

# Service Function Chaining

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**Dr. Walter Haeffner**

Vodafone Distinguished Engineer



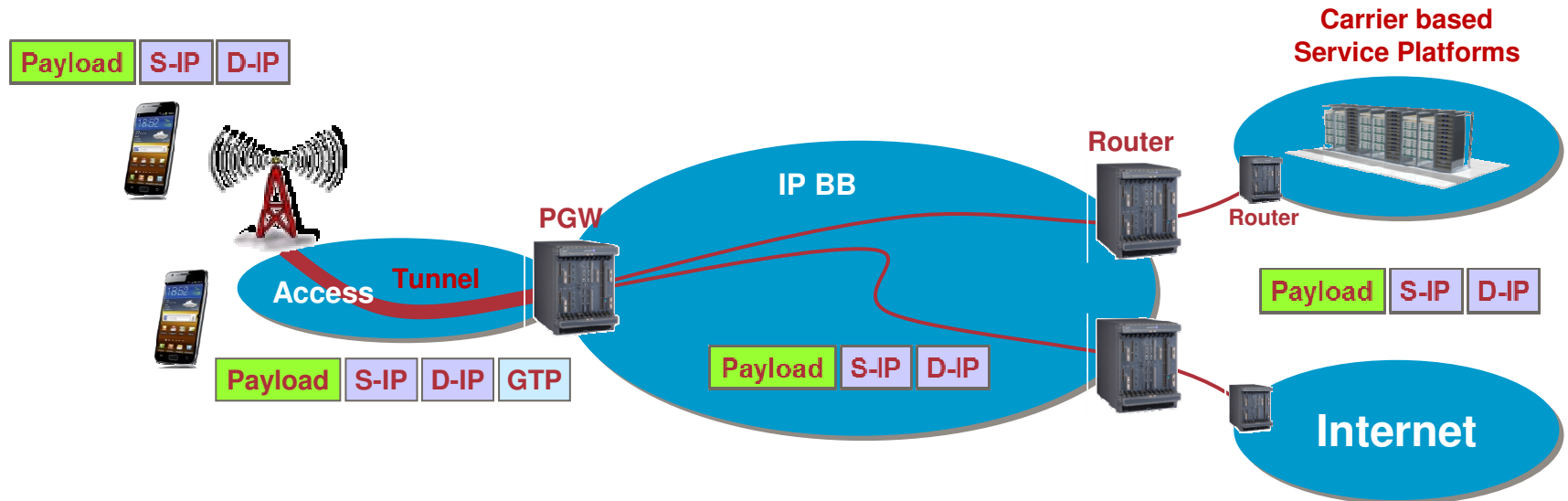
**44<sup>th</sup> Meeting of ITG 5.2.4 Expert Group**

