

CU separated BNG Protocol

draft-cuspdrt-gwg-cu-separation-bng-deployment

draft-cuspdrt-gwg-cu-separation-info-model

draft-cuspdrt-gwg-cusp-requirements

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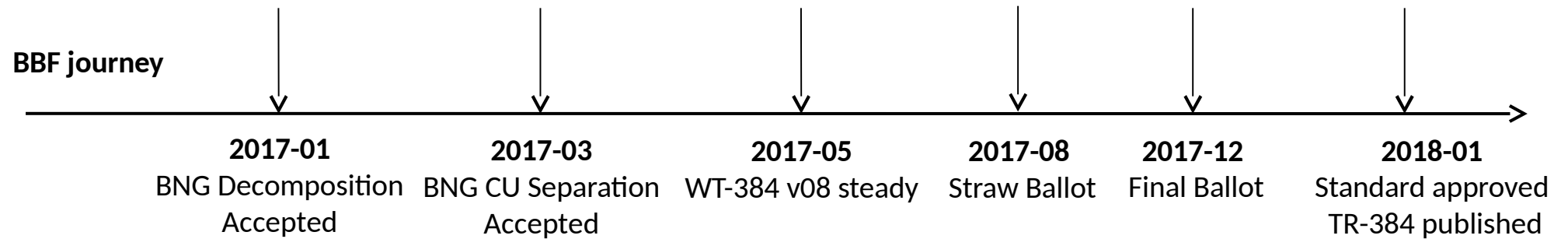
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A brief background introduce—BBF Relative Works

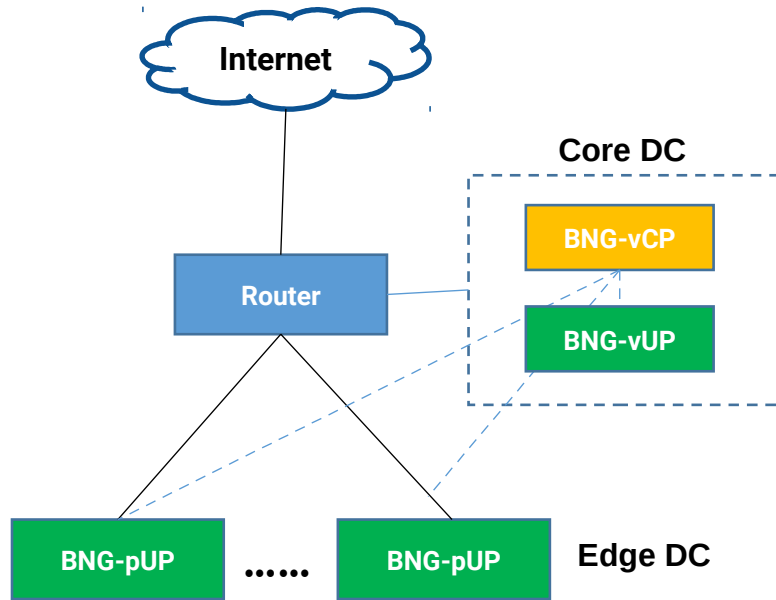
- Relative Works:**
- 2017.01 BNG Decomposition got accepted by WT-384
 - 2017.03 BNG CU Separation got accepted by WT-384
 - 2017.08 WT-384 started Straw Ballot
 - 2017.12 WT-384 started Final Ballot
 - 2018.01 TR-384* is approved and published as a standard



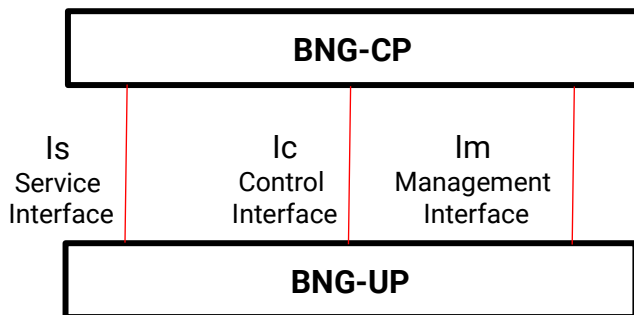
- 2018.03 BBF prepared a liaison to IETF related WG:
<https://issues.broadband-forum.org/browse/LIAISE-128>

