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The bridge to possible

MEC Enablers for 5G Networks

Theory and Practical Aspects for Service Providers

Irfan Ali

Ravi Guntupalli

Principal Engineer, Cisco

Director of Technology, Cisco

BRKSPM-1005

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Introduction



Irfan Ali
Principal Engineer

irfaali@cisco.com
www.linkedin.com/in/irfanali



Ravi Guntupalli
Director of Technology

raguntup@cisco.com
<https://www.linkedin.com/in/rguntupalli/>

Cisco Webex App

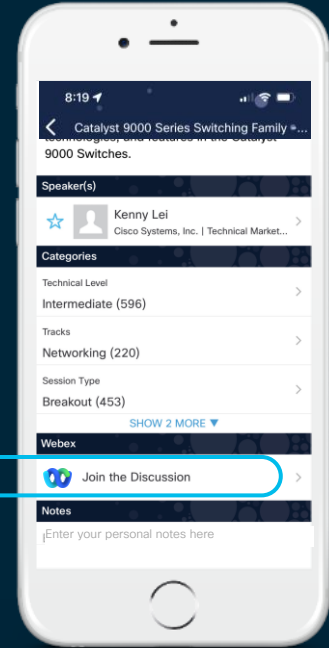
Questions?

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Agenda

- Why even MEC?
- MEC Mechanisms and Practical Aspects
- Summary of Options & Recommendations

Why even MEC?



Does latency even matter?

Yes, latency clearly does matter

- Any TCP traffic benefits from low latency (including HTTP adaptive video)
- Some use cases **absolutely require** low latency: online gaming, mission critical enterprise

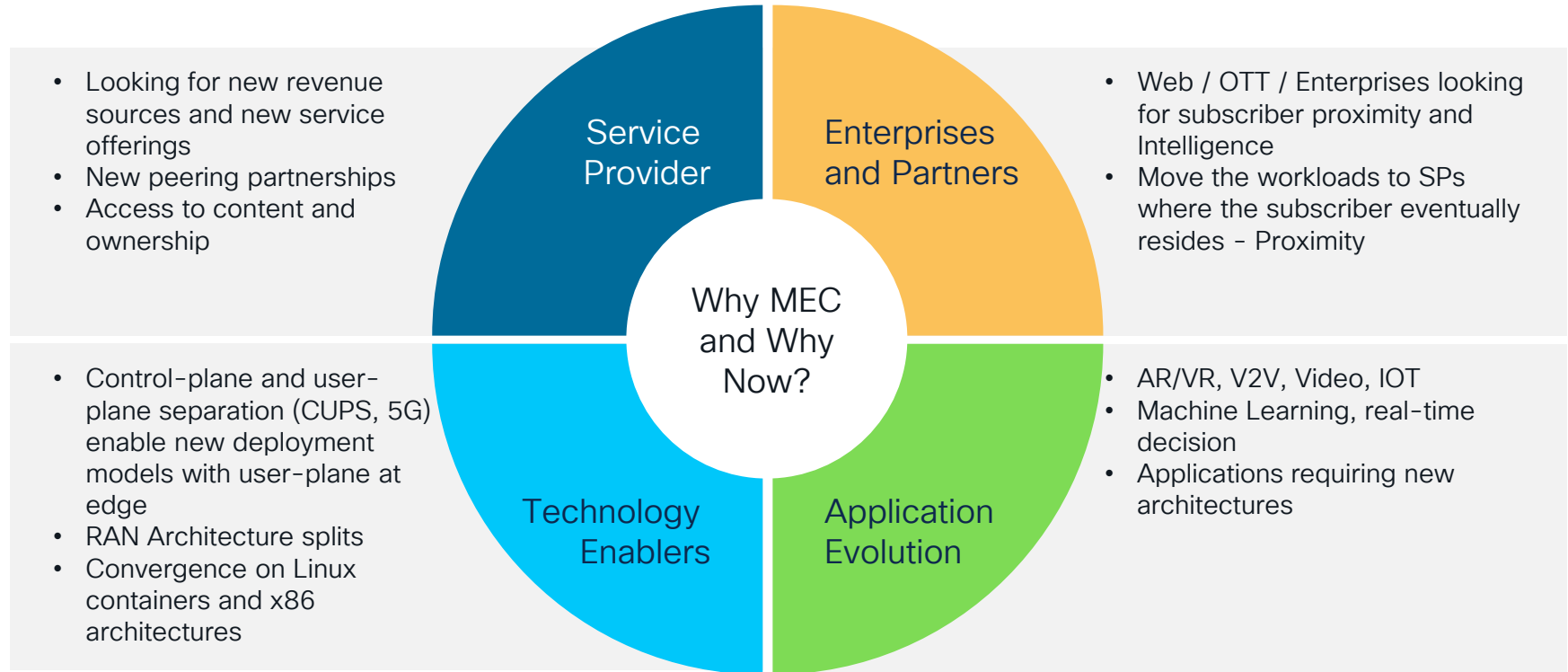
What is needed to deliver latency?

- A flexible network architecture that can provide lower latency based on value i.e., deliver it when needed – on demand (isn't everything?)

Will people pay for lower latency?

- Unknown and unlikely from regular consumer perspective but could be a differentiator
- Enterprises expect low latency as a key requirement in private networks and on top would love for service providers to offer this as a “perk”

Tipping point for MEC



What we intend to achieve with MEC i.e., Goals

End User

Improved quality of experience, new services, reduced cost for service access and more personalized networks

Enable our Service Provider Customers with tools to manage their extended cloud deployments supporting VNFs, Applications and Services with ease regardless of VMs vs. Containers, Compute Heavy vs. Storage Heavy vs. Network Heavy workloads. Increase ease of operations without compromising security regardless of the location of the service and network components so that SPs can launch services faster, closer to the end user with lower costs, improved agility and increased Revenue

