

Software Defined Network への道のり

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ソフトバンク



私について

199x~ : サイトオペレーション

(鉄道電話, 専用線故障窓口, PDH/SDH, D60/70, ATM/FR, etc.,)

1999~ : BGP/MPLS-VPNs, Traffic Engineering

MPLS-IX (mplsASSOCIO)

2007~ : NGN

モバイルバックホール

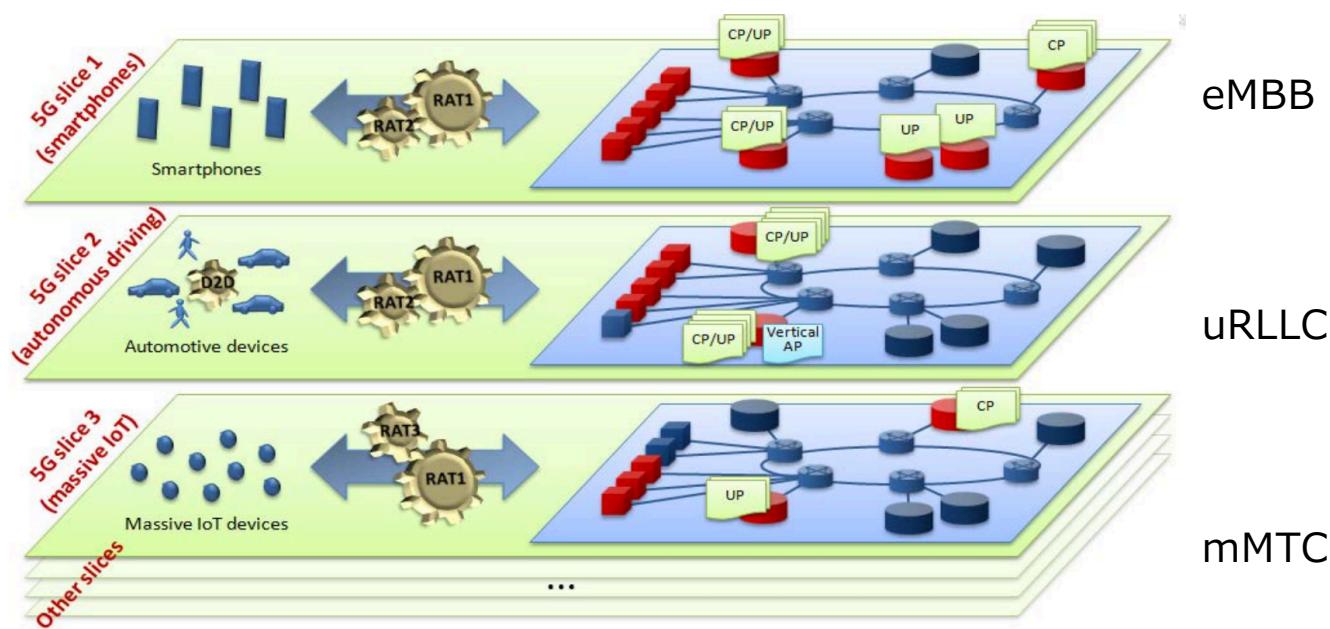
2010~ : IPv4/IPv6 共存

2013~ : コントロール/データプレーン 分離

SDN

2016~ : 5G, SRv6

Generic Expectations for 5G Networks



Source: [NGMN white-paper](#)

Generic Expectations for 5G Networks

PlayOnline™

遅延による問題

FFXI クライアントサーバ間の通信遅延
毎秒3回(0.33秒)のパケット交換
RTT 200msec 以下

1. ゲームパッド(コントローラー)の操作に対するキャラの反応が鈍くなる
→ モンスターに襲われた場合、反撃ができず、気絶
2. 他キャラに流れる時間とズレが生じる
→ 他プレイヤーの動作が不自然
→ コミュニケーションが成り立たない

PlayOnline™

揺らぎによる問題

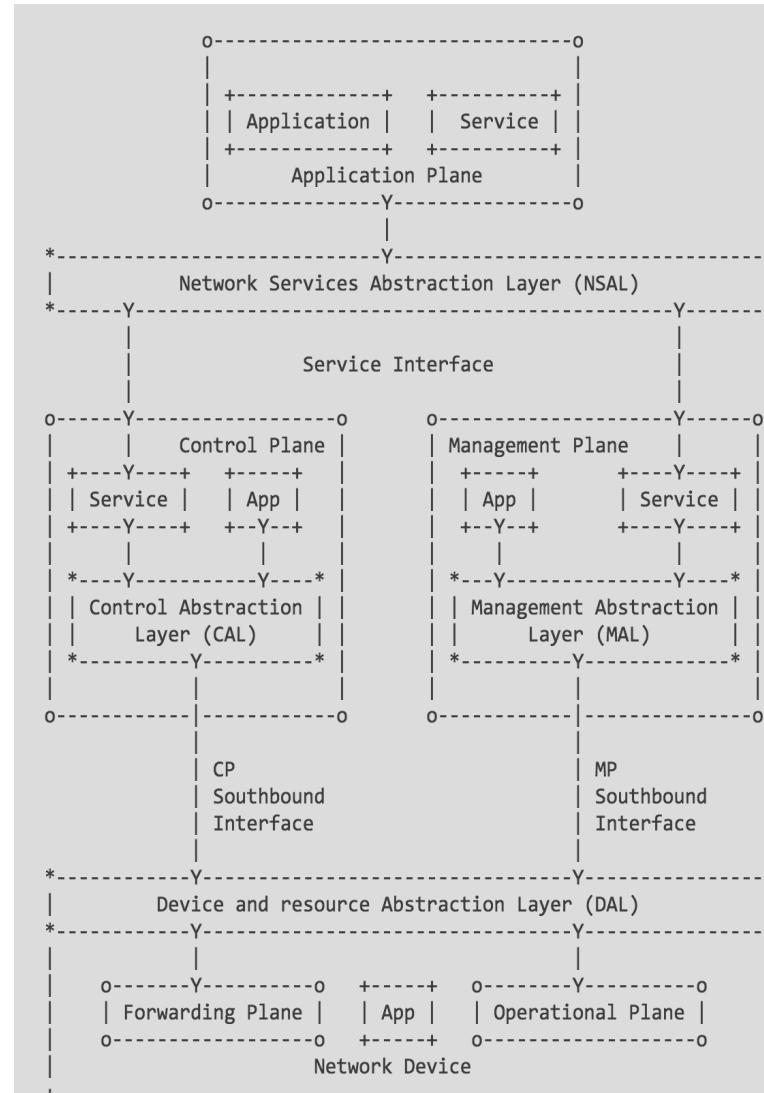
- スムースなアニメーションがくずれる

現在はクライアントアプリケーション側での予測エンジンによってベクトルから、次の行動を予測して、アニメーションを構成している
(例)

- 走り続けているはずなのに、歩いたり、止まったりする
- エルメスの靴を履いていないのに早歩き
- 崖の手前で止まっているはずなのに、
他プレイヤーには落ちているように見える

