5G NSA TOPS enhancements

Architecture Direction Document

V1.0

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Topics

- 5G NSA Launch Scope 2019
- 5G NSA TOPS Architecture
- 5G TOPS enhancements
- EA Blueprint
- 5G Deployment timeline
- Project dependencies
- Operational impact
- Open questions

5G NSA - Launch Scope

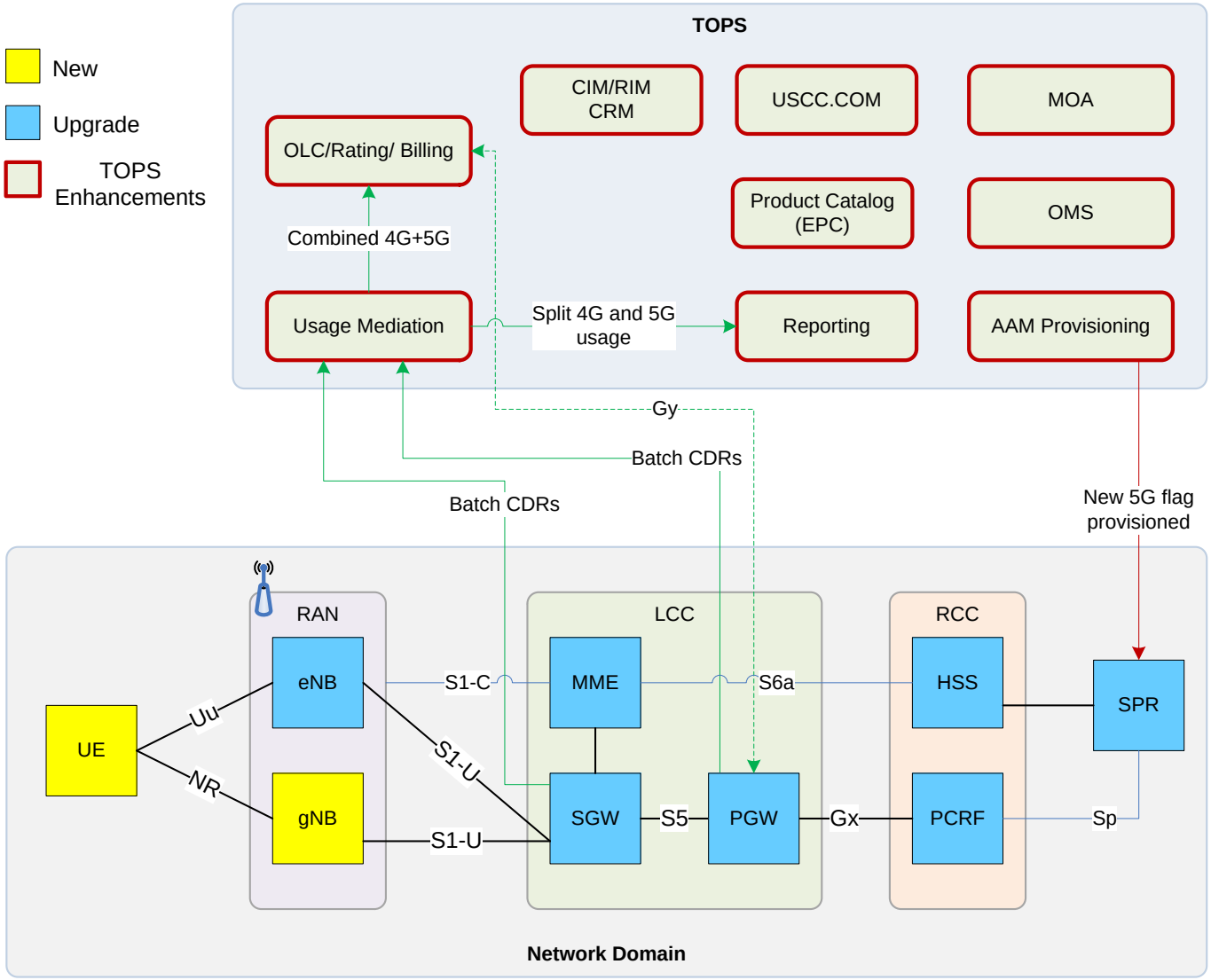
In Scope

- Network enablement in Year 1 markets (Iowa and Wisconsin)
- New TOPS functionality to support 5G provisioning and Usage processing
- Launch of new 5G enabled devices (multiple platforms and device types)
- Operational readiness to support the new technology and any new/updated processes
- Marketing communications (both PR and customer messaging)

Out of Scope

- New 5G-specific pricing structures
- mmWave and CBRS enablement in network and devices
- 5G roaming
- QPP support on 5G
- 5G Prepaid
- Specialized use cases (smart city, network slicing, etc.)

5G NSA – TOPS Support Architecture



5G NSA – TOPS enhancements

- TOPS will support 5G NSA (option 3X) with enhancements to existing systems:

Impacted Systems

•Sales and Provisioning systems

•Charging systems – postpaid and prepaid

•Mediation

•Reporting

The cost and complexity of delivery will vary depending on the following key requirements and business direction provided below.

