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The bridge to possible



Private Mobility

Opportunities, Deployment Models and Challenges

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BRKSPM-2016

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Agenda

- Introduction: Private Mobility – What and Why?
- Private Mobility Solution Models
- Private Mobility Deployment Options
- Preparing for Private 5G Deployment
- Deployment Considerations
- Conclusion

Private Mobility – What and Why?

- What is Private Mobility?
- Why is it appealing to Enterprises?
- What are the target use cases?

Difference Between Public and Private Mobility

Public mobility

Private mobility

Spectrum

Carrier owned

Enterprise owned, shared spectrum (CBRS), or obtained from carrier

Use case

Traditional consumer

Enterprise / IoT

Infrastructure

Owned by carrier

Owned by Enterprises / aaS

Data

Owned by carrier

Owned by Enterprises

Management

Managed by carrier

Managed by Enterprises
through SP / Cisco

Why Are Enterprises Looking for Private Mobility?

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- **Fast hand-off for mobility:** For example, AGVs need much faster and reliable hand-off
- **Extended coverage:** For example, each CBRS 4G radio can cover 20,000sq ft
- **Clean Spectrum:** Carve out clean spectrum dedicated to operational activities (e.g., push-to-talk, surveillance camera, internal voice and data)



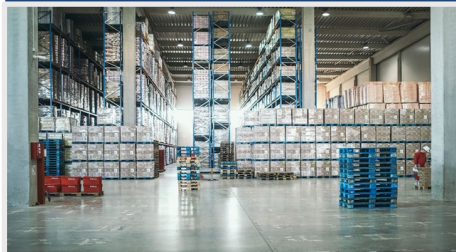
Early Private Mobility Use Cases Across Multiple Verticals

Manufacturing / Industrial IoT



- Robotics process automation and emergency control
- Automated Guided Vehicles
- High speed software downloads
- AR/VR applications
- Ultra low roundtrip latency
- High reliability / availability

Logistics / Distribution / Warehouse



- Distribution line / workflow automation
- Autonomous forklifts and Automated Guided Vehicles
- Push to talk applications
- Seamless handover
- High reliability / availability
- Location and asset tracking

Venues



- Ultra-fast mobile connectivity in dense environment
- Enhanced video streaming
- AR / VR applications
- Facility monitoring / security

Private Mobility Solution Models

- Technology Choice: 4G or 5G?
- Placement Choice: On-Prem or Cloud-Based?
- Acquisition model: Direct Cisco to Enterprise, or Through a Service Provider?

