



ONAP

OPEN NETWORK AUTOMATION PLATFORM

ONAP & 5G Use case

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What about 5G ?



An infographic with a black background. At the top left, it says "2020 Ambient connectivity NR and NGCN". In the center, the text "5G" is written in large, white, bold letters. To the left of the "5G" is a silhouette of a woman in a blue tank top and yellow pants running. To the right is a grey car with white signal waves emanating from its front. In the top right corner, there is an orange circle containing the text "Smartphones and the Internet of Things" and "Up to 10 Gbits/s".

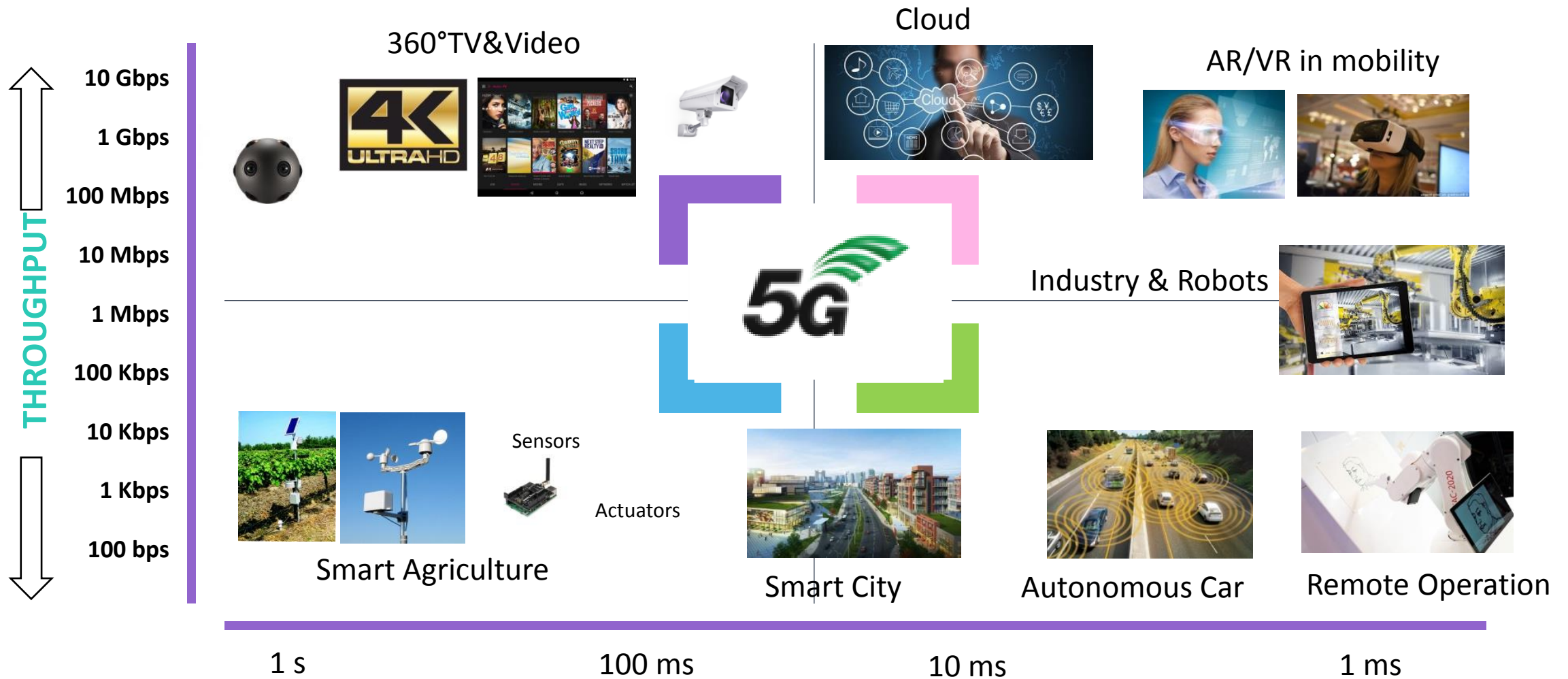
5G will answer customer expectation

| | | |
|-------------------|--|---|
| Coverage | | the customer's expectation is increasing : a high quality connection everywhere (home, transports, rural,...) |
| | | customers ask for a more affordable basic internet access (50 Mb/s) |
| Data Rate | | new usages, like virtual reality or augmented reality, requires very high bit rate > 1Gb/s |
| Connected Objects | | some objects, like driverless vehicles, drones or robots, call for low latency 1ms |
| | | low-end, low energy consumption sensors will be massive and should be handled properly |