出典: https://www.janog.gr.jp/meeting/janog9/pdf/janog9_ise.pdf

Software Defined Network*



* : RFC7426

Key Concepts of Software Defining Work

Topology

Policy

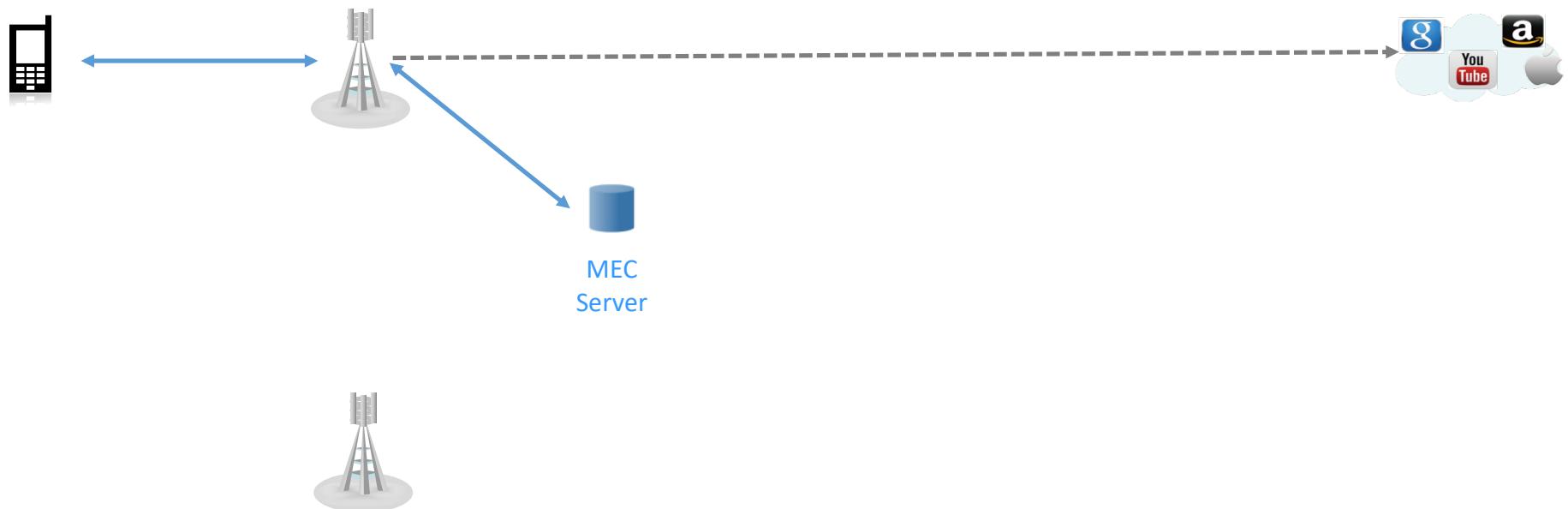
ID

← focus

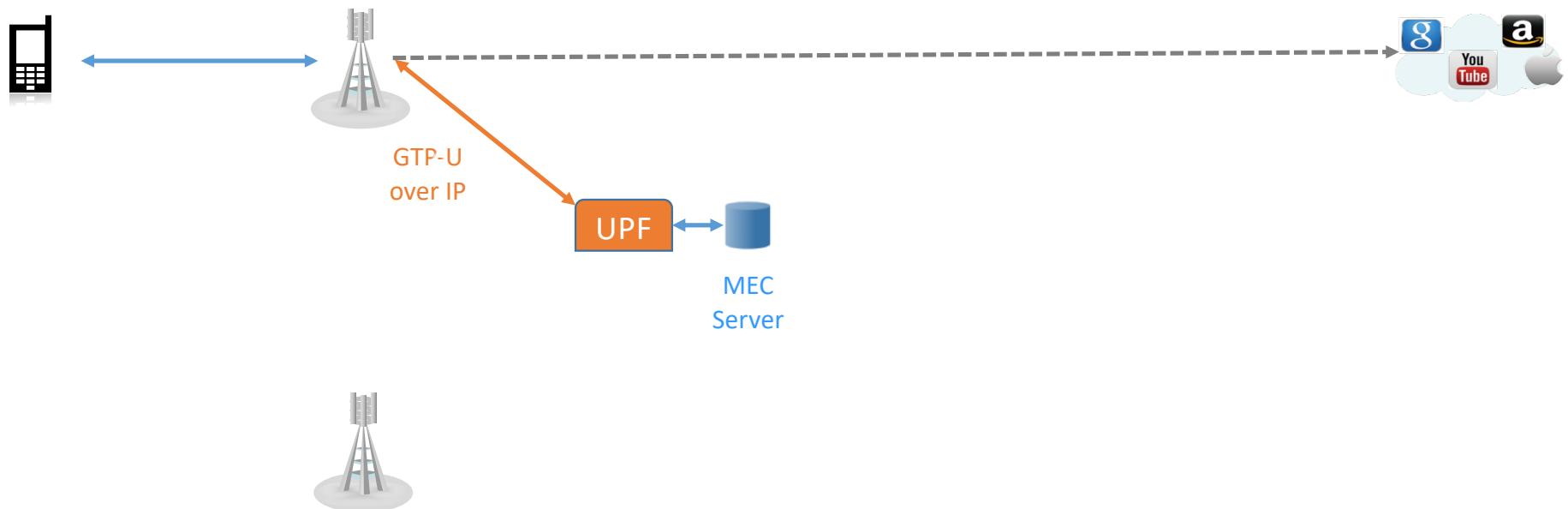
Use Case Study:

MEC (Multi-Access Edge Computing)

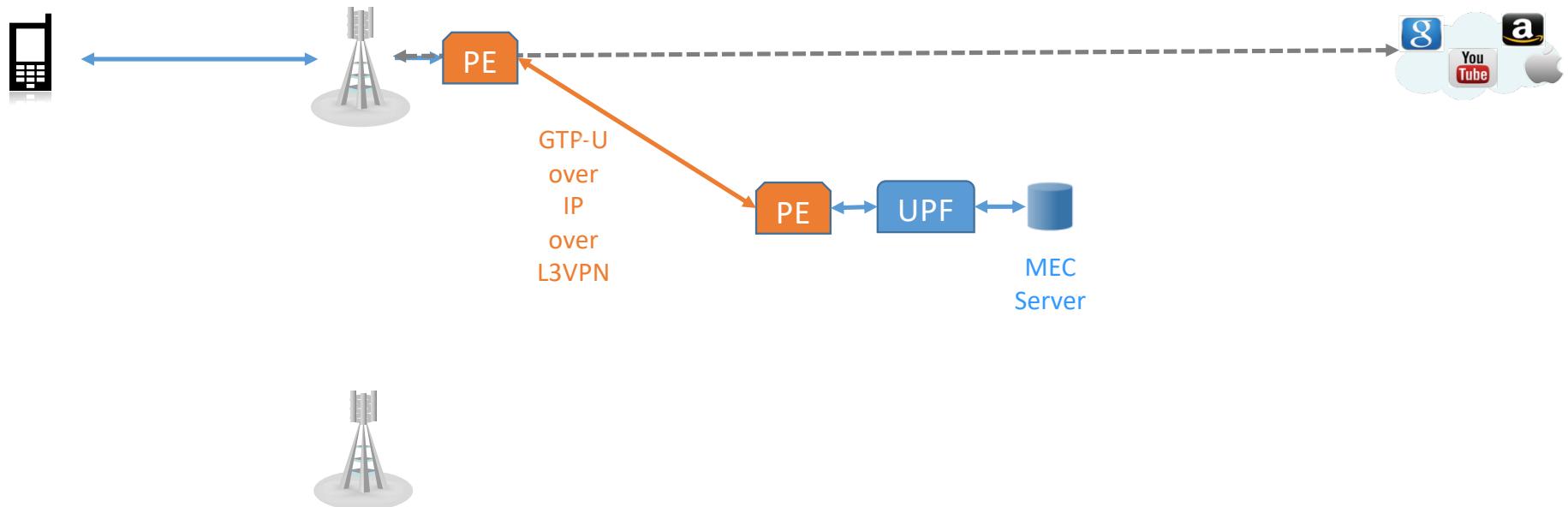
Use Case Study: Multi-Access Edge Computing



