

On Next-Generation Metro and Access Networks

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- **Institute of Advanced Telecommunications (IAT), Swansea University**
 - ✓ A research-centred institute focusing on all aspects of telecommunication technologies.
 - ✓ 13 academics and core research assistants with proven expertise and international profile
 - ✓ Specialized and state-of-the-art labs with capital assets valued at over £4M

- **Photonics research group**
 - ✓ DWDM transmission
 - ✓ Advanced modulation techniques for 100+ Gbit/s
 - ✓ Fiber optical parametric amplifiers (OPAs)
 - ✓ Components and networks research
 - ✓ Optical regeneration, wavelength conversion, and WDM sources
 - ✓ Advanced Erbium-doped amplifier (EDWA)

▪ **Wireless research group**

- ✓ **Signal processing for communications**
 - ✓ **Smart antennas/MIMO, adaptive/iterative receiver design, space-time coding**
- ✓ **Digital communications**
 - ✓ **Adaptive coding & modulation, multiple access (OFDM, CDMA, MC-CDMA)**
- ✓ **RF & Microwaves**
- ✓ **Systems**
 - ✓ **e-Health, intelligent transportation systems**

▪ **Networks Research Group**

- ✓ **Wireless networking**
 - ✓ **Mesh/ad-hoc/sensor networks, radio resource management**
- ✓ **Access & metropolitan area networks**
 - ✓ **WiMAX, TDM/WDM PONs, hybrid optical-wireless networks**
- ✓ **Network security & QoS**
 - ✓ **Internet security, multi-channel scheduling**

- **Bandwidth-hungry services (e.g., VOD, IPTV)**
 - ✓ Increase the amount of *network infrastructure*
 - ✓ Increase the network *energy consumption*
 - ✓ Increase the data-driven *network crashes*

- **Due to:**
 - ✓ Unbalance in capacity between core and access
 - ✓ Mismatch between service/usage models and network infrastructure
 - ✓ Large number of power-hungry and error-prone electrical components/systems

▪ **Changes in network architecture**

- ✓ Performance → *Energy Efficiency* driven design
- ✓ Static → *Dynamic, Reconfigurable* network
- ✓ Dedicated → *Shared* resources
- ✓ Separate, complicated → *Integrated, Simplified* management layers/interfaces
- ✓ Unbalanced → *Balanced* bandwidth link utilization

▪ **Enabled by rapid development in core technologies**

- ✓ Burst-mode communications
- ✓ Optical packet/burst/flow switching
- ✓ Fast tunable optical components

- **Optical-wireless convergence**
 - ✓ **Mesh (multi-hop) networking and 4G will be key technologies**

- **Metro-access integration**
 - ✓ **Common network architecture for both**

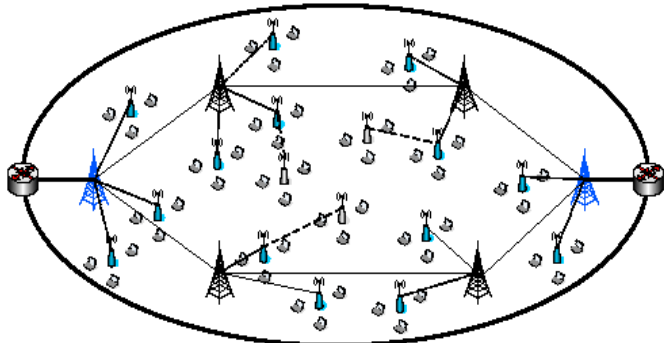
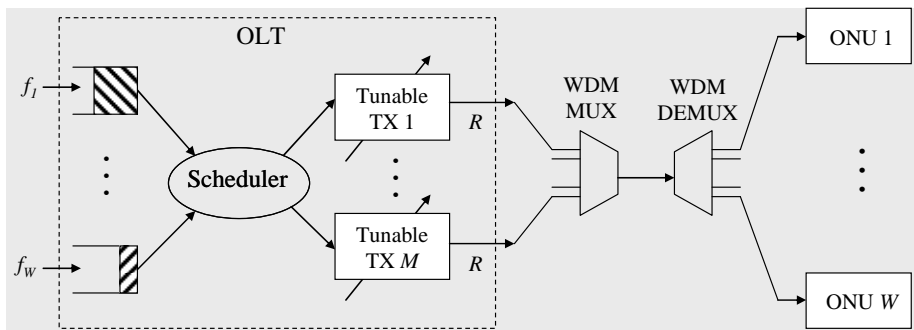
- **Strategy for upgrading existing optical infrastructure (e.g., SONET ring & TDM-PON)**
 - ✓ **By introduction of WDM?**
 - ✓ **Through either WDM or hybrid TDM/WDM (with tunable components)**
 - ✓ **By extension of TDM?**
 - ✓ **Through longer-reach, higher-speed, and higher-split TDM-PONs**

