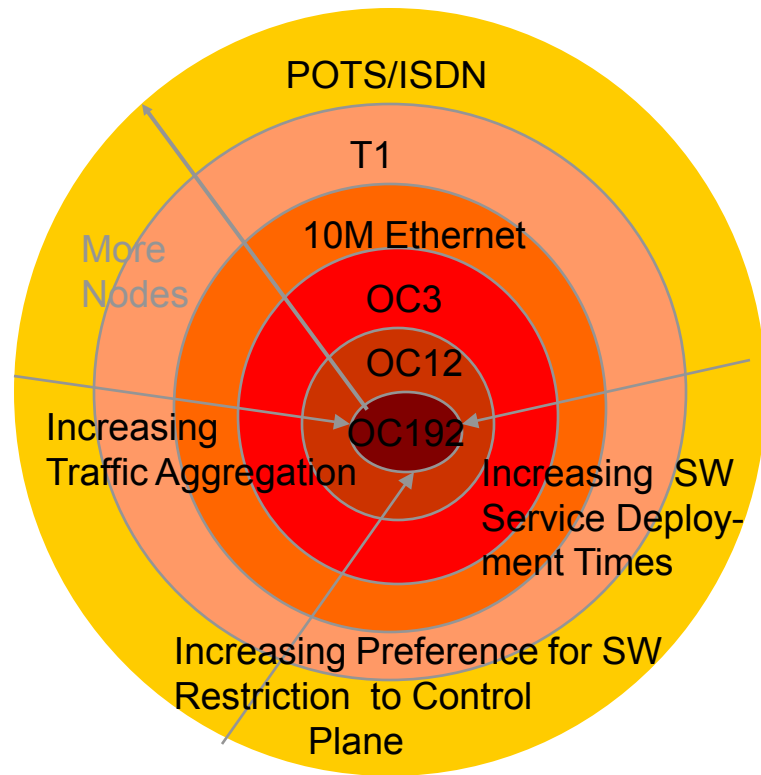


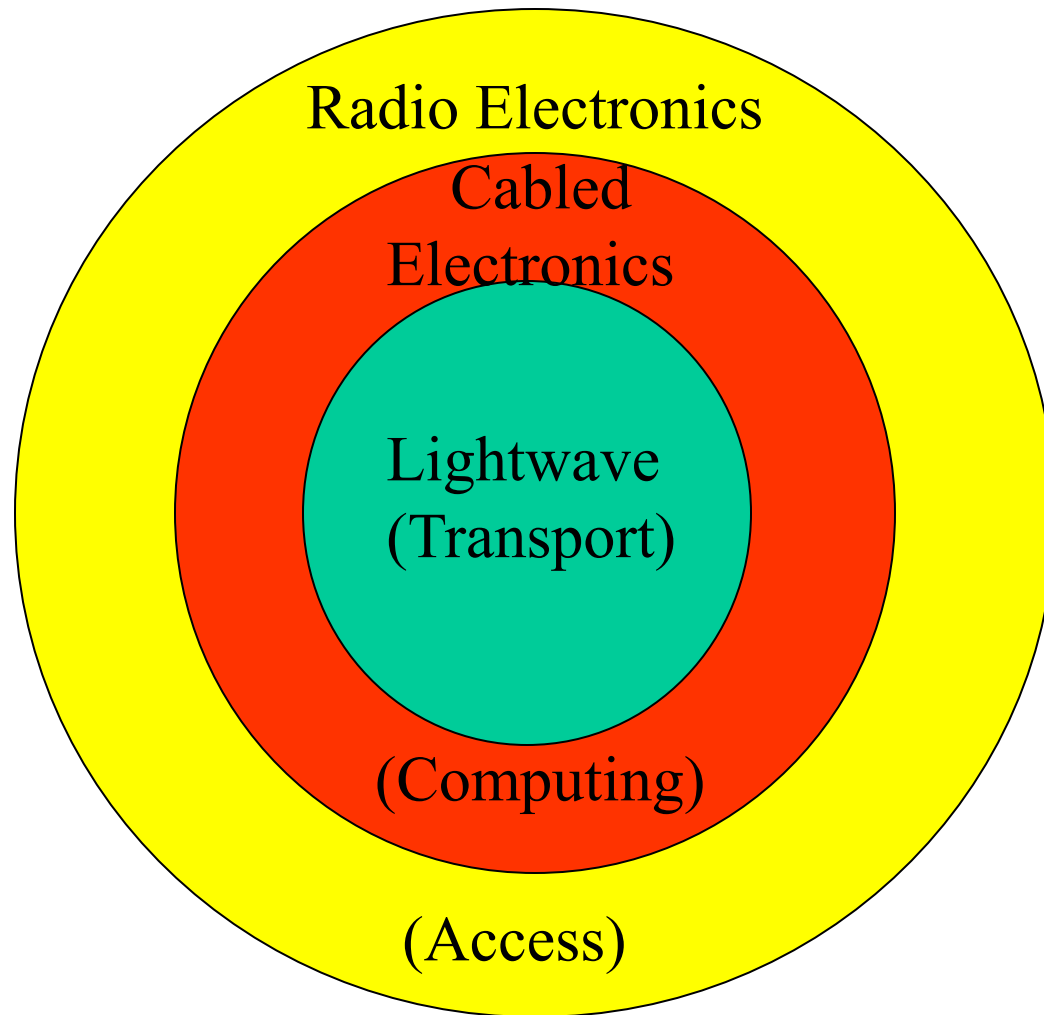
REAL Networks

