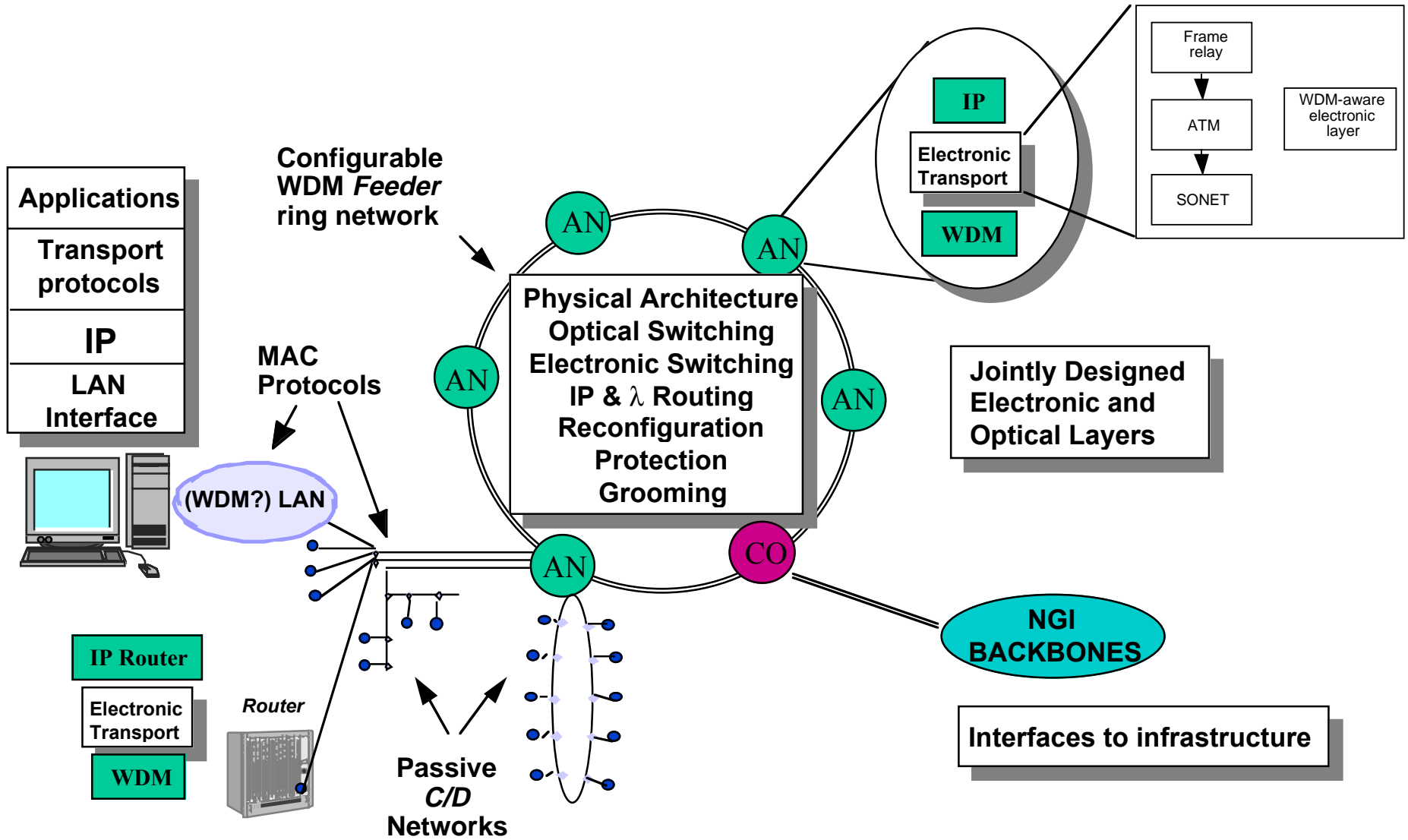


An Architecture For Broadband Internet Services over a WDM-based Optical Access Network

