

JOTS Neutral Host In-Building

SCWS

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Joint Operators Technical Specification forum (JOTS)






■ Who we are

- UK mobile network operator technical forum



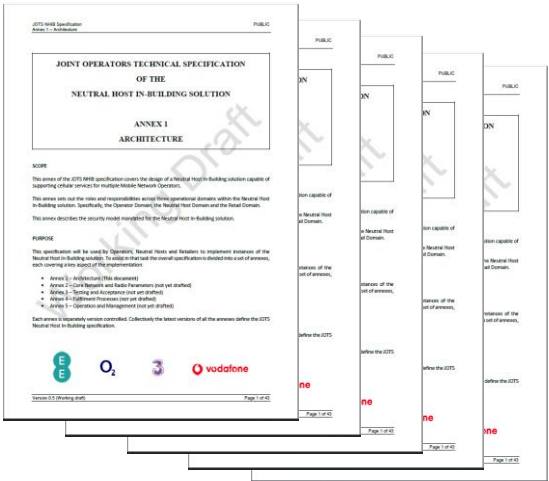
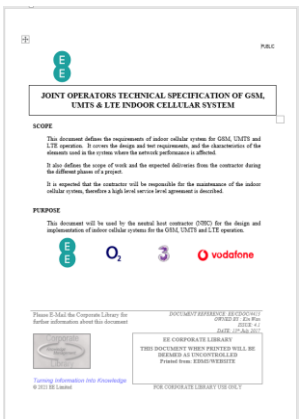
■ What problems are we trying to solve

- Small cell deployment in small to medium sized venues

 High Footfall Public Areas	 Industrial Complexes	 Large Offices /Hotels	 Small Offices	 Shops/Cafes Restaurants/ Pubs
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■ How we go about solving the problem

- We draft technical specifications



JOTS SPECIFICATION
OF GSM, UMTS & LTE
INDOOR CELLULAR
SYSTEM,
Issue 4.1 (2017)

JOTS SPECIFICATION OF
THE NEUTRAL HOST IN-
BUILDING SMALL CELL
SOLUTION,
Issue 1.0 (2020)

The problem we are trying to solve with NHIB

■ Increase the number of in-building small cells for the benefit of customers.

■ Create a technical framework that accelerates small cell rollout.

- Reduce the cost of multi-operator in-building cellular solutions. Move away from a reliance on DAS solutions.
- Increase the attractiveness of in-building solutions by establishing a small cell multi-operator paradigm.
- Simplify the design, deployment and operation of multi-operator in-building cellular solutions.
- Enable rollout to multiple venue types via neutral hosts.

■ Create a technical framework that meets the operator's requirements.

- Create a *common* method for neutral hosts to interconnect with mobile operator core networks.
- Embed within the solution a security model which is trusted by the mobile operators.
- Establish clear demarcations of responsibility between the mobile operator, the neutral host and the reseller.
- Define an architecture which is scalable and satisfies our regulatory requirements.

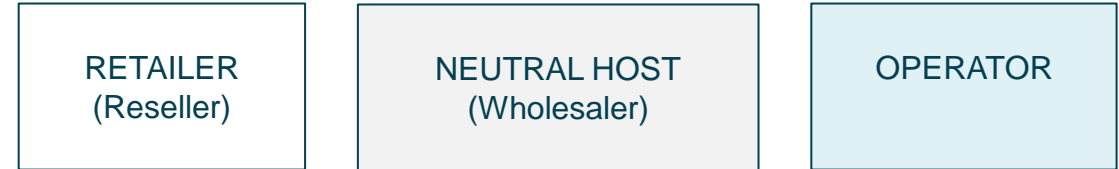
The JOTS answer to the problem

- To write a specification!

- **JOTS Neutral Host In-Building Specification**

- Comprises of five Annexes:
 - › **Annex 1** – Architecture (56 pages)
 - › **Annex 2** – Radio Requirements (25 pages)
 - › **Annex 3** – Testing and Acceptance (31 pages)
 - › **Annex 4** – Operational Processes (20 pages)
 - › **Annex 5** – Fulfilment (25 pages)
- 157 pages in total.
- Version 1.0 issued on 23rd October 2020.
- Version 2.0 to be issued imminently.