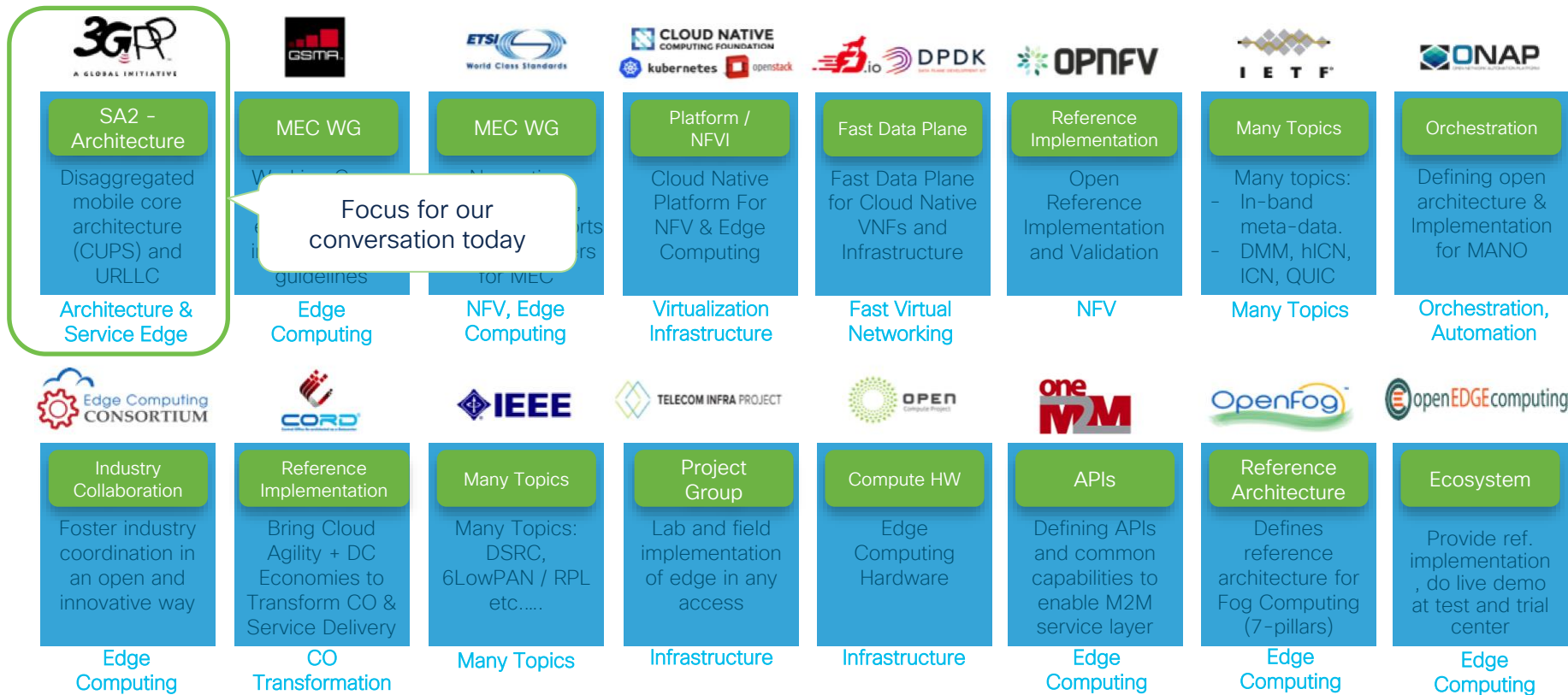
Service Provider

Enterprise

Enable a new set of use cases and address existing scenarios requiring lower latency with more reliable 5G networks – using either private or public 5G architectures

