



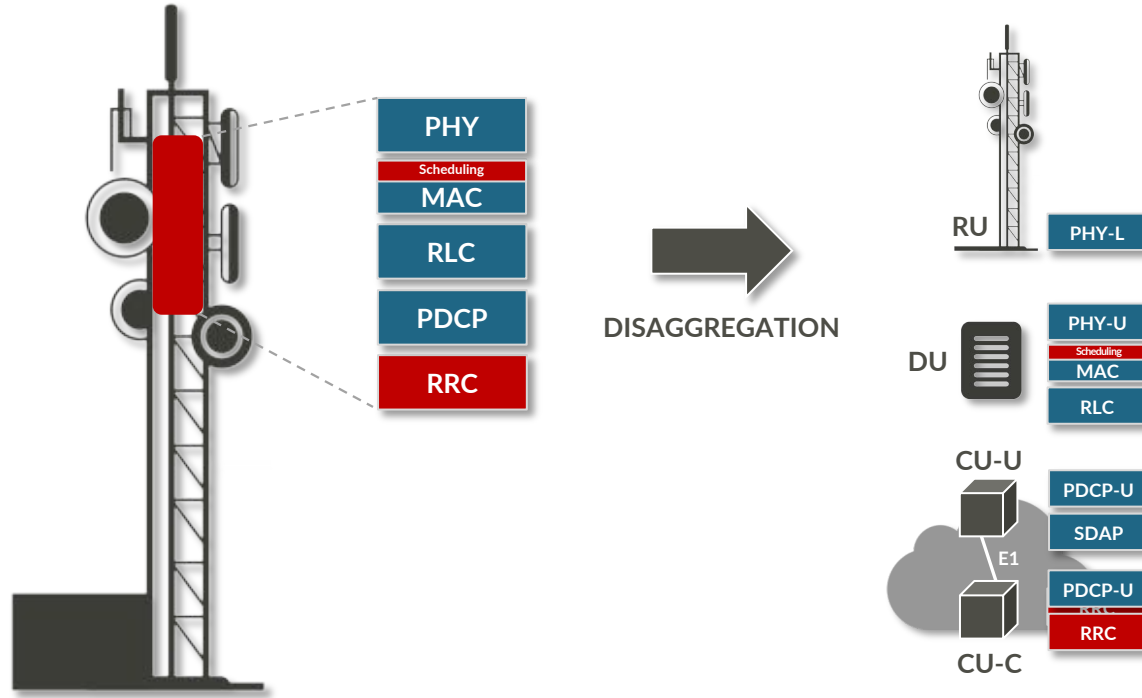
# ONOS STL SD-RAN

SOFTWARE-DEFINED CONTROL OF RAN  
USING ONOS



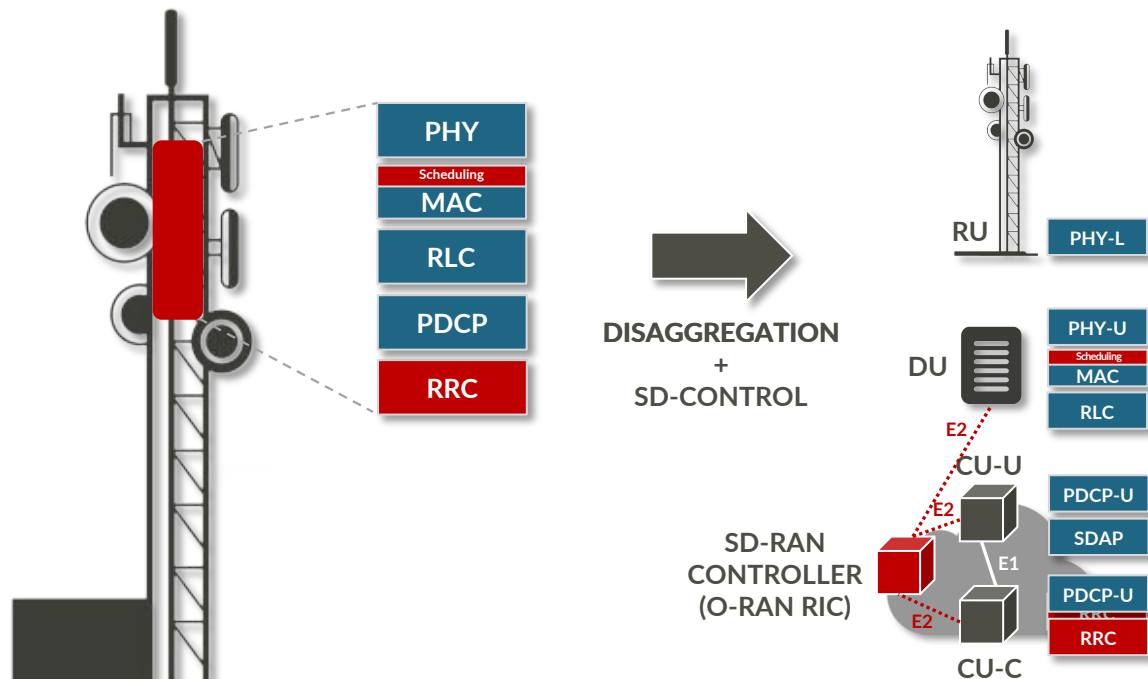