Four Private Mobility Solution Models

Private LTE

- CBRS Private LTE 4G – Direct to Enterprises (U.S.)
- Full Stack On Prem

Solution
Ready

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Private 5G

- Private 5G SA
- Full Stack On Prem

Trial
Ready

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Solution Ready

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Trial Ready

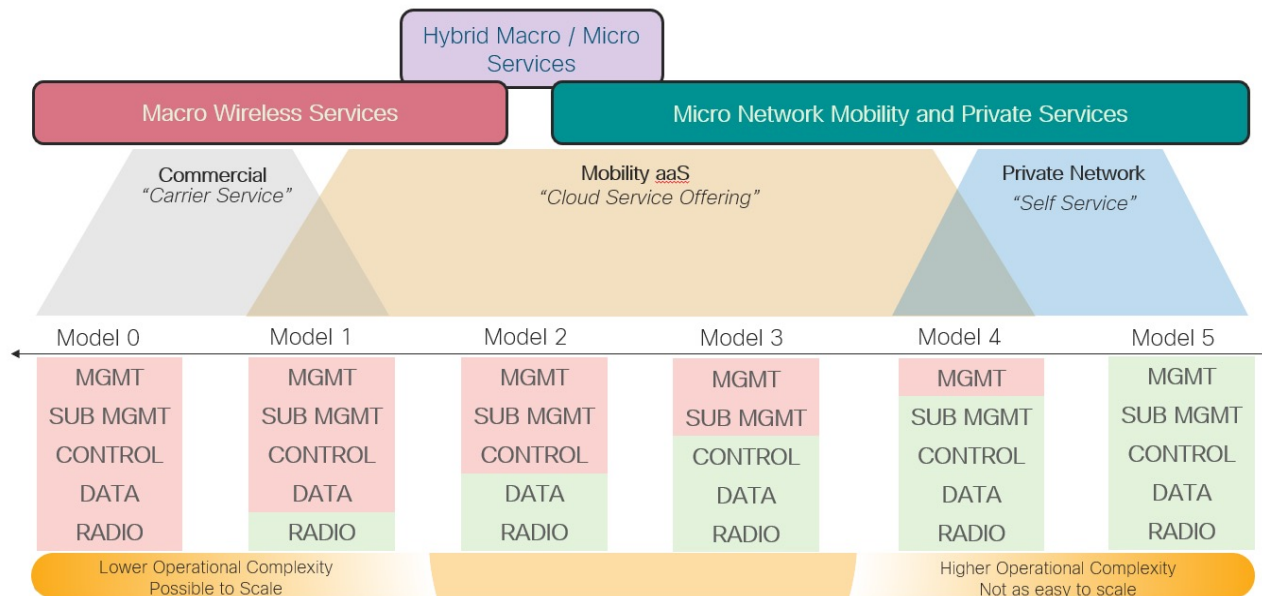
- Private 5G SA
- Cloud Solution

Trial Planned

Private Mobility Deployment Options

- Five Deployment Models
Based on Equipment
Placement

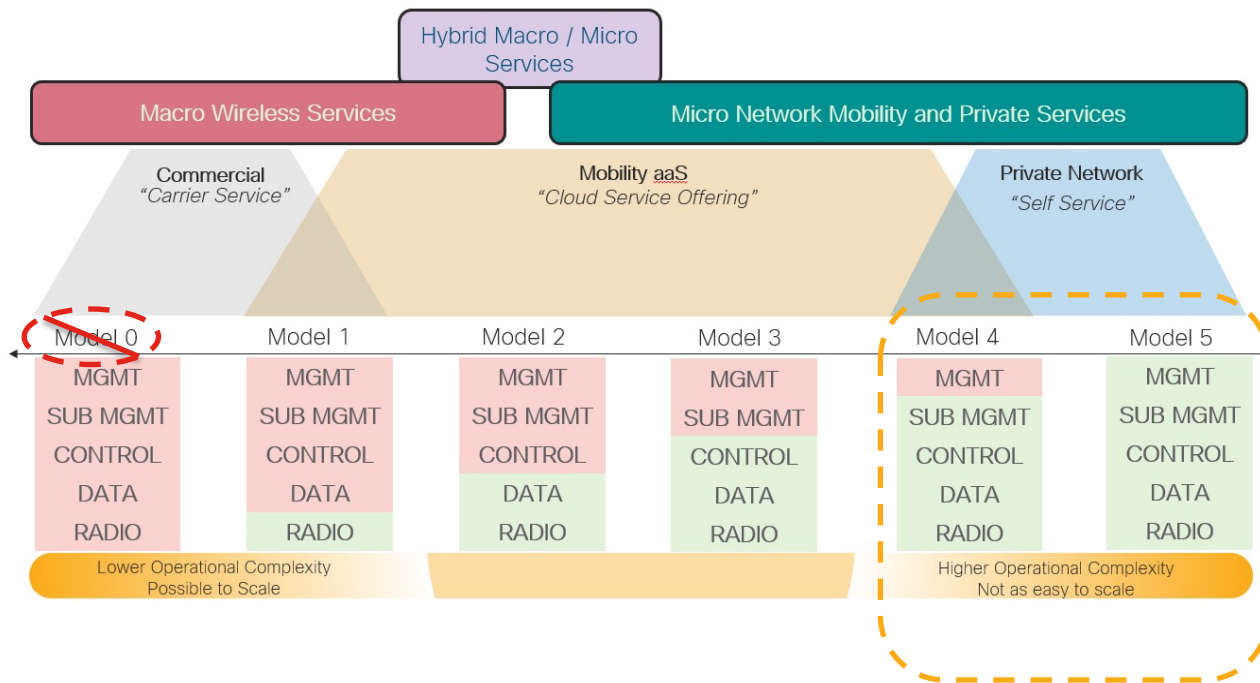
Deployment Options



Cloud Service (shared):
Functions instantiated as
Mobility-as-a-Service

Private Asset (dedicated):
Functions instantiated as
on-premises assets in
Enterprise or facility

