Architecture for delivering multicast mobility services using network slicing

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Current standards

- 3GPP, NGMN slicing definition
  - Same definitions about network slicing
    - Service instance = network slice = network functions + resources + logical network with certain characteristics
    - Network service template = Network slice blueprint
    - Network slice instance
  - Define use cases
    - Diverse requirements: network characteristics (bandwidth, latency), mobility, reliability, reserved resources, priority, usage profile
  - 5G design principles
    - CP/DP separation, SDN/NFV support
    - Multi-RATs, MANO, open source …

NGMN White Paper
3GPP 23.799 v1.1.0 Study on Architecture for next generation system

NGMN use cases

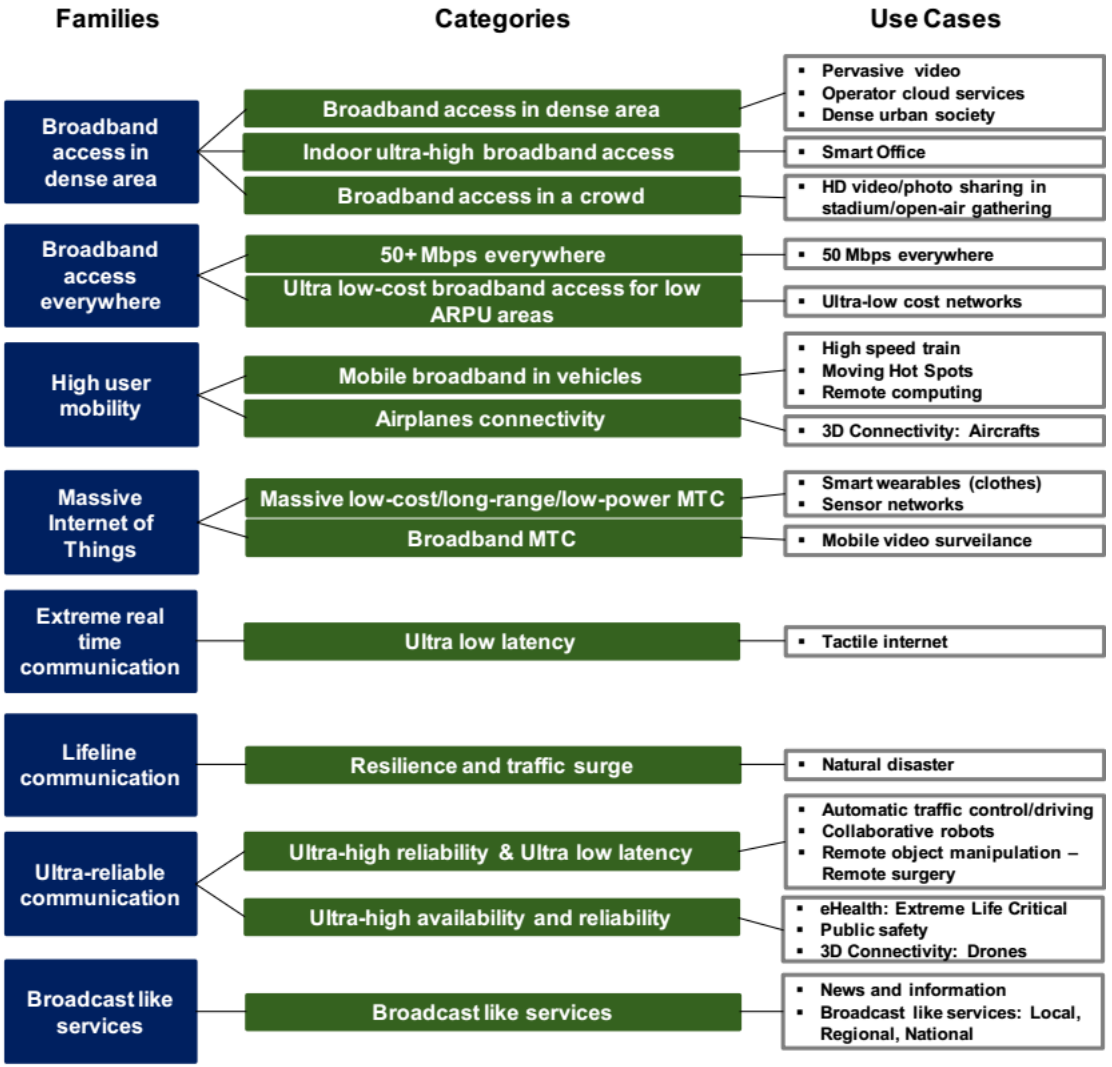


Figure 5: Use case categories definition

NGMN 5G architecture

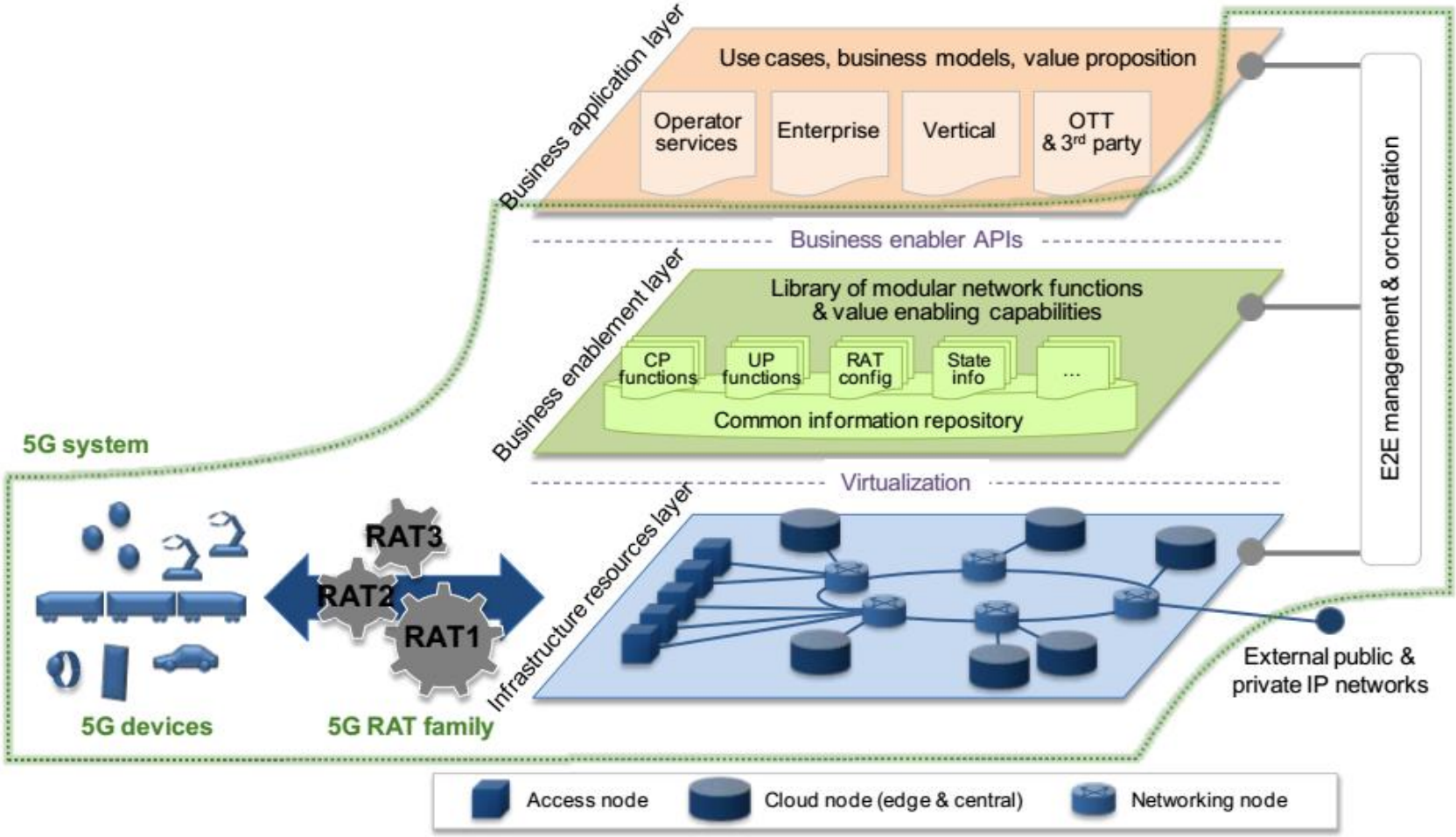


Figure 8: 5G Architecture

Use cases for delivering mobility and multicast services using network slicing

- Several use cases have different requirements on mobility and multicast services
  - Multicast Broadcast : public safety, video surveillance, emergency, sport event
  - Mobility : mobile users without video demand
  - Multicast + mobility : mobile users with video demand
  - Without mobility and multicast: other cases
- Services are provided based on
  - Operator requirements
  - Traffic type
  - Usage profile

Functional description

- Mobility and multicast services could be provided using DMM functions (DMM WG)

Service Primitive	H-CPA	H-DPA	A-CPN	A-DPN	MC	RC
IP Management	X				X	
IP Anchoring		X				
MN Detect			X	X		
Routing		X		X		
Tunneling		X		X		
QoS Enforcement		X		X		
FPC Client	X		X		X	
FPC Agent		X		X		X
NSH Classifier		X		X		

Figure 1: Mapping of DMM functions

FUNCTION	PMIPv6	MIPv6	IPsec	3GPP	Broadband
Home-CPA	LMA-CPA	HA-CPA	IKE-CPA	PGW-CPA	BNG-CPA
Home-DPA	LMA-DPA	HA-DPA	IKE-DPA	PGW-DPA	BNG-DPA
Access-CPN	MAG-CPN	-	-	SGW-CPN	RG-CPN
Access-DPN	MAG-DPN	-	-	SGW-DPN	RG-DPN