Standards & Industry Group Landscape*

* Partial List



Let's agree on terms and what is where

What we are going to call them today

RAN RU

RAN DU

Aggregation DC

RAN DU

RAN CU

Regional DC

SP Applications

Identity

Peering

SMF

UPF

PCF

AMF

Other Mobility Core

CORE

Other Applications

SDM

Charging

Replication / Backups

Every network provider calls these differently and has different components

TIP

Management

Control

Control

Storage

Storage

Storage

Compute

Compute

Compute

Compute

Management

Control

Storage

Compute

Control

Storage

Compute

Control

Storage

Compute

Compute

Compute

Management

Control

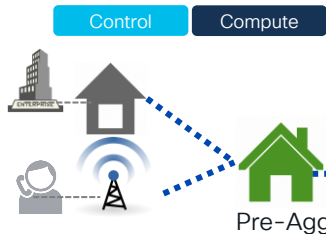
Compute

Compute

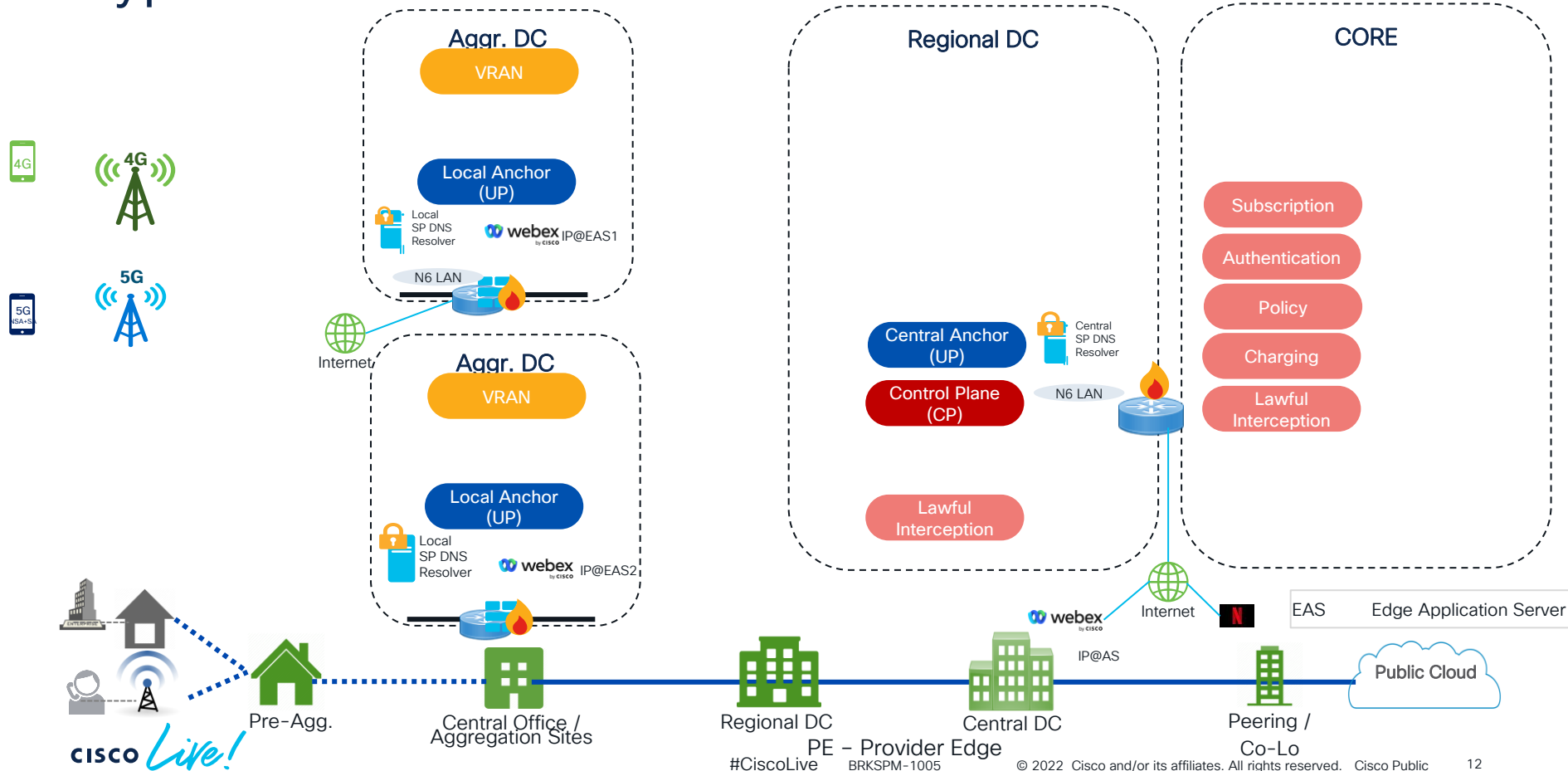
Typically, in 1000s

Typically, in 100s

Typically, in 10s



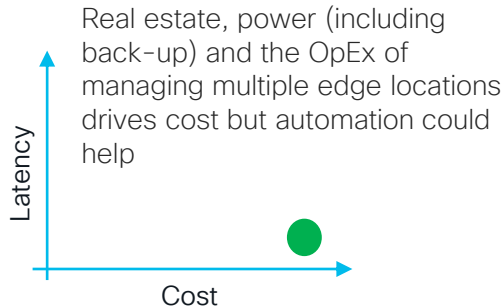
Typical SP Architecture for MEC



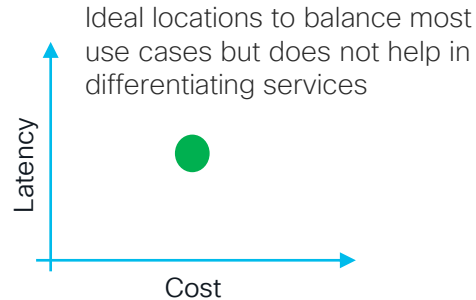
Edge vs. Centralized – Which should we use?

The answer will be **use case dependent** specifically on the required latency and associated value

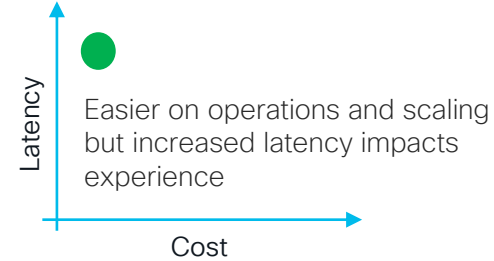
TIP



Aggr. DC



Regional DC



CORE

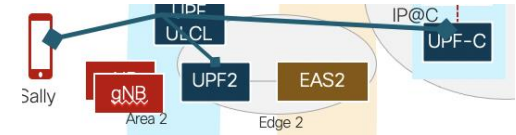
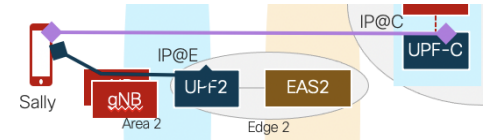
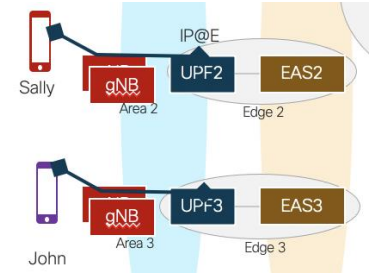
MEC Mechanisms and Deployment Aspects



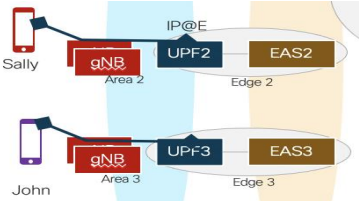
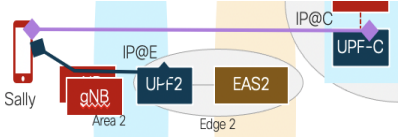
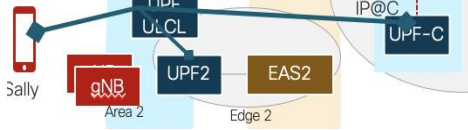


Agenda

- Distributed Anchor Point
- Multiple Sessions
- Session Breakout



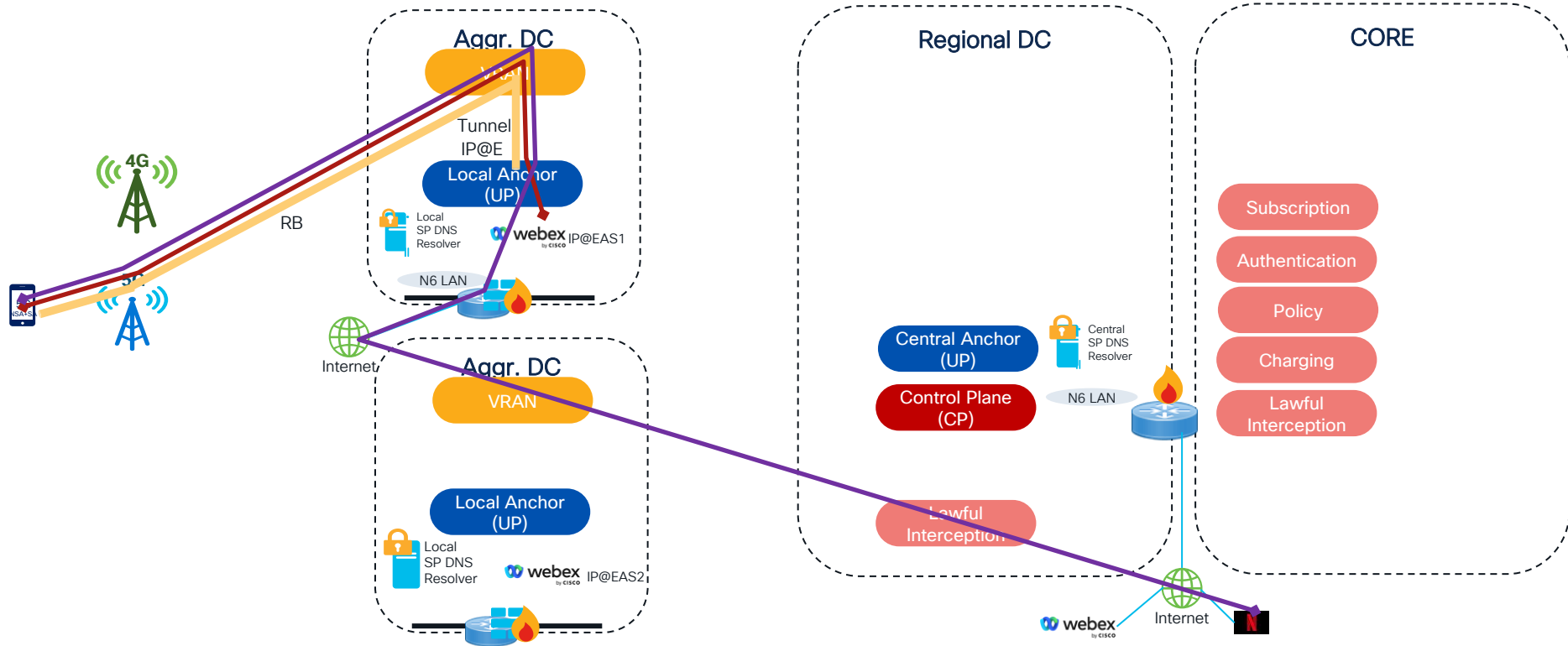
Comparison of the three 3GPP MEC Solutions

