Transforming Network Infrastructure towards 5G
ULAK Solutions & Portfolio

ULAK BASE STATION (LTE/5G)

MILAT SDN/NFV Based NW Tech.

LTE/5G Core Network

R&D for 5G & Beyond

E2E, SECURE, SMART, MANEGABLE, NETWORK INFRASTRUCTURES
ULAK LTE-A Base Stations Deployed since May 2018.
(1500+ Delivered / 1000+ On Air)
Serving 3 operators in Turkey, both governmental & commercial systems
Milat MAYA Potential Application Areas

SOFTWARE DEFINED WIDE AREA NETWORK (SD-WAN)

LOCAL AREA NETWORK (SD-LAN)

SECURITY (SD-Security)

DATA CENTER (SD-DC)

CRITICAL INFRASTRUCTURE (SD-Critical)

Robust and Reliable Communication Infrastructure with ULAK MAYA
ULAK 4.5G/5G Core Network Solution

- Public Safety & Emergency Call
- Mobil Operators Network Infrastructure
- Armed Forces Mobil Network Infrastructure

Development & Integration on going
Our journey with Open Networking started in early 2015 with ARGELA (Supported by Defence Industry Agency) …with a heavy mission to transform networks; more agile, more secure, more efficient
What we looked for ..

- Scalability
- High Performance
- Resiliency
- Open Standards
- Next-Generation Networks support
- 5G Enabler Platform

We decided to continue this journey with ONOS
What we did ..

- Developed in house **ONOS based MILAT SDN / NFV Framework** in two years with the effort more than 100 man-year.

- Contributed many features to ONOS and OpenFlow (*Especially on Openflow 1.5 Support, ONOS OVSDB Feature Enhancements and Performance Healings on Topology Discovery Process*)

- We productized **MILAT** as:
  - MAYA SD-WAN and
  - MAYA SD-DC solutions in the last two years.

- We are now developing **5G Core Network (CINAR)** based on MAYA SDN IP Core
How we use ..

• We locate ONOS as the brain of network control plain.

• We develop all our product's features, as an application, over ONOS controller.

• Modular architecture of ONOS was very helpful for us during development phase.

• By the help of comprehensible code format, we can easily contribute extra features and improvements on ONOS code base.
Where we use ..

• Maya SD-WAN – Integrated with CPEs:
  Milat Manages and Controls Flows, Network Functions and OVS Bridges on Edge Devices

• Maya SD-DC – Integrated with OpenStack as NFVI and OpenBaton as Orchestrator:
  Milat controls networking stack by ONOS VTN Application and manages network functions by integrated OpenBaton

• Maya SD-CORE – Integrated with OFDPA Supported Switches:
  Milat configures Leaf and Spine switches for multipathing and redundancy features by enhanced version of ONOS Segment Routing App
MAYA SD-WAN

• Deployed to customers including:
  • Military,
  • Gov. Organizations,
  • Municipalities institutions,
  • Private Organizations, in TURKEY.

• SDN/NFV Based Secure and Agile WAN

• Control and DataPlane separation with OpenFlow

• Cost efficient and high performance Networks
MAYA SD-WAN TOP LEVEL ARCHITECTURE & ONOS INTERFACES

OPEN BATON

Service MANO

vCPE

Virtual Network Functions

Virtual Network (OVS Based MILAT vSwitch)

Kernel/Hypervisor

CPE Hardware

MAYA SD-WAN CONTROLLER

MILAT Network Services

VTN  PM  NM  GUI

Flow Table

OpenFlow

REST API

ONOS
MAYA SD-DC

- Underlay and Overlay Network Control with MILAT SDN Controller
- Network Virtualization and Multitenancy with Openstack Integration
- Open Architecture with WhiteBox Switches and COTS Hardware
- High Performance and Cost Efficient Service Oriented Architecture
## ONOS Key Benefits for MAYA SD-WAN

- Control Plane and Data Plane Separation with **ONOS Southbound Interface (SBI)** via OpenFlow
- Network Programming with **ONOS Northbound Interface (NBI)** via RESTFULL API
- Network Virtualization Management via OVSDB

## ONOS and TRELLIS Key Benefits for MAYA SD-DC

- Control Plane and Data Plane Separation with **ONOS Southbound Interface (SBI)** via OpenFlow
- TRELLIS ECMP routing for multi-pathing and segment routing path control for selected traffic
- TRELLIS distributed virtual routing to all tenant traffic in the overlay
- TRELLIS Integrates both underlay and overlay configuration and control
- TRELLIS Eliminates complex control protocols in the fabric nodes (no need to BGP implementation)
- Reduce Cost and Maximise DC Network Performance with White Box Leaf-Spine Fabric Architecture
ULAK 5G CORE NW (CINAR) TOP LEVEL ARCHITECTURE & ONOS INTERFACES
What we achieved..

- High Performance Networks
- Cost Efficiency
- More Agility
- Open Architecture
- Trust on MAYA, an ONOS Based system

5G Architecture, functionality and flexibility already fielded at the edge
Getting Ready for 5G gNR integration.
THANK YOU !