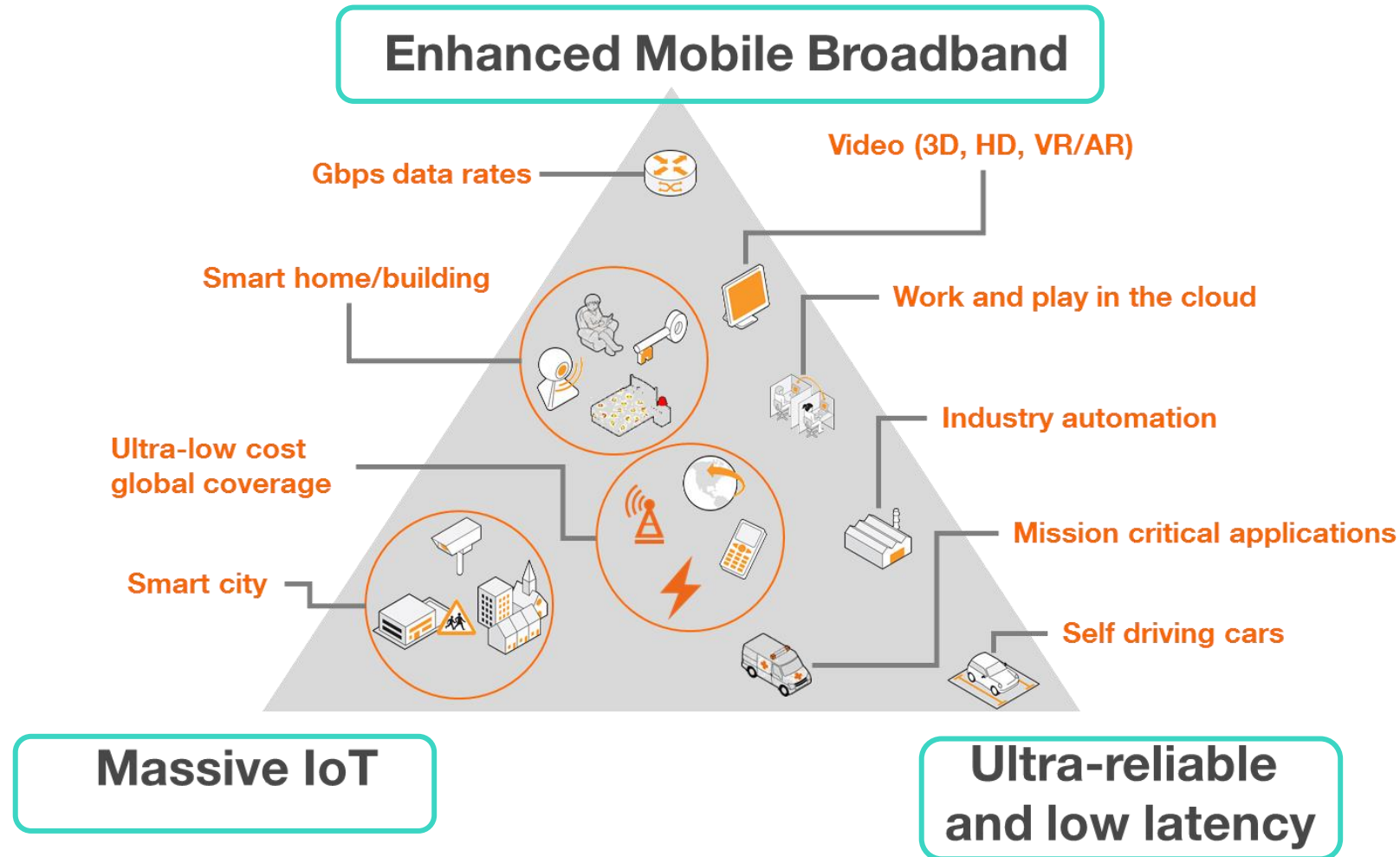


New usages will emerge

5G is truly going to revolutionize usages



Main 5G services : not just mobile broadband



