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Converged Networks and Mobility

Evolved MVNO Architectures for Converged Wireless Deployments

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2021 Fall Technical Forum
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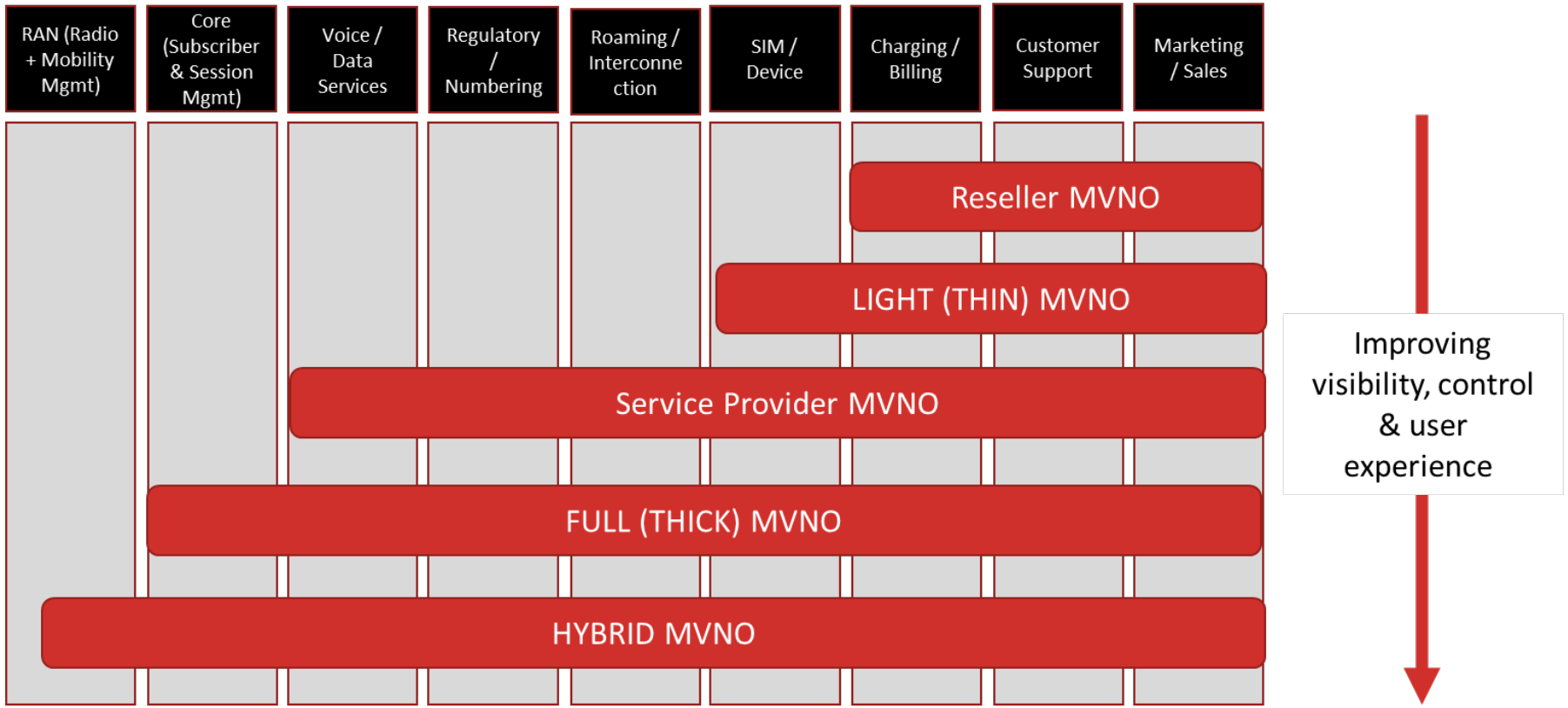
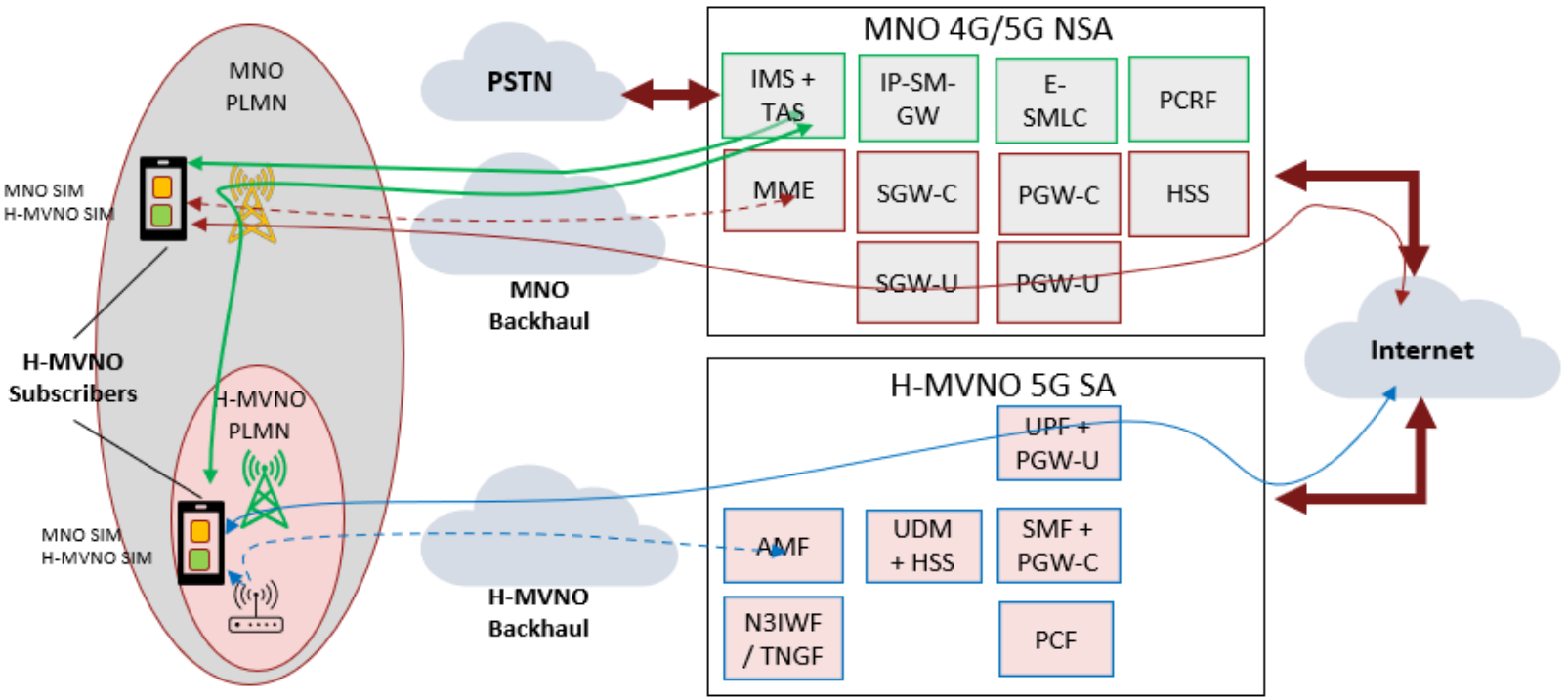
Background – Need to evolve from traditional MVNO architectures



