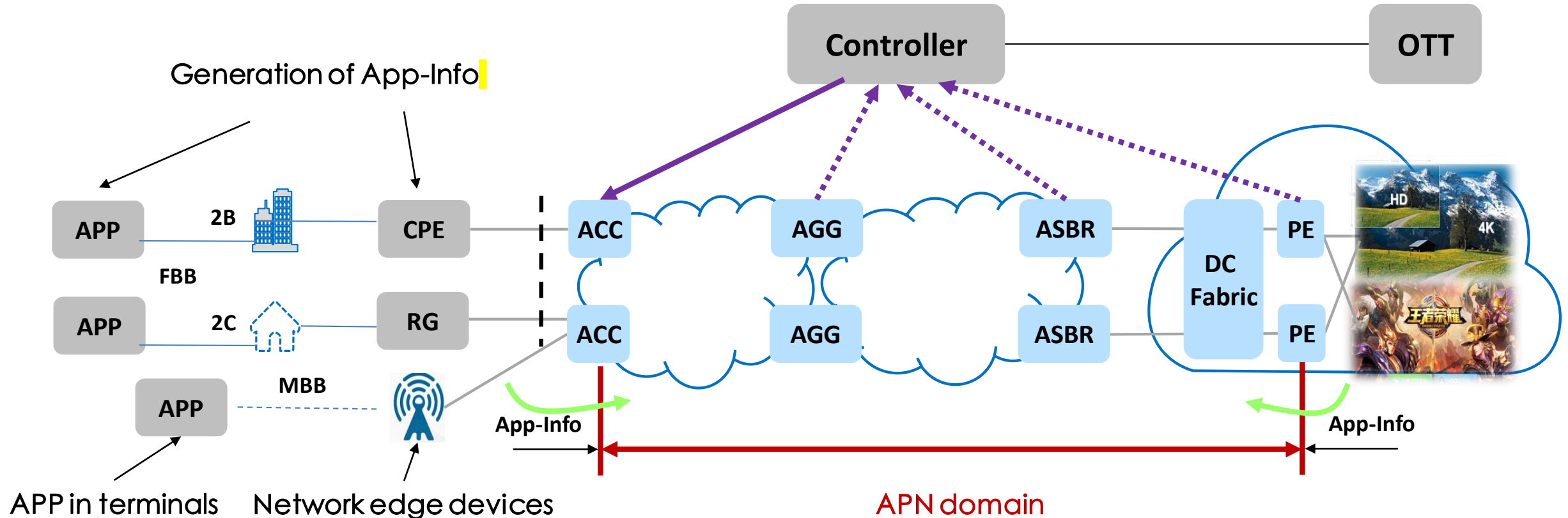# Application-aware Networking (APN)

Shuping Peng, Zhenbin Li
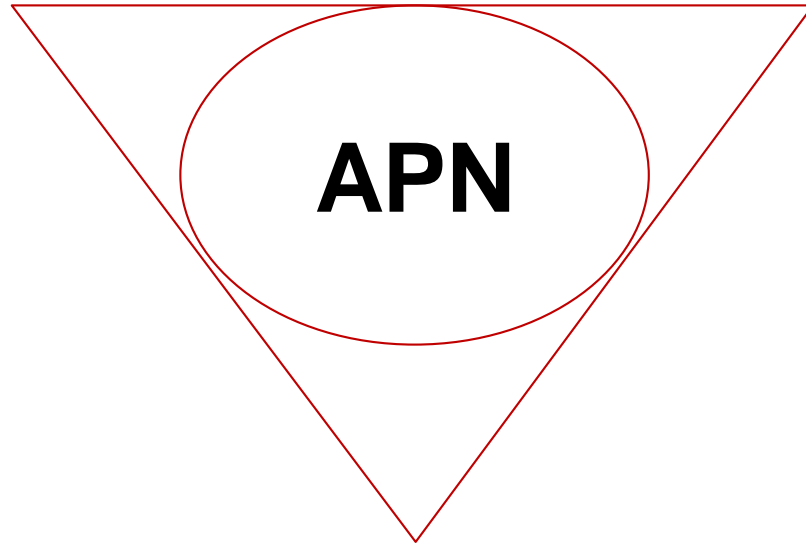**Huawei Technologies**

APN Overview & Scope

- Application is the program installed in user terminals or hosts, such as WhatsApp and Youtube, etc.
- App-Info is application characteristic information, including application identifier, SLA requirements, etc.
- App-Info can be encapsulated directly by the applications, or derived at network edge devices, or via QinQ, etc.

