RADWAN | Rate Adaptive Wide Area Network

Physical Layer of Wide Area Networks
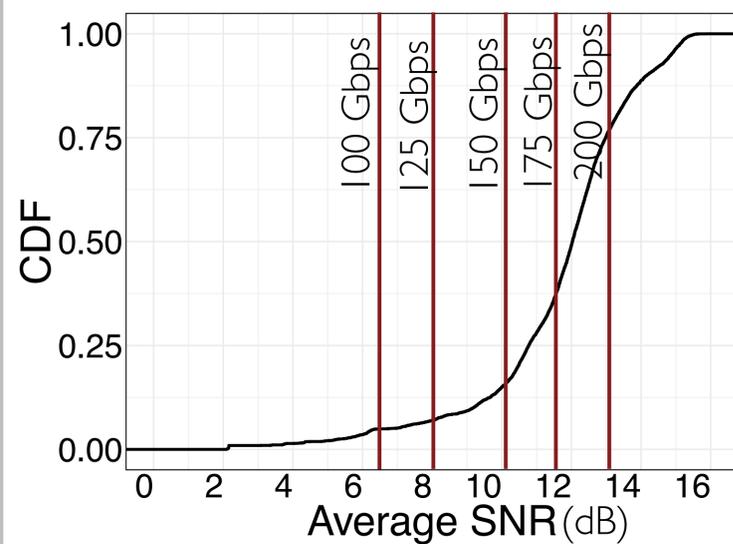
Dedicated Wide Area Network
Costs O(100) million dollars per year
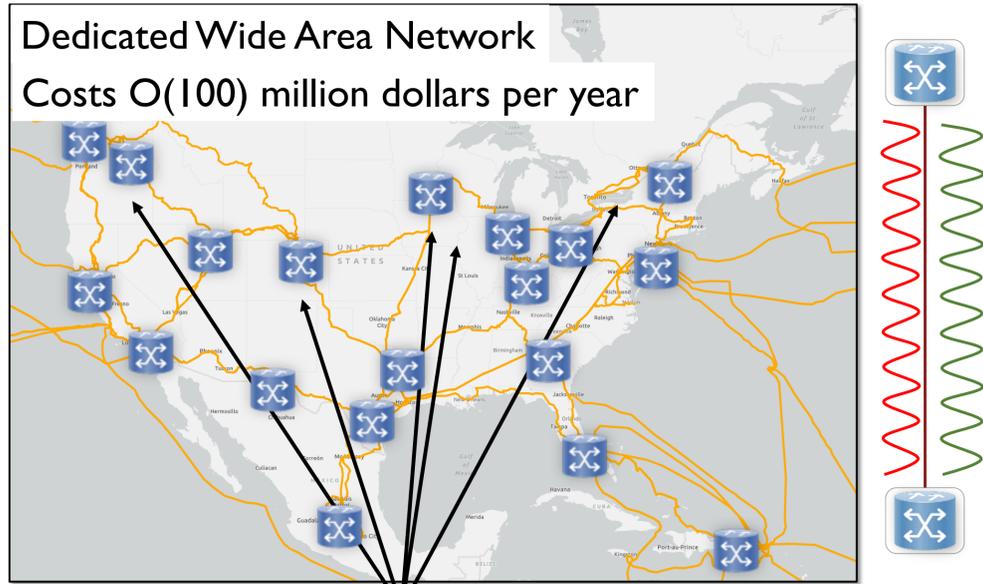
Optical Cross-connects (OXCs)

Longitudinal Signal Quality in Fiber

SNR (dB) vs Date (dd-mm-yyyy)

- 200 Gbps
- 175 Gbps
- 150 Gbps
- 125 Gbps
- 100 Gbps
- 75 Gbps
- 50 Gbps
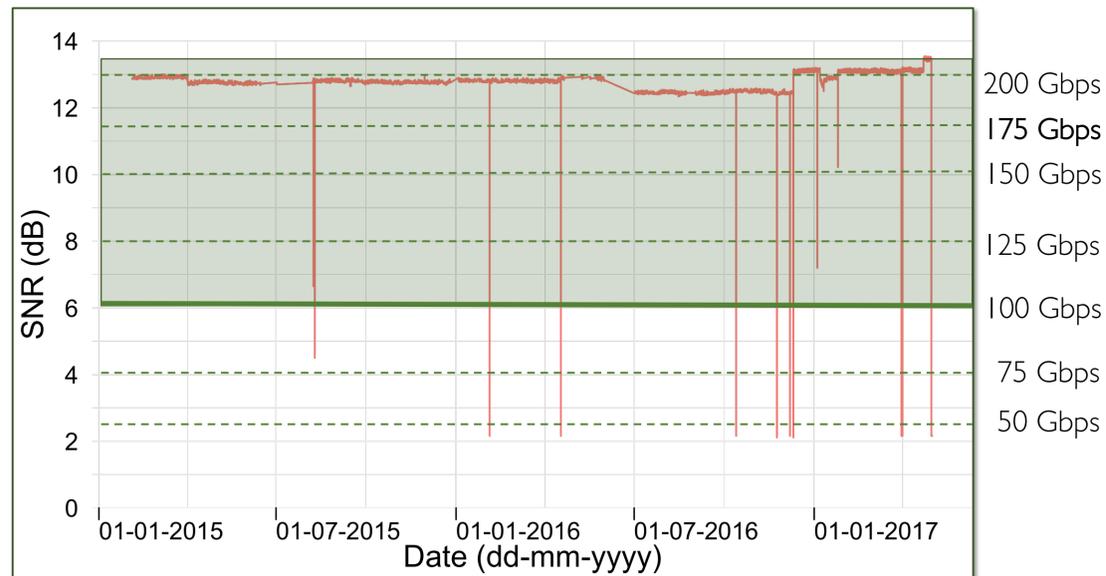
Opportunity to gain capacity and availability

CDF vs Average SNR (dB)

100 Gbps | 125 Gbps | 150 Gbps | 175 Gbps | 200 Gbps

- 64% of optical wavelengths can operate at > 175 Gbps.

- 25% of failures have SNR > 2.5dB and can be prevented by reducing link capacity to 50 Gbps

Dynamically adapt link capacities in response to changes in SNR.

Gain 134 Tbps capacity	Prevent 25% link failures
By increasing link capacity when high SNR	By reducing link capacity when low SNR

Dynamically adapting link capacities is hard

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- Hardware support for capacity reconfiguration (bandwidth variable transceivers).
- Link downtime during capacity reconfiguration.

Bandwidth Variable Transceiver

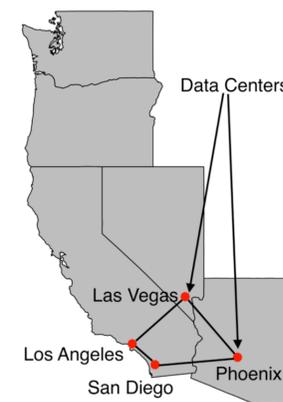## RADWAN: TE For Capacity Reconfig.

$$\text{Maximization Objective} = \sum_{all\ demands} b_i - \epsilon * \sum_{all\ links} churn(l)$$

Maximize network throughput to meet demands

Reconfigured links have one minute downtime

RADWAN achieves 40% higher network throughput compared to state-of-the-art.

Hardware testbed to mimic a WAN

Data Centers

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Los Angeles
San Diego
Phoenix

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