		Distributed Anchor Point	Multiple Sessions	Session Breakout
Communication Model				
Mobile Impacts	UE Modem Impacts	L	M	
	Application / modem interaction (DNS)			H
Network Impacts	Application Specific Config in network			
	5G Core network impacts			
Features	Application Session Continuity	✗		
	Support on 4G	✓		

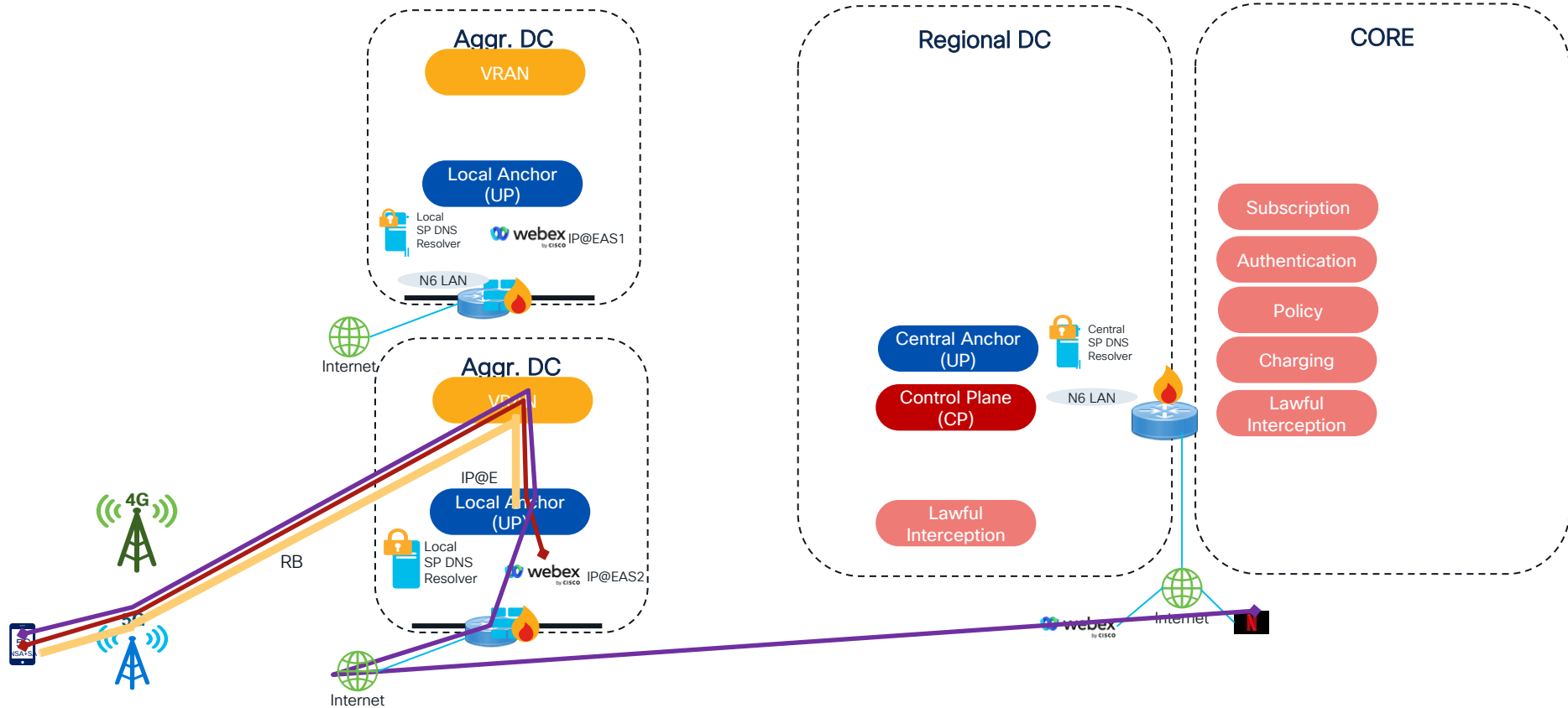
Distributed Anchor Point



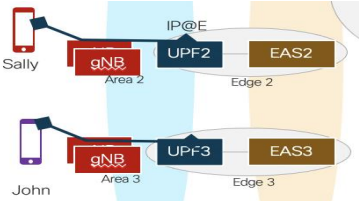
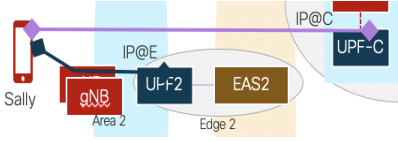
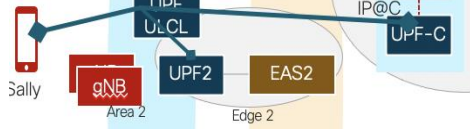
Distributed Anchor Point