APN Key Elements

Open App-Info

(carried based on Agreements)

- App-aware ID
  - SLA
  - APP ID
  - User ID
  - Flow ID
  - …
- Service-para
  - Bandwidth
  - Delay
  - Jitter
  - Packet Loss
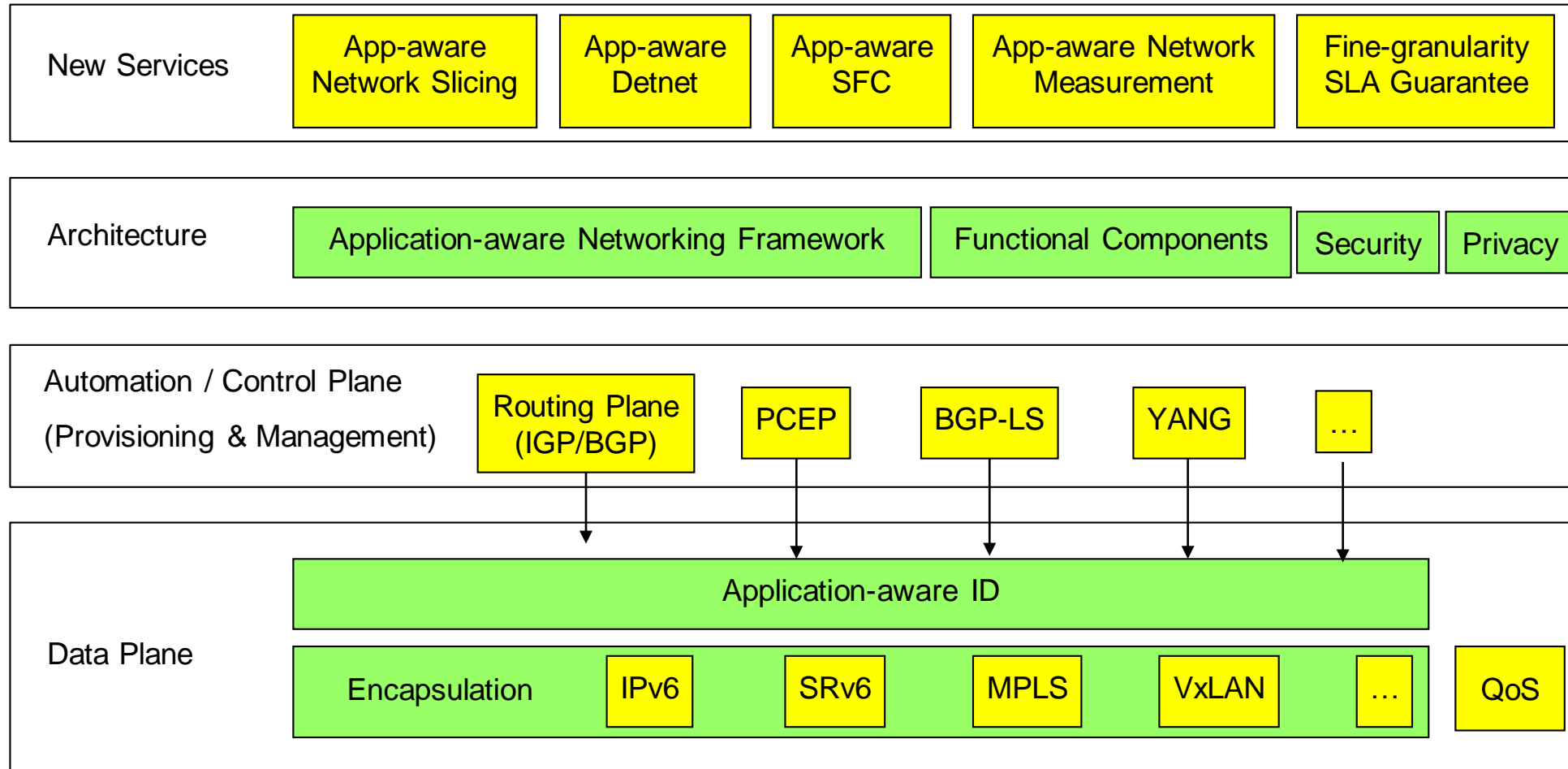 - …