- Depending on level of control and visibility desired, several MVNO models have been deployed over the years
- Hybrid MVNO – A new MVNO model where MVNO owns a mobile radio network deployed in specific geographic areas
- Architecture options for Hybrid MVNOs are the focus of this paper/presentation

H-MVNO DSDS based Architecture with Independent Mobile Core Networks (Option 1)



MNO SIM for voice and data outside the H-MVNO coverage or during an active voice call

H-MVNO SIM for data inside the H-MVNO coverage except during an active voice call

MNO RAN Coverage

H-MVNO + MNO RAN Coverage

Voice/SMS signaling & traffic flow via MNO network

Outside H-MVNO coverage

User traffic flow

Signaling flow

Inside H-MVNO coverage

User traffic flow

Signaling flow

Figure shows MNO network to be a 4G/5G NSA, but the architecture also applies to a scenario where both MNO and H-MVNO networks are 5G SA

The core network elements shown within the MNO and H-MVNO networks will use standardized interfaces

- Independent mobile cores, each using a dedicated SIM
- Transition between networks managed by intelligence within the device
- Voice/SMS/E911 services provided via MNO network utilizing MNO SIM
- Benefits
  - No coordination needed between the two networks
  - Efficient use of H-MVNO's mobile deployment
- Impacts
  - Lack of real time visibility into subscriber's data usage patterns
  - No control over policy, subscriptions and user experience management outside H-MVNO coverage
  - Implementation of ATSSS-like functionality using OTT solution requires client application on device

H-MVNO Evolved DSDS Architecture with S8 Interface Sharing (Option 2)

