

情報ネットワーク論I

Introduction (2)

門林 雄基

TA: 衛藤、横山、Omar、鈴木

Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

授業日程変更

Day		Topic	
(1)	4/9	わたしの思うコンピュータネットワーク (山口編)	山口
(2)	4/14	わたしの思うコンピュータネットワーク (門林編)	門林
(3)	4/16	階層型プロトコルとTCP/IP(1)	門林
(4)	4/21	階層型プロトコルとTCP/IP(2)	門林
(5)	4/23	データリンク技術	山口
(6)	4/28	データリンク技術(つづき)	山口
(7)	4/30	IPv4	山口
(8)	5/7	IPv4(つづき)	山口

Day		Topic	
(9)	5/12	IPv6	山口
(10)	5/14	TCP(1)	門林
(11)	5/19	TCP(2)	門林
(12)	5/21	経路制御(1)	門林
(13)	5/26	経路制御(2)	門林
(14)	5/28	プレゼンテーション層技術とXML	門林
(15)	6/2	期末試験	門林

Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

Why study Internet? from technical perspective

- Biggest distributed system on earth
 - learn from working systems
 - especially if you are building distributed systems
 - good, open architecture
 - documented, running, analyzed
 - reference implementation – a working proof
 - stepwise development
 - every steps documented in “RFC” document series
 - development goes on
 - for diverse applications and services
- Everybody's asset, your research platform

Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

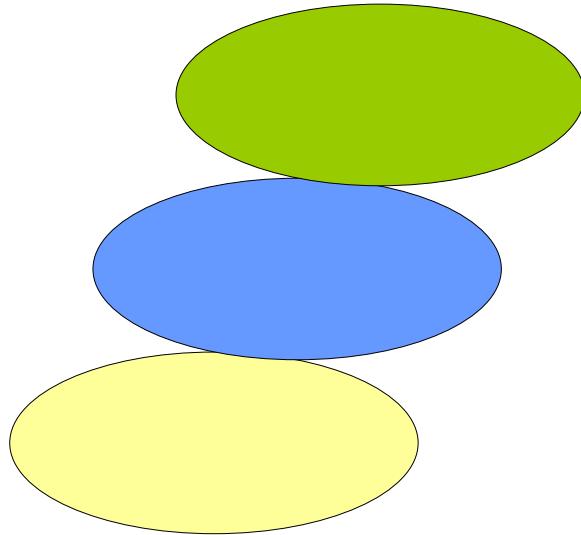
Why study Internet? from social perspective

- open process of innovation and standardization
 - individual volunteers
 - rough consensus
 - individual contributions and group contributions
 - contrary to government-led ISO and ITU
- IETF
- Internet-style activities elsewhere
 - World-wide web consortium (W3C)
 - Global grid forum (GGF)
 - Java community process (JCP)
 - ...

Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

Acronym

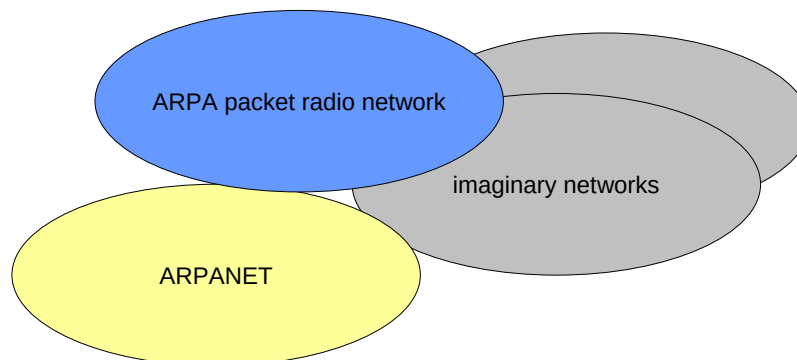
- network
- internetwork
- Internet



Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

The origin

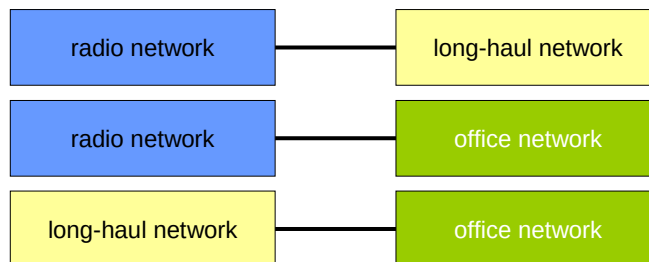
- “other networks will be interconnected...”
- specific interconnection problem
- generic solution



Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

interconnection: a combinatorial problem?