APN

Rich Network Services

(enhanced with app awareness)

- SLA Guarantee
- Network Slicing
- Deterministic Networking
- SFC

Accurate Network Measurement

- Fine granularity matching and optimization
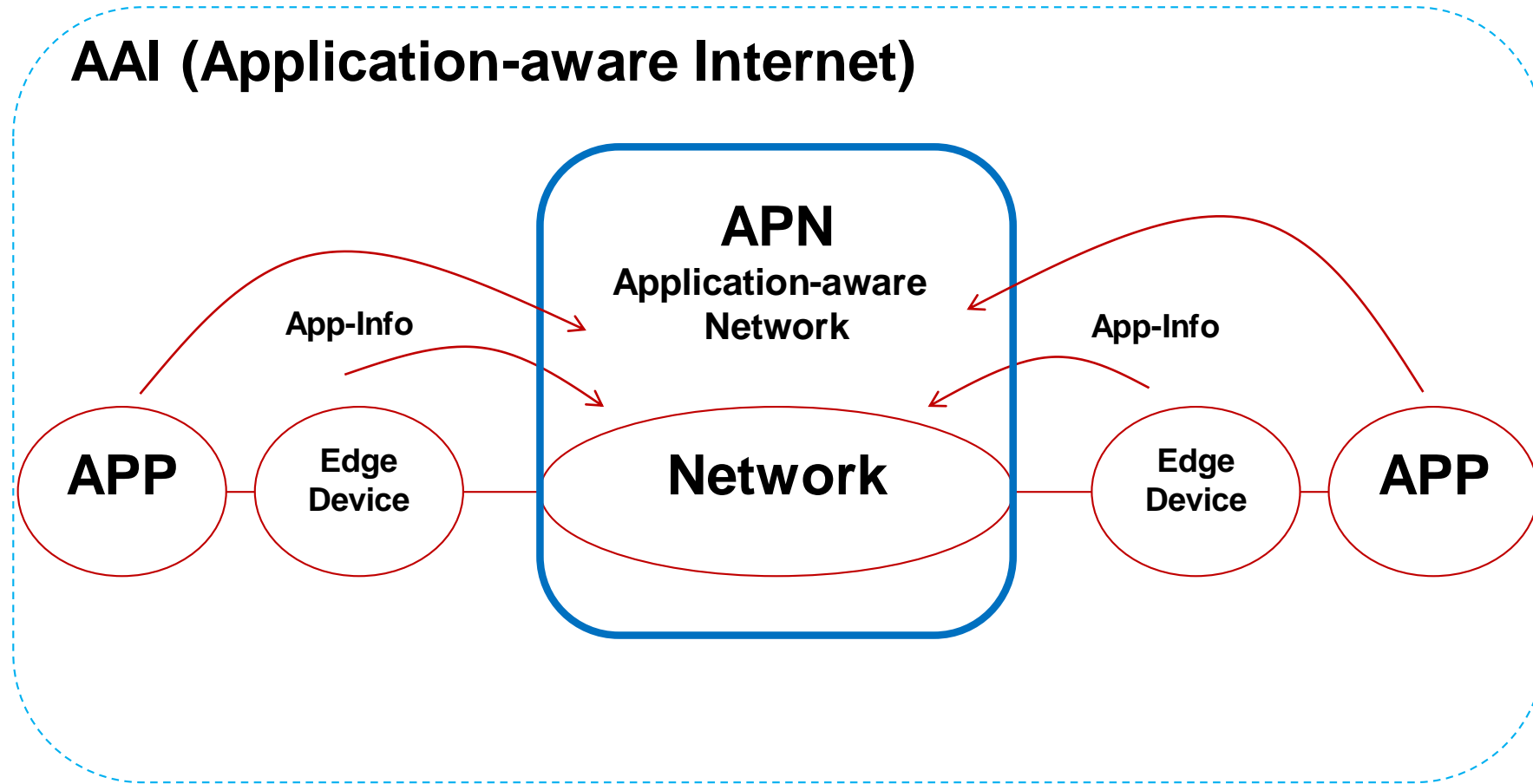- Comprehensive measurements
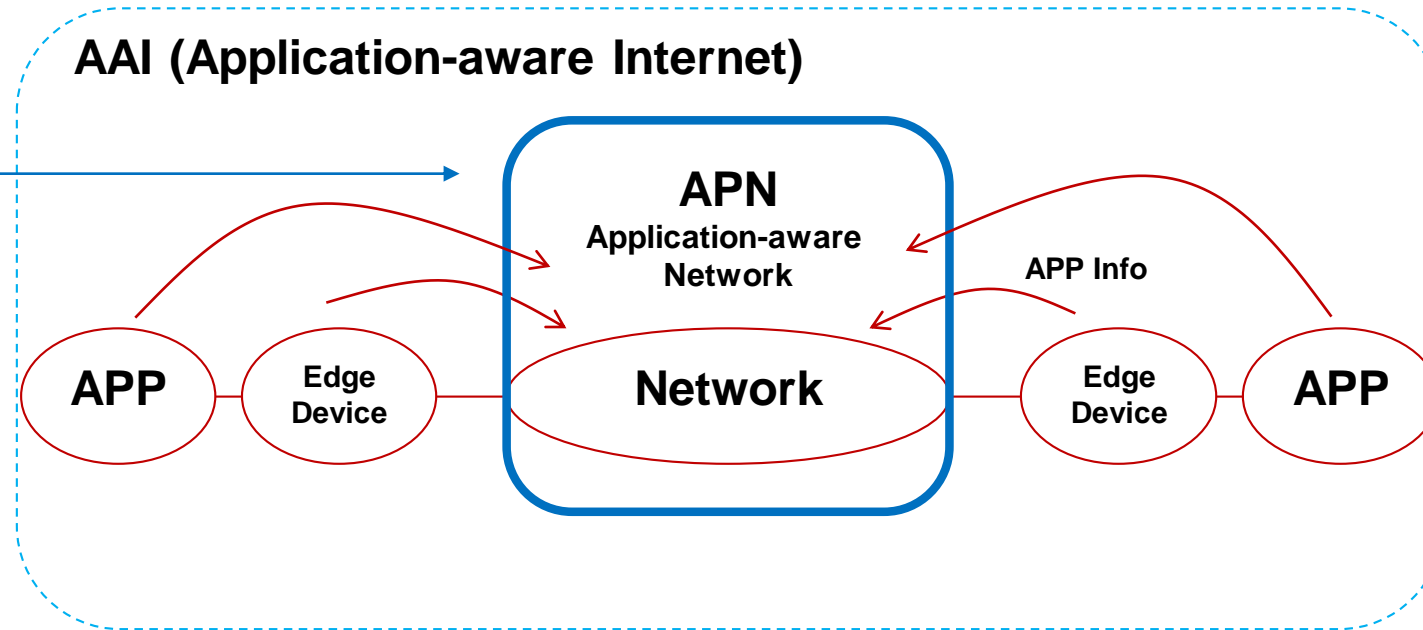
Work Items in APN

