下一世代資訊通訊網路尖端技術與應用(二)

子計畫二

光纖網路及服務品質保證技術

大學學術追求卓越發展延續計畫

成果發表暨技轉說明會

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2005.12.16

Outline

- **Part 1:**

  A 10-Gb/s QoS-enabled Optical Packet-Switching System for Metro WDM Networks (QOPS)

- **Part 2:**

  QoS Technology

- 整體性量化成果
- 成果展示及技轉說明

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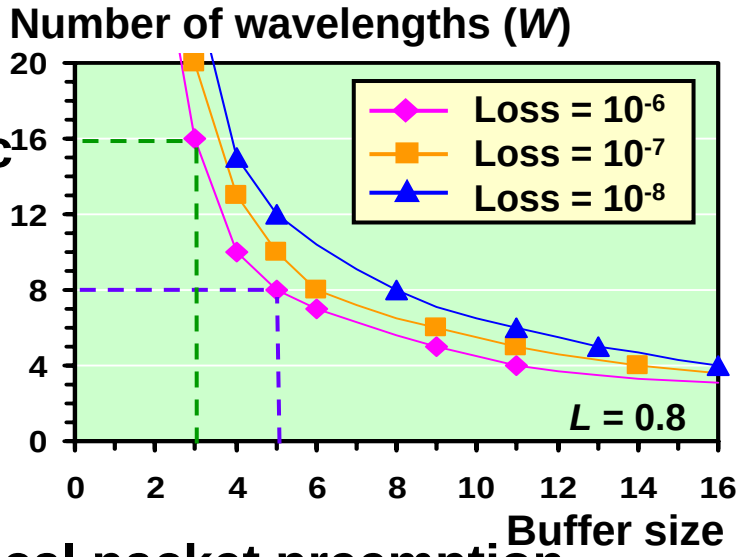
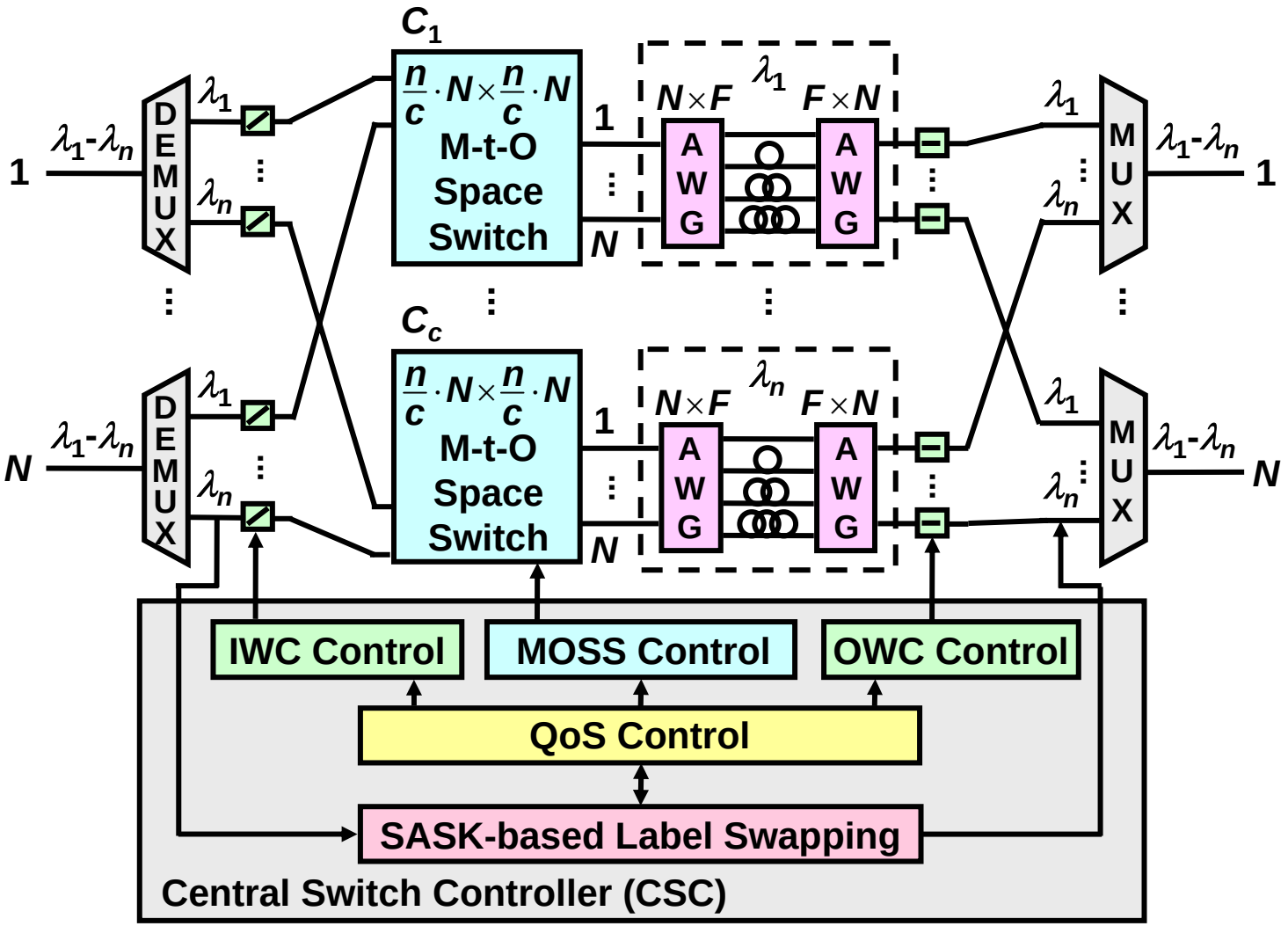
QOPS Design Principles

- **High scalability: by adopting cluster-based wavelength sharing**
- **High cost effectiveness: by using FDL-based single-stage downsized optical buffers**
  - **Few optical buffers yields drastic decrease in loss probability**
  - **As the buffer size grows, the effectiveness is diminished**