# RAN EVOLUTION

## DISAGGREGATION & SOFTWARE-DEFINED CONTROL



# RAN EVOLUTION

## DISAGGREGATION & SOFTWARE-DEFINED CONTROL

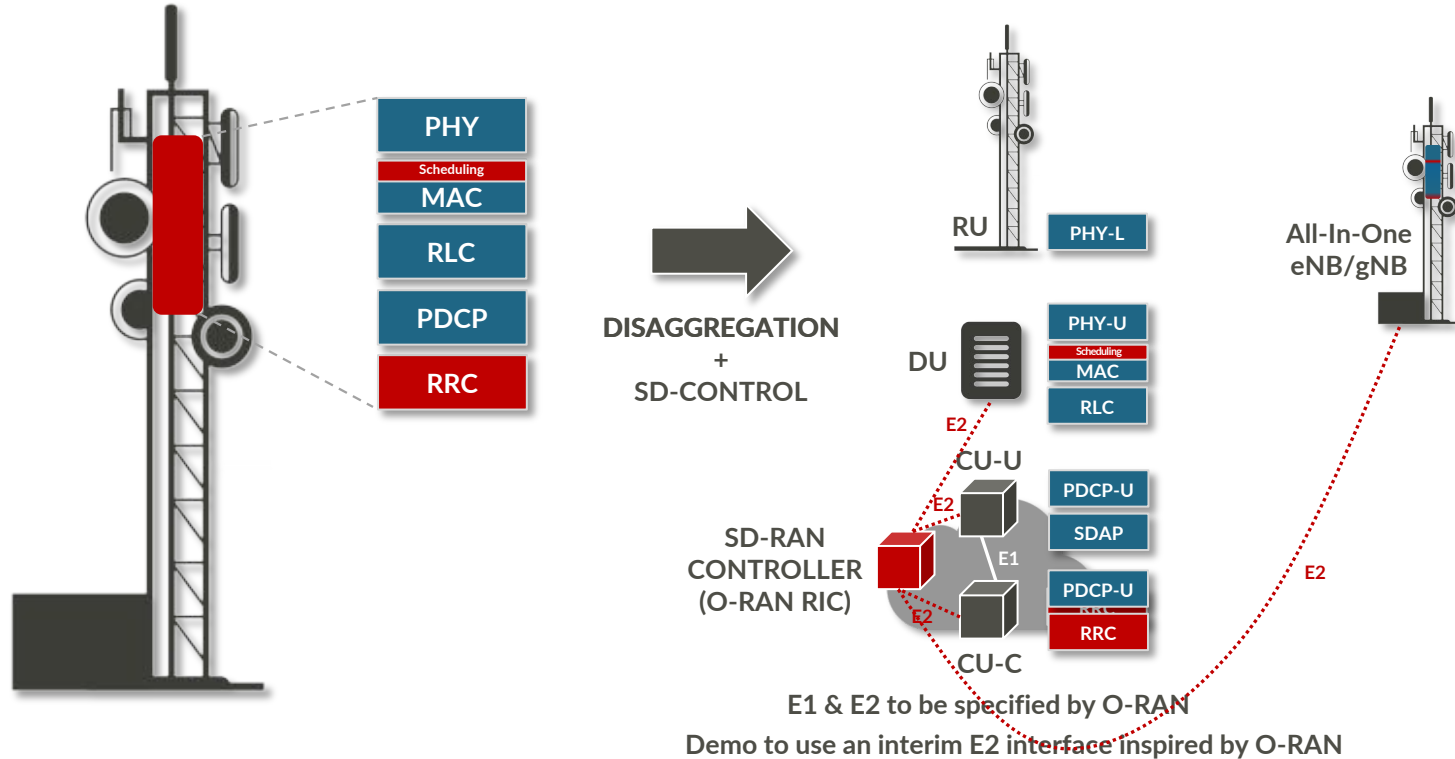