15<sup>th</sup> November, Technical University Munich



# Service Function Chaining

## Context: Any Network - Example Mobile Networks

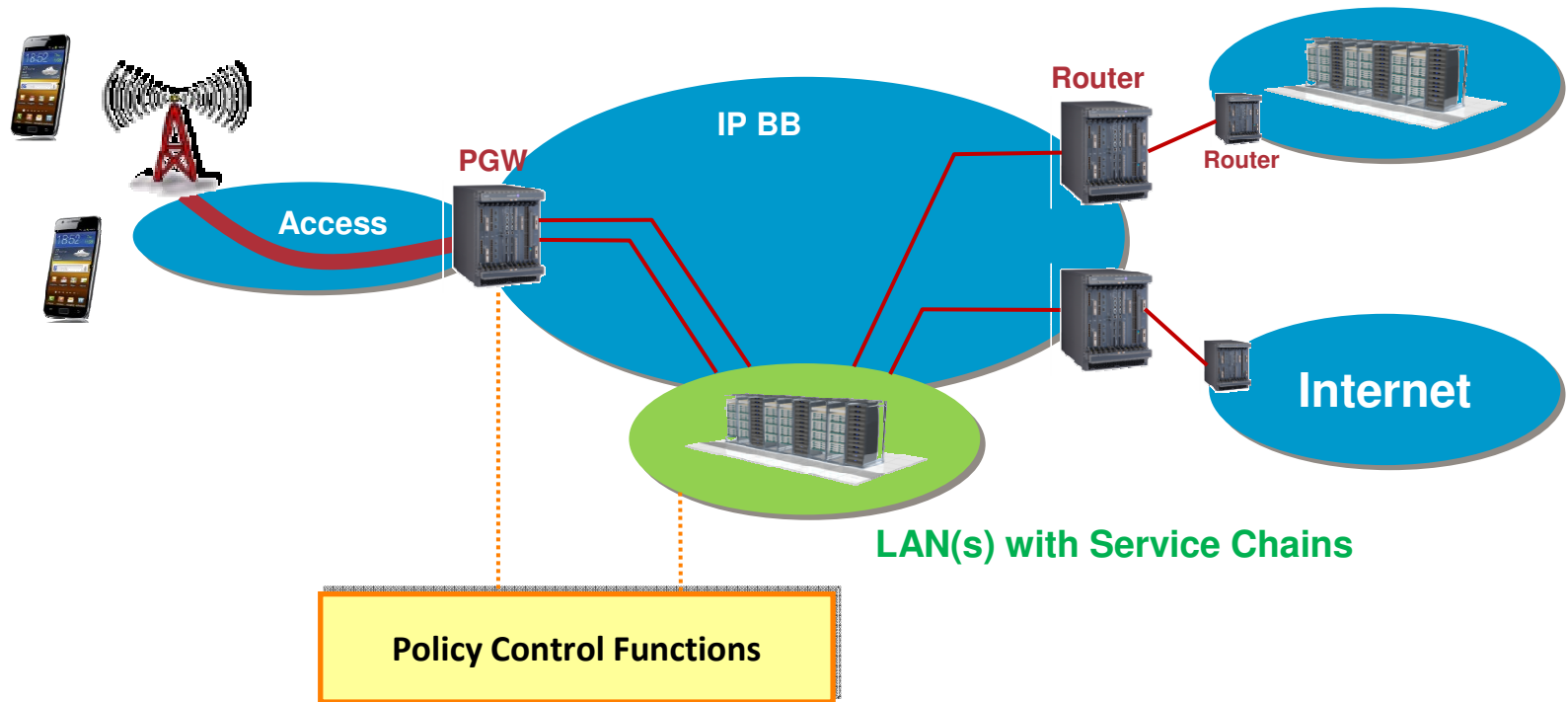


In any network, in fixed networks, in data center networks but specially in mobile networks the management of network resources and the differentiation of services according user profile and network weather conditions is essential to the business and operational model of the operator.



# Service Function Chaining

## Force IP Packets to pass a Service Chain



- ❑ Service Function Chains take care of managing network traffic and network policing.



# Service Function Chaining

## Typical Tasks of Service Function Chains

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**Service functions typically observe, alter or even terminate and re-establish session flows between mobile user equipment and application platforms (Web, Video, VoIP).**

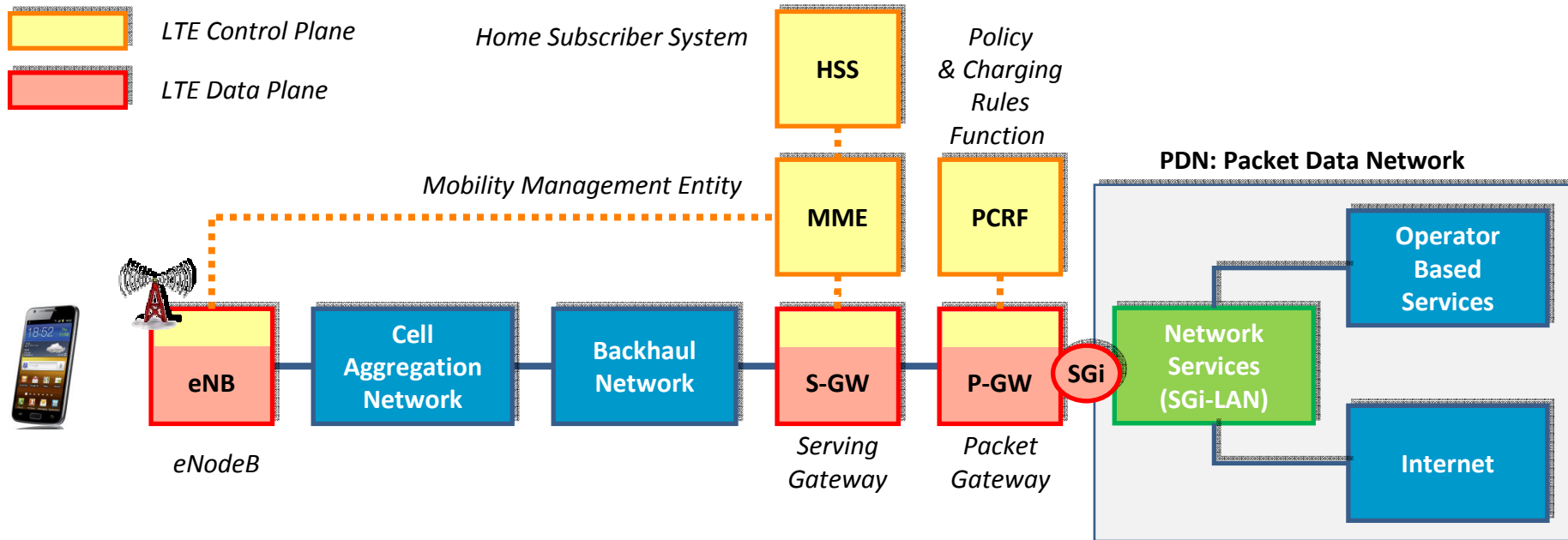
**Important use cases generally include:**

- ❑ Functions to protect the network and the privacy of its users (IDS, FW, ACL, Encryption, Decryption, etc.),
- ❑ Functions that ensure the contracted QoE using e.g. performance enhancements proxies like video optimizers, TCP optimizers or functions guaranteeing fair service delivery based on policy driven QoS mechanisms,
- ❑ Functions like HTTP header enrichment that may be used to identify and charge subscribers real time,
- ❑ Functions like CG-NAT/PAT, which are required just for technical reasons,
- ❑ Functions like parental control or malware detection that may be a cost option of a service offer.