#Generation5G





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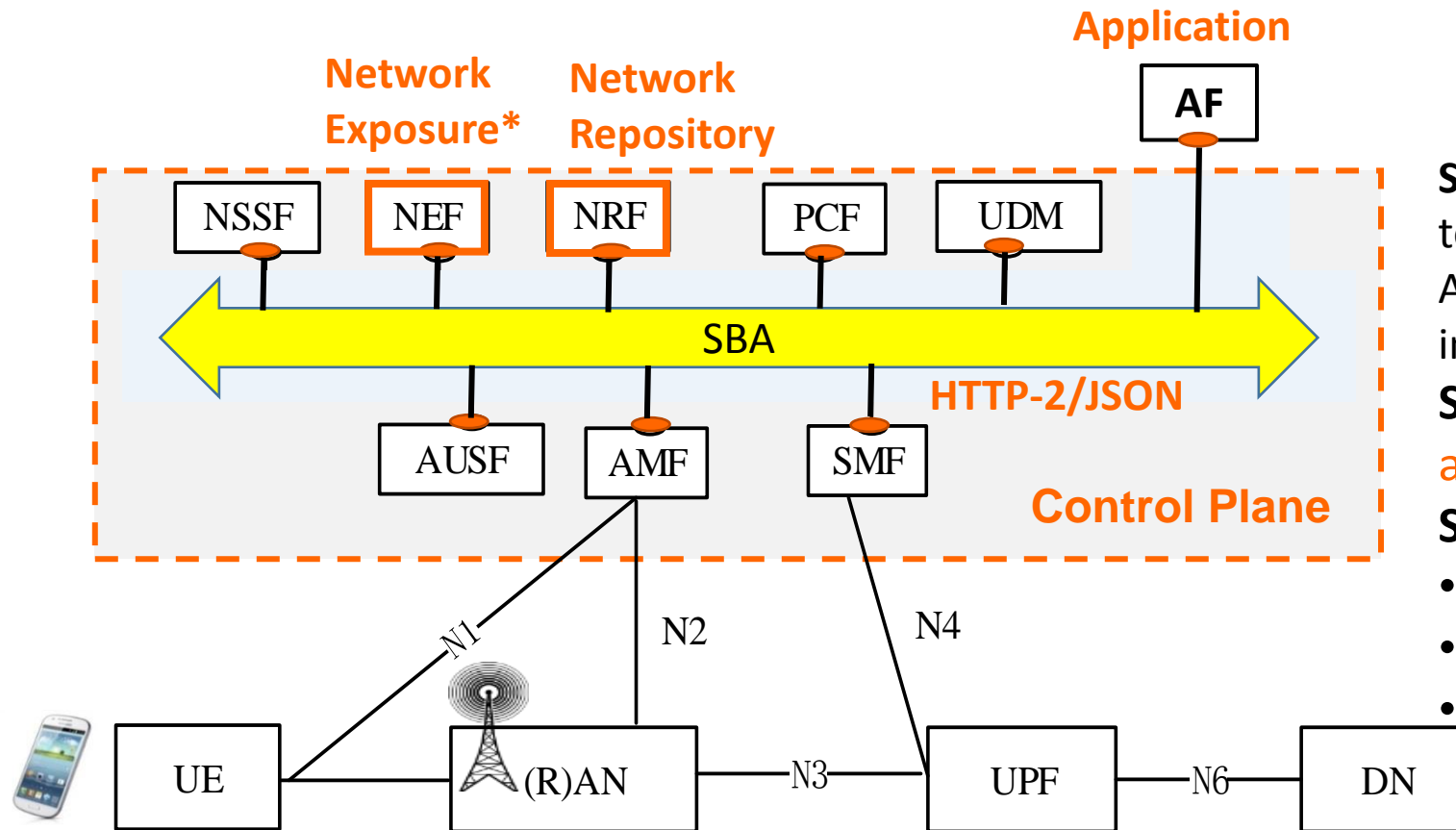
Main Challenges for 5G