1.Will 5G be provisioned at the network for all subscribers by default, or we will offer the ability to provision and control 5G by market, device, or subscriber?

- *Individual Subscriber Provisioning will be required (Engineering Decision)*

2.Should we be able to limit 5G to specific devices/ markets and allow MOA to manage 5G service?

- *Limit 5G to specific devices and Markets and allow MOA (Engineering Decision)*

3.Is it a Marketing requirement that new 5G plans be launched when we deploy 5G?

- *No new 5G plans will be required (Marketing Business Decision)*

4.If new 5G plans are required, does 5G data need to be treated separately from 4G?

- *Depends on the business requirements. Right now we haven't heard that they need to treated differently. If we need to then there will be new AVPs (attributes) for NR usage reporting. (Engineering Direction)*

5.Do we need visibility to how much 5G usage is consumed by device or subscriber?

- *Depends on the business requirements however we can always monitor usage consumed by these devices from network and CDRs. (Engineering Direction)*

6.With 5G NSA deployment, upgrades to core network elements (S/P GW, and HSS) are anticipated. Will the upgrades impact the existing interfaces AAM – Network?

- *There will be changes to the HSS Schema (NR Access Restriction fields) and S-P/GW CDR fields but we don't anticipate changes to the AAM/1NDS interface. (Engineering Direction)*