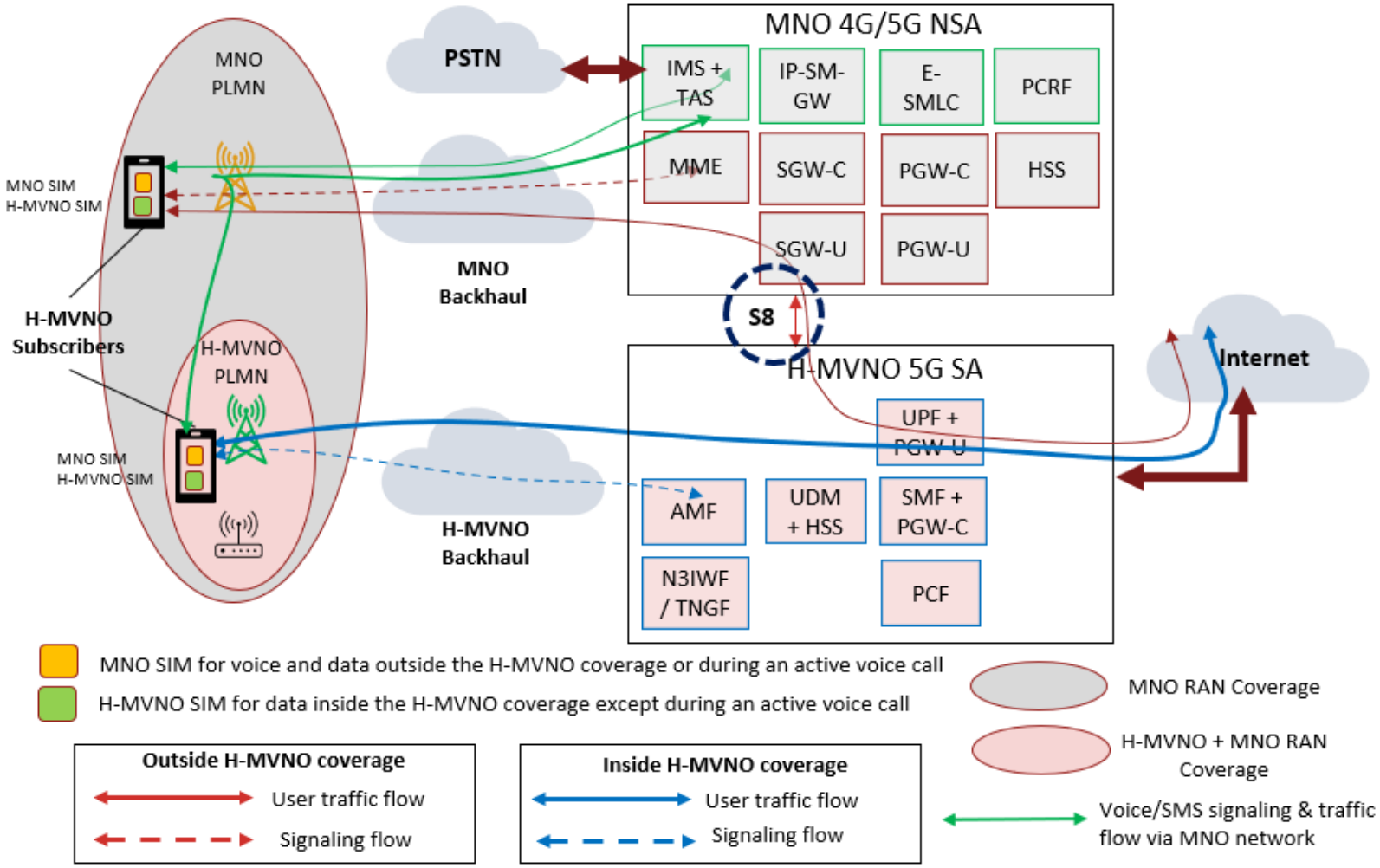


Figure shows MNO network to be a 4G/5G NSA, but the architecture also applies to a scenario where both MNO and H-MVNO networks are 5G SA
The core network elements shown within the MNO and H-MVNO networks will use standardized interfaces

- All user data traffic routed via H-MVNO network using S8 interface
- Common anchor within H-MVNO
- SIM configurations same as in Option 1
- Voice/SMS/E911 services same as in Option 1
- Benefits
  - Ensures full data usage visibility irrespective of network used
  - Facilitates uniform policy enforcement and subscription management
  - ATSSS support across MNO and H-MVNO's Wi-Fi network
- Impacts
  - Some co-ordination required between MNO and the H-MVNO to enable S8 interface

H-MVNO Evolved DSDS Architecture with S6a and S8 Interface Sharing (Option 3)

