

# SRv6MUP

## A Mobile User Plane Network Evolution with SRv6

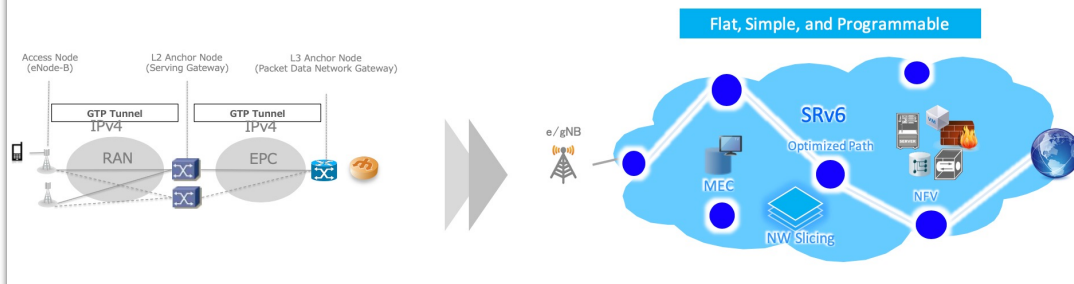
Satoru Matsushima  
SoftBank

# 4 Years Ago

MPLS+SDN+NFVWORLD  
@PARIS2018

## 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.



# 3 Years Ago

SoftBank mobile the Internet energy robot Corporation Company / IR

Company / IR news Company information Growth strategy IR information CSR Human resource measures and recruitment

Press release 2019

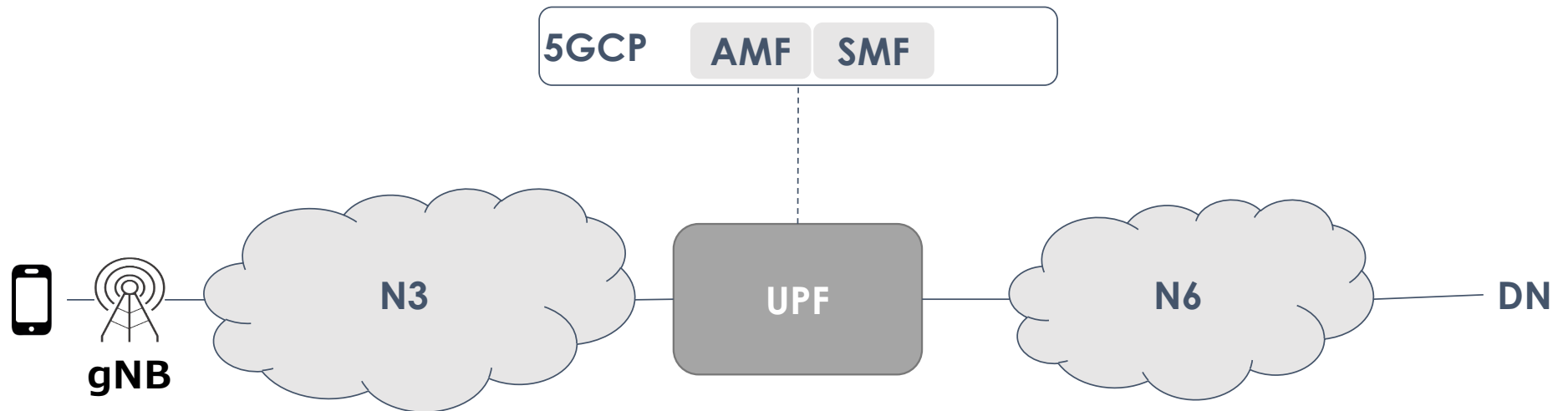
## Started operation of "SRv6 (segment routing IPv6)" in mobile IP network

