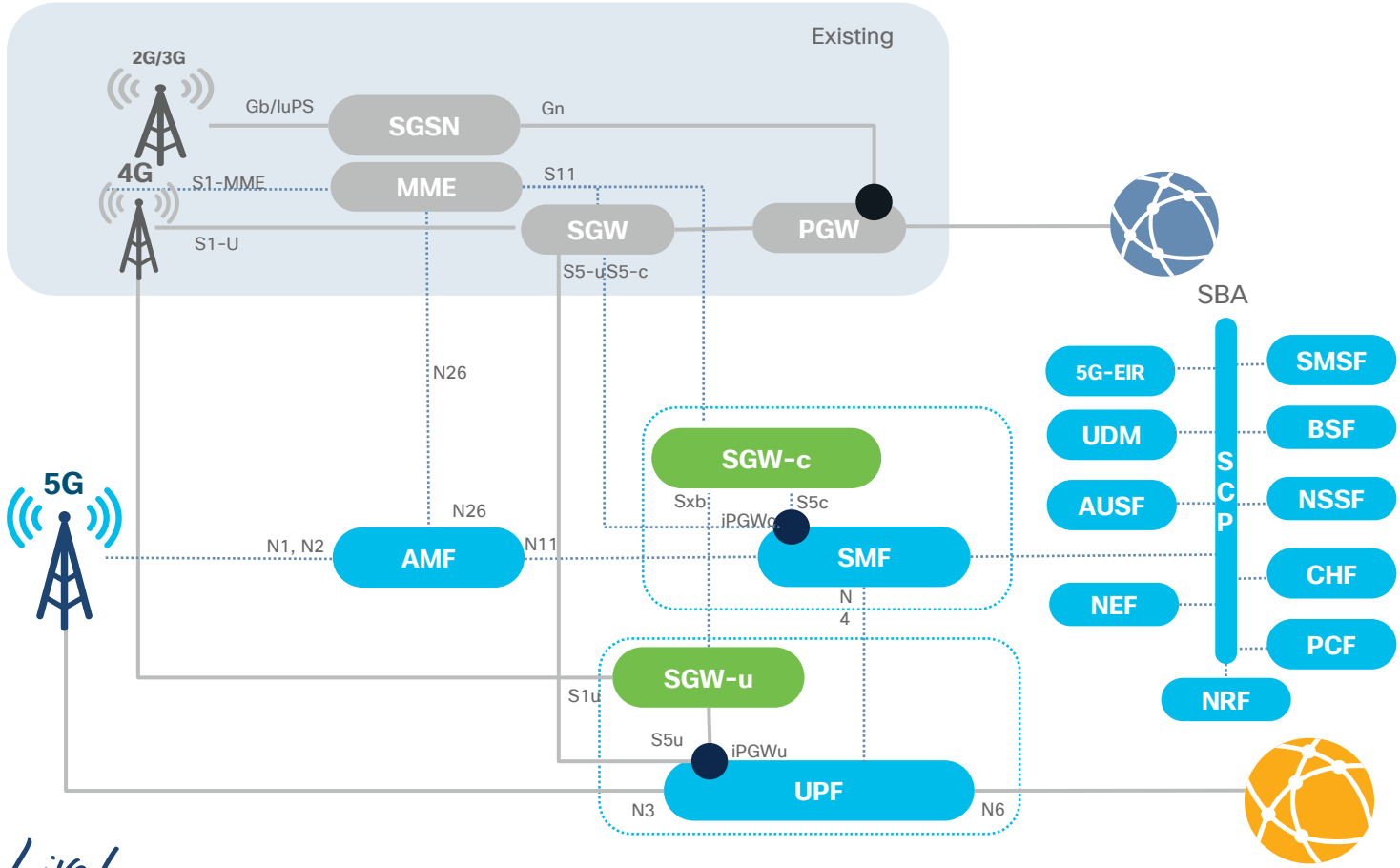
eNB moves data path to 5G radio



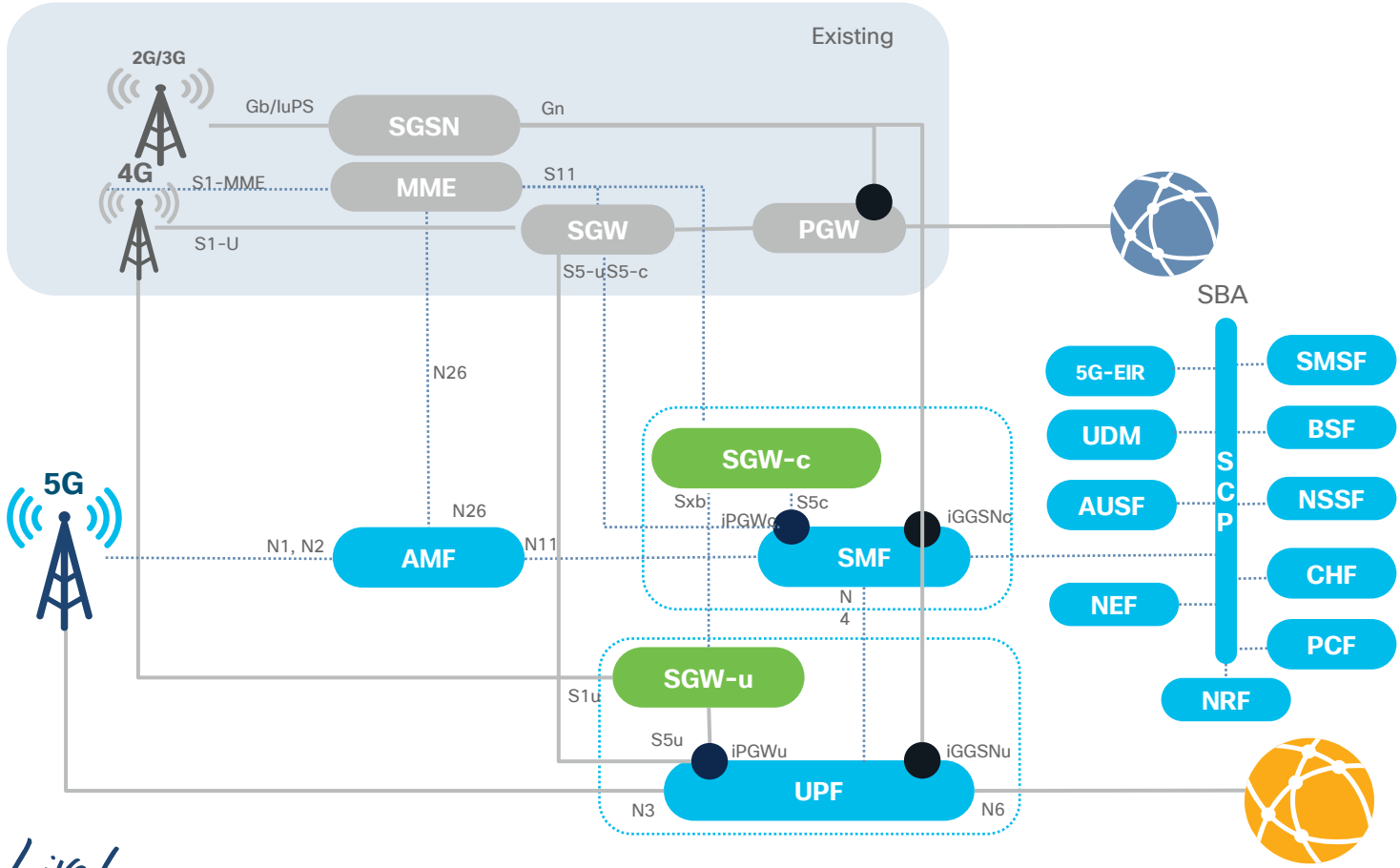
FR1 Sub6 (e.g. 3.7GHz)
FR2 mmWave (e.g. 28GHz)

RAN: Radio Access Network
HSS: Home Subscriber Server (User DB)
DCNR: Dual Connectivity New Radio