Jonathan M. Smith
University of Pennsylvania

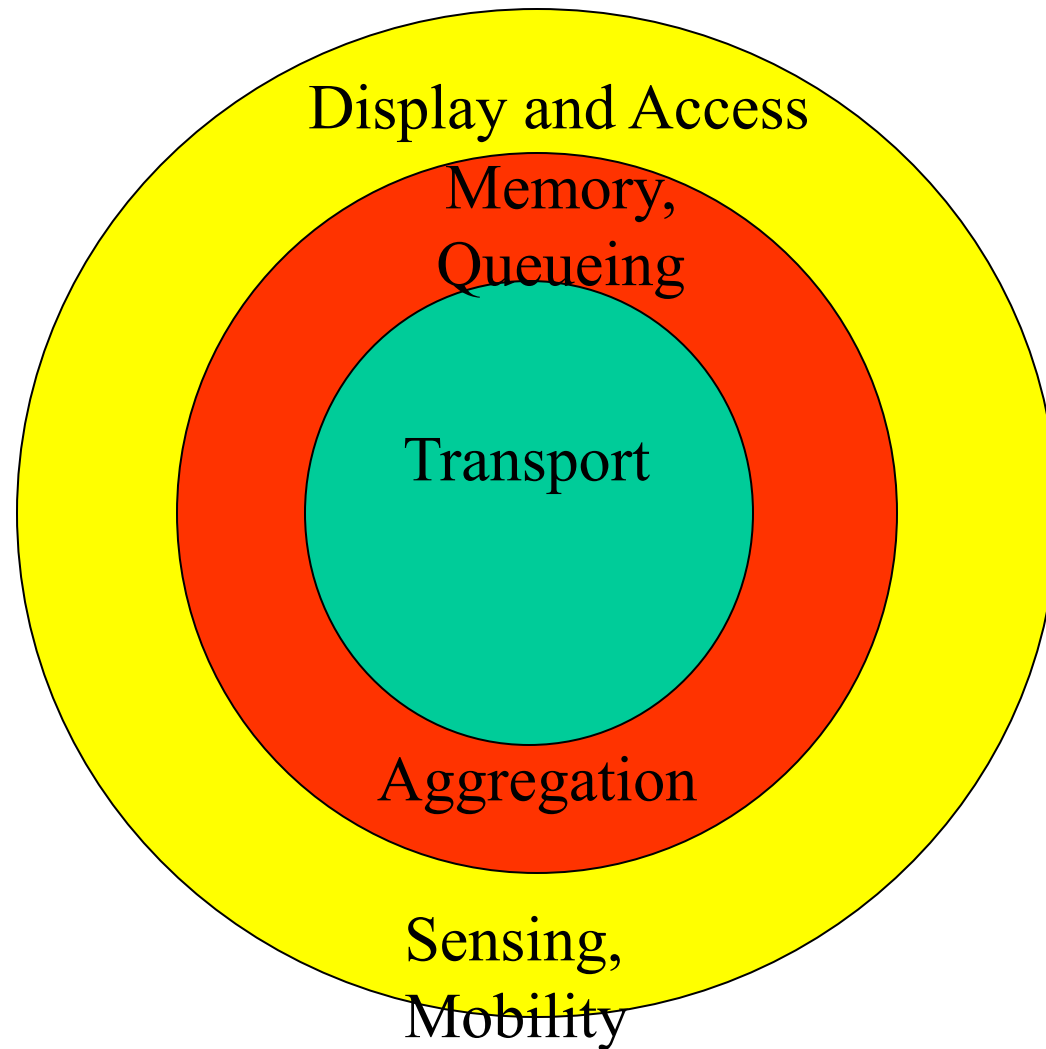
Network Design Pressures:



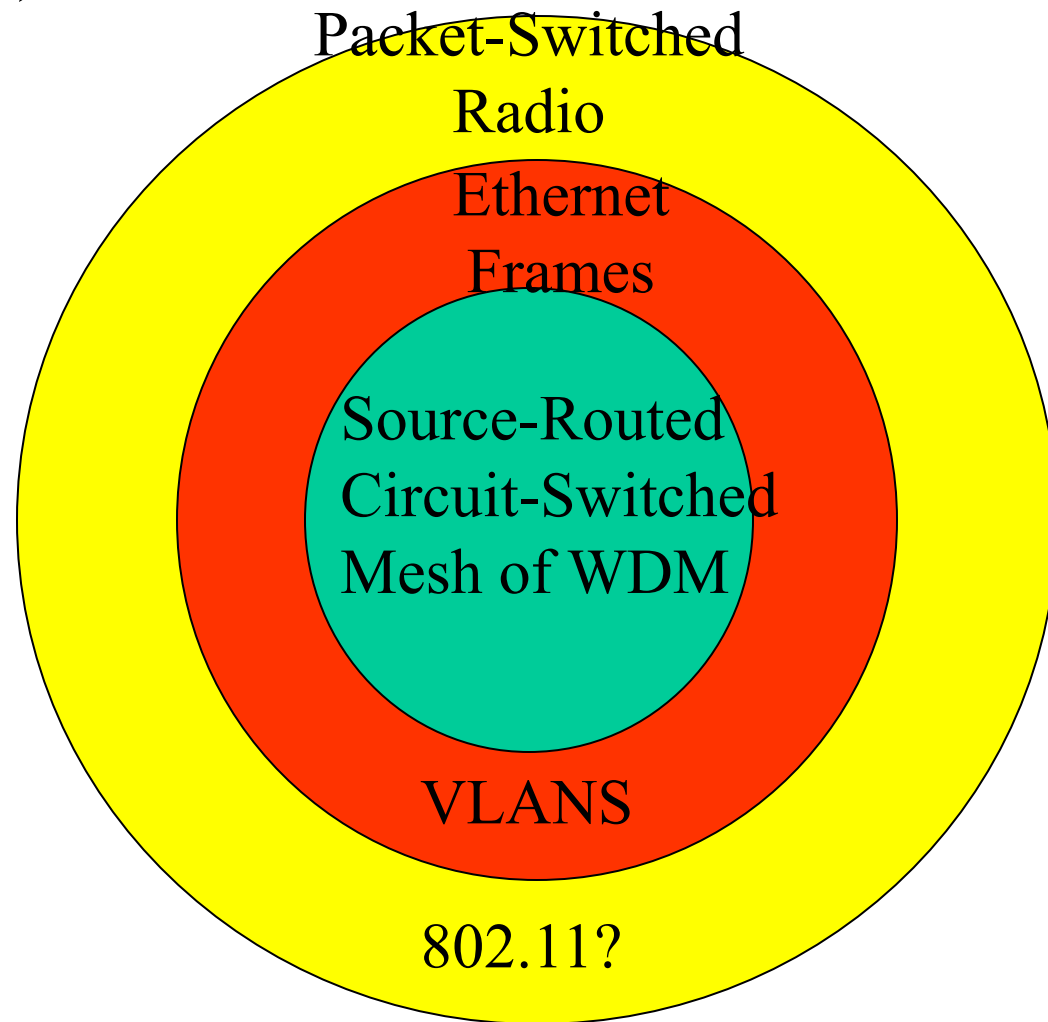
Radio, Electronics and
Lightwave (REAL):
Technologies



