Forefront of SRv6

SRv6 for 5G Mobile Update

Satoru Matsushima

SoftBank

Updates After JANOG40…

“Segment Routing”
Chasmを越えてついに実用段階へ、そしてこれからのNetwork Programmability

SRv6編

松嶋　聡

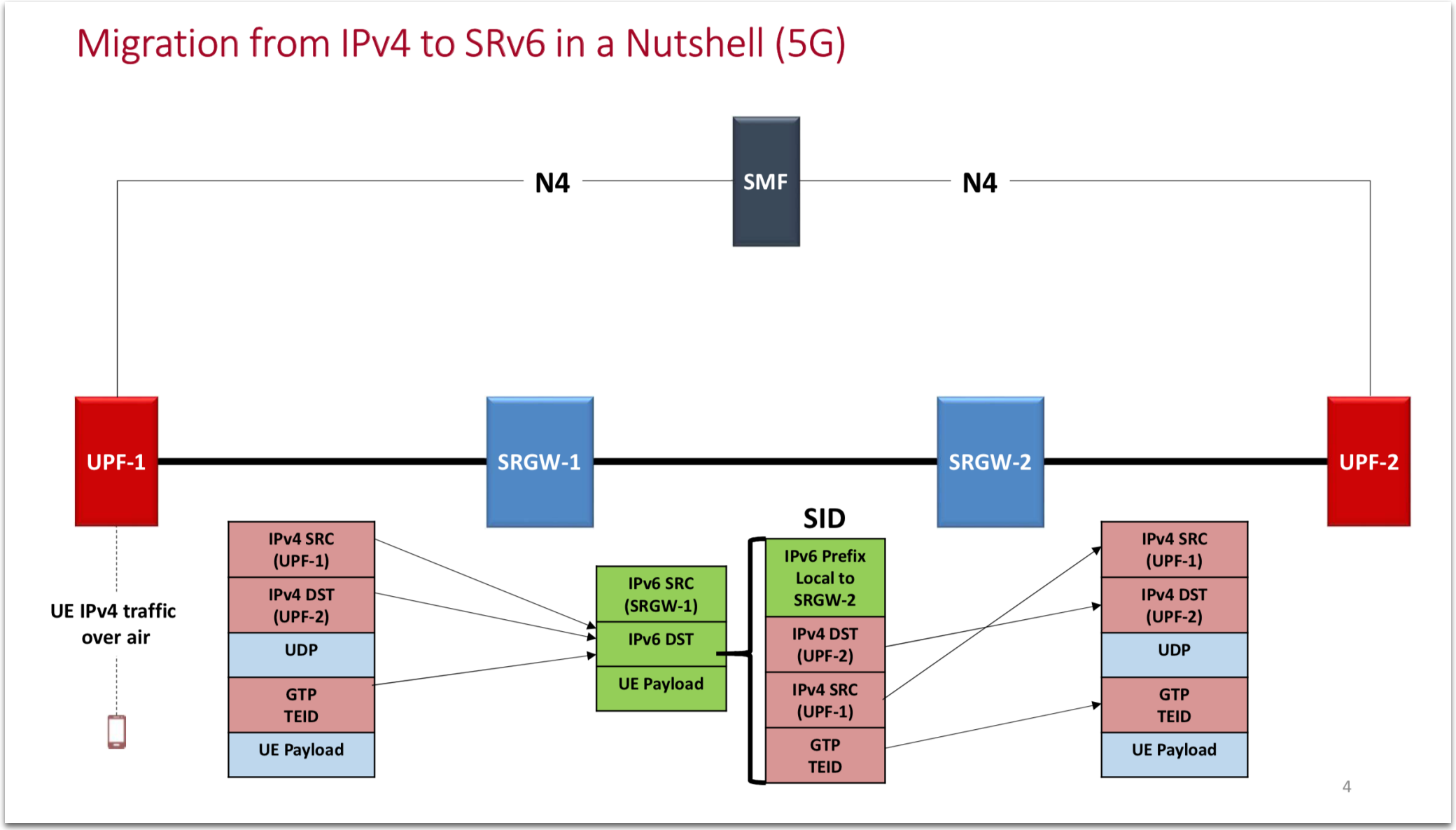
現行のモバイルネットワーク（携帯網）の例

- RAN, EPC, SGi に分割されて構築・管理
- 端末セッションごとのトンネル接続, 移動管理
- 伝送路からみたパスの最適化が困難

いろいろ困ってます。

https://www.janog.gr.jp/meeting/janog40/application/files/8015/0122/1167/janog40-route-matsushima-01.pdf

Stateless Interworking between GTP-U and SRv6 User Plane



https://meetings.webex.com/collabs/url/3sEHGlYO2Ley1qiZUMsoA5JCz6x4bIrbMDH6JHRpCo400000

User Plane Protocol Study in 3GPP has been started!

3GPP TSG CT4 Meeting #81
Reno, US; 27th Nov – 1st Dec 2017

C4-176400

(revision of C4-175222)

Source:	**SoftBank Corp.**
Title:	**New Study Item on User-plane Protocol**
Document for:	**Approval**
Agenda Item:	**5**

3GPP™ Work Item Description

For guidance, see 3GPP Working Procedures, article 39; and 3GPP TR 21.900.
Comprehensive instructions can be found at http://www.3gpp.org/Work-Items

Title: Study on User Plane Protocol in 5GC

Acronym: FS_UPPS

Unique identifier:

1 Impacts

Specification # 29.892 — Satoru

保護された通信 | https://portal.3gpp.org/desktopmodules/Specifications/Specificatio...

3GPP Portal

General | Versions | Responsibility | Related

Specification #: 29.892

Reference:	29.892
Title:	Study on User-plane Protocol in 5GC
Status:	Draft
Type:	Technical report (TR)
Initial planned Release:	Release 16
Internal:	☑
Common IMS Specification:	☐
Radio technology:	☐ 2G ☐ 3G ☐ LTE ☑ 5G

Remarks (0)