APN Scope - APN vs. AAI

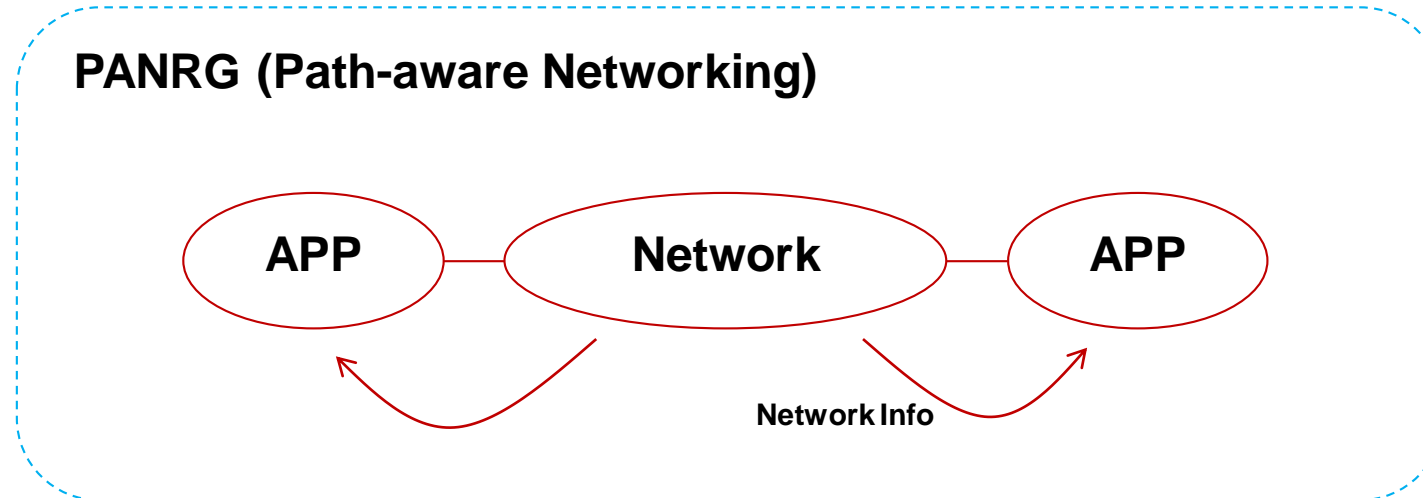**App-Info is injected into the network to describe the service and behavior needed by the application.**

APN Scope - APN vs. PANRG

APN6 Hackathon @IETF108

- https://github.com/APN-Community/IETF108-Hackathon-APN
- Champion(s)
  - Weihong Wu <lara@…>
  - Jiang Liu <liujiang@…>
- Project(s)
  - The implementation of a demo of APN6. The implementation is based on P4 and BMv2
  - The encapsulation of 2 types of Application-aware ID Options and 4 types of Service-Para Sub-TLVs
  - The SRv6-based traffic control according to IPv6 DA, Application-aware ID Options, and Service-Para Sub-TLVs
- Specifications:
  - https://tools.ietf.org/html/draft-li-apn-problem-statement-usecases-00
  - https://tools.ietf.org/html/draft-li-apn-framework-00
  - https://tools.ietf.org/html/draft-li-6man-app-aware-ipv6-network-02
  - https://tools.ietf.org/html/draft-liu-apn-edge-usecase-00
  - https://tools.ietf.org/html/draft-zhang-apn-acceleration-usecase-00

APN Side Meeting @IETF108

Chairs: Zhenbin Li, Daniel King

Date: 12:30-14:00 UTC, Thursday, 2020-07-30

Webex: https://github.com/APN-Community/IETF108-Side-Meeting-APN

Tentative Agenda

- Introduction & Agenda Bashing (**5** mins)
- Attempts in IETF History (**15** mins)
  - What attempts (SPUD and PLUS BoFs)? What lessons learned?
- Requirements on Application-awareness in Networks (**20** mins, 5 mins each)
  - Operators present their use cases to make clear that they have the Requirements on Application-awareness in their Networks
  - Bell Canada – Service/Application aware
  - Telefonica – CDN
  - China Mobile – MEC
  - China Unicom – Game Acceleration
- APN Framework (**5** mins)
  - Introduce APN Framework and the available Demo, Hackathon, INFOCOM, etc.
- Acquisition, Encapsulation and Conveying of Application-related Information (**30** mins)
  - Network Tokens
  - FAST
  - APN6
- Discussions & Clarifications – Collecting views from the IETF community (**10** mins)
  - Whether it will bring privacy issue? If yes, how to overcome?
  - Whether it will bring security issue? If yes, how to overcome?
- Conclusion – the way forward (**5** mins)