New Technologies for Network Innovation in the 5G Era

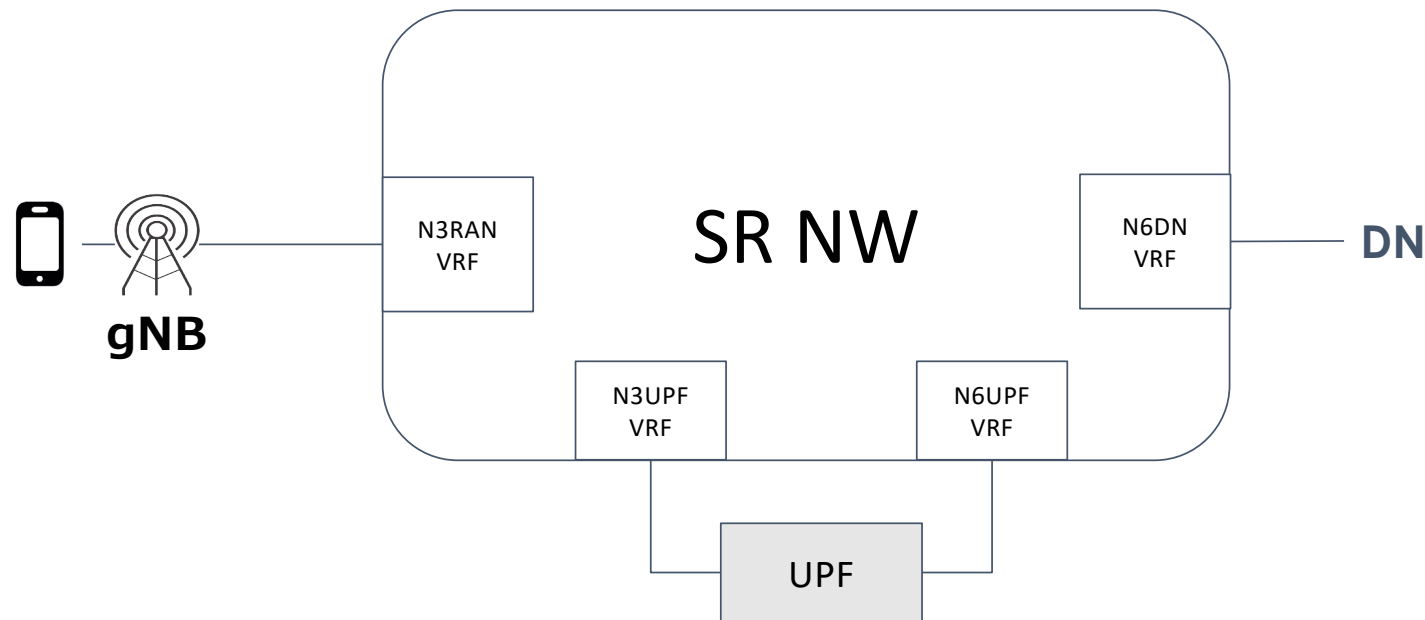
April 24, 2019 Softbank Corporation

SOFTBANK CORP. (Hereinafter referred to as "SOFTBANK") is a new technology that realizes simpler and scalable network configuration in mobile IP networks and implements various functions for the 5th generation mobile communication system (5G) era. We introduced SRv6 (segment routing IPv6) and began full-scale operation on a commercial network from April 2019.

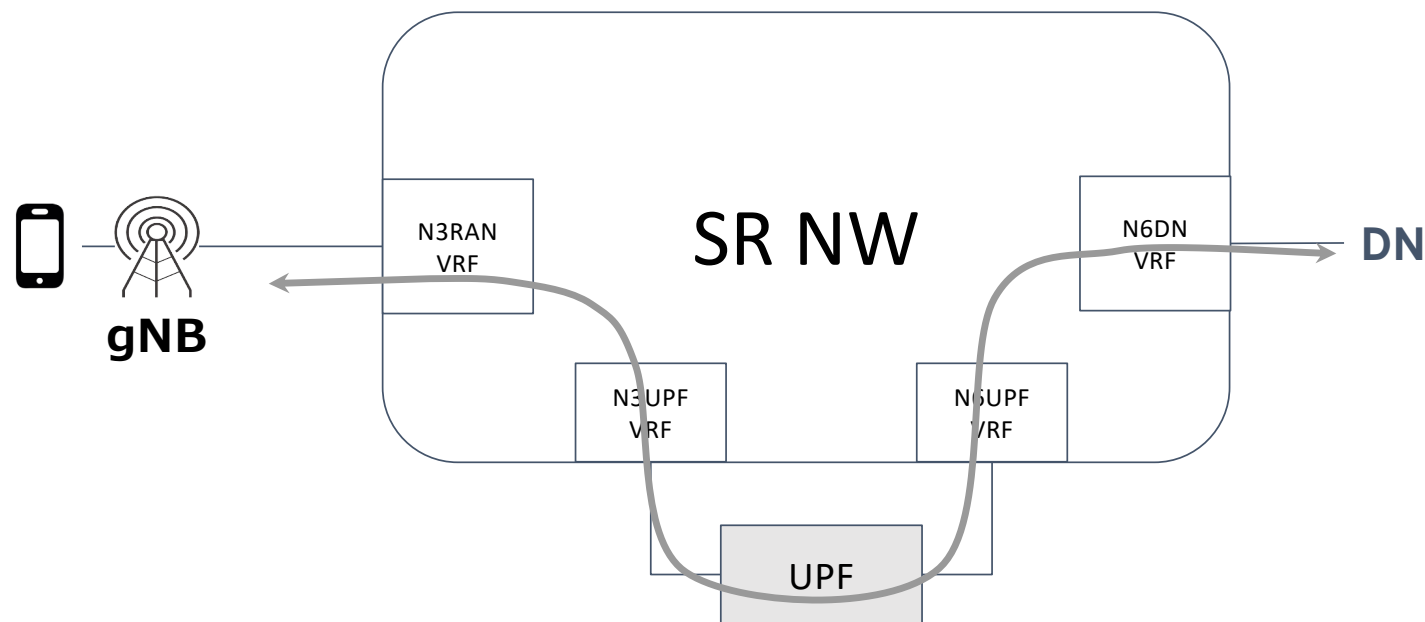
# Now MNOs are building 5G Network..



