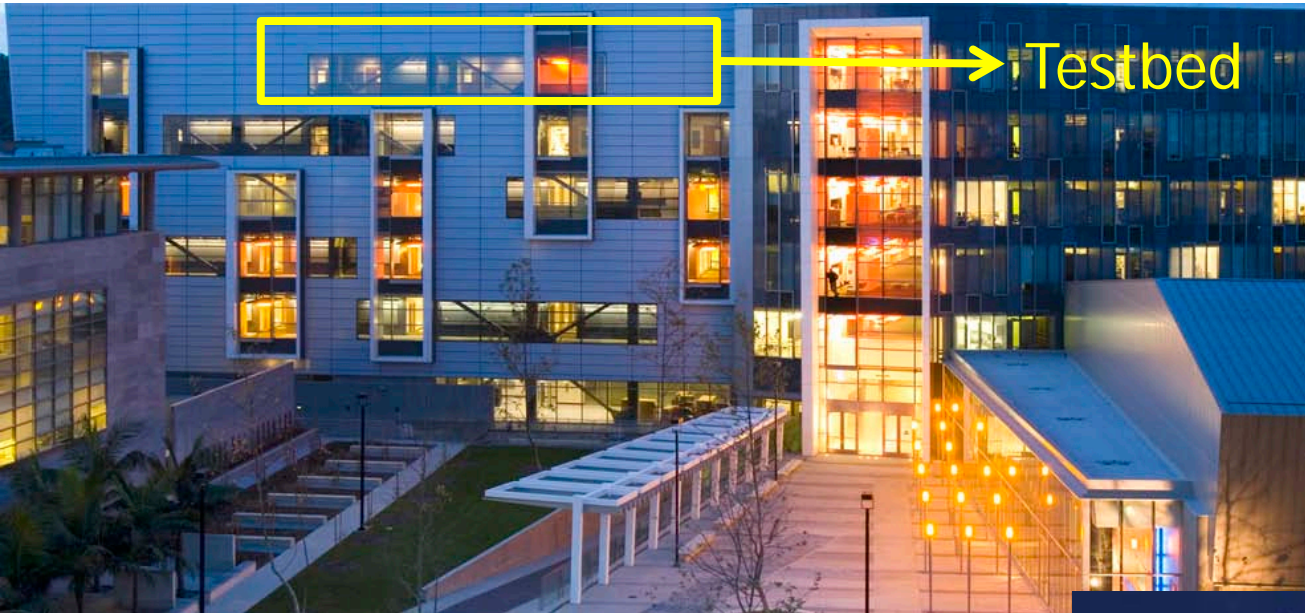

SYSTEM INTEGRATION and HYBRID NETWORK TESTBED

Thrust 1 Optical Communication Systems and Networking
WG1 and WG2

Stojan Radic and Camille Bres



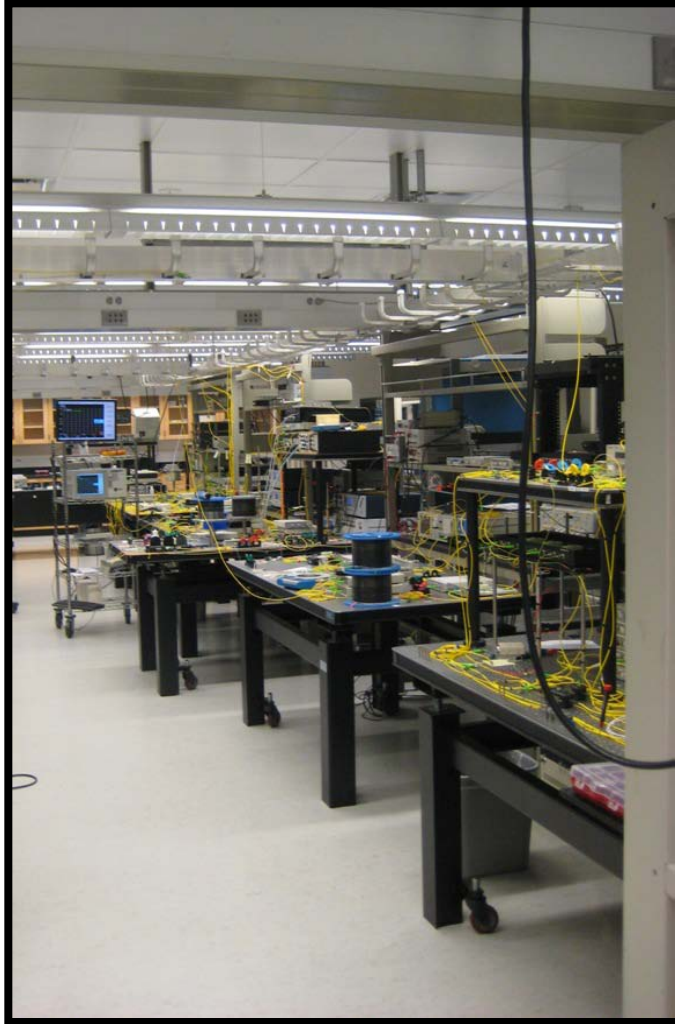


California Institute for Telecommunications
and Information Technologies
(CALIT²)