Distributed Anchor Point



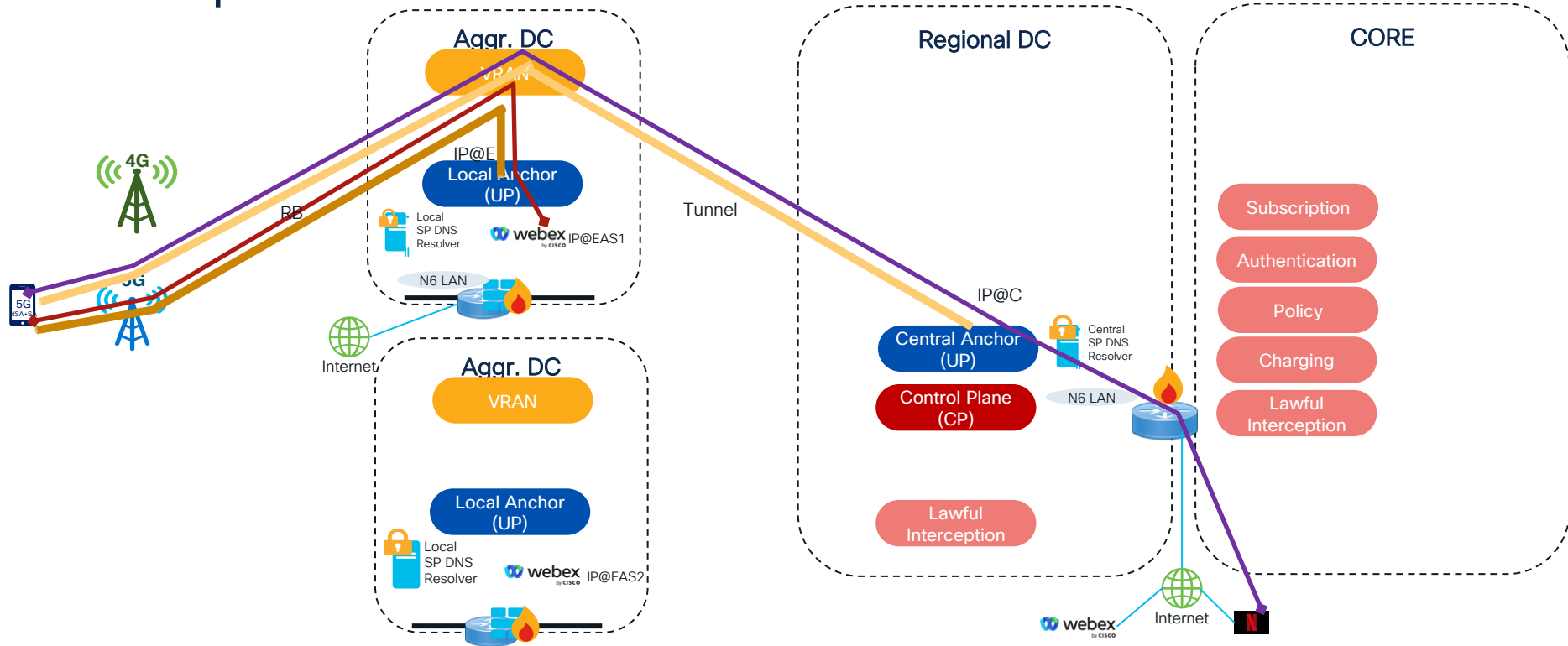
Comparison of the three 3GPP MEC Solutions

		Distributed Anchor Point	Multiple Sessions	Session Breakout
	Communication Model			
Mobile Impacts	UE Modem Impacts	<ul style="list-style-type: none"> Low for make-after-break (SSC Mode 2) High for make-before break (SSC Mode 3) 		
	Application / modem interaction (DNS)	<ul style="list-style-type: none"> Need to perform DNS query on IP@ change 		
Network Impacts	Application Specific Config in network	<ul style="list-style-type: none"> None 		
	5G Core network impacts	<ul style="list-style-type: none"> Edge UPF needs higher capacity 		
Features	Application Session Continuity	<ul style="list-style-type: none"> None 		
	Support on 4G	<ul style="list-style-type: none"> Yes for make-after break 		

Multiple Sessions



Multiple Sessions



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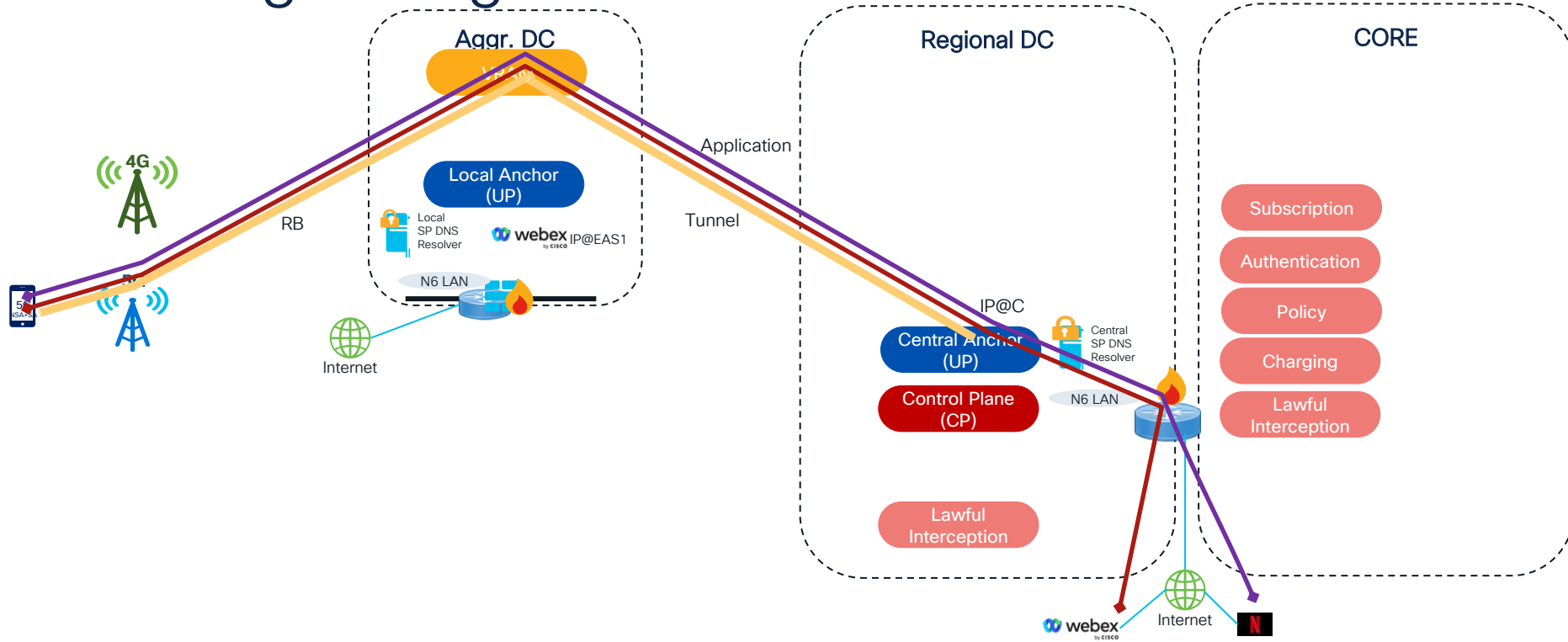
Comparison of the three 3GPP MEC Solutions

		Distributed Anchor Point	Multiple Sessions	Session Breakout
	Communication Model			
Mobile Impacts	UE Modem Impacts	L	<ul style="list-style-type: none"> Support of URSP rules. M	
	Application / modem interaction (DNS)	L	<ul style="list-style-type: none"> Use of SP DNS resolver optional L	
Network Impacts	Application Specific Config in network	L	<ul style="list-style-type: none"> Need to create URSP rules based on applications M	
	5G Core network impacts	M	<ul style="list-style-type: none"> Support of many DNNs. L	
Features	Application Session Continuity	✗	<ul style="list-style-type: none"> No for MEC Application ✗	
	Support on 4G	✓	<ul style="list-style-type: none"> Some. URSP rules cannot be provided/updated in 4G ✗	