- suppose we have three different types of networks that we wish to interconnect:

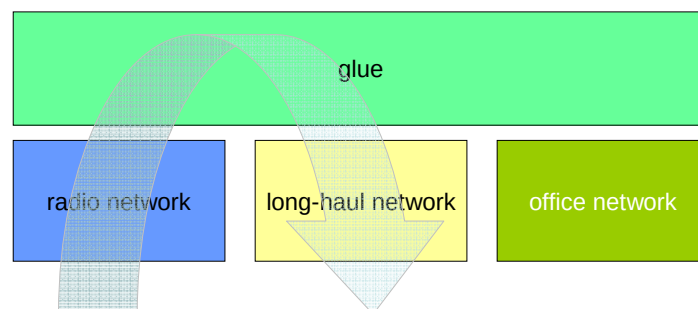


3 different interconnection systems?

Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

interconnection, simplified

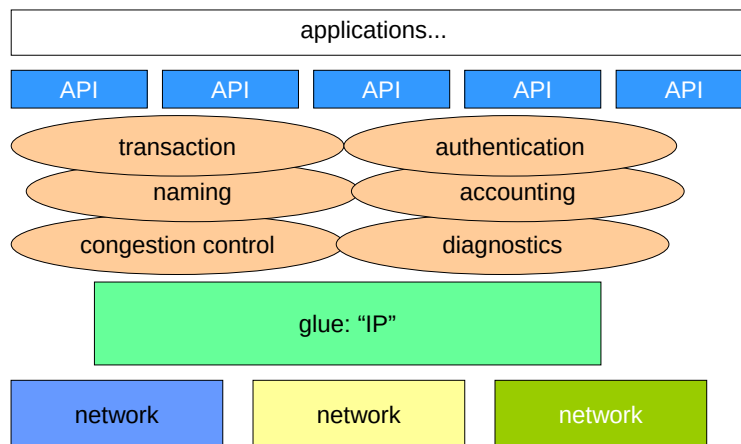
- introduce a “glue layer” between different types of networks
- avoid combinatorial explosion of interconnection systems



Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

hourglass model

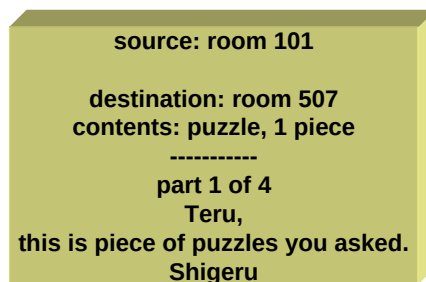
- glue layer – called IP – remain intact
- algorithms, systems, and human interfaces are built atop



Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

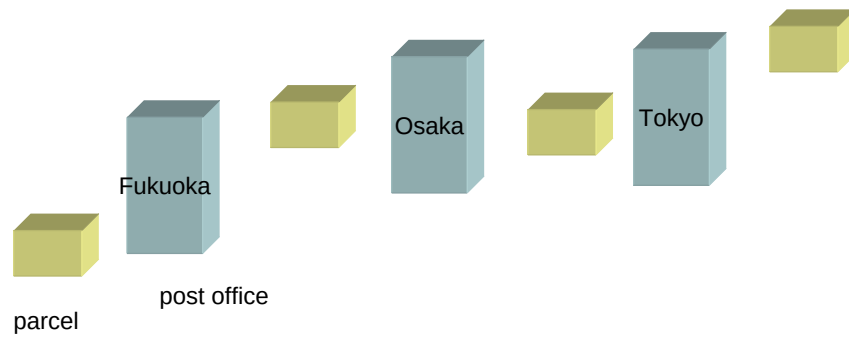
packet: an analogy to postal system

- from (source), to (destination)
- contents (data) sealed by envelope



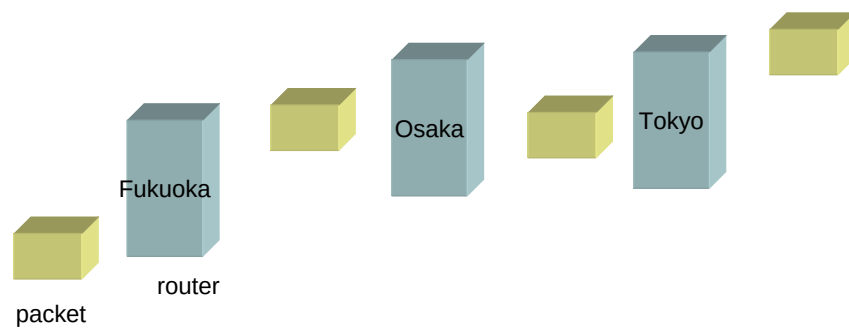
Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