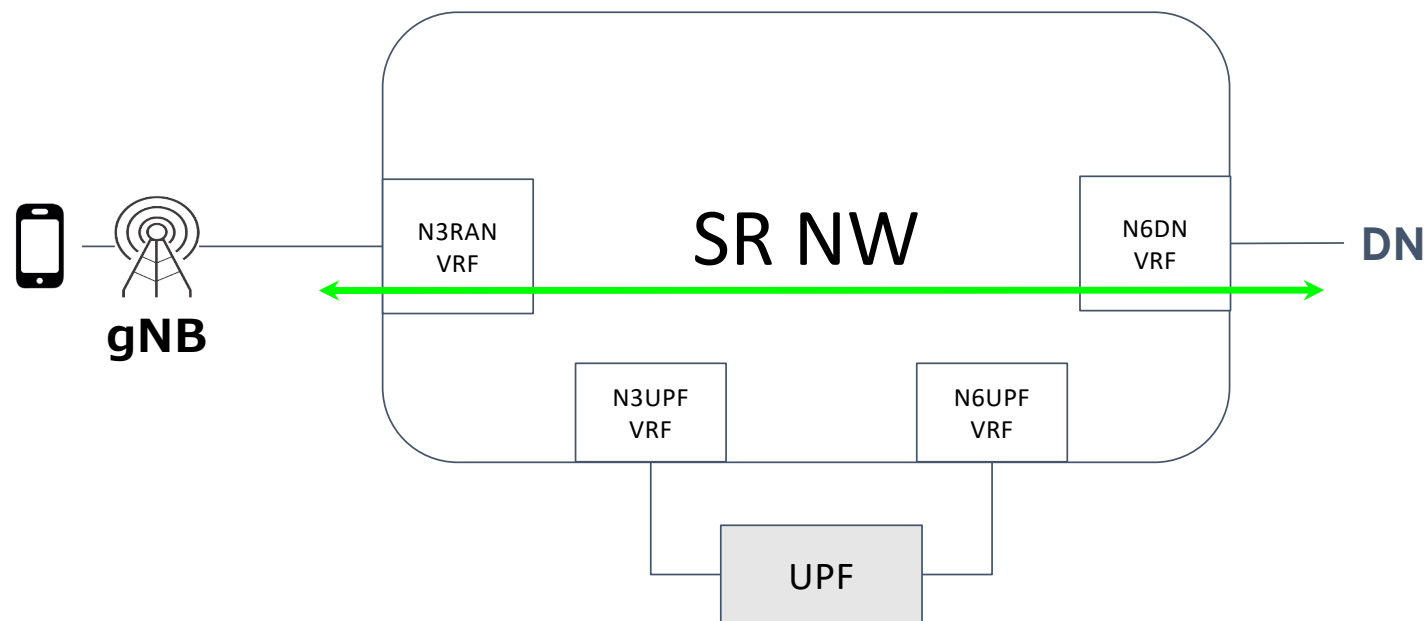
# An MNO May Build 5G Network over SR Like This..