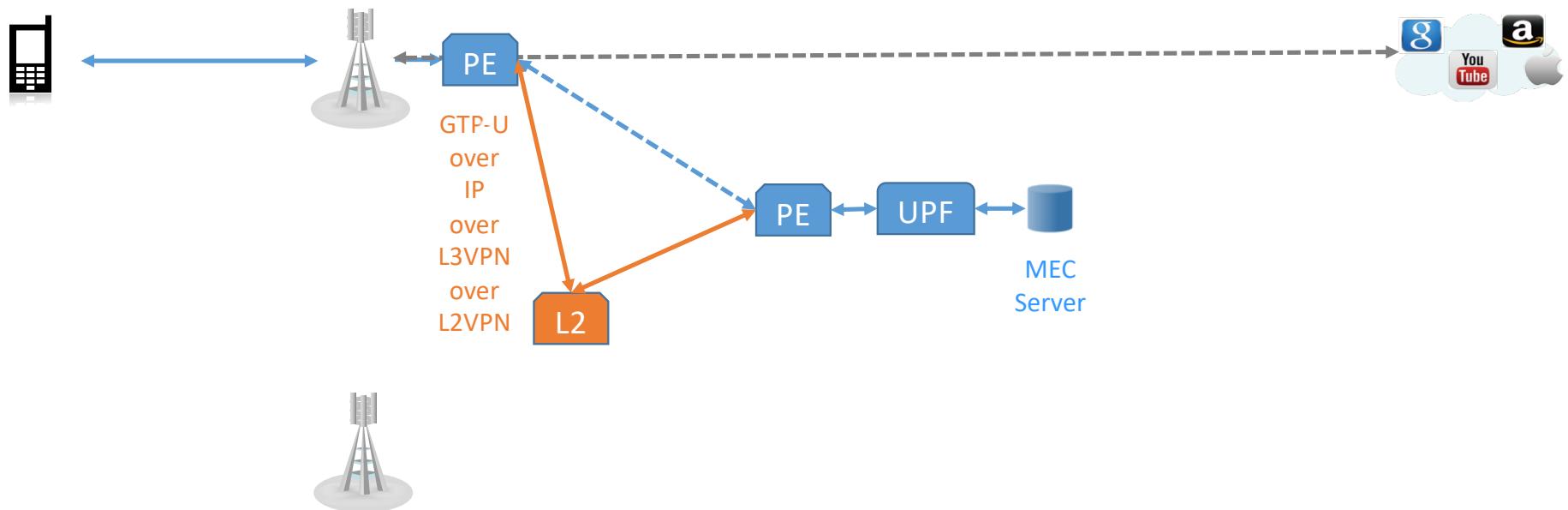
Use Case Study: Multi-Access Edge Computing



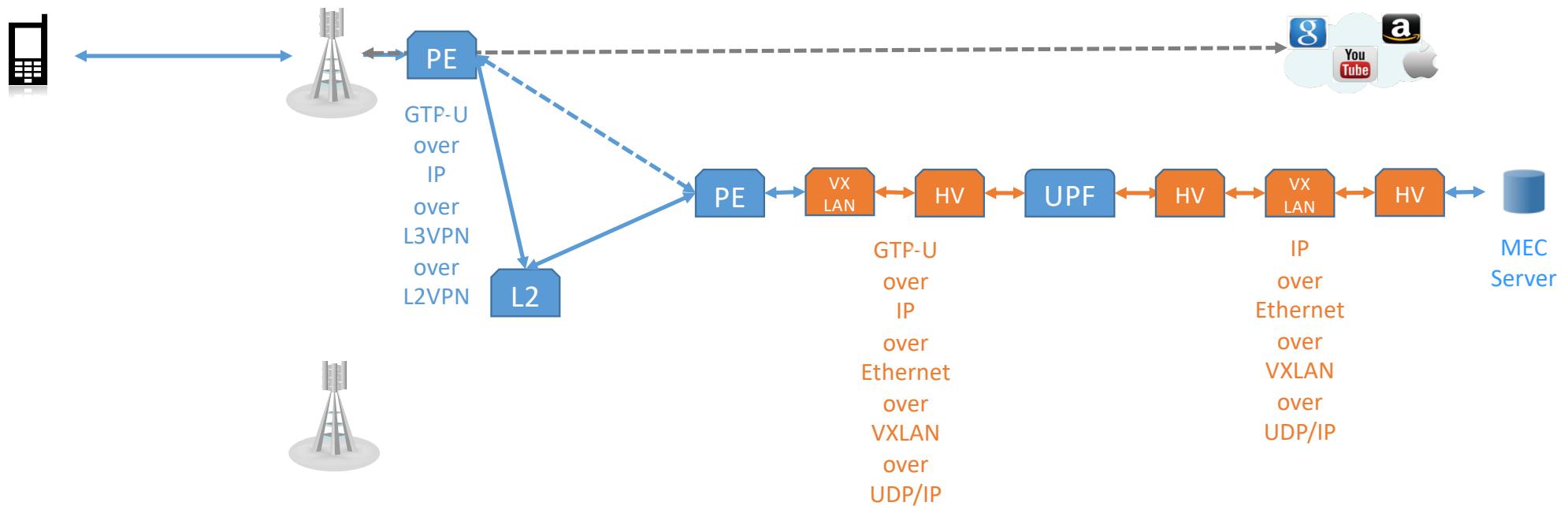
Use Case Study: Multi-Access Edge Computing



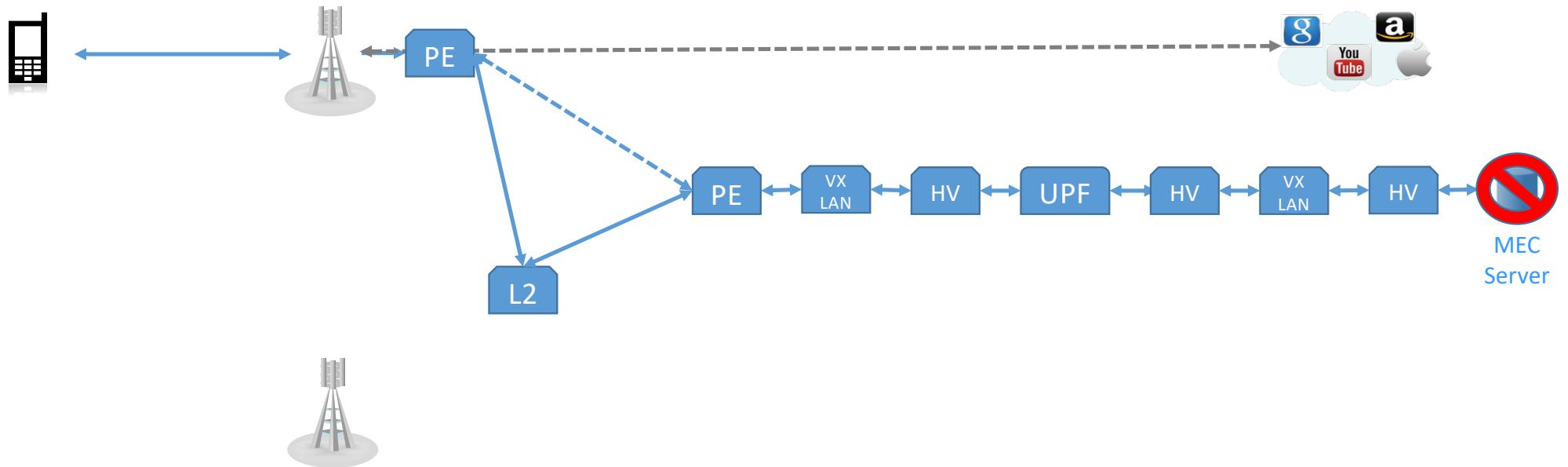
Use Case Study: Multi-Access Edge Computing