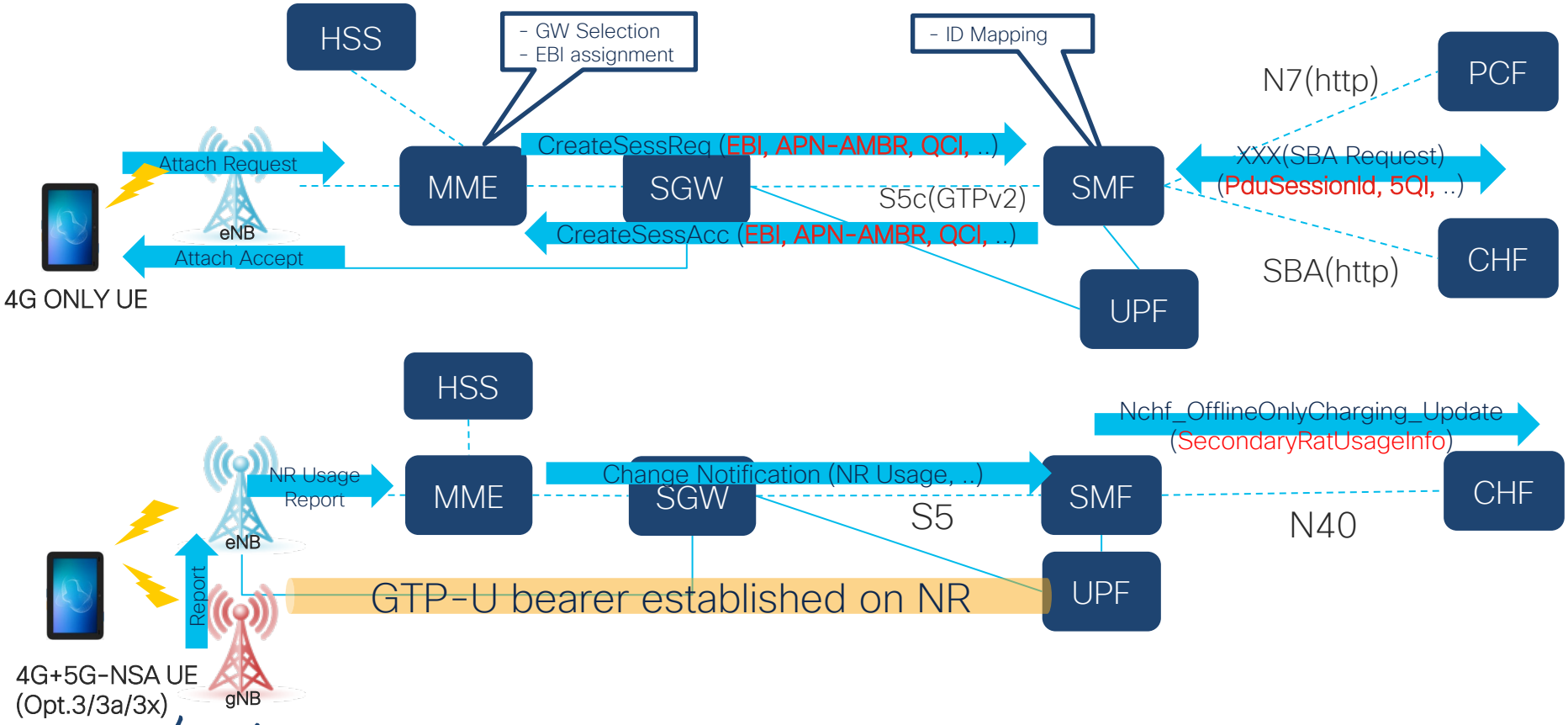
5G SA Overlay Deployment



5G SA Overlay Deployment: 2G/3G Support



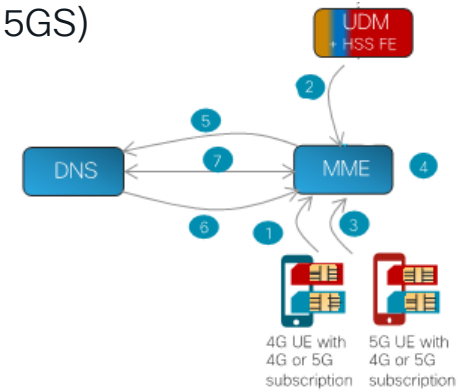
4G+5G-NSA UE Support on SMF/UPF



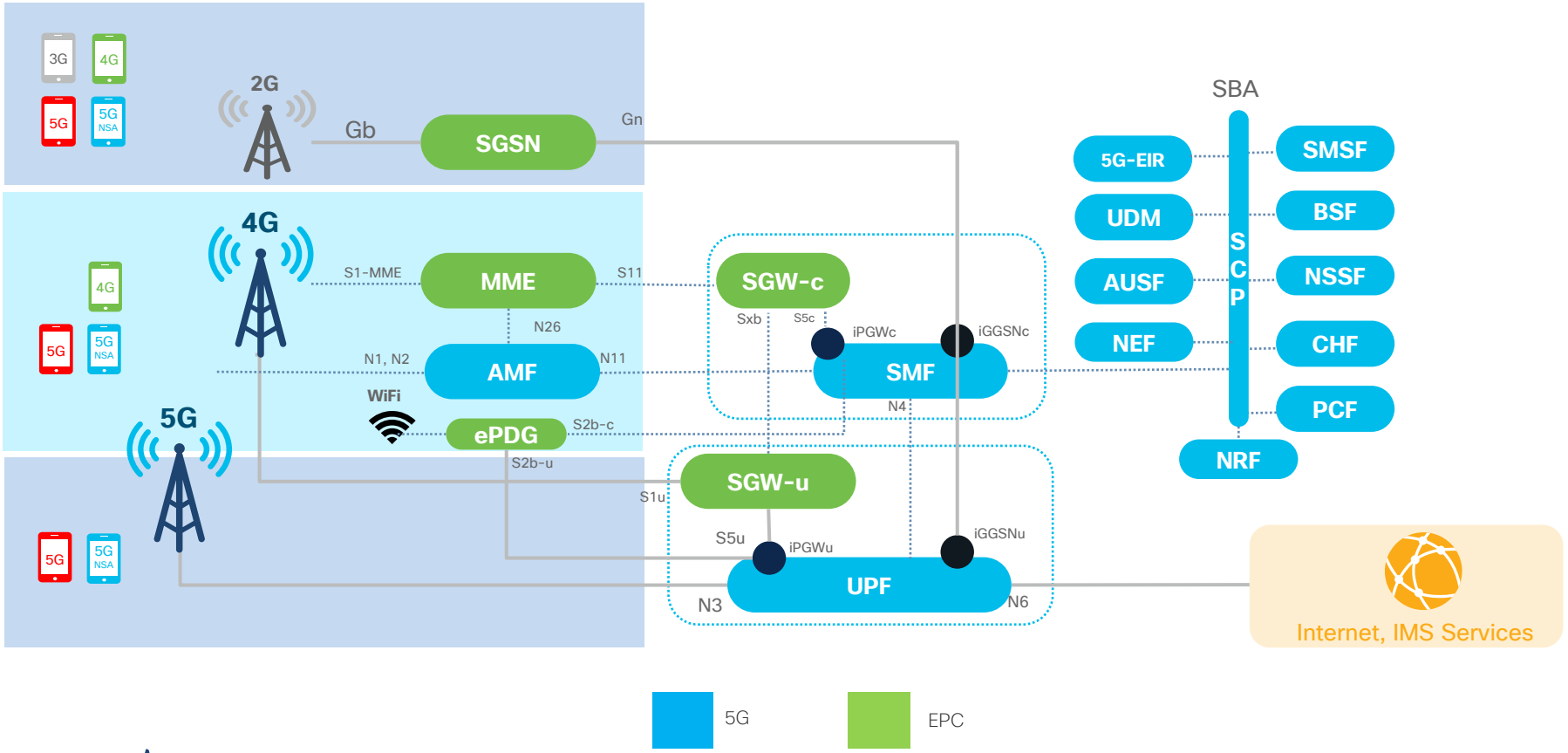
MME Node Selection – Common Scenarios

Scenario	UE 5GC NAS Capability	Core-Network-Restrictions (ULA)	Interworking-5GS APN-Configuration	MME Policy	DNS Request	5GSIWKI	5GCNRS	5GCNRI	PGW or SMF