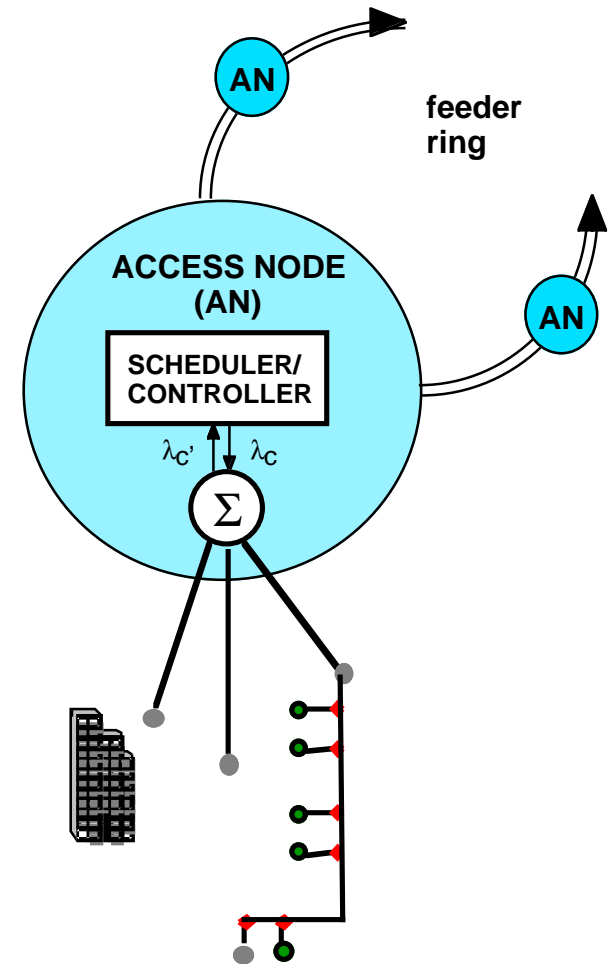
**Eytan Modiano and Eric Swanson
Advanced Networks Group
MIT Lincoln Laboratory**