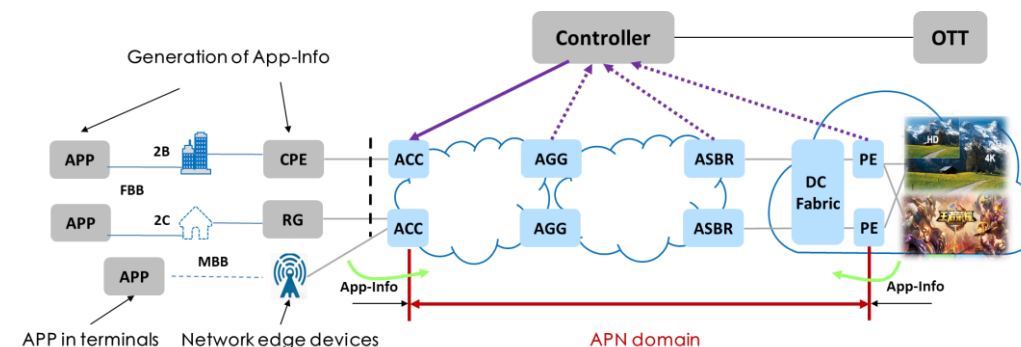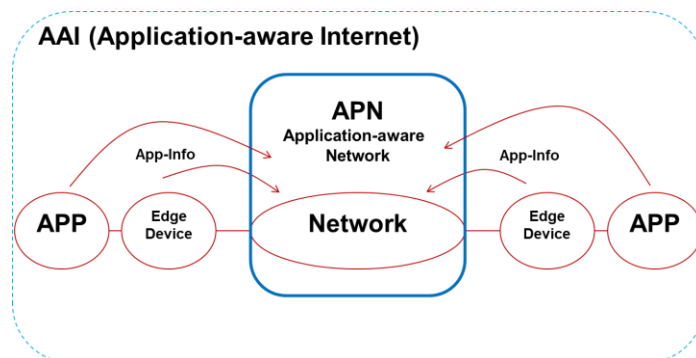# Privacy Issues

- Scenarios

  1. **No privacy issue**: Operators run their own applications – e.g. CMCC MIGU Music

  2. **No privacy issue**: App providers build and run their own networks – e.g. Google B4

  3. **No privacy issue**: APN works only within an operator's controlled limited domain no matter where the App-info is added and encapsulated.

  4. **No privacy issue**: If added at the edge device (i.e. an network operator-controlled device), e.g. Enterprise CPE or Home broadband RG or BNG or WiFi AP or 5GC UPF.

  5. **No privacy issue**: If added at the APP, the App-info is encrypted.

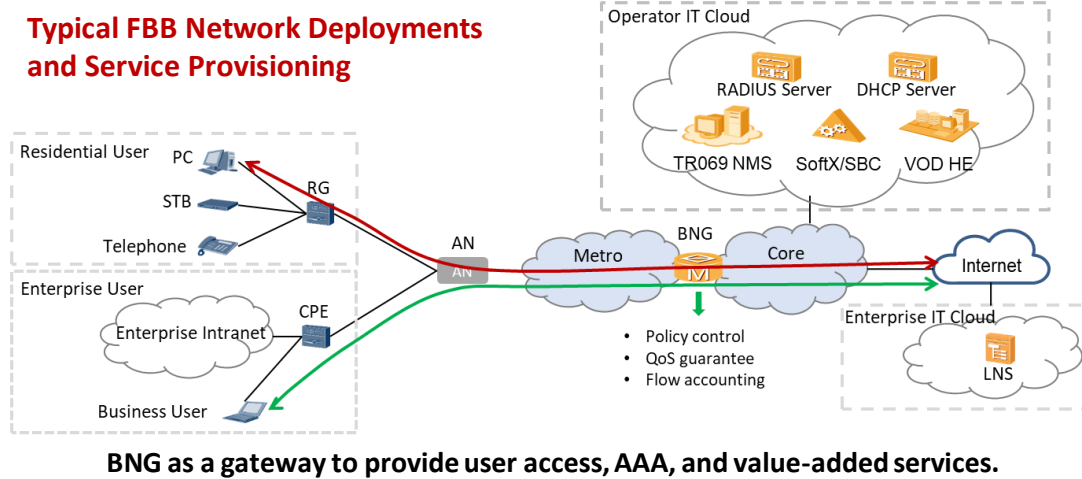 6. **May have privacy issue**: If added at the APP, the explicit App-info is not encrypted.
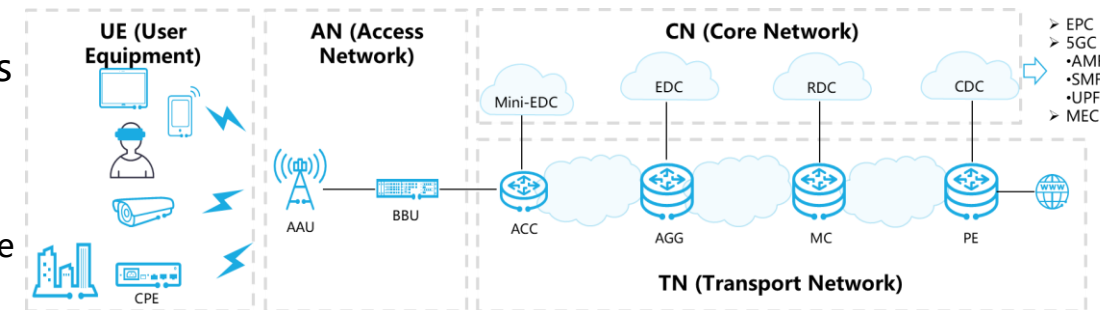
Security Issues