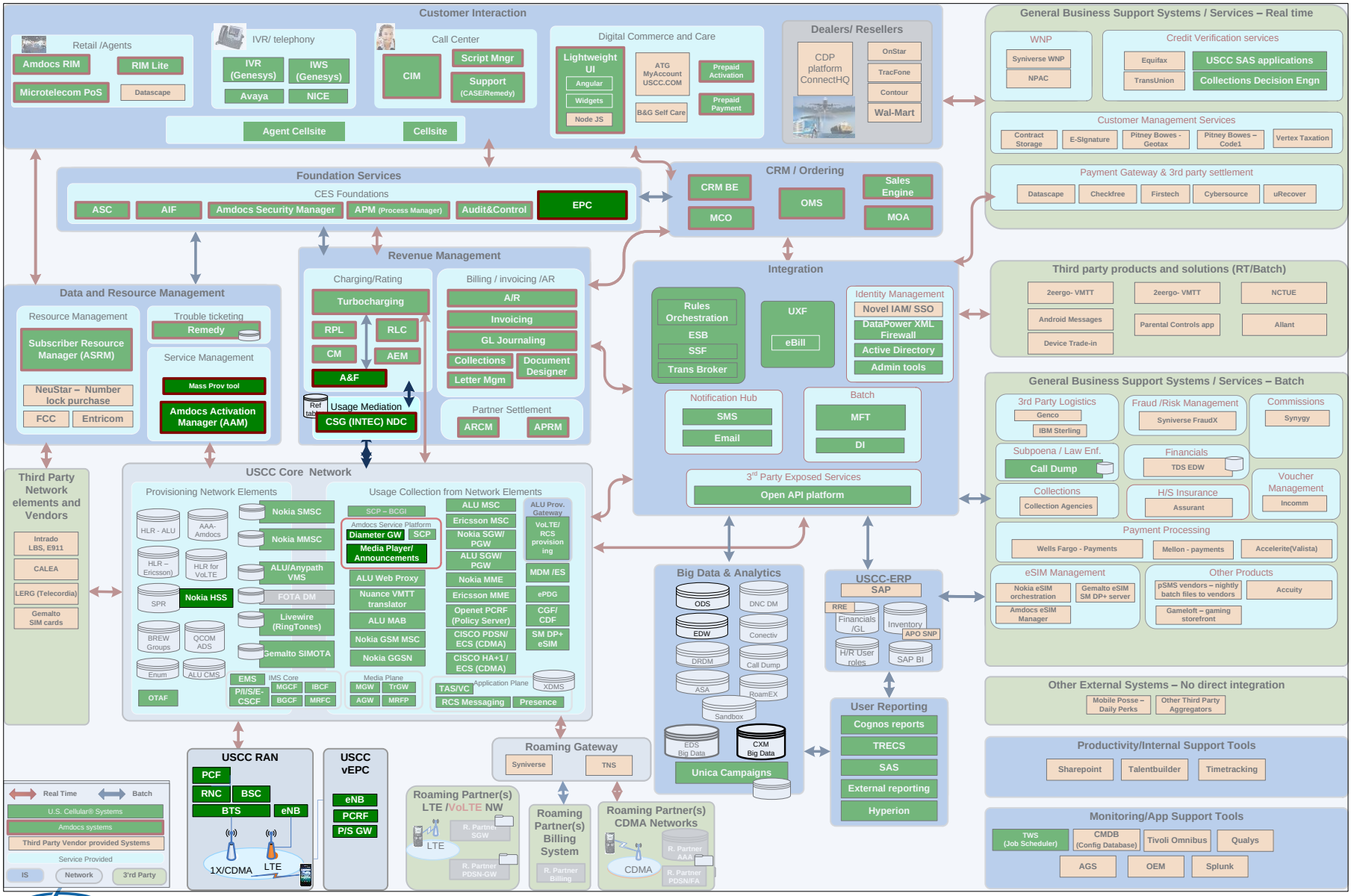
7.Will the existing OLC interface to Network (Gy) need to change for 5G, after network upgrades ? (Assuming no new prepaid plans)

- *We need vendor design detail specs to assess this. Specs anticipated in January '19 (Engineering Direction)*