Deployment Options

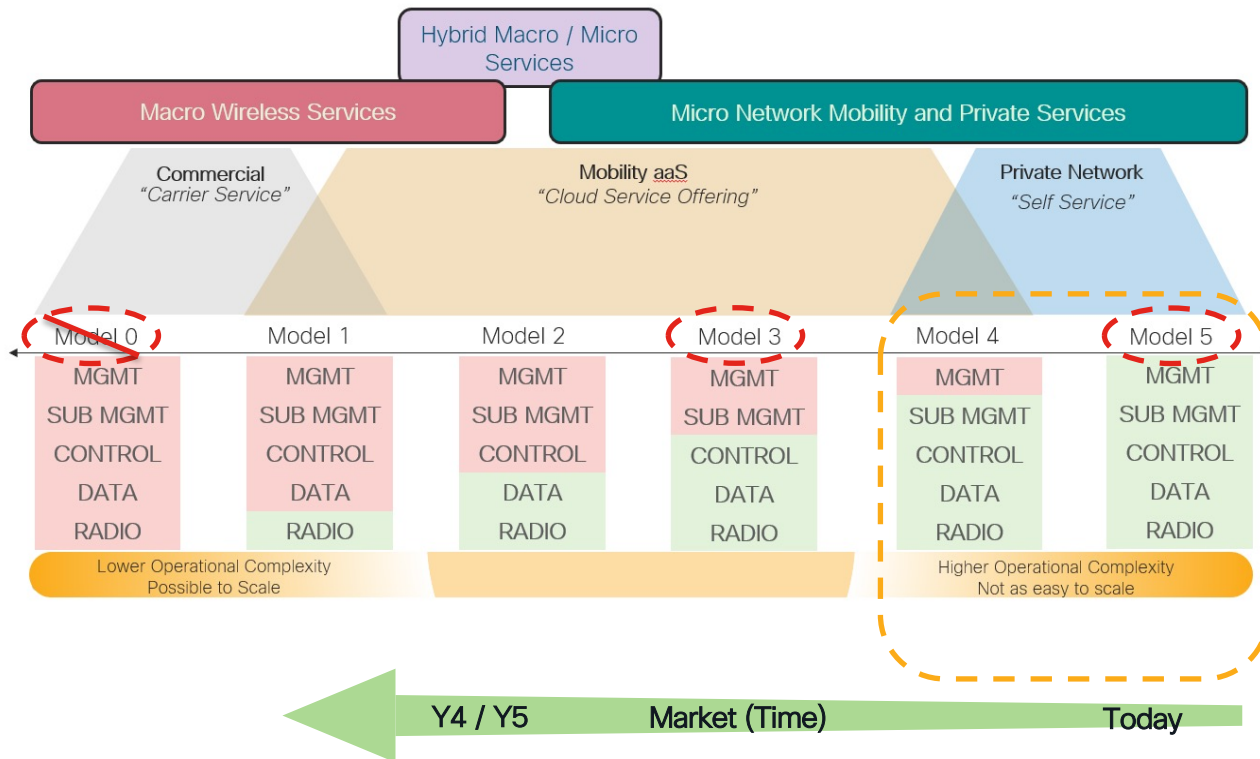


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Preparing for Private 5G Deployment

- What Makes a Good Trial Candidate?
- What is Included in Private 5G Trial?
- Cloud-Based Flavor
- On-Prem (Local) Flavor

5G Enterprise Trials

<u>UE Eco-System</u>	<u>Current Trial Guidelines</u>	<u>Led By:</u>	<u>Potential Trial Customer</u>	<u>Comments</u>
4G + 5G NSA ready	5G NSA StarOS vPC-SI based deployment	Local Cisco engagement (with Central Cisco team support in the backend)	US CBRS Carriers, Private enterprise opportunities in North America	<ul style="list-style-type: none"> No CNDP Semi-automated deployment
5G SA	CN 5G CNDP / BM based deployment RAN, subscriber management and solution management	Local Cisco engagement (with Central Cisco team support in the backend)	EMEA and APJC PoCs North American customers to evolve from 4G deployments	<ul style="list-style-type: none"> CNDP based, servers include Cisco NFs only (AMF, SMF, UPF, and CNDP Cluster manager) NSO CFP based automation is available
4G / 5G NSA + 5G SA	<ul style="list-style-type: none"> Core #1 to support 4G/5G NSA Core #2 to support 5G SA deployment Evolving to 4G/5G converged core 	Local Cisco engagement (with Central Cisco team support in the backend)	More North American Focused	<ul style="list-style-type: none"> Currently 2 distinct cores Evolving to 4G/5G converged core

How to Qualify for a 5G SA Technology Trial?

