大學學術追求卓越發展延續計畫
「下一世代資訊通訊網路尖端技術與應用(二)」

Advanced Technologies and Applications for Next Generation Information Networks (II)

清大、交大總計畫報告

計畫主持人：陳文村教授、蔡文祥教授

April 17, 2006

國立清華大學 National Tsing Hua University

國立交通大學 National Chiao Tung University

緣 起

- 本卓越計畫第一階段四年中，國立清華大學與國立交通大學整合相關研究人員，在本計畫領域已獲得相當可觀的成果。
- 第二階段繼續由此團隊執行，並在原有成果之上，試圖將相關領域研究推至另一新境界。
- 計畫目標：突破高速、高頻寬、無線、網路安全與整合網路之關鍵技術。

計畫架構

總計畫主持人：清大資工系陳文村教授
交大資工系蔡文祥教授

下一世代資訊通訊網路尖端技術與應用(二)

- 核心網路 (Core Networks)
  - 子計畫一:高速網路交換技術 High Speed Networking Technologies
  - 子計畫二:光纖網路及服務品質保證技術 Optical Networking and QoS Technologies
- 無線網路 (Wireless Networks)
  - 子計畫三:後三代全IP無線網路技術 Beyond-3G All-IP Wireless Network Technologies
  - 子計畫四:無線隨意及感測網路技術 Wireless Ad Hoc & Sensor Networking Technologies
- 疊蓋式網路 (Overlay Networks)
  - 子計畫五:網路安全 Network Security
  - 子計畫六:疊蓋式網路之技術與應用 Techniques and Applications of Overlay Networks

三大主題

- 核心網路：電交換與光交換系統與網路
  - 子計畫一：研究及構建超高速交換系統
  - 子計畫二：探討關鍵光纖網路技術並建構10G光纖網路(OPSINET-II) 以及相關服務品質技術
- 無線網路：無線網路核心與擷取技術
  - 子計畫三與四：著重B3G之發展，研究由多樣化的異質無線接取網路(蜂巢式基地台網路、 WLAN無線接取網路、及行動隨意和無線感測網路) 以Internet、UMTS、GPRS等骨幹網路串連，並由all-IP為主要網路通訊協定達成互連目的
- 疊蓋式網路：串流疊蓋網路技術與網路安全
  - 子計畫五：探討網路安全技術，包括主動式資訊隱藏技術、平行化漸進式探勘、知識融合與知識倉儲技術
  - 子計畫六：研究及發展支援資料串流的疊蓋式網路技術

參與人員狀況

參與人員	總計畫	子計畫一	子計畫二	子計畫三	子計畫四	子計畫五	子計畫六	總計
教授	2	8	5	4	8	6	8	41
業界參與人員	0	2	5	0	0	0	3	10
博士後研究員	0	1	1	0	1	1	2	6
專任行政助理	3	1	1	1	1	1	1	9
兼任研究助理	6	37	16	57	64	26	51	257
總計	**11**	**49**	**28**	**62**	**74**	**34**	**65**	**323**

計畫整體量化成果

	期刊論文	會議論文	專利	雛型系統	研討會	獎項榮譽
子計畫一	15	26	1	4	7	6
子計畫二	17	16	13	4	14	2
子計畫三	57	11	11	10	14	23
子計畫四	49	65	13	2	13	21
子計畫五	24	38	3	6	2	9
子計畫六	20	53	13	2	23	5
總計	**182**	**209**	**54**	**28**	**73**	**66**

第二年經費核定

	業務費	研究設備費	國外差旅費	總計
總計畫	2,675,455	170,000		2,845,455
子計畫一	5,303,900	2,640,300	460,000	8,404,200
子計畫二	5,551,985	2,441,273	740,000	8,733,258
子計畫三	6,303,400	1,600,000	300,000	8,203,400
子計畫四	4,579,700	613,800	600,000	5,793,500
子計畫五	4,304,200	950,000	475,000	5,729,200
子計畫六	5,245,900	637,000	760,000	6,642,900
總計	**33,964,540**	**9,052,373**	**3,335,000**	**46,351,913**

獎項與成就

- 子計畫一
  1. 張正尚教授：**IEEE Fellow (2004)**
     財團法人潘文淵文教基金會研究傑出獎**(2005)**
  2. 黃能富教授：**Technology Transfer Award from National Science Council (NSC) of Taiwan，2004.**

- 子計畫二
  1. 楊啟瑞教授：應**IEEE APOC'04**國際會議邀請專題**(2004/11/07)**
     Topic：Optical Coarse Packet Switched IP-over-WDM Network (OPSINET): Technologies and Experiments
     獲經濟部九十三年度科技專案創新技術獎(與工研院合作研發"先進光通訊網路交換技術")

獎項與成就

- 子計畫三
  1. 林一平教授：AAAS Fellow，潘文淵研究傑出獎Japan IPv6 Appli-Contest 實作組 冠軍
  2. 曾煜棋教授：李國鼎穿石獎、傑出電機工程教授獎、Ohio State Univ.傑出校友獎

- 子計畫四
  1. 陳志成教授： 2004通訊大賽 Play Tech組 第一名 (獎金新台幣一百萬)、國立清華大學新進人員研究獎(92年93年二次)
  2. 陳文村教授：IEEE Computer Socity 傑出巡迴演講人2004 ~ 2006、第八屆教育部國家講座(2004，終生榮譽)、台灣積體電路設計學會特殊貢獻獎（2004）
  3. 許健平教授：中央大學特聘教授、傑出工程教授獎、國科會特約研究獎

獎項與成就

- 子計畫五
  1. 蔡文祥教授：
     數位典藏國家型計畫「數位浮水印技術」全國競賽第一名(2004) (with student Y. C. Chiu et al.)
     佳作論文獎兩篇，中華民國影像處理與圖形識別學會 (2004) (with students Y. C. Chiu and C. J. Lai)
     佳作論文獎，中華民國影像處理與圖形識別學會 (2005) (with student L. Y. Weng)
  2. 袁賢銘教授：
     創新獎，"Ubiquitous Family Love: leveraging RFID and Java MHP to construct a context-aware home platform，" 第二屆「IBM杯高校校園創新設計大賽」，IBM China (2005)

- 子計畫六
  1. 許雅三 教授:
     最佳論文獎 2004 International Computer Symposium, (with student Sheng-Kai Hung)
     最佳論文獎 2005 National Computer Symposium. (with Shen-Wei Chen，Wei-Chi Ting，Hung-Min Sun)
  2. 金仲達教授:
     最佳論文獎 First International Conference on Embedded on Ubiquitous Computing (EUC'04) (with H.C. Hsiao and S.Y. Gao)

對審查委員意見之回應

Question 2.1:
It is recommended to clearly demonstrate the impact on advanced teaching.
Response:
Subproject 3 has published a book and 7 book chapters. We will pay more attention to this suggestion.

Question 3.7:
Most meetings have focused on the administration of projects… interaction should go to the technical level.
Response:
We always have technical discussions in the meetings but not shown in the report.
We will put them in the report in the future.

Question 3.8:
It is difficult to judge the quality of each award or recognition…
Response:
Most of the contest awards are made by national competitions.

對審查委員意見之回應

Question 4.1:

A continuous market research is necessary…

Response:

Actually we have close relations with a lot of venders like Cisco, Intel, HP etc. So we are familiar with the market trends. But we will also pay more attention to update our market knowledge.

Question 4.3:

… that all sub-projects met twice in a year is not enough to share ideas…

Response:

We met 6 times in the past 2 years, and each subproject actually meets approximately once a month.

核心網路群
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核心網路 (Core Networks)

子計畫一：高速網路交換技術
High Speed Networking Technologies

子計畫二：光纖網路及服務品質保證技術
Optical Networking and QoS Technologies

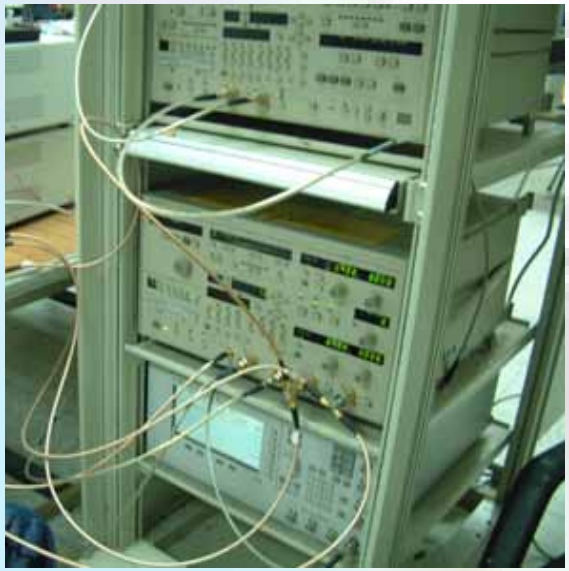
張正尚 教授
黃能富 教授
李端興 教授
許雅三 教授
邱瀞德 教授
馮開明 教授
吳仁銘 教授
徐碩鴻 教授

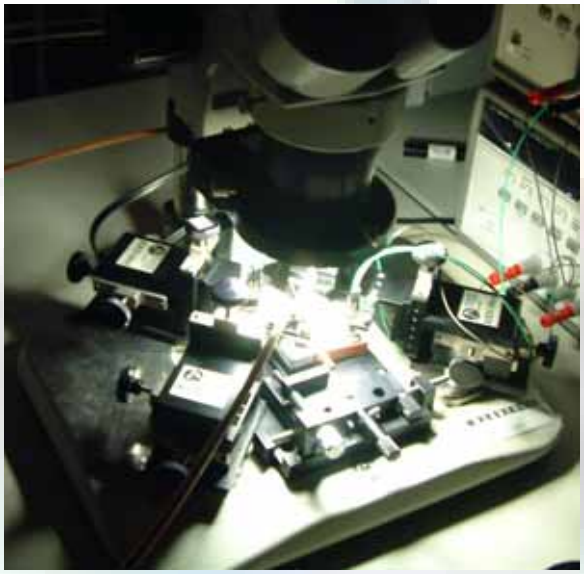
楊啟瑞 教授
林盈達 教授
鄭聖慶 博士
李三良 教授
陳智弘 教授
田伯隆 教授

Main Objectives

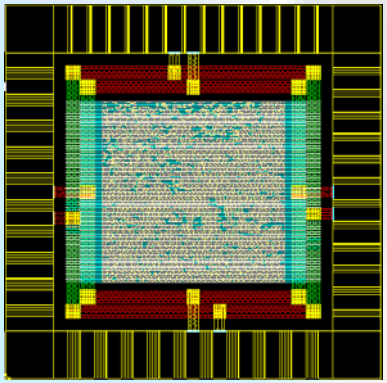
- Design and implementation of high-speed switches that scale with the speed of fiber optics
  - The electronic approach: switch architectures and high speed IC design
  - The optical approach: all optical network testbed and optical queuing theory
- Design and implementation of high-speed multi-service switches/gateways