# Service Function Chaining

## Major Building Blocks of a LTE Service Platform

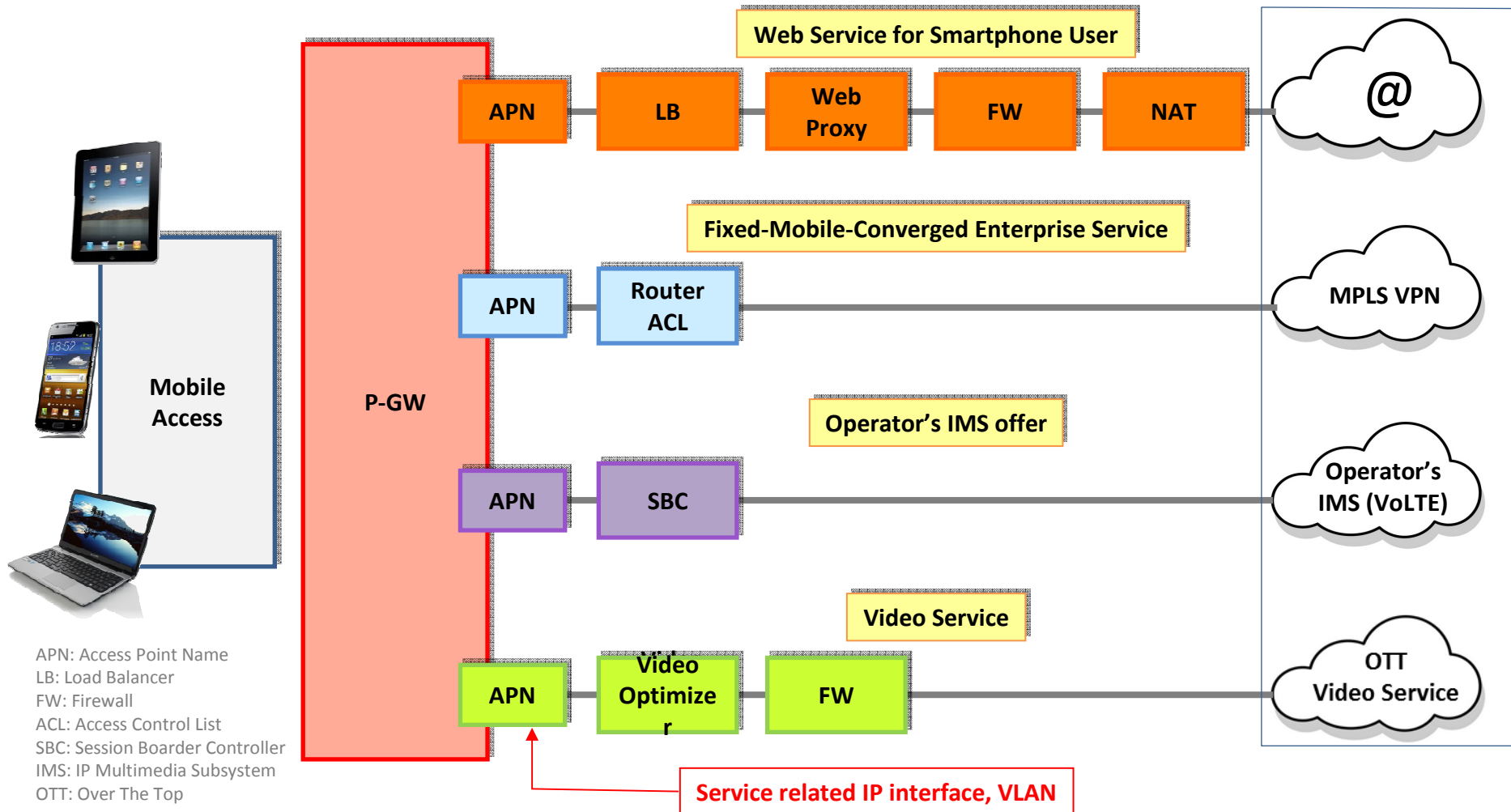


- ❑ SG-interface is the 3GPP reference point between P-GW and Packet Data Network.
- ❑ SGi protocol structure, data content, scope not specified (equal for Gi in 3G networks).
- ❑ Operator based services like, VoLTE, Mail, Web, RCS-e/Joyn, SMS, MMS not in scope.
- ❑ Scope here: network services like firewalls, DPI, performance enhancement proxies for videos, TCP optimization & header enrichment, NAT, load balancers, caching, etc.