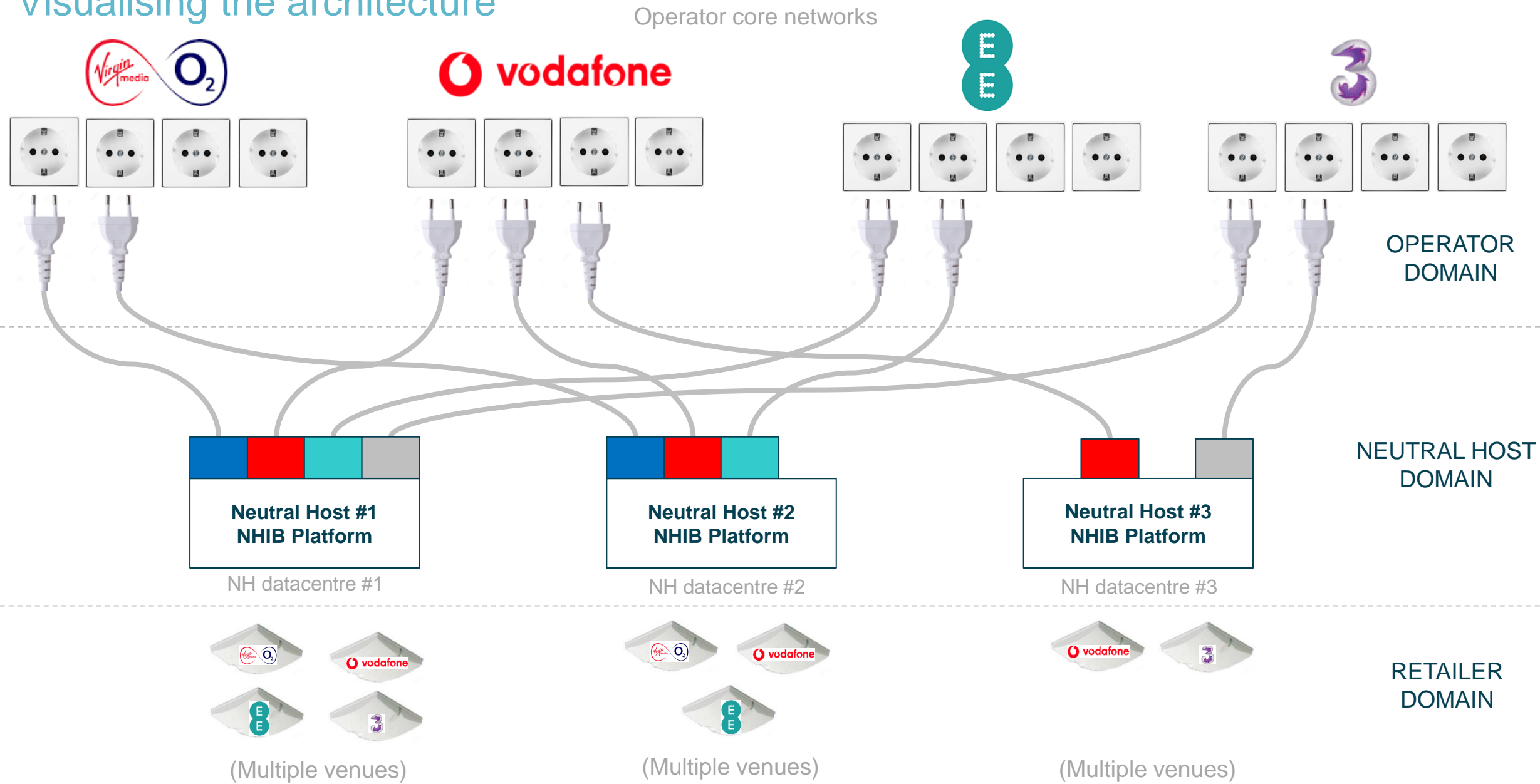
- Sets out domains of responsibility



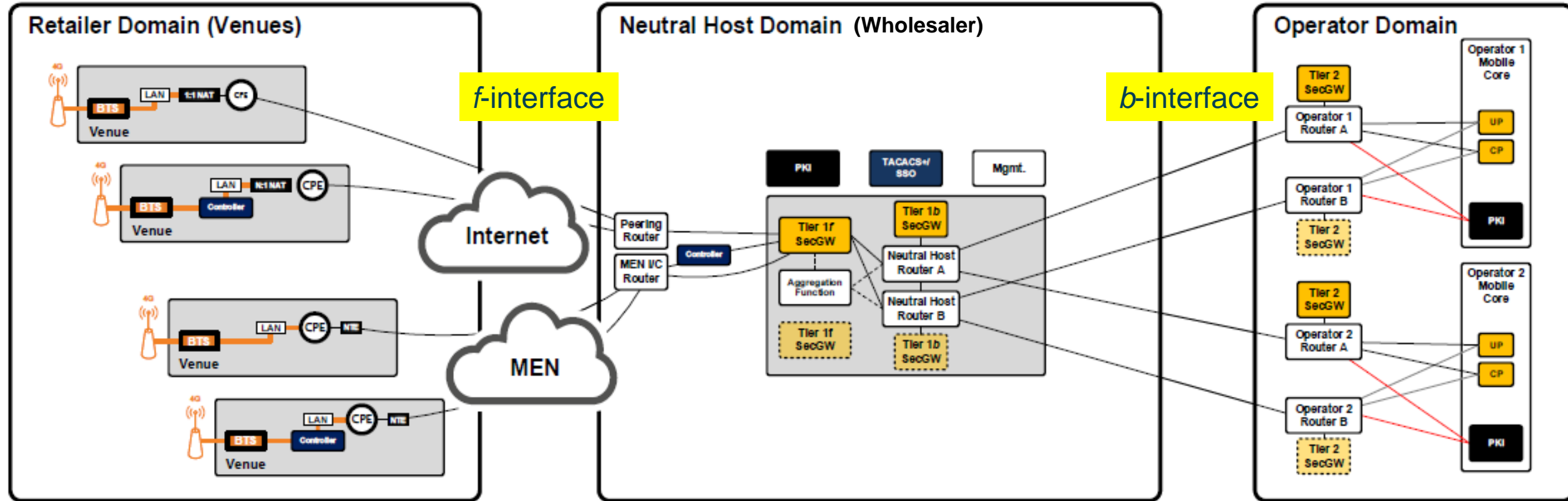
- **OPERATOR**
 - › Operates and maintains their own mobile *core* network.
- **NEUTRAL HOST**
 - › Owns and operates a radio access network NHIB platform.
- **RETAILER**
 - › Deploys radios points into venues ...
 - › ... connected via an NHIB platform.

