Institute for the Wireless Internet of Things
at Northeastern University

Making the Case for Open, Softwarized, Data-Driven 802 Networks

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Main Strategy So Far?

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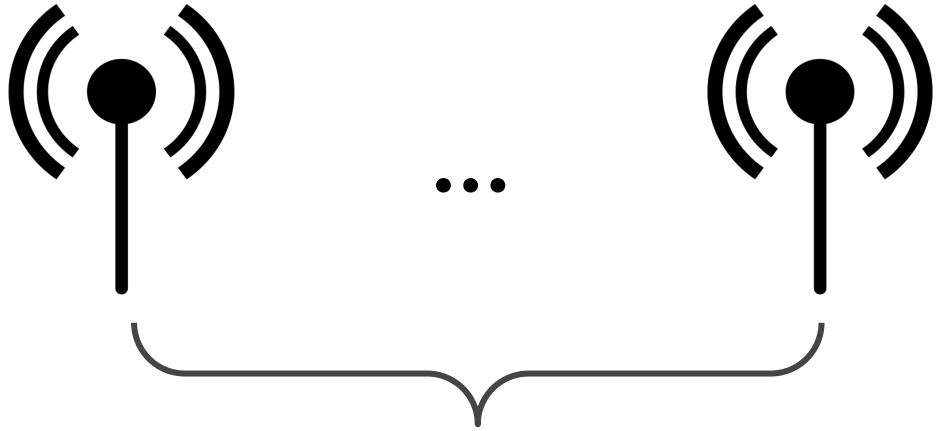
- Increase Bandwidth (2x)

160 MHz (802.11ax)

320 MHz (802.11be)

- Increase Spatial Streams (2x)



16 Spatial Streams
4 SS per STA

Garcia-Rodriguez, Adrian, et al. "IEEE 802.11 be: Wi-Fi 7 Strikes Back." *IEEE Communications Magazine* 59.4 (2021): 102-108.

Issues

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Throwing more BW and SS is likely not to be enough as a long-term strategy

Real-time AI-driven techniques will become fundamental to deal with the increased spectrum complexity

What are other communities doing about this?