A brief background introduce—Operator deployment

C/U separation BNG architecture which combined NFV and SDN advantages satisfy the requirements of field network



Architecture of C/U separated vBNG



Interfaces of C/U separated BNG

■ Cloud-based BNG-CP is a centralized control center

- **BNG-vCP** : the brain of user control and management, including the state machine of PPPoE/IPoE processing, User control and management, AAA, and UP management;
- **CP performance**: **20 million user sessions, 20000/s access rate, 50000/s user table sending rate;**

■ High-performance BNG-pUP (physical) is in distributed deployment for traffic offloading

- **BRAS-pUP** : user policies executing and traffic forwarding ;
- **UP performance**: the throughput is **1Tbps, 10000/s access rate, 1 million user sessions;**

■ BNG-vUP is a virtual centralized UP for light traffic services with many sessions.

■ Standardized interfaces between CP and UP

- **Is**: send PPPoE/IPoE dial-up packets between CP and up by VXLAN tunnel;
- **Im** : deliver static configurations from CP to UP, based on NETCONF and standard YANG model will be supported ;
- **Ic** : CP send user forwarding entries to UP, and now we adopt the protocol called CUSP in IETF

The data came form tests and trials of China Mobile

Updates since last IETF meeting

Information Model:

- Migrating the draft ([draft-wcg-i2rs-cu-separation-infor-model-02](#)) from I2RS to RTGWG.
- New ID: [draft-cuspdt-rtgwg-cu-separation-infor-model-00](#)

CUSP requirements:

- Update the abstract section and add a paragraph (section 3.1) to clarify that this protocol works on the control interface.
- Update the reference, especially BBF related works.
- Fix some clerical errors

CU separated BNG deployment:

- Add a section to introduce the “high availability consideration”
 - N+N active standby BNG-CP: 1:1 backup
 - N+K active standby BNG-CP: N:1 backup

Open Issues: I – How to define the CUSP's data model

Option 1:

- Based on Information model to design a set of flow tables;
- Each flow table is composed of a fixed header and a number of tuples, each consisting of a Type, a Length, and a Value (TLV).
- Advantages :
 - It can encoding information in a flexible and extensible.
 - Low overhead, high-performance.

Option 2:

- Based on Information model to define a YANG data model;
- Mapping this YANG data model to binary format such as Concise Binary Object Representation (CBOR);
- Using CUSP to translate this CBOR file between the CP and UPs.
- Advantages : Yang is a human-readable language.
- Disadvantages:
 - YANG is usually used to model configuration data, not be used to model control channel's flow tables
 - Not guarantee optimum performance.

Open Issues: II – Why not reuse 3GPP' s CUPS

- Background:
 - 3GPP specifies a CUPS standards for Control and User Plane Separation of EPC nodes (<http://www.3gpp.org/cups>)
- Related documents:
 - Functional Architecture and Procedures:
 - TS 23.214 Architecture enhancements for control and user plane separation of EPC nodes.
 - Protocols
 - TS 29.244 Interface between the Control Plane and the User Plane of EPC Nodes.
 - TS 23.007 Restoration procedures
 - TS 29.303 DNS procedures for UP function selection
- The Main Gaps Are:
 - Different architecture (More details please review the appendix II);
 - The CUPS entry is delivered based on UDP.
 - There is no guarantee of ordering of packets with UDP.
 - Therefore, it is not suitable for CU separated BNG.