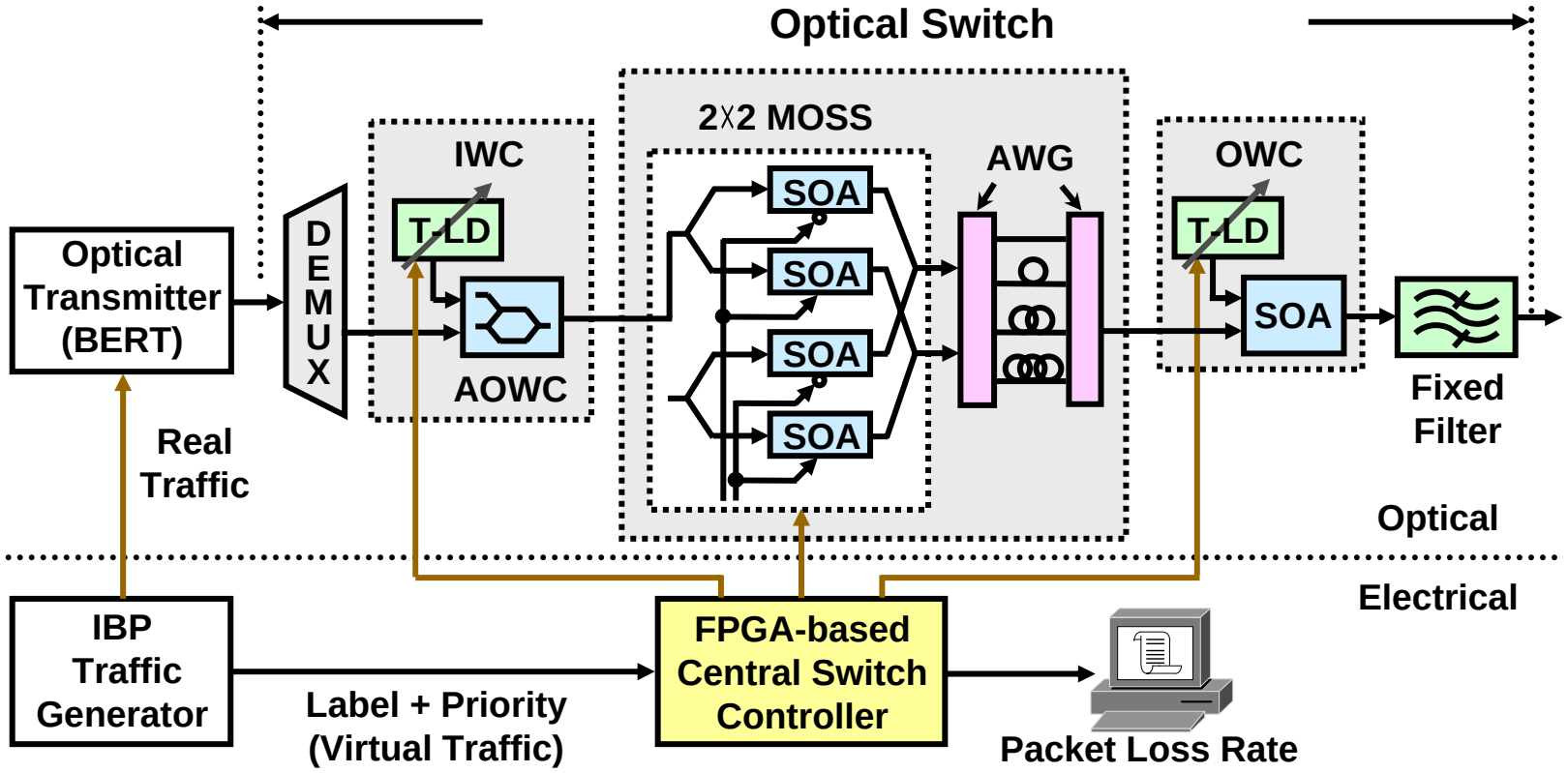


- **QoS differentiation: by allowing optical packet preemption**
  - **Newly arriving high-priority packet can preempt a low-priority packet that has been in a delay line**