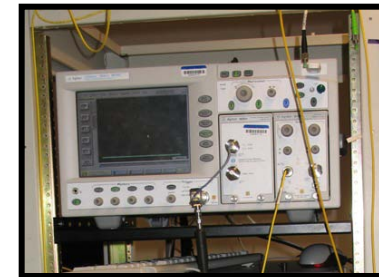
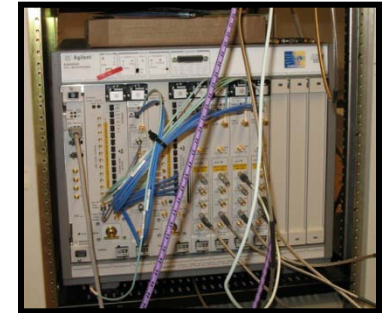
CENTER FOR
INTEGRATED ACCESS NETWORKS

System Integration Testbed UCSD



Testbed Equipments

- Tunable lasers (Agilent, Luna)
- Narrow linewidth, high power lasers (NP photonics)
- 50GHz Real time oscilloscope (Tektronix)
- 10GHz, 40GHz signal generation (Agilent)
- Optical spectrum analyzers (Agilent, Yokogawa)
- Oscilloscopes (Agilent, EXFO)
- MHz-resolution true heterodyne optical spectrum analyzer (Agilent)
- Polarization analyzer (Agilent)
- Network analyzer (Advantest)
- Dispersion characterization
- Optical boosters (IPG)
- Simulation software (VPI)



Network testbed insertion

□ Application areas

- High capacity/mixed channel distribution and high exchange rate across wireline/wireless platforms