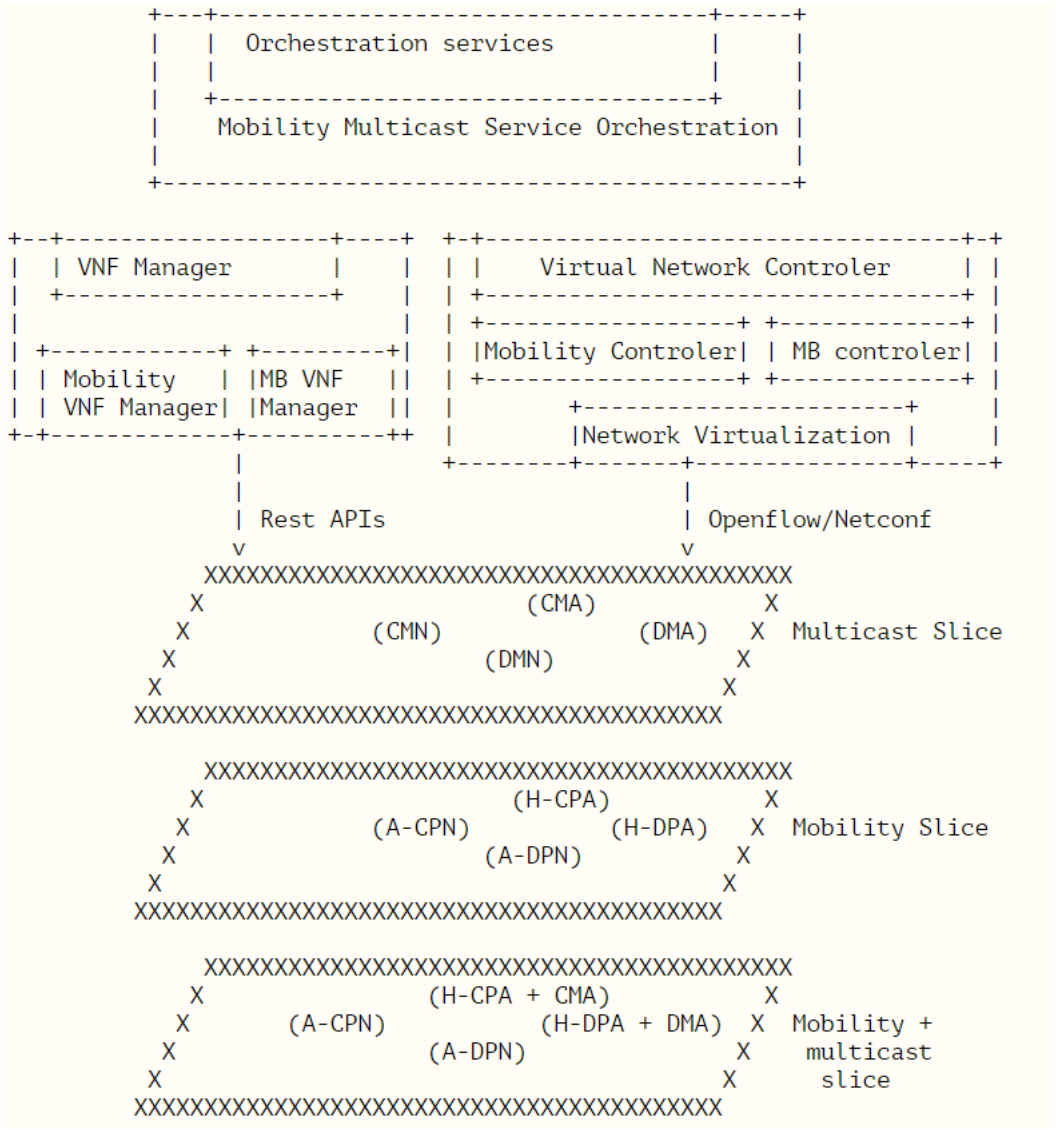
Figure 2: Mapping of DMM functions

FUNCTIONS	3GPP	IETF
CMA	BMSC-CPA	Multicast Router-CPA
DMA	BMSC-DPA	Multicast Router-DPA
CPN	MBMS-GW-CPN	Multicast Proxy-CPN
DPN	MBMS-GW-DPN	Multicast Proxy-DPN

Figure 3: Mapping of Multicast functions

draft-ietf-dmm-deployment-models
draft-kjsun-dmm-deployment-scenarios-multicast-dmm

Reference architecture



Functional description

- The specific VNF managers are used to instantiate, configure, and manage DMM functions
  - These DMM functions are described by VNF descriptors
- The specific network controllers are used to configure virtual networks with specific characteristics for slice
- A combined orchestration service
  - based on operator's requirements to compose different DMM functions to provide appropriate network services for each use case

IETF protocol enhancement considerations

- Protocols in IETF
  - Need to support
    - CP/DP separation
    - Function decomposition, function chaining → On-demand provisioning, combination to serve more specific use cases
    - Deployment with considerations of management and orchestration framework
  - Use case specific protocols
    - More configuration options for protocols to support slicing
      - more reliable protocols for slice with higher reliability requirements
  - Overlay network protocols
    - QoS, latency, bandwidth guarantee

Conclusion

- Network Slicing
  - Allocate efficient resources, network characteristics for specific use cases
  - Different ways to realize network slice
    - Resource allocation and reservation mechanisms
    - Reliability mechanisms
    - Deterministic network with required bandwidth, latency
  - From protocols point of view
    - Support function decomposition and chaining
    - More options for protocol deployment