5G: FROM MYTH TO REALITY

5GXCrosshaul

NEXT GENERATION OF FRONTHAUL/BACKHAUL INTEGRATED TRANSPORT NETWORK

Project Info

· Starting Date: 01/07/2015
· End Date: 31/12/2017
· Cost: 8,352,271.56 €
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· More Info: http://5g-crosshaul.eu

Vision

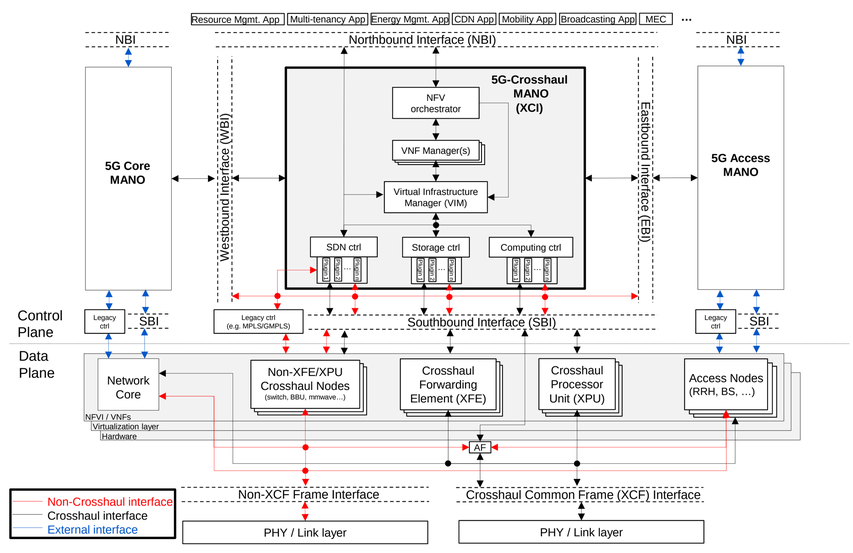
· 5G-Crosshaul will design an integrated backhaul/-fronthaul solution to solve the fundamental challenges of cost, efficiency and scalability anticipated in future 5G transport network.
· The fronthaul and backhaul will converge into a 5G-Crosshaul SDN/NFV-based framework capable of supporting new 5G RAN architectures and performance requirements.

Mission

· Design and Trial a high capacity low latency 5G transport solution that lowers costs and guarantees flexibility and scalability.
· The **5G Berlin** initiative (http://5g-berlin.org/) core and access infrastructure is located directly in the center of Berlin in Charlottenburg.
· The **5TONIC** laboratory (http://5tonic.org/) infrastructure, located in Madrid, is a base framework oriented to test and develop 5G deployments.

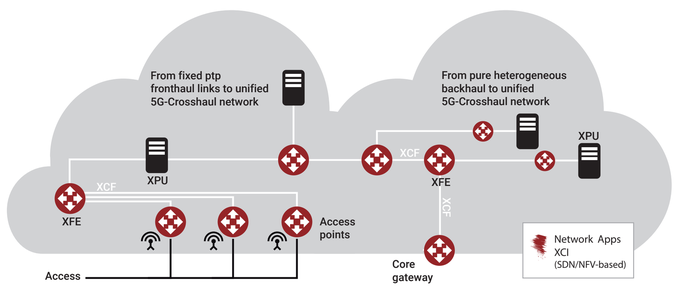
ARCHITECTURE

· The architecture of the 5G-Crosshaul is based on 1) decoupled data plane and control plane, 2) logically centralized control, 3) exposure of abstract resources and state to applications.
· The **Data Plane** is a mixed optical and packet switched transport network, formed by switching entities (XFEs) with circuit-switching (XCSE) and packet-switching (XPFE) capabilities, processing units (XPU) under a common frame format (XCF).
· The **Control Plane** is divided in two different layers: a top layer for external applications and the 5G-Crosshaul Control Infrastructure (XCI) below.



MAIN COMPONENTS

· **5G-Crosshaul Forwarding Element (XFE)**: The switching units that support single or multiple link technologies (e.g. mmWave, Ethernet, fiber, etc.), including the **Packet Forwarding Element (XPFE)** and the **Circuit Switching Element (XCSE)**.
· **5G-Crosshaul Common Frame (XCF)**: Based on MAC-in-MAC Ethernet, it can separate networks of different tenants and prioritize traffic flows thanks to the Ethernet header.
· **5G-Crosshaul Processing Unit (XPU)**: It allows the execution of virtualized network functions and/or centralized access protocol functions (V-RAN).
· **5G-Crosshaul Control Infrastructure (XCI)**: It follows the SDN control principles in a ETSI/NFV MANO architecture, offers control and management functions to operate the resources of the 5G-Crosshaul infrastructures, including XFEs and XPUs.

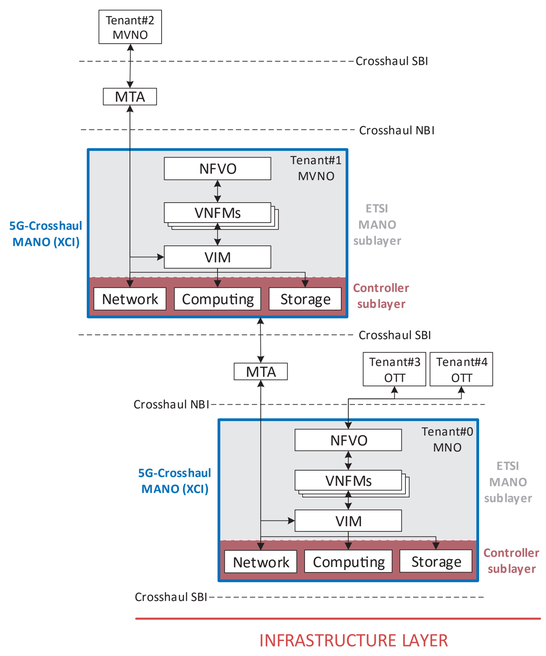


NETWORK APPLICATIONS

· **Re-configurability**: The Resource Manager Application (RMA) and the Virtual Infrastructure Manager and Planner (VIMaP) offer dynamic allocation of resources with high degree of flexibility and efficiency depending on the demand of the network.
· **Energy efficiency**: The Energy Management and Monitoring Application (EMMA) uses different techniques to optimise the energy consumption (e.g., dynamic de-activation, load- balancing, decommissioning of scarcely used network portions).
· **Media distribution**: The CDN Management Application (CDNMA) and the TV Broadcasting Application (TVBA) distribute multimedia contents in an efficient way with the lowest delay, less cost and minimum spectrum consumption possible.
· **Mobility**: The Mobility Management Application (MMA) provides mobility management and optimization of traffic offloading even in the harshest scenarios (e.g., high-speed trains).

MULTI-TENANCY

· In the 5G-Crosshaul domain, three kinds of tenants are distinguished:
  · **Over-The-Top (OTT) Service Provider**: service providers which use the 5G-Crosshaul transport infrastructure to connect distributed service points. They operate in an agnostic way over the infrastructure and they do not require control.
  · **Mobile Virtual Network Operator (MVNO)**: a provider of a virtual infrastructure made over a 5G-Crosshaul network.
  · **Mobile Network Operator (MNO)**: the owner of the physical infrastructure which can serve to end users, as well as OTT or MVNO
· Multi-tenancy reduces the CAPEX and OPEX by efficiently sharing the infrastructure maximizing its use in a Multi-MANO paradigm that requires an XCI recursion to support reselling of virtual and physical resources over a unique physical infrastructure.



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