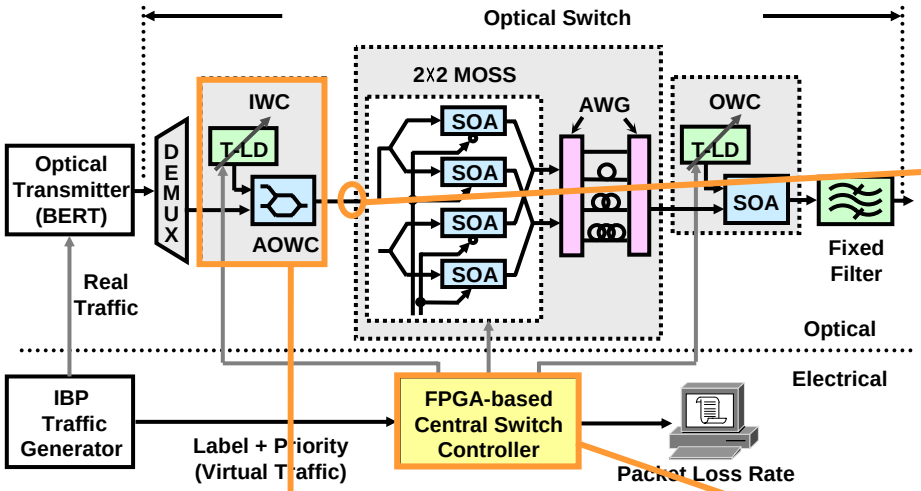
QOPS- System Architecture

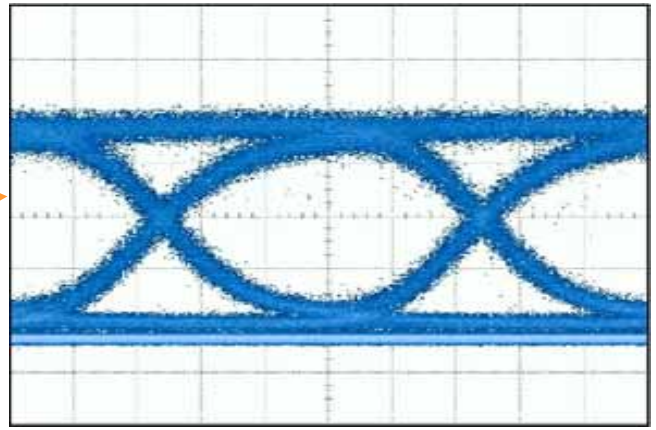


QOPS Testbed Setup

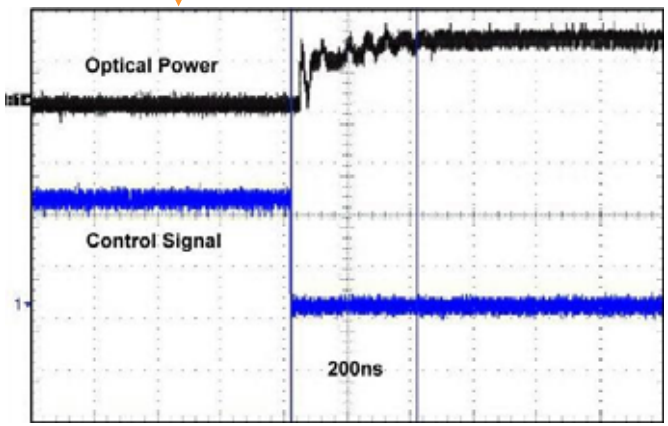


Experimental Results (1)

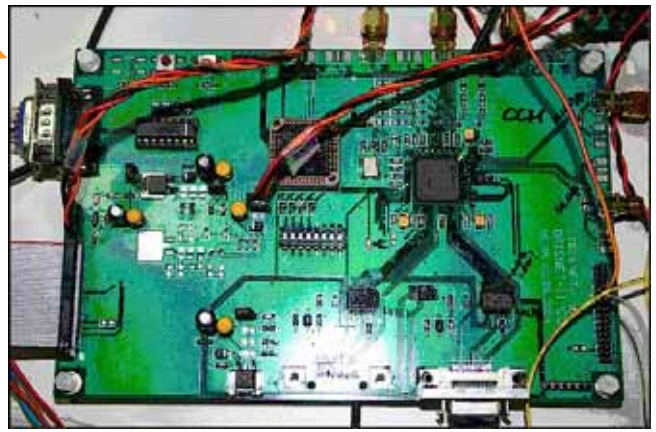




Eye diagram of tunable wavelength converter

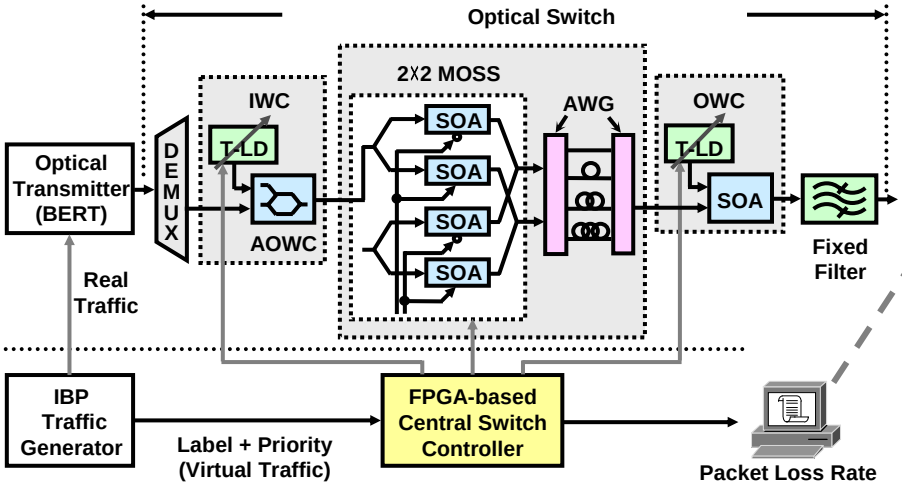


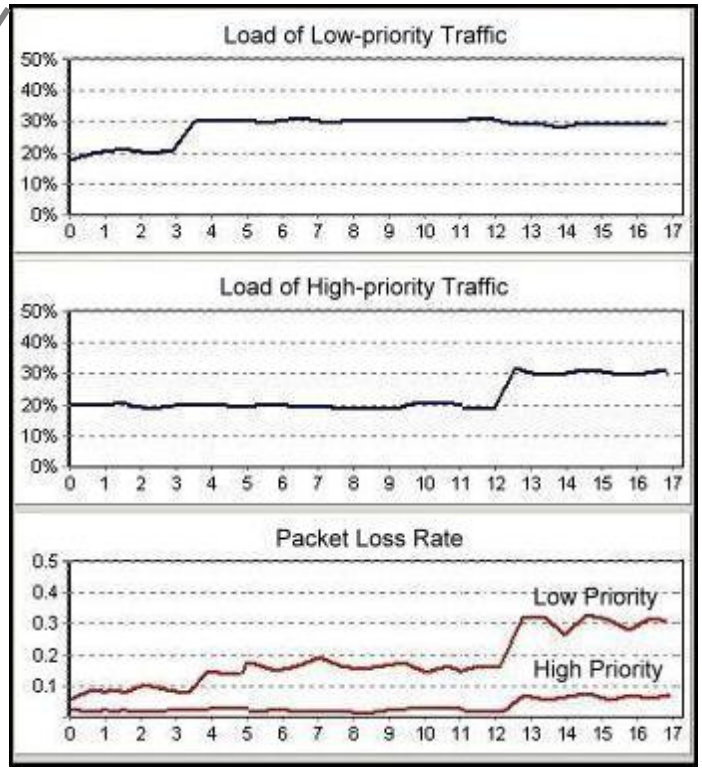
Transient time of tunable laser-based wavelength converter