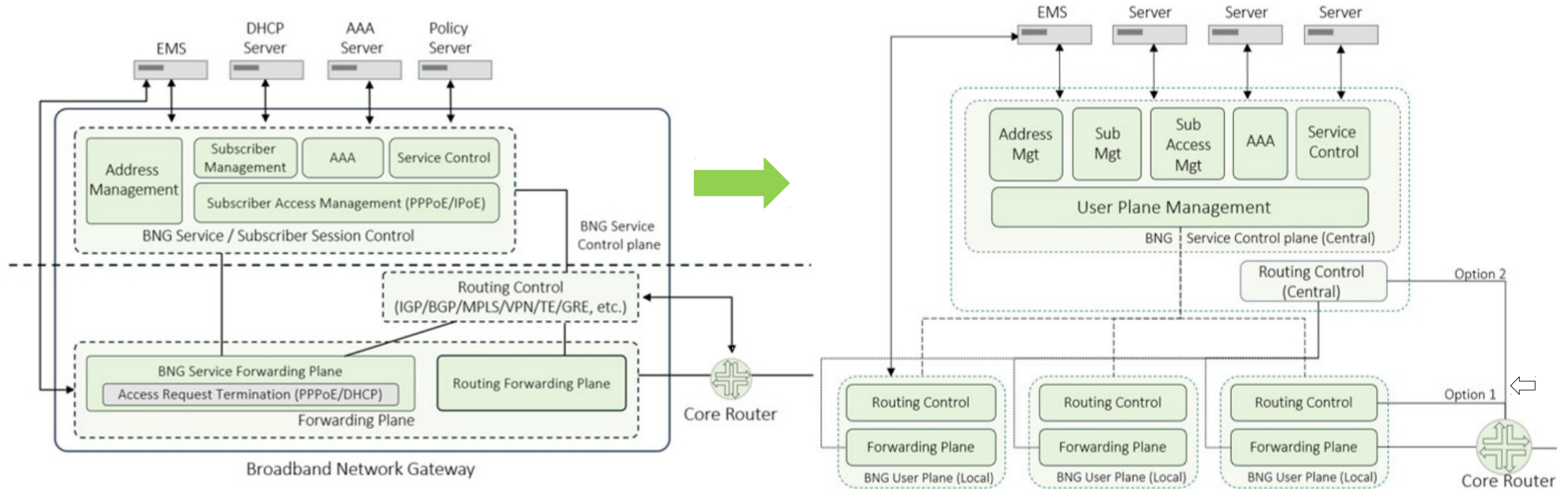
Next Steps:

- **Documents update:**
 - ❖ The authors appreciate thoughts, feedback, and text on the content of the documents.
 - ❖ And then prepare another version.
- **IETF102 Montreal Hackathon:**
 - ❖ Welcome to join us!
- **IETF102 Montreal or IETF103 Bangkok Bits & Bytes.**

Thank you

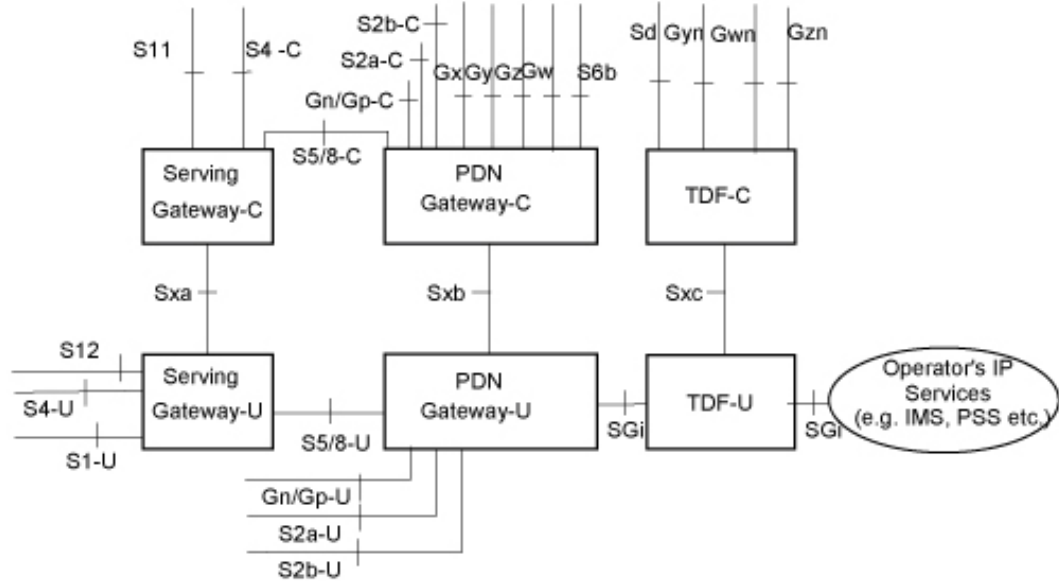
Appendix I: BNF architecture for CU Separation of disaggregated BNG