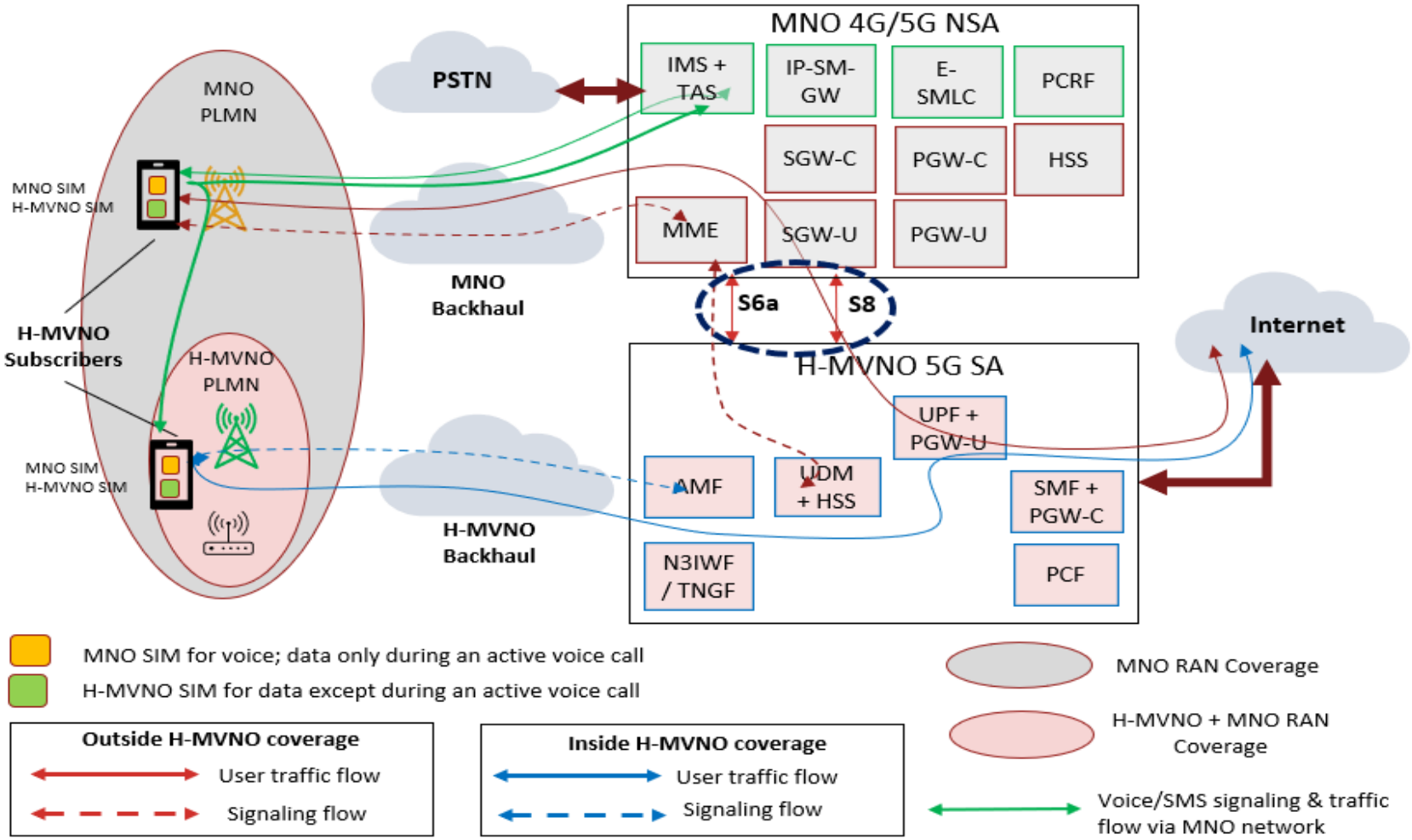


Figure shows MNO network to be a 4G/5G NSA, but the architecture also applies to a scenario where both MNO and H-MVNO networks are 5G SA

The core network elements shown within the MNO and H-MVNO networks will use standardized interfaces

- H-MVNO SIM configured to connect via MNO network outside H-MVNO coverage using S6a interface
- Data sessions always established using H-MVNO SIM except during a voice call
- Voice sessions continue to be established using MNO SIM as in Options 1 & 2
- Benefits
  - All of Option 2
  - Standards based ATSSS across MNO mobile, H-MVNO mobile and H-MVNO Wi-Fi networks
- Impact
  - Some co-ordination required between MNO and the H-MVNO to enable S6a and S8 interfaces

HMVNO Single SIM Architecture with S6a, S8, N26 Interface Sharing (Option 4)