Central switch controller module

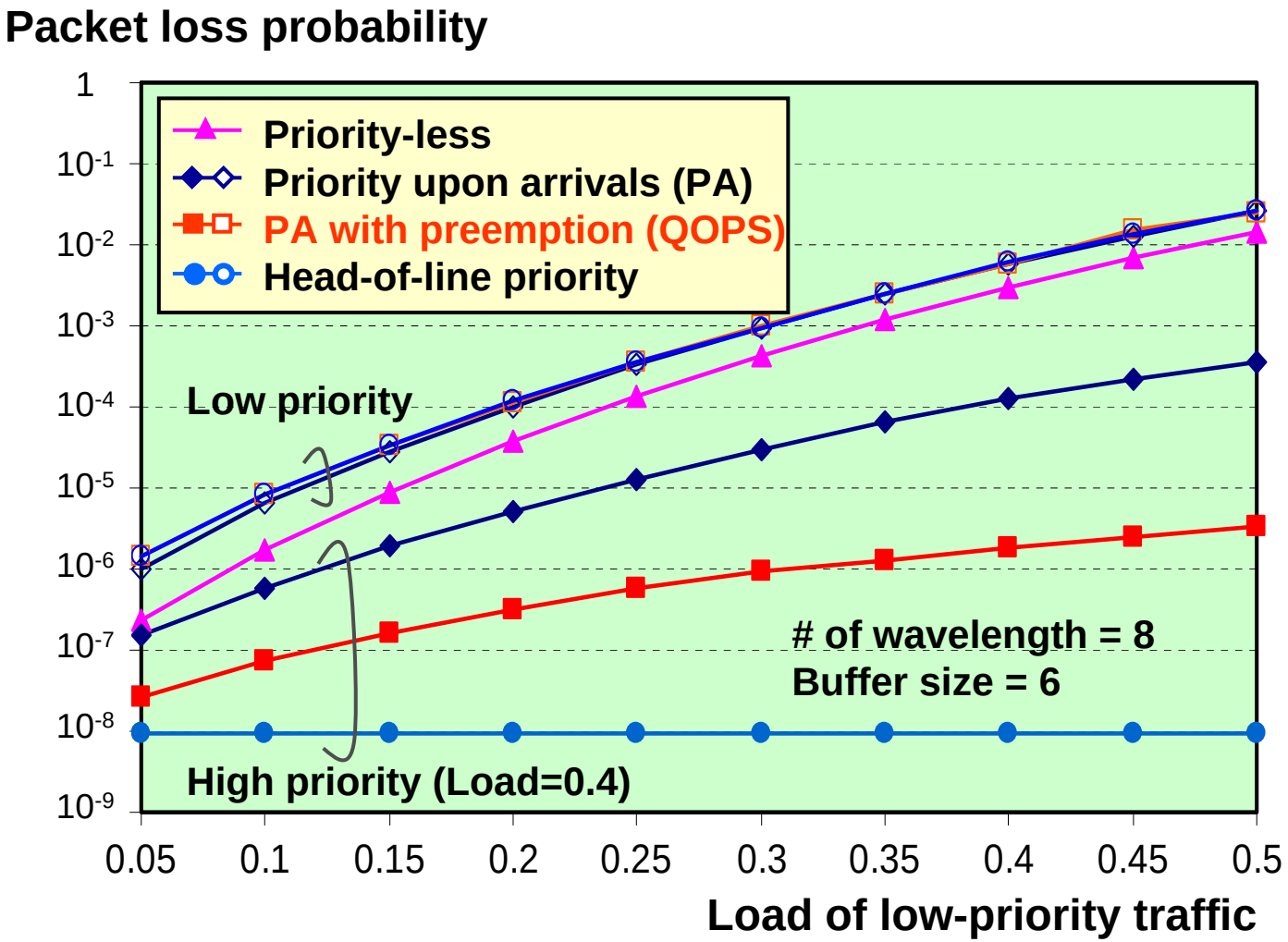
Experimental Results (2)