- 1. How to simplify 5G Network Function Interfaces and protocols ?**
 - **Service Based-Architecture**
- 2. How to improve QoS, Policy usage for 5G services ?**
 - **Control and User Plane Separation SDN & ultra Reliable and Low Latency**
- 3. How to meet network requirements of 5G services ?**
 - **Network Slicing , Virtualization and Mobile Edge Cloud MEC**

1- Service Based-Architecture (SBA)

5G Service-Based Architecture SBA

From telecom-style protocol interfaces to web-based APIs



SBA: Network Functions offers services to other **Network Functions** using REST API instead of direct point-to-point interfaces between two functions.

SBA includes **service registration and discovery** (NRF) features.

SBA Benefits:

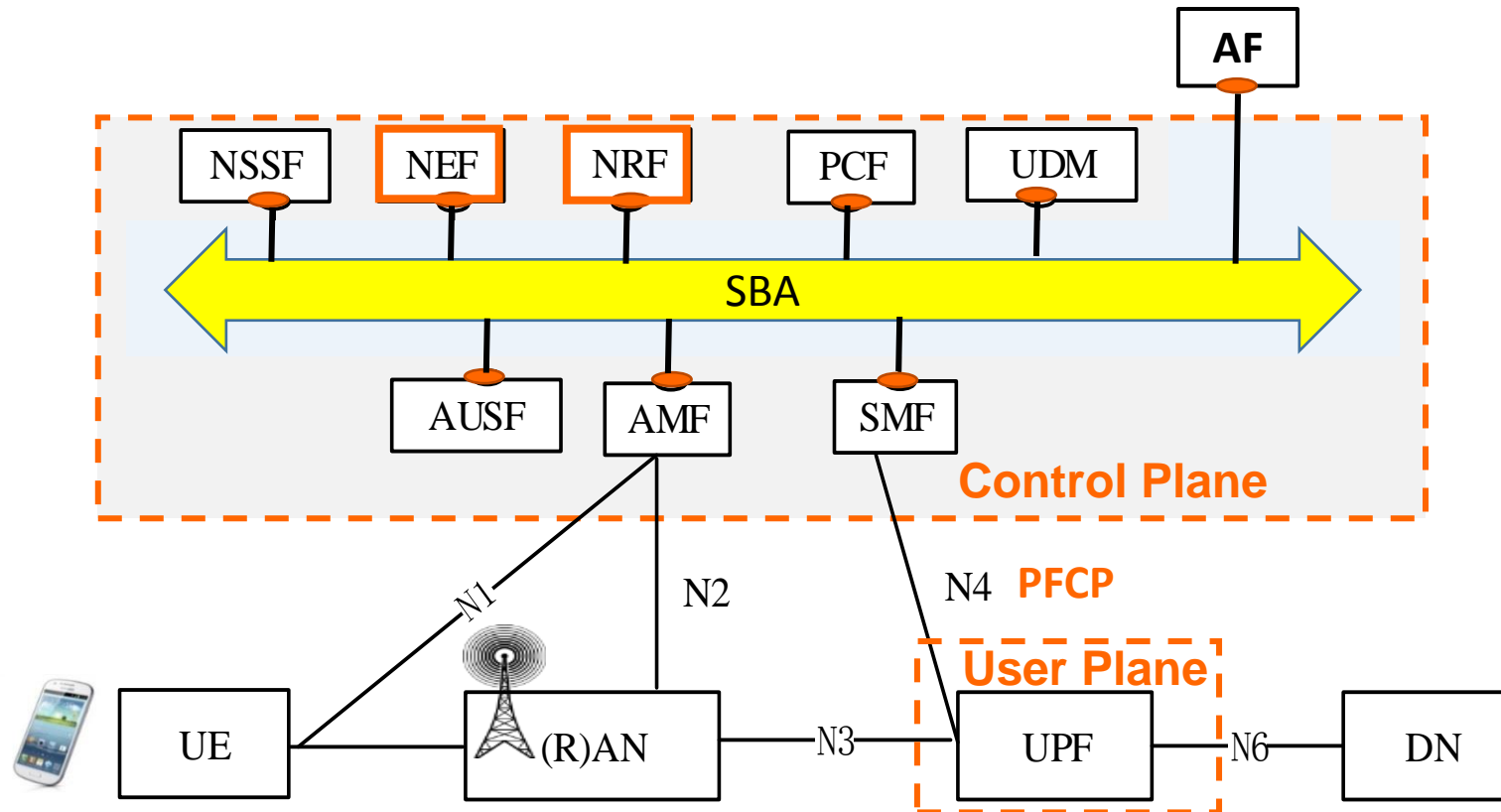
- Extensibility (add NF)
- Updatability (Loosely-Coupled)
- Reusability