ARCHITECTURES AND PROTOCOLS FOR BROADBAND IP SERVICES USING WDM

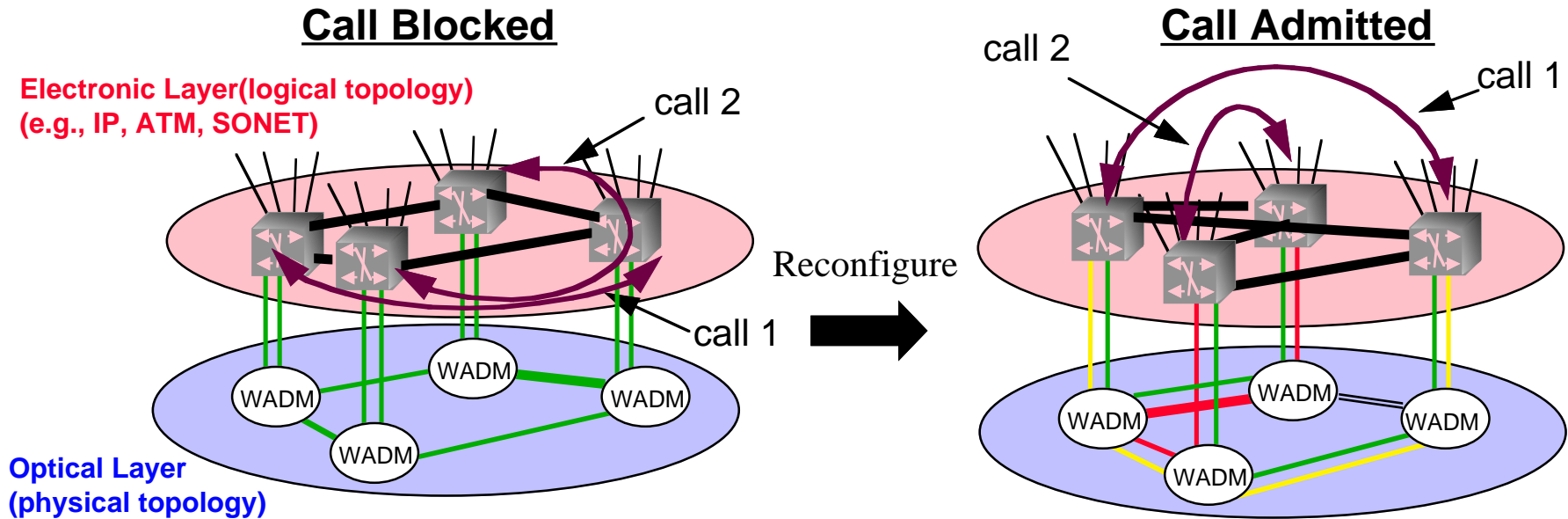


MAC protocol for passive C/D network

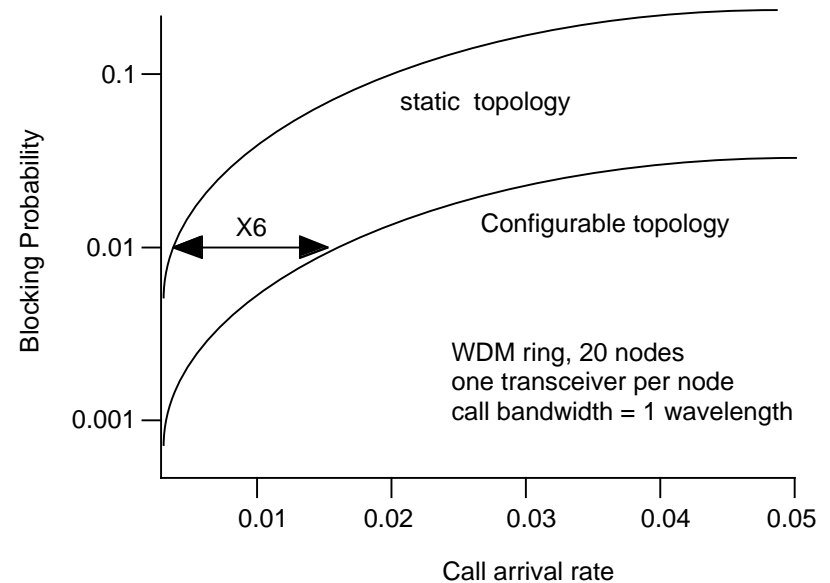
- In C/D network cost is a big factor
 - Limited equipment sharing
 - Passive components reduce costs
 - Traffic is bursty
- WDM MAC protocol lets users share fiber
 - Existing MAC protocols not well suited to the access network
 - Inefficient in high latency
 - Require slotting and synchronization
 - Multiple transceivers per node
- Simple master/slave protocol
 - No need for slotting and synchronization
 - Scheduler times transmissions to overcome effect of propagation delay => no “dead-time”
 - Scheduling algorithms that can be implemented in real-time
 - Bursty traffic
 - Multicast traffic