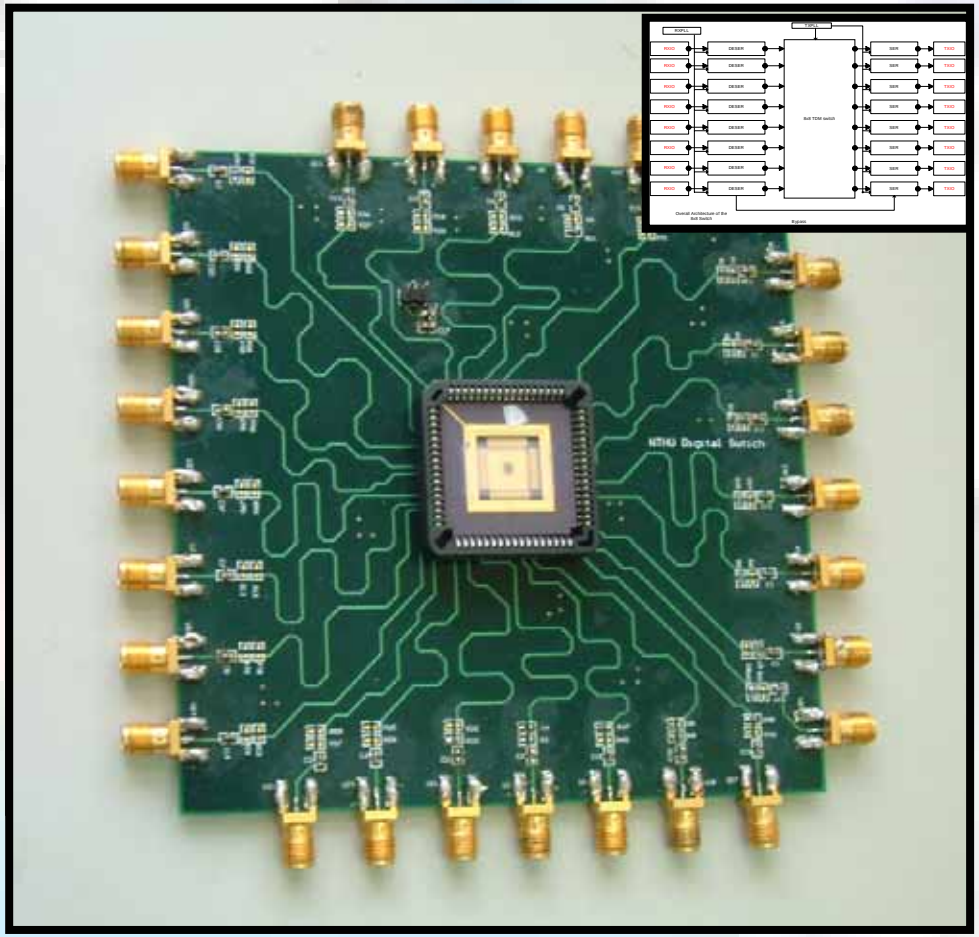
A Mixed Mode 30Gbps Time Division Multiplexing (TDM) Switch IC with 8/10B CODEC

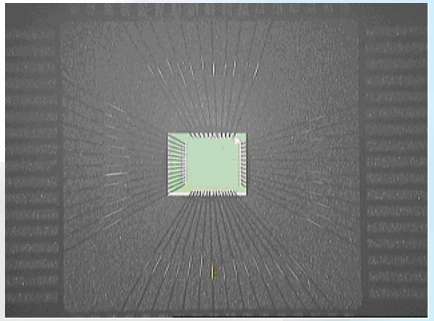




8X8 TDM Switch Chip Design





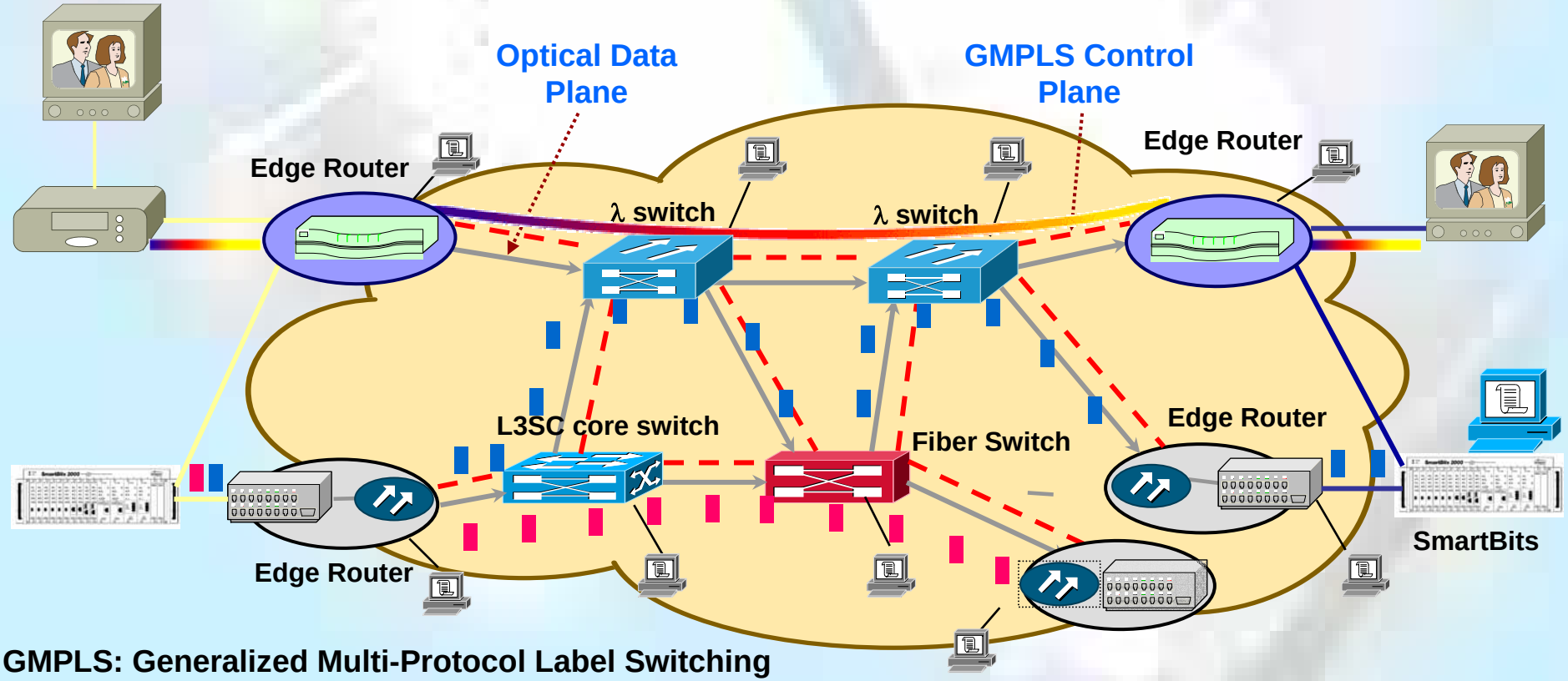


突破性成果與主要貢獻

- 被國際大學及研究單位引用：
  - **(Stanford University)** I. Keslassy, S.-T. Chung, K. Yu, D. Miller, M. Horowitz, O. Slogaard, N. McKeown, “Scaling Internet routers using optics,” ACM SIGCOMM 2003, Karlsruhe, Germany, Sep. Stanford’s implementation for 100 Terabits/sec optical router.
  - **(M.I.T.)** C. Koksal, R. Gallager, and C. Rohrs, “Rate quantization and service quality over single crossbar swtiches, IEEE INFOCOM 2004.
  - **(Poly Tech)** H. J. Chao, J. Song, N. S. Artan, G. Hu, and S. Jiang, “Byte-focal: a practical load-balanced switch”.
  - **(UIUC)** J.-J. Jaramillo, F. Milan, and R. Srikant, “Padded frames: a novel algorithm for stable scheduling in load-balanced switches.”
  - **(Bell-Laboratories)** J. Gripp, J.E. Simsarian, P. Bernasconi, J.D. Le Grange, L. Zhang, L. Buhl, D. Stiliadis, D.T. Neilson, M. Zirngibl, “Load balanced optical packet router based on 40Gb/s wavelength converters and time buffers.”
  - **(Harvard University)** Raymond Yim, Natasha Devroye, Vahid Tarokh and H. T. Kung, “Achieving fairness in generalized processor sharing for Network Switches.”

OPSINET : Optical Packet Switched IP-over-WDM Network (10 Gbps)

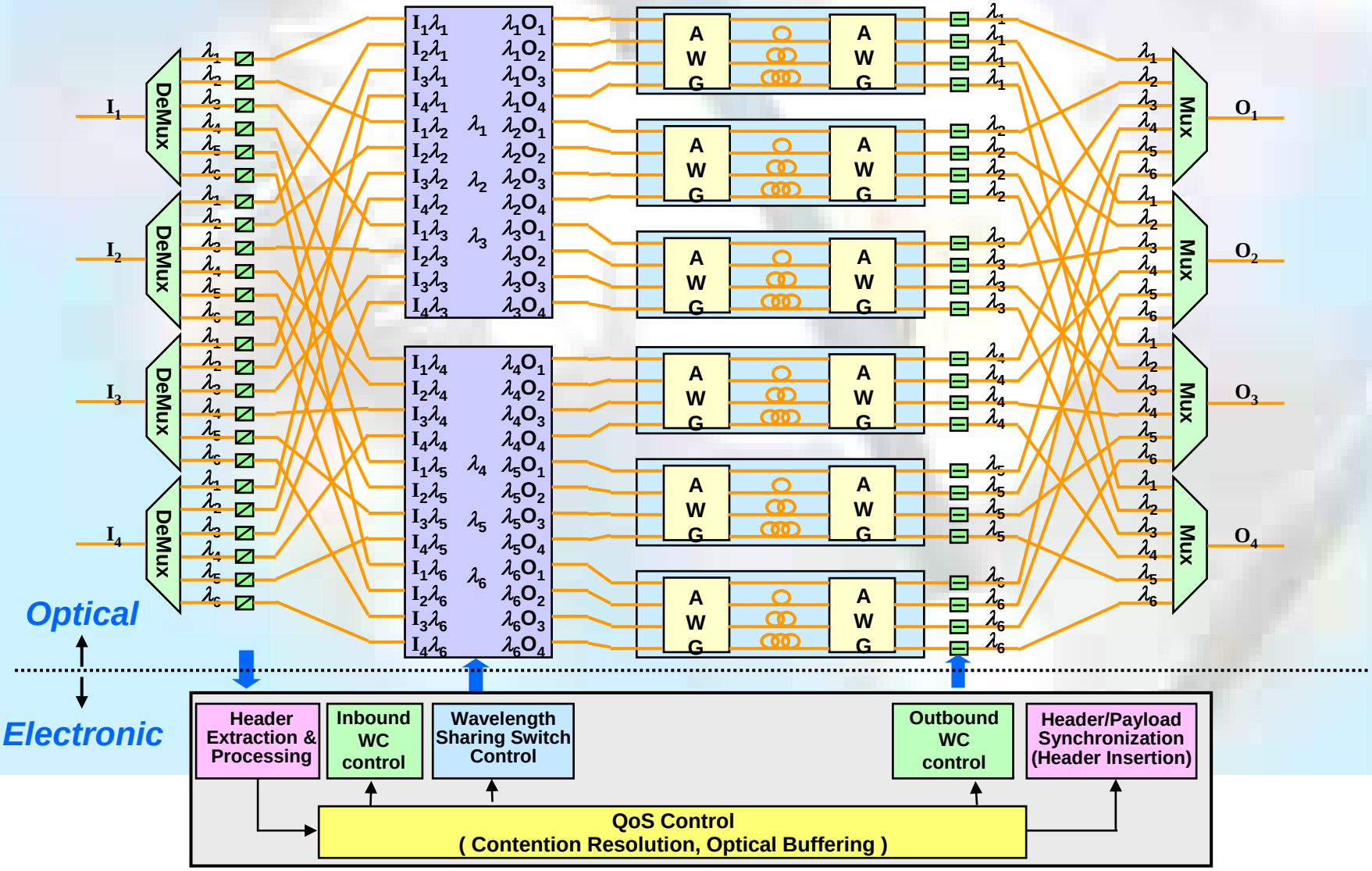
- 完成國際第一個具 GMPLS 控制之全光 IP-over-WDM研究實驗網路