*SCEF

One HTTP-2 Service Bus for **Control and Application** Functions

2- Control and User Plane Separation

Ability to advertise the capabilities of the User plane to the Control plane



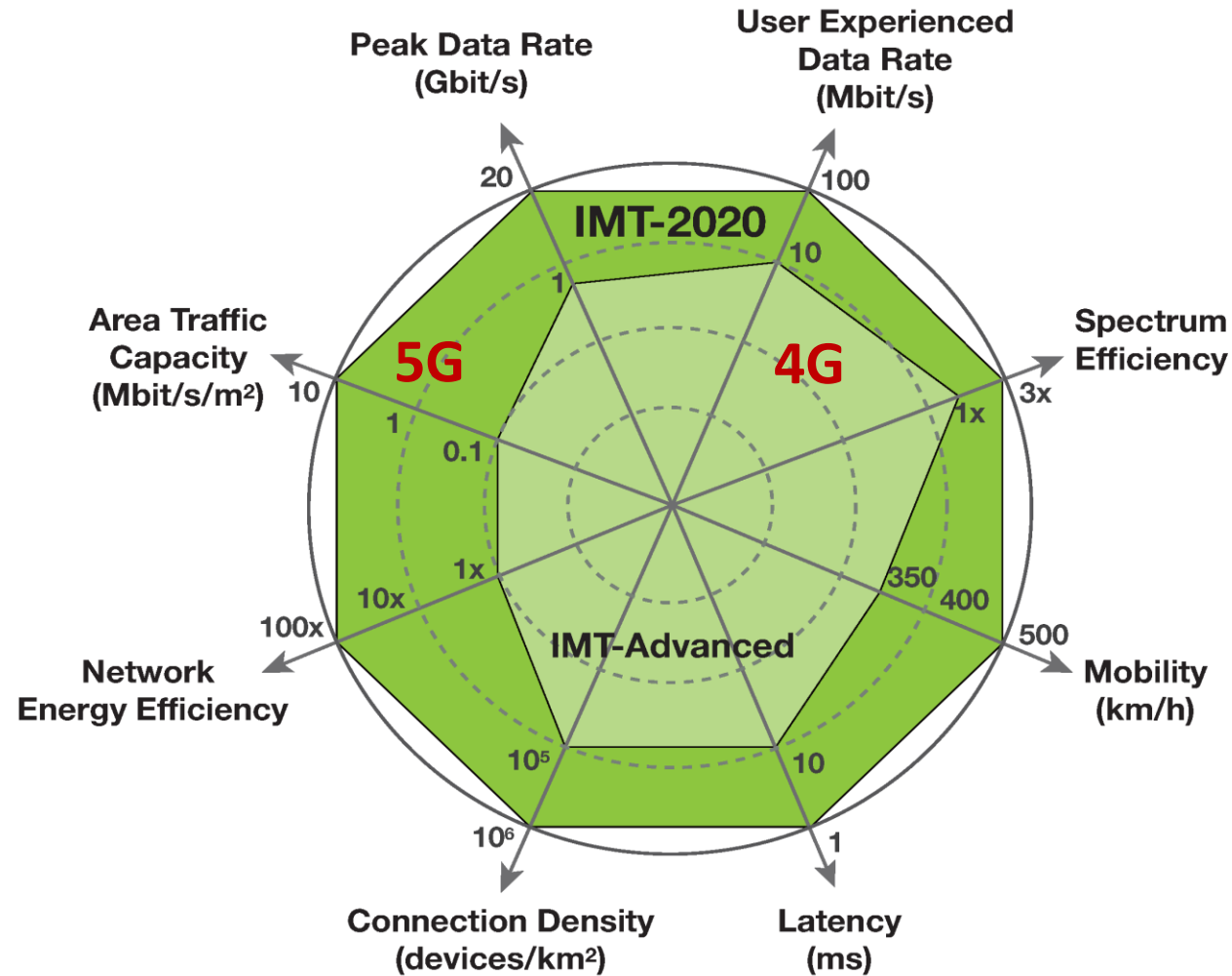
- **Control and User Plane Separation** (SDN approach)
- **3GPP Packet Forwarding Control Protocol PFCP*** for:
 - Packet Forwarding
 - Policy
 - Charging Control
 - Lawful Interception