Creation date	Author	Remark
No Remarks Added		

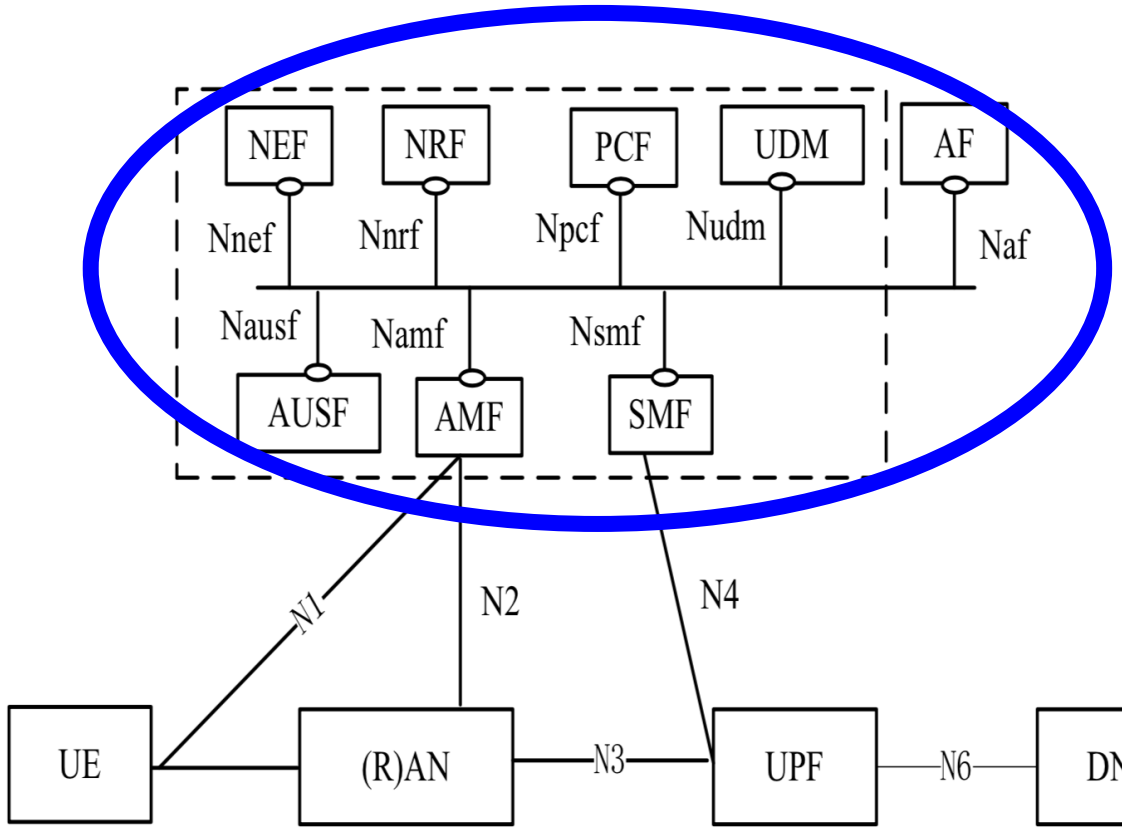
History

Action date	Action	Author
2018-01-02 10:11 UTC	Specification has been created for release Rel-16	John M Meredith

Exit

3GPP Rel-15 Architecture (5G Phase.1)

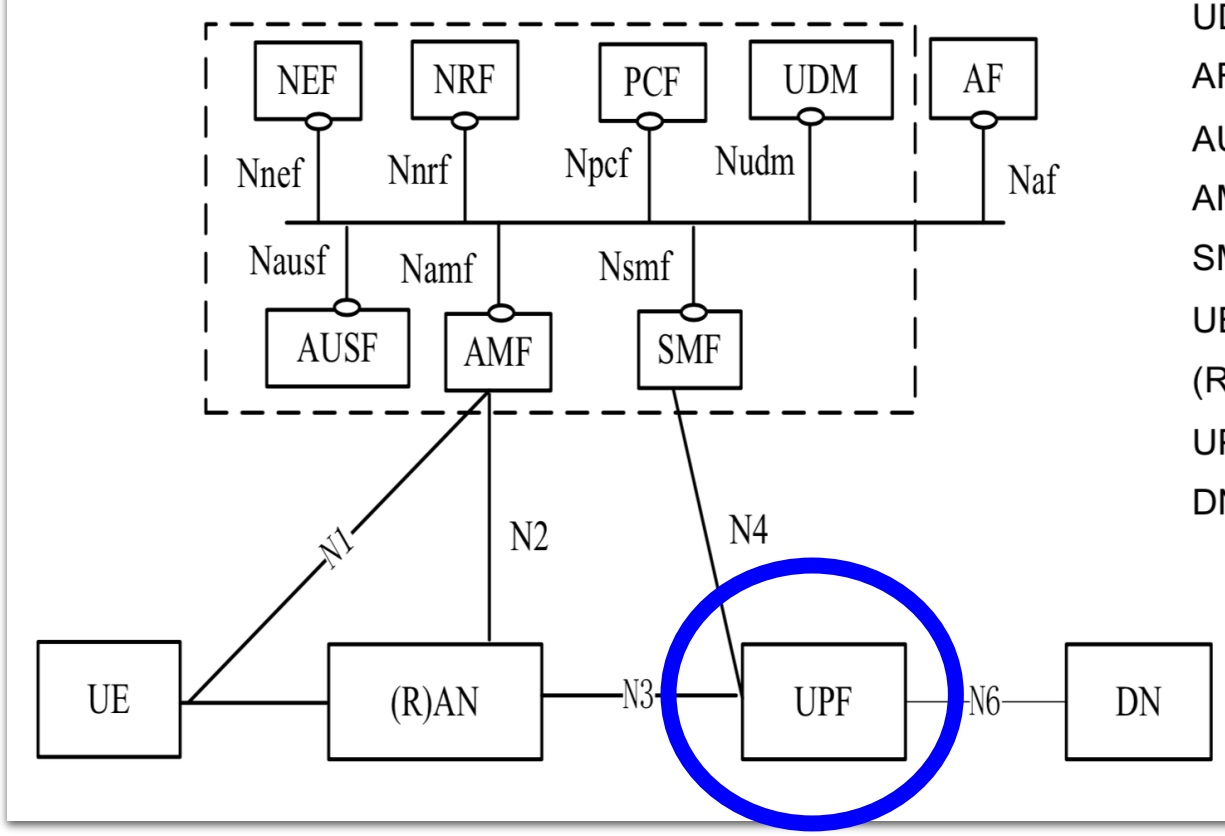
Transforms Control Plane to Service Based Architecture



NEF	Network Exposure Function
NRF	Network Repository Function
PCF	Policy Control Function
UDM	Unified Data Management
AF	Application Function
AUSF	Authentication Server Function
AMF	Access &Mobility Management Function
SMF	Session Management Function
UE	User Equipment
(R)AN	(Radio) Access Network
UPF	User Plane Function
DN	Data Network

3GPP Rel-15 Architecture (5G Phase.1)

User Plane Is Dramatically Simplified, Why?



