☰ CS5070: NWS (Aug 2021)

Your answer   **Classmate answers**

Q5: Compare 5G Deployment Options   ✕

Pallavi Saxena Yesterday

5G ARCHITECTURE: DEPLOYMENT SCENARIOS AND OPTIONS

There are two solutions to combine the existing 4G LTE services with 5G NR namely standalone and non-standalone services.NSA adds 5G carrier on the existing 4G LTE network.SA deploys a new 5G NR and 5G core network. These solutions are being published in three successive "drops" within the 3GPP release-15 set of specifications:

Release 15 introduced NSA with dual connectivity with the concept of the master node connected to the 4G EPC Core Network.
The main drop upgraded LTE to support 5GC by adding 5GC to SA
Late drop added the concept of master(LTE or NR). It also includes NR and eLTE dual connectivity

INITIAL 5G NETWORK ROLLOUT

A)Option 3 NSA will use existing 4G LTE base stations with upgrades to support the NSA features and deployment of new 5G NR cells to provide dual-connectivity, with interconnection
B)Option 2 will introduce 5G NR base stations and avoid reconstruction of EPC core networks and minimize changes to LTE enB.
C)Option4 extends option2 to offer dual connectivity under NR master carrier

We can select either Option3 or 2 as the initial setup for migrating the network.
OPtion 3:Conserves voice services and provides simple 5G service for eMBB.
SWG and PGW need to be replaced for higher performance. The initial solutions should be followed by support for option 5 "eLTE" and options 4 and 7 NSA.
Can be optimized using Option 2,4,5,7 because of 5G core network and optimized 5G NR access.
Option2: Uses TDD bands above 3 GHz providing capacity relief and low latency services.
Next Migration steps:
Option 5 provides the "enhanced" LTE (eLTE) extensions to LTE access
Option 7 extends option 5 to offer NSA dual connectivity under an eLTE master carrier
Option 4 extends option 2 to offer NSA dual connectivity under an NR master carrier

POSSIBLE PATHS
1)Option2 -> Option 4 or 7
5GC interfaces will be added and to increase capacity and coverage new NR carriers will be deployed.
To extend it option4 or 7 make gNB or eNB as the master.

2)NSA-> option 7 ->Option 2
Maintain eNB as master but upgrade it to support 5GC interfaces.Addition of NR carriers to expand coverage and capacity.
Delays the need for a low band NR carrier

≡ CS5070: NWS (Aug 2021)   ⠿ S

Your answer   **Classmate answers**

COMPARISON OF MIGRATION STRATEGIES
A number of potential long term 5G migration approaches may be identified and determining which unique approach is best for a given TSP requires a careful balance of the below-mentioned factors
A)Availability of suitable spectrum
B)Business and technical planning
C)Investment plan to support LTE features and secondary node operations
D)End to end customer adoption of 5G services
E)Upgradation of early 5G devices
F)Refarming strategies for 2G/3G/4G spectrum
G)National regulation affecting 4G.5G sharing between TSP

Drive LInk:https://docs.google.com/document/d/1S79-n_SSLELeYBRu-VjwjQ0KqL8Jw1y8DCze7iL1w9Q
/edit?usp=sharing

   Reply

Satvik Padhiyar   2:45 PM

https://docs.google.com/document/d/1nJPEFemmN7ZvhHCPBaAVMZ-AecBvmpQlgVJXRoTyxTU
/edit?usp=sharing

   Reply

SOWRYA GALI   4:32 PM

Currently, 4G-LTE is in wide usage, and with the development of 5G, we have to think of a gradual roll-over of 5G services and smoothen the transition from 4G to 5G. However, there are many caveats to address during this transition and the authorities designing specifications of various deployment options should keep them in mind. The constraints that affect the deployment of 5G include the cost of installing new infrastructure, availability of the user edge devices with the capability to communicate with 5G base stations, region-specific business needs, regulations from local government, etc. Keeping all these factors in mind, 3GPP, the colossal organization that mandates the specification of 5G, has released possible options to deploy the 5G in conjunction with LTE to meet the business needs of various Telecom Service Providers(TSP).

The options can be broadly categorized into two viz., "Standalone" (SA) deployment and "Non-Standalone" (NSA) deployment. In SA deployments, only one type of RAN is used, and a kind of core

?