Session Breakout

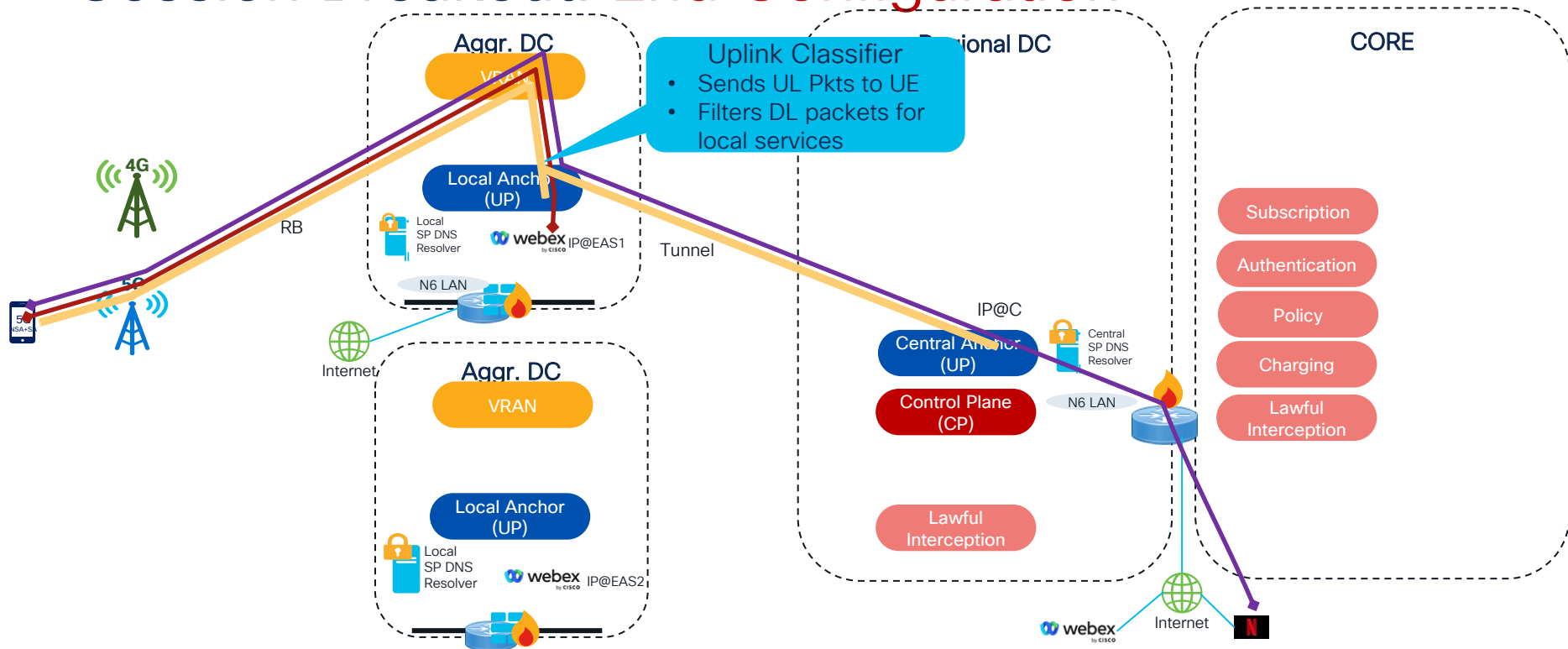


Starting Configuration

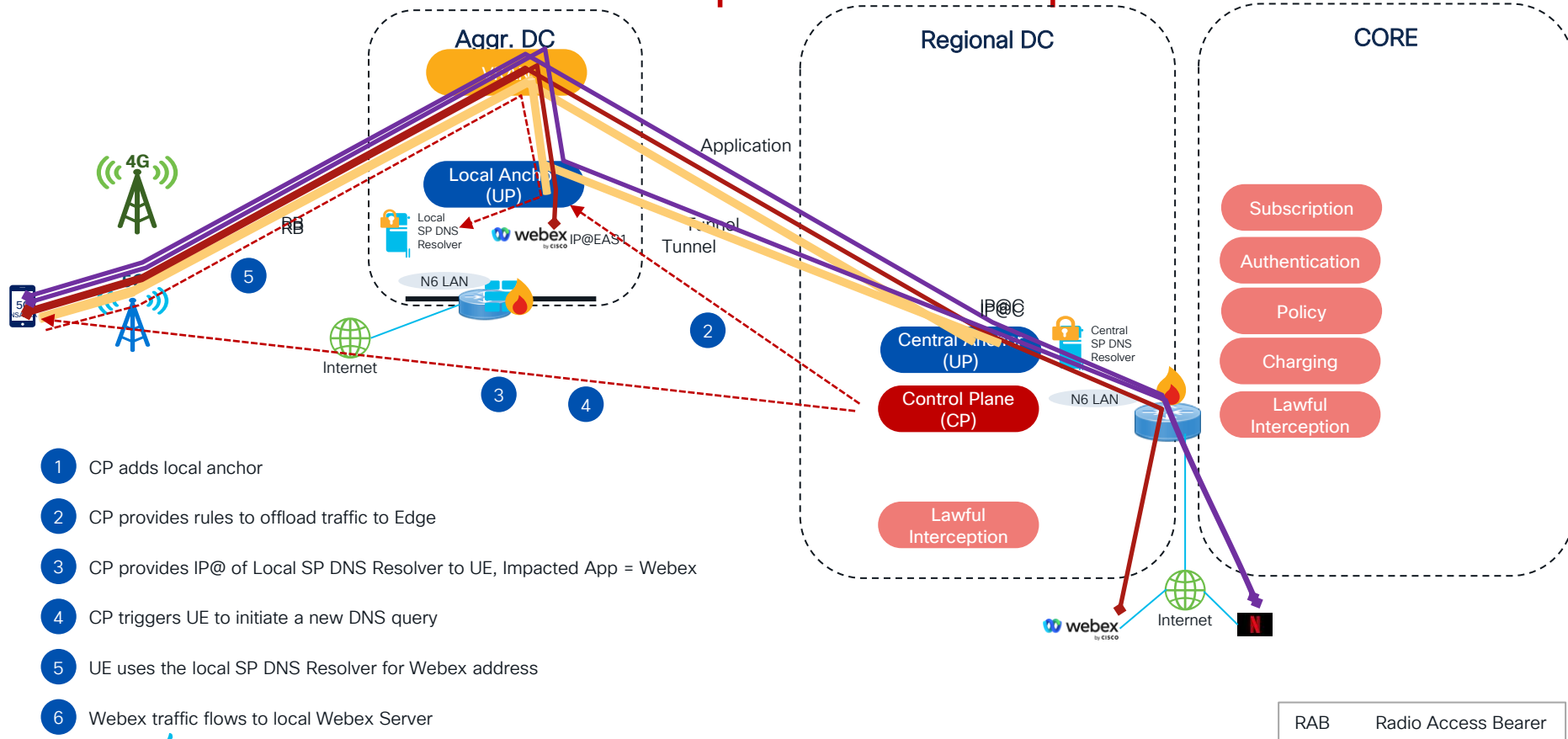


RB Radio Bearer

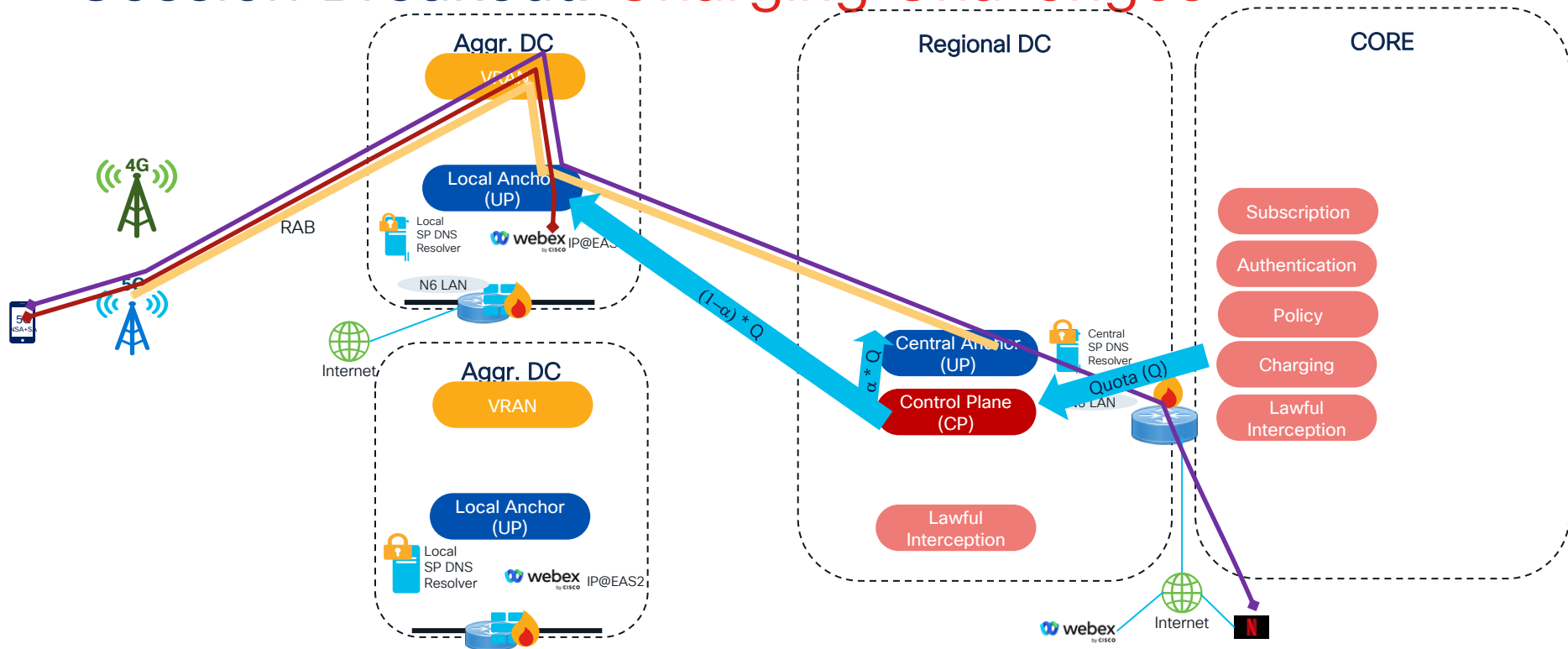
Session Breakout: End Configuration