NEF	Network Exposure Function
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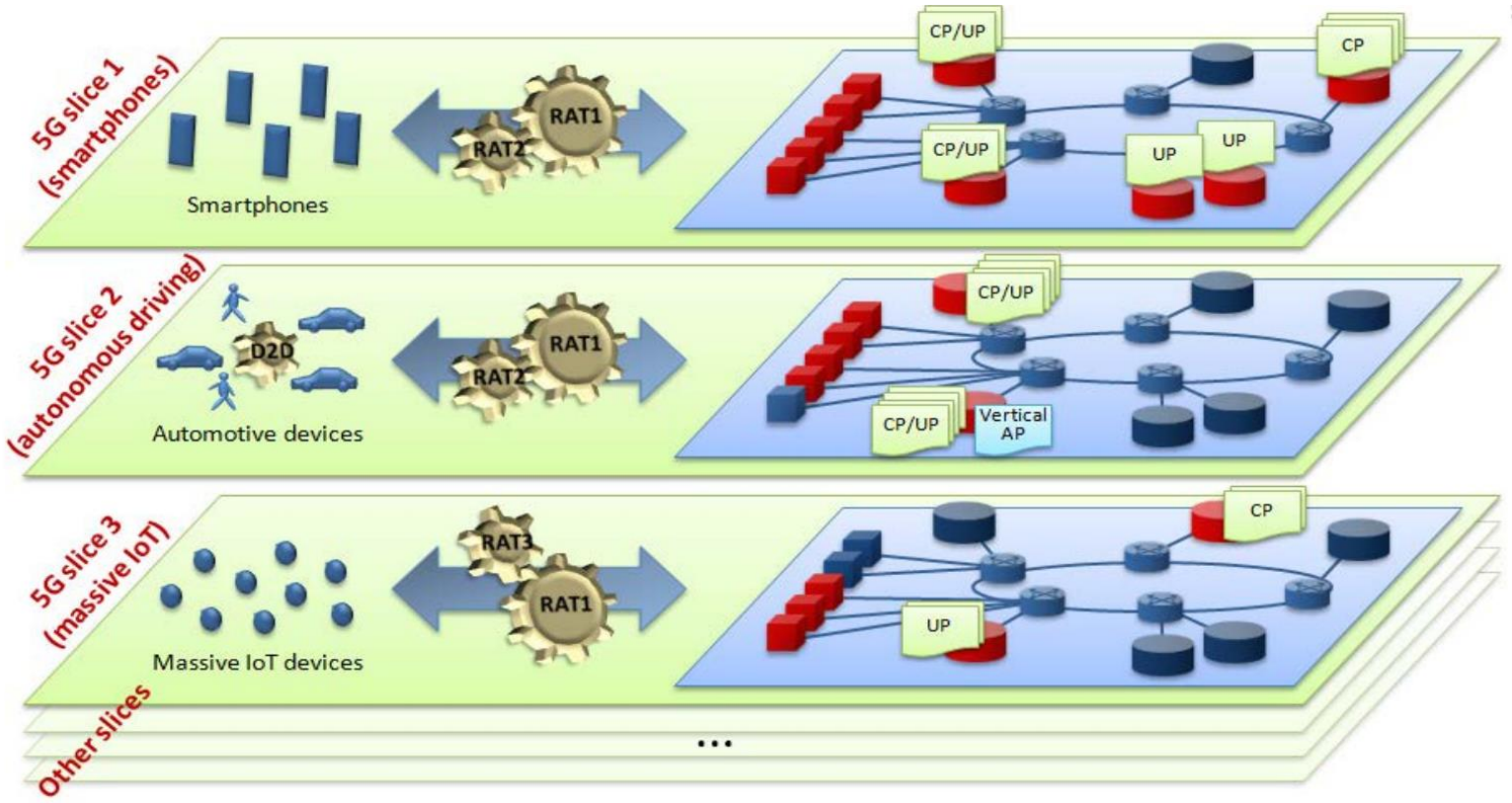
Generic Expectations for 5G Networks

U-Plane must be simplified because to meet Complicated Optimizations



eMBB

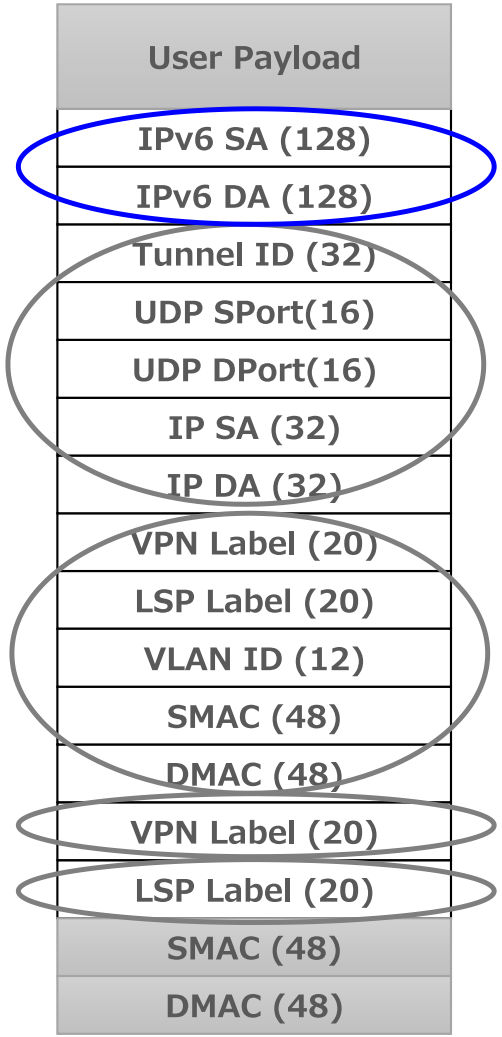
uRLLC

mMTC

Source: NGMN white-paper

But Today's U-plane Transports Are Well Complicated Already, Why?

Stacking Multiple Small ID Space Networks to Fulfill Requirements of Reliability, VPNs, etc.,



IPv6 as User PDN Protocol

GTPv1U as Mobile User-Plane Protocol
Multiplexes Sessions in A Tunnel Between Two Nodes

Deploys Mobile Back-haul and Core
w/ High Quality and Reliability
For C/U-Plane and O&M Networks

Multiple Virtual Networks Co-exist
Provides High Quality and Reliability

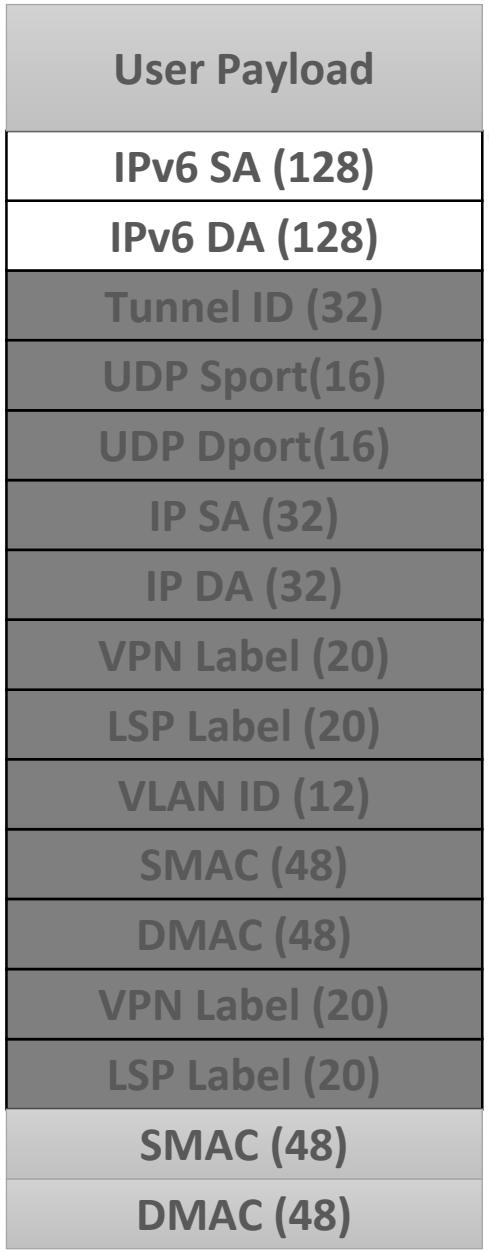
So Please Beware..

