

# 3GPP 5G CoreNetwork Status

TSG CT Chairman  
Georg Mayer (Huawei)

A GLOBAL INITIATIVE

# Outline



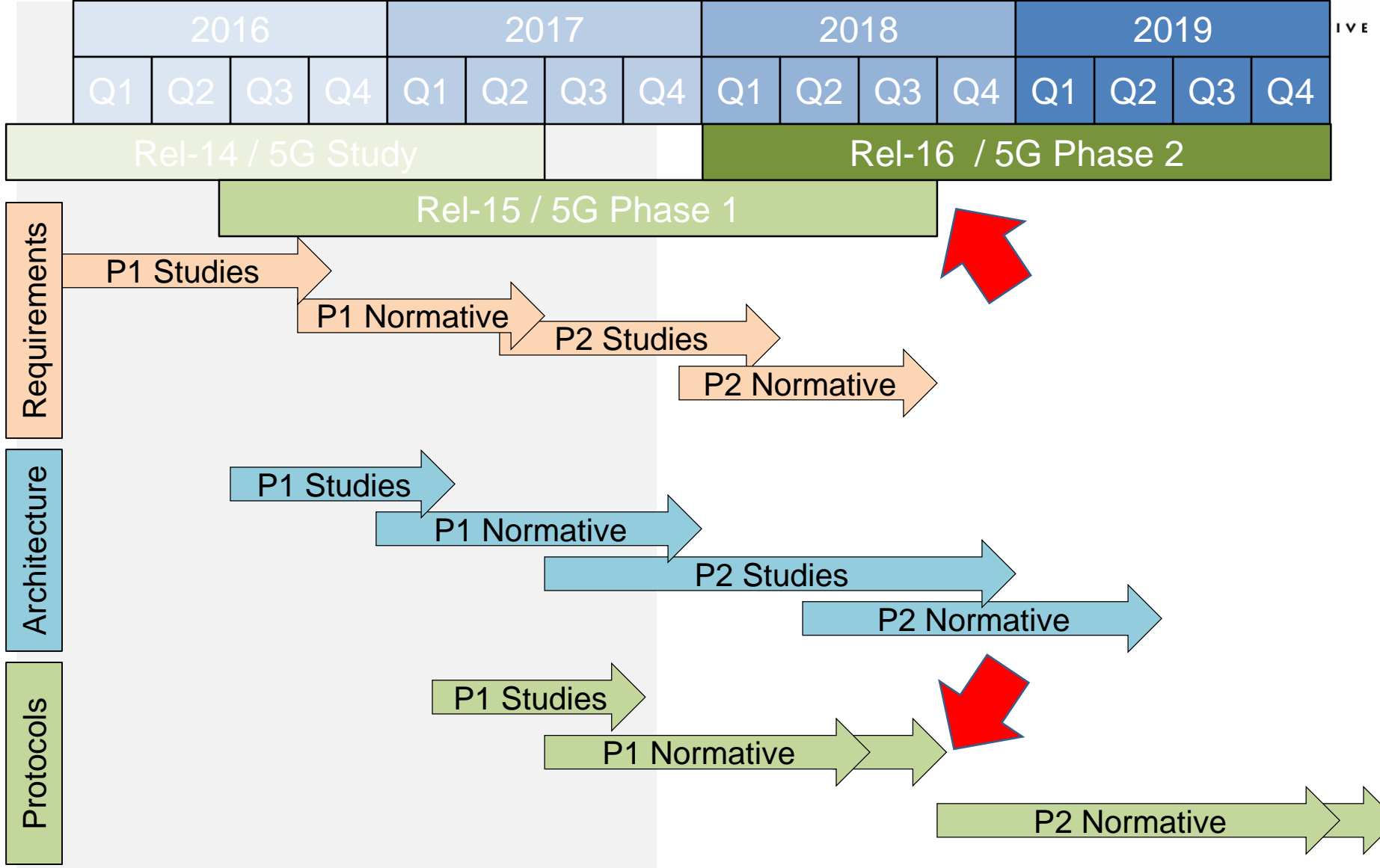
- › **5G in 3GPP (CT)**
  - › Timeline
  - › Landscape
  - › Transformation of the CoreNetwork
- › **Service Based Architecture**
  - › Framework, Roles, Services
  - › Protocols, API Operations
- › **Status of Other 5G Issues**
  - › Northbound APIs
  - › Network Slicing
  - › Misscion Critical Services

# Outline



- › **5G in 3GPP (CT)**
  - › Timeline
  - › Landscape
  - › Transformation of the CoreNetwork
- › **Service Based Architecture**
  - › Framework, Roles, Services
  - › Protocols, API Operations
- › **Status of Other 5G Issues**
  - › Northbound APIs
  - › Network Slicing
  - › Mission Critical Services