E1 & E2 to be specified by O-RAN

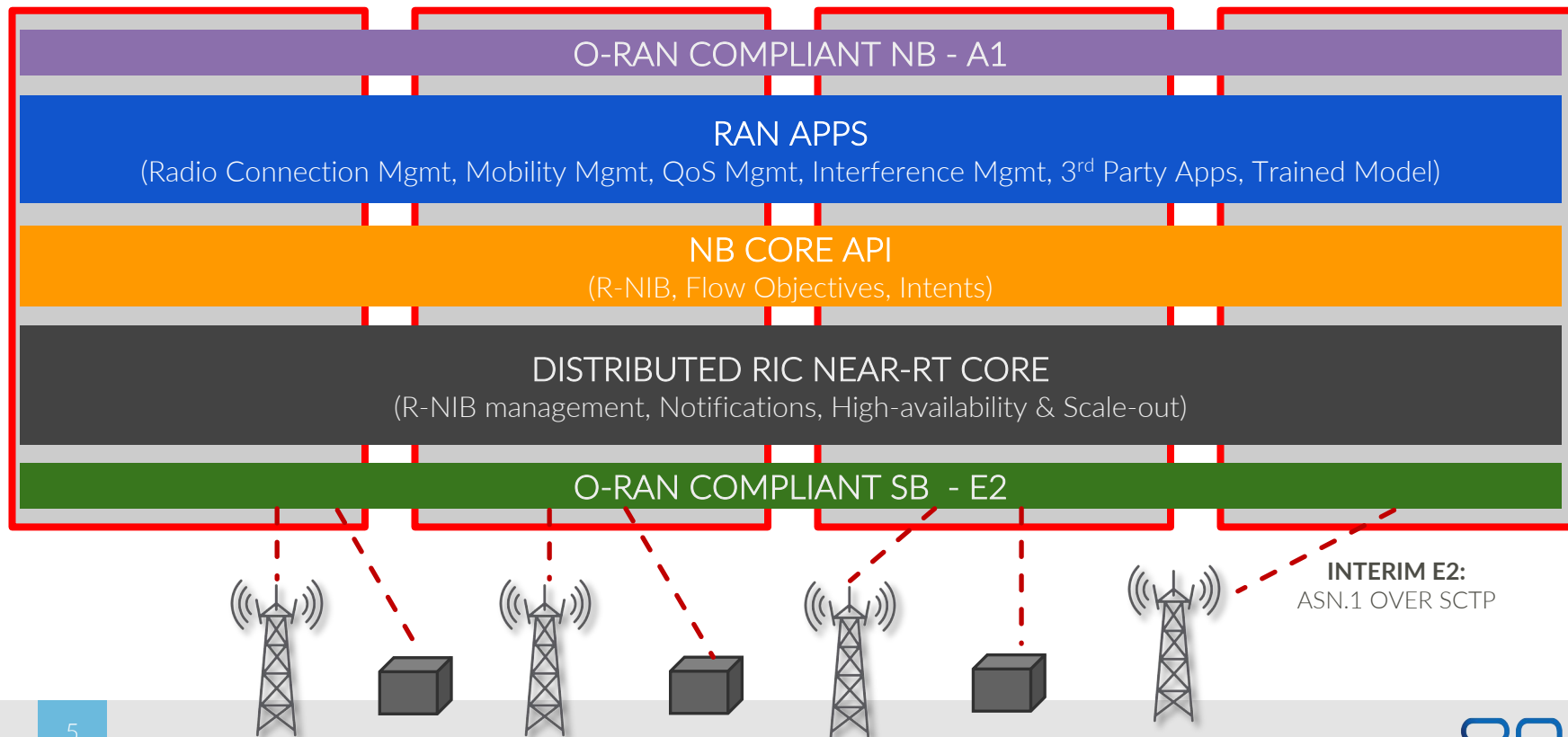
Demo to use an interim E2 interface inspired by O-RAN