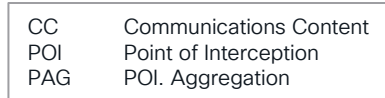
Session Breakout: Sequence of Operation



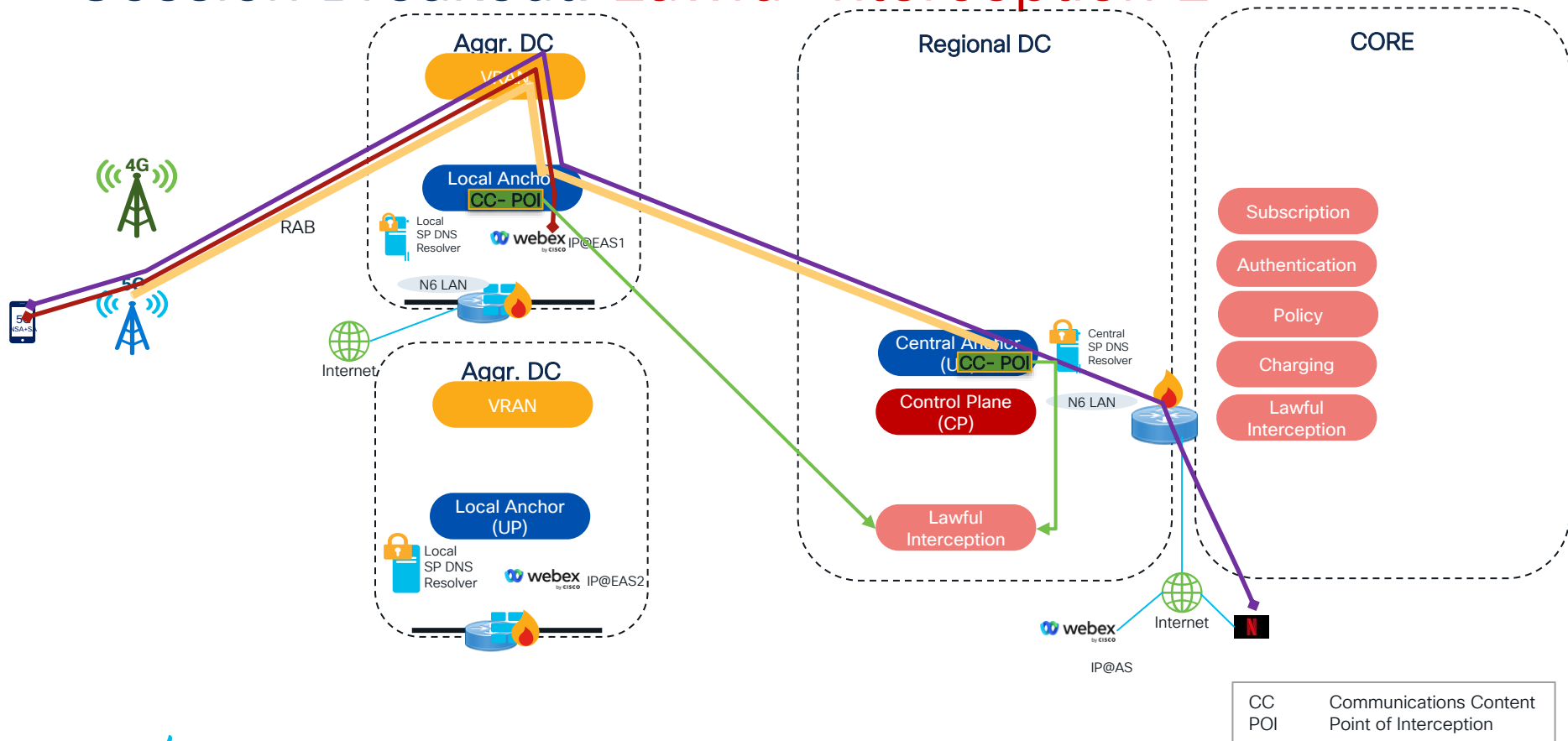
Session Breakout: Charging Challenges



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Session Breakout: Lawful Interception 2