Integrating Mobile UPlane and Transport is A Key

- For Mobile Experts:
  - The wire you see is **NOT** actual wire.
  - There are many layers stacked underneath the wire.

- For IP/Transport Experts:
  - Your end customers are **NOT** accommodated onto your VXLAN/LSP/Pseudo-Wire tunnels.
  - They are accommodated onto far more tunnels (GTP-U!) on top of the VXLAN/LSP/Pseudo-Wire tunnels.

How to Integrate Complicated Stack? Simplify!



572bits

Consolidates All Layer Roles Into One Single IPv6 Layer

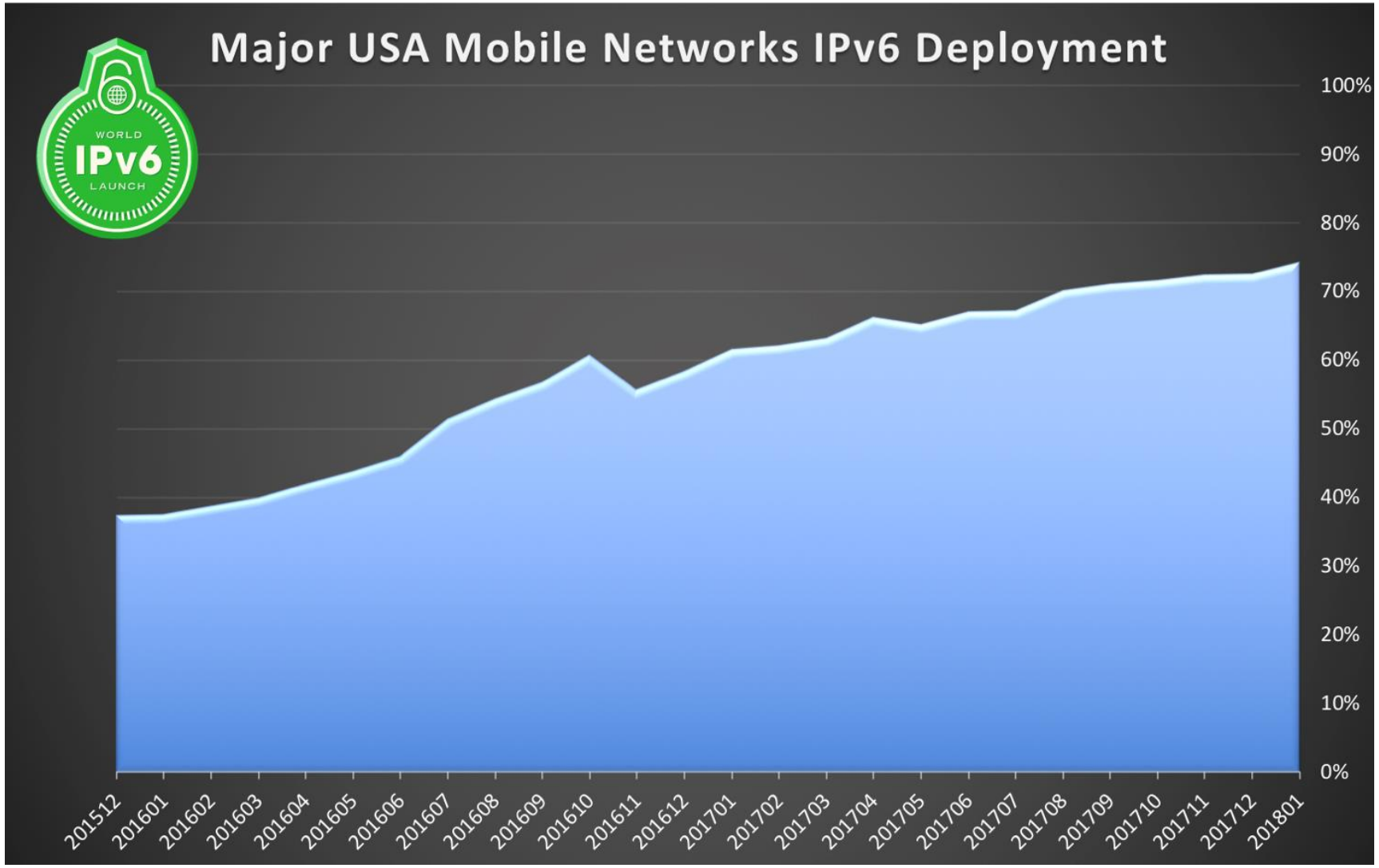
512bits

- Segment-ID [1]* (128)
- Segment-ID [0]* (128)
- IPv6 SA (128)
- IPv6 DA (128)

*Exist in Segment Routing Extension Header (SRH)

So SRv6 Requires IPv6 Customers, Where Are They?

In fact, IPv6 is widely deployed in Mobile already!