# 5G Timeline

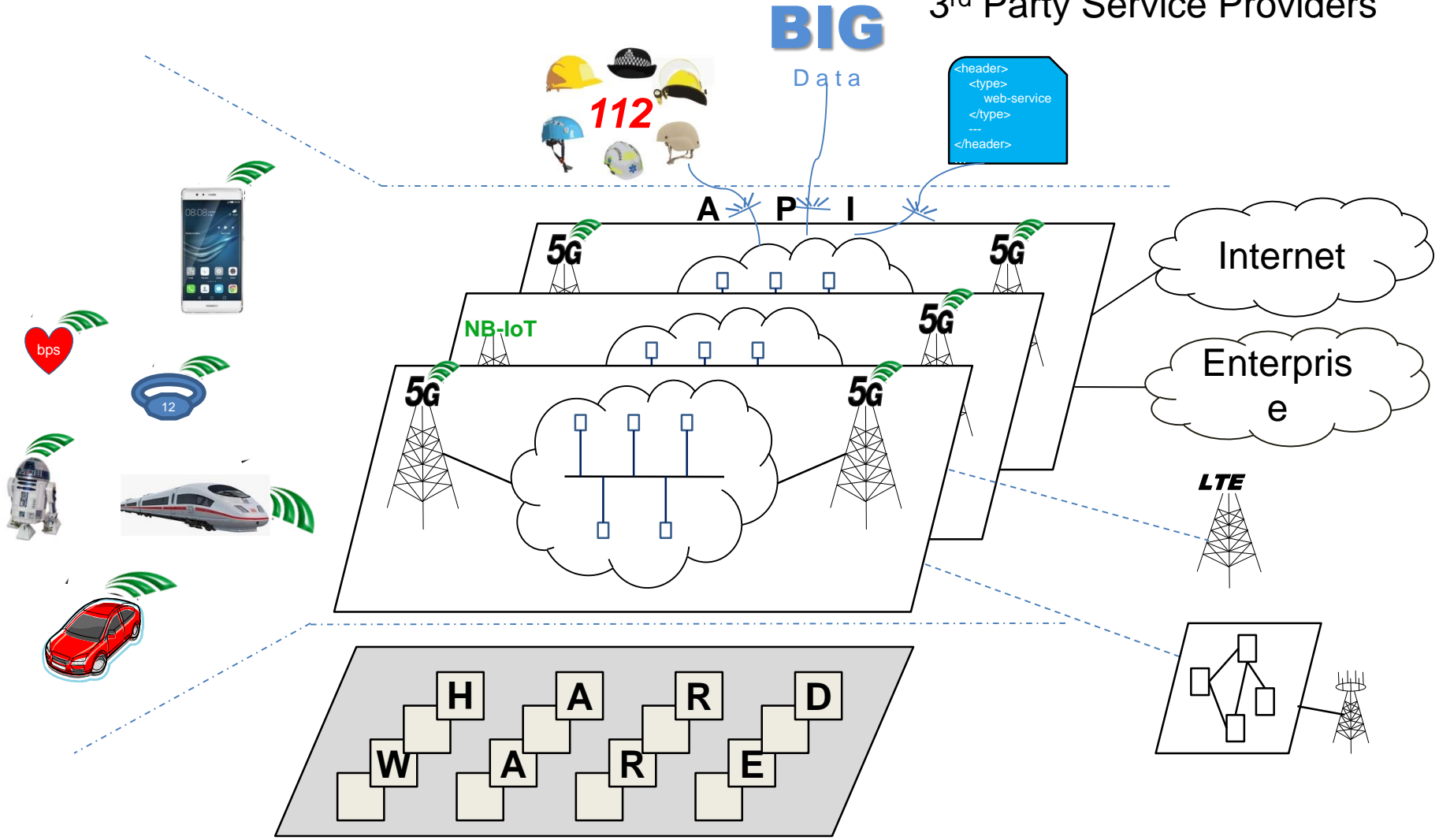


# 5G Landscape

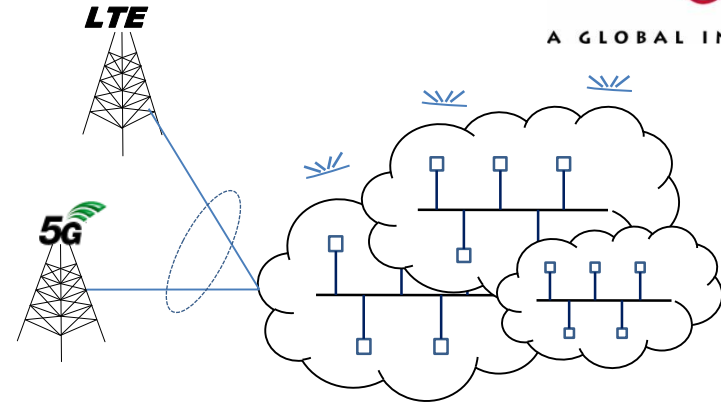
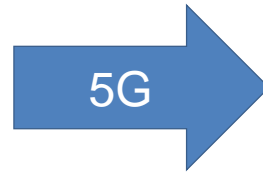
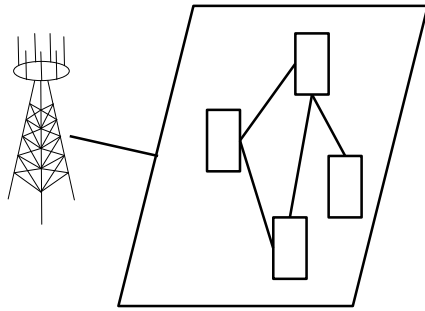