Spectrum	Customer has direct access to cellular spectrum (whether this private or shared) – only limited to sub-6 GHz spectrum
Technology	5G Standalone (SA) only; all components are on Enterprise premises
Use Case	Data only (test latency, throughput, handover, etc.); no voice
Budget	Budget is needed to implement a 5G technology trial
Timeline	Timeline for delivery of the trial is 2021

Details of the Private 5G Trial

What Cisco delivers (Full scope * - includes packet core, subscriber management, RAN & networking)

- Solution design based on 3GPP rel 15.
- Site survey, deployment and integration
- Use case definition and validation
- Program management
- Knowledge transfer
- Operations support and optimization

Duration

- 6-12 months

Additional Cisco services not in PoC scope :

- Security
- Enterprise WiFi integration
- Application onboarding (use case specific), design and validation

Typical customers

- Direct Enterprise customers with access to spectrum.

Types of use cases

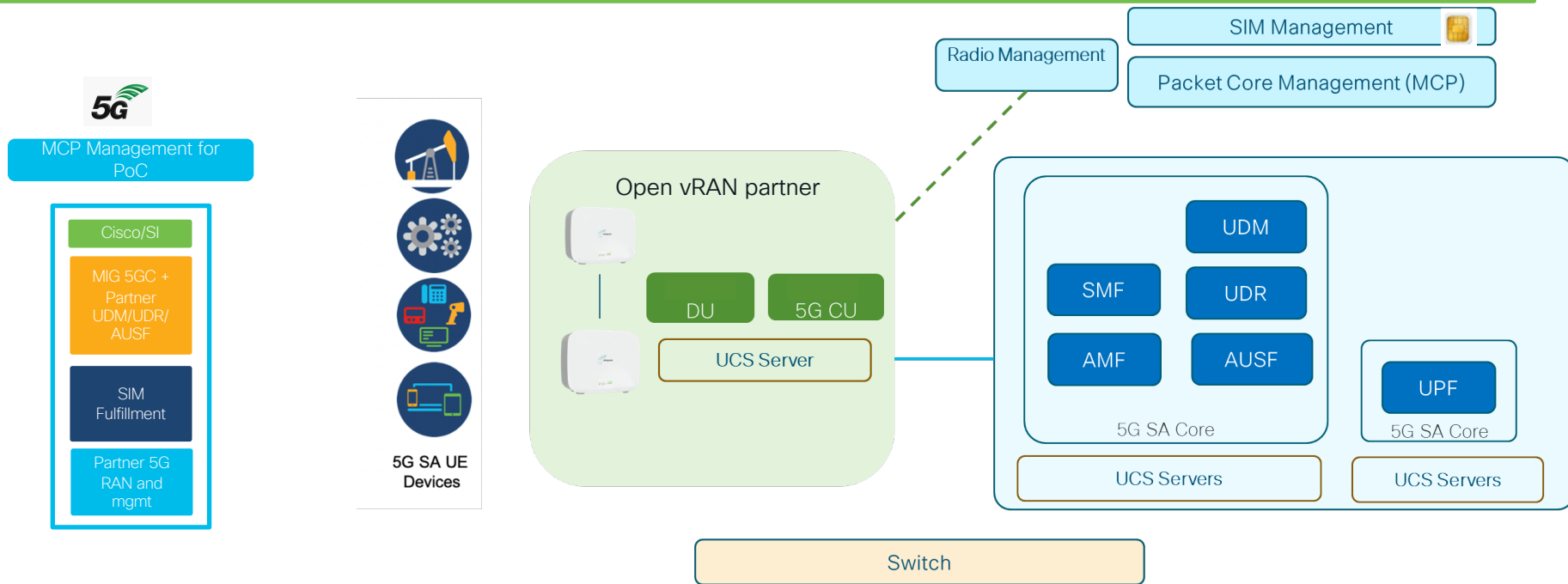
- Use case definition and requirements to be identified at project start
- Cisco will design, deploy and test solution as per defined use case requirements
- Common use cases for initial PoCs customers are auto manufacturing R&D, e-health.