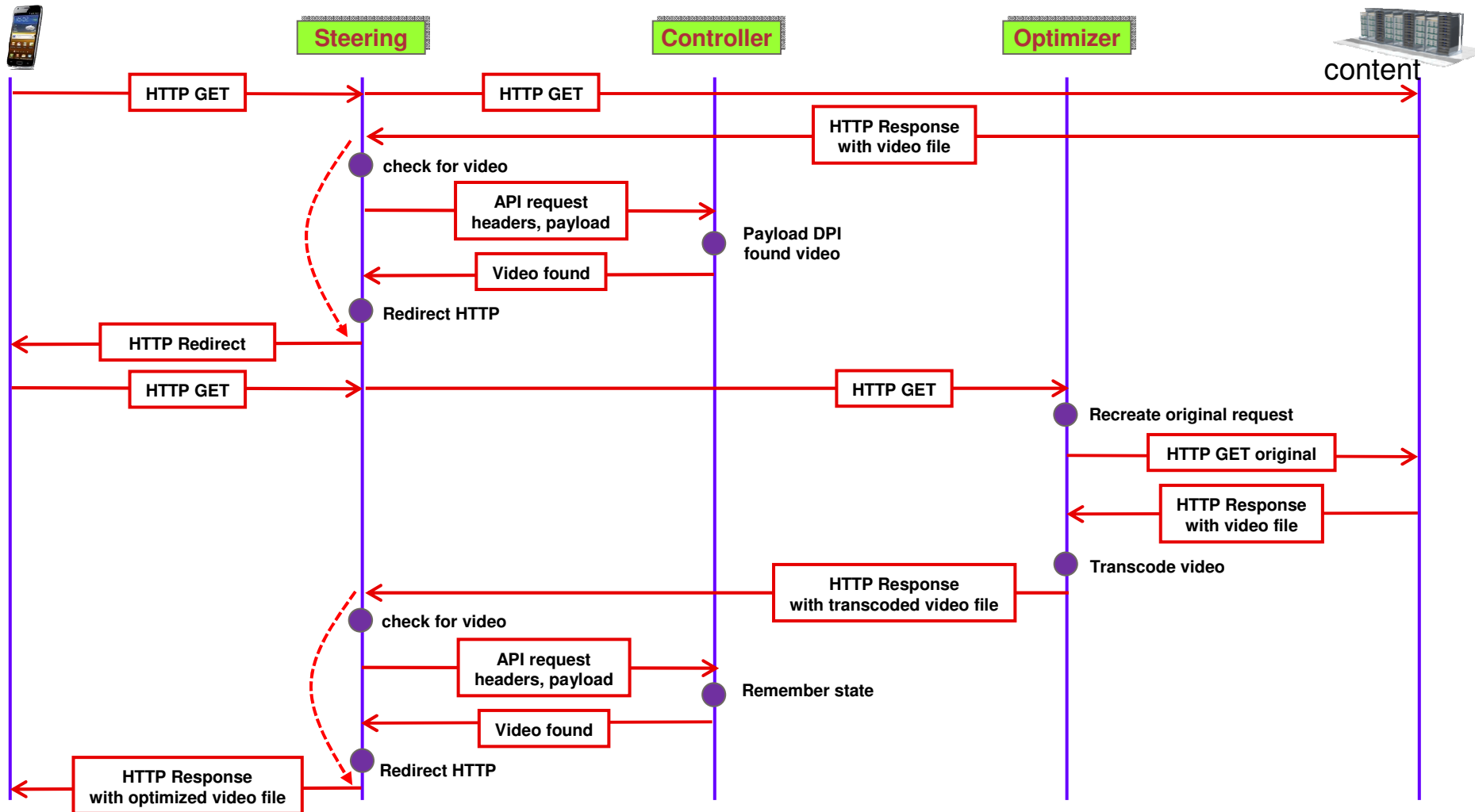
# Service Function Chaining

## Current Common Approach – Logical View on Typical Use Cases



# Service Function Chaining

## Example: Video Optimizers

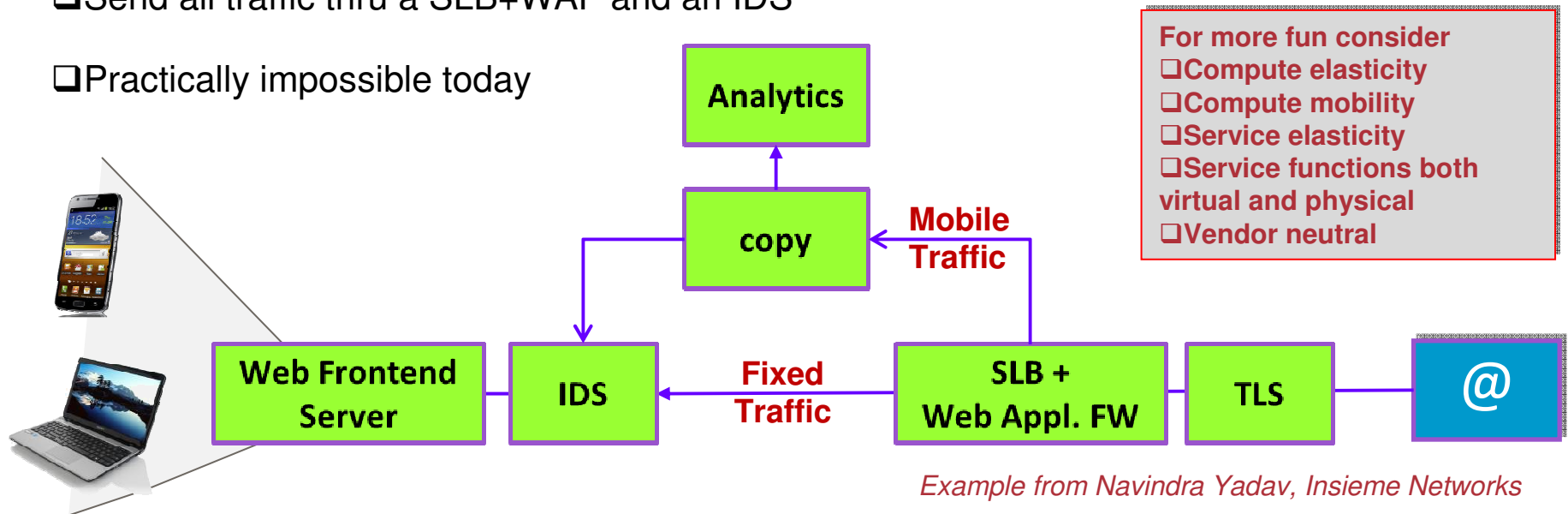


# Service Function Chaining

## Example: Extract Web Statistics for Mobile from Internet Stream

For all traffic between Internet and Web Front End Servers, apply

