SOFTWARE-DEFINED CONTROL OF RAN USING ONOS
RAN EVOLUTION
DISAGGREGATION & SOFTWARE-DEFINED CONTROL
RAN EVOLUTION
DISAGGREGATION & SOFTWARE-DEFINED CONTROL

DISAGGREGATION + SD-CONTROL

SD-RAN CONTROLLER (O-RAN RIC)

E1 & E2 to be specified by O-RAN
Demo to use an interim E2 interface inspired by O-RAN
RAN EVOLUTION
SD-RAN CONTROLLER CAN ALSO CONTROL NON-DISAGGREGATED eNBs/gNBs
ONOS-BASED SD-RAN CONTROLLER

O-RAN COMPLIANT NB - A1

RAN APPS
(Radio Connection Mgmt, Mobility Mgmt, QoS Mgmt, Interference Mgmt, 3rd Party Apps, Trained Model)

NB CORE API
(R-NIB, Flow Objectives, Intents)

DISTRIBUTED RIC NEAR-RT CORE
(R-NIB management, Notifications, High-availability & Scale-out)

O-RAN COMPLIANT SB - E2

INTERIM E2:
ASN.1 OVER SCTP
DEMO FEATURES

- ONOS-Based SD-RAN controller supporting an interim O-RAN E2 southbound
- ONOS maintaining and displaying the Mobile Network State over the entire geography
- A simple handover application running on ONOS SD-RAN conducting near real-time control
- A simple radio channel emulation platform distributing SD-RAN compliant base stations and mobile handsets over a geography
1. Mobile Handsets transmit mobile channel quality info to their serving base stations every 1ms following 3GPP standards
2. Base stations transmit time-varying mobile network state information to ONOS SD-RAN every 5ms using the interim E2 interface.
3. ONOS SD-RAN maintains and displays time-varying mobile network state in near-real-time.
4. R-NIB is exposed to the RAN handover application. When necessary, this app triggers handovers.
SD-RAN DEMO SETUP

GUI

Handover App

R-NIB

ONOS SD-RAN

[Diagram showing the SD-RAN demo setup with GUI and Handover App connections]
5. When handover is triggered, using E2, ONOS SD-RAN orders the serving and target base stations to execute it.
6. Handover takes place.
7. The updated mobile network state is transmitted up to ONOS SD-RAN in the next periodic E2 message.
SD-RAN CONTROLLER USING ONOS

KEY TAKEAWAYS & NEXT STEPS

Next Step: High Availability and SD-RAN Control Federation
ONOS’s production-grade HA and federation capabilities will be incorporated in the ONOS SD-RAN. A hierarchical R-NIB is envisioned where only relevant subset of R-NIB is made consistent across the controller federation.

Next Step: Enhancements to Interim E2 Interface
Based on requirements of various RAN applications, additional southbound messages will be specified.

Next Step: Open Source Ecosystem
The demo has been developed with Sterlite. Additional ecosystem partnerships will be solicited to collectively develop additional RAN applications and corresponding ONOS SD-RAN enhancements.

ONOS as an SD-RAN Controller
ONOS has demonstrated promising performance to maintain mobile network state and expose this to RAN applications for near real-time control.

SD-RAN Control Southbound
A feasible interim E2 southbound has been demonstrated. Once O-RAN specifications are completed, this southbound will be replaced with the O-RAN E2.

SD-RAN Handover Application
A simple handover application has been developed as proof-of-concept for the ONOS-based SD-RAN control.