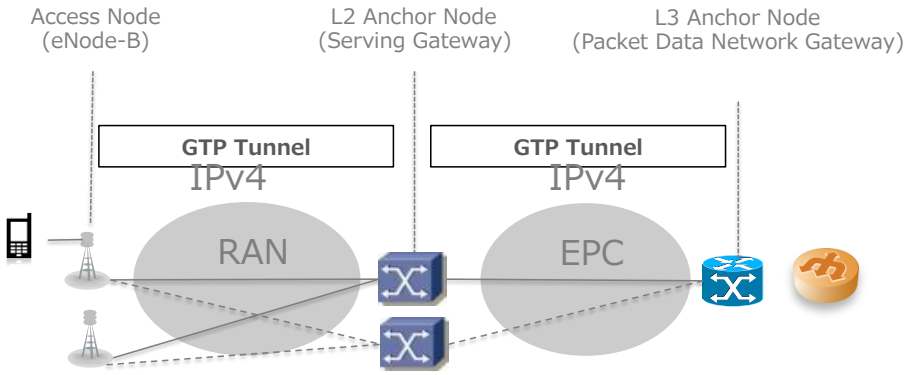


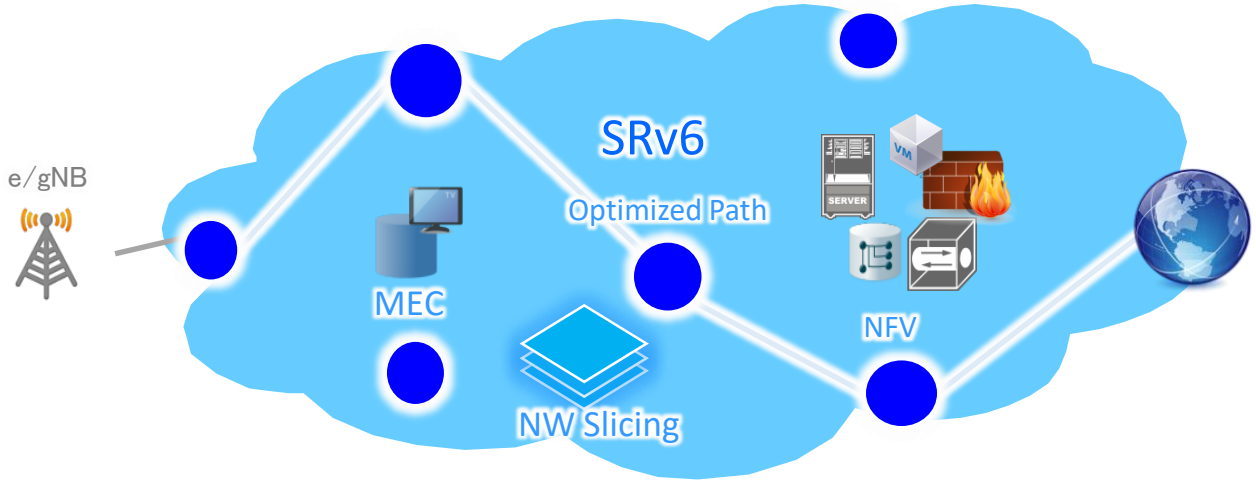
http://www.worldipv6launch.org/blog/

What if SRv6 Becomes An Alternative of GTP-U Tunnel?

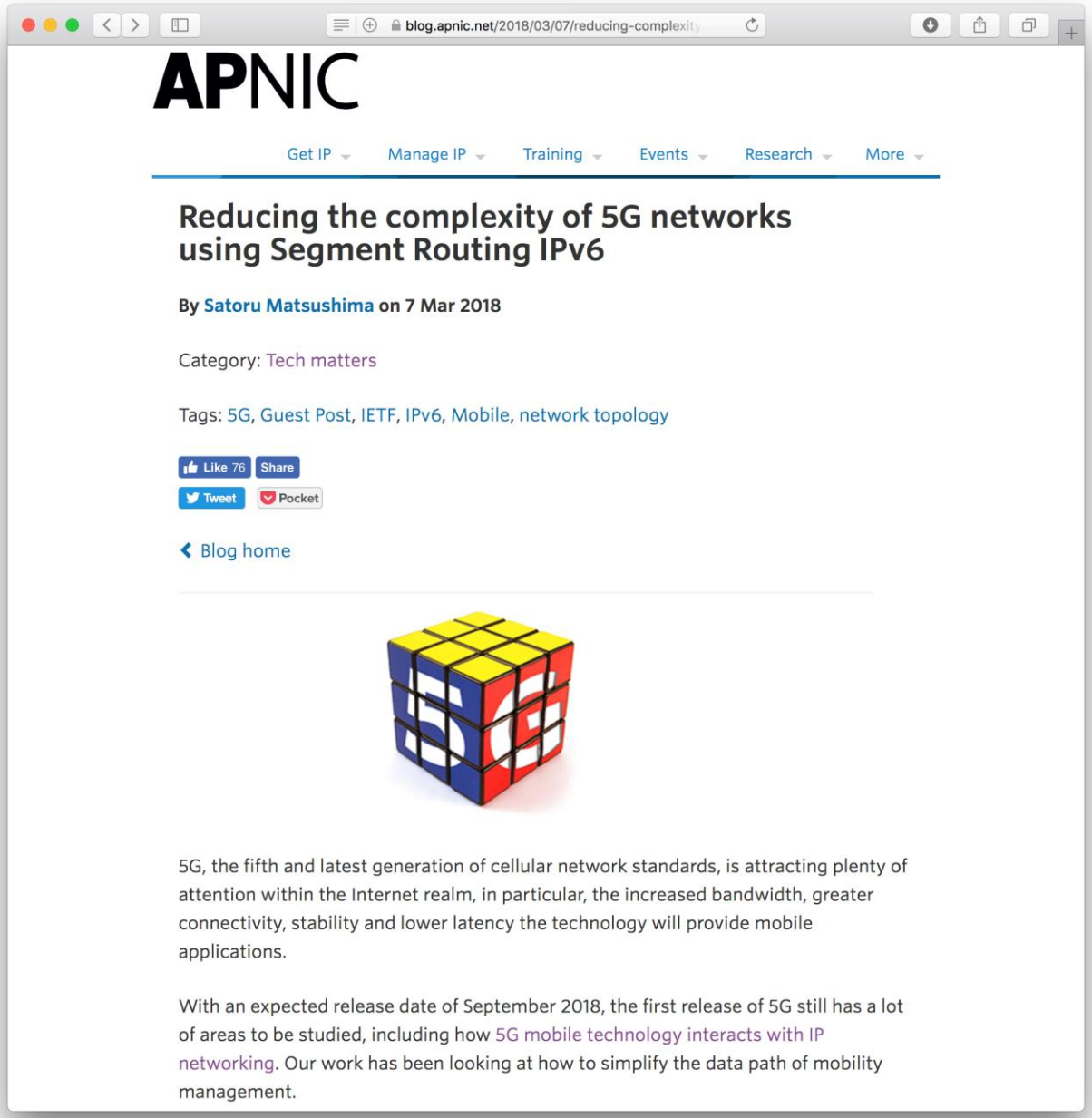
- ~~Well fragmented to RAN, EPC and SGi.~~
- ~~Per-session tunnel creation and handling.~~
- ~~Non-optimal data-path.~~
- **IPv6 integrates networks of the mobile and others.**
- **A SID represents data-plane role and function.**

Flat, Simple, and Programmable





A Blog Entry: Reducing the complexity of 5G networks using SRv6



https://blog.apnic.net/2018/03/07/reducing-complexity-5g-networks-using-segment-routing-ipv6/

Latest Status in SDOs

Latest Status in IETF

DMM Working Group
Internet-Draft
Intended status: Standards Track
Expires: April 25, 2019

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Futurewei
October 22, 2018

Segment Routing IPv6 for Mobile User Plane
draft-ietf-dmm-srv6-mobile-uplane-03

Abstract

This document shows the applicability of SRv6 (Segment Routing IPv6) to the user-plane of mobile networks. The network programming nature of SRv6 accomplish mobile user-plane functions in a simple manner. The statelessness of SRv6 and its ability to control both service layer path and underlying transport can be beneficial to the mobile user-plane, providing flexibility and SLA control for various applications. This document describes the SRv6 mobile user plane behavior and defines the SID functions for that. It also provides a mechanism for end-to-end network slicing.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