* Includes 3P vendor support, engagement model to be agreed

* Rack, stack and cabling is out of scope

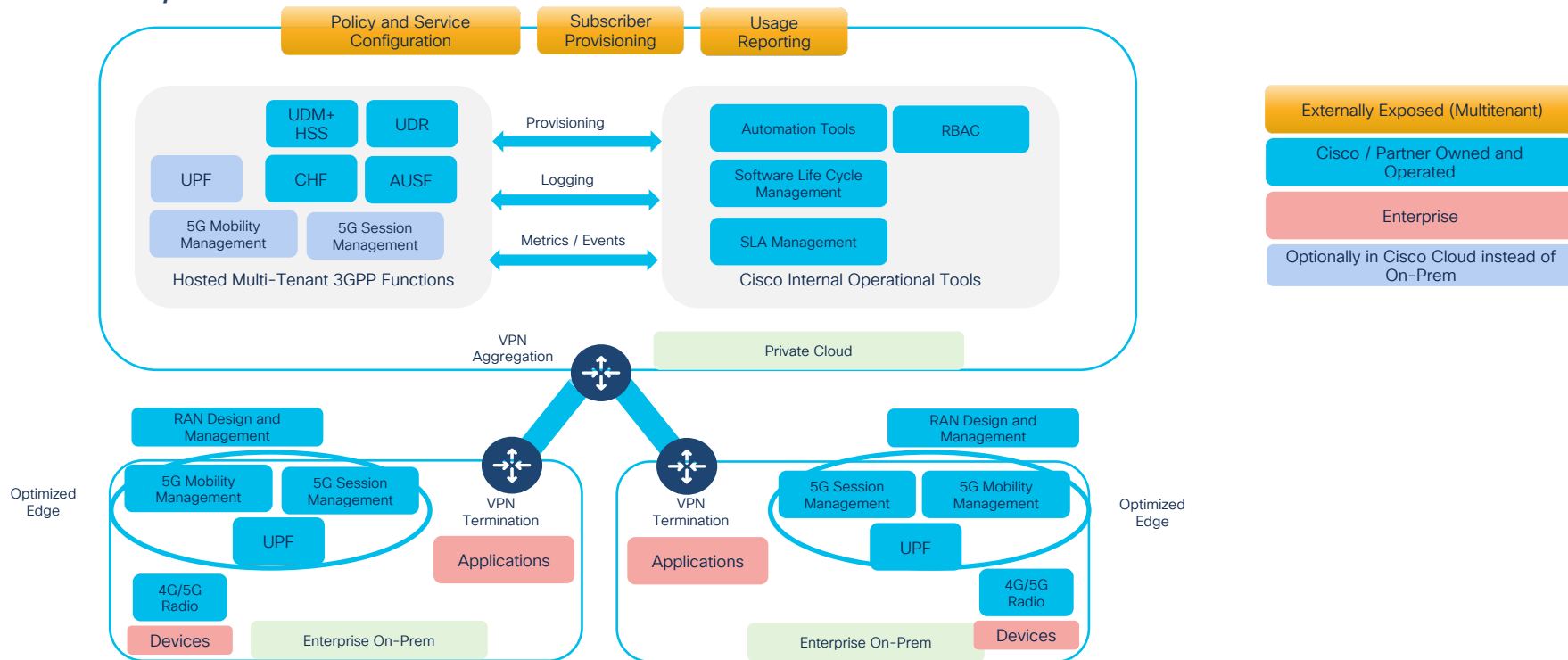
Private 5G Trial Architecture

Cisco Trial



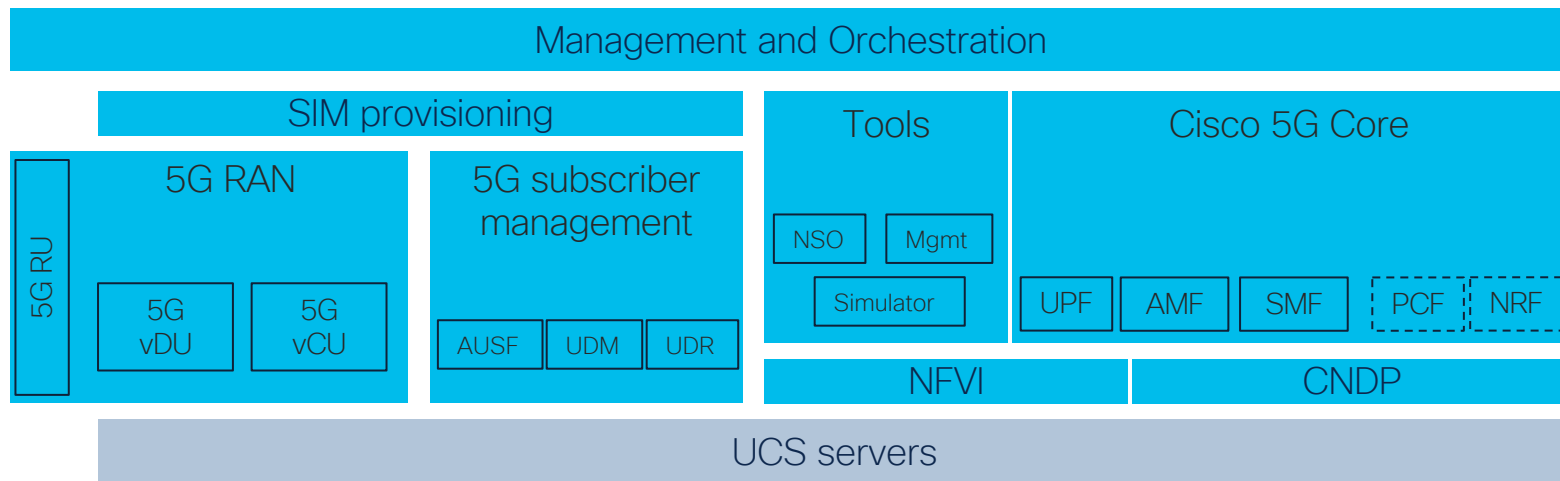
Private 5G Enterprise Cloud-Based

On-Prem / Cloud



Private 5G On-Prem Solution

Block Diagram



On-Prem (Local) Solution Assumptions and Phases

Assumptions:

- Aligned with Ultra Cloud Core roadmap and software availability
- Data-only (voice is out of scope)
- No macro roaming
- Enterprise gateway to provide external connectivity
- Enterprise IP network integration
- UEs provided and managed by the Enterprise

Possible Deployment Phases:

- Phase 1: Full solution with 5G-SA core
- Phase 2: Full solution with converged 4G/5G core
- Phase 3: Network slicing

Deployment Considerations

- Solution Improvements
From Trial to Production
- Deployment
Considerations

Solution Improvements (from Trial to Prod)

- Architecture
 - Common platform per phase
- Management and Orchestration
 - Deployment and Operational automation
 - Integration with Enterprise NMS option for common management
 - Integration with ISE for common policy and authentication
- LCM / Service Assurance
- Security
 - Secure remote management, firewalls and intrusion detection
- Stable GA-grade code
- Fully redundant
- Use Case span/scope agreement
- Expanded Testing
 - Functional Testing
 - Performance Testing
- Network Slicing
- Migration Services to a cloud-based solution

Private Mobility Considerations

- Scalability
 - Existing models too large
- Footprint
 - Minimal space required on-prem
- Early use case identification
 - Need to satisfy critical business need
 - UE availability to be considered
- Cost considerations
 - Competitive solution pricing is expected
 - UE cost can be significant (use case dependent)
- Macro integration may be needed
 - SP's subscribers on Enterprise premises
 - Enterprise subscribers off-prem
- Voice integration out of scope
- WiFi handovers will be needed
 - Cellular / WiFi capable UEs
- Overall Mgmt plan / lack of Enterprise operational expertise
 - Support model to be clarified
 - Managed Service option alignment

Conclusion

Summary

- Private Mobility brings new opportunities to Enterprise customers of many verticals for new levels of efficiency in their use cases
- 4G or 5G, on-prem or cloud-based, direct acquisition or through an SP - Cisco has a solution
- Focus on two flexible private 5G deployment models: cloud-based or on-prem customer managed
- Preparing for deployment: technology trial, followed by a production deployment of a chosen flavor
- Many points should be considered prior to a deployment: UE availability, spectrum availability, solution management etc.



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Thank you

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