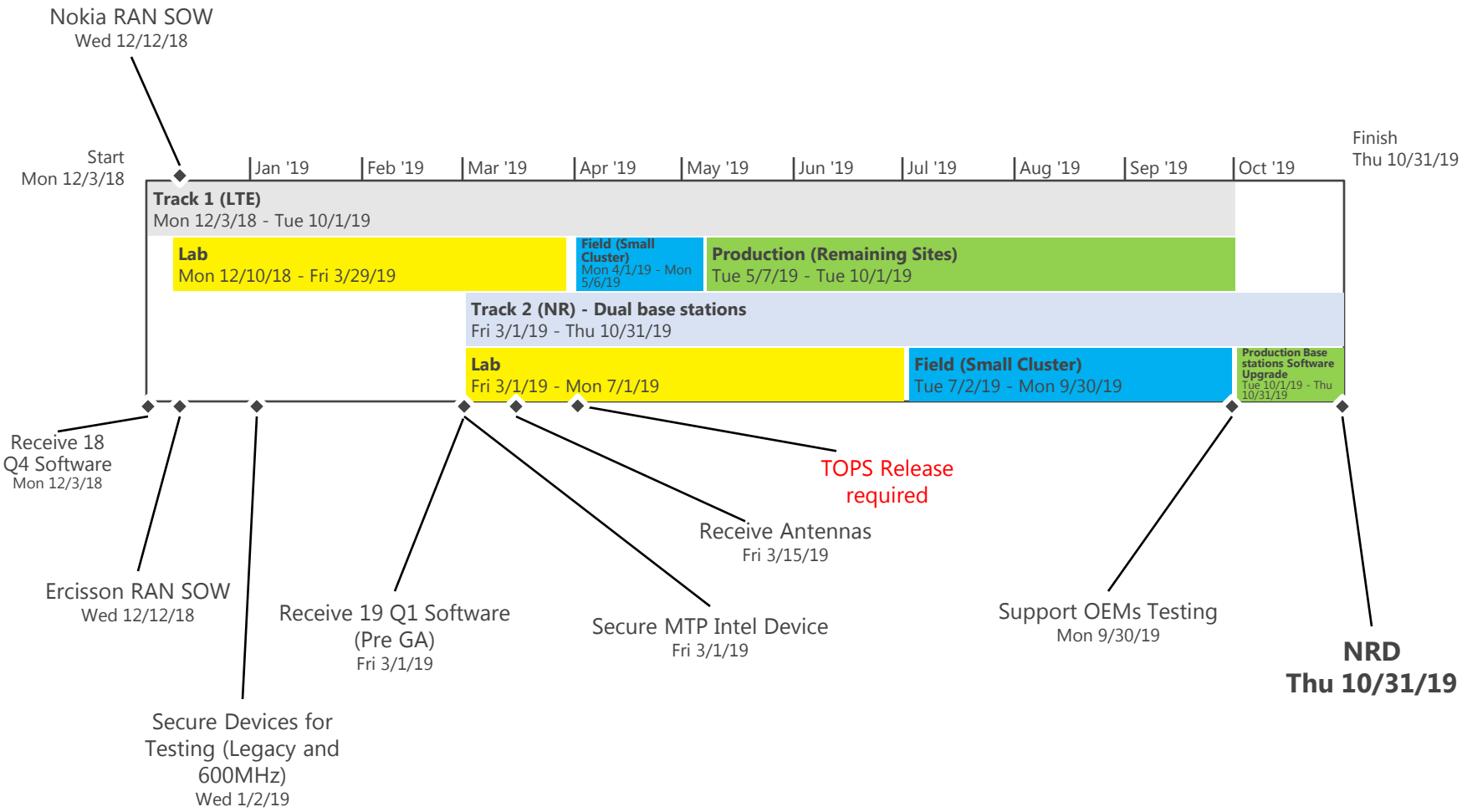
5G NSA – TOPS enhancements (Cont)

Tops Module	Impact
OMS	Enhancements to provision NEW 5G flag in HSS
AAM	Enhancements to provision NEW 5G flag in HSS
EPC	Creation of new "simple product spec" for 5G devices, and creation of a new device attribute (5G capable).
Mediation	Receive new combine 4G/5G usage from P/S GW and separate 4G usage from 5G usage using RAT parameter. Currently P/S GWs create 4G CDRs. The same P/SGWs will produce CDRs with combined 4G and 5G usage for a given session. VoLTE usage will remain as it is currently using 4G only. In addition, testing will be required when the enhanced core is available in the lab to ensure that legacy 4G CDRs are processed properly (includes legacy Gy Interface for LTE).
CIM/RIM	Creation of a new flag to Enable or Disable 5G. Provisioning the 5G flag can be automatic if the device is 5G capable. A market check (edit) will be in place to ensure 5G is enabled in launch markets only, and support FUT by allowing role based access to the market check
MOA	Prepare MOA to allow mass provisioning or de-provisioning of 5G subscribers, leveraging the new 5G enablement flag in CIM/RIM
Reporting	Depending on the detail reporting requirements, 5G usage must be separated from 4G usage. Mediation will make this separation and the system to process this usage will depend on the detail requirements.
CXM	CXM will be the likely target to process separated 5G usage and create such reports as how much usage a subscriber with 5G device is using. It should be noted that 5G usage will not be visible to TOPS as all usage is combined as 4G+5G usage
WeDo reporting	An attempt will be made to minimize impact to WeDo Rev Assurance tool by keeping the WeDo feed as pure KB usage without separation of 4G vs 5G CDRs. The same principle will be adopted when sending usage to TOPS. TOPS usage will be combined 4G+5G Kb in the UFF records
DANE	Additional planning and alignment with DANE will be required to ensure user experience is maintained or exceeds previous 4G experience. The Profiles provisioned through DANE must be aligned with the new QCI configurations for the 5G network.
Turbocharging	Validation will be required when the enhanced core is available for test. We need to ensure that the Gy interface to the P/SGWs remains intact.
Intra-company reporting	Although this is not in scope at this point, a likely requirement will dictate enhancements to our current intra-company reporting to support both 4G and 5G revenue allocation and settlement reporting.