- CU Separation of disaggregated BNG – TR-384 Section 5.2.5
 - BNG Service Control Plane (Centralized): BNG Service / Subscriber Session Control
 - BNG User Plane (Distributed): Routing Control and Forwarding Plane
 - User Plane Management in the centralized Control Plane manages the distributed BNG User Planes

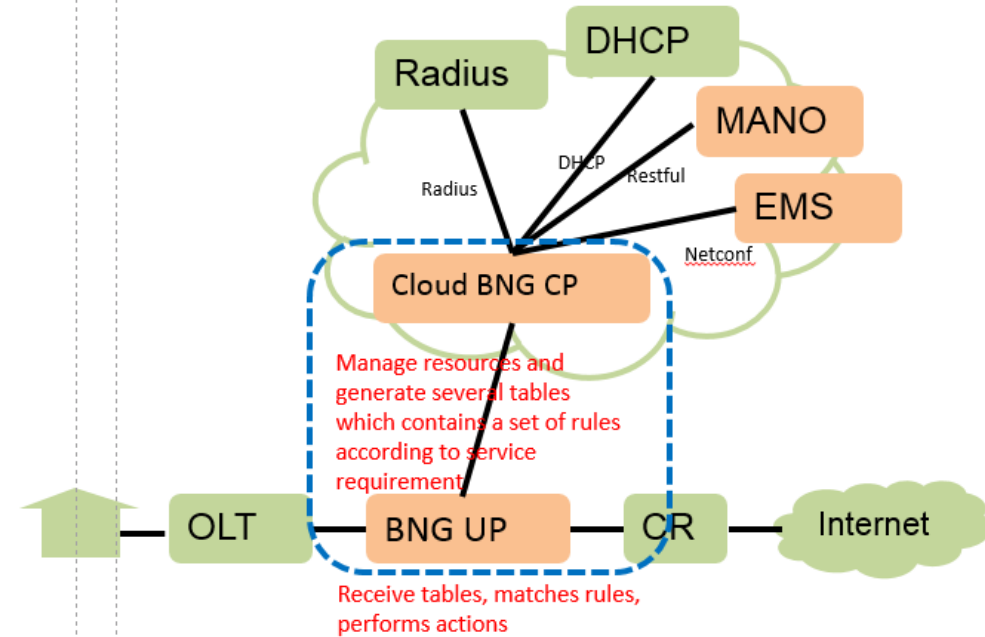


BNG functional decomposition

Appendix II: CU Separation of EPC vs CU Separation BNG



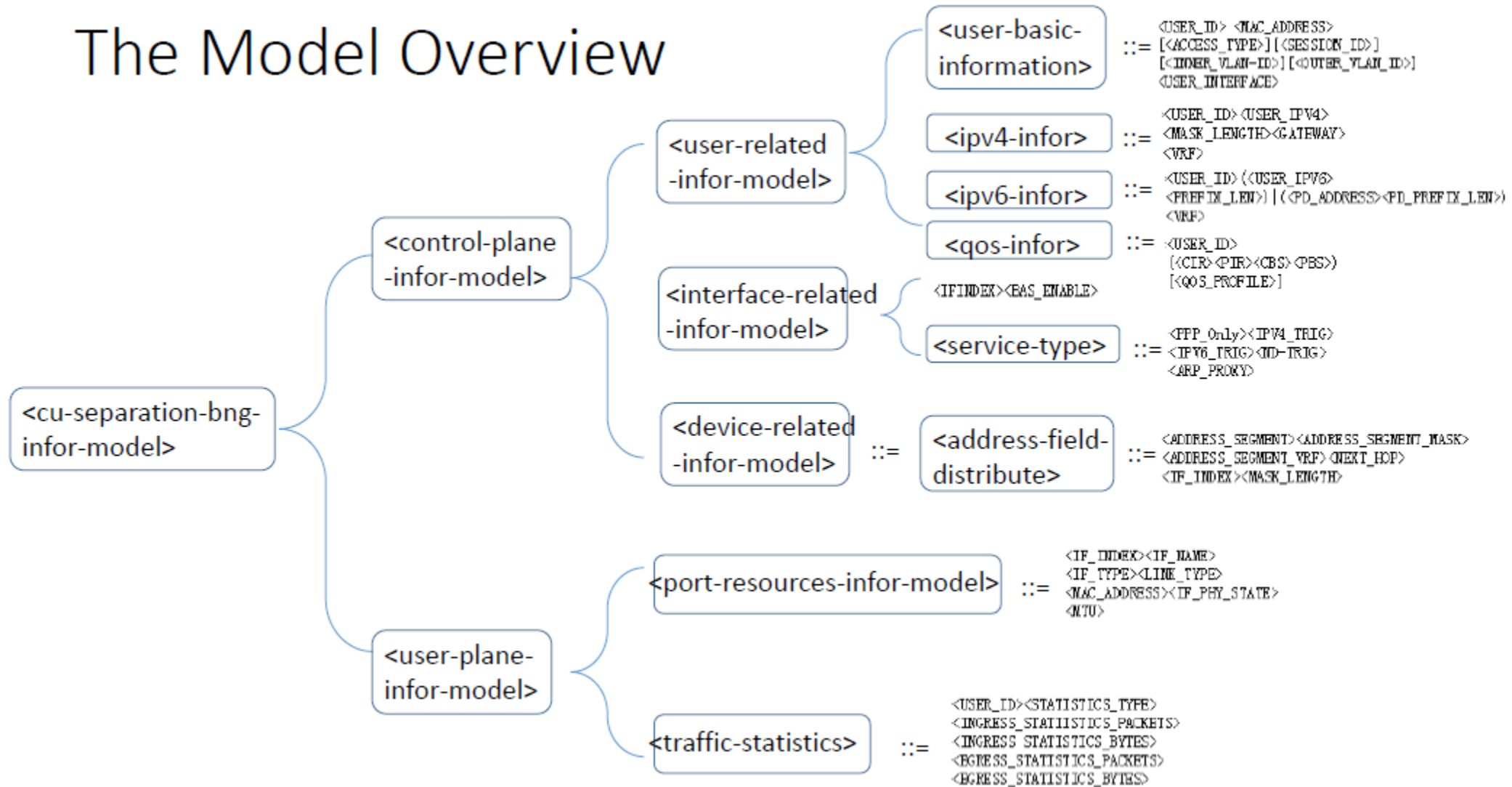
Architecture for Control and User Plane Separation of EPC