≡ CS5070: NWS (Aug 2021)   ⠿   S

Your answer   **Classmate answers**

Secondly, let us discuss the options of NSA deployment. Option 3 consists of eNB as a master node, gNB as a secondary node, and LTE-EPC core. The primary advantages include aggregating throughput over LTE and 5G-NR, leverage on the existing LTE coverage, usage of 5G for capacity layer, a more straightforward introduction of 5G for eMBB service and maintenance of current voice services. The disadvantages include limited coverage of 5G-NR-RAN (mmWaves) and availability of 5G spectrum. Option 4 consists of the gNB master node, eNB secondary node, and 5G-CN core. The advantages include full support of 5G related services, extends option 2 to offer NSA dual connectivity under an NR master carrier. The disadvantages include the investment cost to deploy 5GC and 5G-RAN and to upgrade eNBs for eLTE. Option 7 consists of eNB as a master node, gNB as a secondary node, and 5G-CN core. The primary advantages include aggregating throughput over LTE and 5G-NR, leveraging the existing LTE coverage, 5G for capacity layer, and extending option 5 to offer NSA dual connectivity under an eLTE master carrier. The disadvantages include limited 5G-RAN range, non-availability of 5G spectrum, investment costs of deploying 5GC.

The current 4G cellular networks resemble option 1; we either go to option 2 directly or stick to SA and move to option five and then to option 2. If 4G is widely used, it may not be feasible to move through SA deployment, so in that case, we move via option 3 for a smoother transition depending on various factors. From option 3, if we want SA deployment, then we can go to option 2 directly. In some cases, both 4G and 5G have to coexist, so we move to option 7 and then depending on the usage of 5G, we can move to option 4.

Reply

👤 **Pratik Abhijeet Bendre** 5:08 PM

https://drive.google.com/file/d/1HCI18yclmCuA_5XGd24LGOxVMLZ7cj7I/view?usp=drivesdk

Reply

👤 TATIPELLY VAMSHI 7:14 PM

?

☰ CS5070: NWS (Aug 2021)   ⁙   S

Your answer   Classmate answers

The Standalone deployment option consists of only one generation of radio access technology, whereas the Non-Standalone deployment option consists of two generations of radio access network (RAN) i.e 5G and 4G LTE.

Under SA deployment, we have option 1, option 2, option 5. In option 1, we have Evolved Packet Core(EPC) as core network and LTE as master RAT. In option 2, we have 5G Core as the core network(The 5G Core/5GC is a new generation of mobile core network. Designed to be cloud-native and heavily dependent on virtualization, 5GC is expected to bring the most value to the network) and NR as master RAT. In option 5, we have 5G Core as core network and eLTE as master RAT.

Under NSA deployment, we have option 3, option 4, option 7. In option 3, we have EPC as core network and LTE as master RAT and NR as secondary RAT. In option 4, we have 5GC as core network and NR as master RAT and eLTE as secondary RAT. In option 7, we have 5GC as core network and eLTE as master RAT and NR as secondary RAT.

Since options 1,3 have EPC as a core network, they cannot support many 5G use cases because a 5G core is essential for achieving all 5G use cases. Options 4, 5 and 7 enable operators to continue using legacy 4G equipment while connecting to 5G Core.

Migration :
From NSA option 3, operators can migrate to other options. Migration paths 3→5/7,3→4/2, 7→4, 1→4/7 and 4→2 have been suggested.
Consider migrating from NSA option 3 to SA option 5 or NSA option 7. Master RAT in these three options is LTE. By doing this, we can achieve all use cases of 5G because of 5G Core.
Migration from NSA option 3 to SA option 2 requires operators to acquire and deploy 5G equipment.

For the early stage deployment, the following two options are used as their standardisation has been

⑦

≡ CS5070: NWS (Aug 2021)

Your answer   **Classmate answers**

options cannot provide support for all 5G use cases so sooner or later operators have to deploy one of the other SA deployment options.

Options 1,2 and 5 are defined for SA deployment. Options 3,4 and 7 are defined for NSA deployment.

SA deployment :
    Option 1: EPC is used for core network and LTE is used for master RAT
    Option 2: 5G is used for core network and NR is used for master RAT
    Option 5: 5G is used for core network and eLTE is used for master RAT

NSA deployment:
    Option 3: EPC is used for core network, LTE is used for master RAT and NR is used for secondary RAT
    Option 4: 5GC is used for core network, NR is used for master RAT and eLTE is used for secondary RAT
    Option 7: 5GC is used for core network, eLTE is used for master RAT NR is used for secondary RAT

Migration:
Operators who deploy NSA option 3 initially can migrate to options 4,5 and 7. Other migration paths that have been suggested are 7 to 5, 7 to 4, 1 to 4, 1 to 7 and 4 to 2.
To support all 5G use cases, a deployment option should have 5G core. Options 4,5 and 7 enable telecommunication operators to connect to 5G core while using 4G equipment. Options 1 and 3 cannot

?

≡   CS5070: NWS (Aug 2021)   ⠿   S

Your answer   **Classmate answers**