	From UE	From HSS		Local	Local policy	On S11			PGW/ SMF
1-4	Yes or No	5GC not allowed	SUBSCRIBED or NOT SUBSCRIBED	No	PGW	0	1	0	PGW
5	Yes	5GC allowed	SUBSCRIBED	No	SMF (nc-smf)	1	1	1	SMF
6	Yes	5GC allowed	NOT SUBSCRIBED	Operator Policy	SMF or PGW	0	1	0	SMF or PGW
7	No	5GC allowed	SUBSCRIBED	Operator Policy	SMF (nc-smf)	0	1	1	SMF
8	No	5GC allowed	NOT SUBSCRIBED	Operator Policy	SMF or PGW	0	1	0	SMF or PGW

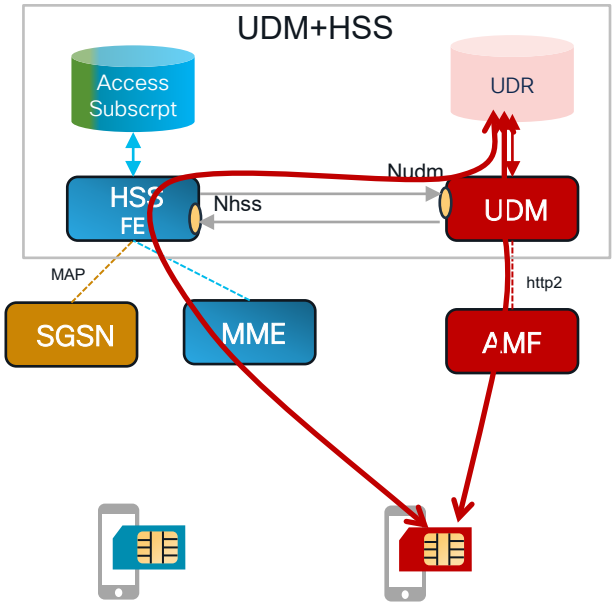
- 8 Scenarios (UE Capability/Core-Network-Restrictions/Interworking-5GS)
- MME Operator Policy
- DNS has two entries for S5-C, one for SMF and one for PGW-C
  - If SMF selected: DNS Query: x-s11c-gtp+nc-smf
  - If PGW-C selected: DNS Query: x-s11c-gtp
- MME selects SMF or PGW-C from DNS response



