# Structure of the thesis

**Environment**

Optical Packet Switching: cope with the electronic bottleneck exploiting the statistical multiplexing directly in optical domain; the optical packets travel along the network transparently while the headers are converted in electrical domain at each hop to take forwarding decisions.

**In this dissertation**

Quality of Service is defined by IETF (RFC 2386) as *"the complete set of service requirements to be met by the network while transporting a flow"*. This dissertation mainly focuses on providing QoS in both wide area and metropolitan environment using OPS environment assigning/managing/controling resources such that not all customers are treated the same.

**OPS-based metropolitan area networks**

Scenario: two composite network topologies

- Multi-PON topology
- Multi-ring topology

Tasks

- Identification of the service requirements
- Optimization of the proposed schemes
- QoS supporting all types of services
- Benchmarking study

*Identification of the service requirements*

- Guaranteed service: data with real-time constraints.
- Priority service: data near-real-time, less delay and bandwidth-sensitive.
- Best-effort service: data that can be sent at the leisure of the node.

| *Multi-PON* | *Multi-ring* |
|---|---|
| Related work<br>• MAC protocol<br>• QoS supporting Best-effort and Guaranteed services | Related work<br>• MAC protocol<br>• QoS supporting Best-effort and Priority services |
| Contributions<br>• Optimization of MAC protocol<br>• Support of Priority service | Contributions<br>• Optimization of MAC protocol<br>• Support of Guaranteed service |

*Benchmarking study*

A cost-effectiveness study is performed to assess the benefits of the OPS-based solutions comparing them to non-OPS technologies such as SONET, Ethernet and RPR.

**OPS-based wide area networks**

Scenario: single OPS switch

Tasks

- Analysis of the related work
- Identification of the critical metrics
- Novel techniques for QoS support in connection-oriented OPS networks

*Analysis of the related work*

- Several contention resolution algorithms ranging from simple random to complex void filling queueing selection
- QoS provisioning based on the following method:
  - design a contention resolution algorithm which minimizes the packet loss rate
  - then apply a QoS mechanism to differentiate the packet loss rate using resource reservation, offset time or hybrid electrical/optical buffers

*Identification of the critical metrics*

- Packet loss rate
- Out-of-sequence delivery of packets
- Computational complexity

*Novel techniques*

- Contributions to the development of the connection-oriented OPS network.
- Design of original policies to setup OVC in such a scenario.
- QoS management in connection-oriented OPS network.