GMPLS: Generalized Multi-Protocol Label Switching

All Optical WDM Packet Switching System

- 研究並實現高效能光纖交換器及控制系統 (10 Gbps)



OPSINET- Prototyping Network

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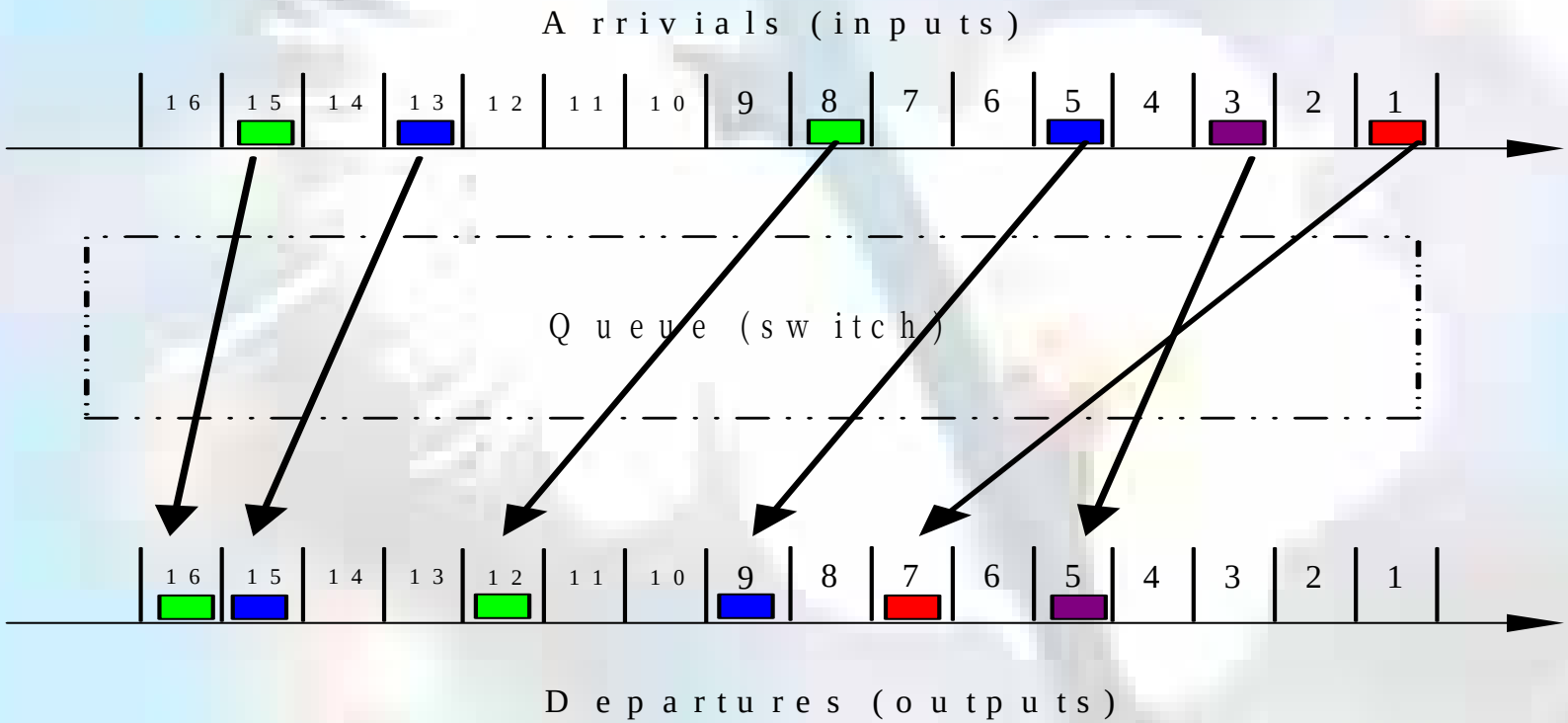
National Chiao Tung University

Optical Queues

- The key problem of optical packet switching is lack of cheap optical memory.
- Traditionally, queues are relatively cheap to build via electronic memory.
- However, it is very costly to convert optical packets into electronic packets.

A natural question is then: How does one construct a queue and how complex is it to do so?

Main Findings



- **Discrete-time queues can be viewed as infinite dimensional switches in time**
- **As in switching theory, there exist multistage constructions (recursive constructions) for various optical queues**

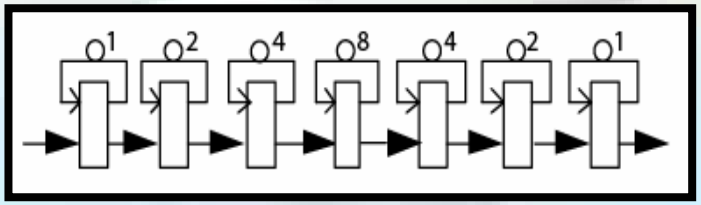
研究成果與貢獻

- **Cheng-Shang Chang, Duan-Shin Lee and Chao-Kai Tu, "Recursive construction of optical multiplexers with switched delay lines," IEEE Transactions on Information Theory, Vol. 50, pp. 3221-3233, 2004.**（第四屆徐有庠基金會通訊光電組最佳論文獎）
- **(UC, Berkeley) A. D. Sarwate and V. Anantharam, ``Exact emulation of a priority queue with a switch and delay lines," to appear in *Queueing Systems Theory and Applications*.**

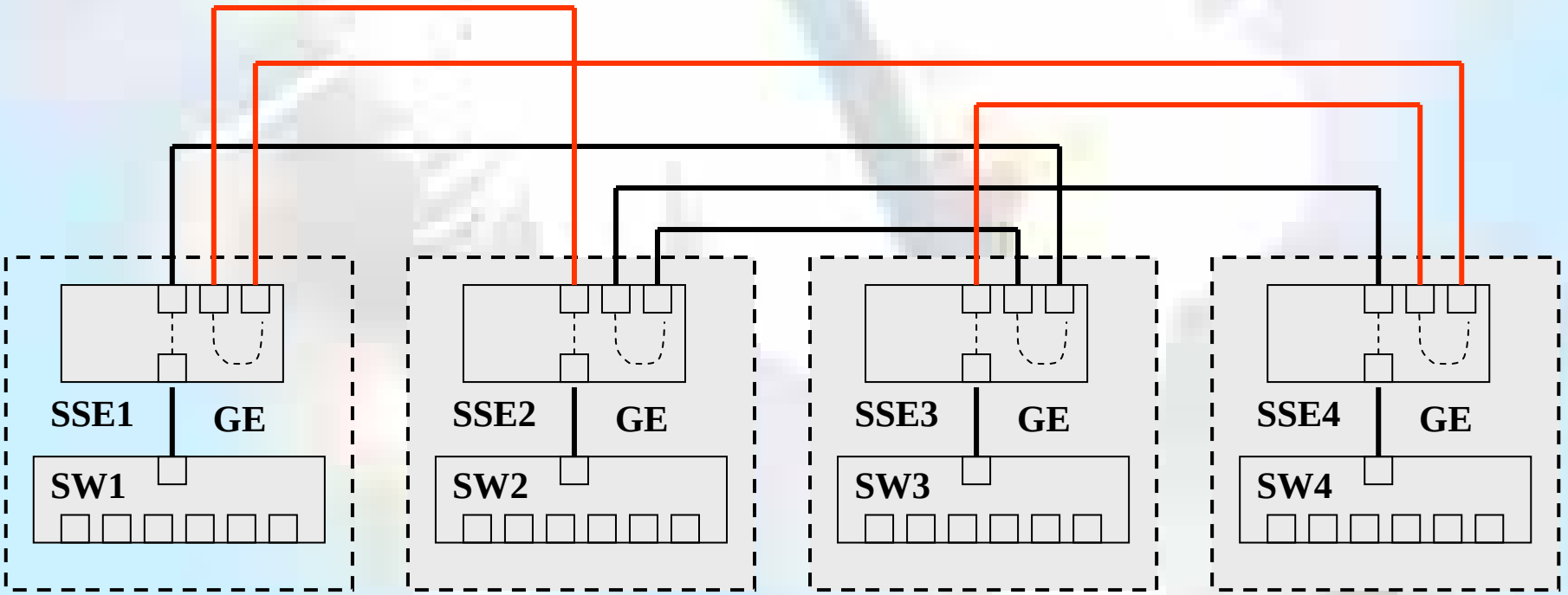
Waiting for technology to catch up!!!

Dream: optical queues can be built with the same size as their electronic counterparts.

Slow light !!!