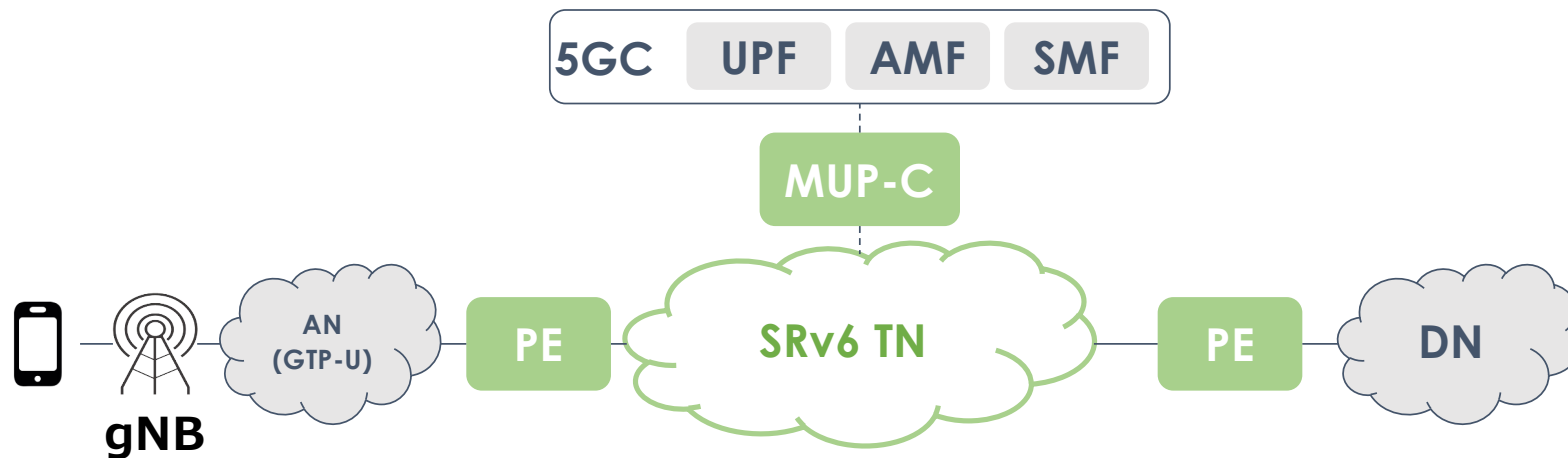
# The User Plane Data-Path Looks Not Optimal..



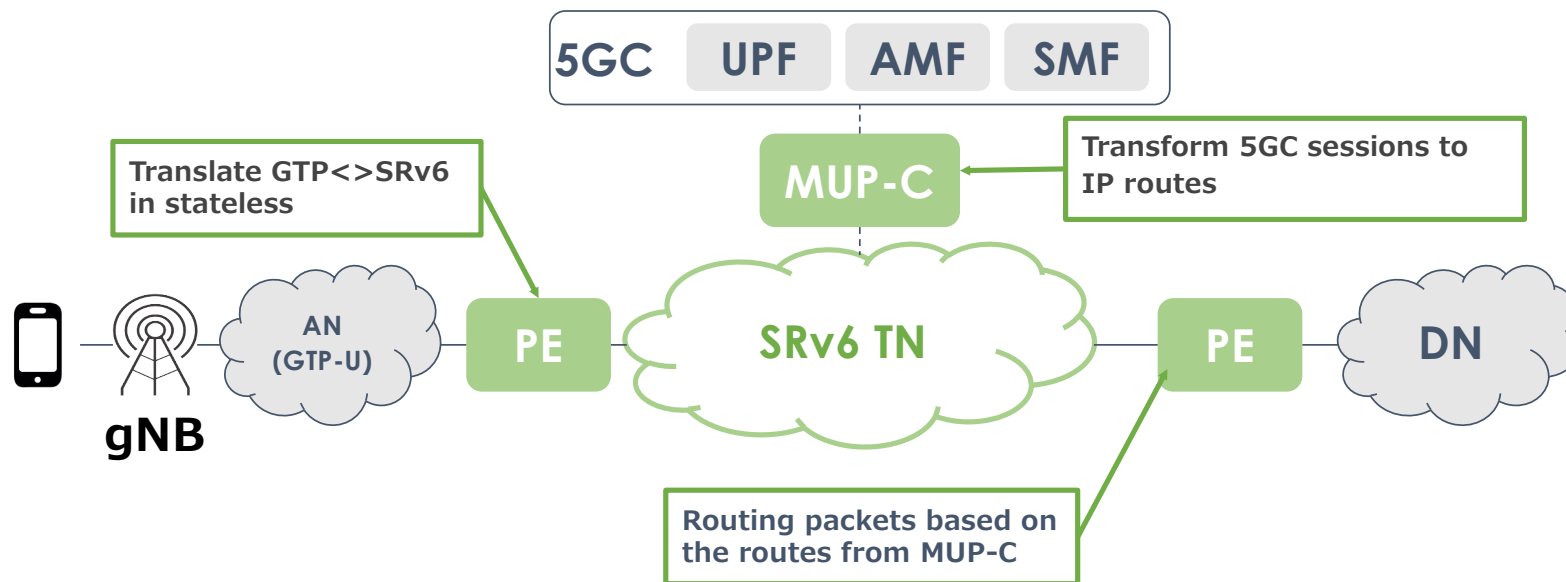
# What if We Could Do This.. SRv6MUP!