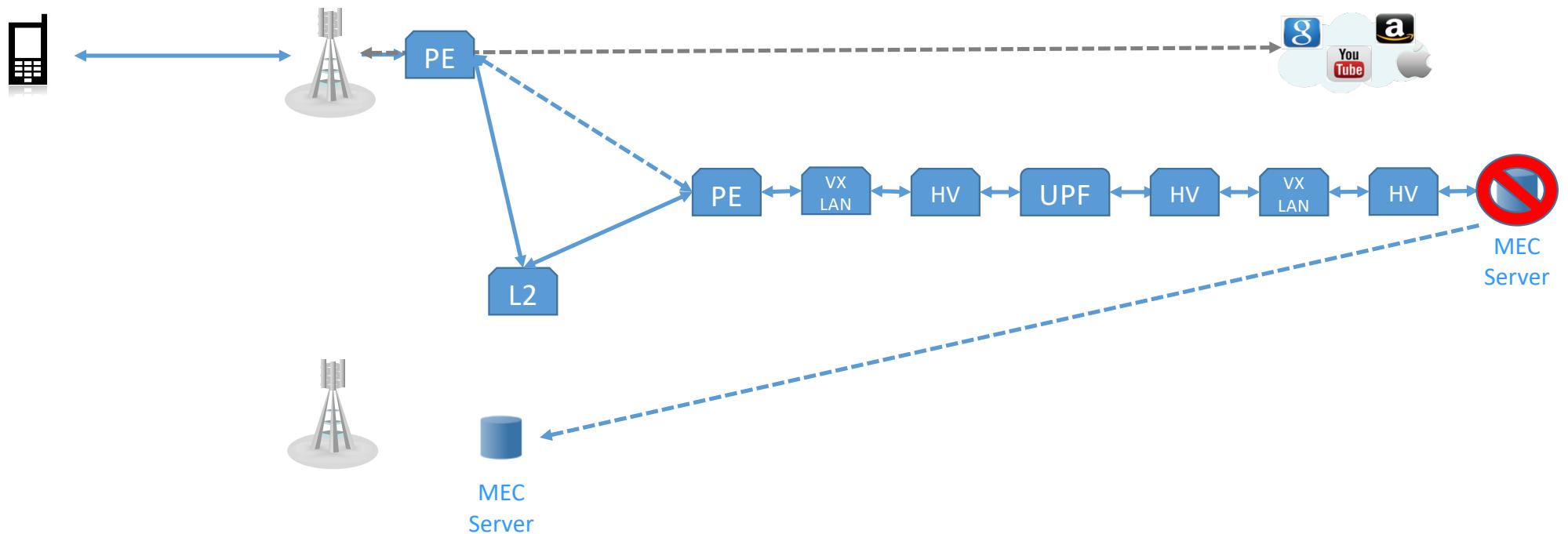
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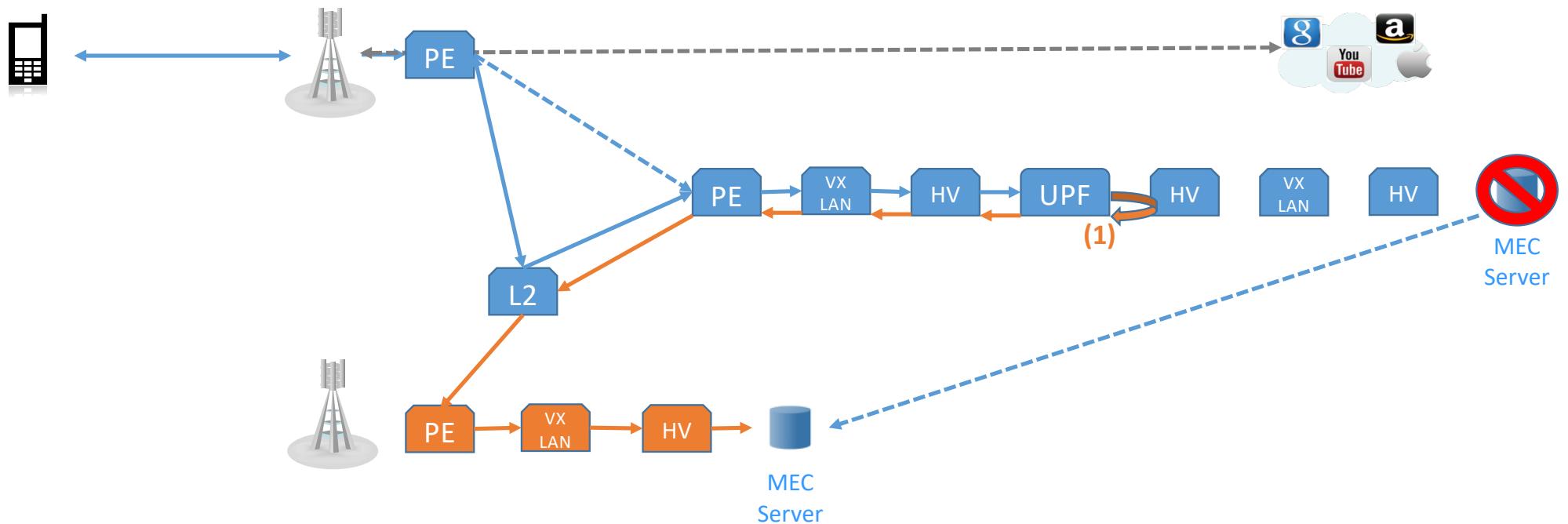
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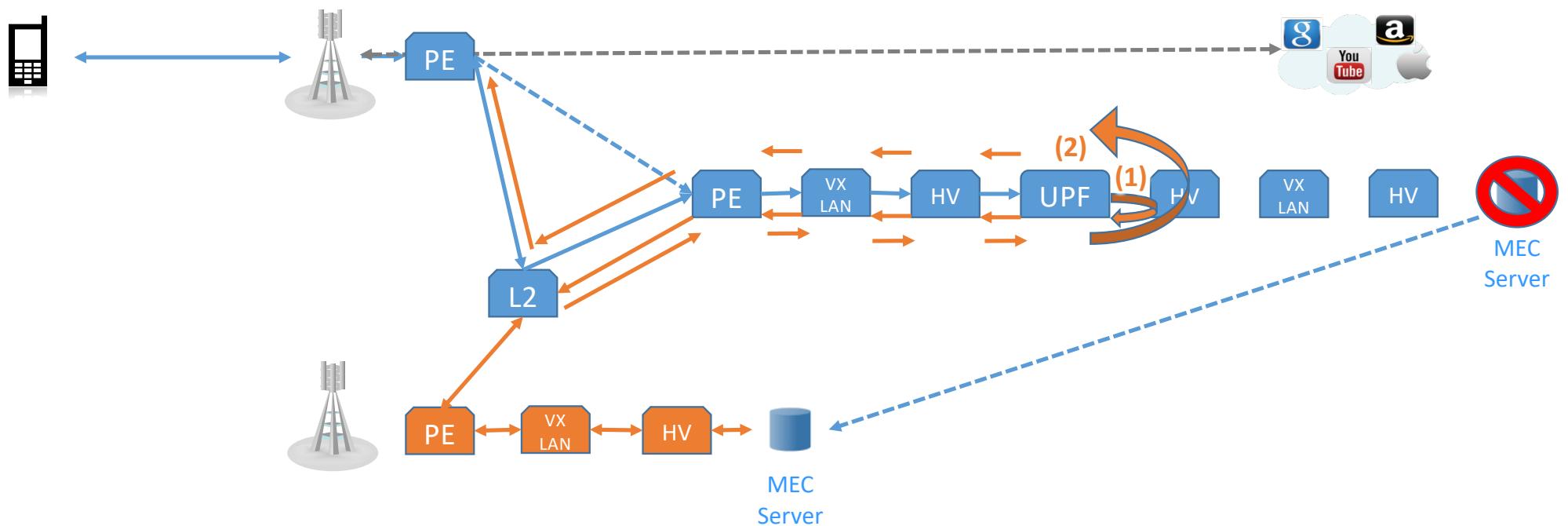
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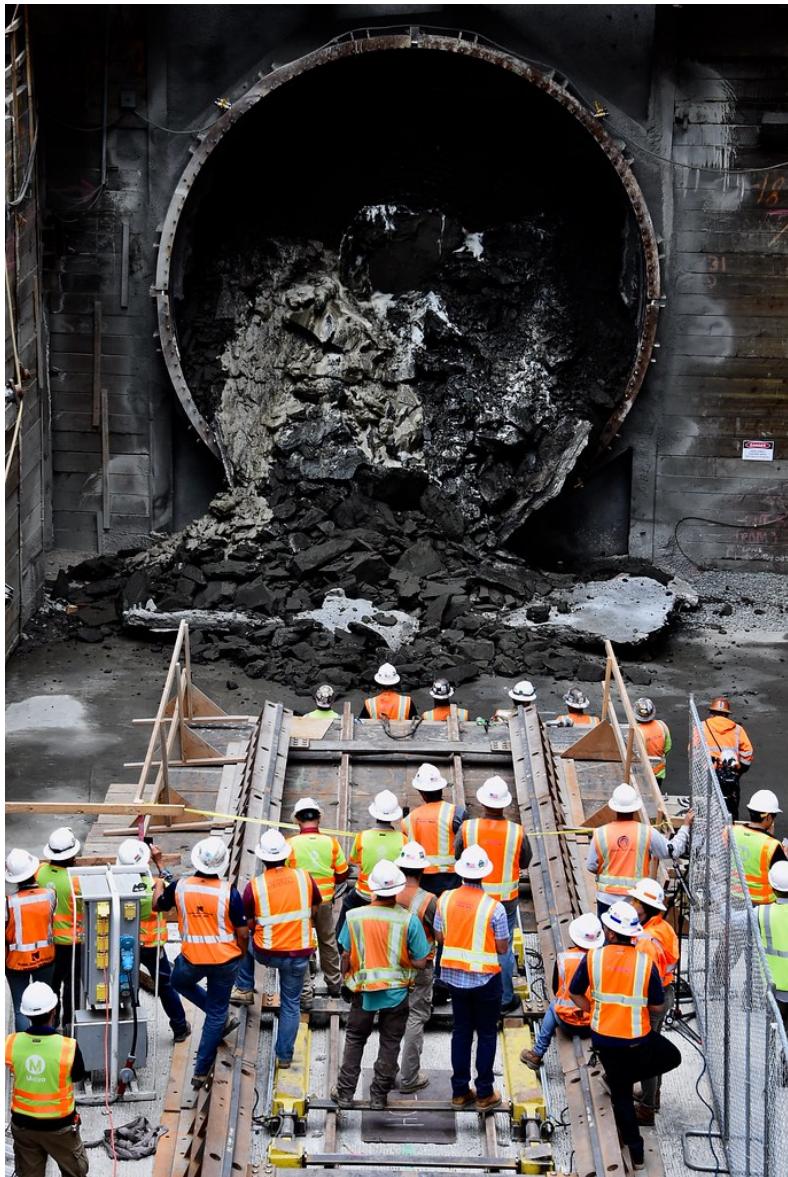


