

NETWORK SLICING

M. Oğuz Sunay November 15, 2017

An Operator Led Consortium

















5**G**

- 5G is not just about making the throughput larger than LTE
- It is also about offering user experiences and inclusion of vertical sectors that haven't been included in 4G so far.

These use-cases will need new types of **connectivity services** that are **highly scalable** and **programmable** in terms of speed, capacity, security, reliability, availability, latency and impact on battery life.

5G systems will be built to meet a range of performance targets, so that different services with widely differing demands can be deployed on a single infrastructure.

Network Slicing



The four phases for realizing network slicing on a 5G network can be performed simultaneously.

NOKIA

RAN slicing as enabler for low latency services

NETWORK SLICING

greater elasticity brought about by network alic and flexibility requirements imposed by future.

Network slicing is one of the key capabilities that will enable flexibility as it allows multiple topical nationals to be created on top of a common shared revuebal intrastructure. Network slicing is one of the key consultant that will enable floatbilly as it allows in logical meteories to be created on top of a common stared physical infrastructure. In greater elasticity troucht about by network sidon wit help to address the cost. logical networks to be created on log of a common shared ritysical interstructure. The greater seaticity trought about by retriever sidence will help to address the cost, efficiency, and feasibility returnments imposed by keune.

BT and Huawei announce research into 5G ented by A. Maeder, NOKIA Bell Labs ns by Z. Li, P. Rost, C. Sartori, A. Prasad, <u>C. Mannweiler</u>

treffen

a de waa

Nokia-led 5G Monarch Project to Focus on Network Slicing Argela implements RAN slicing over Turk Telekom's LTE-A network

Turk Telekom and Argela have announced the successful incorporation of ProgRAN - Argela's fully programmable RAN architecture allowing for dynamic radio access network (RAN) slicing - into Turk Telekom's commercial LTE-Advanced (LTE-A) network. The limited deployment covers an enterprise area in Istanbul's commercial centre. Maslak, with plans to extend the demonstration to a second location in the capital, Ankara. In addition, going forward the two companies are planning to extend their RAN slicing demonstration to include centralised RAN (C RAN) platforms. Bulent Kaytaz, Argela CEO, said: '5G needs to be built in a flexible way so that capacity and coverage are allocated in virtual RAN slices to dynamically meet the demands of each potential use case ... A RAN architecture built on the nillars of software-defined networking and network virtualisation is necessary to effectively use the limited wireless resources amongst increasingly diverse use cases. At Argela we have developed ProgRAN with 5G in mind, but also made sure that it is operational on today's LTE networks so operators do not have to wait until 2020 to start using the network slicing technology. We are thrilled to see it in action on Turk Telekom's commercial LTE-A network

What is Network Slicing?



Network slicing is a mechanism to create and dynamically manage <u>functionally-</u> <u>discrete</u>, <u>virtualized</u> networks <u>over a</u> <u>common infrastructure</u>.

What is Network Slicing?





How to Slice?



RAN Slicing



CORE Slicing



Transport Slicing



RAN Slicing: ProgRAN Architecture



Assignment of Resource Blocks to RAN Slices





ProgRAN Operation



RAN Disaggregation



High

C-RAN ProgRAN Operation



RAN Slicing Profile



RAN Anchored Core Network Slicing



Core Network Slicing





LWIP Link Aggregation



Link Aggregation and Network Slicing



XOS Orchestration of Network Slicing





PRIVATE LTE WITH M-CORD

Private LTE



 Private LTE is an independent LTE offering to provide specific performance and/or control for an enterprise, organization, vertical sector, etc., and/or to establish coverage where public networks don't reach.

When?



UNIQUE REQUIREMENTS

Specific design, operational, and performance requirements that cannot be met by the SP



QoS

Not enabled, or available options not fit for purpose



ALLOCATION RETENTION

No pre-emptive dropping of lowerpriority users according to SP policies



Need for enterprise control of one or more of the following: coverage, capacity, capability, subscription, resource utilization, traffic handling



TRUST

Lack of faith in ability to meet service levels - zero tolerance for breach.

COVERAGE

Inadequate breadth or depth of coverage

How?



VIRTUALIZATION

Enables personalization of Private LTE offerings optimized for each customer, allows for introduction of future capabilities in software, enables lower CAPEX and OPEX



SD-RAN

Enables the programmability of the RAN - allowing for the enterprise to decide how to allocate wireless resources across its different user groups

SPECTRUM FLEXIBILITY

Allows for use-case specific selection of spectrum: dedicated spectrum, CBRS band or unlicensed band, enables the capability of network sharing across multiple SPs via a Neutral Host architecture

Solution Requirements



Architectural Enablers

MULTIPLE PRIVATE CLOUDS

- Each participating SP has its private cloud. These clouds do not have any access components.
- The enterprise has its own private cloud. Included in this cloud is the Neutral Host RAN.

HIERARCHICAL ORCHESTRATION

- Each participating SP has its own XOS for EPC configuration
- The enterprise has its own XOS for RAN as well as local enterprise services configuration
- The Private LTE has its own XOS for stitching services for an end-to-end service

ISOLATION OF CLOUDS

- The services from each private cloud has ingress and egress public IPs
- Each private cloud has a vRouter service providing configurable NAT capability.
- The service maps within a cloud are not disclosed to the other clouds
- Each private cloud can dynamically configure the service maps

PRIVATE LTE XOS

 This XOS enables ONOS E to use L3VPN to programmatically stitch private clouds allowing the configuration of E2E Service descriptions,

Architectural Overview



Hierarchical Service Orchestration





Sample Service Configuration



MWCA Demo