A GLOBAL INITIATIVE

3rd Party Service Providers



# Transformation of the Core Network



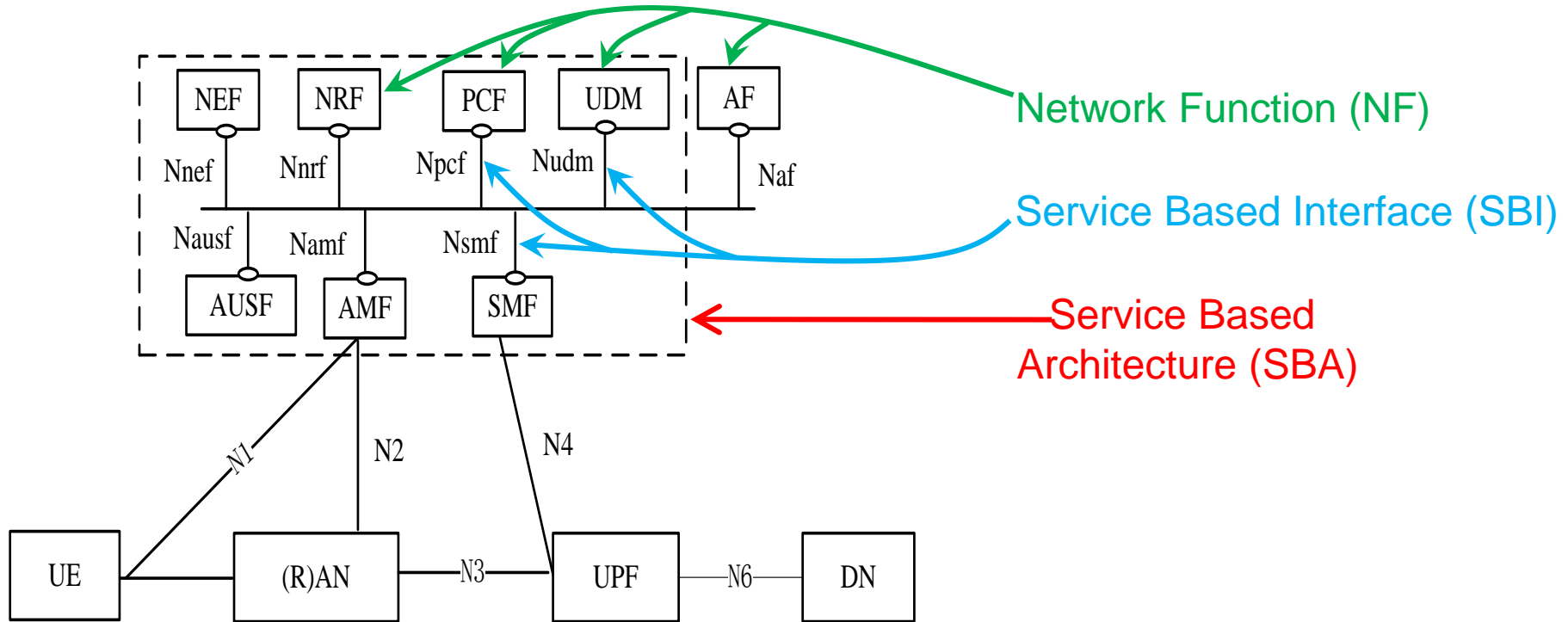
- › Functional entities
- › Single Core
- › Dedicated protocols
- › Service Based (SBA/SBI/NAPS)
- › Virtualization & Slicing
- › Softwarization / Cloudification
- › Application Programming Interfaces
- › Harmonized protocols (HTTP ...)
- › Exposure to 3<sup>rd</sup> Parties
- › Backward & Forward Compatibility

# Outline



- › 5G in 3GPP (CT)
  - › Timeline
  - › Landscape
  - › Transformation of the CoreNetwork
- › **Service Based Architecture**
  - › Framework, Roles, Services
  - › Protocols, API Operations
- › **Status of Other 5G Issues**
  - › Northbound APIs
  - › Network Slicing
  - › Misscion Critical Services