# SRv6 MUP Architecture.. No Change 5G, Just Plug-in

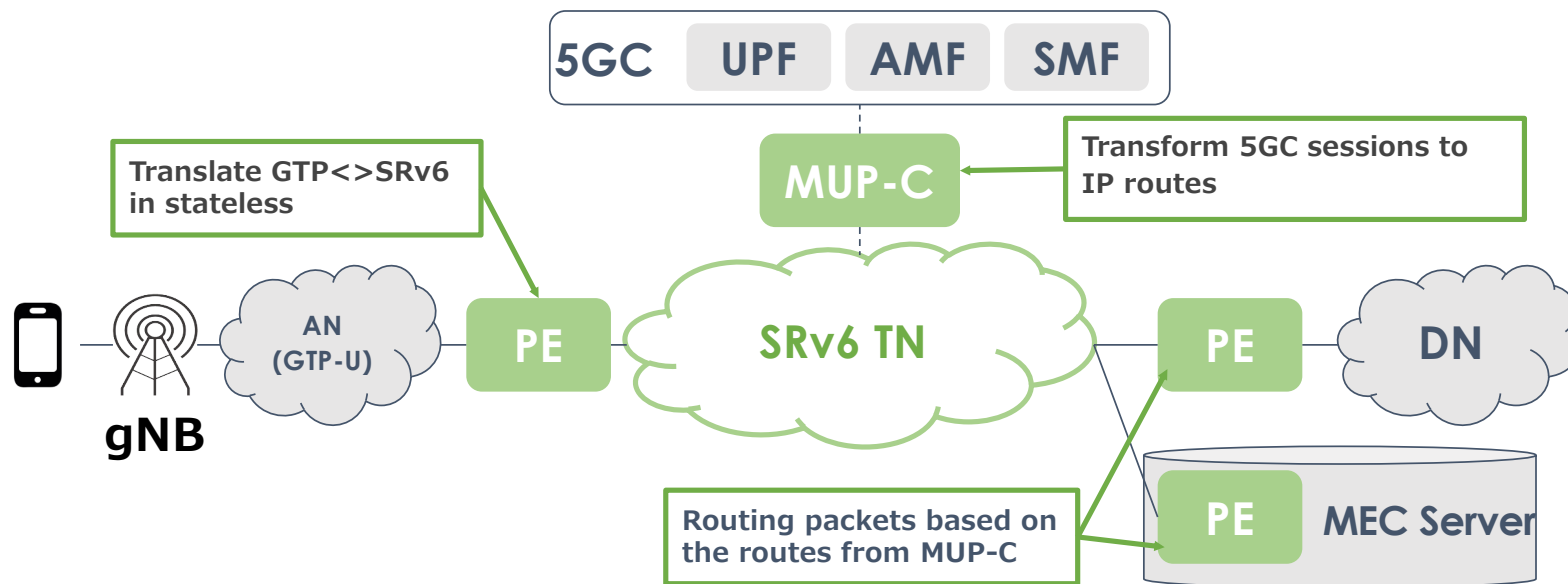


# SRv6 MUP Architecture.. No Change 5G, Just Plug-in

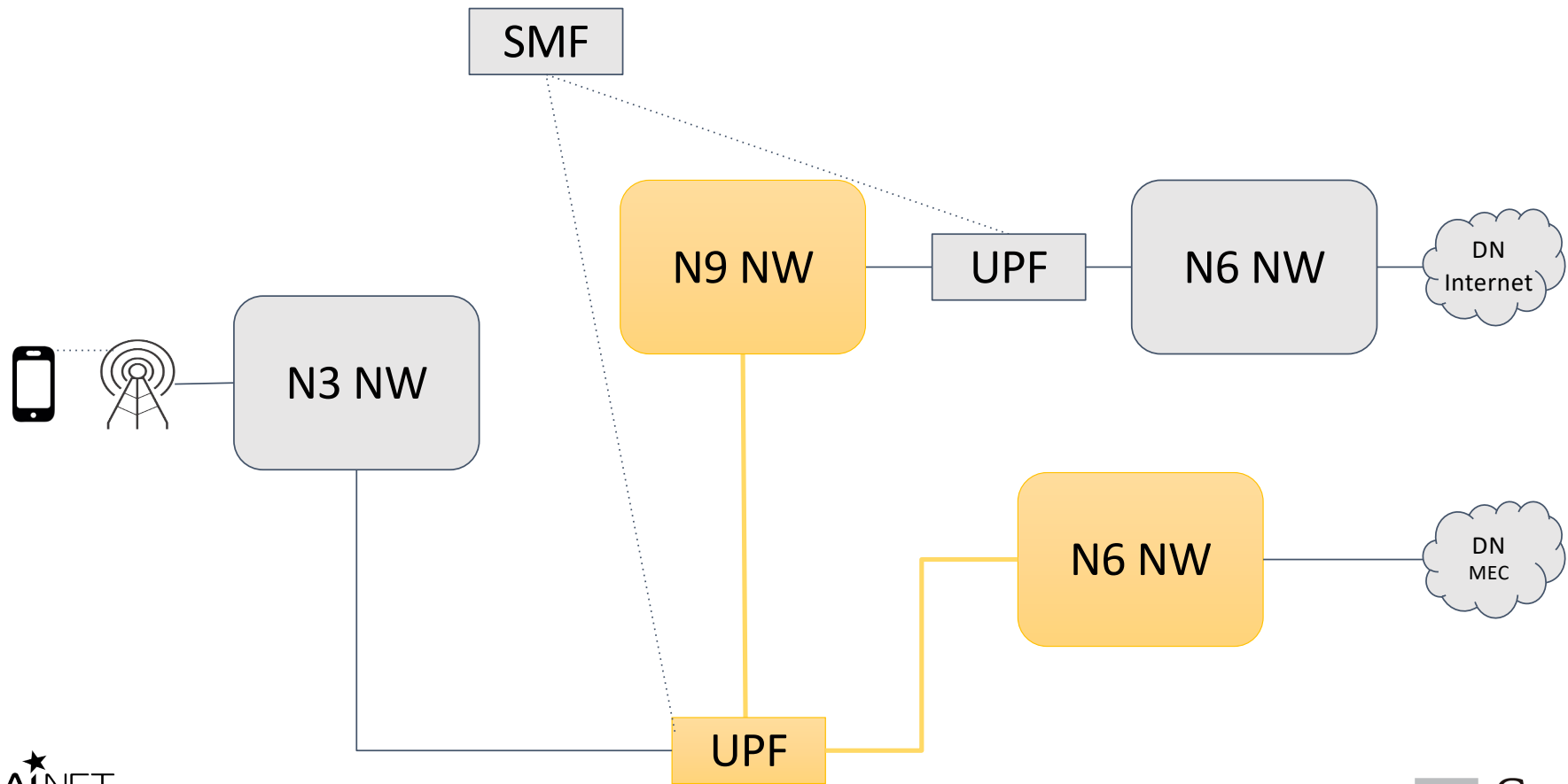