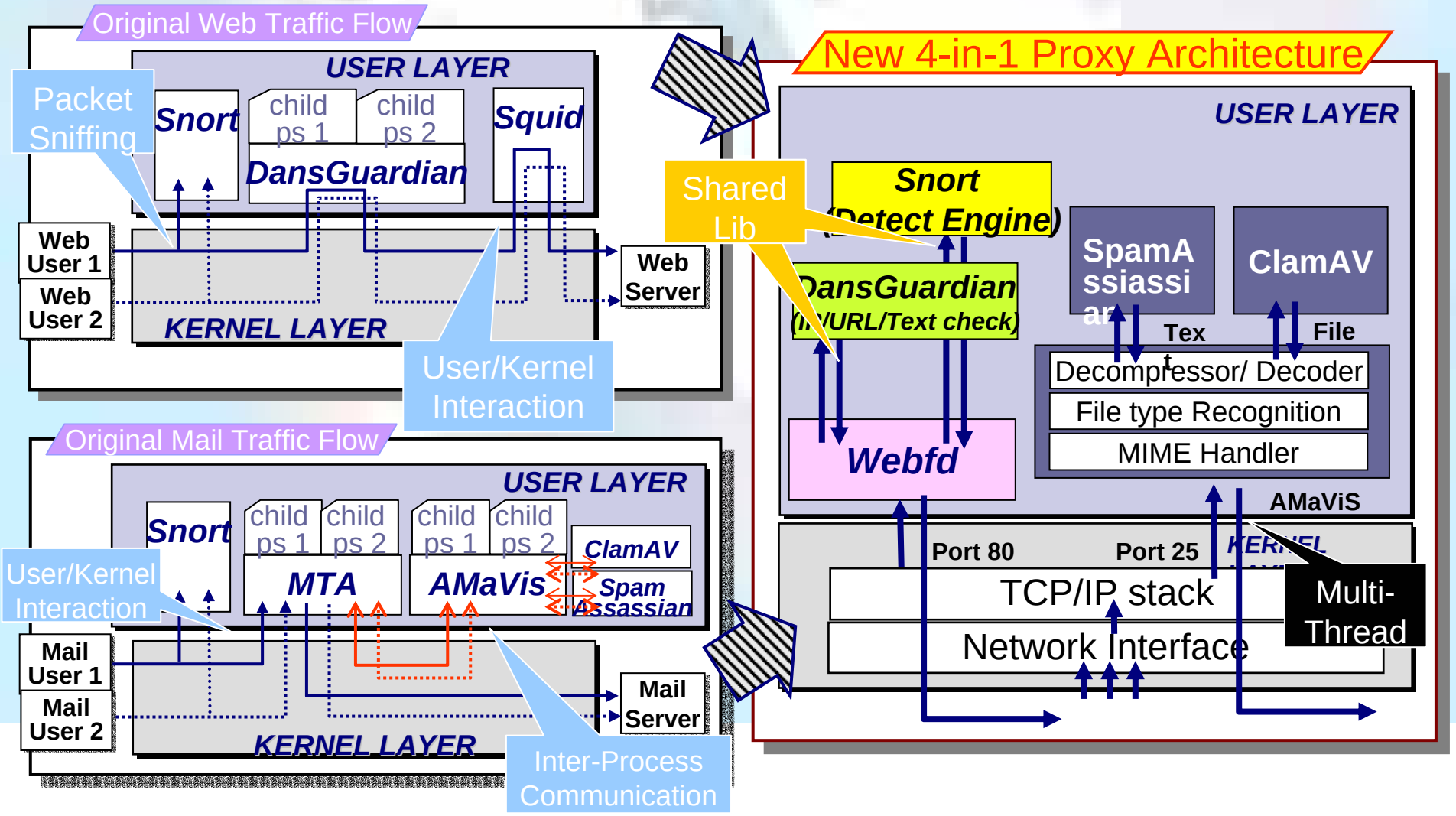


Scalable HA/Load Balance Architecture for Security Switch



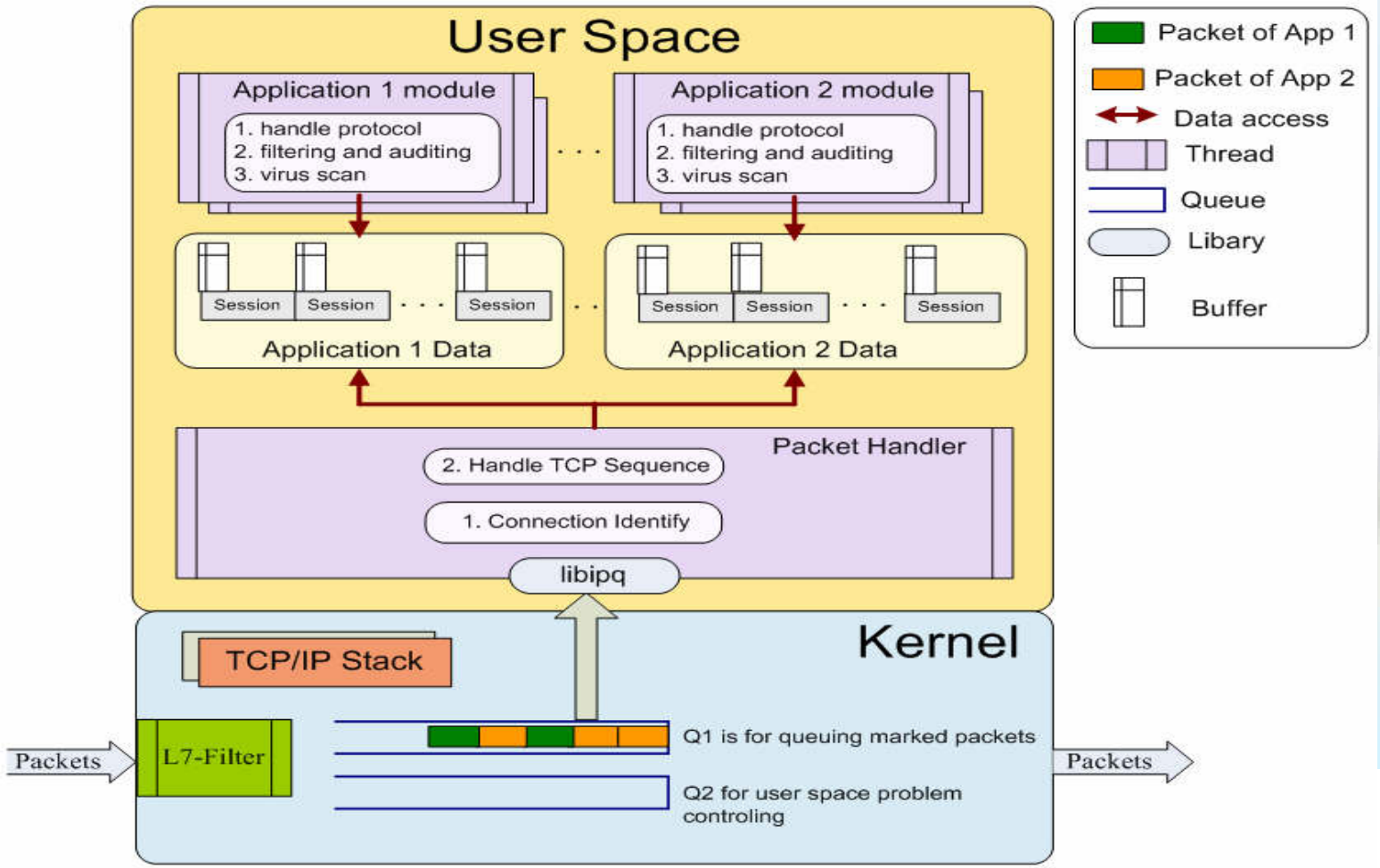
4-in-1 Proxy Architecture

- Reducing IPC and reusing modules
- To appear in IEEE Computer



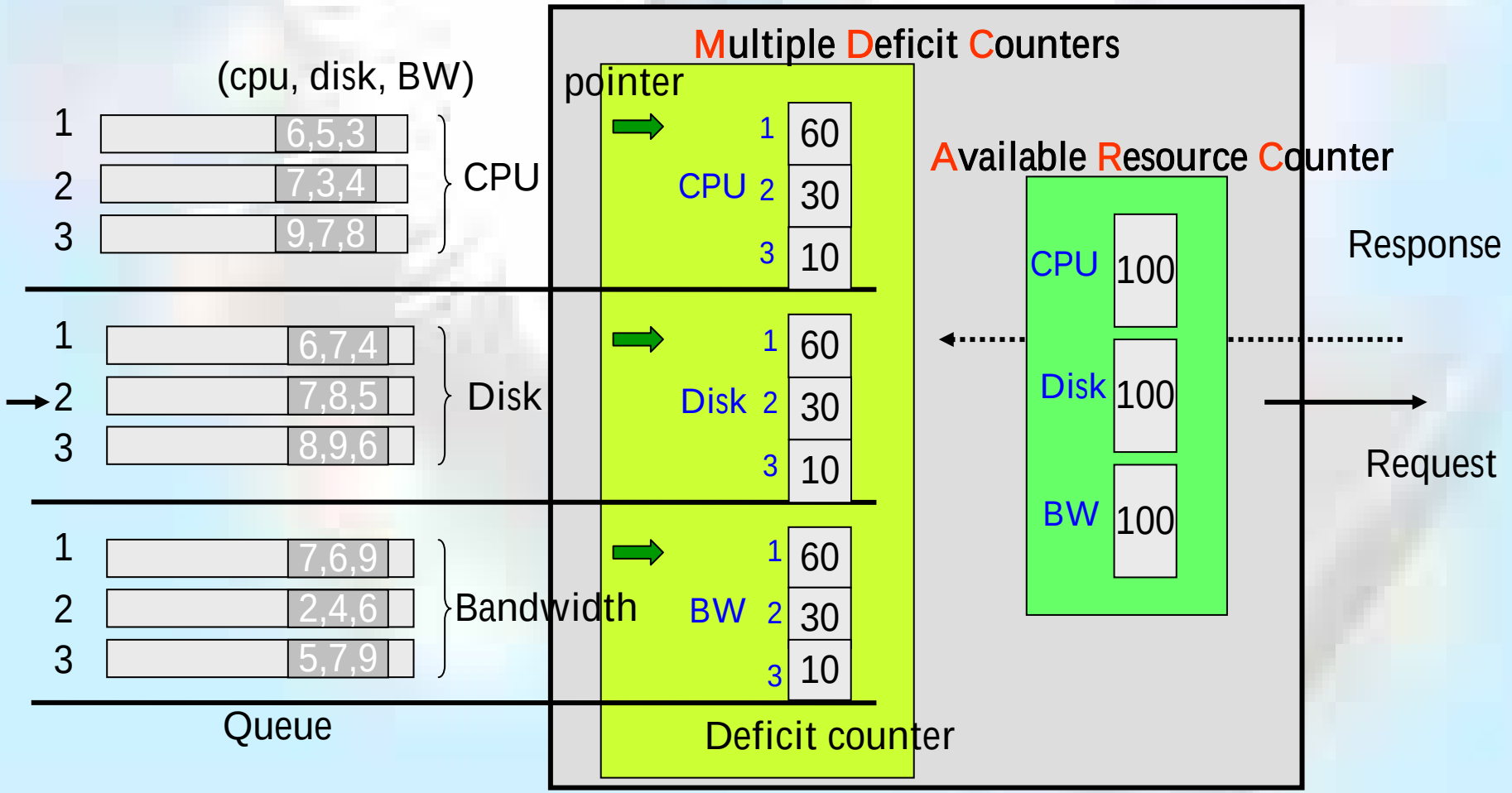
P2PADM Gateway:
P2P and Instant Message Management

- Classify traffic by application signature, not by port
- Dual queue synchronization between kernel and proxy
- Being transferred to 2 vendors



Website Gateway: Multiple Resource Request Scheduling

- Multi-resource requests scheduled by multi-counter DRR
- Differentiated server QoS



整體性量化成果

成果統計時間：**2004/03/01～2006/03/31**

子計畫	期刊論文	會議論文	專利	雛型系統	研討會	獎項榮譽
一	15	26	1	4	7	6
二	17	16	13	4	14	2

子計畫二－第三年度研究設備費變動說明

研究設備費撥出500,000元至人事費支援；撥出200,000至國外差旅費支援。
理由說明：
研究設備費－考量到以不影響實驗研究進度為原則，原核定申請購置之多波長雷射電流驅動器及高速光纖交換器改購置數量為一，軟硬體部份則減量採購。來支援人事費及國外差旅費不足。

人事費－由於碩博士生研究支援人力增加，並需要短期支援協助測試、驗證、分析等工作之臨時人員，故需要多增加人事費以補不足。

國外差旅費－由研究設備費撥入新增金額200,000，作為參訪考察下列大學、研究機構及公司之全光全光通訊網路及無線網路實驗室：
1.Stanford University, University of Maryland, University of Florida, UC Davis. 2.Telcordia Technologies, Lucent Technologies. 3. ANDevices(光纖元件公司), OPVISTA(光纖系統公司) 進行研究交流及技術討論並商討可能之研究合作，期望在尖端領域技術上有所突破；並與國內光通訊領域之相關研究單位、業界及學術單位進行交流溝通。藉此利用一學年的考察及研究，可為未來合作進行先期準備工作，希望能有更進一步的研究成果；進而發表論文、專利申請及研究計畫合作等等。

無線網路群
(Wireless Networks)

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無線網路 (Wireless Network)