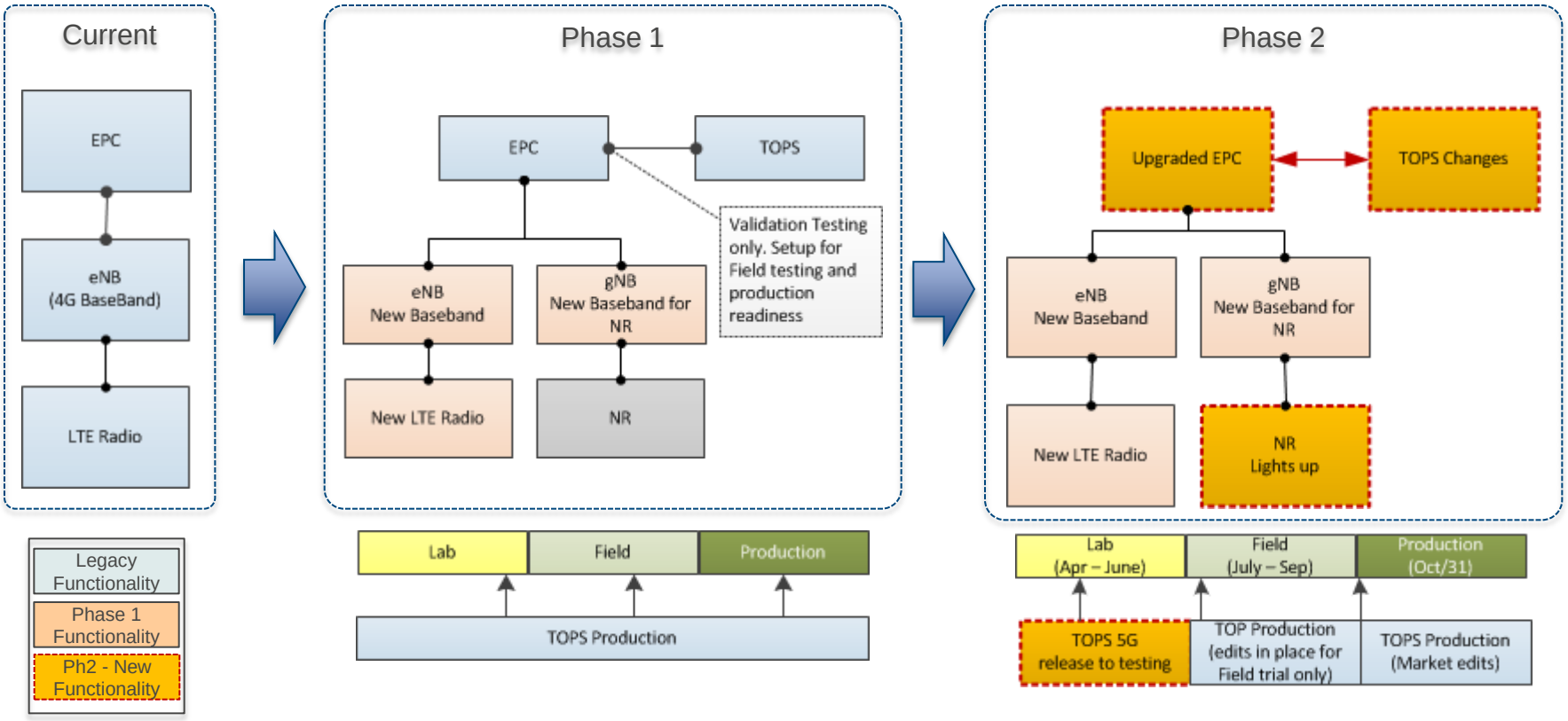
EA Blueprint



5G NSA – Network deployment timeline (draft)



5G NSA - TOPS deployment plan



TOPS Release requirements

- For phase 1, there are no TOPS dependencies, but regression testing will be needed to ensure that enhancements to LTE radios do not impact legacy TOPS functions (e.g., usage processing is not impacted)
- For phase 2 TOPS enhancements will be required. TOPS changes must be delivered during testing of phase 2 functionality (upgraded EPC) to ensure that 5G flag is provisioned in HSS and usage is reported appropriately. For commercialization, additional CIM/RIM functionality will be in place to ensure that market provisioning by market is supported and MOA can provision/de-provision specific devices or subscribers devices in mass.

Recommended Capabilities Break-Down

IS Capability	IS Scope	IS Teams Impacted	IS Delivery Track
Regression Testing for Engg. Phase 1	Regression testing scope focused on legacy TOPS function	IS Mediation, IS ETQA, Amdocs for awareness	Track 1
Charging for 5G Usage - w/o any indicator in downstream systems	Usage processing including mediation, rating and billing + OLC for PrePaid Regression	IS Mediation, Amdocs, ETQA	Track 2.1
Provisioning for 5G Core N/W Changes	Provisioning using specifications for the upgraded network components	IS PDC, Amdocs, EPC/BPT, ETQA	Track 2.2
MOA for 5G Roll Out On Demand	MOA scripts for using 5G flags in the process	Amdocs, IS Operations, ETQA	Track 2.2
Reporting Enablement for 5G	To Be Determined. Capability in solution backlog.	To Be Determined	To Be Determined
Enhancements to DANE for 5G	To Be Determined. Capability in solution backlog.	To Be Determined	To Be Determined