# RAN EVOLUTION

SD-RAN CONTROLLER CAN ALSO CONTROL NON-DISAGGREGATED eNBs/gNBs



# ONOS-BASED SD-RAN CONTROLLER

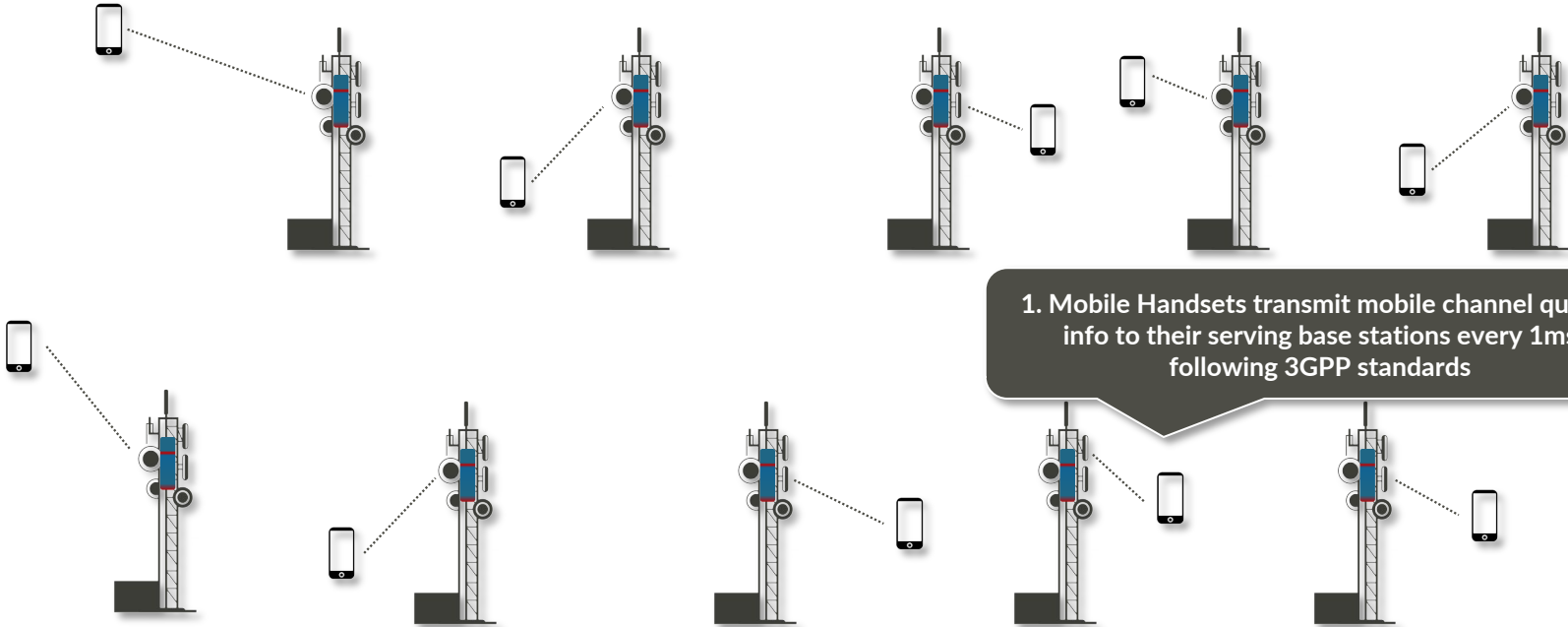


# DEMO FEATURES

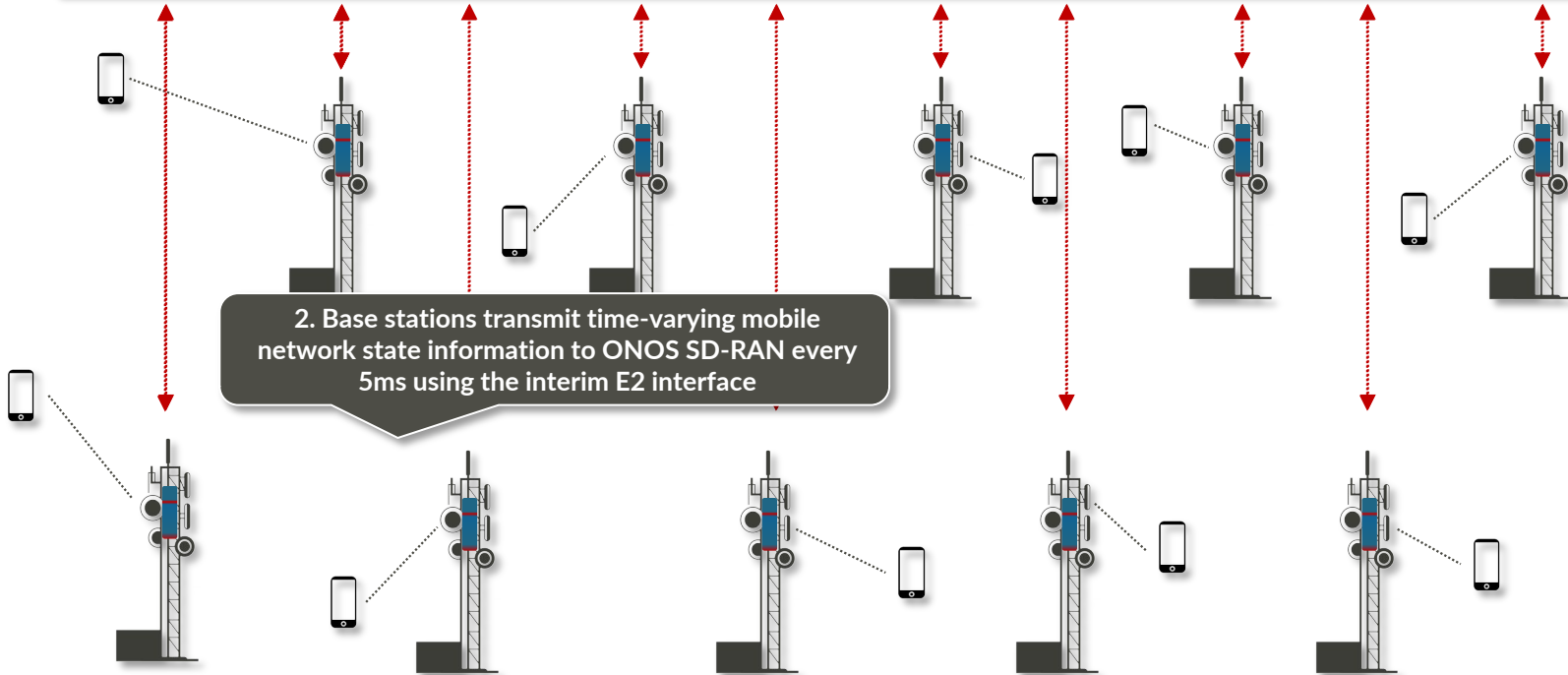
- ONOS-Based SD-RAN controller supporting an interim O-RAN E2 southbound
- ONOS maintaining and displaying the Mobile Network State over the entire geography
- A simple handover application running on ONOS SD-RAN conducting near real-time control
- A simple radio channel emulation platform distributing SD-RAN compliant base stations and mobile handsets over a geography