DMM Working Group
Internet-Draft
Intended status: Informational
Expires: July 10, 2019

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January 6, 2019

User Plane Protocol and Architectural Analysis on 3GPP 5G System
draft-ietf-dmm-5g-uplane-analysis-00

Abstract

This document analyzes the mobile user plane protocol and the architecture specified in 3GPP 5G documents. The analysis work is to clarify those specifications, extract protocol and architectural requirements and derive evaluation aspects for user plane protocols on IETF side. This work is corresponding to the User Plane Protocol Study work on 3GPP side.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

Latest Status in 3GPP

3GPP TR 29.892 V0.4.0 (2018-12)

Technical Report

セクション区切り (次のページから新しいセクション)

3rd Generation Partnership Project;
Technical Specification Group Core Network and Terminals;
Study on User Plane Protocol in 5GC.
(Release 16)

5G

3GPP™ A GLOBAL INITIATIVE

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6.1.1.2 IP Transport for GTP-U
6.1.1.3 Path/Tunnel Management functions
6.1.1.4 Load Balancing
6.1.1.5 Multicast
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6.1.3 Solutions for Impacts due to IETF RFC 82
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6.1.3.2.1 Solution Description
6.1.3.2.2 Identified Impacts
6.1.x System Impacts
6.2 Segment Routing IPv6 (SRv6)
6.2.1 General SRv6 Description

Summary

SRv6 benefits 5G Mobile by solving User Plane issues.

Integrating User Plane with its underlying layers' functions.

Flat, Simple and Programmable User Plane

SDOs have started to work on User Plane issues.