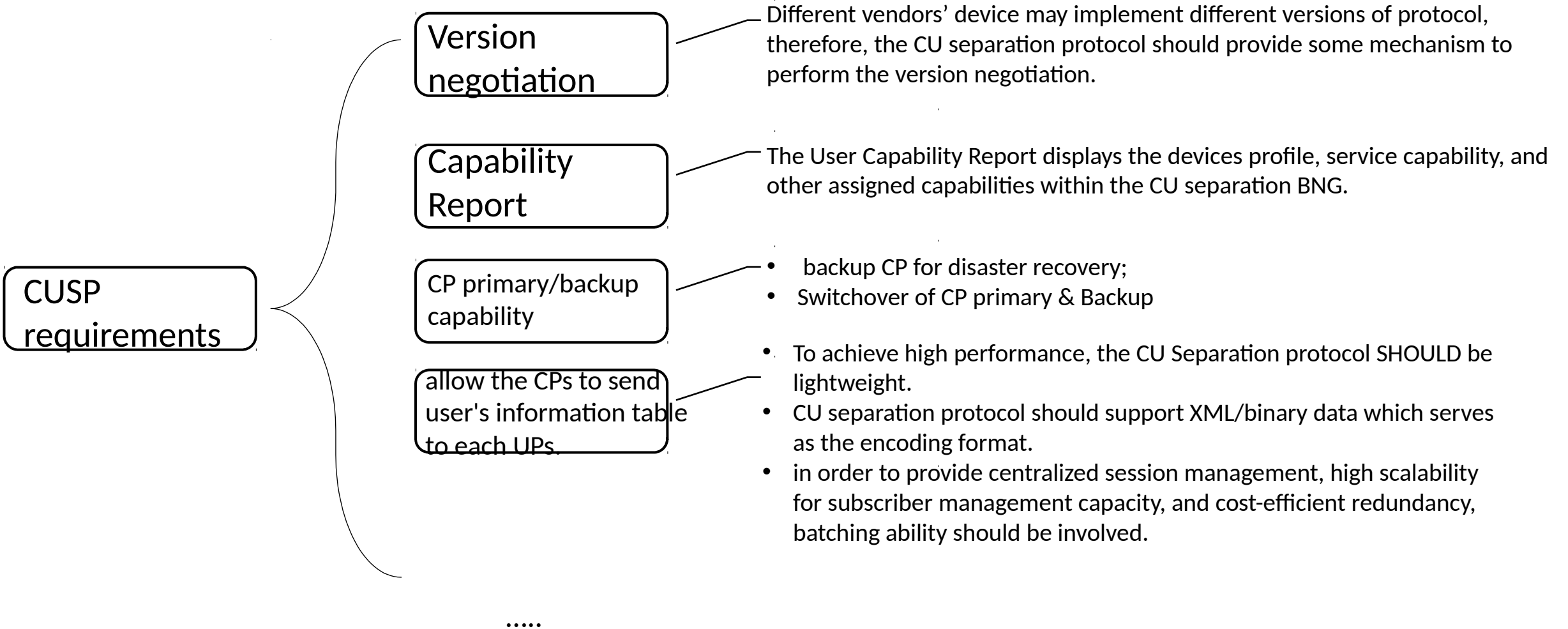
Architecture for Control and User Plane Separation of BNG