# Service Based Architecture

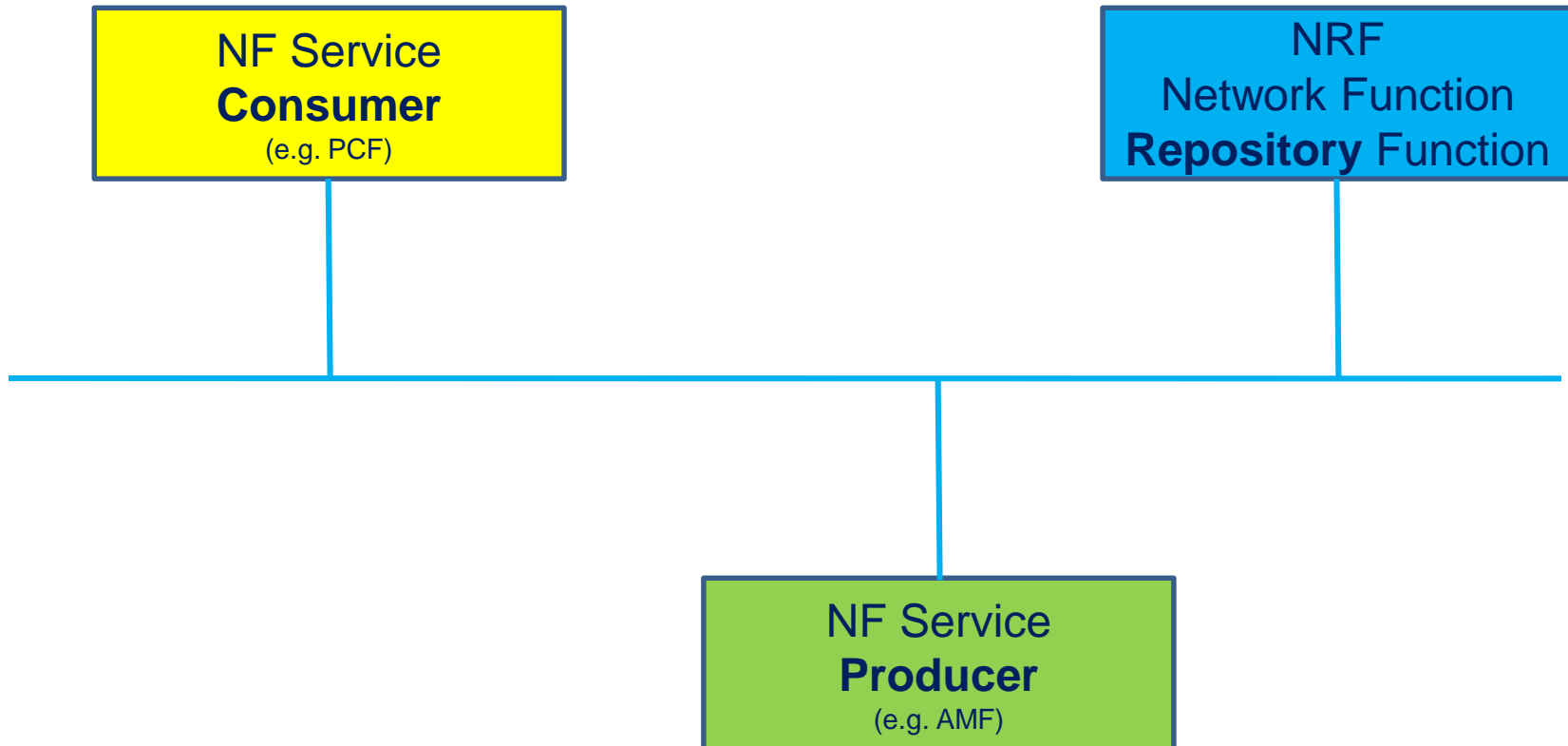


NEF Network Exposure Function  
 NRF Network Repository Function  
 PCF Policy Control Function  
 UDM Unified Data Management  
 AF Application Function  
 AUSF Authentication Server Function

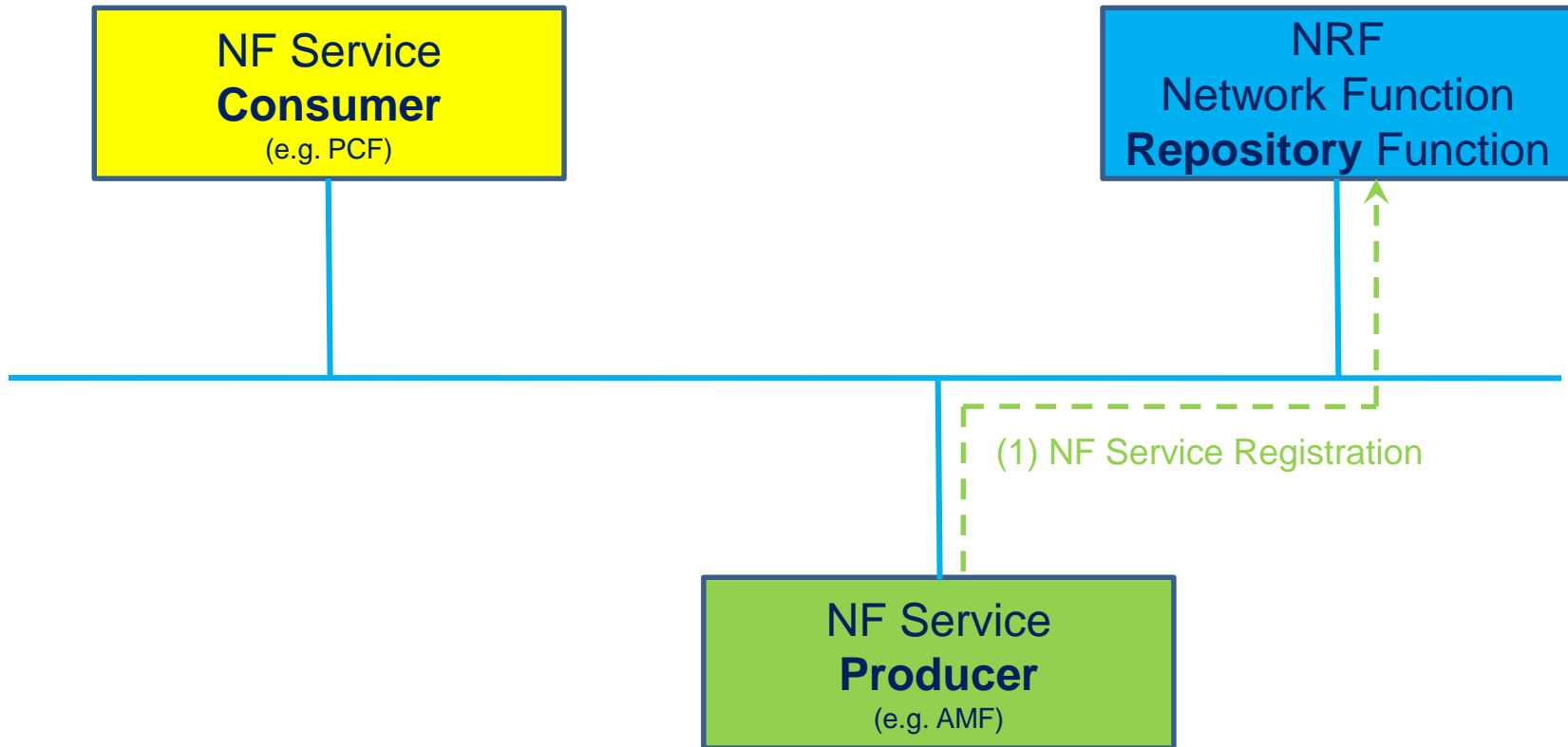
AMF Access & Mobility Management Function  
 SMF Session Management Function  
 UE User Equipment  
 (R)AN (Radio) Access Network  
 UPF User Plane Function  
 DN Data Network