- De/Encryption with highest throughput/low latency and least € cost
- Copy all 'Mobile' only transactions to a Big Data Analytics system
- Perform copy at most optimal path (€ cost and least latency impact)
- Send all traffic thru a SLB+WAF and an IDS
- Practically impossible today



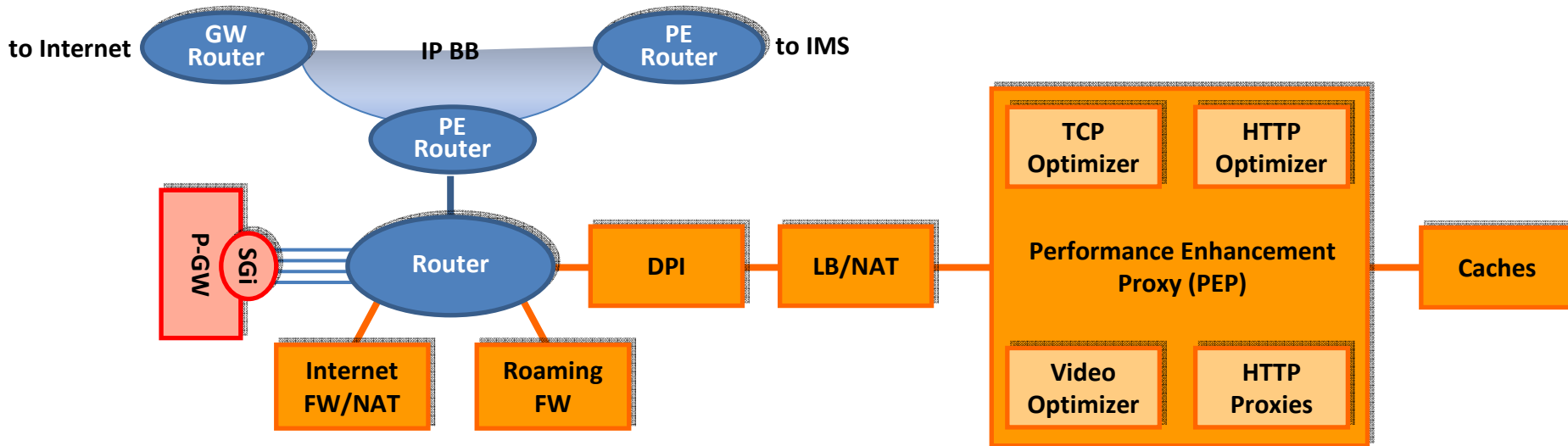
Example from Navindra Yadav, Insieme Networks