* also used for 4G LTE

3- Network Slicing, Virtualization & MEC

How to achieve a perfect network ?

The “One-size-fits-all” model is no longer adapted to 5G

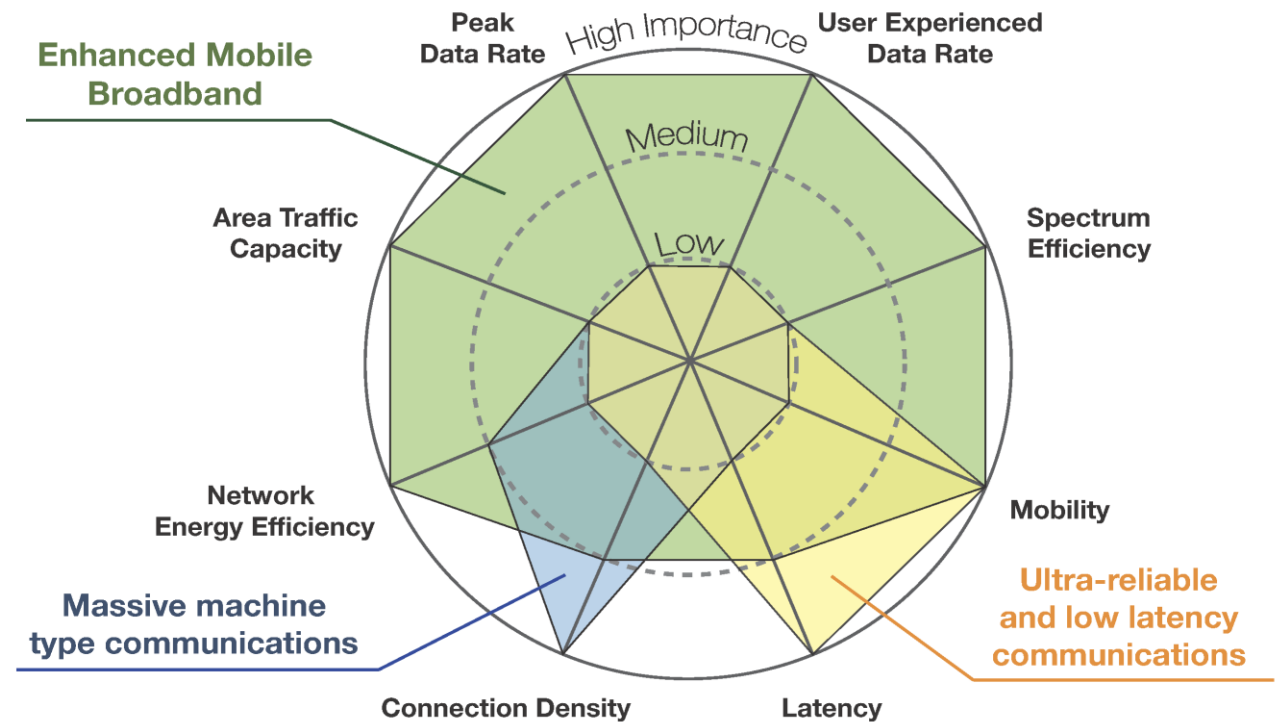


Network Slicing

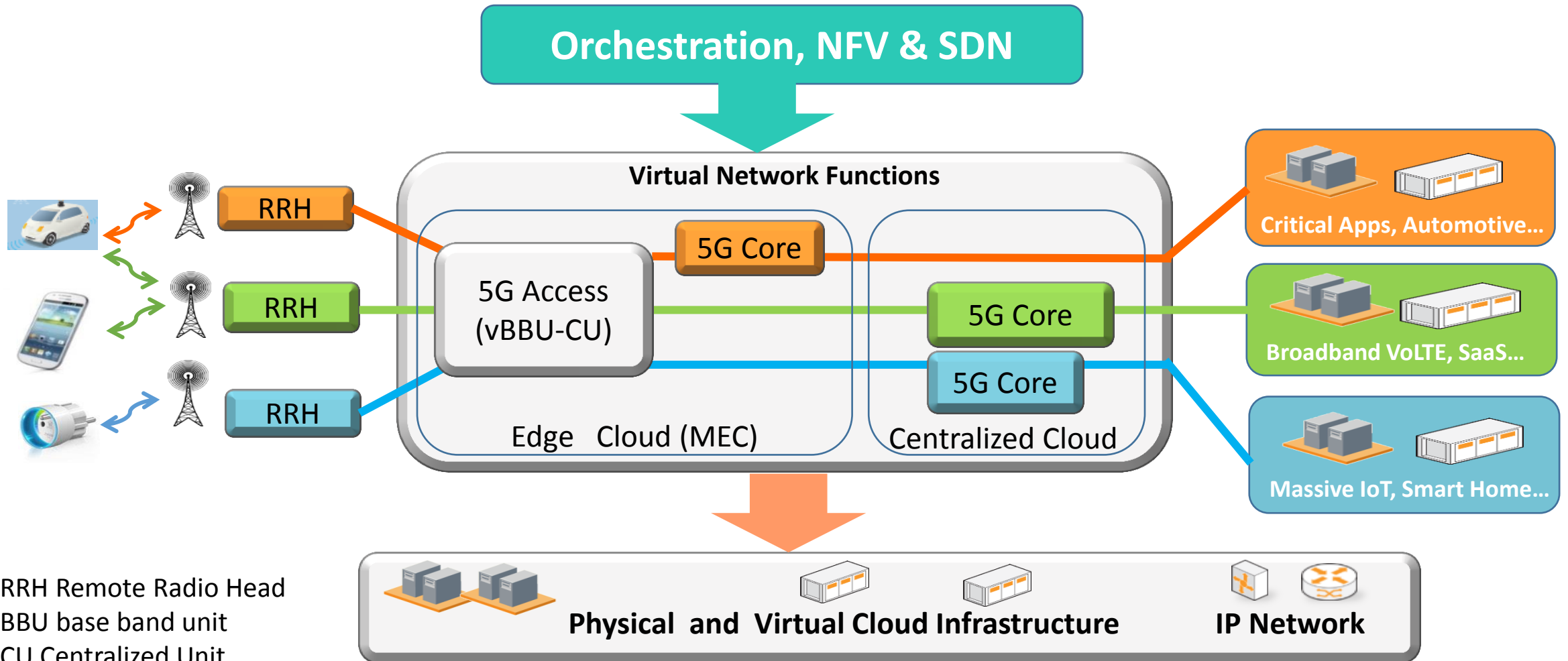
Network partition 'Slice' for a usage scenario

Slice: collection of **Network Functions** to support a **5G Service(s)**

1. **Enhanced Mobile Broadband**
>1Gb/s
2. **Massive Machine Type Com IoT**
>100 000/km²
3. **Ultra Reliable and Low Latency Com**
<1ms



Network Slicing enables creating multiple logical networks over the same network infrastructure



RRH Remote Radio Head
 BBU base band unit
 CU Centralized Unit

High Level use case for Casablanca:

- Deployment of the hybrid 5G Radio Network (PNFs & VNFs)
 - Complete PNF Support
 - Platform Enhancements to Deploy Edge PNF & Virtual Radio Network Functions
- Optimization of the deployed 5G network
 - OOF enhancements for optimal placement of edge resources
 - Edge Analytics to Support 5G Network Optimization
- Support for Modeling, Creation & Management of Network Slice
 - Design & Lifecycle Management of Slice & Slice Subnet Instances









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Thank You!