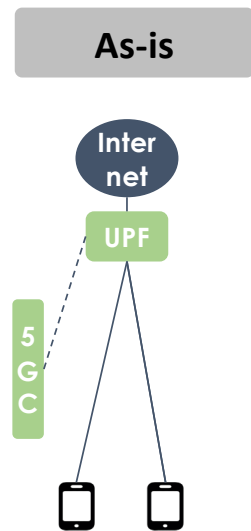
# SRv6 MUP Architecture.. No Change 5G, Just Plug-in



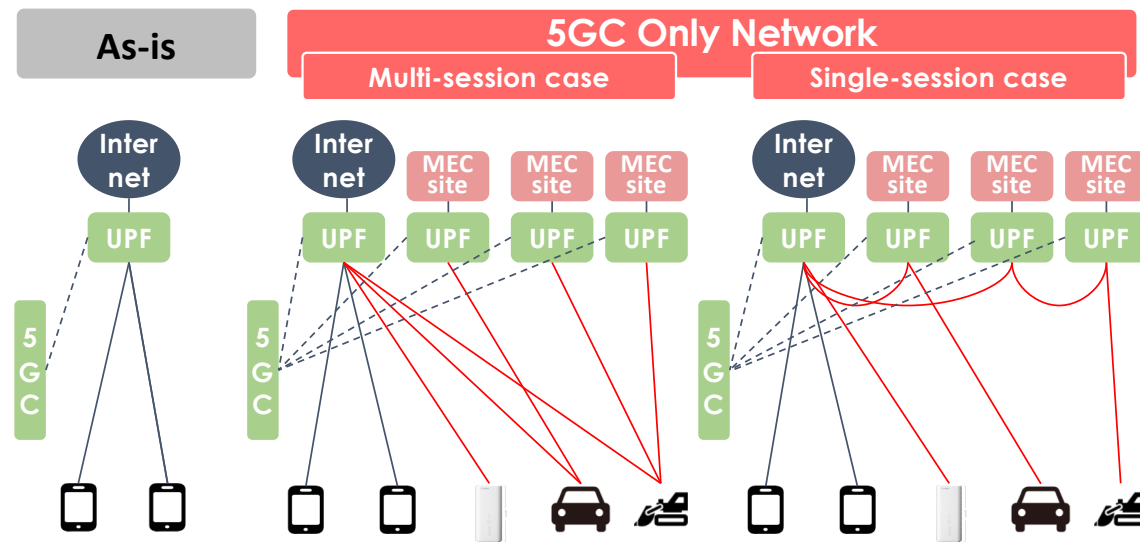
# Additional UPFs and N6/N9 NWs for MEC w/o SRv6MUP..