Use Case Study: Multi-Access Edge Computing



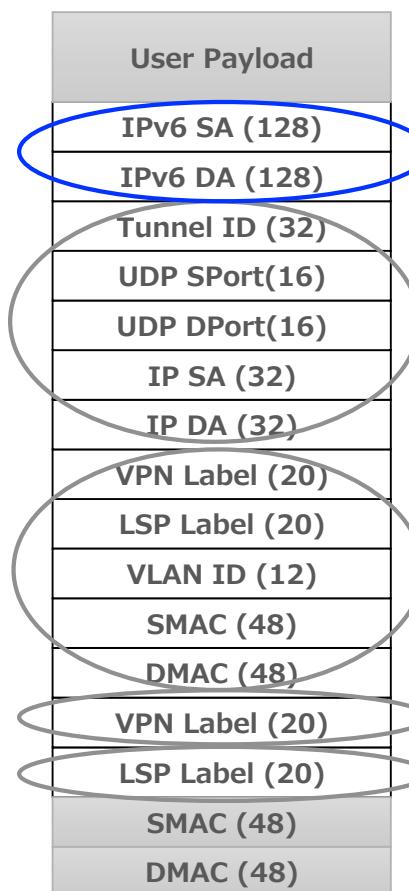
Use Case Study: Multi-Access Edge Computing





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Network Stack of the Current Data Plane