Target Any-G Architecture

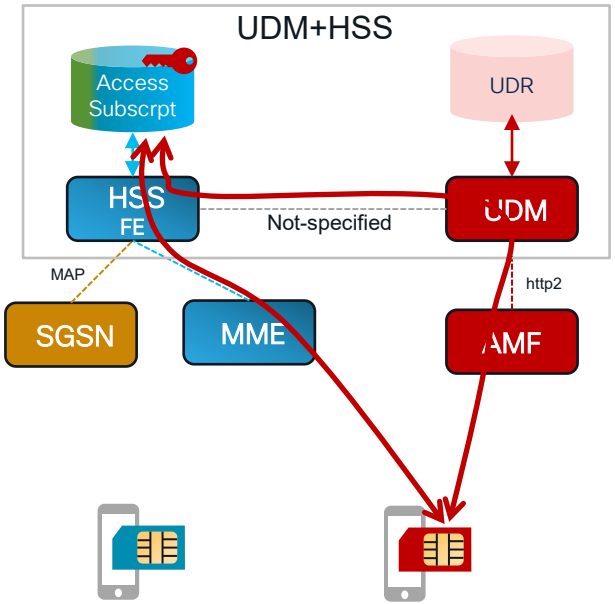


SDM Evolution – HSS-UDM Interworking



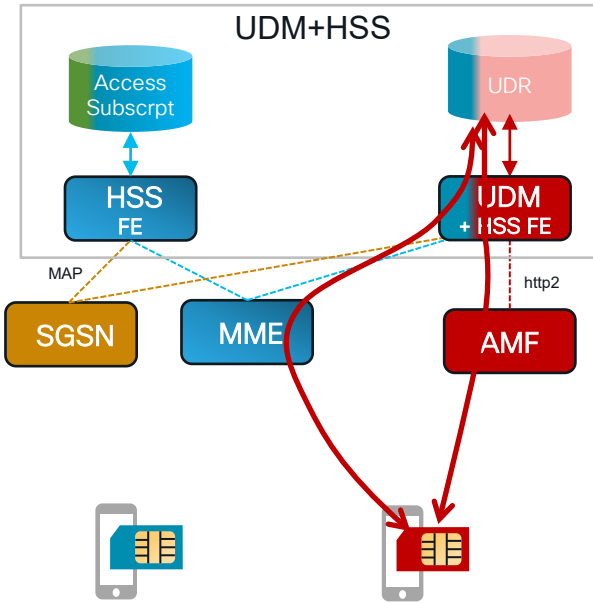
Solution #1: HSS Support SBI

Specified in 23.632



Solution #2: 5G Key in 4G UDR

Recommendations in 900 series TR

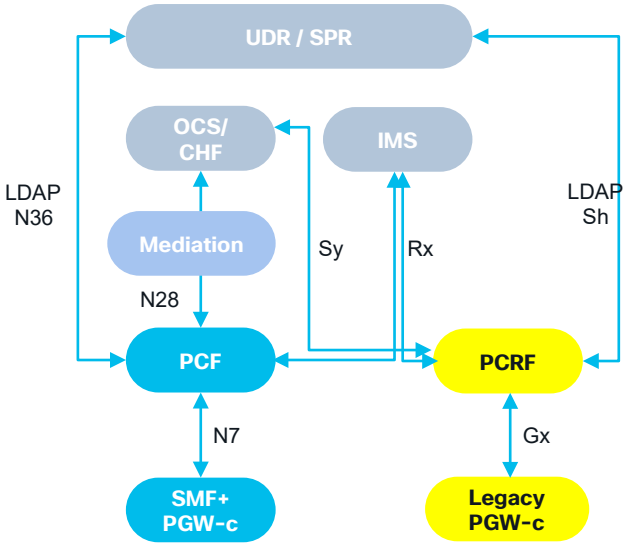


Solution #3: UDM+HSS FE

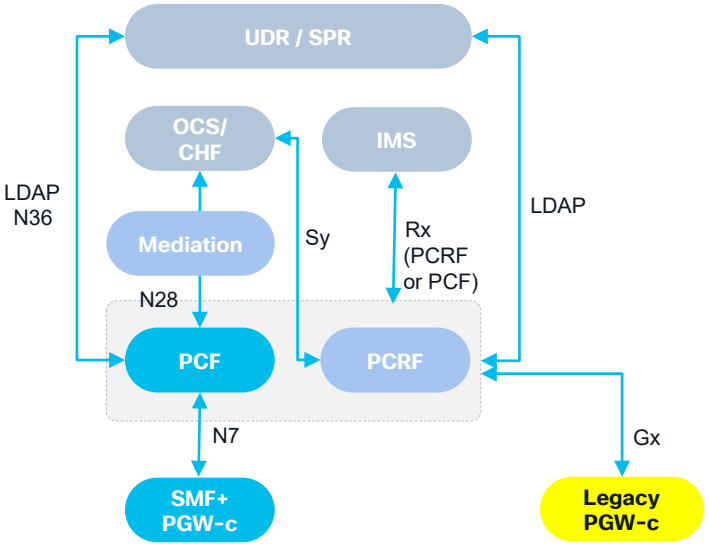
Recommendations in 900 series TR

Policy Evolution

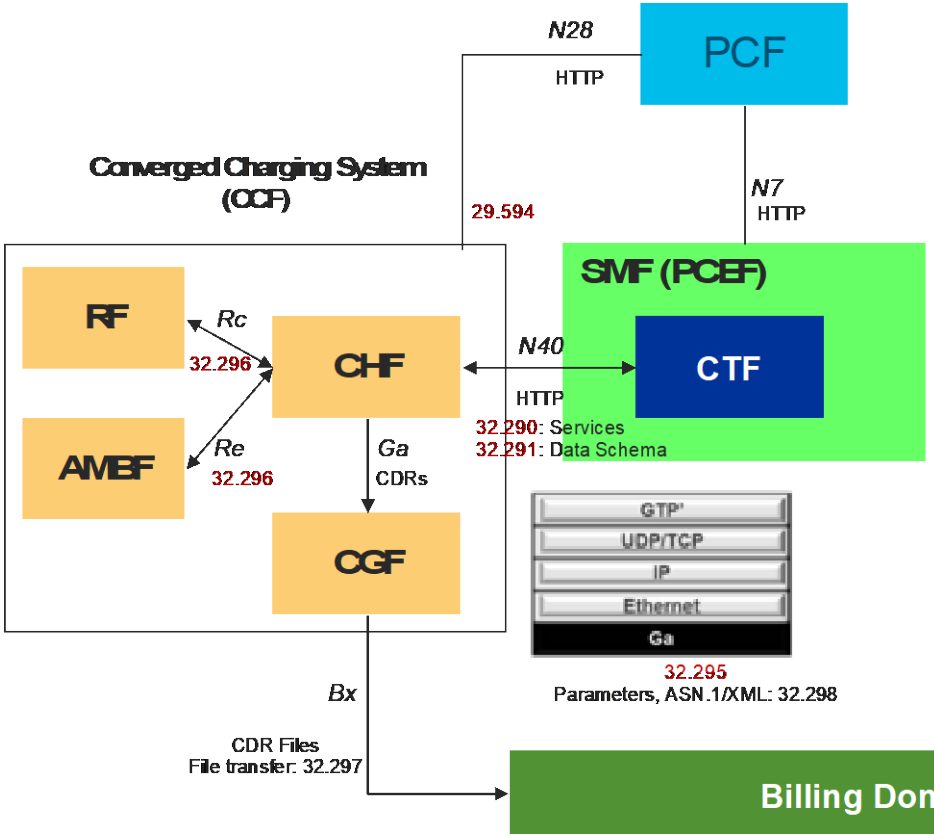
5GC Overlay

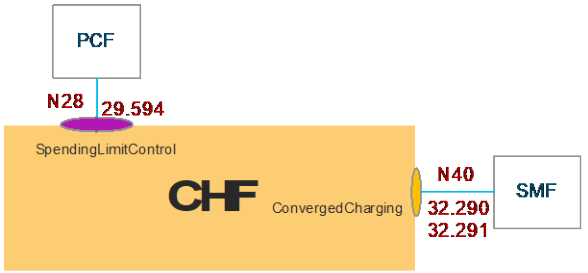