子計畫三：後三代全IP無線網路技術
Beyond-3G All-IP Wireless Network Technologies

子計畫四：無線隨意及感測網路技術
Wireless Ad Hoc and Sensor Networking Technologies

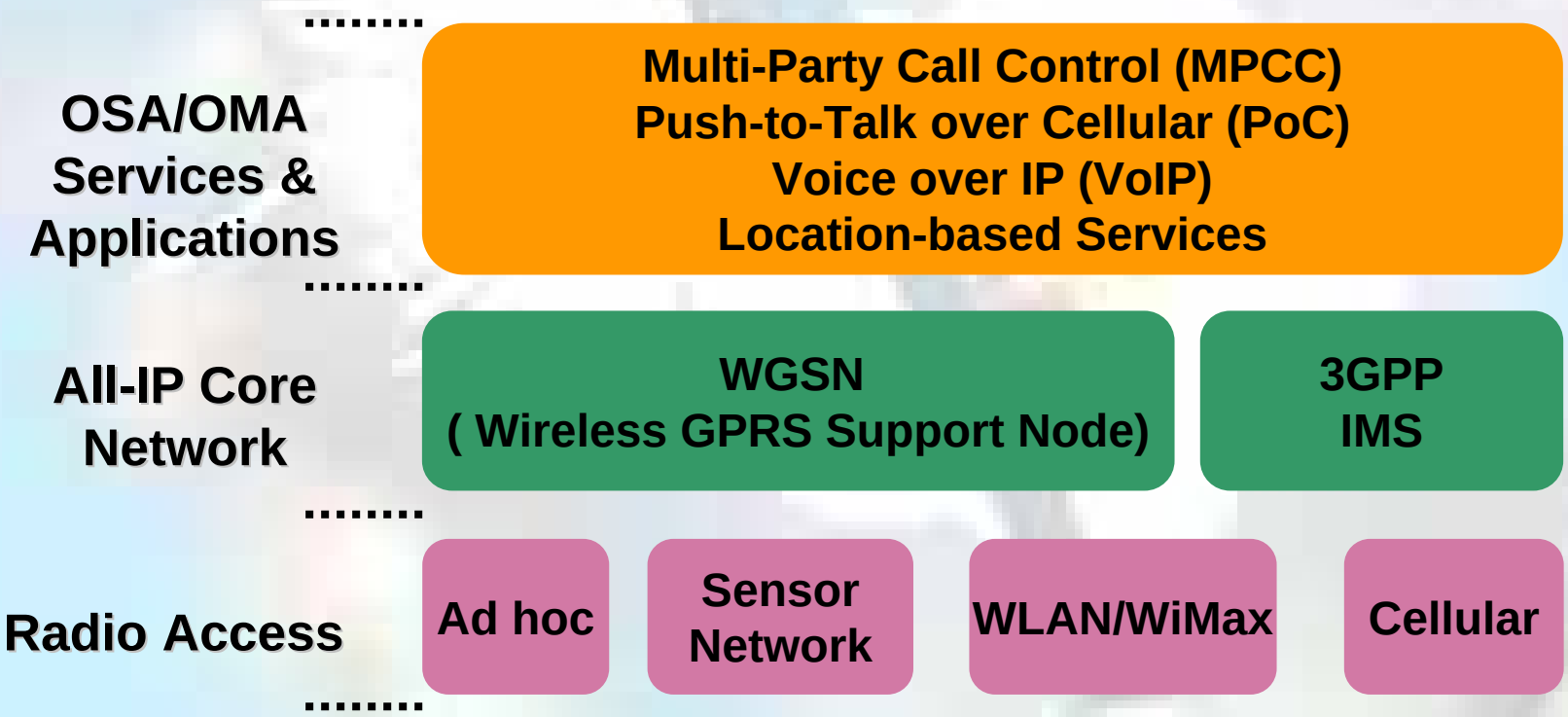
林一平 教授
簡榮宏 教授
曾煜棋 教授
張明峰 教授

陳文村教授
曾煜棋教授
許健平教授
陳志成教授
蔡育仁教授
王晉良教授
張志勇教授
楊舜仁教授

國立清華大學 National Tsing Hua University

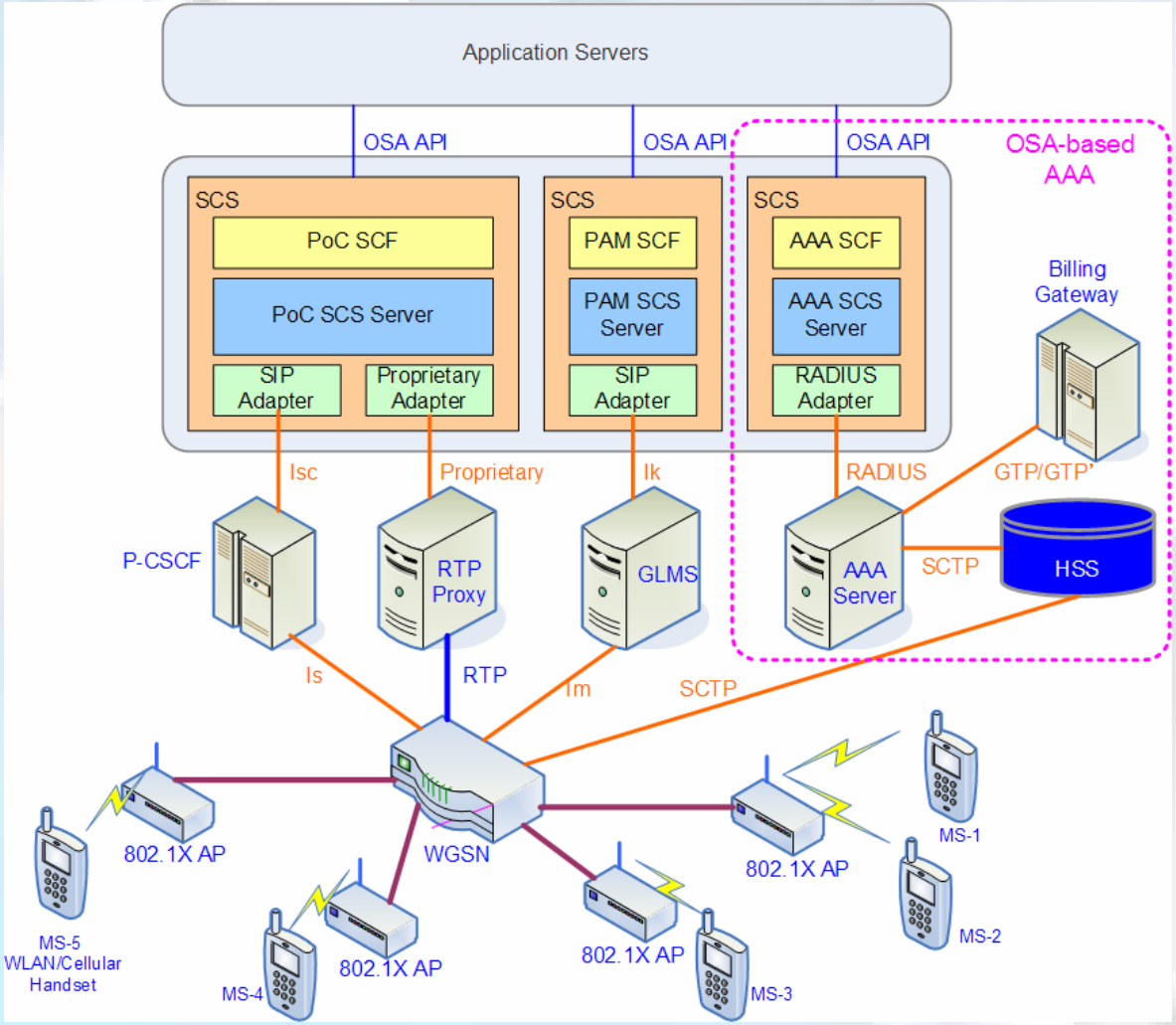
國立交通大學 National Chiao Tung University

後三代全IP核心與隨意感測無線網路架構圖



3.7

Beyond-3G All-IP Wireless Network Technologies



Collaboration with ICL, NICI and NTP.

System Design of The B3G Core Network

- CORBA-based OSA (100%, Lin)
- IPv4-IPv6 Interworking for IMS (100%, Lin)
- One-Pass WGSN and WCSCF Authentication (100%, Lin, Chang)
- Location Register for Dual-mode Handsets (100%, Chang)
- Call termination for WLAN/Cellular Network (100%, Lin)
- WiMax Core Network (50%, Lin)
- HIM : Heterogeneous Intersystem Mobility (Chen)(100%)
- RAMP : Reconfigurable Architecture and Mobility Platform (Chen)(100%)
- Modeling and Performance Analysis of UMTS Power Saving Mechanism (Yang)(100%)

Broadband Wireless Access Technologies (1)

- Security and Authentication: IEEE 802.1x and IPv6 RADIUS (100%, Jan)
- Thin AP Architecture for WLAN (100%, Jan)
- Rogue AP Detection (100%, Jan)
- Seamless Handoff Technologies for WLANs (100%, Chang)
- Location Sensing and Location Database Management (90%, Tseng)
- Multi-channel Wireless Mesh Network (50%, Tseng)
- MIMO Ad Hoc Network (20%, Tseng)
- Fast Handoff Technologies for Wimax (20%, Jan)
- Media Independent Handoff (10%, Jan)

Broadband Wireless Access Technologies (2)

- An two-tier heterogeneous MANET architecture for providing Internet access (Tseng) (100%)
- A Bluetooth-based sensor network and Visitor System (Tseng) (100%)
- Logical Coordinate Assignment for Geographic Routing in Wireless Sensor Networks (Sheu) (100%)
- Distributed location estimation algorithm for wireless sensor networks (Sheu) (100%)
- Distributed IP Address Assignment Scheme for Ad Hoc Networks (Sheu) (100%)
- Indoor Positioning and Tracking Techniques (Wang) (100%)
- The coverage problem in wireless sensor networks (Tseng) (100%)
- Coverage-preserving routing protocol for cluster-based WSNs (Tsai) (100%)
- An adaptive multi-channel MAC protocol for multi-channel wireless networks (Chen) (100%)

Applications and Services(1)

B3G

- Location-based Services: Visitor System (100%, Tseng)
- VoIP Gateway Supporting One-Stage Dialing (100%, Chang)
- VoIP over MANET (70%, Tseng)
- VoIP for Dual-mode Handsets (70%, Chang)
- Location Services in OMA (60%,Tseng)
- VoIP Monitoring (50%, Lin)
- Fast Hand over for VoIP Services(20%, Tseng)
- IMPS System (10%, Lin)
- Wireless P2P Service Platform (10%, Chang)

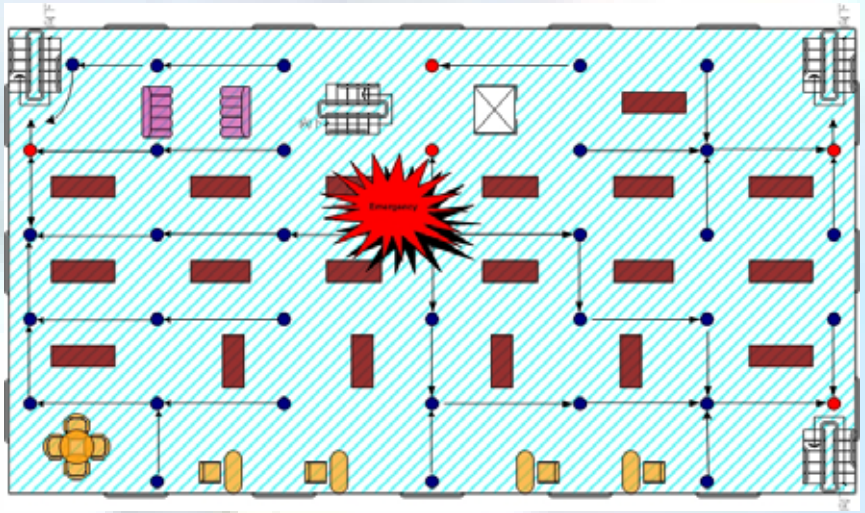
Applications and Services(2)