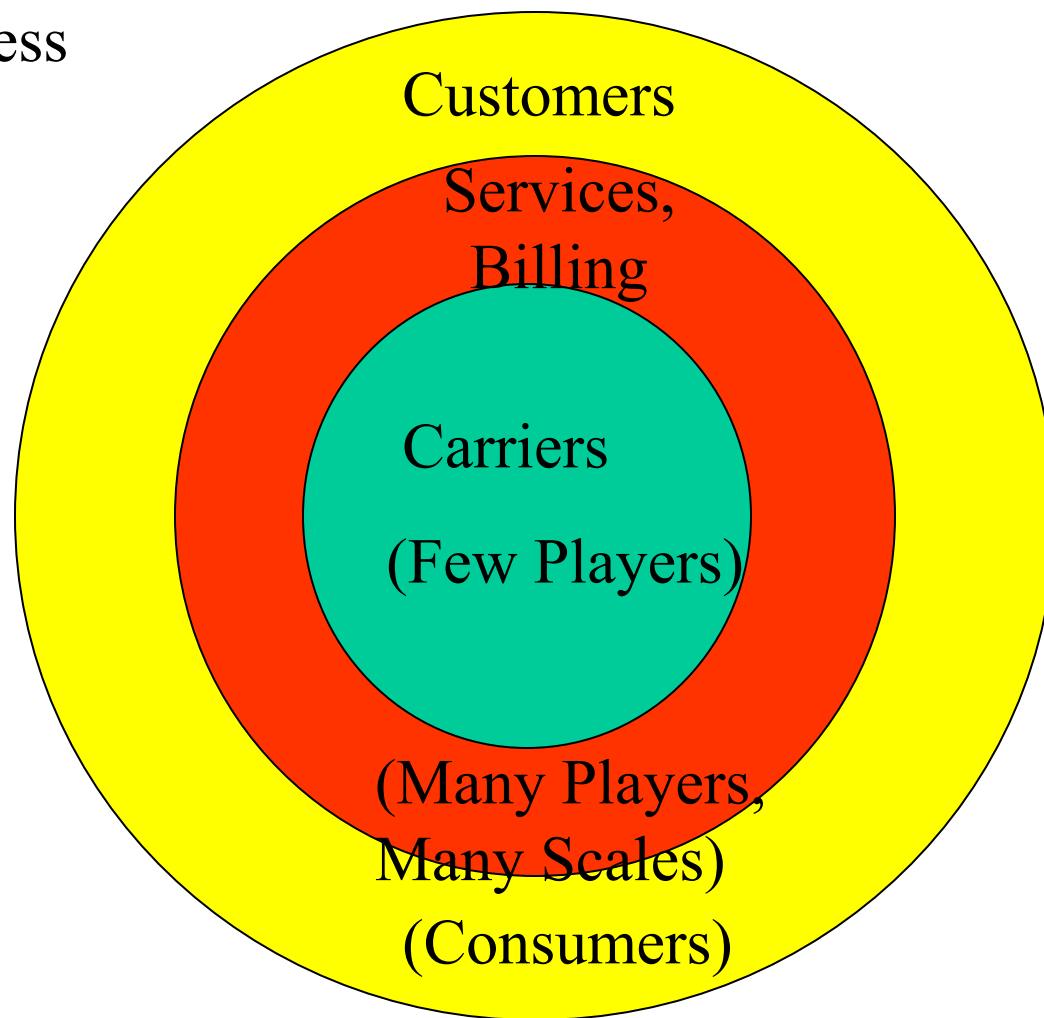
Radio, Electronics and
Lightwave (REAL):
Functions