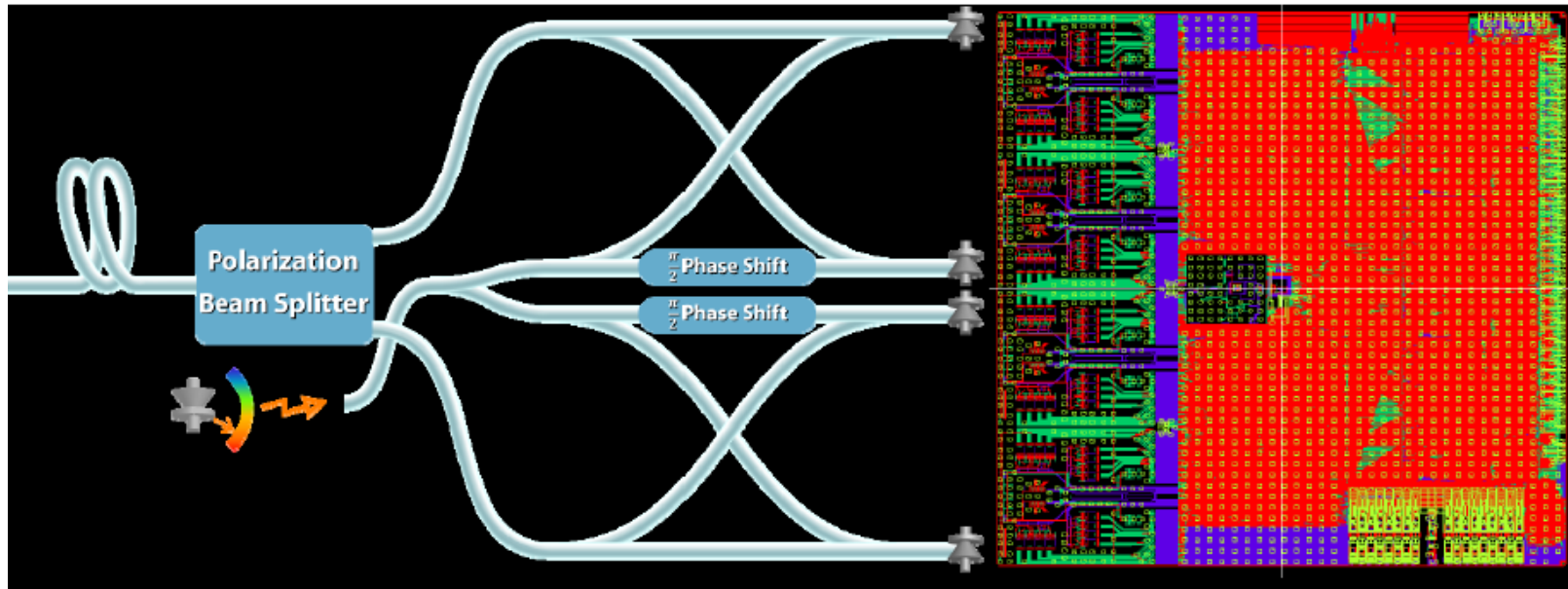
□ Testbed insertion

- WG1: Signal Translation efficiently implemented at the physical layer, Wavelength selective switches (Transparent routing), tunable laser
- WG2: Intelligent Cross-Layer Optimization, Dynamic Resource Allocation, format and bandwidth transparent processing units



Optical processing – Motivation

Conventional approach: all-electronics – “wireless-like”



Unsustainable with respect to:

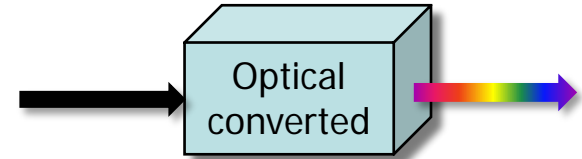
- Dissipation,
- Scalability,
- Channel Rate.

Optical processing – what role?

- Not compatible with **complex** operations
- Increased optical-layer **functionality**
- Much **faster** than picosecond (GHz)
- Can be used for specialized spectral/temporal, **fast** manipulation.
- Serves as a **bridge** to electronic plane, *not as an competing technology*

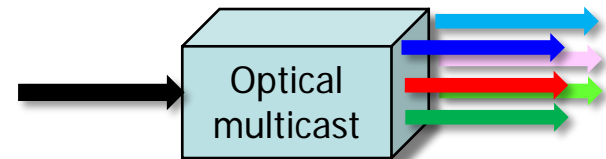
Mixed channel data distribution

- Compatible with intelligent and dynamic allocation
 - One to many, one to one, many to many
 - Format transparent
 - Low loss
 - Flexible bandwidth allocation