WSN

- Indoor Security Monitor and Emergency Navigation System (Tseng)
  - Distributed Emergency Navigation Algorithm (100%)
  - Network Deployment Tool Reliable (100%)
  - Topology Reconstruction Protocol (100%)
  - LED Indicator Board (100%)
  - Extension to 3D Environment (50%)
- Location Aware Services of a Hybrid Network for a Shopping Center (Sheu)
  - User guiding system (80%)
    - Integrating WLAN & WSN based localization systems
  - Merchandise data base construction (100%)
  - Sopping cart (100%)
  - Web-based purchasing in advance system (100%)
  - Purchase record system (100%)

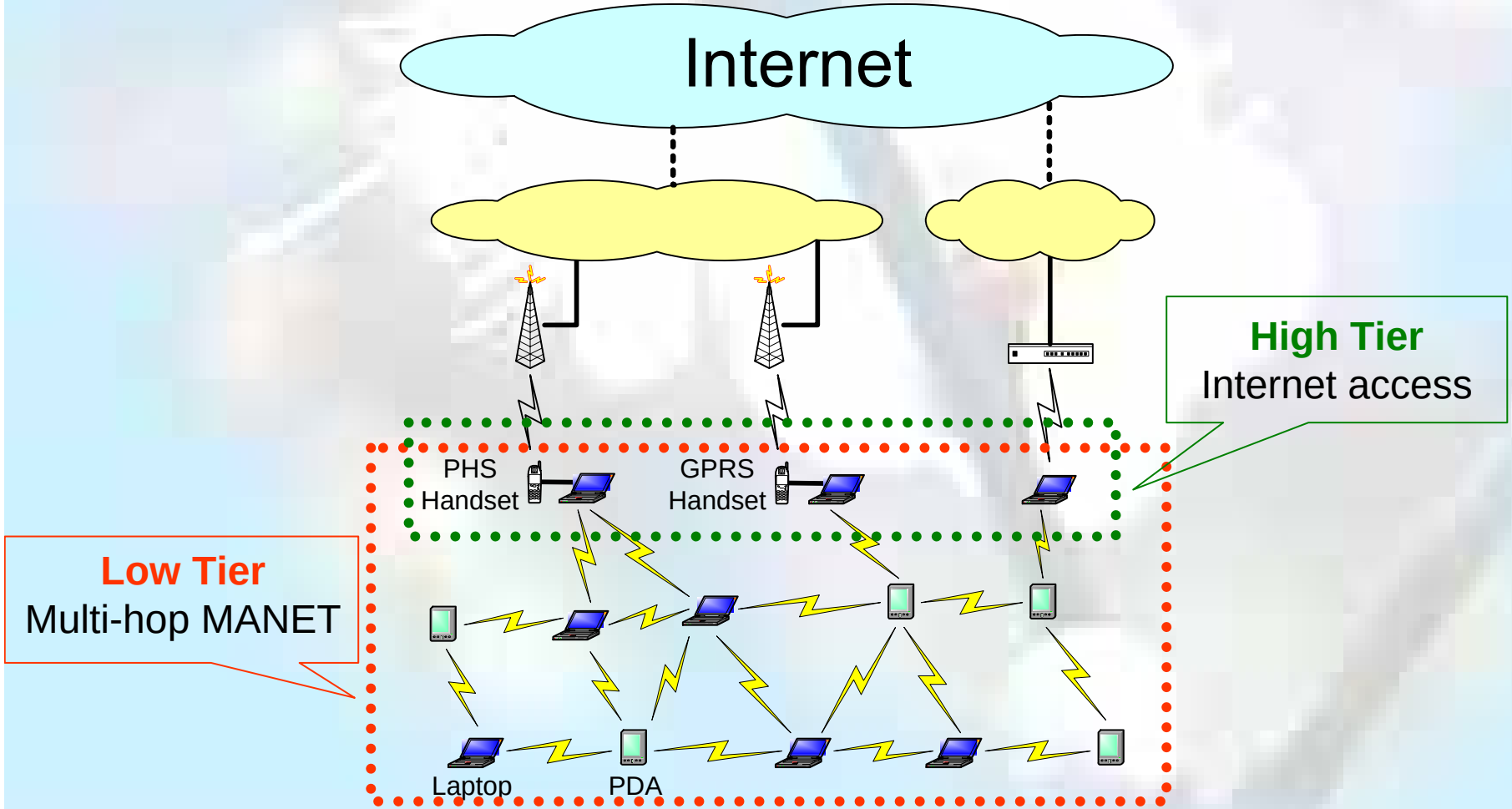
突破性成果:
Indoor Security Monitor and Emergency Navigation System

- Network Deployment Tool
  - Java-based interface
  - Network deployment planning
  - Logic link configuration
  - Auto configuration
- Reliable Topology Reconstruction Protocol
  - Regular reporting based on spanning tree
  - Auto reconstruction if nodes crash
- Distributed Emergency Navigation Algorithm
  - Emergency rescue
  - In network processing
  - Multiple exits
- LED Indicator Board



突破性成果:
Proposed MANET architecture for providing Internet access

- **The two-tier heterogeneous MANET architecture**



整體性成果:產學合作與成果推廣

經由電信國家型計畫之建置案及學術計畫擴大成果

- Intel: Broadband Wireless Mesh and WiMAX Networks , 2005.08~2006.07
- 工研院/交大聯合研發中心計畫："Wireless Internet" (Lin & prof. Chang), "Pervasive Wireless Networks" (Tseng), 2005.01-2005.12.
- ZyXEL: 802.11e無線網路下的傳輸品質與快速換手之研究", 2005.03-2006.02
- 資策會:先進網路系統技術之研究,2005.02~2005.12
- 本建置案之經驗轉移至國內產業 (宜蘭縣縣網中心VoIP網路建置案, 教育部電算中心VoIP建置案, 台灣網路資訊中心VoIP研究案, 金葉科技VoIP建置案)
- 與21家廠商合作，提供技術諮詢及互通性測試 (工研院資通所、兆赫電子、金葉科技、皇泰數位傳、和宇寬頻、台灣微軟、麗台科技、廣達電腦、宏達國際電子、仲凌科技、普邦科技、中華電信數據分公司網際網路處、創界科技、國庭科技、世紀民生、光寶科技、台灣網路資訊中心、台北市電腦公會、永結科技、安源資訊、廣聯科技等)

2.3
4.1

整體性成果:國際交流及學術合作

經由電信國家型計畫之建置案及學術計畫擴大成果

- 與法國電信INT合作，建立SIP VoIP之互連測試
  - 訂立共同研究主題SIP Mobility、Peer-to-Peer Voice over IP及IMS Application Server
  - 獲得法國政府STIC Asia Programme將於未來兩年，每年補助一萬歐元進行雙邊合作
- 與Ohio State University合作，進行大型wireless ad hoc and sensor network之研究

2.4

3.6

整體性量化成果

成果統計時間：2004/03/01～2006/03/31

子計畫	期刊論文	會議論文	專利申請與獲得	雛型系統	研討會舉辦
三	57 *	11	申請: 7 獲得: 4	10	14
四	49 **	65	申請: 6 獲得: 7	4	13

2.2

5.2

* IEEE論文計31篇, ACM論文計2篇

** IEEE論文計18篇, ACM論文計5篇

國立清華大學 National Tsing Hua University

國立交通大學 National Chiao Tung University

子計畫三－第三年度研究設備費變動說明

1. 原研究設備費1,835,000元，變更後其為1,035,000元；其餘800,000元撥入人事費。
2. 原出席國際會議240,000元，變更為0元，全部240,000元撥入國外差旅費，國外差旅費金額變更為300,000元。
3. 原人事費為4,350,000元，變更為6,023,072元；包含原研究設備費轉入800,000元和子計畫四轉

   入的博後一名人事費用876,072元，轉入金額用途說明如下:

   (1) 碩、博士班研究生研究助學金原1,872獎助單元，變更為2,266獎助單元。

   (2) 臨時工資原5,604元，變更為17,604元。

   (3) 博士後研究一名。

   薪資：57,000*9.5=541,500；59000*2.5=147,500

   年終：57,000*1.5=85,500　　小計：774,500

   勞健保費：（1,936+2,809)*10=47,450

   （1,936+2,955）*2=9,782　　小計：57,232

   公提離職儲金：57,000*0.06*9.5=32,490

   59,000*0.06*2.5=8,850

   小計：41,340

   總計：873,072

子計畫四－第三年度研究設備費變動說明

1. 人事費由本計劃的博士後研究員(黃啟富)--873,072元，轉至第三分項的人事費-博士後研究員(黃啟富)-- 873,072元。

   薪資：57,000*9.5=541,500；59000*2.5=147,500

   年終：57,000*1.5=85,500　　小計：774,500

   勞健保費：(1,936+2,809)*10=47,450

   (1,936+2,955）*2=9,782　　小計：57,232

   公提離職儲金：57,000*0.06*9.5=32,490

   59,000*0.06*2.5=8,850　　小計：41,340

   總計：873,072

   故，人事費由3,474,102元變更為2,601,030元。

2. 人事費：碩士班研究生研究助學金原576獎助單元增為756獎助單元，博士班研究生獎助金原504獎助單元增為624獎助單元。(故，人事費再由2,601,030元，變更為3,201,030)

3. 研究設備費由原核定為1,223,409擬變更為623,409元。

專書發表(1)

- **Book**
  1. Yi-Bing Lin and Ai-Chun Pang. Wireless and Mobile All-IP Networks, Wiley, 2005 (ISBN: 0-471-74922-2)
- **Book Chapters : (2004/4/1 ~ 2006/03/31)**
  1. Y. -C. Wang and Y. -C. Tseng, " Packet Fair Queuing Algorithms for Wireless Networks" (a book chapter in " Design and Analysis of Wireless Networks" , Nova Science Pub., edited by Y. Pan and Y. Xiao, 2004, ISBN: 1-59454-186-8)
  2. Y. -C. Tseng and S. -R. Ye, " Wireless LAN MAC Protocols Using Busy Tones and Jamming Signals" (a book chapter in " Wireless LANs and Bluetooth" , Nova Science Pub., edited by Y. Xiao and Y. Pan, expected 2006).
  3. Y.-C. Wang and Y.-C. Tseng, “Attacks and Defenses of Routing Mechanisms in Ad Hoc and Sensor Networks” (a book chapter in Security in Sensor Networks, CRC Press, 2006, ISBN: 0849370582, edited by Y. Xiao).

2.1

專書發表(2)

4. C.-F. Huang, P.-Y. Chen, Y.-C. Tseng, and W.-T. Chen, "Models and Algorithms for Coverage Problems in Wireless Sensor Networks" (a book chapter in "Theoretical and Algorithmic Aspects of Sensor, Ad Hoc Wireless and Peer-to-Peer Networks", CRC Press, edited by J. Wu, expected 2004).
5. C.-F. Huang, S.-P. Kuo, and Y.-C. Tseng, “Positioning and Tracking in Wireless Sensor Networks” (a book chapter in Handbook of Sensor Networks: Compact Wireless and Wired Sensing Systems, CRC Press, 2005).(tentative)
6. M.-S. Pan and Y.-C. Tseng, “Constructing Wireless Sensor Networks Using the IEEE 802.15.4 Standard” (a book chapter in Sensor Network and Configuration: Fundamentals, Techniques, Platforms, and Experiments, Springer-Verlag, edited by N. P. Mahalik).
7. J. P Sheu, Y. S. Chen, and C. Y. Chang, “Energy Conservation for Broadcast and Multicast Routings in Wireless Ad Hoc Networks,” J. Wu (Eds) Handbook on Theoretical and Algorithmic Aspects of Sensor, Ad Hoc Wireless, and Peer-to-Peer Networks, Jan. 2006 by Auerbach Publications, Taylor & Francis Group.