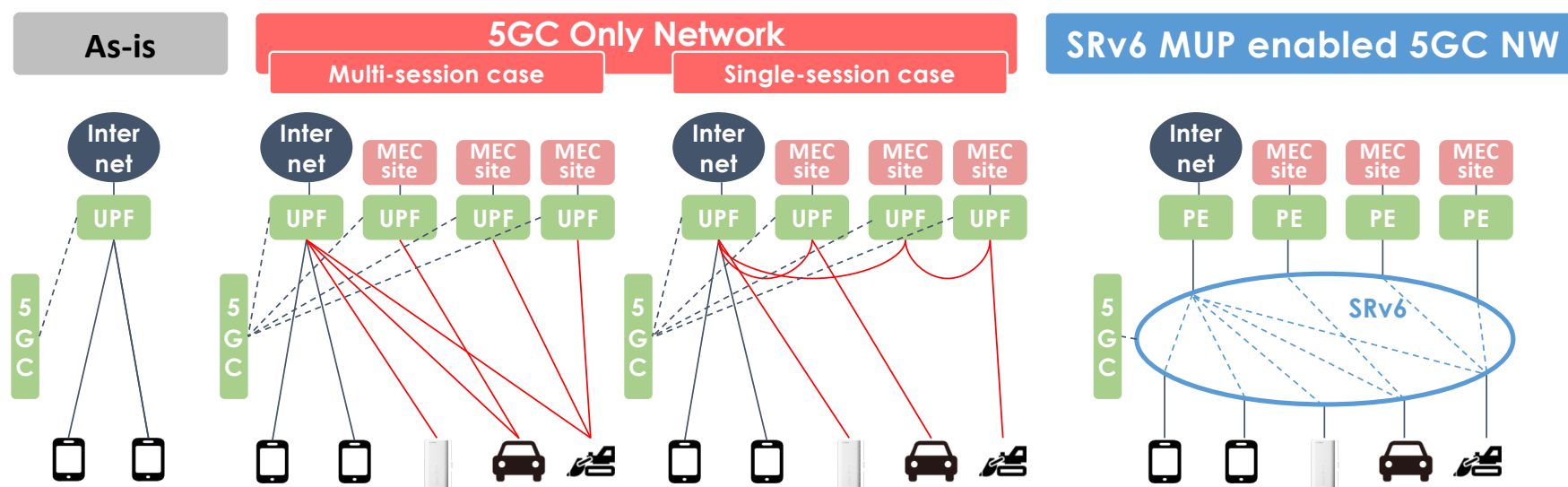
# Toward the Future of Massive Distributed Computing



# Toward the Future of Massive Distributed Computing



# Toward the Future of Massive Distributed Computing



# SRv6MUP is Open To Be Implemented and Standardized.

 **FD.io VPP** v21.10-rc0-260-g38071b133  
Vector Packet Processing

Main Page	Related Pages	Modules	Namespaces	Data Structures	Source
<ul style="list-style-type: none"><li>QoS Hierarchical Scheduler</li><li>RDMA (ibverb) Ethernet driver</li><li>SELinux - VPP Custom SELinux Policy</li><li>VPP SPAN implementation</li><li>SR-MPLS: Segment Routing for MPLS</li><li>SRv6: Segment Routing for IPv6<ul style="list-style-type: none"><li>Segment Routing</li><li>Segment Routing terminology</li><li>SRv6 Features in VPP</li><li>SRv6 LocalSID development framework</li><li>SR LocalSIDs</li><li>Creating a SR Policy</li><li>Steering packets into a SR Policy</li><li>Sample SRv6 LocalSID documents</li><li>SRv6 endpoint to SR-unaware</li><li>SRv6 endpoint to SR-unaware</li><li>SRv6 endpoint to SR-unaware</li><li><b>SRv6 Mobile User Plane Plugins</b></li><li>vcl-ldpreload: a LD_PRELOAD lib</li><li>VMWARE vmxnet3 device driver</li><li>AF_XDP Ethernet driver</li><li>Wireguard vpp-plugin</li><li>VPP Top Installation</li><li>VPP stats segment FUSE filesystem</li></ul></li><li>Developer Documentation</li><li>Release Notes</li><li>Debug CLI</li><li>Startup Configuration</li><li>Node Identifiers</li><li>Modules</li><li>Namespaces</li><li>Data Structures</li></ul>					

## SRv6 Mobile User Plane Plugins

### Introduction

This plugin module can provide the stateless mobile user plane protocols translation between GTP-U and SRv6. The plugin packet encapsulated in GTP-U. These plugin functions take advantage of SRv6 network programmability.