Comparison of the three 3GPP MEC Solutions

		Distributed Anchor Point	Multiple Sessions	Session Breakout
	Communication Model			
Mobile Impacts	UE Modem Impacts			<ul style="list-style-type: none"> None L
	Application / modem interaction (DNS)			<ul style="list-style-type: none"> UE MUST use SP DNS and the DNS client must be controlled by network H
Network Impacts	Application Specific Config in network			<ul style="list-style-type: none"> Required significant configuration about DNS and Application to edge DNS H
	5G Core network impacts			<ul style="list-style-type: none"> Use of ULCL. Charging and Lawful intercept impacts H
Features	Application Session Continuity			<ul style="list-style-type: none"> Yes ✓
	Support on 4G			<ul style="list-style-type: none"> No ✗

Comparison



Comparison of the three 3GPP MEC Solutions

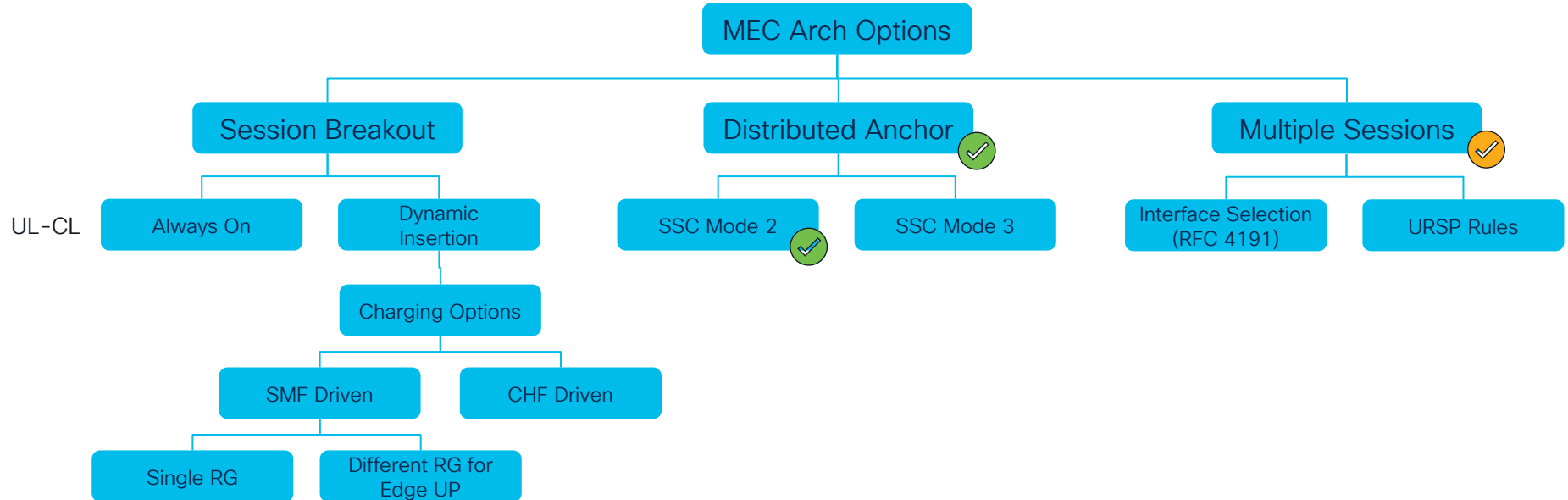
		Distributed Anchor Point	Multiple Sessions	Session Breakout
	Communication Model			
Mobile Impacts	UE Modem Impacts	L	M	L
	Application / modem interaction (DNS)	L	L	H
Network Impacts	Application Specific Config in network	L	M	H
	5G Core network impacts	M	L	H
Features	Application Session Continuity	✗	✗	✓
	Support on 4G	✓	✗	✗


Highlights

- **Achieving Application Session Continuity** is tricky without tight interaction between 5GC and Application Server/Client
- **Session Breakout** model provides more control to Operator for MEC applications
- **Distributed anchor point** may be easiest to implement from core network, but results in IP@ change for UE. Also requires dedicated APN/DNN or SSC Mode signaling
- **Multiple sessions** has dependencies on UE and is based on URSP, which cannot be updated when on 4G and does not work with NSA UEs

Cisco Recommendations

Choices for architecture and recommendations





The key is to understand that there is no single silver bullet option for MEC. Need to consider application and network interactions.

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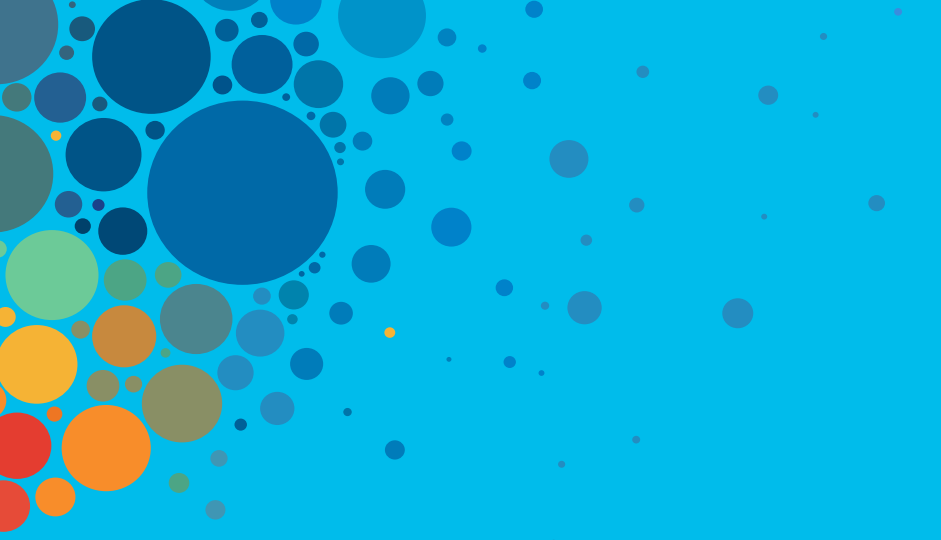
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