Annex 1 - Architecture

Visualising the architecture



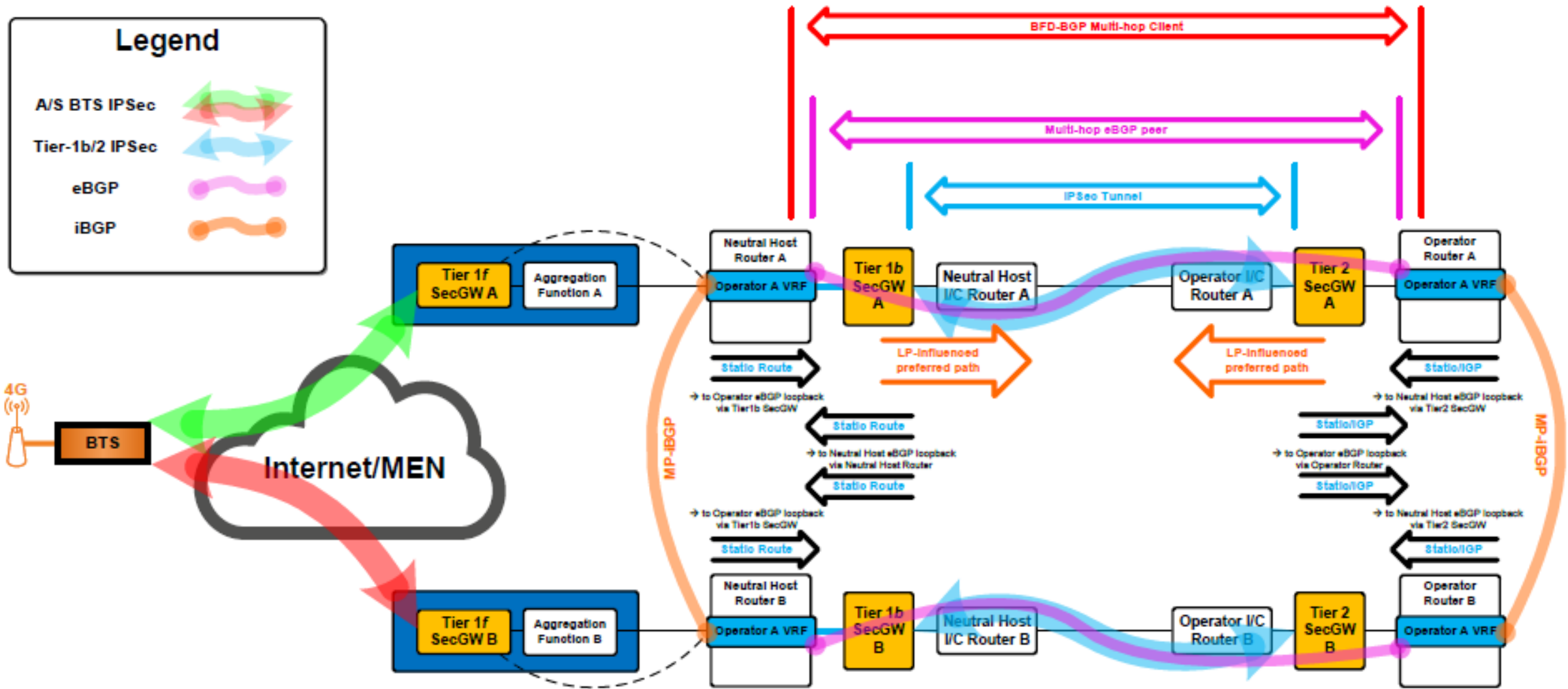
NHIB Architecture and Domains



- The Retailer and Neutral Host are responsible for the **f-interface**.
- The Neutral Host and Operator are responsible for the **b-interface**.
- The Neutral Host is responsible for building an NHIB platform to the JOTS NHIB architecture specification.