# SD-RAN DEMO SETUP



# SD-RAN DEMO SETUP



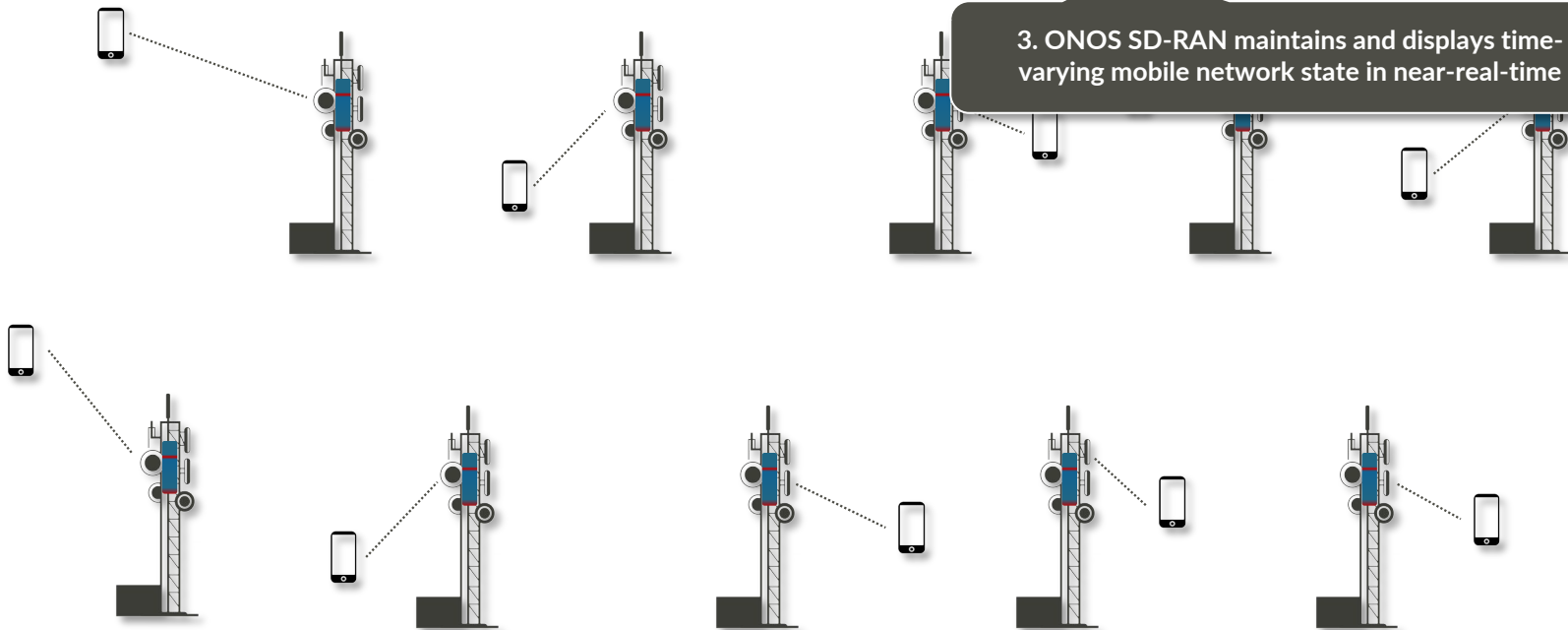


# SD-RAN DEMO SETUP

 ONOS SD-RAN

R-NIB

3. ONOS SD-RAN maintains and displays time-varying mobile network state in near-real-time



