

CSF641

Peer-to-Peer Computing

點對點計算

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Peer-to-peer Model

“ Peer-to-Peer (P2P) is a way of structuring distributed applications such that the individual nodes have symmetric roles. Rather than being divided into clients and servers each with quite distinct roles, **in P2P applications a node may act as both a client and a server.**”

Excerpt from the Charter of Peer-to-Peer Research Group,

IETF/IRTF, June 24, 2003

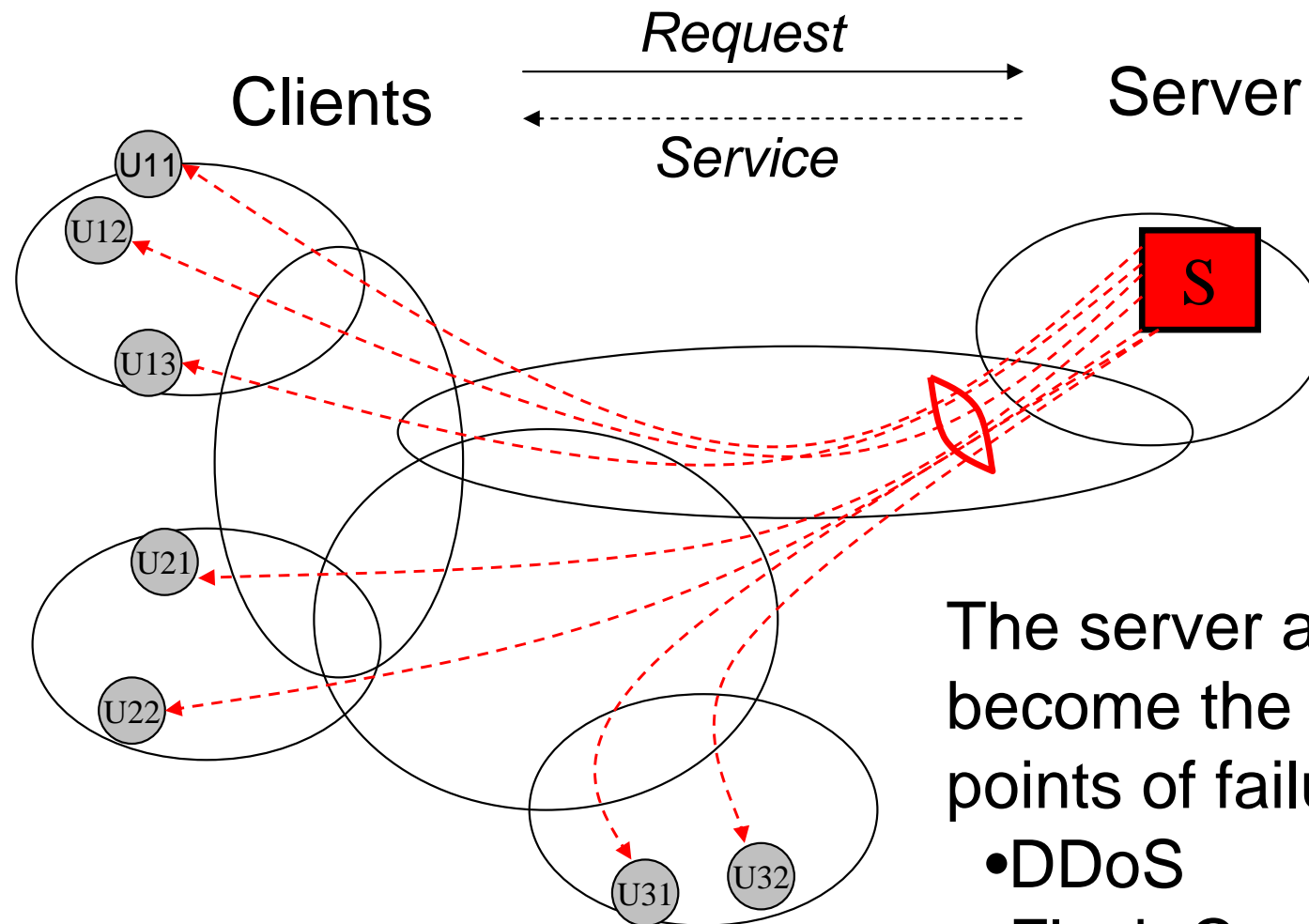
<http://www.irtf.org/charters/p2prg.html>