Wavelength conversion

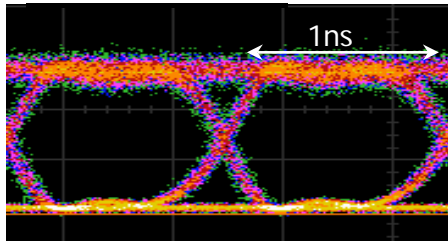
Industrial partner: LUNA Innovations



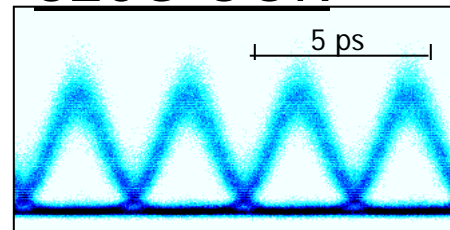
Broadband and Hybrid Multicasting

Industrial partner: Lockheed Martin

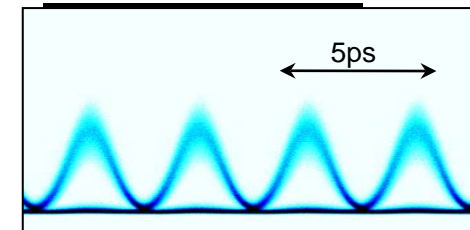
10G OOK



320G OOK

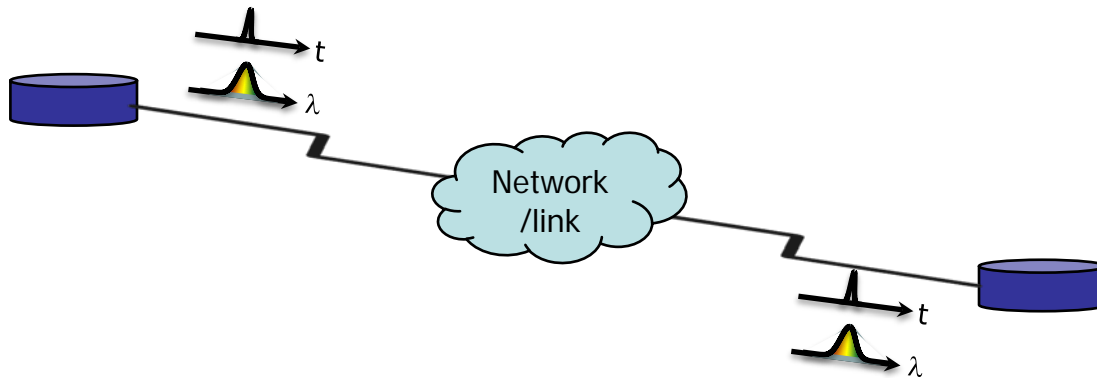


320G DPSK



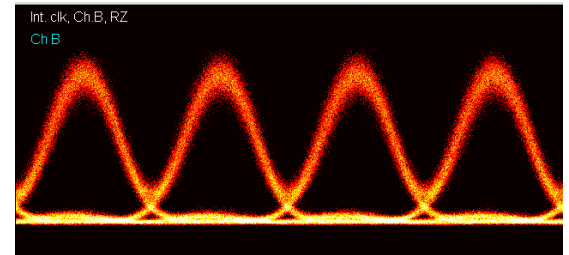
Channel data transmission

- Compatible with dynamic allocation
 - Format transparent
 - Wavelength transparent

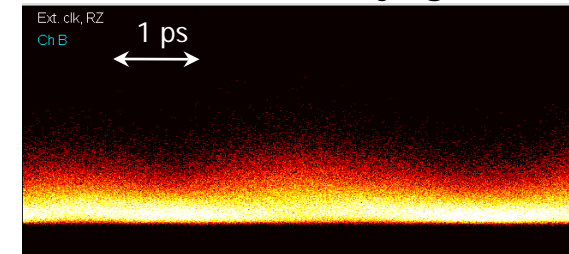


Industrial partner: Alcatel Lucent

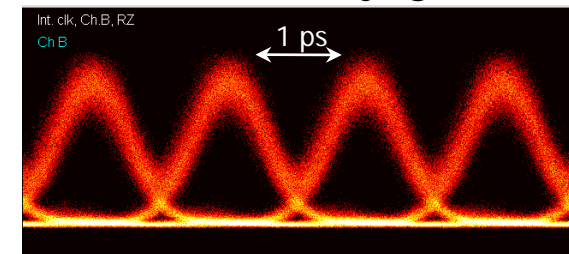
Input



100 km w/o conjugation



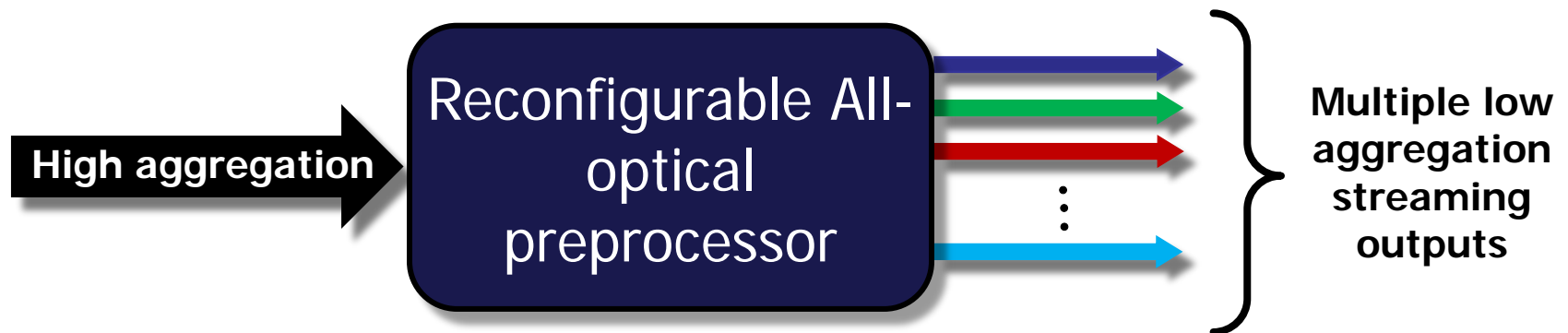
100 km w/ conjugation



Wireless and Hybrid Data Preprocessing

- All optical signal deconstruction, real-time Data Acquisition
 - Any Format, Any Rate
 - Analog or Digital
 - Phase or Intensity

University partner: UCLA



System integration testbed

- Main testbed for optical processing and transmission
- Development of all-optical unit for data distribution
 - to be connected to the scalable data center at UCSD
 - Compatible for integration with the cross-layer optimization testbed from Columbia University
- System oriented environment
- Unique test capabilities for component integration and measurement of key performance metrics