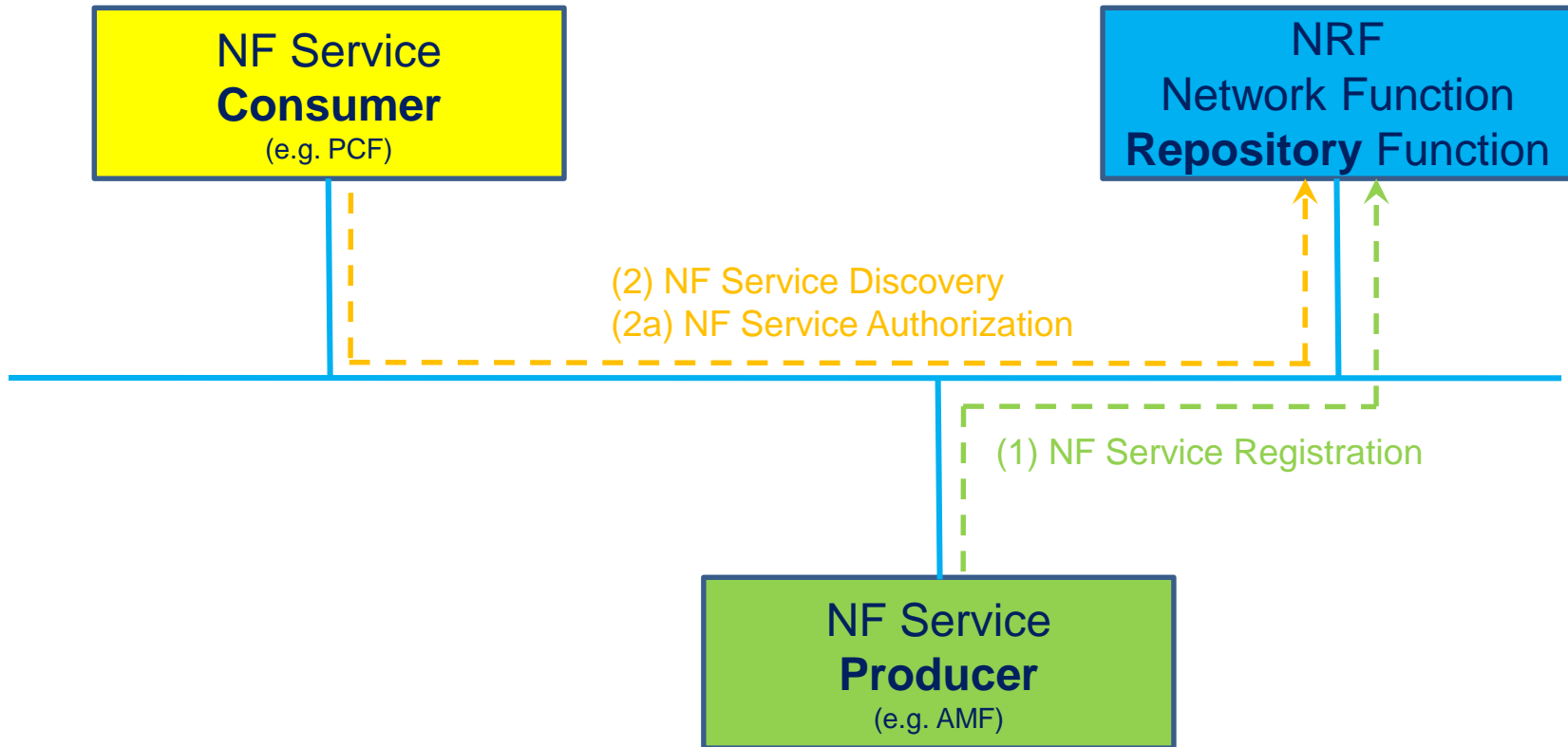
# SBA Service Framework



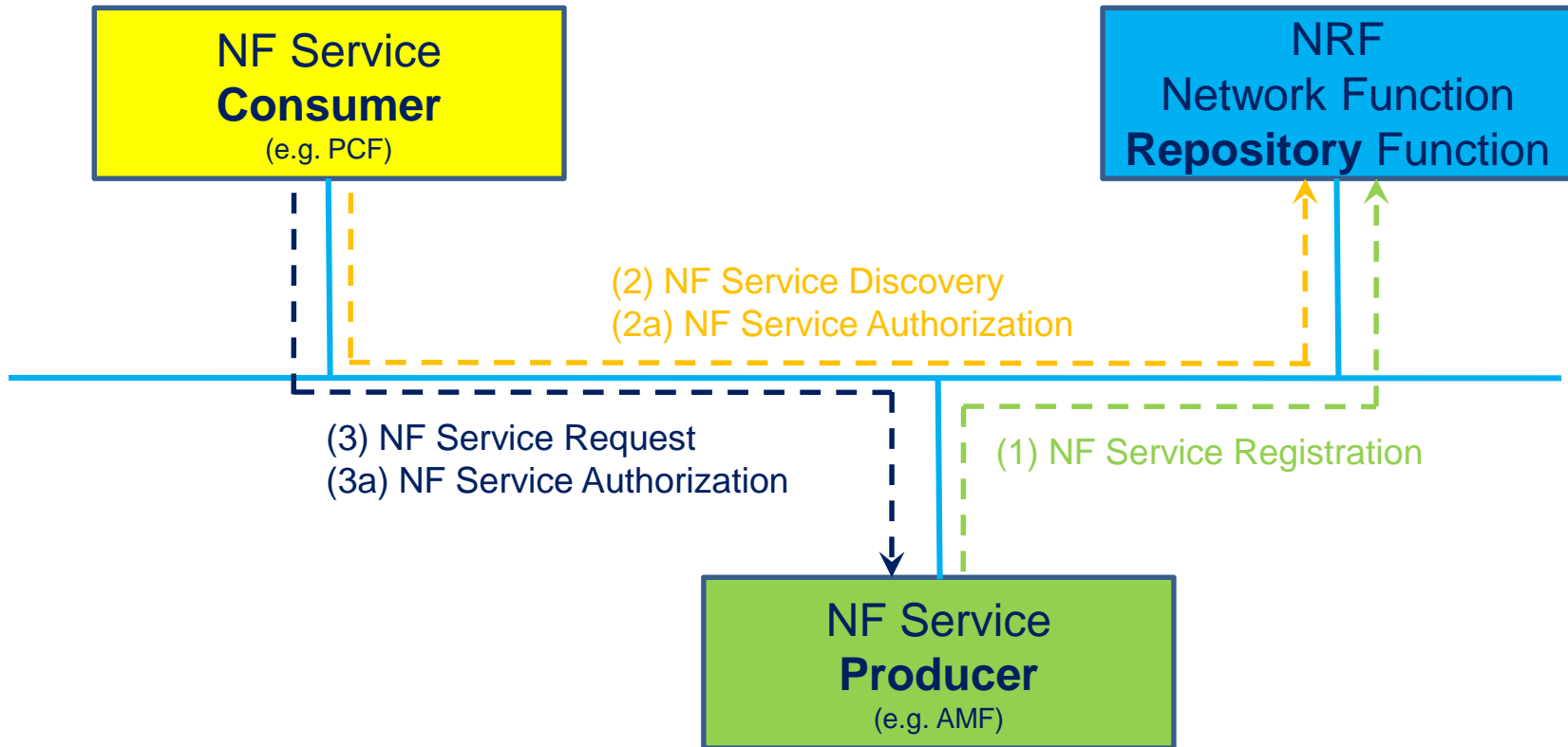
# SBA Service Framework



# SBA Service Framework



# SBA Service Framework

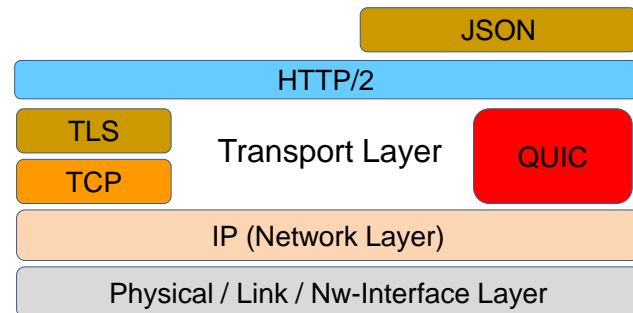


# SBA Example NF Services

- › AMF (Access Management Function)
  - › Communication – enables other NFs to communicate with the UE / the access network
  - › Mobility Event Exposure – other NFs can subscribe to notifications about the UE's mobility events
- › SMF (Session Management Function)
  - › PDUSessions – Protocol Data Units exchange with the UE, including policy and charging.
- › UDM (Unified Data Management)
  - › Context – provides information about UEs serving NF & status
  - › UEAuthentication – provides authentication data & info

# 5G SBI Protocols

- › HTTP/2 adopted as the application layer protocol for the service based interfaces
- › TCP adopted as the transport layer protocol;
- › Use of QUIC, binary encoding (e.g. CBOR) and other aspects are left FFS for possible support in future releases
- › JSON adopted as the serialization protocol;
- › REST-style service design whenever possible and custom (RPC-based) methods otherwise.



# REST

- › Representational State Transfer
- › distribute web services *paradigm*  
(not a architecture, not a protocol)
- › Principles
  - › Client-server based
  - › Stateless
  - › Addressable Resources (unique URI)
  - › everything is a resource (service trigger, dynamic data, ...)
- › Example:
  - › temperature in a room (continuously provided by a sensor) is a unique uri,  
<https://example.home/living-room/1.0/temp?format=celcius>
  - › 3GPP AMF Service  
[https://amf3.slice5.operator.3gpp/ Namf\\_Communication /1.0/?query](https://amf3.slice5.operator.3gpp/ Namf_Communication /1.0/?query)