**SRv6 Mobile User Plane** defines the user plane protocol using SRv6 including following stateless translation functions:

- T.M.GTP4.D:** GTP-U over UDP/IPV4 -> SRv6
- End.M.GTP4.E:** SRv6 -> GTP-U over UDP/IPV4
- End.M.GTP6.D:** GTP-U over UDP/IPV6 -> SRv6
- End.M.GTP6.E:** SRv6 -> GTP-U over UDP/IPV6

These functions benefit user plane(overlay) to be able to utilize data plane(underlay) networks properly. And also it benefits routing paradigm.

In addition to the above functions, the plugin supports following functions:

- T.M.GTP4.DT[4|6|46]:** FIB table lookup for IPv4/IP6 encapsulated in GTP-U over UDP/IPV4
- End.M.GTP6.DT[4|6|46]:** FIB table lookup for IPv4/IP6 encapsulated in GTP-U over UDP/IPV6

Noted that the prefix of function names follow naming convention of SRv6 network programming. "T" means transit function. Mobility specific function. The suffix "D" and "E" mean that "decapsulation" and "encapsulation" respectively.

### Implementation

All SRv6 mobile functions are implemented as VPP plugin modules. The plugin modules leverage the `sr_policy` and `sr_local`.

### Configurations

#### GTP-U to SRv6

The GTP-U tunnel and flow identifiers of a receiving packet are mapped to a Segment Identifier(SID) of sending SRv6 packet.

#### IPv4 infrastructure case

In case that **IPv4** networks are the infrastructure of GTP-U, T.M.GTP4.D function translates the receiving GTP-U packets to SRv6.

A T.M.GTP4.D function is associated with the following mandatory parameters:

- SID:** A SRv6 SID to represents the function
- DST-PREFIX:** Prefix of remote SRv6 segment. The destination address or last SID of out packets consists of the prefix and the receiving packets.
- SRC-PREFIX:** Prefix for src address of sending packets. The src IPv6 address consists of the prefix followed by the source address.

Internet Engineering Task Force  
Internet-Draft  
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Expires: 20 September 2022

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19 March 2022

Segment Routing IPv6 Mobile User Plane Architecture for Distributed  
Mobility Management  
draft-mhkk-dmm-srv6mup-architecture-03

## Abstract

This document defines the Segment Routing IPv6 Mobile User Plane (SRv6 MUP) architecture for Distributed Mobility Management. The requirements for Distributed Mobility Management described in [RFC7333] can be satisfied by routing fashion.

# SRv6 MUP Demo Movie

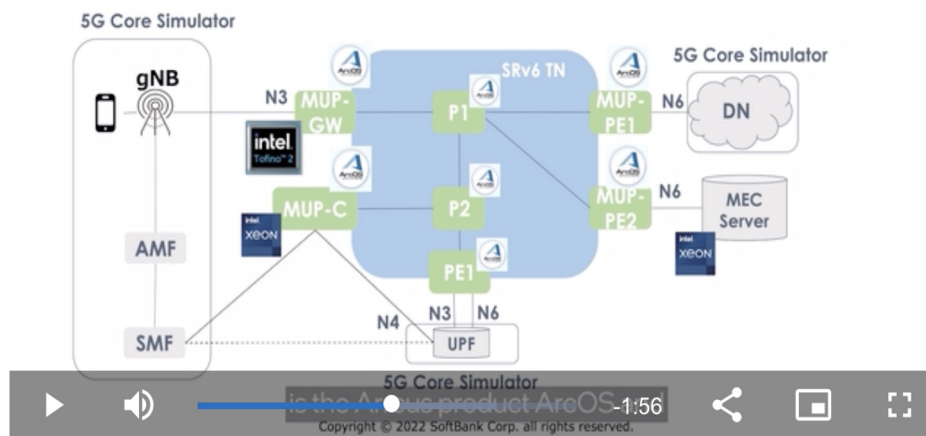
## SRv6 MUP Demo Topology

SoftBank

### 5G Gateway SRv6

3:59

By using SRv6 for traffic forwarding, communication service providers can better achieve massive distributed computing at scale, with a lower TCO.



<https://www.intel.com/content/www/us/en/events/mobile-world-congress.html?videoId=6298415001001>



# Summary

- Mobile Operators who are building 5G over SR networks can get a chance to evolve your Mobile User Plane
- SRv6MUP is a plug-in to optimize the data-path for 5G Mobile User Plane
- SRv6MUP is open to be implemented and standardized with much industry supports

Thank you

Question/Comments?

# FAQ

## **Q: Is SRv6MUP available over SR-MPLS?**

A: SRv6MUP is an application of IPv6. So SRv6MUP can run over any IPv6 VPN solutions, not only over SR-MPLS, but also legacy MPLS.

EoF