Peers play similar roles

No distinction of
responsibilities

Client-server Model

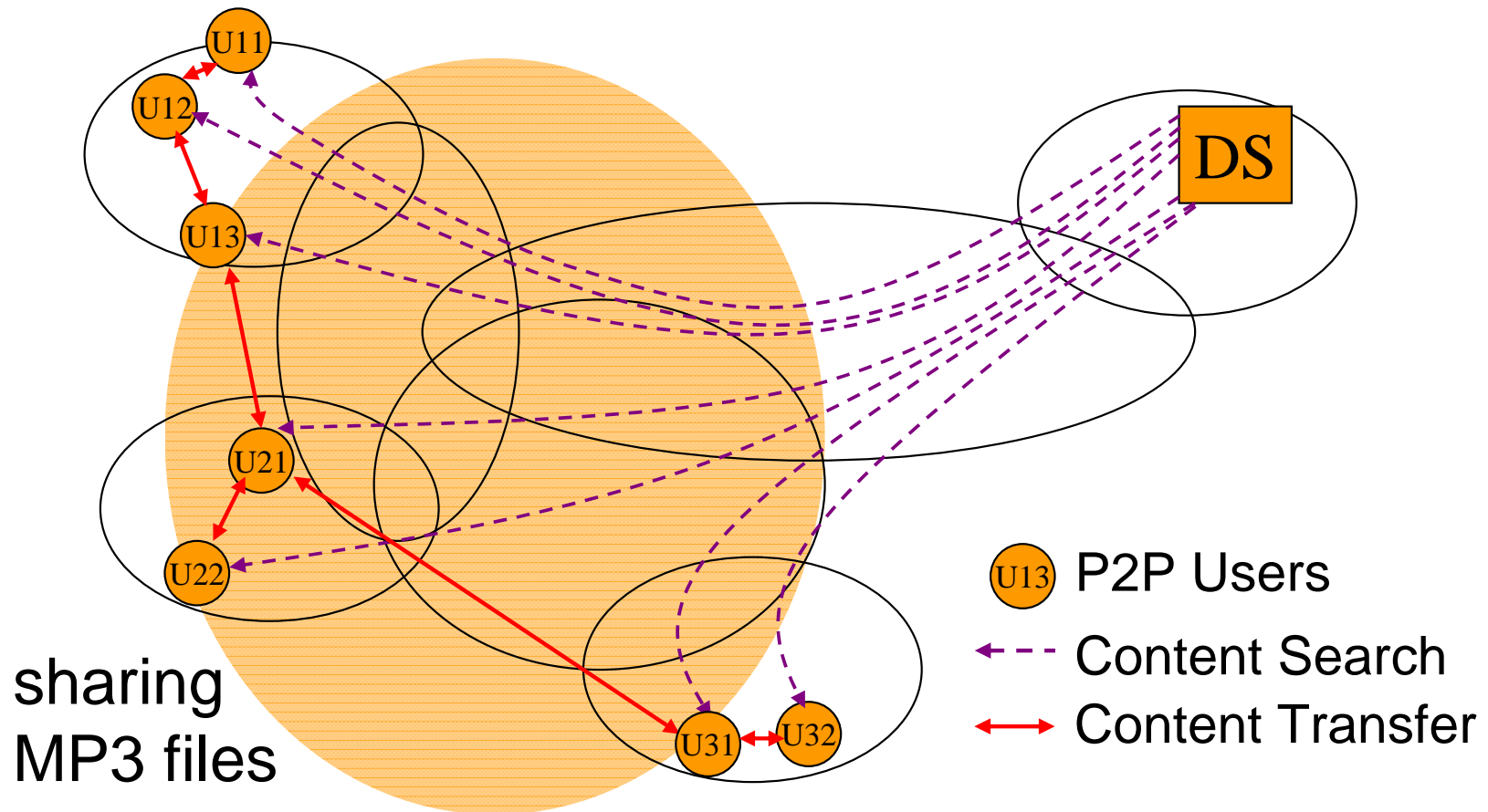
Clients and servers each with distinct roles