# Service Function Chaining

## Current Common Approach – Physical View reflects Weaknesses

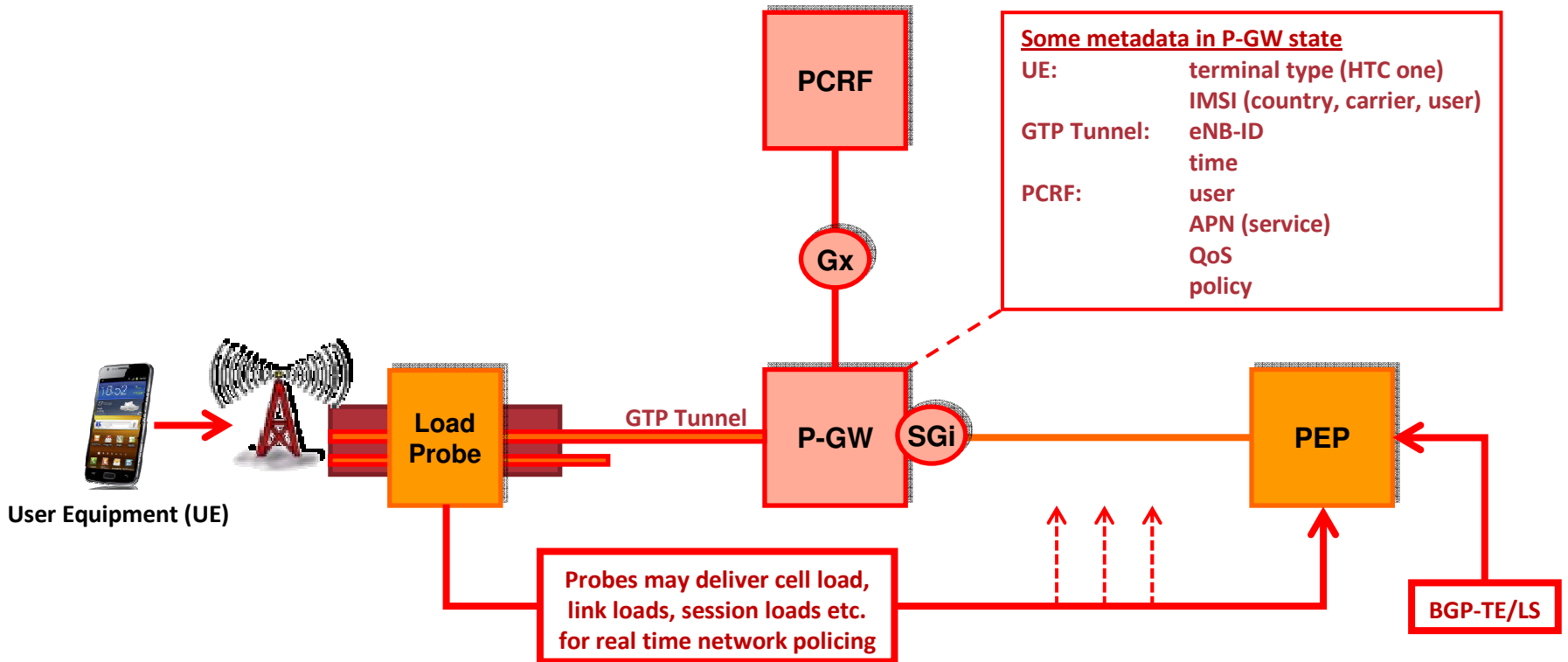


- ❑ With deployment of additional value-added services increasing number of functions required in SGi-LAN. Some functions in dedicated devices, sometimes multiple functions in one box.
- ❑ Due to fast service introduction cycles service chains emerge, growth & change evolutionary.
- ❑ Results in **steadily increasing, handcrafted complexity and decreased visibility of functional dependencies** between service chains and underlying LAN topology. Means **expensive OAM**.



# Service Function Chaining

Network providers also use Metadata to differentiate



- ❑ We may connect all relevant service functions with all relevant sources for metadata or
- ❑ We may piggyback metadata information with the IP packets traversing a service chain.
- ❑ Piggybacking metadata seems to be more straightforward than picking them out with DPI.