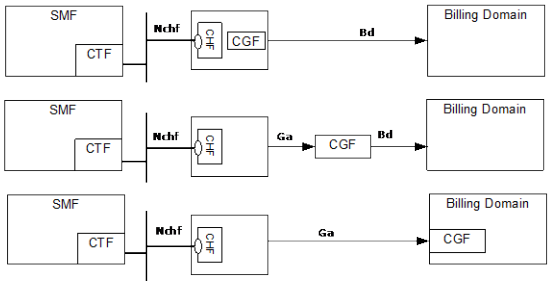
2G/3G/4G/5G NSA Migration



Charging Evolution

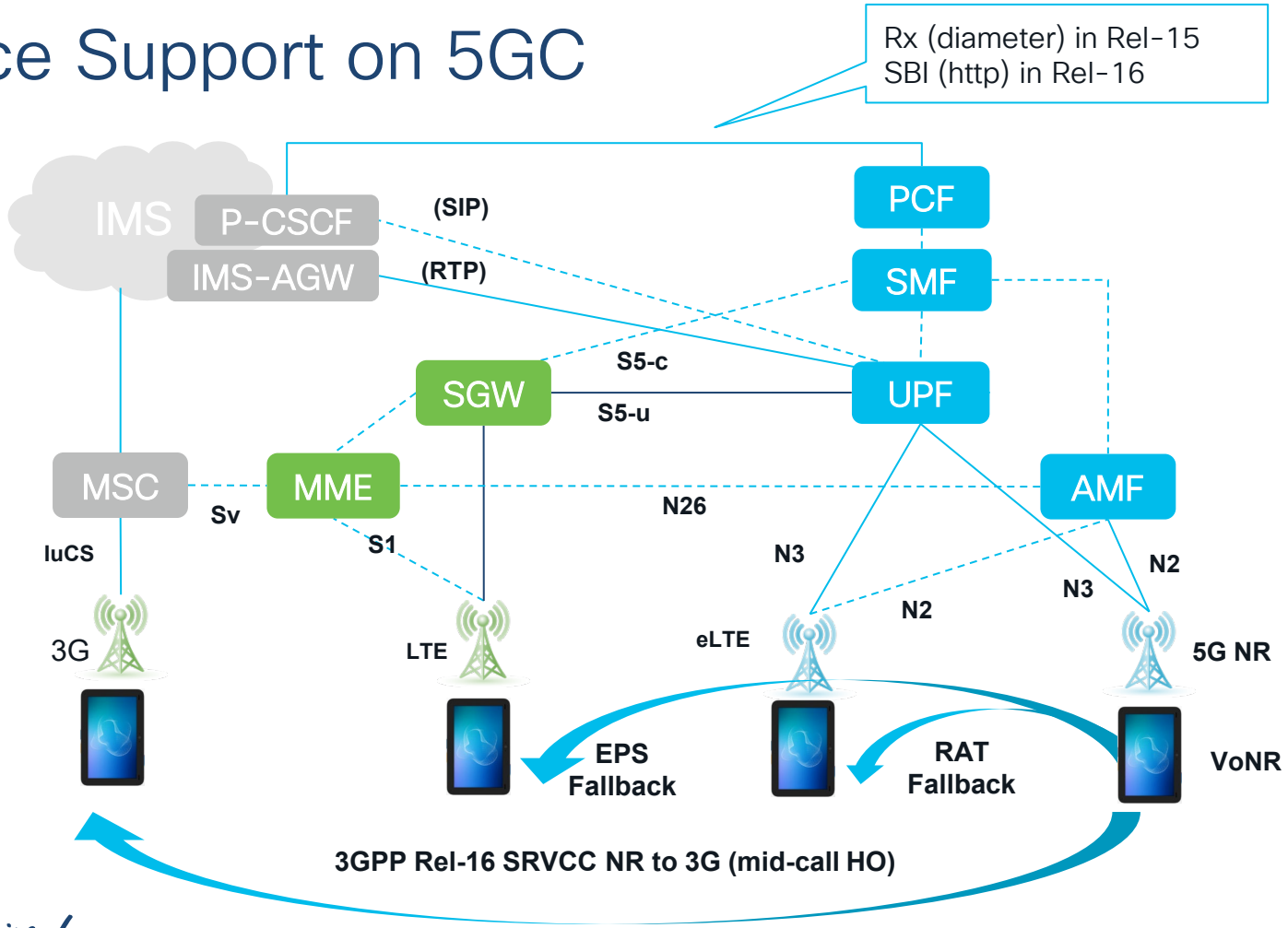






CHF	CHarging Function
CGF	Charging Gateway Function
RF	Rate Function
AMBF	Account Balance Management Function

Voice Support on 5GC



Conclusion

- 5G Core addresses EPC shortcomings to enable a wide range of new Use Cases with divergent requirements on a common infrastructure
- Cloud-native architecture as enabler for programmable NFs / network automation
- Service mapping analysis critical as part of traffic migration to new 5GC -> trade-off between complexity and legacy service equivalence
- Impacts on SDM, Policy, Charging also key to defining migration path

Continue your education

Demos in the Cisco campus

Meet the engineer 1:1 meetings

Walk-in labs
Related sessions:
Cloud Native 5G Packet Core - BRKSPG-2026
Orchestrating 5G End-to-End - BRKSPG-2018

The bridge to possible

Thank you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