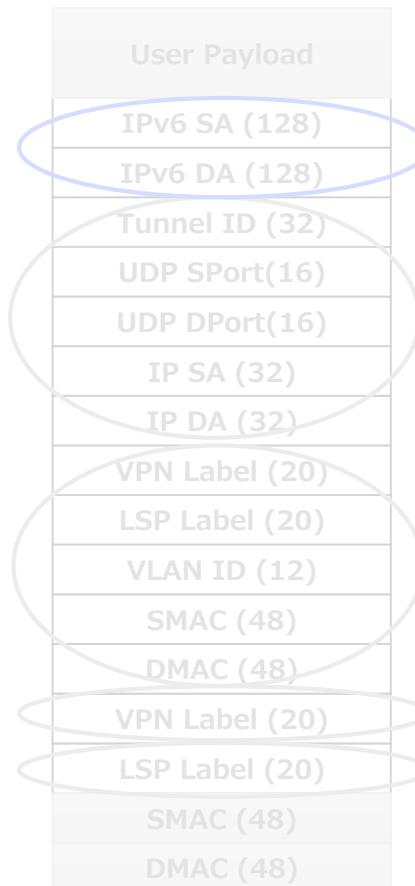
IPv6 as User PDN Protocol

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

Network Stack of the Current Data Plane



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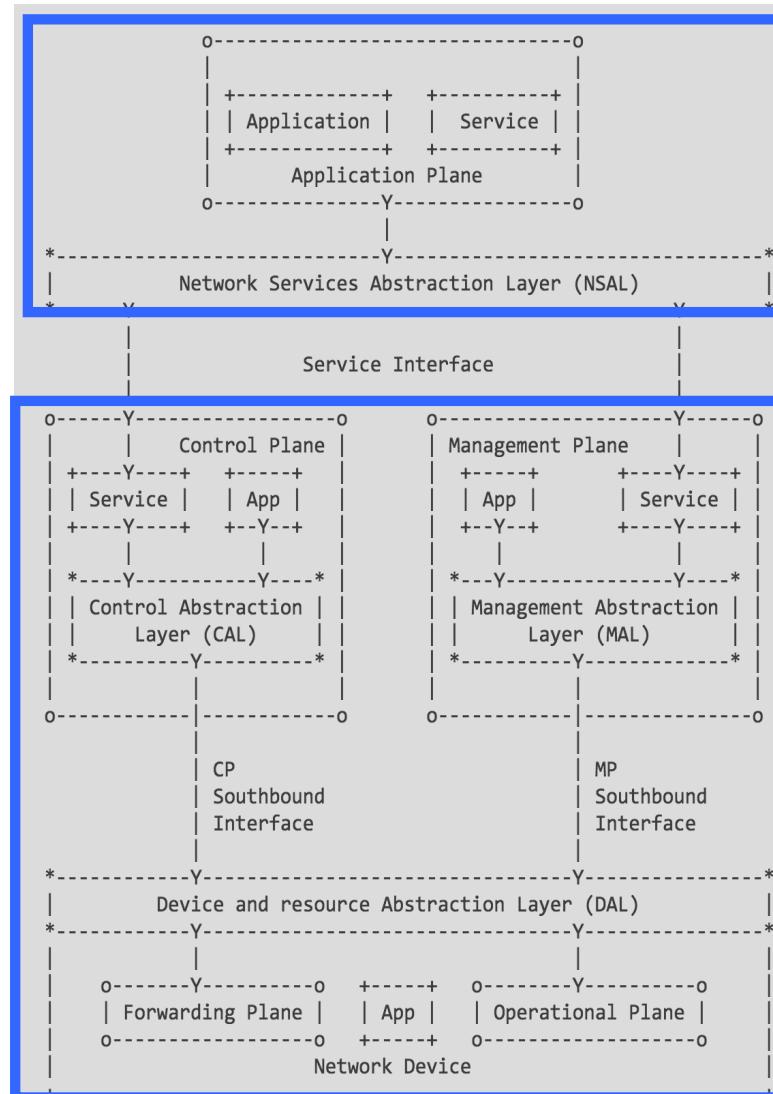
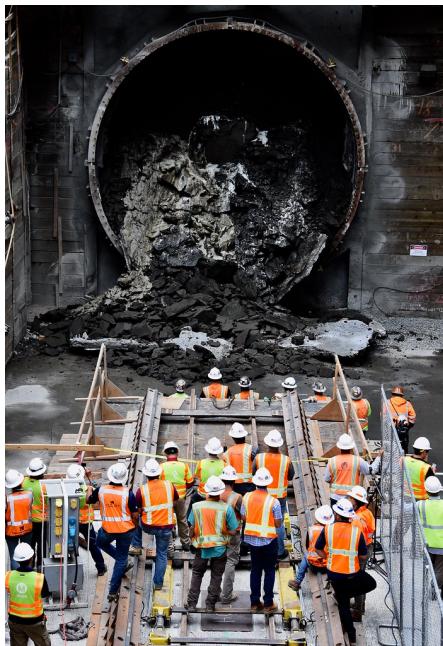
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between Two Nodes

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works

Multiple Virtual Networks Co-exist
Provides High Quality and Reliability

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Software Defined Network

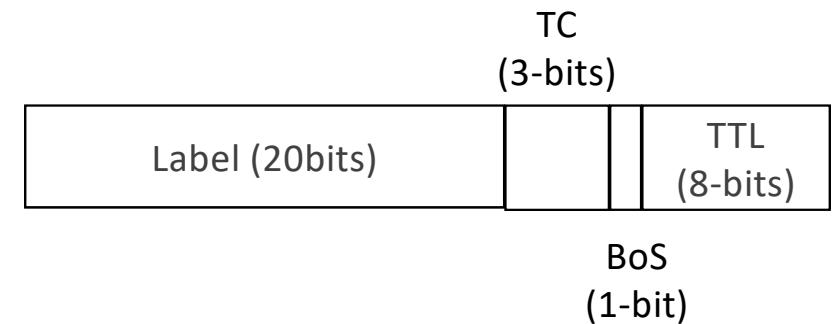
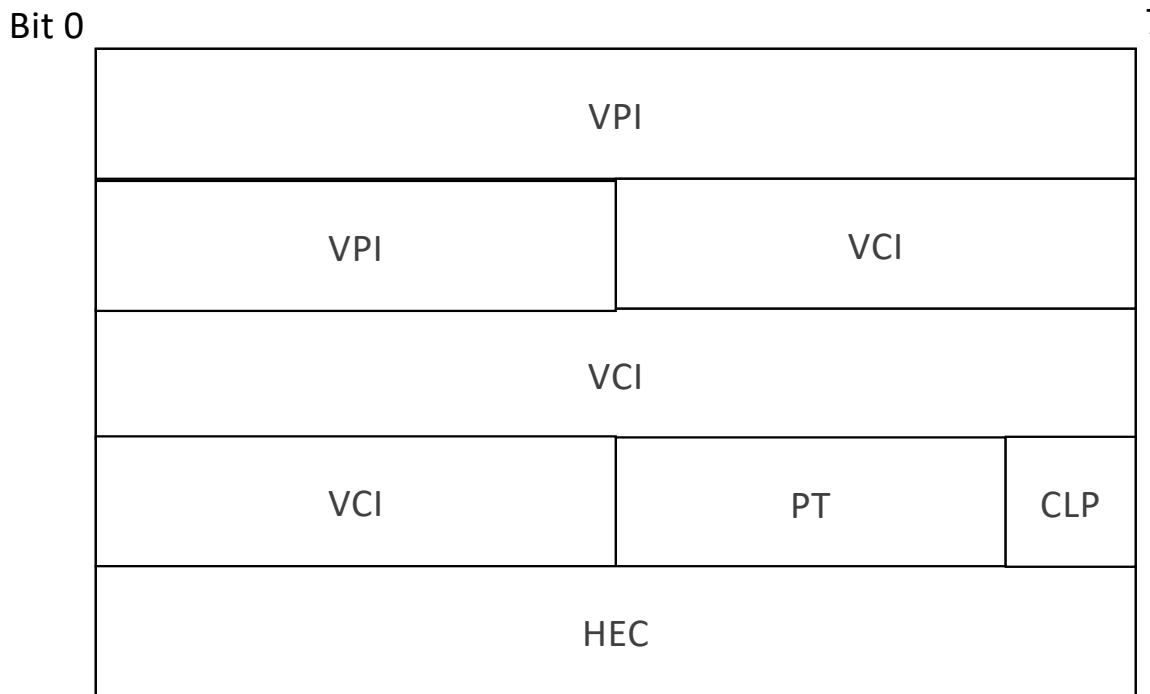