Intra-Company Settlement for 5G	To Be Determined. Capability in solution backlog.	To Be Determined	To Be Determined
Fixed Wireless Device for 5G	To Be Determined. Capability in solution backlog.	To Be Determined	To Be Determined

Project Dependencies

Dependency	Impact
Vendor specs - HSS	The revised HSS spec with new schema will be required for the TOPS provisioning interface to start
Vendor specs – P/SGW	Two P/S GW specs will be required: (a) The P/SGW CDR specs will be required for the Mediation effort to start. (b) The Gy spec must be required for review to ensure that the existing interface to Turbocharging will not be impacted by 5G
DANE	The DANE project must be completed prior to 5G launch and subscriber bands must be aligned with the network profile definitions for 5G
CXM	CXM plans must be in place to process 5G usage, correlate with TOPS CRM data, and produce the desired reports. The report requirements are TBD
eSIM solution	It is very likely that 5G devices will be eSIM capable. An eSIM solution must be in place to support provisioning of these devices. A QR based eSIM solution will be in place for 2019 devices
Device availability and specs	5G devices must be available for testing

Operational Impact

Operation	Impact
MOA	Operations must be prepared to support MOA process in case issues with specific 5G devices is encountered in the network.

Open Questions

Question	Response
Devices and Device Specs are needed before an eSIM solution is identified. Will the devices be able to support QR code? Will the devices have a QR code reader?	
Detail Reporting Requirements are needed to design usage reporting for 5G.	