Radio, Electronics and
Lightwave (REAL):
Networking

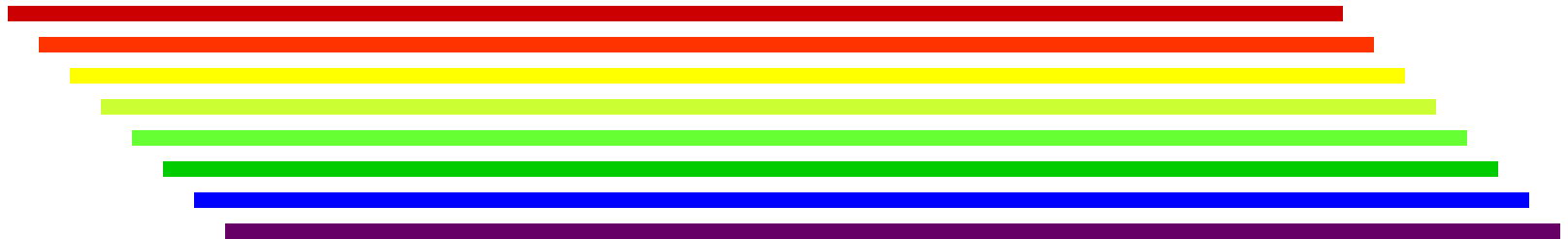


Radio, Electronics and
Lightwave (REAL):
Economics/Business



Optical Portion

- Optical network is about real estate
 - Underwater, bridge-crossings, miles=\$\$
 - Optical DWDM preferred
- Easy to build circuits, easy to build optical “mesh” from colors
- Hard to build memories, logic circuits and familiar switching elements



Electronic Portion

- This will look to devices at its edge just like an Ethernet of today
- Pure 802.11/802.3 bridges easy
- Natural LAN speeds, economics
- Track Moore's Law for electronics
- Dynamic Routing/Switching/Crypto, all of traditional IP here - but basic network looks like VLAN

Radio Portion

- Variety of wireless devices
 - IP clients (laptops?)
 - (mobile?) Ad-hoc networks (timescales?)
 - Sensors / Actuators
- Locus of DRM/Identity
- Locus of HCI (display, audio, *etc.*)
- Likely “circuit-like” model (*viz.* TCP)
- Base-station real estate important, not wireline access real estate

Routing

- Source routing from E/O (thru mesh)
- Routing R/E - probably selection of VLAN
- Ideal role for IP - IPSEC tunnels, VPNs
- How to deal with QoS for media streams?

Open Architecture

- Interesting access models questions
 - Will code download onto mobiles?
 - Will mobiles customize their access networks from malleable software?
 - Will the toll-takers live in the wired electronic “services” ring, or elsewhere?
- Continued need for safe sharing of resources

AN: Model for R/E gateway

- Active Networks: *code* migrates
- Natural for thin clients
- Natural for enhanced services
- Natural for “low” bandwidth edge using high-bandwidth core services
- Accelerate Service Deployment

And IP?

- IP may be used as a legacy overlay
- But Ethernet VLANs win (bridging)
- IP may run on wireless devices as a legacy overlay
- But 802.11x wins (bridging to 802.3)
- IP at VLAN interchanges???

Thanks

- Folks with whom I've discussed this:
Andy Herbert, Jon Crowcroft, Derek McAuley, Ian Pratt, Ian Wakeman, Paul Barham, Rebecca Isaacs, Roger Needham (RIP)
- Support includes:
 - DARPA
 - NSF