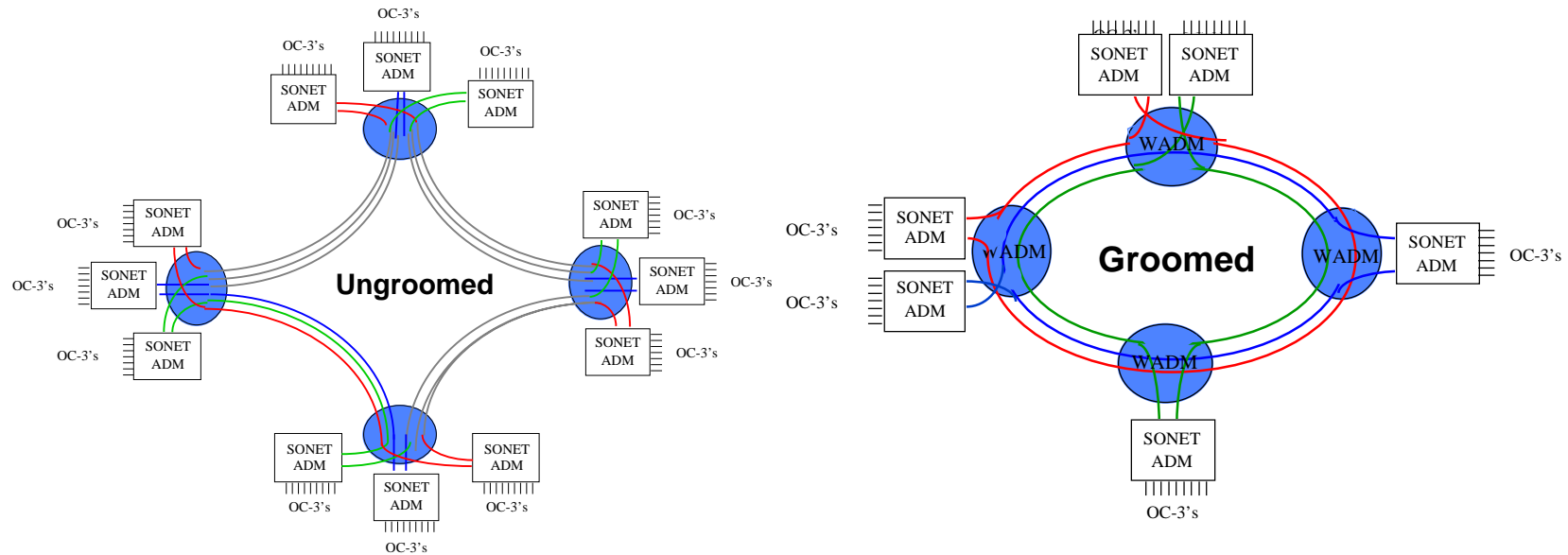
Topology Reconfiguration



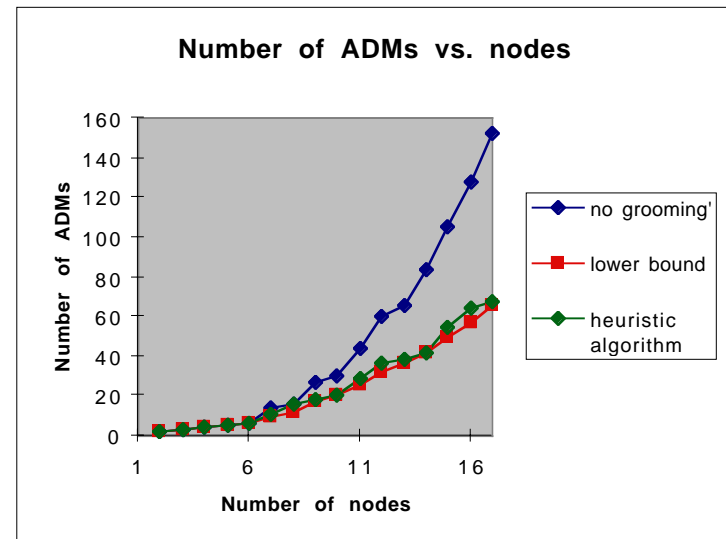
- **Reconfigure the electronic topology in response to changes in traffic conditions**
 - **Electronic switches are connected using lightpaths**
 - **Lightpaths can be dynamically rearranged using WADMs**



Traffic Grooming

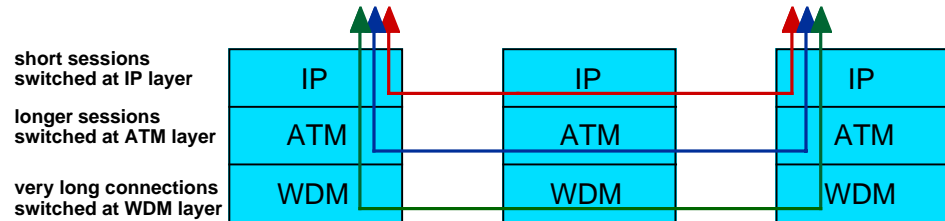


- **Groom traffic onto wavelengths in order to minimize the number of wavelengths that must be dropped at each node**
 - **Minimize number of SONET ADMs**
 - **Example:**
 - SONET ring network (OC-3/OC-48)
 - Uniform Traffic



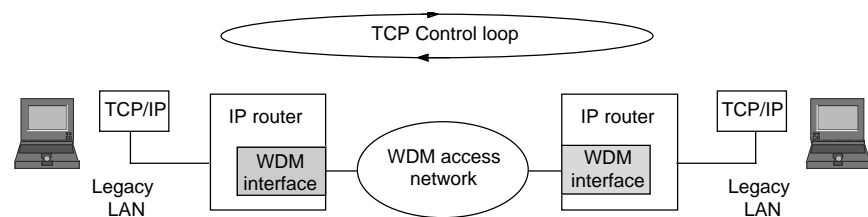
Higher layer protocol issues

- **Multi-layer switching**
 - Switch long sessions at lower layers
 - e.g., IP over ATM
 - Future: IP or ATM over WDM



- **IP routing**
 - instabilities due to rapid topology changes

- **TCP flow control**
 - Slow response
 - Ineffective in configurable WDM environment



- **Optical vs. electronic protection**