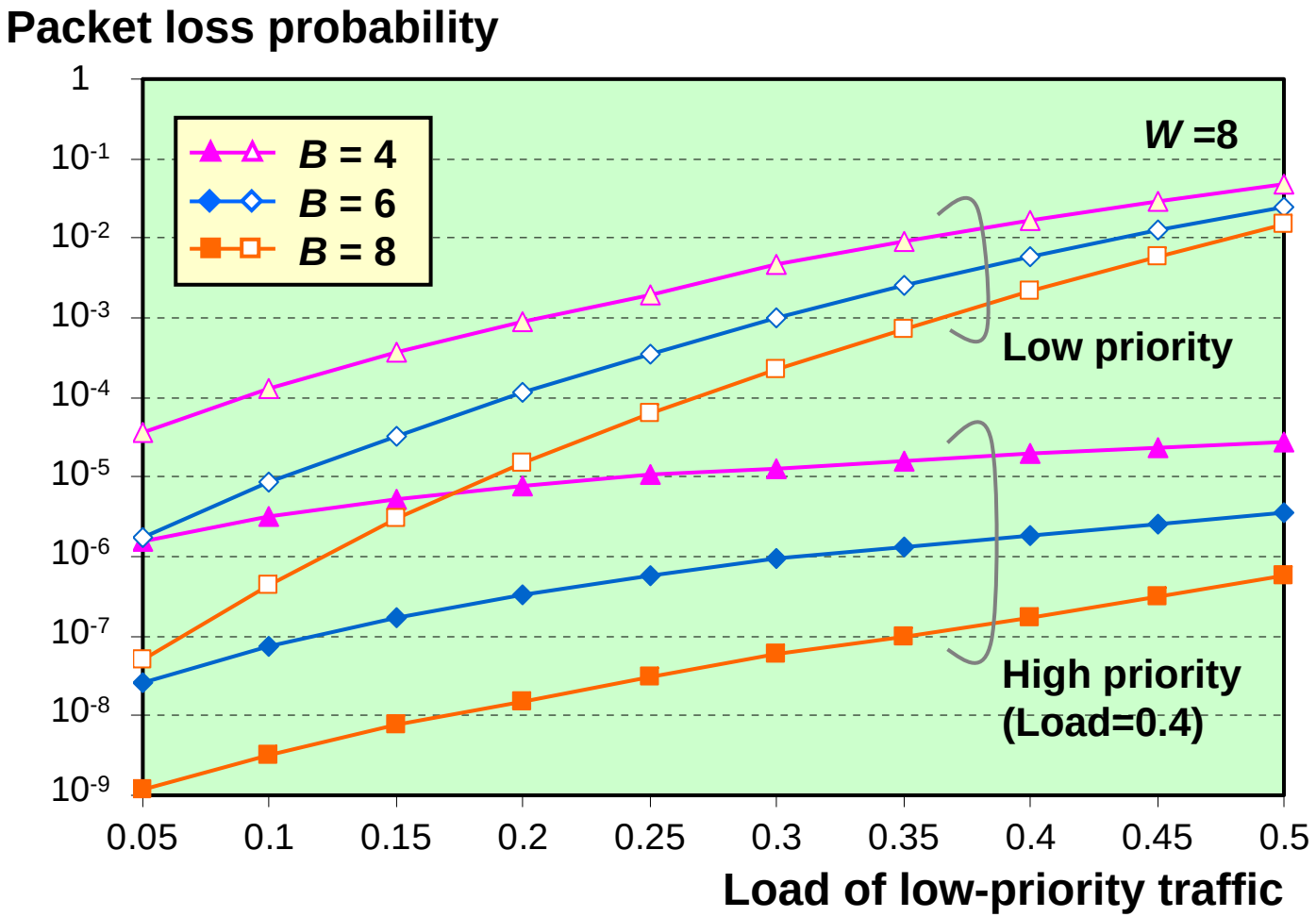


- Loss rate of high-priority traffic is unaffected by load of low-priority traffic
- High-priority traffic suffers higher loss under increasing load of the same class

QoS Differentiation- Comparisons



QoS Differentiation- Performance Results



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Evolution of Wall

From Packet Networking to Content Networking

- **7-in-1 (NetBSD)**
  - **Handling the problems in *TCP/IP layer***
  - **NAT, Firewall, VPN, Router, BW mgnt., IDS, URL filter**
- **10-in-1 (NetBSD)**
  - ***Content-aware***
  - **Anti-Virus, Anti-Spam, CF/Keyword**
  - **Reducing System Overheads: New Arch./Alg.**
- **N-in-1 (Linux)**
  - ***Easy* to add new modules**
  - **UPnP, APP Firewall, SSL-VPN, Wireless AP**

Completed Research Tasks (~ 2005/6)

Content Networking with Deep Packet Inspection

- **System Performance**
  - Architecture:
    - + ***4-in-1 proxy arch.:*** **Spam+ Virus+ IDS+ CF (Throughput** X 2)
    - + ***Stream-based mail proxy for anti-virus***
    - + ***Content security processing on network processors and ASIC***
    - + ***P2P Traffic Management***
  - ***Algorithm:***
    - + ***Profiling summary on string matching algorithm and application***
    - + ***Adaptive generic signature matching engine***
- **Request Scheduling for Differentiated QoS**
  - ***Website gateway:*** **Multi-Resources Request Scheduling**
  - ***Access gateway:*** **Requestized-GPS with Window-base Service Rate Control**

New Research Tasks

Content Networking withDeep Packet Inspection

- **System Research**
  - Architecture:
    - ***WiMax Base Station on Network Processors***
    - ***Content security processing on network processors & ASIC/FPGA***
  - Methodology:
    - ***Extract and Replay of Attack Traffic***
    - ***P2P Traffic Management*** **(reducing false negative)**
- **Scheduling for Differentiated QoS**
  - Latency-driven Request Scheduling on Website gateway
    - ***Multiple Resources***
    - ***Multiple Servers***
  - **Request Scheduling on WiMax BS**