# Service Function Chaining

## Problem Statement: Current Approach – It is a Dead End Street

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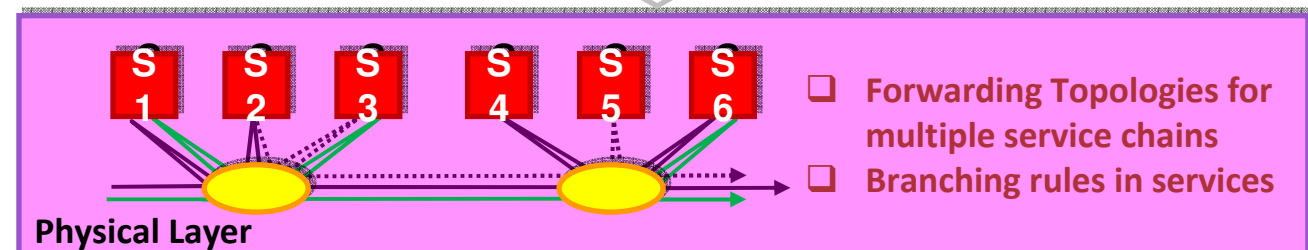
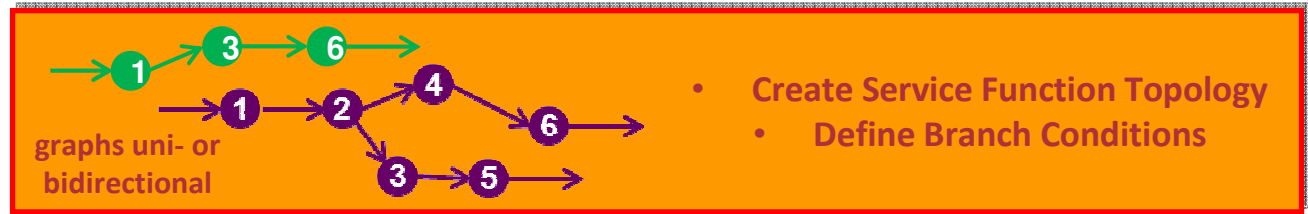
**Often static IP links, policy routing, VRFs etc. used to enforce required service sequence:**

- ❑ This results in **very static service chain instances**, hard-wired on network layer. Means
- ❑ **No flexibility w.r.t.** reusing, adding, removing **service nodes, reprogramming service chains.**
- ❑ **High complexity to manage/maintain** evolutionary grown “handcrafted” connectivity models
- ❑ Basic **implementation** paradigm **based on APNs** (that is service types) only and
- ❑ Granularity down to user/service level by **individual injections of context-related metadata.**
- ❑ **No natural information exchange on network status between services and network.** This
- ❑ Would be fine to **manage finite network resources based on subscriber profiles** more easily.
- ❑ Practically **impossible to implement automated service provisioning** and delivery platform.
- ❑ **Scaling up flows** or service chains with service or subscriber related metadata **may not work.**