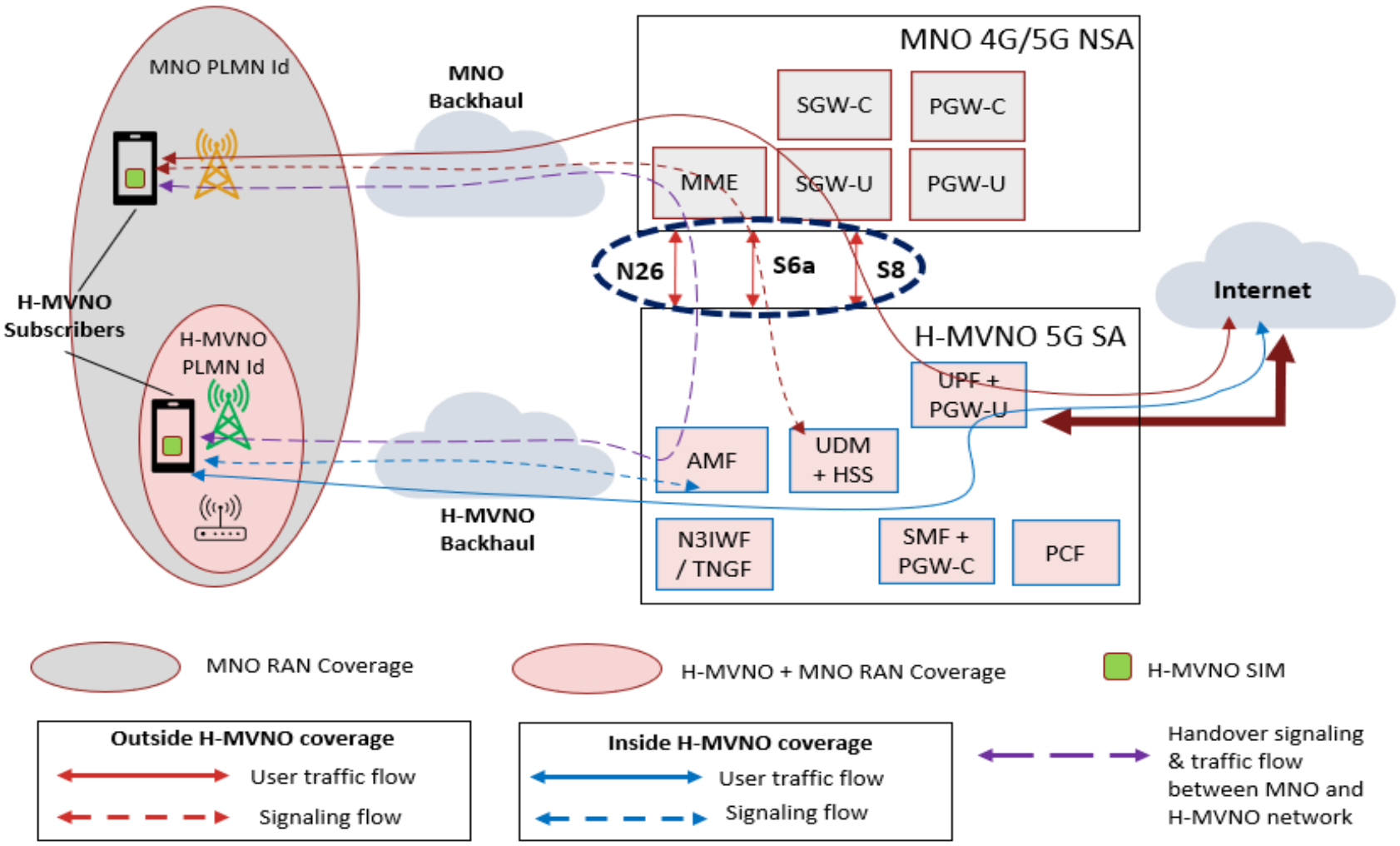


Figure shows MNO network to be a 4G/5G NSA, but the architecture also applies to a scenario where both MNO and H-MVNO networks are 5G SA

The core network elements shown within the MNO and H-MVNO networks will use standardized interfaces

- Introduces N26 interface between MNO and H-MVNO for handover
- Benefits
  - All of Option 3
  - Seamless low-latency user experience
  - Support for single SIM devices
- Impacts
  - Increased signaling traffic load on MNO's core
  - Increased operational overhead (with multiple H-MVNO partners)
  - Requires H-MVNO specific mobility configurations in MNO RAN
  - Additional architecture and coordination impacts related to voice/SMS for single SIM devices

H-MVNO Dedicated Core Architecture (Option 5)