# SD-RAN DEMO SETUP

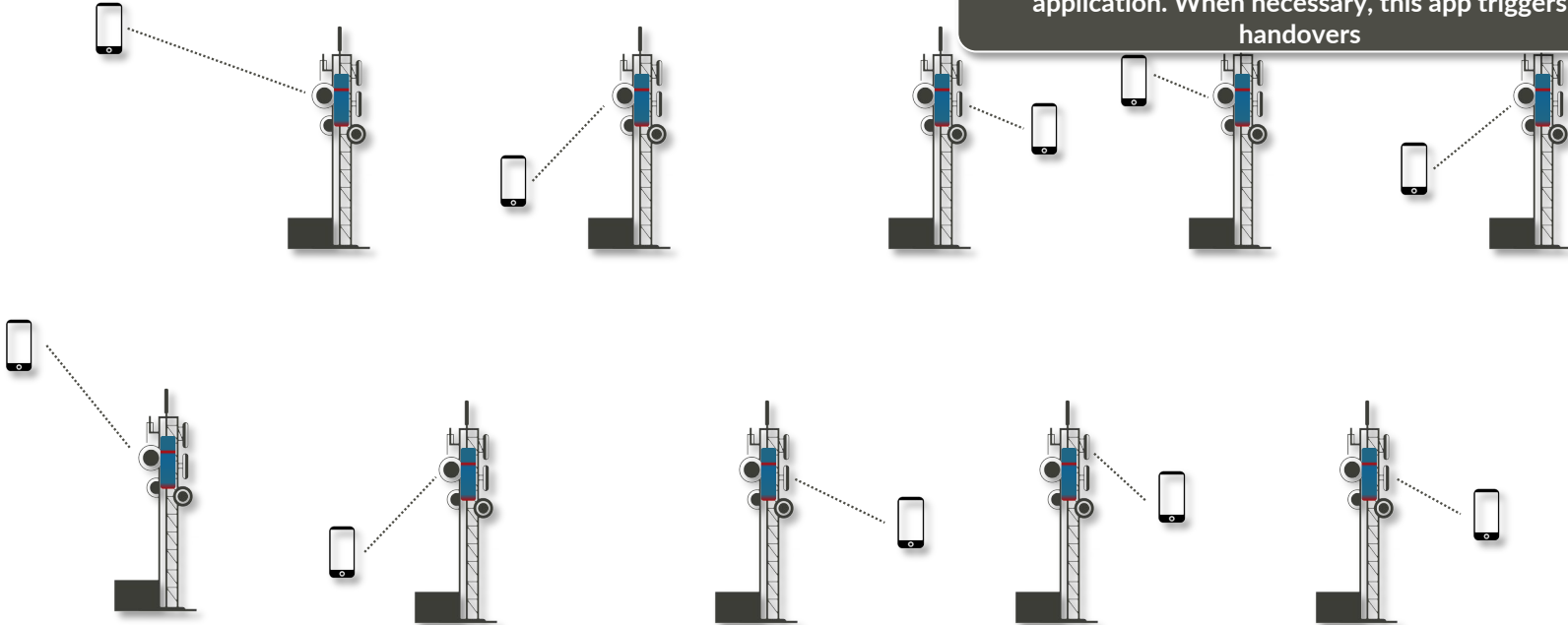
 **ONOS SD-RAN**

GUI

Handover App

R-NIB

4. R-NIB is exposed to the RAN handover application. When necessary, this app triggers handovers



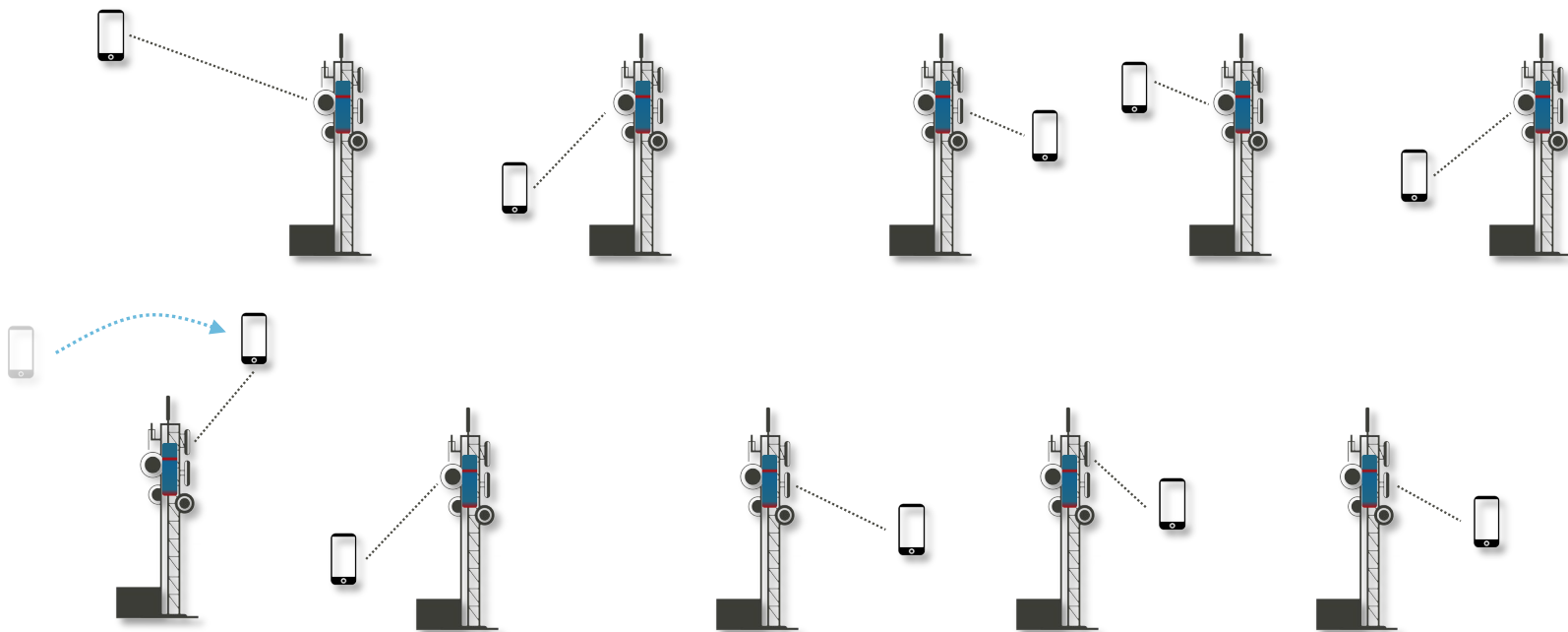