The server and the network become the bottlenecks and points of failure

- DDoS
- Flash Crowd

P2P Example - Napster

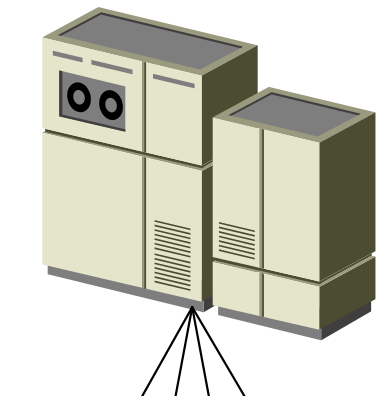


- Any two P2P nodes can exchange contents directly
- + Running P2P software is much easier than maintaining servers
- + Reduce the load of server, even without servers

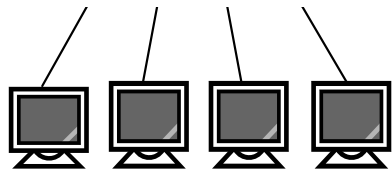
Paradigm Shift of Computing System Models

1980~

Terminal-Mainframe
(Super-computing)



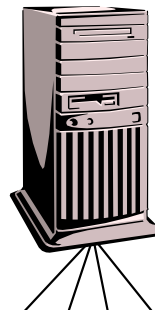
RS-232



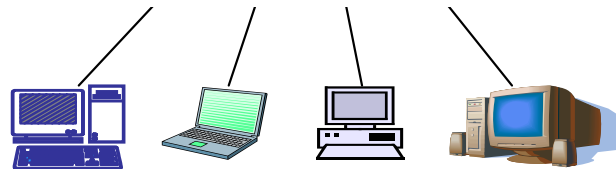
VT100/DOS

1990~

Client-Server
(Personal Computer)



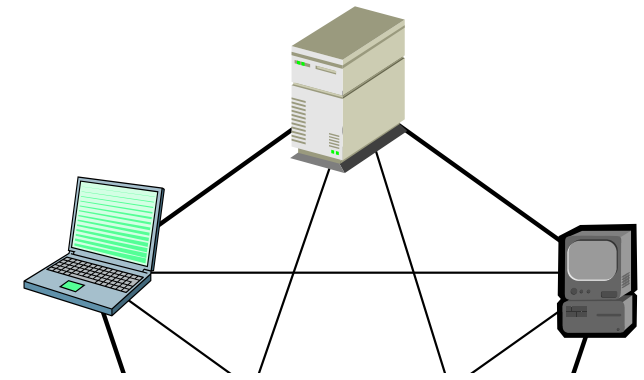
Dialup/10M Ethernet



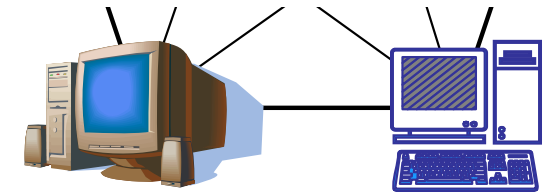
Windows 31/95

2000~

Peer-to-Peer
(Ubiquitous computing)



ADSL/100M+ Ethernet



Linux/Windows XP

2010~ Cloud Computing



Android/
iOS/WP

課程資訊

教學目標:

網際網路的普及，除了擴大資訊的傳播外，也增進了人類彼此之間的溝通與分享，已對人類文明發展產生了巨大的影響。傳統網際網路的應用，多以主從架構(client-server)來開發系統，而點對點計算(Peer-to-Peer, P2P)則是新興的網路應用模式，各網路節點能同時扮演用戶端、伺服器或中繼者等多重角色，因此比傳統的應用模式更具多樣性。這幾年來P2P的相關應用都大受歡迎，相關技術也被廣泛應用在主幹架構或企業內部網路系統中。有鑑於此，我們規劃「點對點計算」課程，期能透過課堂學習、分組討論與專題實作，增進學生對於新興點對點網路方面所需具備的技術與能力，並培訓具創新、整合能力的網路應用與服務研發人才。課程兼顧理論基礎及實務應用，並透過資源網站推廣優良教材，以期縮短產學供需的落差、擴大人才培訓成效，並彌補產業人才不足。

授課方式:

- 投影片授課暨書報討論
- 學生論文研讀報告及專題製作
- 上機實習

教材

教科書

無

指定論文

上網公布

參考「資通訊科技人才培育先導型計畫」的「點對點通訊協定及應用」推廣教材及相關學術論文。

<http://exodus.cs.ccu.edu.tw/p2p/>

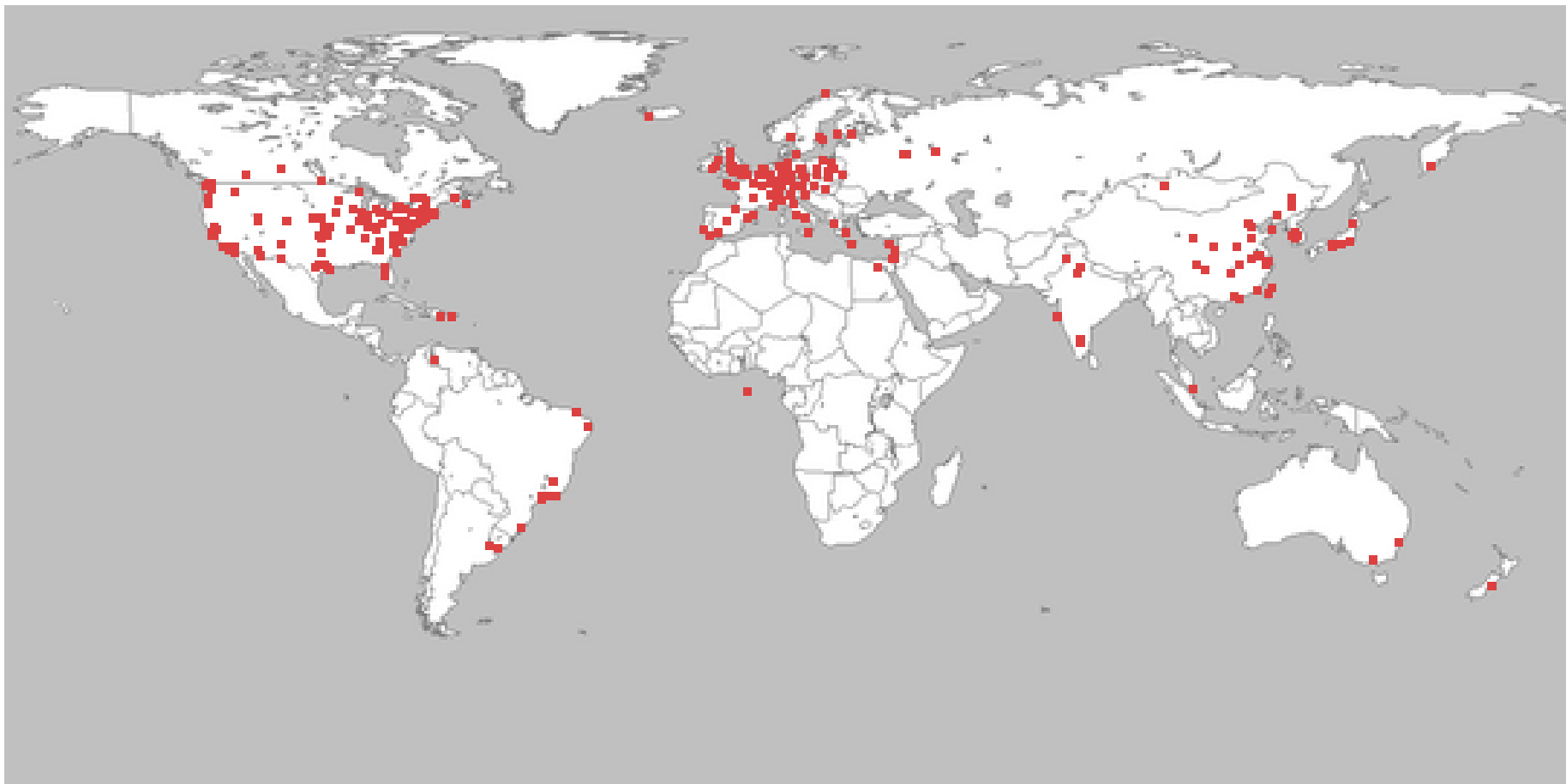
參考書

- John F. Buford, Heather Yu, and Eng Keong Lua, **P2P Networking and Applications**, Morgan Kaufmann, 2009

PlanetLab

An open platform for developing, deploying, and accessing planetary-scale services