# Service Function Chaining

## Vision: Service Chain Abstraction and Network Compilation (SDN)



1 Abstract service

→ Abstract link

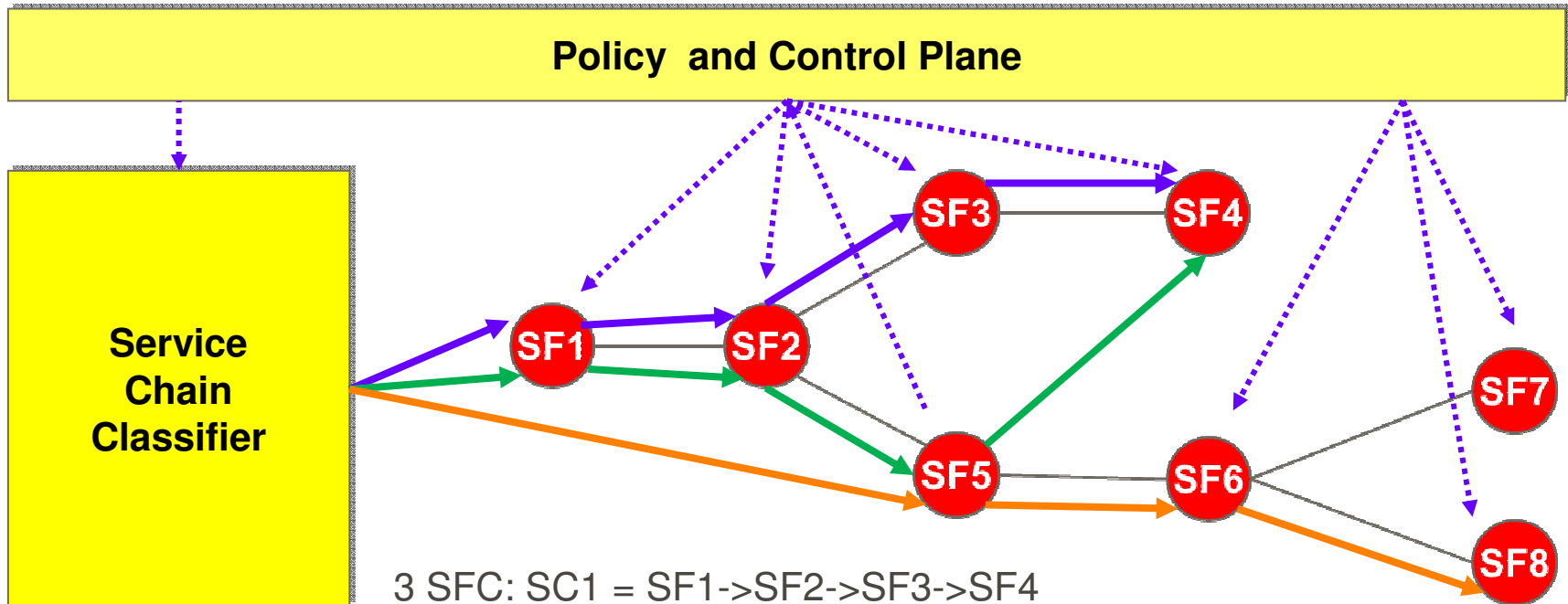
S  
1 (virtual) service engine

(virtual) forwarding device



# Service Function Chaining

## Forwarding in the abstract Service Function Topology



3 SFC: SC1 = SF1->SF2->SF3->SF4

SC2 = SF1->SF2->SF5->SF4

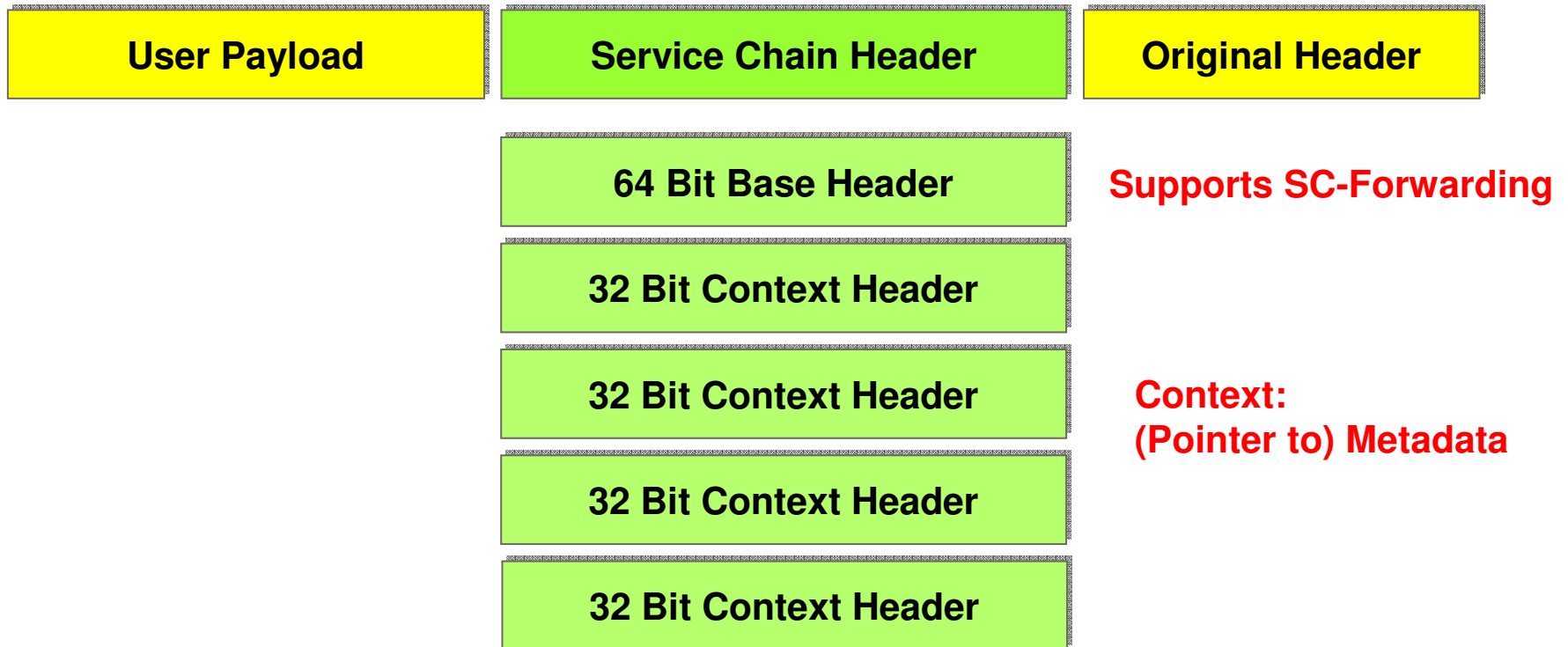
SC3 = SF5->SF6->SF8

- ❑ Edges represent service overlay topology, Vertices are logical service functions
- ❑ Service classifier “starts” the path
- ❑ Optional reclassification by service functions (i.e., with co-resident classifier)



# Service Function Chaining

## Abstract “Routing” in the Service Function Topology



- Header processing should work in silicon
- Alternative: TLVs for Context
- Details are subject of current work (see IETF87 and IETF88 SFC Web resources)





**thank you for listening**  
**walter.haeffner@vodafone.com**