Overlay & Underlay

OverlayとUnderlayの特性がミスマッチしてしまった例

ATM PW (Pseudo-Wire) over MPLS

VCごとのQoSを、VP PWで実現したい



OverlayがUnderlayの状態を考慮しようと頑張った例

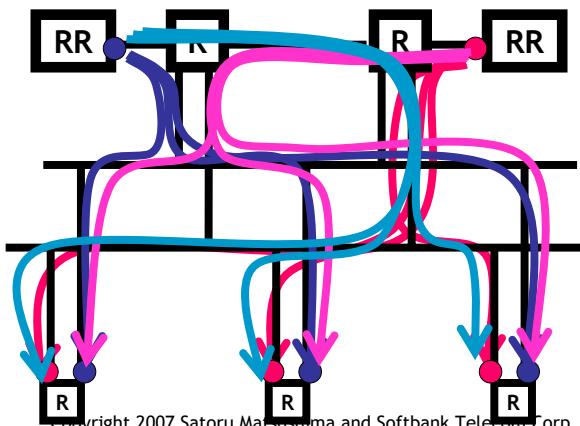
高速な障害復旧に必要な
思いやり

ソフトバンクテレコム
松嶋 聰

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検証::障害検知時の動作

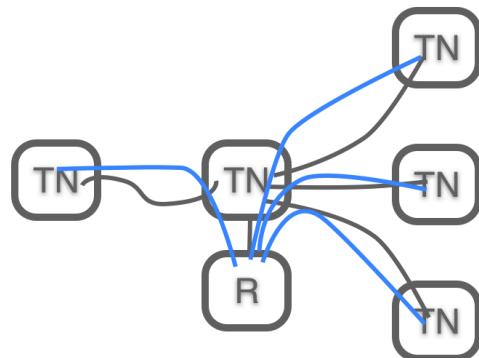
- やりなおし::プローブのかけ方



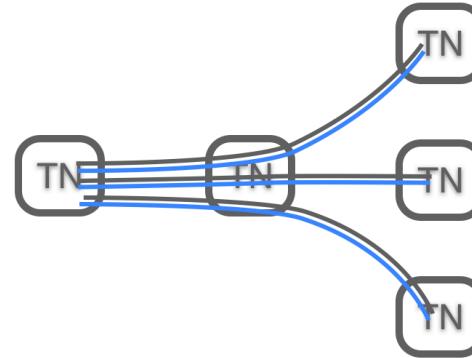
https://www.janog.gr.jp/meeting/janog20/pdf/kosoku_matsushima_post01.pdf

OverlayなのにUnderlayのキャパを超えてしまった例

What we did:



What we want:



— LSP
— Pseudo-Wire

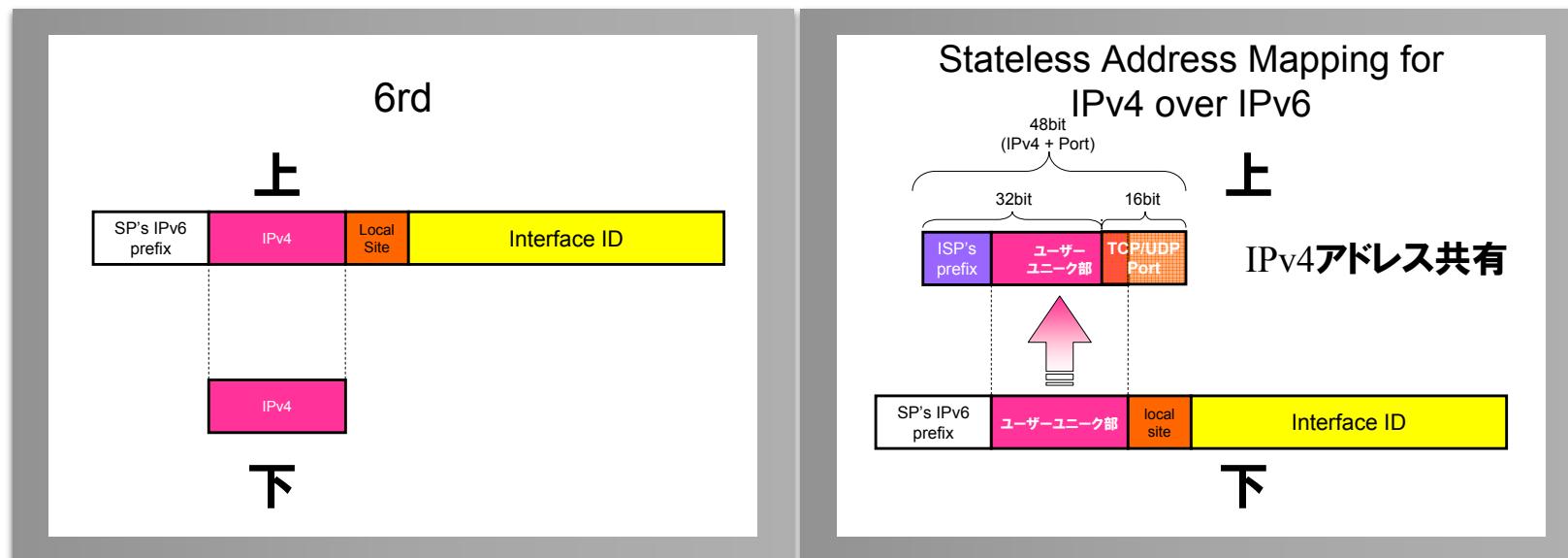
OverlayがUnderlayの特性をうまく考慮できた例

IPv4/IPv6 Stateless Address Mapping

SAM: Stateless Address Mapping

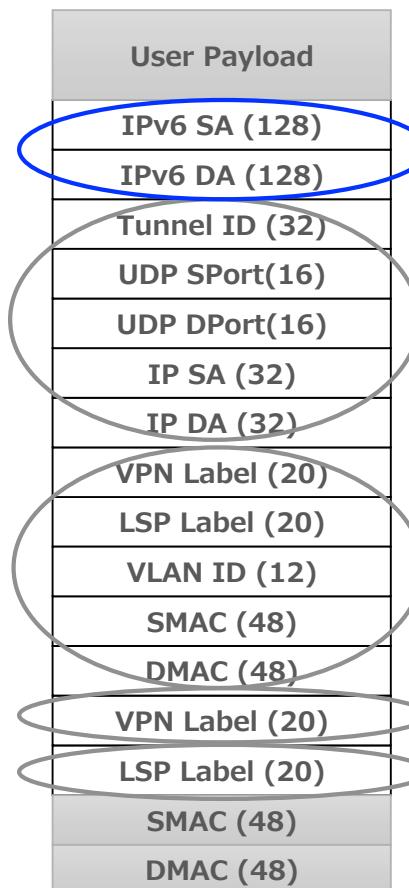
~IPv6時代のIPv4を考える~

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Network Stack of the Current Data Plane