The O-RAN Paradigm

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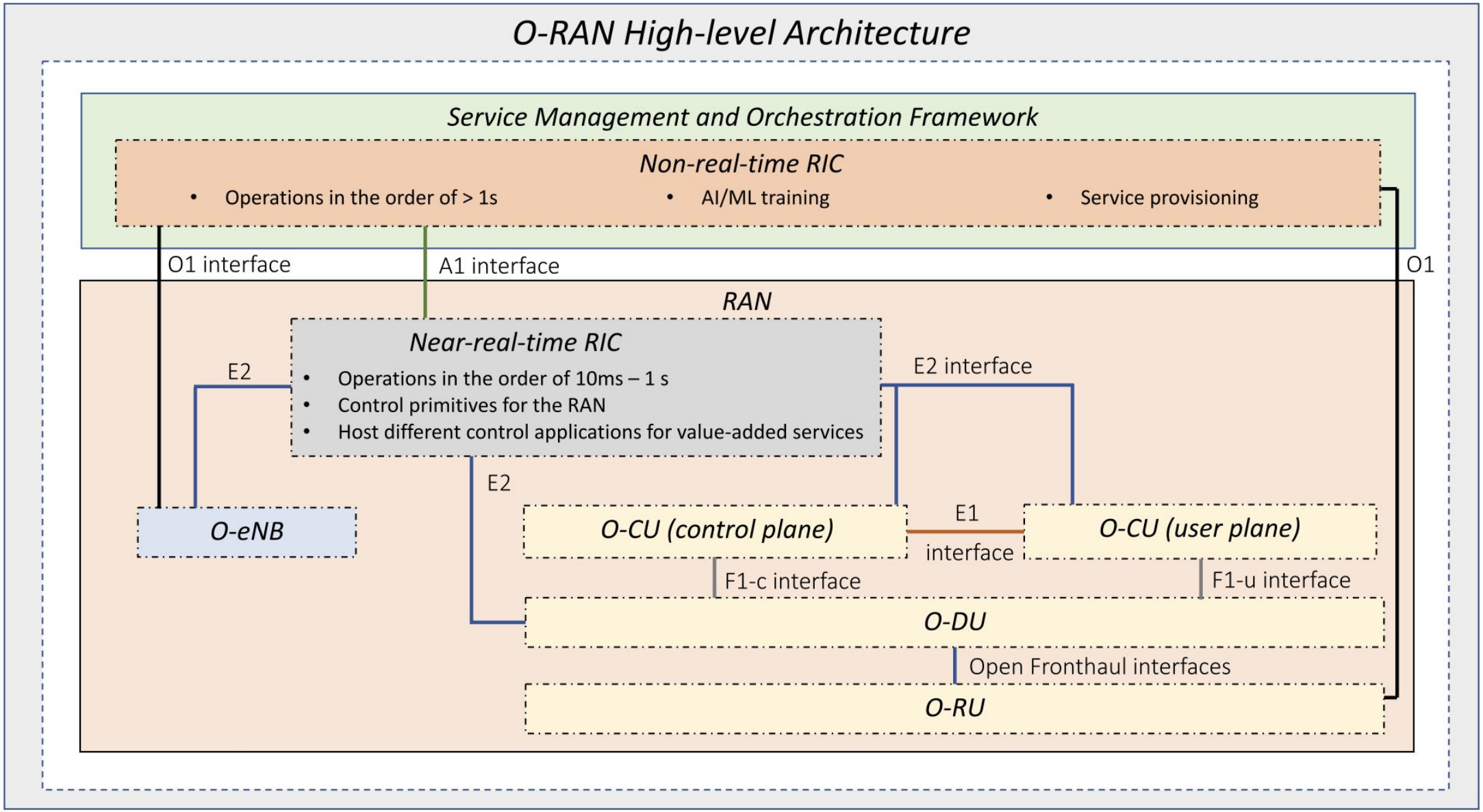