- Current distribution of 1110 nodes over 537 sites (Feb 22, 2012)
- <http://www.planet-lab.org/>



課程內容與進度

1. Introduction to P2P

- Introduction (what, why)
- Survey of P2P networks (commercial, freeware, research)
- Issues of P2P (infrastructure, search, routing, download)

2. Infrastructure of P2P

- Centralized (Napster)
- Unstructured (Gnutella)
- Structured (Chord, CAN, Pastry)
- Hybrid (unstructured + structured, KaZaa, BT)
- Hierarchical

3. Performance issues of P2P

(improvement of P2P performance)

- Neighbor selection
- Infrastructure maintenance overhead
- Routing (proximity)

- Searching (keyword, semantic content search)

- Download

- Mobile issues

- Replication (cache)

- Hot spot and Free rider issues

4. Applications of P2P

- File sharing

- Storage

- Video Streaming (Live, VOD, P2PTV)

- VoIP over P2P (skype, P2PSIP)

- Wireless (structured or MANET)

- Semantic content search

- Game

5. Performance analysis of P2P

- Simulation tool: PeerSim

- Analytical models

6. Implementation of P2P

- JXTA

評分標準 (暫定)

1. 出席課堂及討論 (20%)
2. 期中報告(20%)
 - A. P2P軟體使用分析口頭報告(10+ slides)
 - B. 論文研讀書面報告(摘要、心得討論各250字)
3. 指定論文報告(20%)
 - 書面報告(摘要、心得討論各250字)
 - 口頭報告(15+ slides)
4. 期末專題製作 (40%)
 - 展示與口頭報告(10+ slides)
 - 書面報告 (term paper)

Schedule

1	2/23	預備週	10	4/26	Routing
2	3/01	Introduction	11	5/03	Incentive
3	3/08	Search(I)	12	5/10	Incentive
4	3/15	Search(II)	13	5/17	Storage
5	3/22	Transmission(I)	14	5/24	Search
6	3/29	Transmission(II)/題目	15	5/31	指定論文研讀報告
7	4/05	清明節	16	6/07	指定論文研讀報告
8	4/12	Measurement	17	6/14	指定論文研讀報告
9	4/19	期中報告	18	6/21	期末專題報告

碩士班教育目標：培育高素質之資訊人才

一. 著重理論與實務並重之專業訓練

- 研究相關的數學、演算理論與實作之能力
- 專業性論文閱讀與撰寫之能力
- 智慧型、嵌入式系統、網路與通訊等專業領域知識、專案規劃與整合應用之能力

二. 培養獨立思考與創新能力

- 理論推導及數據歸納之能力
- 發掘、分析及獨立解決問題之能力
- 創新及持續自我學習之能力

三. 具備人文素養與團隊合作精神

- 負責態度、社會關懷及豐富之人文涵養
- 良好之溝通技巧與團隊合作精神
- 良好之外語能力及國際觀

參考組織與會議

- ACM (Association for Computing Machinery)
www.acm.org
 - SIGCOMM - SIG Data Communication
- IEEE (Institute of Electrical and Electronics Engineers)
www.ieee.org
 - Communication Society (www.comsoc.org)
 - Computer Society (www.computer.org)
- IETF (Internet Engineering Task Force)
www.ietf.org
- Conferences and Journals
 - ACM SIGCOMM
 - HotNets, IMC (Internet Measurement Conference)
 - IEEE INFOCOM
 - IEEE P2P
 - HotP2P (with IPDPS)
 - IPTPS (International Workshop on Peer-to-Peer Systems)
 - IEEE or ACM Journals

論文網站

Cite SeerX	citeseer.ist.psu.edu
Google Scholar	scholar.google.com
Microsoft Academic Search	academic.research.microsoft.com
Elsevier Scirus	www.scirus.com
IEL (IEEE Xplore)	ieeexplore.ieee.org
ACM Digital Library	portal.acm.org
Springer-Verlag Link	www.springerlink.com
Wiley InterScience	www.interscience.wiley.com
Elsevier ScienceDirect(SDOS)	sdos.ejournal.ascc.net
JCR (Journal Citation Report)	isiknowledge.com
CONCERT 電子期刊聯合目錄	ulej.stpi.org.tw

連絡資訊

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星期三：10:10 - 12:00PM

by appointment

<http://www.csie.nuk.edu.tw/~wuch/course/csf641/>