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



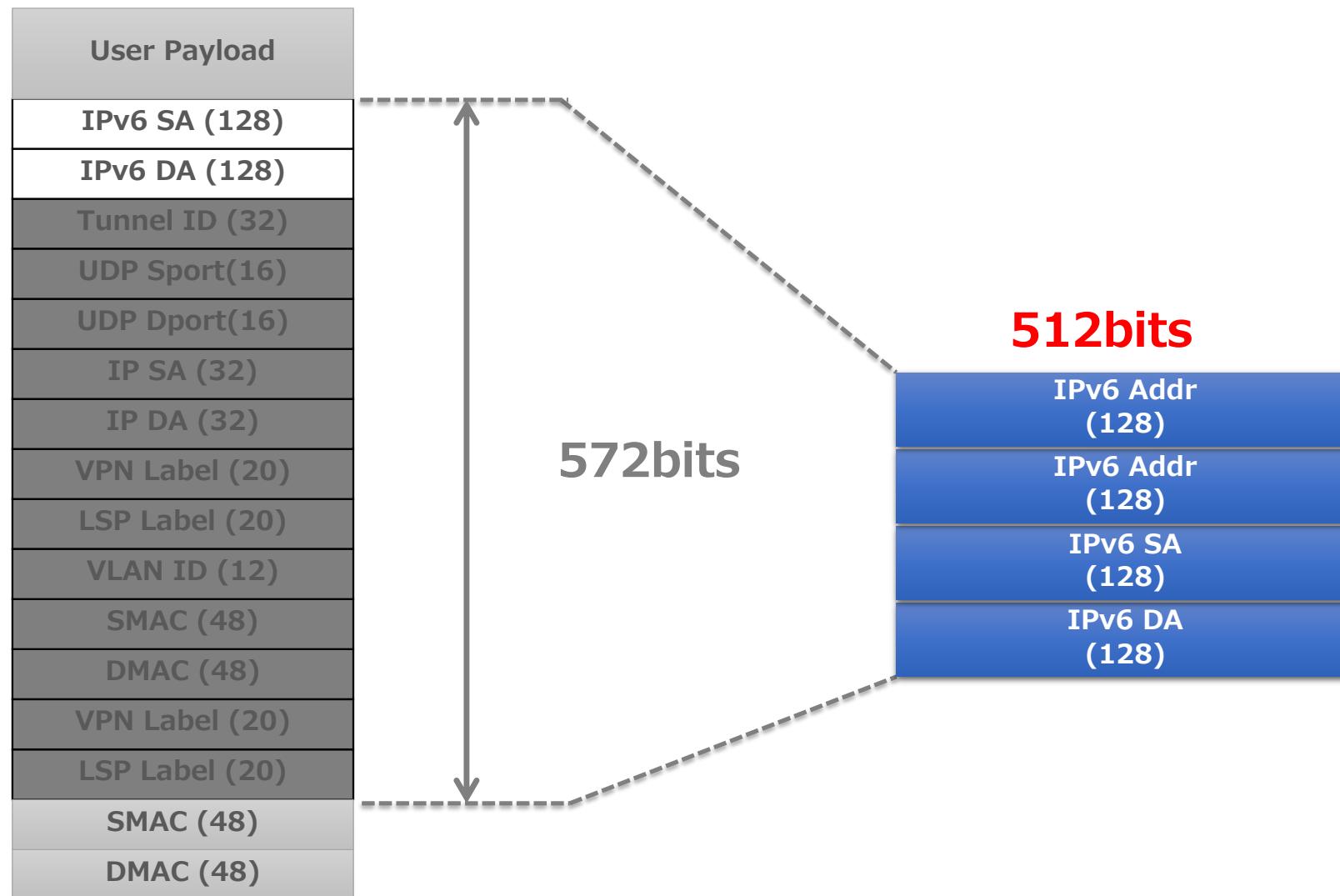
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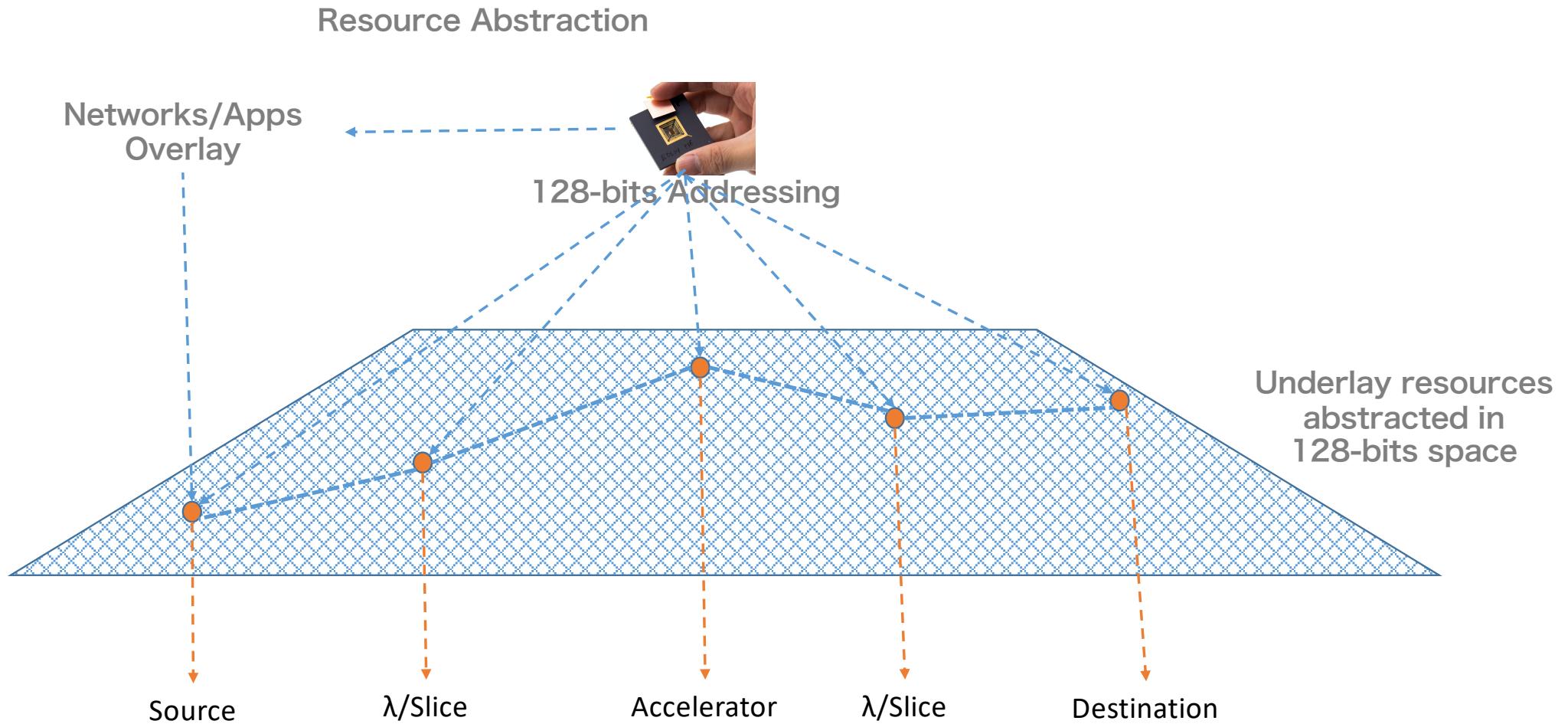
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Multiple Virtual Networks Co-exist
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How to Integrate Complicated Stack? Simplify!



128-bits Resource Abstraction for Underlay/Overlay Integration



IPv6とソースルーティングでデータプレーンをフラットに



ご清聴ありがとうございました

つづきはまたどこかの機会で...