學術獎勵/競賽得獎(1)

林一平

- K.T. Lee Breakthrough Award, IICM, 2004.
- Fellow, American Association for the Advancement of Science (AAAS), 2004. Citation:Honored for distinguished contributions to the design and modeling of mobile telecommunications networks and for leadership in personal communications services education.
- Recognition of Excellence, Ministry of Economic Affairs, ROC.2004. Citation: In recognition of his significant achievement in setting directions for the wireless communication industry of Taiwan.
- IEE Fellow, 2004
- Advisory Board, Intl. Journal of Ad Hoc and Ubiquitous Computing
- 教育部通訊專題製作競賽 大專組 冠軍 (陳懷恩博士帶領), 2004
- NICI IPv6軟體程式競賽 冠軍 (陳懷恩博士帶領), 2004
- Japan IPv6 Appli-Contest 實作組 冠軍 (陳懷恩博士帶領), 2004
- NCHC國網盃軟體設計競賽 團體精神獎 (吳坤熹博士帶領), 2004
- 教育部通訊專題製作競賽 大專組 冠軍 (陳懷恩博士帶領), 2005

3.8

學術獎勵/競賽得獎(2)

林一平

- Quanta's Outstanding Invention Award, 2005
- W.Y. Pan Distinguished Research Award, 2005.
- Teco Award, 2005
- 中華民國資訊榮譽獎章, 2005

曾煜棋

- Yu-Chee Tseng, Outstanding Research Award (National Science Council, 國科會傑出研究獎, 2003~2005)
- Distinguished Alumnus Award, 2005, The Ohio State University.
- Elite Information Technology Award, Annual Computer Show Org., Republic of China, 2004. (九十三年資訊月「傑出資訊人才獎」)
- Outstanding EE Professor Award, The Chinese Institute of Electrical Engineering, 2005 (中國電機工程學會, 傑出電機工程教授獎).
- Acer Dragon Paper Award, 2005, by Acer Foundation (第十九屆宏碁龍騰知識經濟論文優等獎, 2005).
- Excellent Paper Award, The 10th Mobile Computing Workshop, 2004 (J.-R. Jiang, Y.-C. Tseng, and B.-R. Linn, “A Mechanism for Quick Bluetooth Device Discovery”).

學術獎勵/競賽得獎(3)

曾煜棋

- Annual Best Paper Award, 1st place, Chinese Institute of EE Society, “Event-Driven Messaging Services over Integrated Cellular and Wireless Sensor Networks: Prototyping Experiences of a Visitor System”, with Y. K. Liu, 2004. (九十三年中國電機工程學會，青年論文獎第一名，“整合行動電話網路及無線感測網路之事件驅動訊息系統”，劉衍谷同學)
- Energy-Conserving and Coverage-Preserving Protocols for Wireless Sensor Networks”, with L.-C. Lo, 2005. (九十四年中國電機工程學會，青年論文獎第三名，“無線感測網路中省電並維持覆蓋程度之分散式協定”，羅立竹同學)
- Best Paper Award, National Computer Symposium, 2005 (P.-Y. Wu, Y.-C. Tseng, and H. Lee, “Design of QoS and Admission Control for VoIP Traffics over IEEE 802.11e WLANs”)
- National Communication Contest, 1st place, Ministry of Education, Taiwan, "An Ad Hoc Network-Based Home VoIP System", with L. Li, P. H. Lee, J. Z. Chen, and Q. Wu, 2004. (教育部九十二學年度大專校院通訊科技專題製作競賽，研究所組，優勝獎，吳坤熹，李淩，李沛鴻，陳建志同學)
- National Communication Contest, 2nd place, Taiwan, 2005, “Indoor Security and Emergency Navigation Services by Wireless Sensor Networks”, awarded by Ministry of Education, with Y. Y. Tsai, C. H. Tsai, M. S. Pan, and C. F. Huang. (教育部九十三年「通訊競賽」研究所組優等獎，蔡岳洋，蔡佳宏，潘孟鉉，黃啟富，題目：以無線感測器網路實作室內安全監控以及緊急逃生導引系統)

學術獎勵/競賽得獎(4)

曾煜棋

- 國立交通大學 「第14屆思源創意競賽」金竹獎, 指導教授, 2005 (獲獎學生:游敦皓, 吳秉禎, 林慧榛, 呂依璇, 題目:墓仔埔也敢去－異質位置感知導覽系統及其應用平台, Heterogeneous Location-Aware Guide System and Service Platform).
- 國立交通大學 「第14屆思源創意競賽」銀竹獎, 指導教授, 2005 (獲獎學生:范日中, 顏宗信, 林素貞, 題目: 哺(ㄅㄨ)哺(ㄅㄨ)加上小蜘蛛—無線攝影車與室內無線感測網路之應用, The Application of Wireless Controlling Car and Sensor Network).
- K.T. Lee Breakthrough Award, IICM, 2005.

陳志成

- 2004通訊大賽 Play Tech組 第一名 (獎金新台幣一百萬), 主辦單位：經濟部工業 (陳志成 教授)
- 九十三學年度 大專院校 通訊科技專題製作競賽 研究所組 佳作 (陳志成 教授)
- 九十三年度國立清華大學新進人員研究獎 (陳志成 教授)
- 九十二年度國立清華大學電機資訊學院新進人員研究獎 (陳志成 教授)

學術獎勵/競賽得獎(5)

陳文村

- IEEE Computer Socity 傑出巡迴演講人，2004 ~ 2006
- 第八屆教育部國家講座（2004，終生榮譽）
- 台灣積體電路設計學會特殊貢獻獎（2004）
- 中華民國科技管理學會院士（Fellow，2004）

許健平

- 中央大學特聘教授 2005
- Distinguished Engineering Professor Award, The Chinese Institute of Engineers, 2003.
- Specially Granted Researchers, National Science Council, 1999 ~ 2002 and 2002 ~ 2005.

疊蓋式網路群
(Overlay Networks)

國立清華大學
National Tsing Hua University

國立交通大學
National Chiao Tung University

疊蓋式網路 (Overlay Network)

子計畫五：網路安全
Network Security

子計畫六：疊蓋式網路之技術與應用
Techniques and Applications of Overlay Networks

蔡文祥 教授
陳耀宗 教授
曾憲雄 教授
袁賢銘 教授
洪宗貝 教授
張玉山 教授

金仲達 教授
陳良弼 教授
許雅三 教授
王家祥 教授
鍾葉青 教授
李政崑 教授
林華君 教授
陳宜欣 教授

國立清華大學 National Tsing Hua University

國立交通大學 National Chiao Tung University

Information Streaming and Security on Overlay Networks

Streaming applications

Overlay network

Internet

Issues:
- Requiring efficient continuous query
- Protection of multimedia content

Solutions:
- Approximate matching
- Multidimensional online mining
- Active information hiding

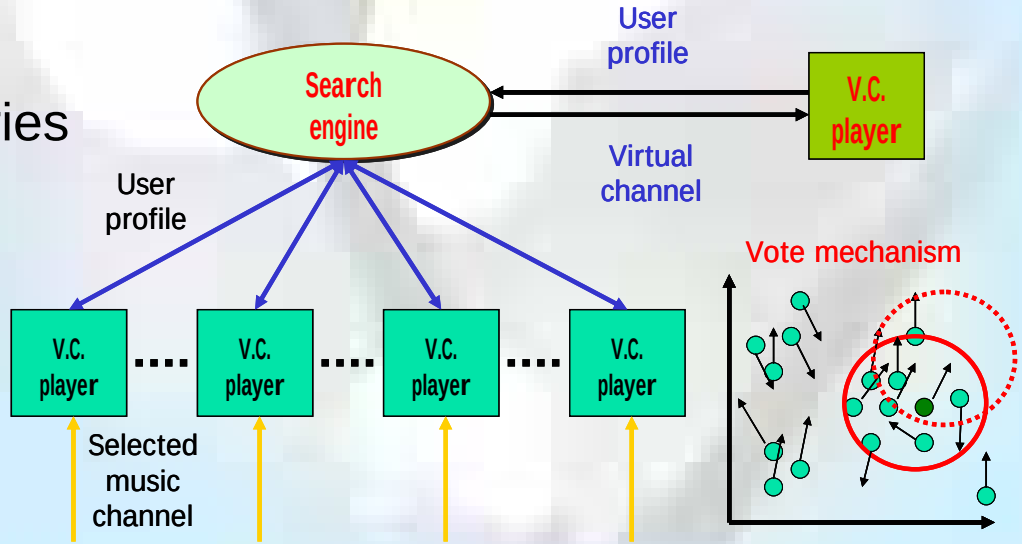
Issues:
- Lack of user friendly development tools
- Secured overlay networks

Solutions:
- Java based development tools
- Pluggable security framework

Efficient Continuous Query

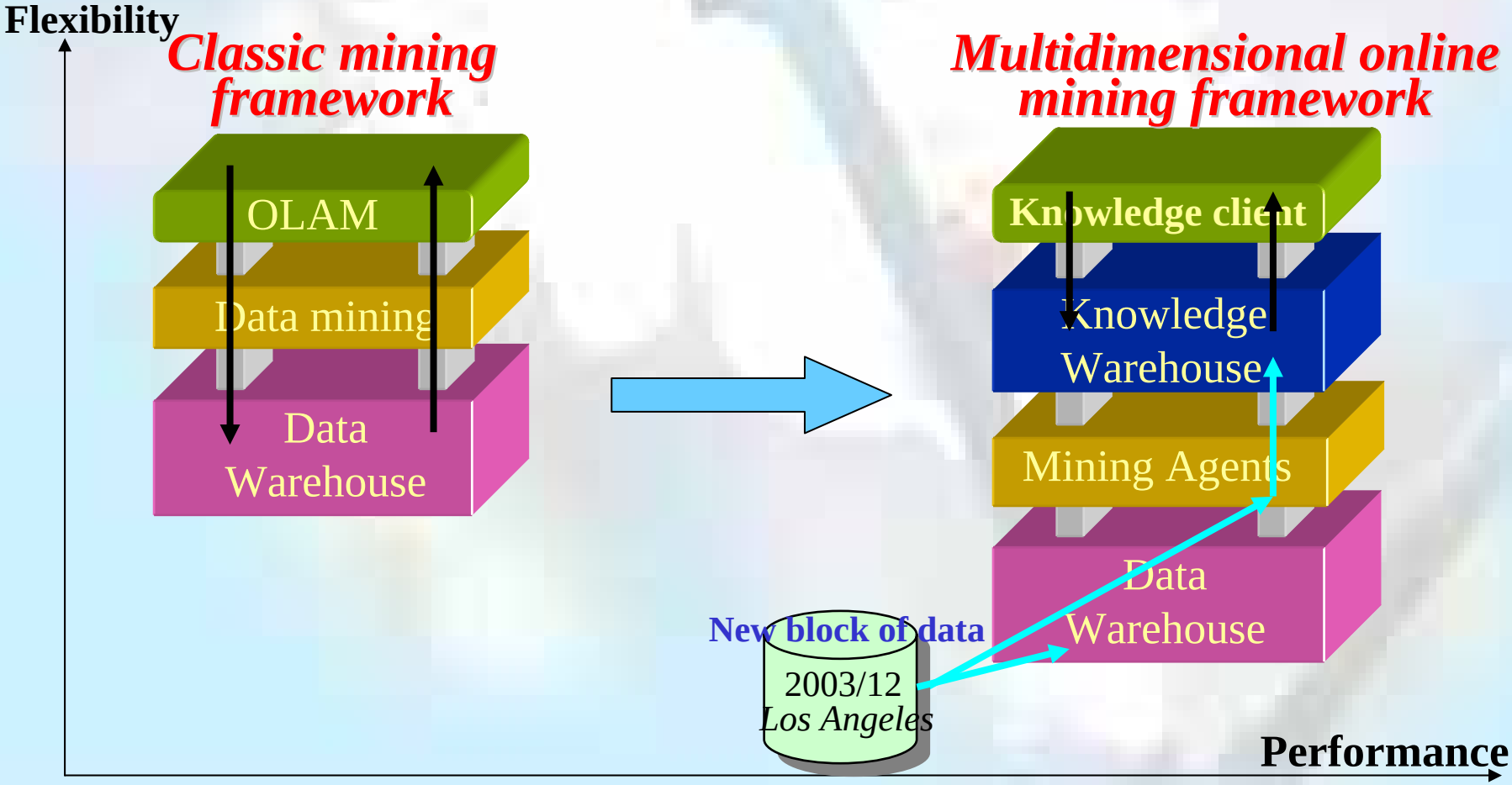
Solution: Approximate matching

- Mechanisms for processing continuous queries
  - Continuous query processing over event streams based on approximate matching mechanisms
  - Continuous searches for moving objects in high-dimensional space
    continuous range queries
    + continuous kNN queries
- A prototype system
  - Music virtual channel
    + Virtual channel
    + Favorite channel