Openness Enables Full-Stack AI-based Control

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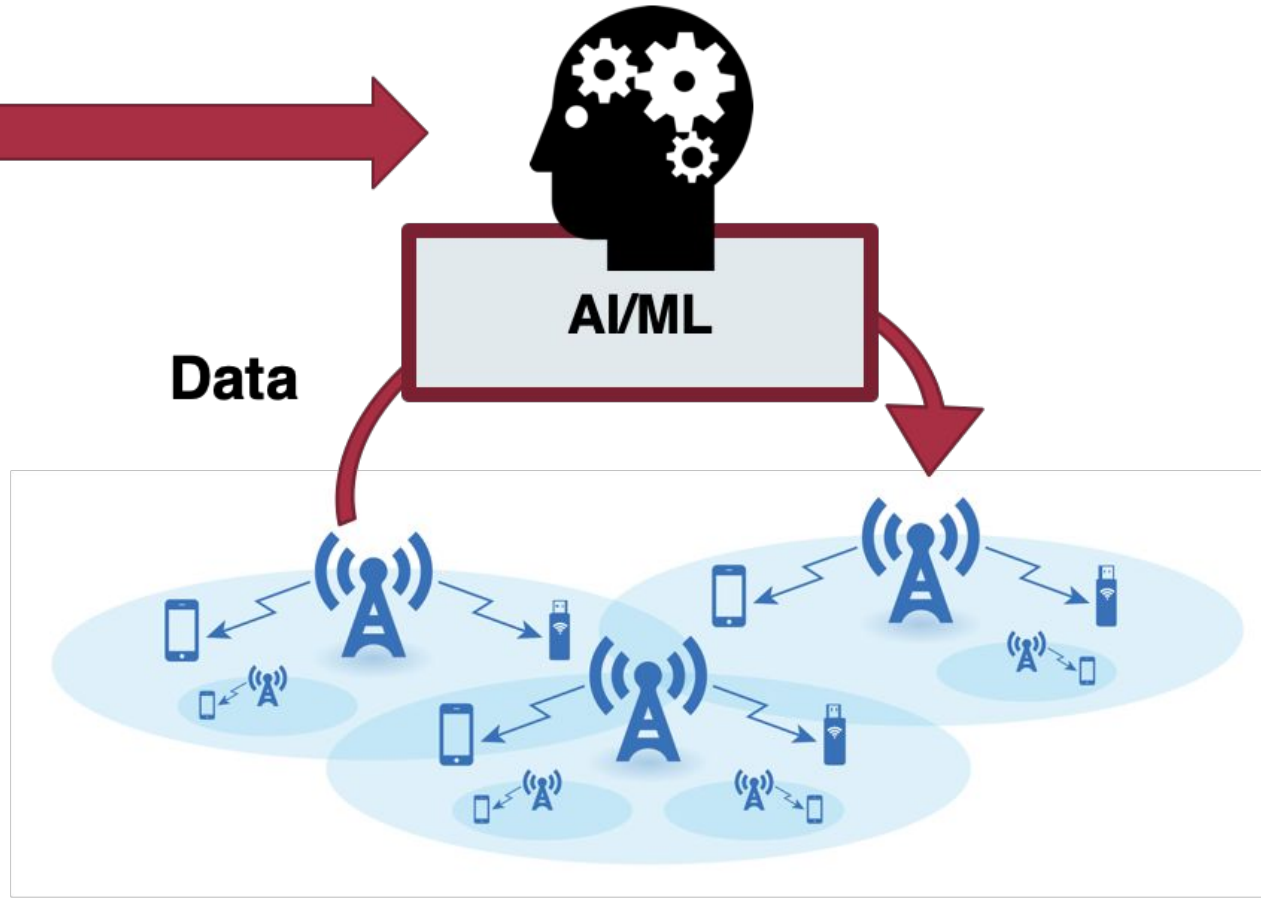
I need to stream 4K video to 100 users in Times Square, NY from 8pm to 9pm



- **Automated** software generation
- **Intent recognition**
- **Adapt** to network state and traffic demand
- **Best performance**
- **Zero-touch reconfiguration**

Advantages of Open, Virtualized Networks

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1. Disaggregation of **hardware** and **software** possible
2. AI operations can be integrated **by design** into the network
3. Interoperability enables diversity and **reduces CAPEX (60%)**
4. **Future-proof** – no rip and replace infrastructure
5. Easier maintenance results in **reduced OPEX (65%)**
6. Faster deployments, higher throughput, coverage and capacity

O-RAN market is estimated to attain a revenue of USD 419.51 Million in 2021 and USD 21,371.47 Million in 2028, CAGR of 83.1%

https://www.researchnester.com/reports/open-radio-access-network-market/2781

Parallel Wireless, "OpenRAN – 7 vital benefits for MNOs," https://www.parallelwireless.com/blog/openran-7-vital-benefits-for-mnos/

Consequences?

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Better service to the final customer

Mobile subscriptions costs going down

802 standards could become obsolete

How do we fill the current gap?

How can the 802 RM evolve?