- No Security Issue: Inter-DC scenario

- No Security Issue: Enterprise scenario, access through a controlled BNG interface

- APN only imposes security issues when users access from an untrusted domain, but

  - **Home broadband scenario** can be validated via BNG
  - **Mobile broadband scenario** can be validated via 5GC

- APN potentially imposes four types of security issues

  1. Within one terminal – can be tackled via OS; blocked via BNG or 5GC
     a) An application in one terminal (UE) adds arbitrary App-Info (incl. Request)
     b) An application in one terminal adds the App-Info of the other App in the same terminal

  2. Once sent out it will be validated via Network-side security solutions
     a) An application in one terminal forges the App-Info of the same App in another terminal
     b) App-Info is tampered along the way between the App-Info creator and the Network Boundary
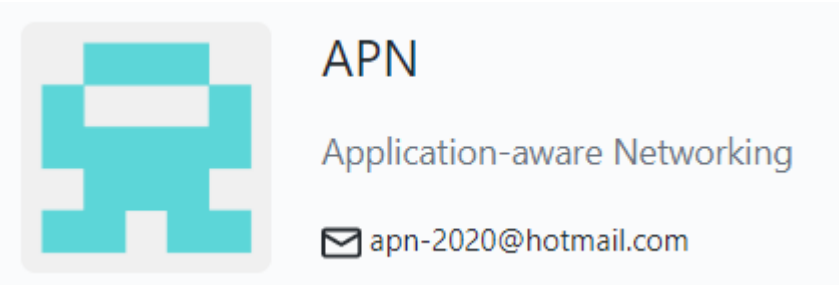
Typical FBB Network Deployments and Service Provisioning

BNG as a gateway to provide user access, AAA, and value-added services.

Typical 5G MBB Network Deployments and Service Provisioning

APN Related Information

- Problem statement & Use cases:
  - https://tools.ietf.org/html/draft-li-apn-problem-statement-usecases-00
  - https://tools.ietf.org/html/draft-liu-apn-edge-usecase-00
  - https://tools.ietf.org/html/draft-zhang-apn-acceleration-usecase-00
- Framework
  - https://tools.ietf.org/html/draft-li-apn-framework-00
- Requirements on Application-awareness in Networks
  - https://tools.ietf.org/html/draft-yiakoumis-network-tokens-01
  - https://tools.ietf.org/html/draft-herbert-fast-04
  - https://tools.ietf.org/html/draft-li-6man-app-aware-ipv6-network-00
- APN Community including Information about APN6 Side meetings
  - https://github.com/APN-Community
  - https://github.com/APN-Community/IETF105-Side-Meeting-APN6
  - https://github.com/APN-Community/IETF108-Side-Meeting-APN

APN
Application-aware Networking
apn-2020@hotmail.com

Thank you for your attention!