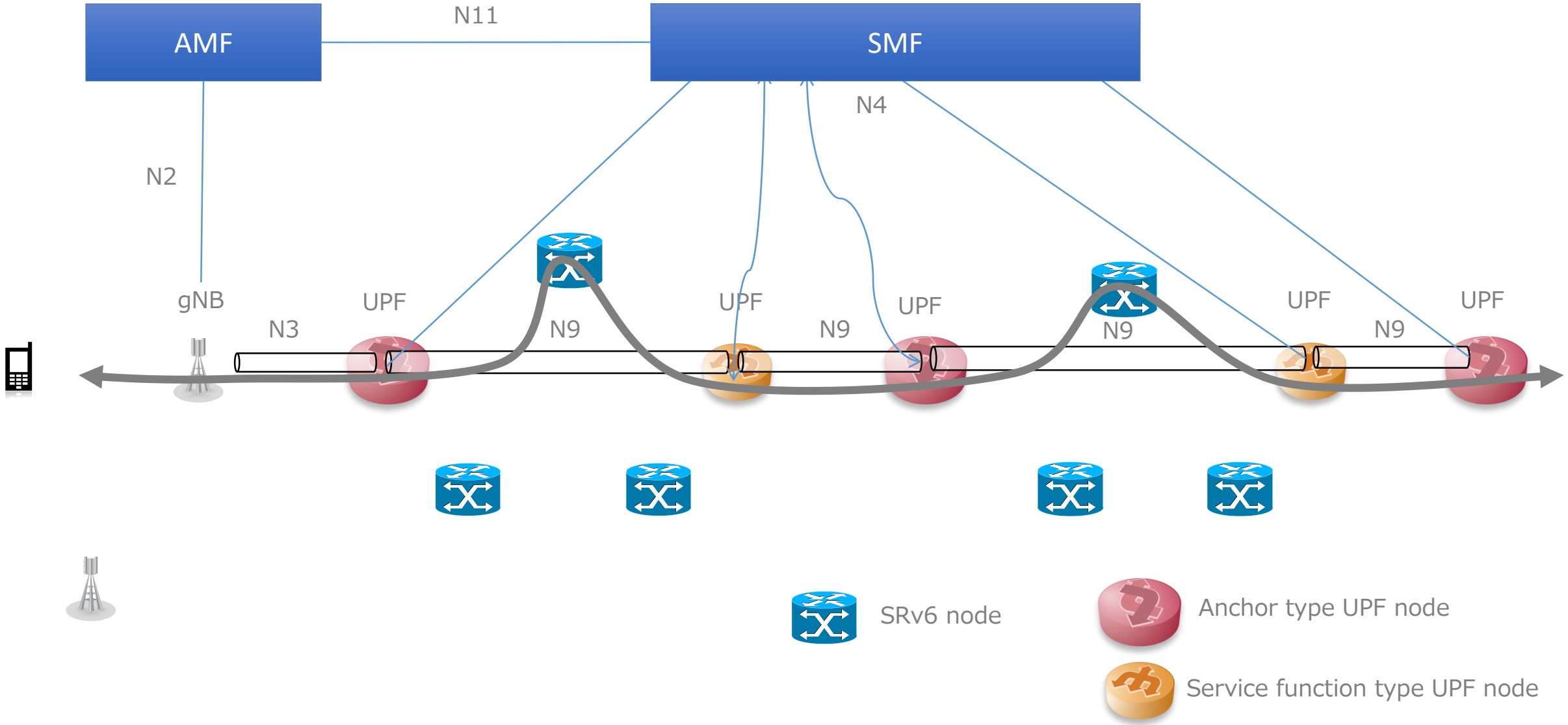
User Plane Protocol Study in 3GPP

IETF works together with 3GPP

Thank you

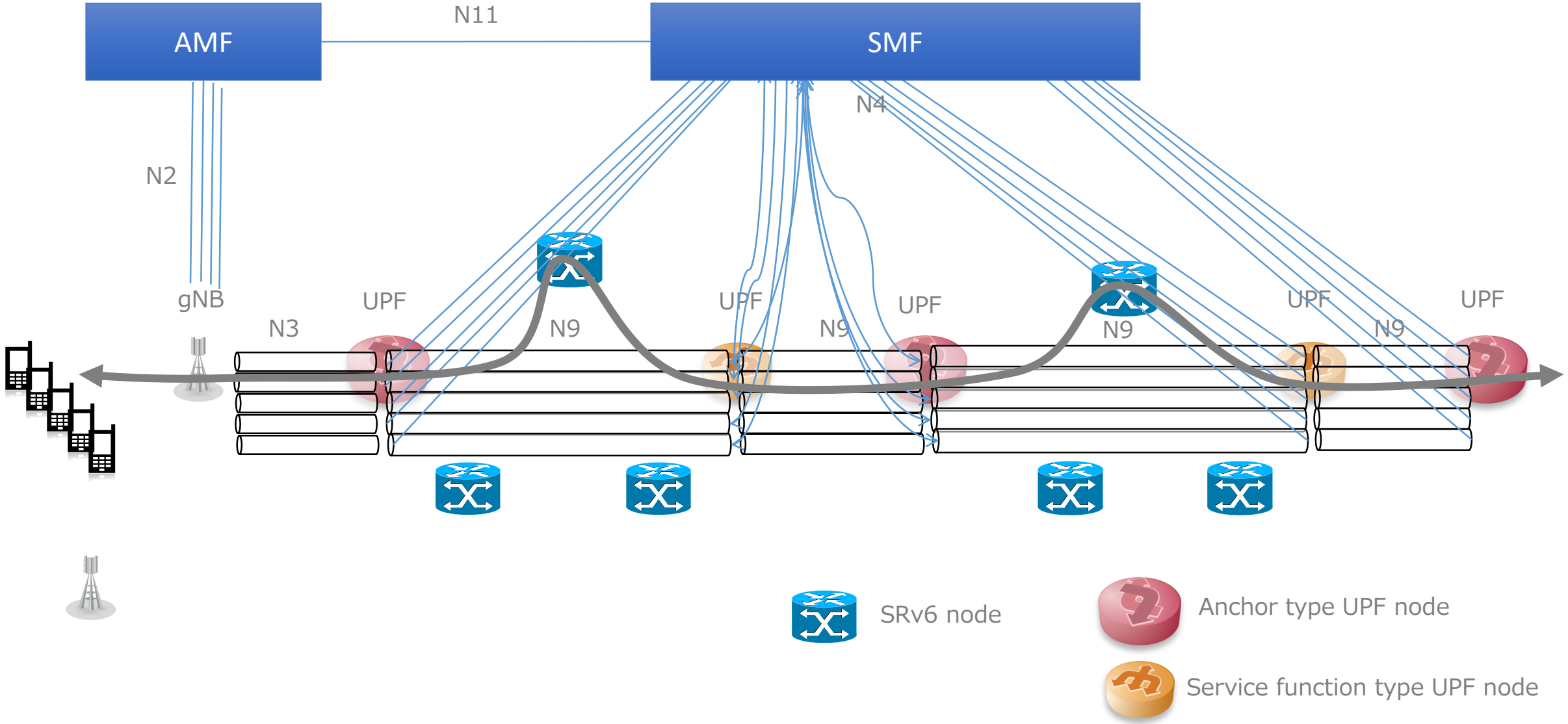
Backup Slides

Multiple UPFs in GTP-U Case (1)

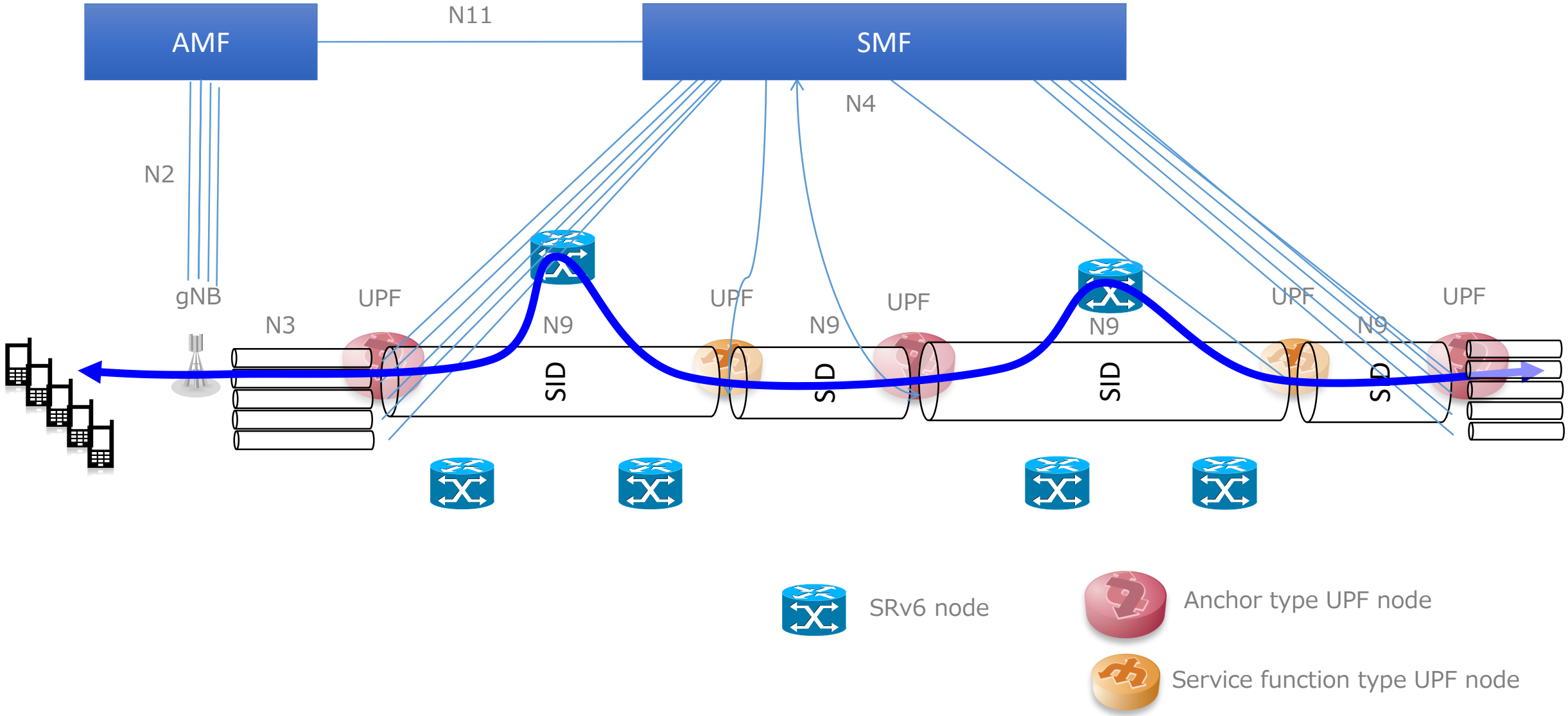


Multiple UPFs in GTP-U Case (2)