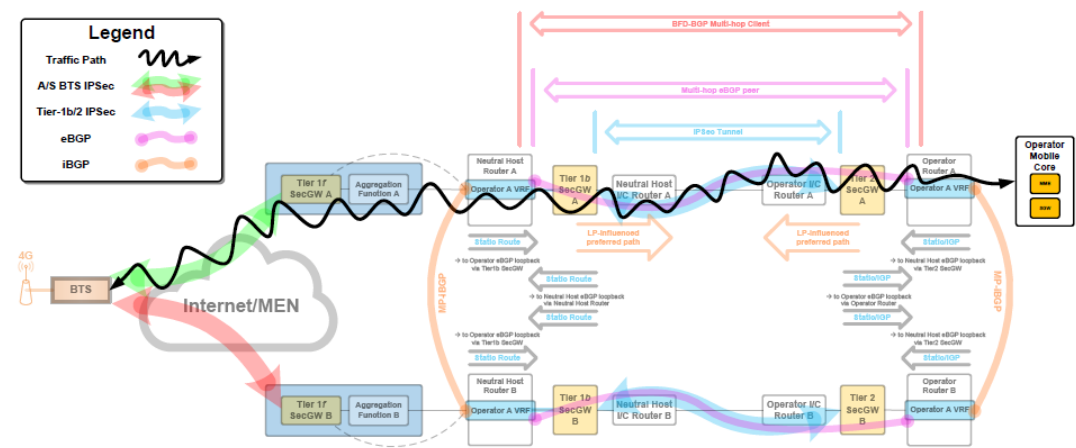
Routing and resilience

- End-to-end view

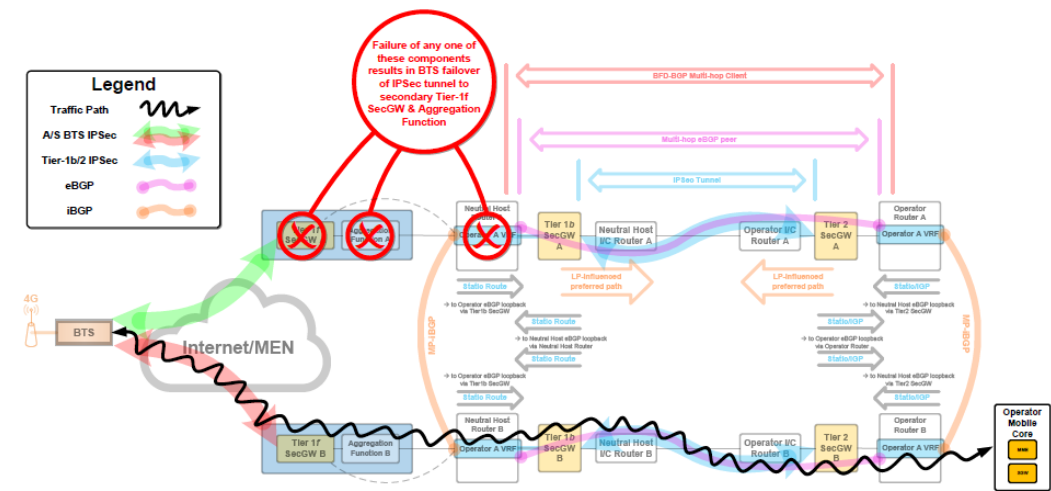


Fail-over

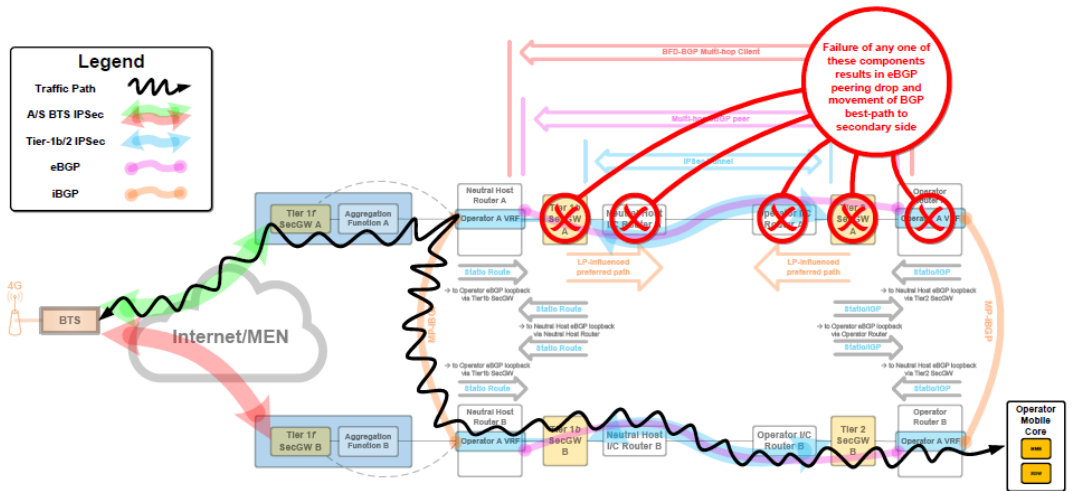
- Normal running



- A-side Tier-1f/HeNB-GW/NH-Router failure



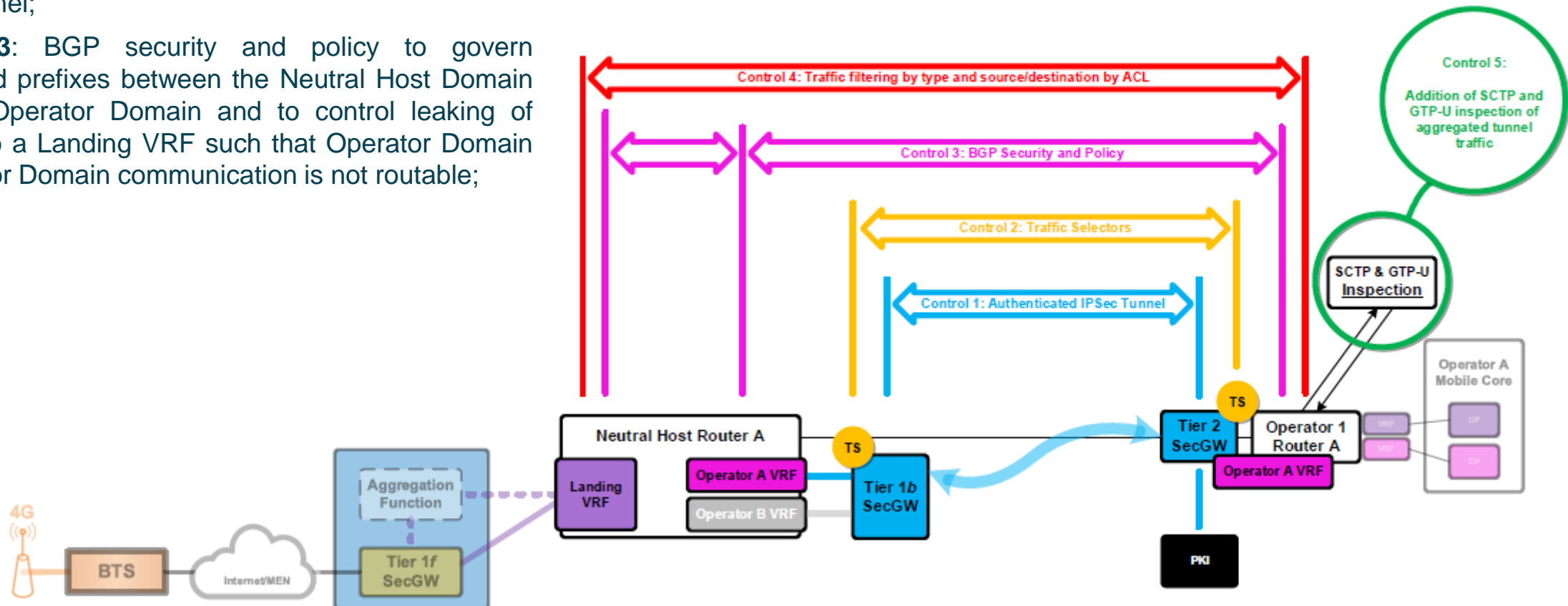
- A-side eBGP Session Down



Security controls

- **Control 1:** Certificate authenticated IPSec Tunnel for b-interface;
- **Control 2:** Operator-specific Child-SA Traffic Selectors, allowing only expected traffic types and source/destination pairs to traverse the established IPSec tunnel;
- **Control 3:** BGP security and policy to govern exchanged prefixes between the Neutral Host Domain and the Operator Domain and to control leaking of prefixes to a Landing VRF such that Operator Domain to Operator Domain communication is not routable;

- **Control 4:** Traffic filtering based on traffic types and source/destination pairs as a second line of checks in case of Traffic Selector misconfiguration.
- **Control 5:** GTP-U traffic inspection (a per Operator decision).



Annex 2 – Radio Requirements

Radio Requirements

- Coverage requirement split into zones:
 - **Zone A** – Areas within public venues where mobile customers are expected to stop and consume mobile services.
 - **Zone B** – Residential multi-dwelling units, general offices, places where mobile customers are expected to transit.
 - **Zone C** – Transitional areas between indoor networks or between indoor and outdoor networks.

LTE (hand held MT – in-building)			
Type of zone	A: High data rate service	B: Medium data rate service	C: Portal area ONLY
95% downlink reference coverage (reference signal received power, RSRP) (*)	>-95 dBm	>-105 dBm	>-110 dBm
95% uplink loss	<110 dB	<120 dB	<125 dB
Typical area	Zone A: low mobility <u>and</u> high density mobile. Zone B: medium mobility <u>and</u> low/medium density mobile. Zone C: portal area ONLY.		

- Specification defines:
 - Coverage levels
 - Coverage overlap
 - Portal areas and handover zones
 - Health and Safety considerations (ICNIRP)
 - Commissioning and testing requirements
 - Radio survey guidelines
 - Documentation requirements

Annex 3 – Testing and Acceptance
Annex 4 – Operational Processes
Annex 5 – Fulfilment

Testing and Acceptance, Operational Processes, Fulfilment

- **Annexes 3, 4 and 5** collectively address the commissioning, operation and upgrade of the NHIB platform and the rollout of NHIB sites.
- **Annex 3 – Testing and Acceptance**
 - Sets out the testing that the neutral host must carry out:
 - › Platform configuration and management testing
 - › Connectivity testing
 - › Routing and security testing
 - › Resilience and fail-over testing
 - › PKI testing
 - › PEN testing (hardening)
 - › End-to-end service testing
 - › Cell locking/unlocking testing
 - › PM/CM/FM data-feed testing
 - It also describes, at a high-level, the process by which a neutral host can *upgrade* their NHIB platform once it is connected to multiple operator core networks.
- **Annex 4 – Operational Processes**
 - Sets out requirements for:
 - › Physical security
 - › Kit inventory
 - › f/b-interface operational responsibilities
 - › BTS shut-down process to meet operators regulatory requirement
 - › Platform and transmission link capacity planning
 - › Performance monitoring and KPIs
 - › Fault management and trouble ticketing
 - › Site decommissioning process
- **Annex 5 – Fulfilment**
 - New site build process, site naming convention and new site documentation requirements.