Appendix III: Brief introduce for CU separation BNG information model

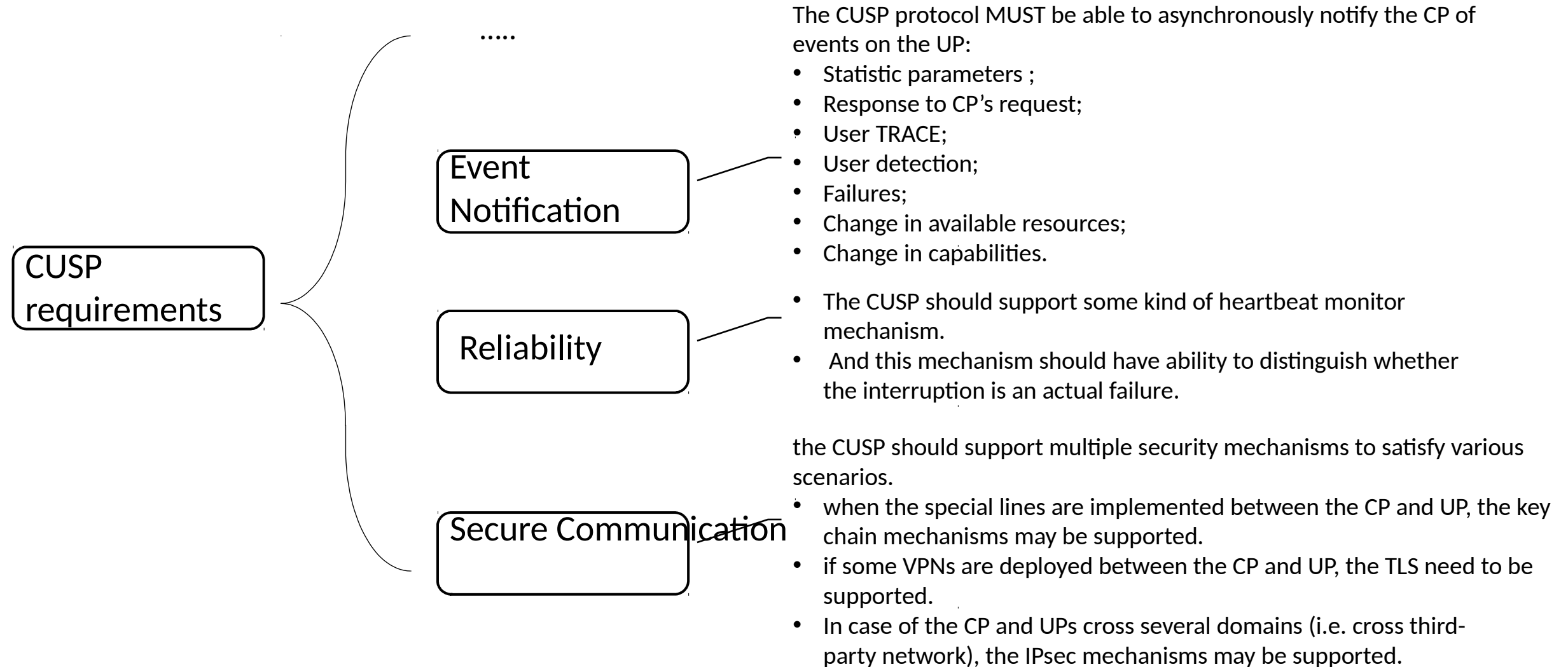
The Model Overview



Appendix IV: Brief introduce for CU separation BNG Protocol Requirements



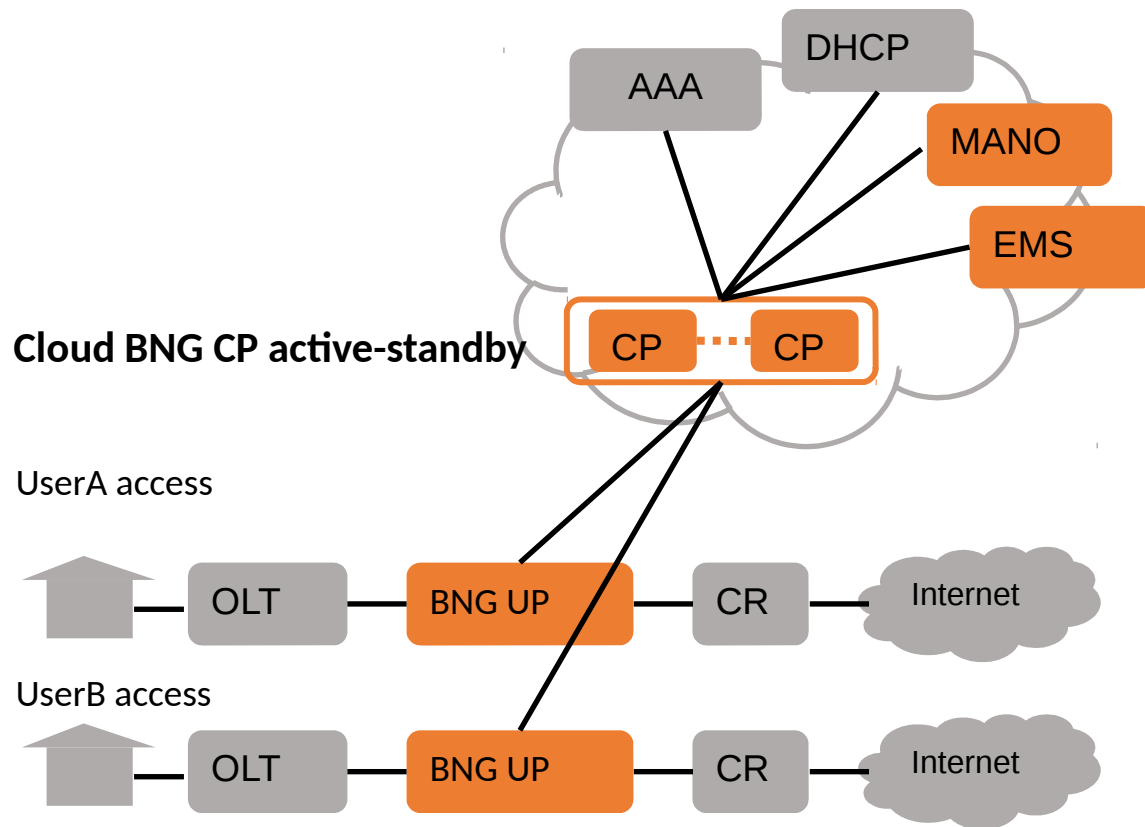
Appendix IV: Brief introduce for CU separation BNG Protocol Requirements



Appendix V: Brief introduce for CU separated BNG deployment

CU separated BNG deployment

- ◆ BNG-CP centralized and BNG-UP distributed



Considering the actual deployment

- ◆ BNG-CP centrally deployed in the Core DC such as

In one province

- ◆ BNG-UP deployed in the edge DC such as in the city

Or town which is easily for the User access.

- ◆ ~~Much to be done~~ BNG-CP's high available should be thought over

- ◆ BNG-vUP exists when large session and low traffic

- ◆ BNG-CP follows NFV's architecture such as flexibility, migration and so on, besides HA

- ◆ ...

Appendix VI: BBF liaison



TR-384 shows a way of disaggregating the traditional Broadband Network Gateway (BNG), i.e. the IP service edge of a fixed network, into various network functions and separates service control plane and user plane. Further, the BNG service control plane and its user plane can be separately

deployed, with the service control plane centralized and virtualized providing significant benefits such as centralized session management, flexible address allocation, high scalability for subscriber management capacity, and cost-efficient redundancy, etc., while the user plane distributed and localized. The User Plane Management module in the BNG service control plane centrally manages the distributed BNG user plane as well as the setup, deletion, and maintenance of interfaces between the BNG control plane and the user plane. The details regarding the interfaces need to be further investigated.

Currently in IETF, the standards work on the interfaces of the disaggregated BNG has started. For example, the draft “Information model of control plane and user plane separation BNG”:
<https://datatracker.ietf.org/doc/draft-cuspdt-rtgwg-cu-separation-infor-model/>.

In addition, the draft “Requirements for the protocol of the control plane and user planes separation BNG”:
<https://datatracker.ietf.org/doc/draft-cuspdt-rtgwg-cusp-requirements/>

We look forward to continued IETF progress on the drafts for interfaces of the disaggregated BNG which will give operators a complete view of the BNG disaggregation. It also can provide a standardized way to manage multiple vendors in the BNG access devices and improve the cooperation and interconnection of different vendors’ devices. Therefore, the standards works are very important to the BNG disaggregation’s deployment and development.

Please find the link to BBF TR-384 “Cloud Central Office Reference Architectural Framework”
<https://www.broadband-forum.org/technical/download/TR-384.pdf>