# HTTP/2

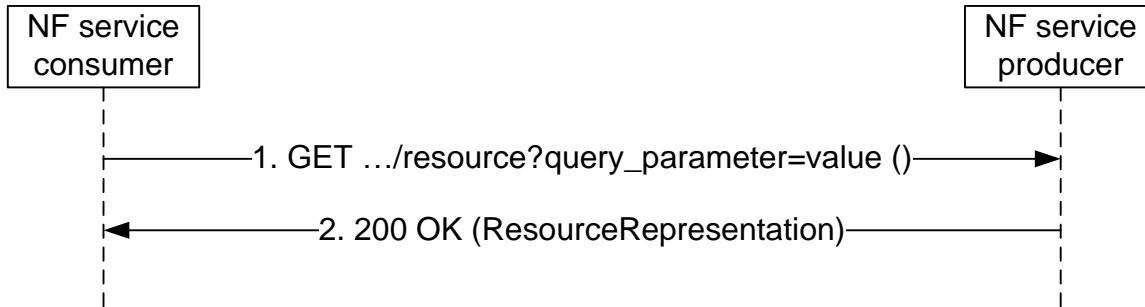
- › HTTP 1.1
  - › browsing the web
  - › web applications / transporting API calls and responses
  - › widely deployed, lots of experience, huge developer community
- › HTTP 2
  - › natural evolution of HTTP 1.1
  - › already widely accepted and deployed
  - › text & binary encoding
  - › header compression, stream multiplexing, flow control



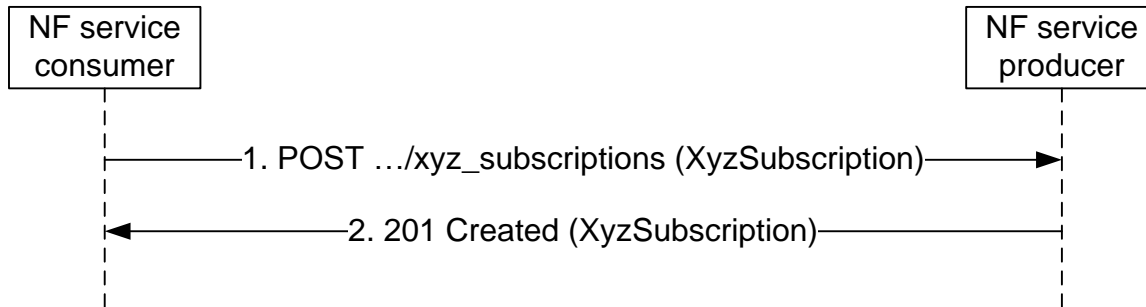
# QUIC

- › QUIC = Quick UDP Internet Connections
- › Replacement of TCP/TLS transport
- › Resolving several problems (head-of-line blocking, multiplexing)
- › Currently under development by IETF
- › Will not be finished by end of Rel-15, but most likely during Rel-16
- › Several open issues, e.g. privacy & security requirements need to weight against needs of network management

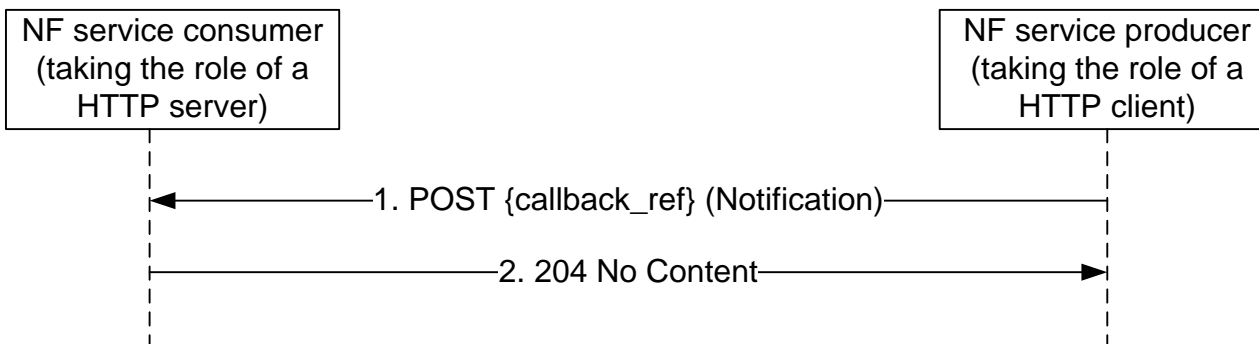
# Example API Operations



Query (Resource)  
e.g. UE's Authentication Data @UDF



Subscription  
e.g. to UE's mobility events @AMF



Notification  
e.g. about UE mobility events

# Outline



- › 5G in 3GPP (CT)
  - › Timeline
  - › Landscape
  - › Transformation of the CoreNetwork
- › Service Based Architecture
  - › Framework, Roles, Services
  - › Protocols, API Operations
- › **Status of Other 5G Issues**
  - › Northbound APIs
  - › Network Slicing
  - › **Misscion Critical Services**