JOTS NHIB version 2 updates

Version 2 updates

■ Evolution path to IPv6 addressing

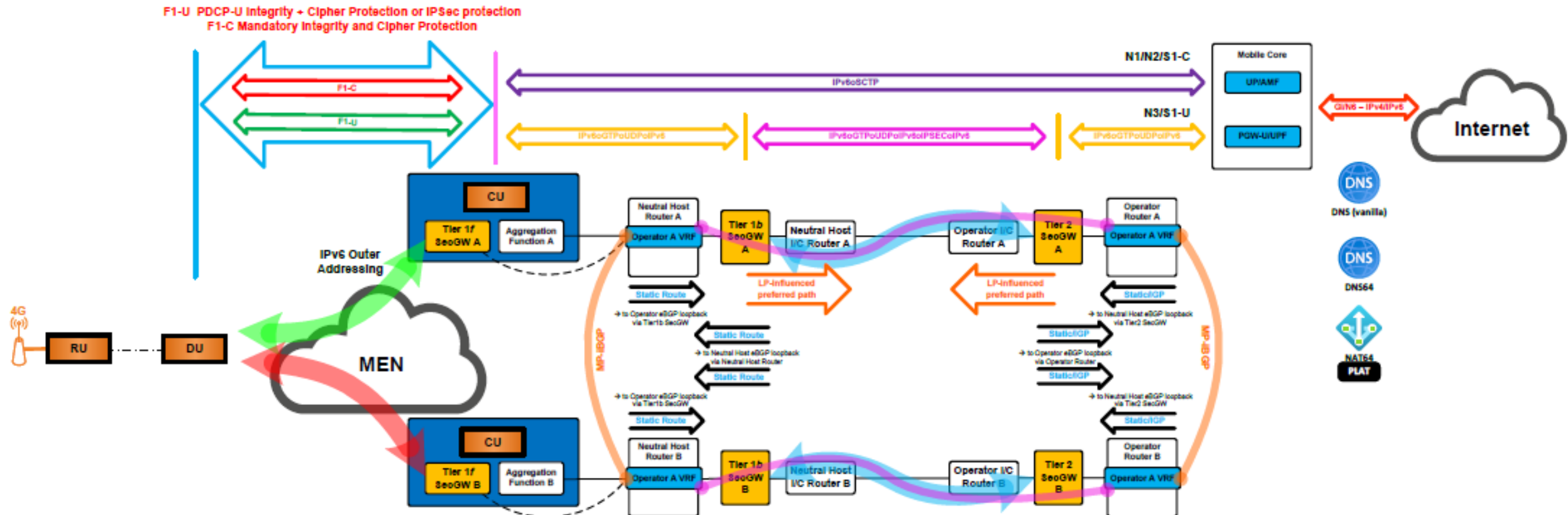
- Tunnel-inner addressing relating to BTS endpoints must be **unique per-Operator**. Thus there is a strong Operator driver to move to IPv6 for tunnel-inner addressing and for IPv6 addressing more generally.
- A three stage evolution path is proposed:
 - › **Stage 1** – IPv6 User Plane addressing
 - › **Stage 2** – IPv6 Inner Addressing
 - › **Stage 3** – IPv6 Outer Addressing

■ Introduction of aspects in support of 5G

- Incorporation of a TDD radio interface option
 - › via adoption of phase synchronisation, either GPS or otherwise
- Introduction of Disaggregated RAN concepts into the NHIB architecture.

Disaggregated RAN

- In NHIB V2, RAN disaggregation is limited solely to the Neutral Host Domain and the Retailer Domain (i.e. the Operator Domain is not in scope).
- The CU resides in the Neutral Host Domain, the RU resides in the Retailer Domain.
- The DU can reside in either the Neutral Host Domain or the Retailer Domain.



JOTS NHIB

■ NHIB is intended to be of benefit to all:

- Mobile Customers
- Landlords / Building Owners / Tenants
- Retailers (Resellers)
- Neutral Hosts
- Mobile Operators

■ JOTS NHIB aims to:

- Lower the barriers to small cell deployment
- Lead towards widescale indoor rollout
- Specify a security and resilience model that is scalable whilst meeting the operator's regulatory requirements.
- Provide a harmonised operational framework to enable ease of operation.

■ It's on the web

- Copy available at <https://www.mobileuk.org/jots>