postal network analogy



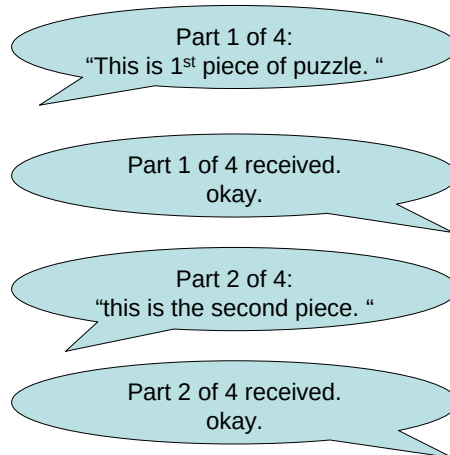
Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

postal network analogy: store-and-forward of packets



Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

protocol: an analogy to conversation



Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

review

- interconnection
- purpose of glue layer
- packet
- protocol

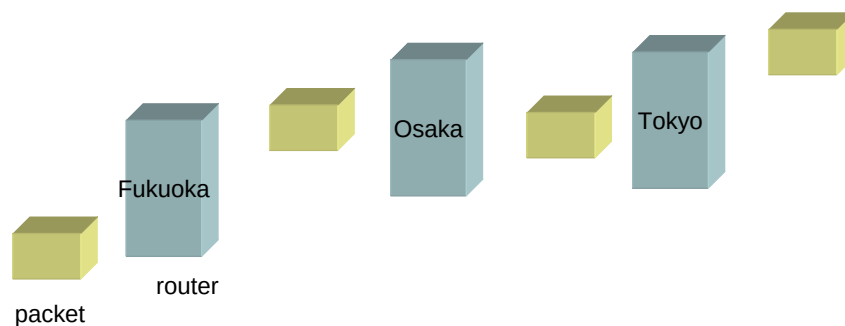
Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

Internet design principles (1)

- minimalism, autonomy - a network should be able to operate on its own, with no internal changes required for it to be internetworked with other networks.
- best-effort service: internetworked networks would provide best-effort, end-to-end service. if reliable communication was required, this could be accomplished by retransmitting lost packets from the sending host.

Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

autonomy / best-effort



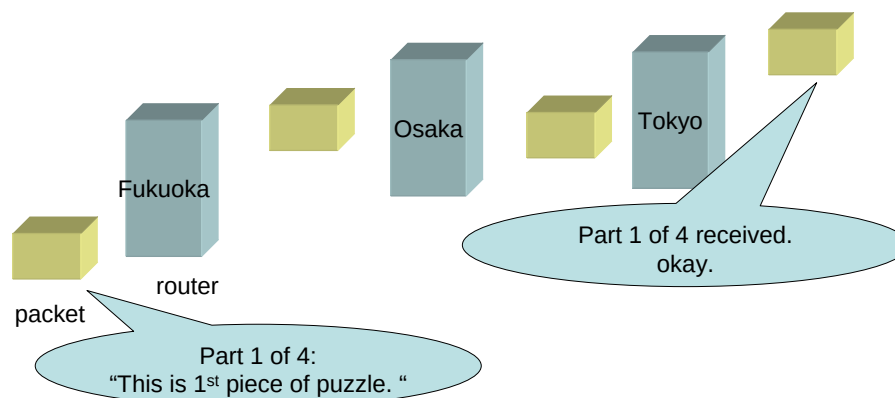
Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

Internet design principles (2)

- stateless routers: the routers in the internetworked networks would not maintain any per-flow state (memory) about any ongoing connection.
- decentralized control: there would be no global control over the internetworked networks.

Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

stateless / decentralized control



Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

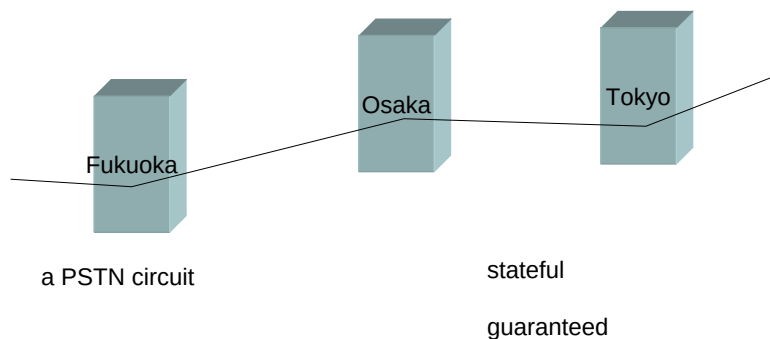
Acronym

- packet
- protocol
- router
- stateless
- best-effort
- end-to-end

Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

Alternative approach: telephone system

- “circuit switched”, as opposed to “packet switched”



Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

From subsequent lectures...

- models
- communication abstractions
- identifiers
- encapsulation
- framing
- connection
- congestion control / flow control
- survivability in the face of failures
- autonomy, decentralized control
- ...

Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.

Questions?

Copyright(C)2003 Youki Kadobayashi, NAIST. All rights reserved.