# SD-RAN DEMO SETUP

 ONOS SD-RAN

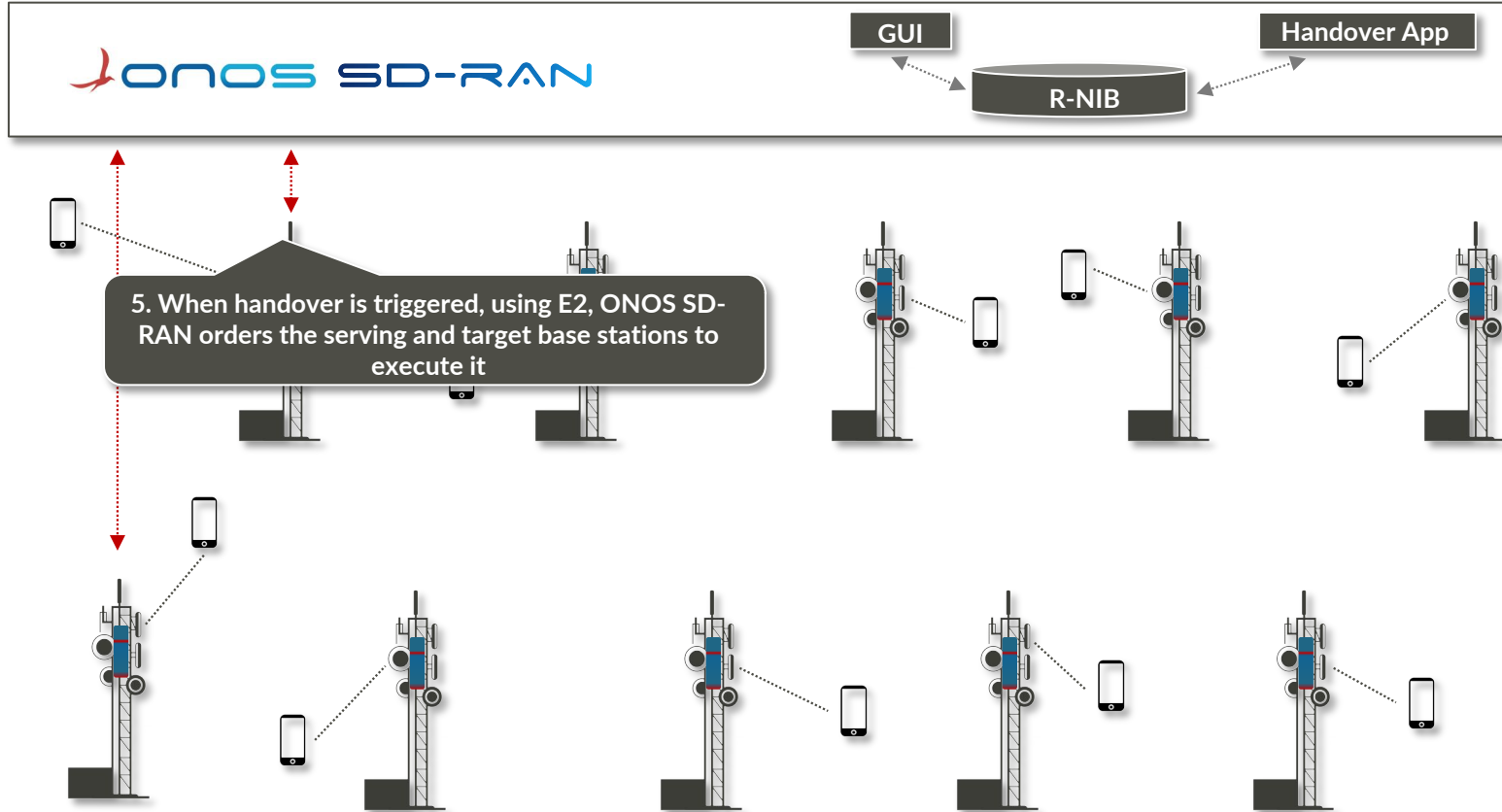
GUI

Handover App

R-NIB



# SD-RAN DEMO SETUP



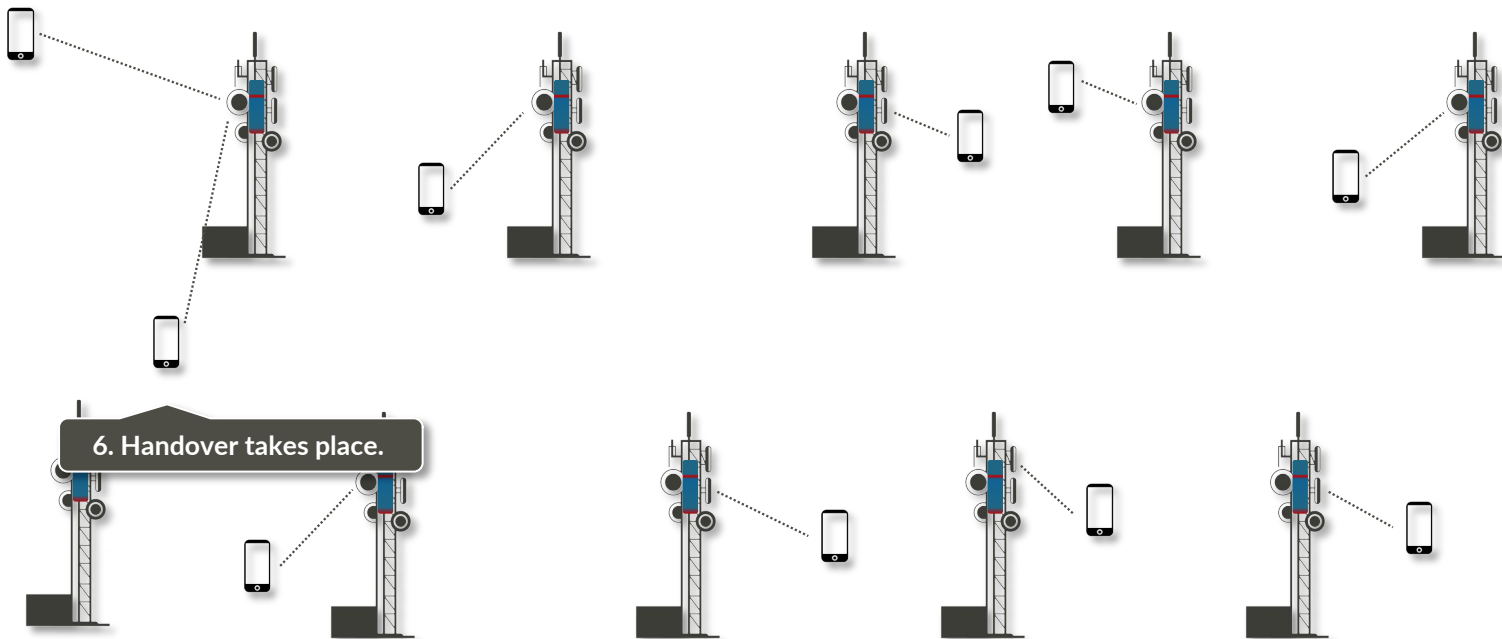
# SD-RAN DEMO SETUP



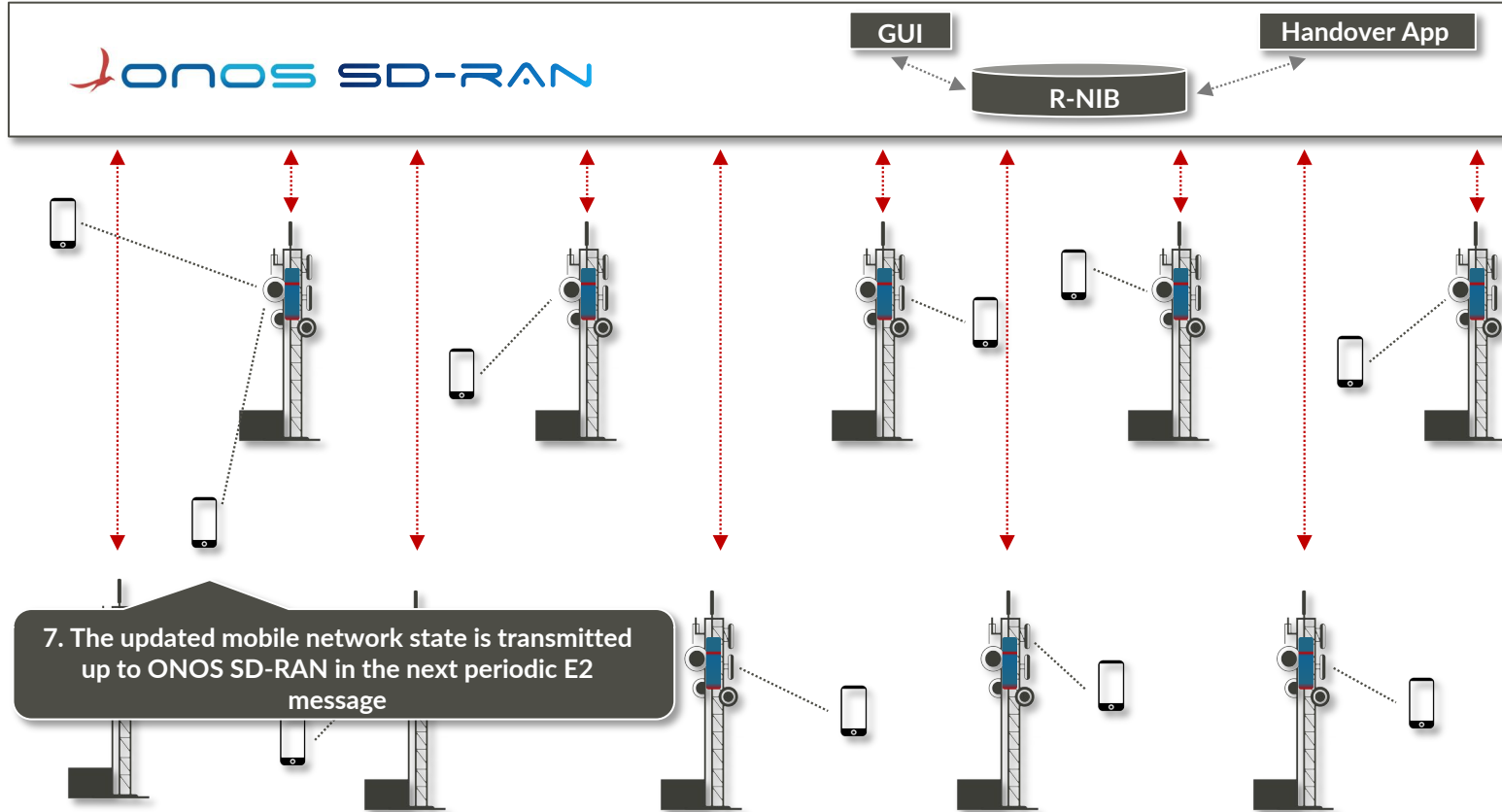
GUI

Handover App

R-NIB



# SD-RAN DEMO SETUP



# SD-RAN CONTROLLER USING ONOS

## KEY TAKEAWAYS & NEXT STEPS

### 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



### 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.