Efficient Continuous Query

Solution: Multidimensional online mining

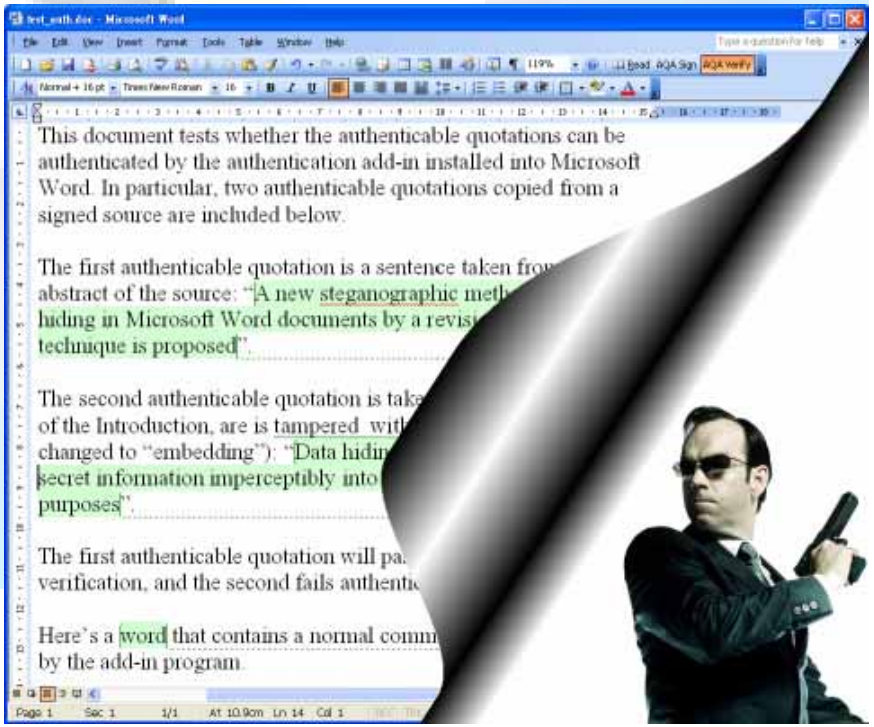


Protection of Multimedia Content

Solution: Active information hiding

Embedding Active Agents in Media

- Active Copyright Protection in HTML files
  - Transmission and storage of protected contents
  - Active recovery in legal situations
- Active Content Authentication
  - Automatic tamper detection
- Active Quotation Authentication
  - Automatic generation of authenticable quotations
  - Immediate, offline quotation verification

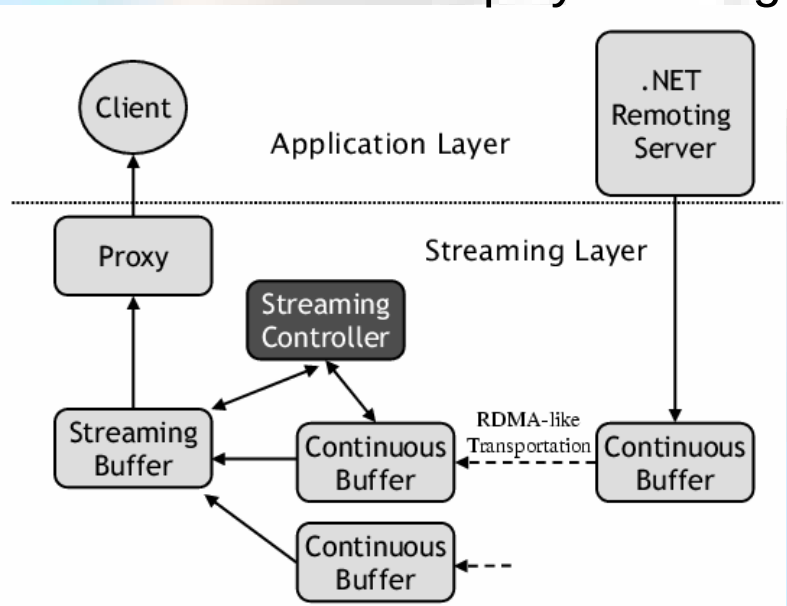


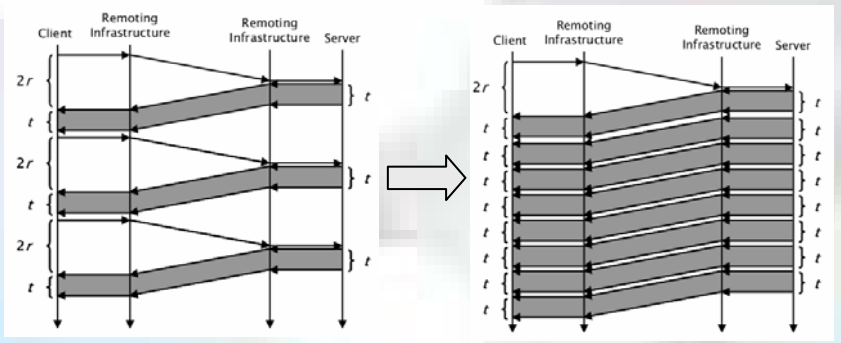
User Friendly Overlay Development Tools

Solution: Java based development tools

Integration of streaming with remote object (Java RMI, .NET Remoting)

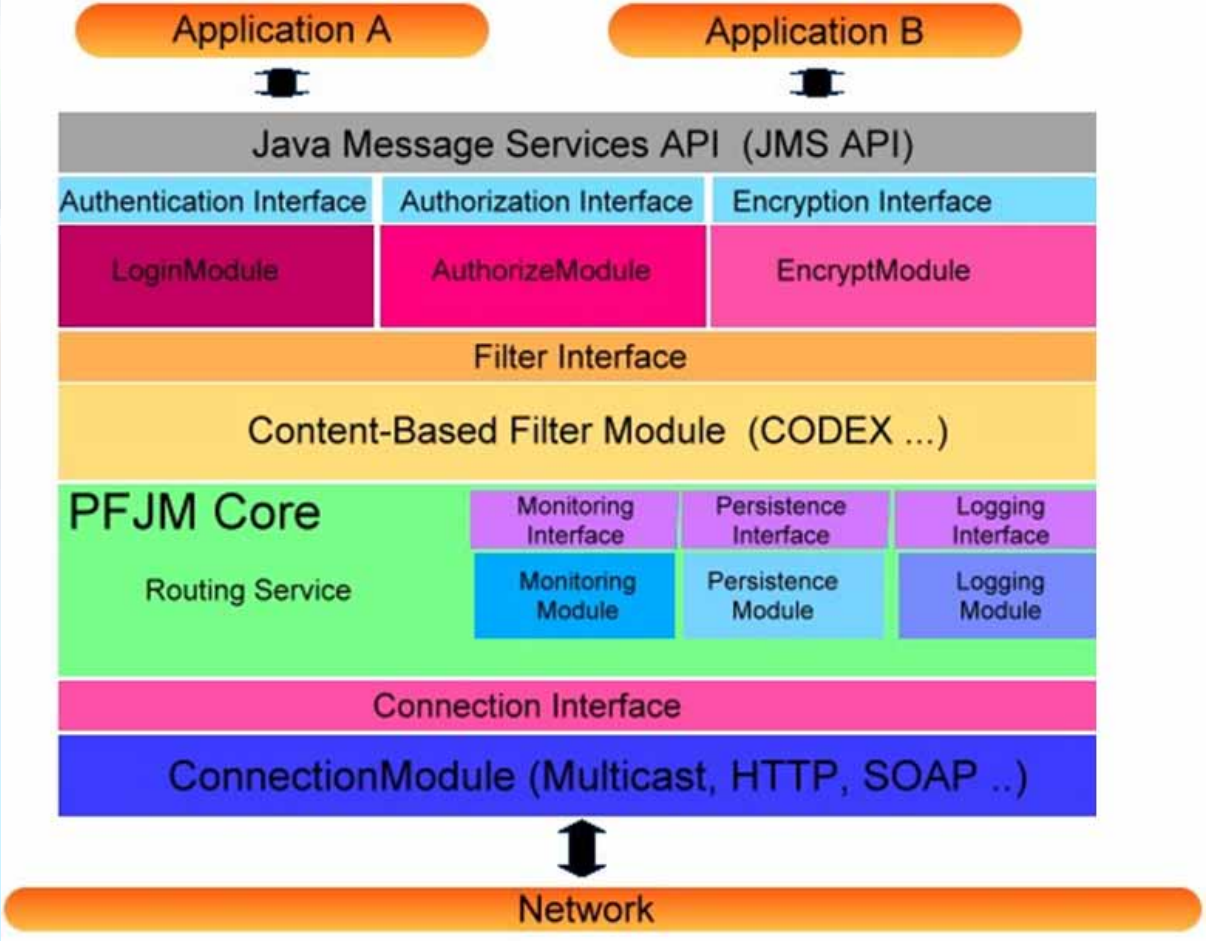
- Novice mechanisms for performance and programmability
- APIs to simplify creating streaming sessions





Secured Overlay Networks

Solution: Pluggable security framework



Research Topics

- Active copyright protection in HTML files
- Active content authentication
- Active quotation authentication
- Multidimensional online mining
- Persistent fast Java messaging
- P2P security gateway
- Distributed indirect overlay for exchange of ubiquitous streaming
- User-friendly overlay development tool
- Mining frequent itemsets on streams
- Content filtering on multi-valued data stream
- Layered chaining for scalable video streaming

突破性成果與主要貢獻

- Active copyright protection in HTML files
- Knowledge warehousing technology
- Persistent fast Java messaging
- Passive TCP splicer kernel module
- Java-based user-friendly overlay development tool by Integration of streaming with remote object
- Continuous searches for moving objects in high-dimensional space continuous range queries

整體性量化成果

成果統計時間：2004/03/01～2006/03/31

子計畫	期刊論文	會議論文	專利	雛型系統	研討會	獎項榮譽
五	24	38	3	6	2	9
六	20	53	13	2	23	5

結語

- 本計畫過去兩年已獲致相當豐碩之成果。
- 本計畫不只著重學術研究，亦非常強調與業界合作，曾對業界舉辦過技轉與成果說明會(94.12.16)。
- 本計畫將在往後之兩年中強調國際化學術提升、技術與系統整合、應用推廣及業界移轉。