■ **Metro/Access**

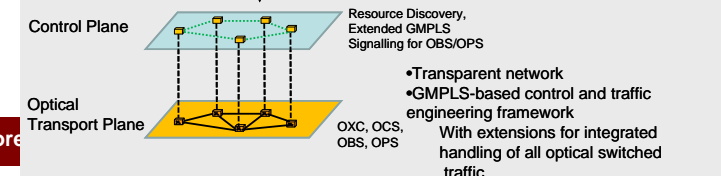
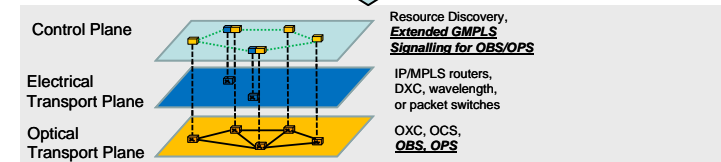
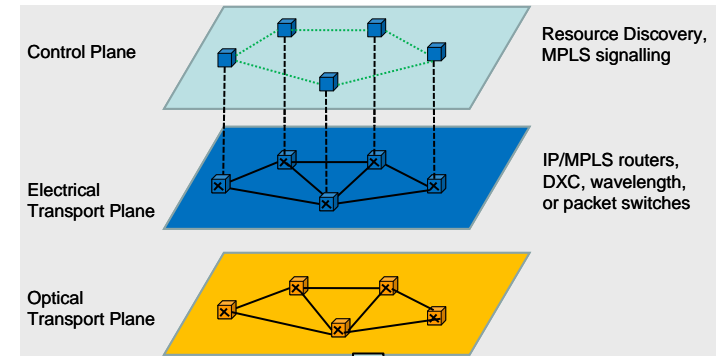
- ✓ Multi-channel scheduling with tunable transceivers in WDM optical networks
- ✓ Wi-Fi Cities: Hybrid two-tier wireless metro/access networks

■ **WAN**

- ✓ MiSON: Evolution Strategy toward Future All-Optical Networks



optical backbone node
 WIMAX base station
 optical link
 wireless link
 wireless gateway
 wireless mesh router
 wireless end user



- **Preparation of joint research proposals for FP7/ICT with Korean partners**
 - ✓ **Multi-channel scheduler with tunable transceivers in WDM optical networks**
 - ✓ **Ongoing collaboration with Stanford (through SUCCESS and GROW-Net)**
 - ✓ **ETRI and LG (through their WDM-PON experience in Korea) could be potential partners, especially for test bed implementation.**

 - ✓ **Wi-Fi Cities**
 - ✓ **Need good expertise in WiMAX (WiBro) base station in studying interfacing between WiMAX and WLAN mesh.**

 - ✓ **MiSON**
 - ✓ **Ongoing collaboration with BT**
 - ✓ **KT and other network operators could collaborate with BT through this project.**



Thank you for your attention!

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