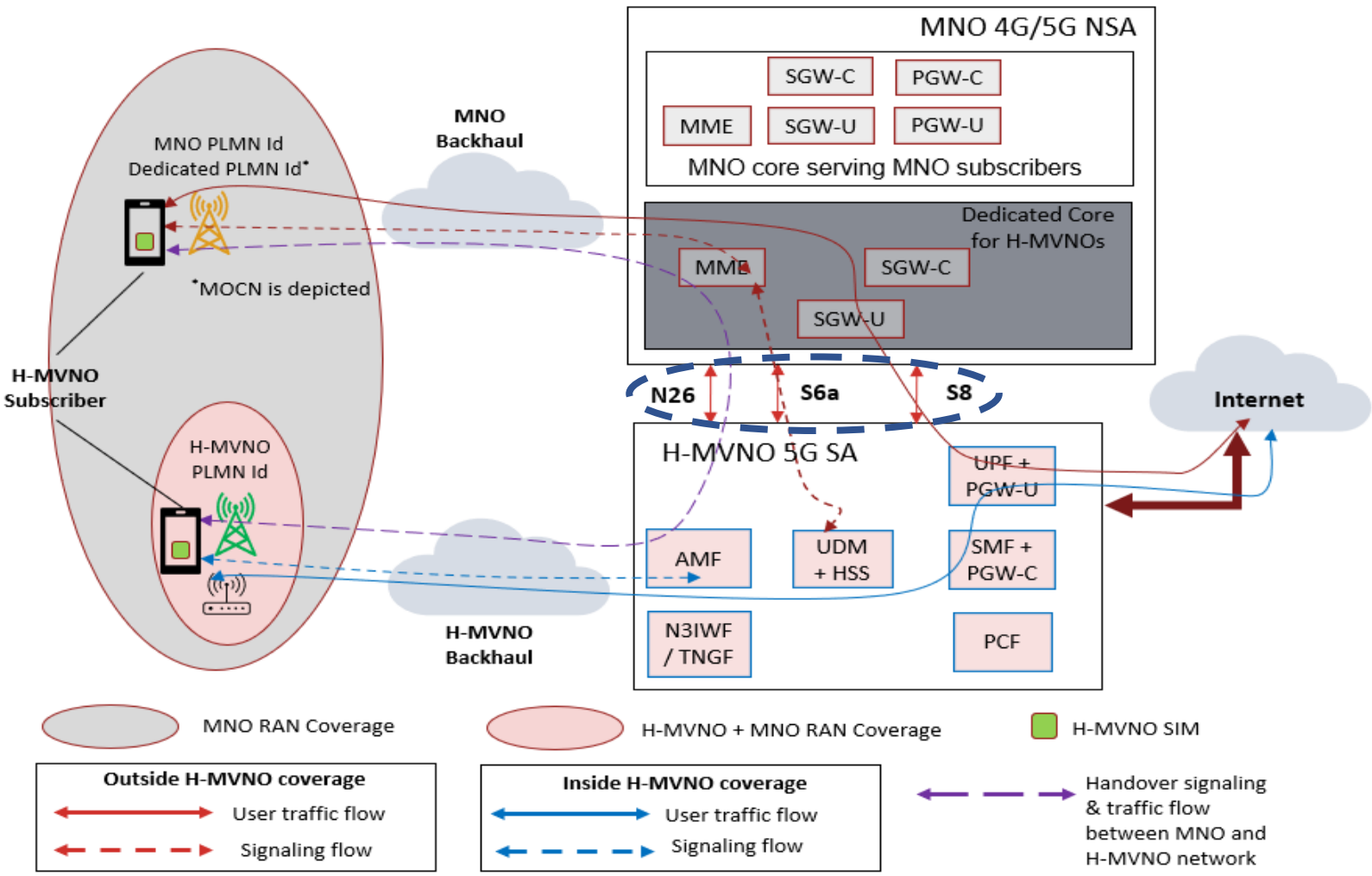


Figure shows MNO network to be a 4G/5G NSA, but the architecture also applies to a scenario where both MNO and H-MVNO networks are 5G SA

The core network elements shown within the MNO and H-MVNO networks will use standardized interfaces

- Uses separate dedicated core to interface with H-MVNO mobile cores
  - MOCN – MNO RAN uses a separate PLMN Id for H-MVNO devices
  - DECOR/eDECOR – MNO RAN / Core redirects based on subscription or DCN-ID provided by the user device
- Dedicated core directs traffic to appropriate H-MVNO network
- Benefits
  - All of Option 4
  - No signaling traffic load on MNO core
  - No operational overhead (with multiple H-MVNO partners)
- Impacts
  - Requires a dedicated core to be deployed (and associated functionality in MNO RAN/Core)
  - Requires dedicated PLMN Id specific mobility configurations in MNO RAN
  - Voice/SMS impacts for single SIM devices similar to Option 4

H-MVNO Single SIM Architectures (Voice Option A)

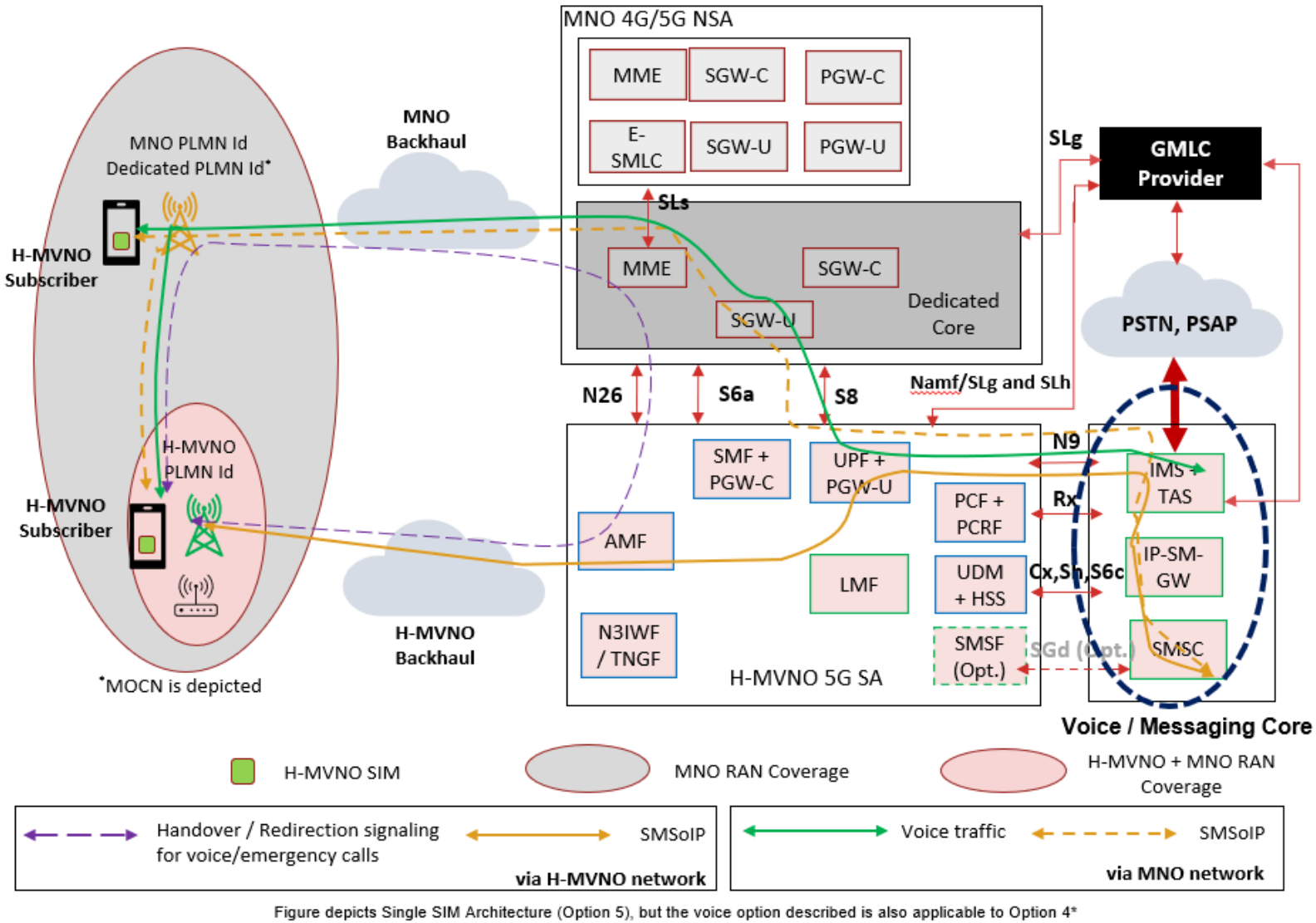


Figure depicts Single SIM Architecture (Option 5), but the voice option described is also applicable to Option 4*