PNF PnP Enhancements

| TOPIC | ICON | DESCRIPTION |
|--|--|---|
| PNF Registration Handler (PRH) Improvements |  | New VES Event domain for PNF registration with corresponding support in VES collector, DMaaP and PRH. |
| SO Workflow enhancements |  | Introduction of dedicated 5G use case work-flow |
| Service Configuration Improvement |  | Service configuration improvements from APP-C/SDN-R to PNF after PNF registration to PRH |
| Security Enhancements |  | Authentication, Certificates, User name & password and intra-ONAP security. |
| Modeling enhancements |  | Modeling enhancements to support 5G PNF in ONAP. Inheritance, and PNF characteristics for sharing. Focusing on PNF connectivity. PNF-SDK. |
| PNF Onboarding / Package |  | Defining <i>PNF Onboarding Package</i> . Extending framework to work with PNFs. Defining PNF Package framework. |

Service Configuration Enhancements

| TOPIC | ICON | DESCRIPTION |
|---|--|---|
| CDT Integration to SDC |  | <i>Configuration Design Tool</i> (CDT) which provides a GUI to build artifacts to be used by APP-C (using Tosca models) to configure Templates incorporated into SDC. |
| PNF Software Version Checking |  | Reporting PNF S/W version to ONAP controller (SDN-R) & A&AI. Demonstrate the PNF S/W version has been updated in A&AI. |
| PNF & CU Application Level Configuration |  | Enhancements for SDN-R. Single Persona to control/create 5G PNFs (NE). |
| Life-Cycle Management Support |  | Change management and CLAMP for life-cycle support for PNF. |




PERFORMANCE ANALYSIS & OPTIMIZATION

| TOPIC | ICON | DESCRIPTION |
|---|--|--|
| Bulk Performance Measurements (PM) Collection |  | Performance Measurements Collection with ONAP. Development and evolution of event collection through VES collector. |
| High Volume & Real-Time Performance Measurements (RTPM) Collection |  | Performance Measurements Collection for Real-Time collection from PNF for sub-minute intervals (configurable). Introduces a High-Volume VES collector for high-volume data management (in DCAE) using a persistent connection. Introduces new data encoding (GPB). Distributed collection at cloud edge (for scalability). |

Optimization Framework Enhancements

| TOPIC | ICON | DESCRIPTION |
|---|------|---|
| Optimal placement of vNF | | Placement of Mobility Virtual Network Elements (CUs) across the highly distributed edge clouds is a fundamental requirement. Service Providers must also optimize the performance of the 5G RAN in real-time. |
| Slice optimization problem formulation | | Ability to model the problem as a constrained optimization problem, closely tied up policies |
| Slice optimization problem solving | | Ability to use appropriate algorithms and solvers to solve the problem in acceptable time frames. |
| SON - problem formulation | | Ability to formulate SON problems as constrained optimization problems, policy driven. Potential use cases - (1) Energy optimization (2) Load balancing |
| SON - problem solving | | Ability to use appropriate algorithms and solvers to solve the problem in acceptable time frames. |
| | | Impacted systems: SO, Policy, AAI, DCAE, MultiCloud (possibly), SDN-R |

Modeling & Management of Network Slice (Proposed)

| TOPIC | ICON | DESCRIPTION |
|--|---|---|
| Design/SDC Enhancements For Modeling |  | <ul style="list-style-type: none"> – Design/SDC Enhancements For Modeling – Multiple Allotted Resources Per Service – Nested Allotted Resources Per Service – Service Hierarchy |
| SO Workflow enhancements |  | To Support Slice Model/Hierarchy |
| Controller & Inventory Enhancements |  | To Support Slice Model/Hierarchy |
| Note: | | <p>Domain Models For Slicing – From SDOs are not mature & have not been standardized; however, the identified enhancements will be needed when Operators implement slices as models become available (whether using vendor-specific or standardized models)</p> <p>With the identified enhancements implemented in the Casablanca timeframe, we hope to have vendor/operator implementations post-Casablanca</p> <p>This still allows for slicing work/demonstrations (on existing networks using existing ONAP capabilities)</p> |