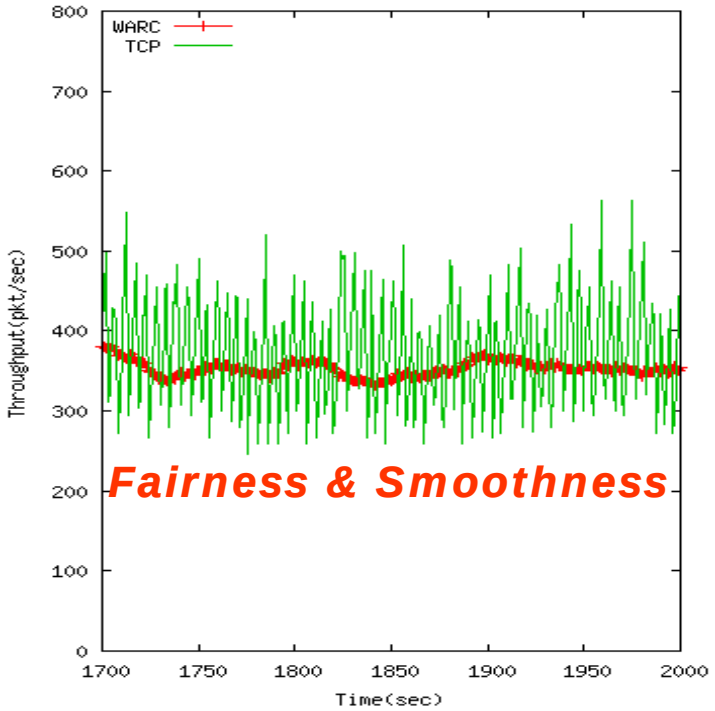
Research Tasks at NBL

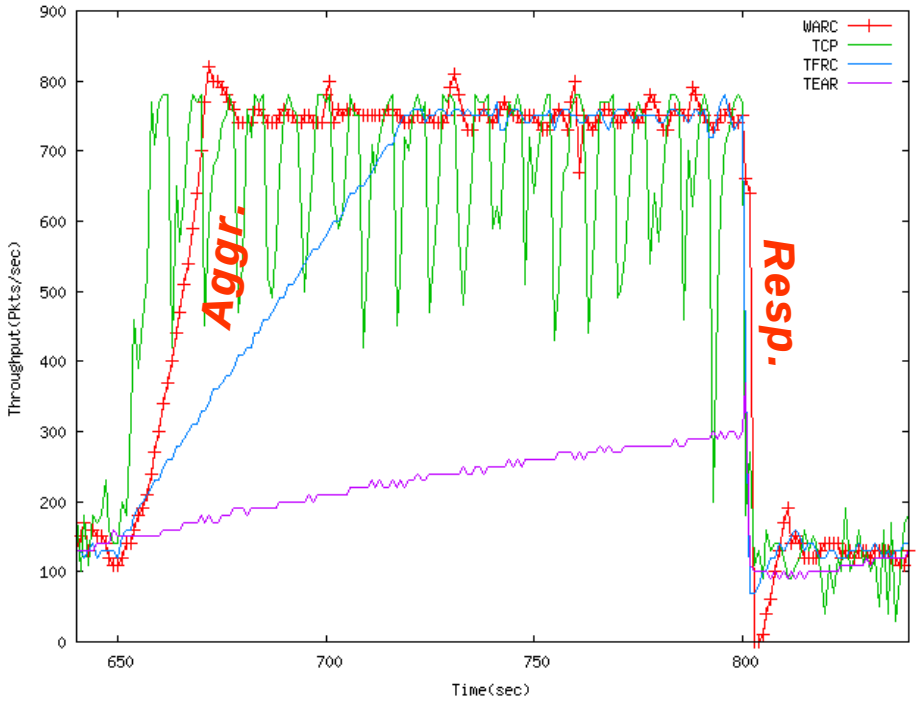
From Test Service Provider to Test Solution Provider

- **WiMax (new!)**
  - **MAC design with mobility and roaming**
  - **Test plan and test bed at NBL**
- **SAN (new!)**
  - **iSCSI performance, conformance, interoperability testing**
- **Wi-Fi**
  - **Voice quality over WLAN with mobility and roaming**
- **Security**
  - **In-lab live testing with real traffic**
  - **Analyzing attacks, viruses, spams, and pornography**
- **Switch/Router**
  - **Automatic conformance and performance testing on L2/L3 switches**
- **VoIP**
  - **PSTN/VoIP interoperability testing**

TCP-Friendly Congestion Control

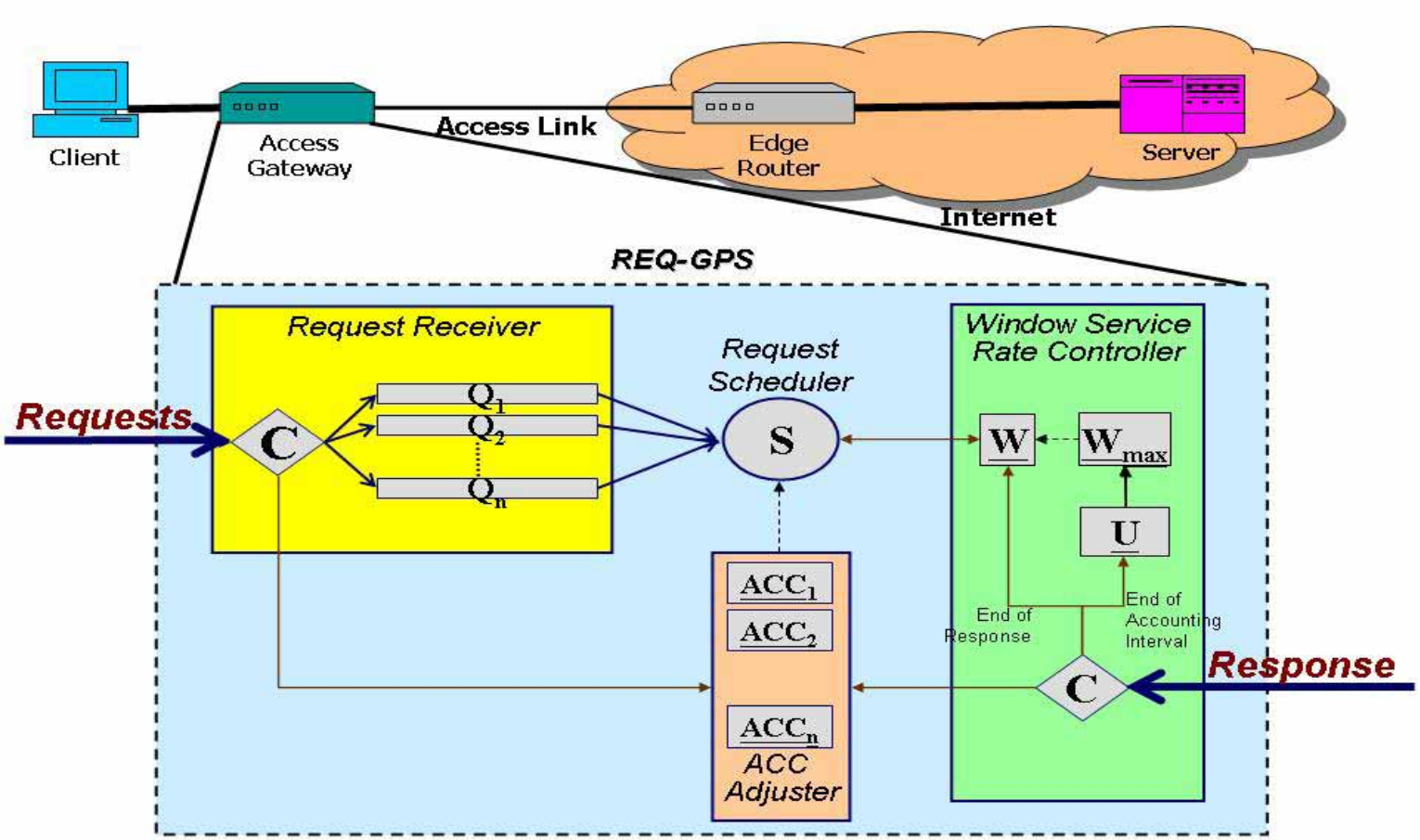
- Window-Averaging Rate Control (WARC)
- Fairness and Smoothness in steady-state
- Aggressiveness and Responsiveness in transient-state