- Voice and Messaging service platforms deployed by H-MVNO or its voice service partner
- Benefit
  - Minimal MNO coordination required to enable voice/messaging services
- Impacts
  - Requires H-MVNO to deploy
    - voice/messaging platforms
    - additional core function (LMF)
  - Requires H-MVNO to interface with
    - PSTN / PSAP
    - GMLC provider to retrieve location during text to 911
  - Additional inter-domain interfaces needed if a voice services partner is used

H-MVNO Single SIM Architectures (Voice Option B)

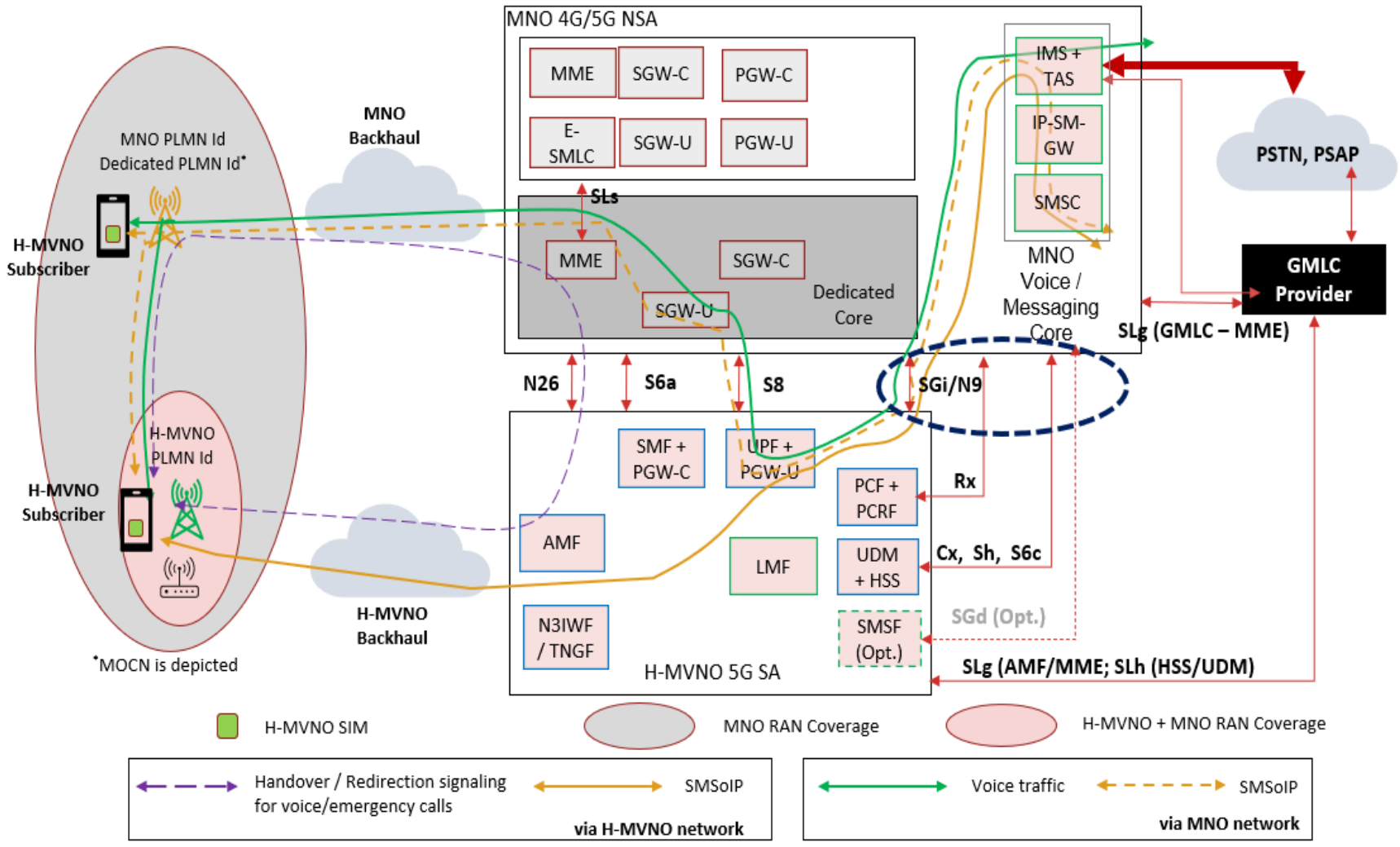


Figure depicts Single SIM Architecture (Option 5), but the voice option described is also applicable to Option 4*