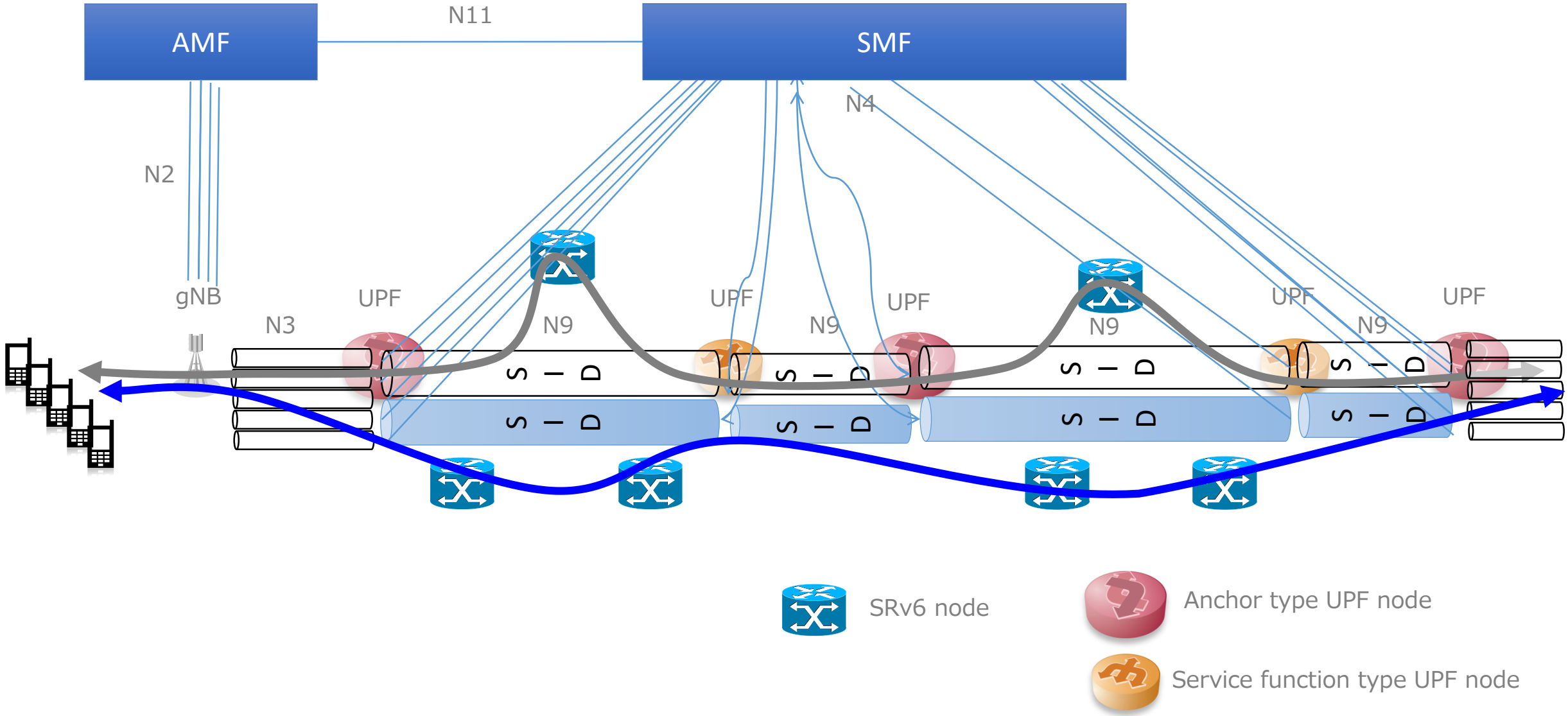
- **Increase states in User Plane.** <- Can be scaled up but costy
- **Non-optimum data-path.** <- Hard to meet Apps reqs



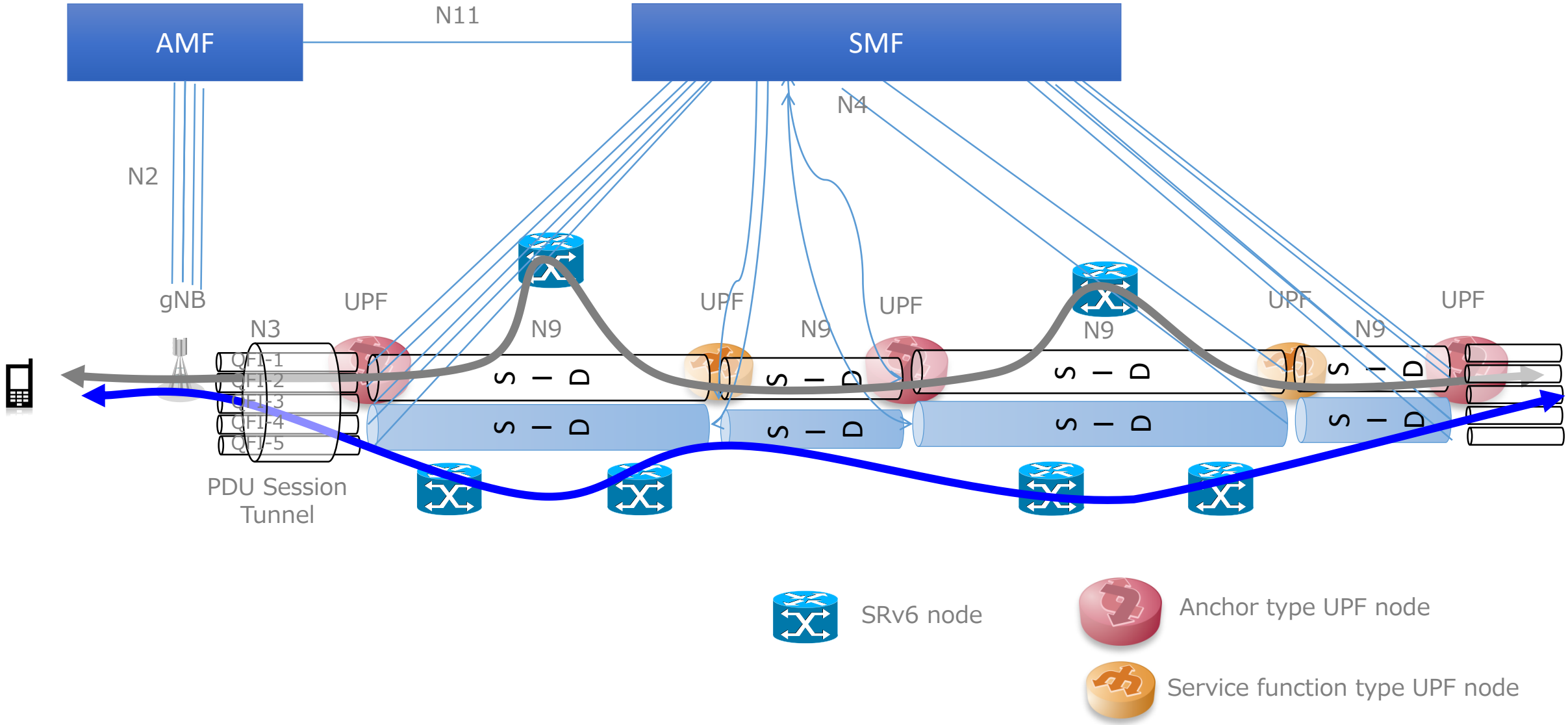
Multiple UPFs in A SRv6 Case



TE Support for Multiple UPFs in A SRv6 Case



TE Support for Multiple QFIs in A Single PDU Session



Leveraging Current Control-Plane

Minimalizes Impact to the Rest Parts of the System