# Northbound APIs (NAPS)

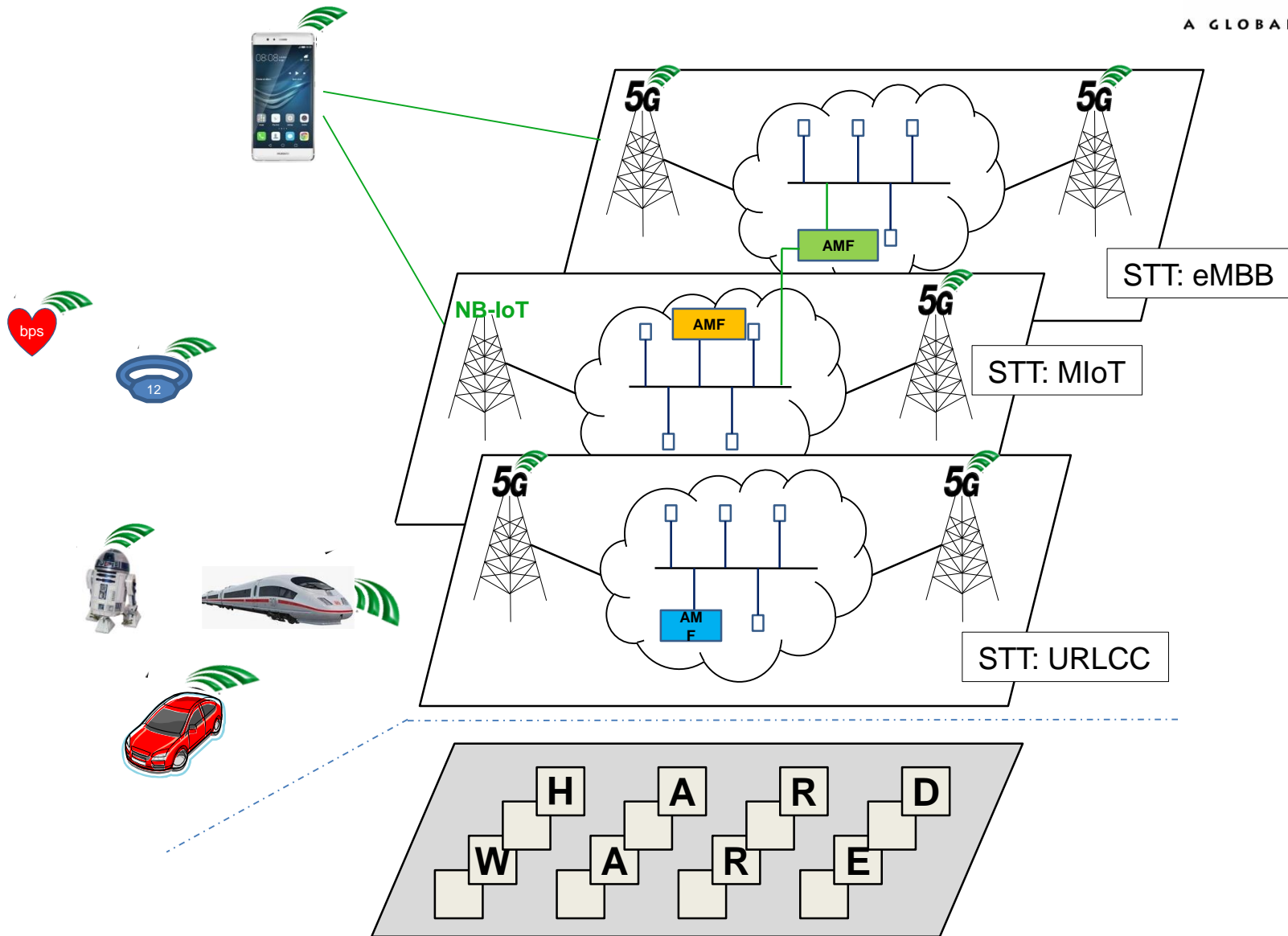


- › NEF – Network Exposure Function
- › Core Network capabilities exposed to 3<sup>rd</sup> parties
- › Service specific
  - › e.g. oneM2M specific (NAPS)
- › Framework study currently ongoing (SA6)
- › Also here: HTTP & REST

# 3GPP Network Slicing - Simplified



A GLOBAL INITIATIVE



# Mission Critical Services



- › Mission Critical work is essential part of 3GPP since Rel-13
- › Rel-13 MCPTT (MC Push to Talk) was completed
- › Rel-14 included 3 MC Services:
  - › Improvements to MCPTT
  - › Mission Critical Video
  - › Mission Critical Data
- › Only a stand-alone subset of these services was completed in R14.
- › Rel-15 therefore has three more MC Service related Work Items
- › Rel-15 will also see other MC related work, e.g. for railroads

# Thank You

## Georg Mayer

3GPP TSG CT chairman

+43 (699) 1900 5758

georg.mayer.huawei@gmx.com



The screenshot shows the 3GPP website with the following content:

- Header:** 3GPP A GLOBAL INITIATIVE, THE Mobile Broadband Standard, GPRS, and a photo of three people.
- Navigation:** About 3GPP, Specification Groups, Specifications, 3GPP Calendar, Technologies, News & Events.
- Specification Groups:** A section with a link to "Specification Groups".
- TSG Structure:** A section titled "Project Co-ordination Group (PCG)" containing four columns of TSGs:
  - TSG GERAN:** GSM EDGE, Radio Access Network, GERAN WG1 (Radio Aspects), GERAN WG2 (Protocol Aspects), GERAN WG3 (Typical Testing).
  - TSG RAN:** Radio Access Network, RAN WG1 (Radio Layer 1 spec), RAN WG2 (Radio Layer 2 spec), RAN WG3 (Sub spec. for spec. to meet UTRAN RAN requirements), RAN WG4 (Radio Performance, Protocol aspects), RAN WG5 (Mobile Terminal Conformance Testing).
  - TSG SA:** Service & Systems Aspects, SA WG1 (Services), SA WG2 (Architecture), SA WG3 (Security), SA WG4 (Core), SA WG5 (System Management).
  - TSG CT:** Core Network & Terminal, CT WG1 (M3GPP Core), CT WG2 (Manufacturing with external interfaces), CT WG4 (MANAGED Core), CT WG5 (Smart Card Aspects, Security).
- Right Sidebar:** RSS Subscription (3GPP News & 3GPP Forum News), Search Site (3GPP Website search), Advanced FTP Search, Statistics (10484 unique visitors, 488 connected visitors), and Tutorial.