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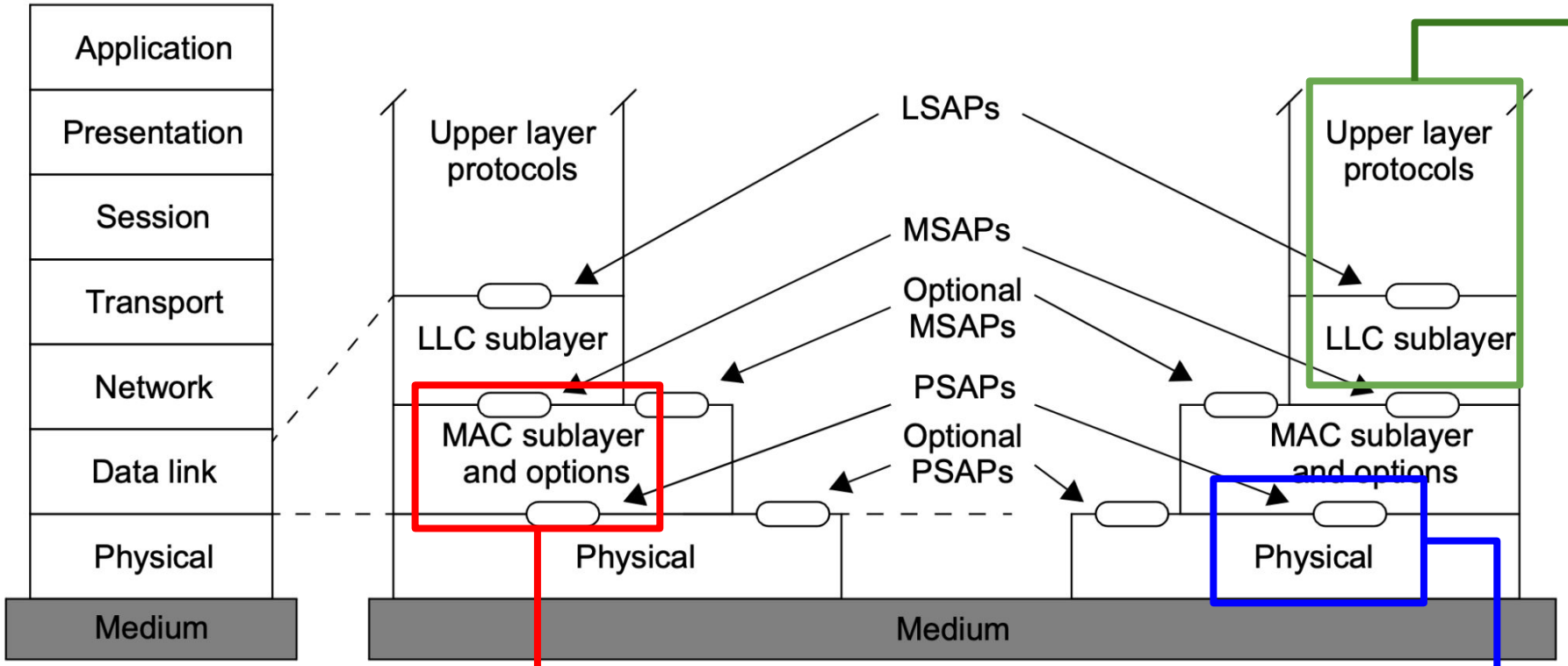
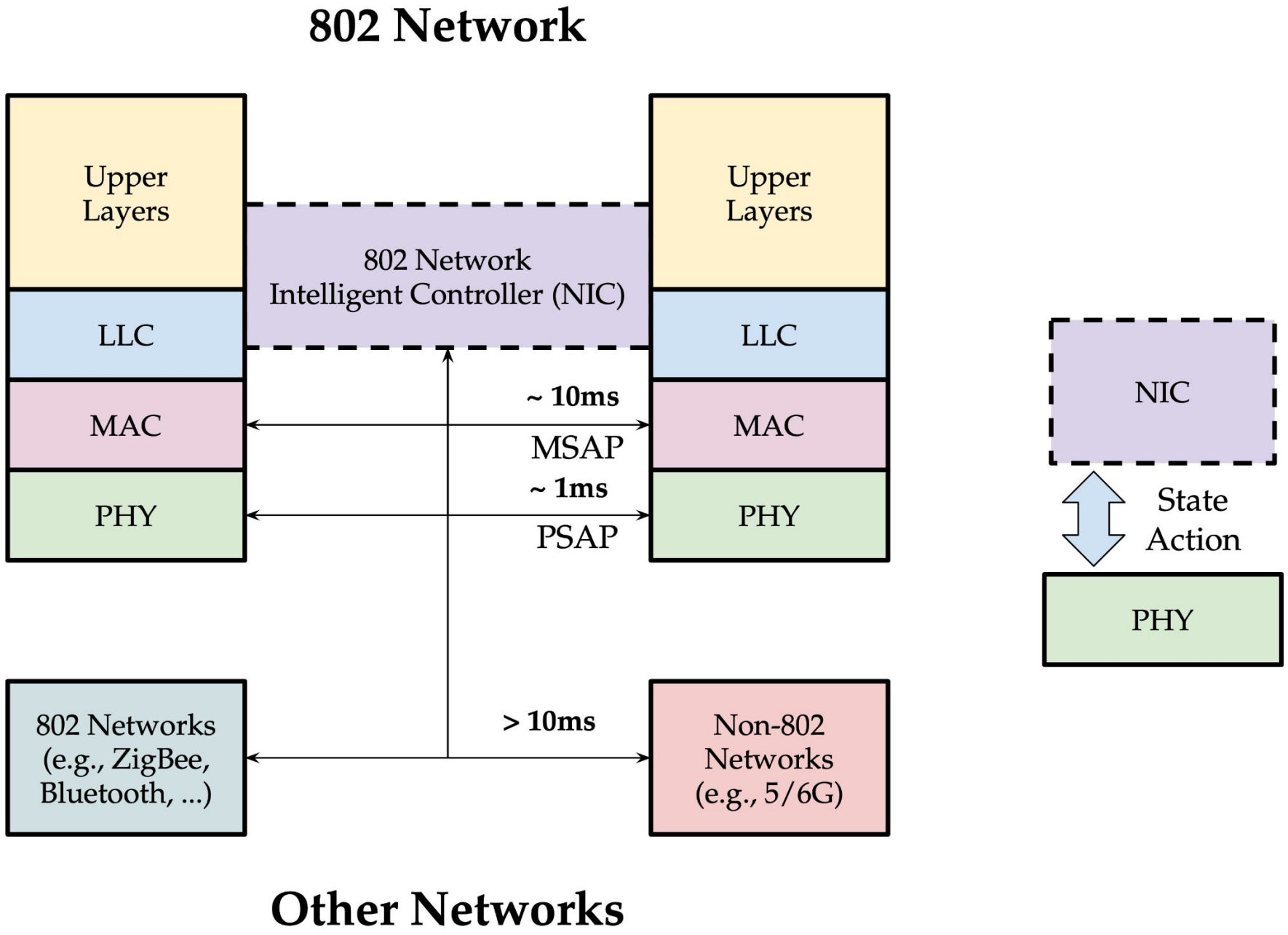


Figure 3—IEEE 802 RM for end stations

- **Modules** for distributed & centralized control of MAC/PHY,
  - for current 802 network
  - across 802 networks
  - different networks (e.g., O-RAN)
- If **centralized**, interfaces from/to central controller (e.g., AP in Wi-Fi)

Modules and Interfaces

- **Interfaces** for MAC control & monitoring (CSMA/CA, frame size, etc)
- **Interfaces** for radio control & monitoring (e.g., beams, modulation, coding, etc) and channel control (e.g., CSI)


802 Network
Upper Layers
LLC
MAC
PHY
802 Network Intelligent Controller (NIC)
Upper Layers
LLC
MAC
PHY
~ 10ms
MSAP
~ 1ms
PSAP
802 Networks (e.g., ZigBee, Bluetooth, ...)
> 10ms
Non-802 Networks (e.g., 5/6G)
Other Networks
NIC
State Action
PHY

Thanks!
Questions?