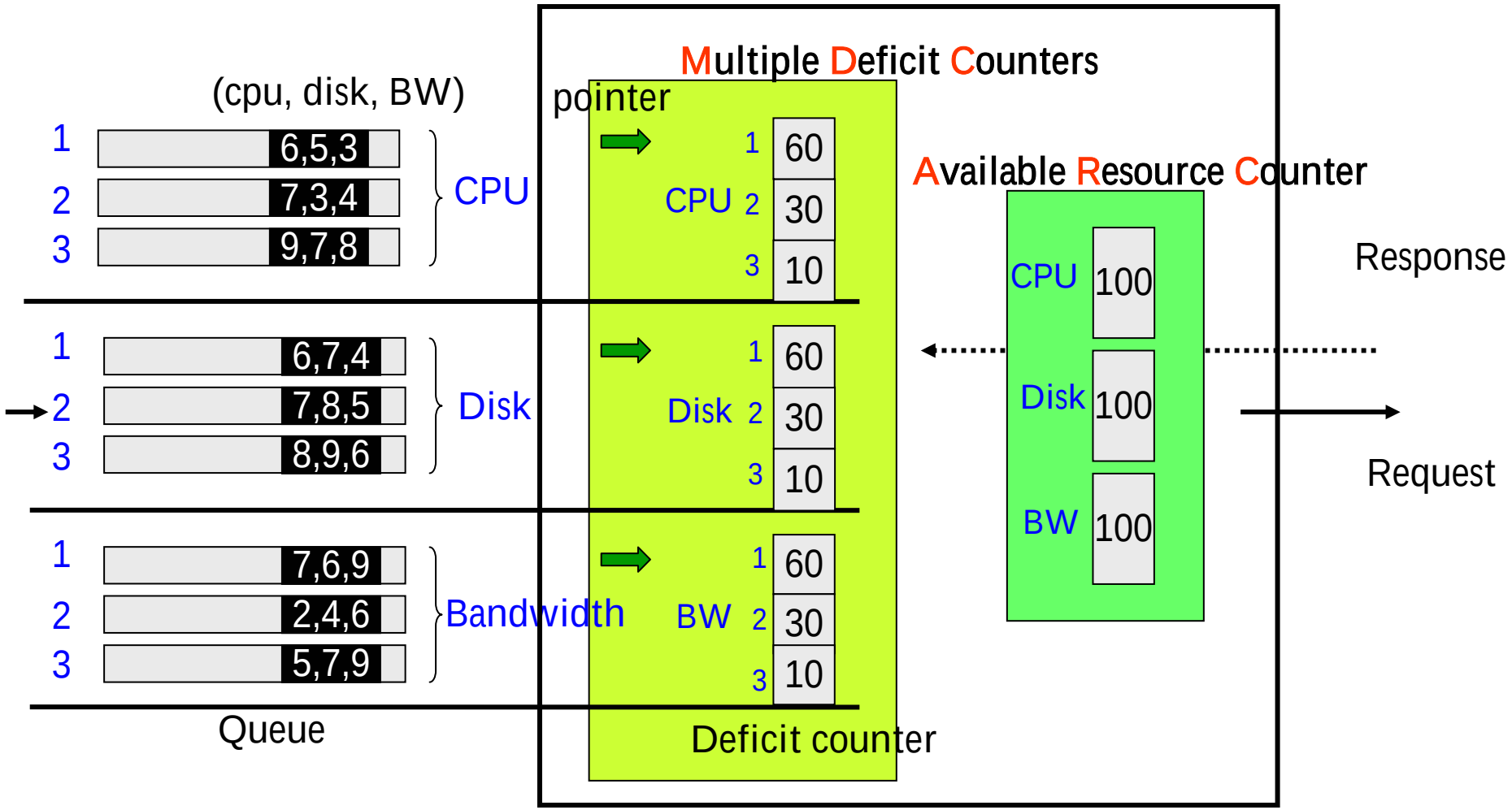
Access Gateway: Requestized GPS with Window-based Service Rate Control

- **Scheduling requests to control bandwidth consumed by responses**



Website Gateway: Multiple Resource Request Scheduling

- Multi-resource requests scheduled by multi-counter DRR



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整體性量化成果

成果統計時間：**2005/04/01～2005/11/30**

期刊論文	會議論文	雛型系統	研討會
5	**7**	3	5

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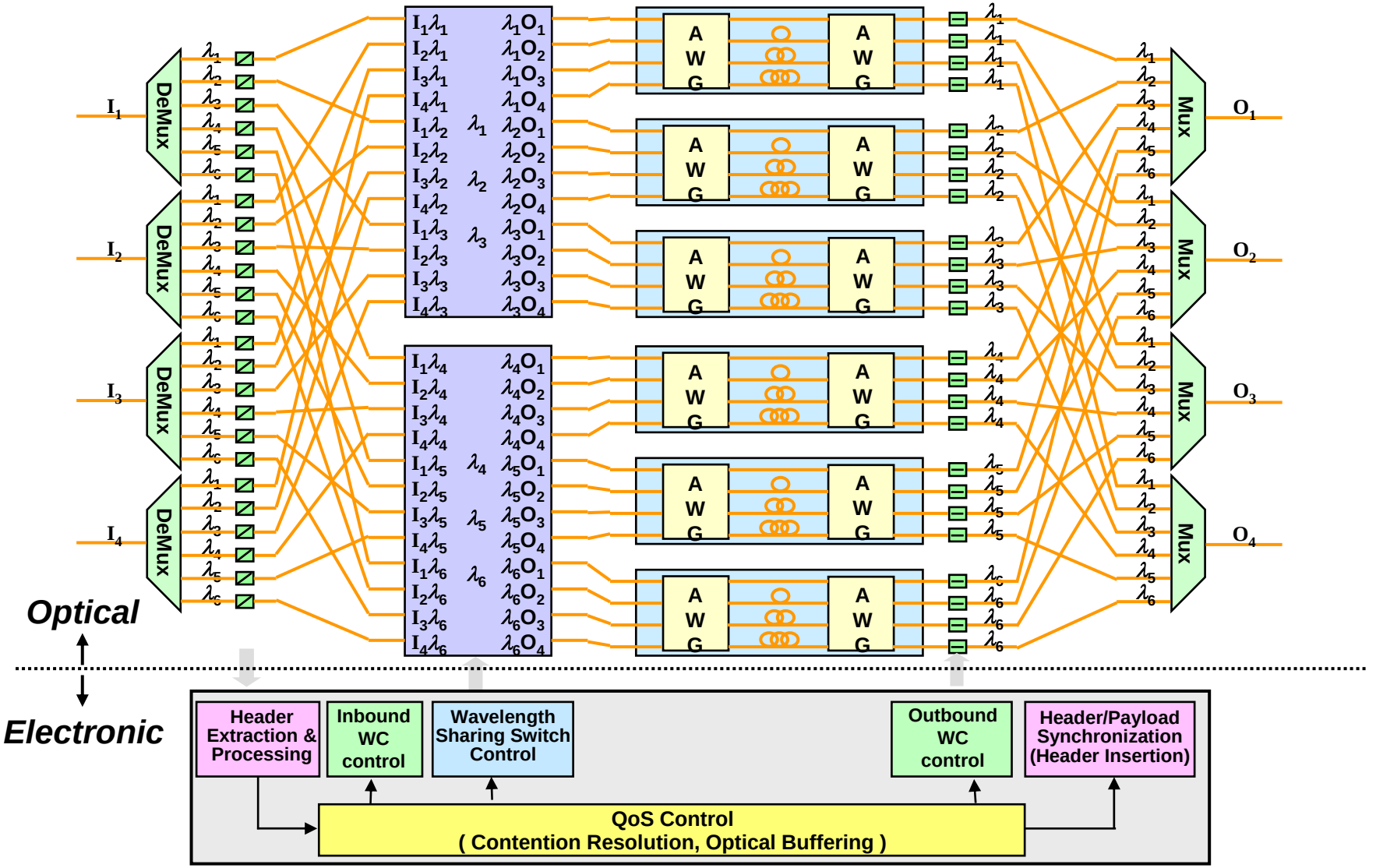
成果展示及技轉說明