- Leverages MNO's voice and messaging platforms
- Voice/SMS subscription configured in H-MVNO core network
- Benefits
  - Re-use of MNO's existing PSTN / PSAP relationship
  - No need for H-MVNO to deploy voice/SMS platforms
- Impacts
  - Coordination of additional interfaces between MNO and H-MVNOs – increased operational overhead for MNO
  - Like Option A, deployment of LMF and interface to GMLC provider still required by H-MVNO

H-MVNO Single SIM Architectures (Voice Option C)

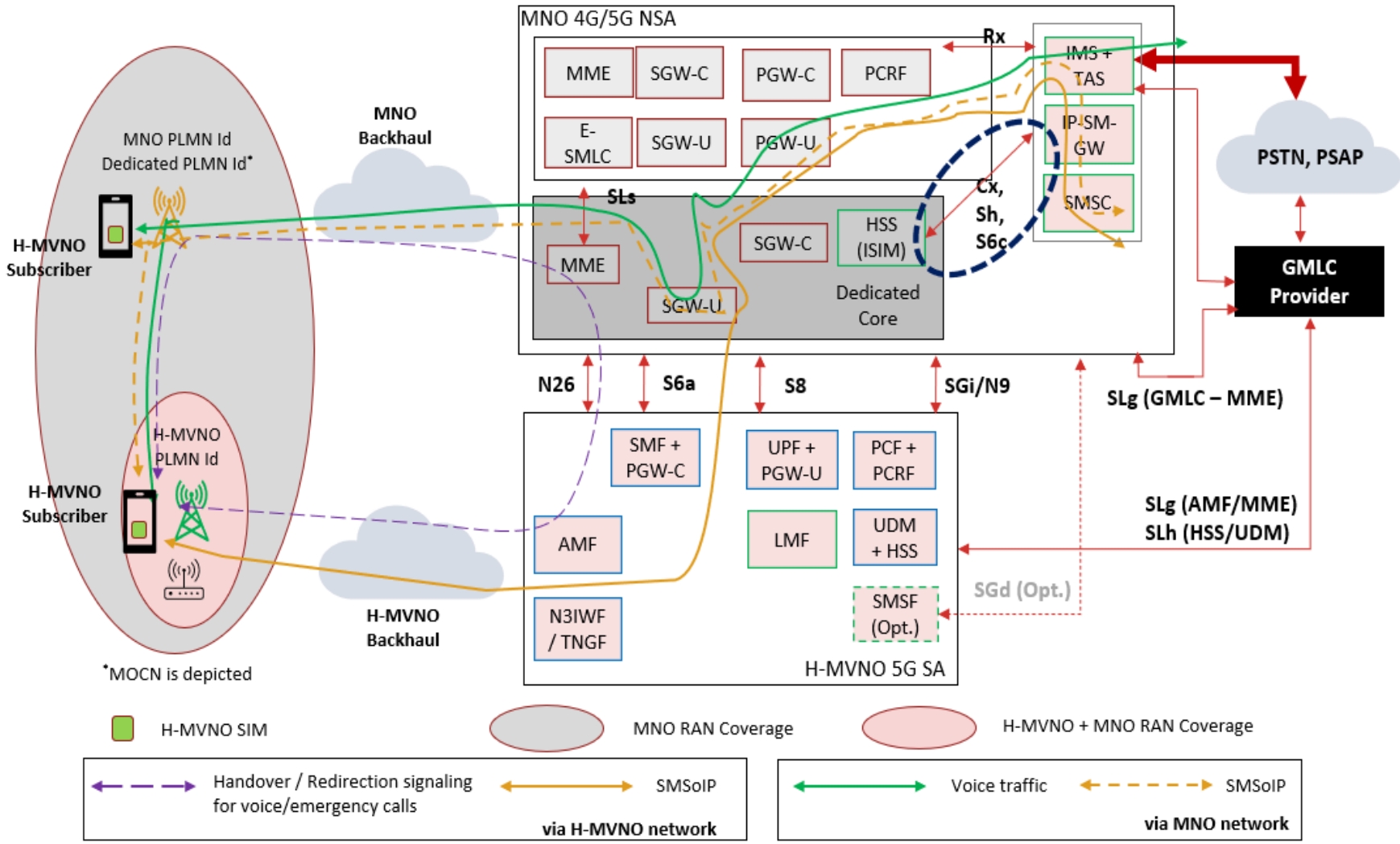


Figure depicts Single SIM Architecture (Option 5), but the voice option described is also applicable to Option 4*

- Like Option B, leverages MNO's voice and messaging platforms
- Voice credentials (ISIM) provisioned in dedicated core; 5G credentials (USIM) provisioned in H-MVNO core network
- Benefit
  - All of Option B
  - Fewer interfaces required between networks when compared to Option B
- Impacts
  - Dual provisioning required
  - Interworking function required (in absence of combined 4G/5G MNO core)
  - Interface to GMLC provider still required

Summary

- Paper has identified several novel yet standards compliant architectural options to converge H-MVNOs' wireless connectivity service across all their wireless platforms
- The presented architecture options provide opportunities for MNOs to differentiate their MVNO arrangements
- The presented architecture options are evolutionary in nature - members could opt for a dual SIM architecture to begin with and then evolve to a single SIM architecture when needed

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Thank You!

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