O-RAN
How Open Source Software and Standards Will Transform Radio Access

Phil Robb – V.P. Operations - Networking & Orchestration
May 6th, 2019
RAN market is following Network Switch disruption but…
with one major difference

Proprietary
- Apps, Management & Orchestration
- Control Plane
- OS & Hardware (User/Data plane)

SDN
- Apps, Management & Orchestration
- Control Plane
- OS & Hardware (User/Data plane)

NFV
- Apps, Management & Orchestration
- Control Plane
- OS & Hardware (User/Data plane)

Disaggregation, Innovation on top
- Apps, Management & Orchestration
- Control Plane
- NOS Hardware

Open RAN Requires
- Open API / open specification or standards
- Open Source Software
AND
Vendor innovation (proprietary development) which can be leveraged by an Open RAN architecture
O-RAN announced at MWC

The key principles of the O-RAN Alliance include:

› Lead the industry towards open, interoperable interfaces, RAN virtualization, and big data enabled RAN intelligence.

› Specify APIs and interfaces, driving standards to adopt them as appropriate, and exploring open source where appropriate.

› Maximize the use of common-off-the-shelf hardware and merchant silicon and minimizing proprietary hardware.
The O-RAN Architecture

O-RAN Alliance is aiming at building an “Open” and “Smart” Radio Access Network (RAN) for future wireless systems.
What is the RIC?

**Objective:** customize RAN functionality for regional resource optimization or new services

- **What? Area-wide data and controls**
  - UE/cell/DU/CU level L1/L2/L3 measurements
  - UE locations and predicted trajectory
  - UE context info (video, voice, non-GBR data)
  - Per-UE policy-driven control of band/cell/bearer selection, admission control, handover, scheduler

- **Why? Customize RAN with short time-to-market for:**
  - **Efficient resource usage** – improve customer experience and optimize spectral efficiency by using policies/ML to tailor RAN for unique spectrum position and geography based on holistic area-wide network view
  - **New RAN services** – customize RAN behavior for the needs of specific verticals. E.g., create RAN slices for drones, connected cars, IoT, etc.
RAN Intelligent Controller – a new function introduced by O-RAN

- Latency Control for Wireless Domain Management
  - QoS optimization
  - Slicing optimization
  - Mobility optimization
  - 3rd Party application

- RAN Intelligent Controller (RIC)
  - A1: intent based interface
  - E2: RAN closed loop
  - O1: for data collection and control

- Use cases
  - AI/ML for Programmability
  - Platform made avail in Open Source
  - Network Intelligence
  - Handover Optimisation
  - Radio-Link Management
  - Advanced SON
  - Load Balancing
  - Slicing Policy

- RAN Data Analytics & AI Platform
  - QoS optimization
  - Mobility optimization
  - 3rd Party application

- RAN
  - CU-CP
  - 3GPP E1
  - CU-UP
  - DU
  - ORAN NGF-I
  - RRU

Real-time

10-100 ms

Latency Control for Real-time
Why RIC?

The RIC takes customization into the RAN

Network Optimization
› Fine grain network optimization customized for each environment

Smart factory/industrial IoT
› Carve out private 5G slice/namespace for business customer on industrial campus
› Security services

Connected Car
› Quality of Service enforcement to provide low latency and/or high bandwidth to vehicle applications

Shipping, Logistics, Tracking, Asset Management
› Lowering power of IoT devices to enhance battery life

Health Care
› Enforce highest level of network security for sensitive medical data
Linux Foundation and O-RAN, bringing it together

Open API for Standards
LF helps harmonize with key standards for API or Architecture & Interface Specs

Open Source Community Innovation
LF can create a community to expand integration, interoperability in automation, orchestration

Vendor Driven Innovation & Reference Implementation

Apache2.0

Open API, Open Standards & Specifications
O-RAN Software Community

› Mission:
Manage all software development, code storage, tooling and developer integration testing aligned with the architecture specified by O-RAN Alliance

› Project Scope:
• Software development including documentation, testing and integration of the open source software project
• Coordinate efforts with related open source software projects and standards communities
• Aligned with O-RAN architecture

› Licensing:
1. Standard Apache 2 license for Open Source
2. O-RAN specification license that adds protection for 3GPP and O-RAN essential patents for software contribution
O-RAN Software Community (O-RAN SC) structure

- …under Linux Foundation (LF)
- ...exclusively sponsored by O-RAN Alliance to develop open source software to realize O-RAN components and systems
- The O-RAN SC Technical Oversight Committee (TOC) will be responsible for all technical oversight of the software community
O-RAN Alliance + LF Community = New Opportunities

- The foundation of O-RAN Alliance has been one of the most influential events in telecom industry in 2018.

- The formation of O-RAN Software Community could become one of the most impactful events in LF.

Join the O-RAN Software Community and **Accelerate Access into the future!**
To Wrap Up....

› A Big Thanks For Source Material and Slides To:
  › Arpit Joshipura
  › Hank Kafka
  › Oliver Spatscheck

› For More Information & To Get Involved:
  › O-RAN Alliance Website: https://www.o-ran.org/
  › O-RAN Alliance Whitepaper:
    https://static1.squarespace.com/static/5ad774cceb74940d7115044b0/t/5bc79b371905f4197055e8c6/1539808057078/O-RAN+WP+Final+181017.pdf
  › O-RAN Software Community: https://o-ran-sc.org
Thank you