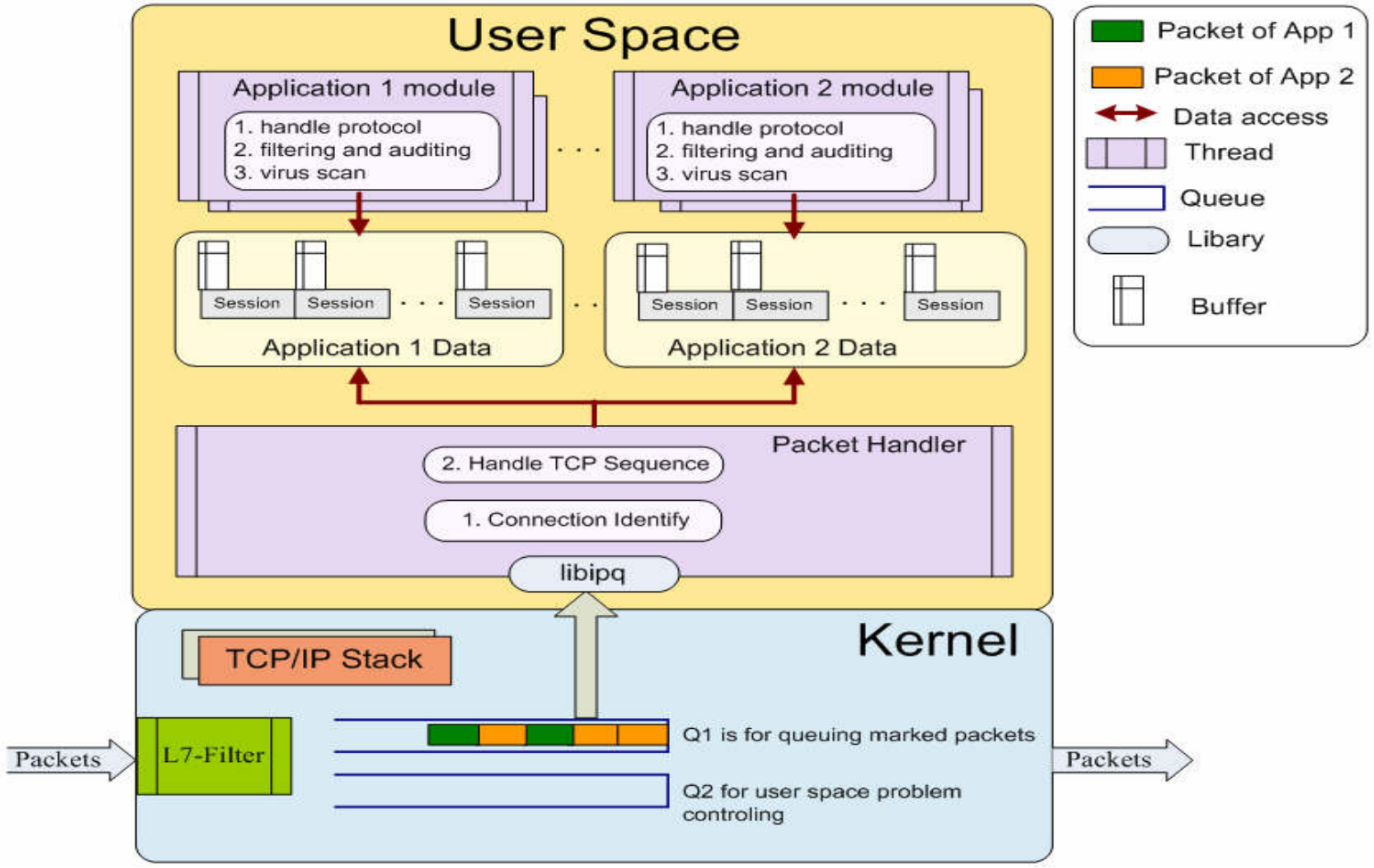
1. **QOPS: A QoS Optical Packet-Switching System for Metro WDM Networks**
2. **P2PADM: P2P及Instant Message管理（軟體套件）**
3. **Stream-based Anti-Virus Mail Proxy(軟體套件)**

QOPS: A QoS Optical Packet-Switching System for Metro WDM Networks



P2PADM:P2P及Instant Message管理(軟體套件)

- Classify traffic by application signature, not by port.
- One connection between two peers
- Dual queue synchronization



Stream-based Anti-Virus Mail Proxy (軟體套件)

- Interleaved processing without file system access
- Single process concurrency
- Supporting various compression formats: gzip, rar, bzip2, self-ex,etc.