

SOI Asia Server Installation

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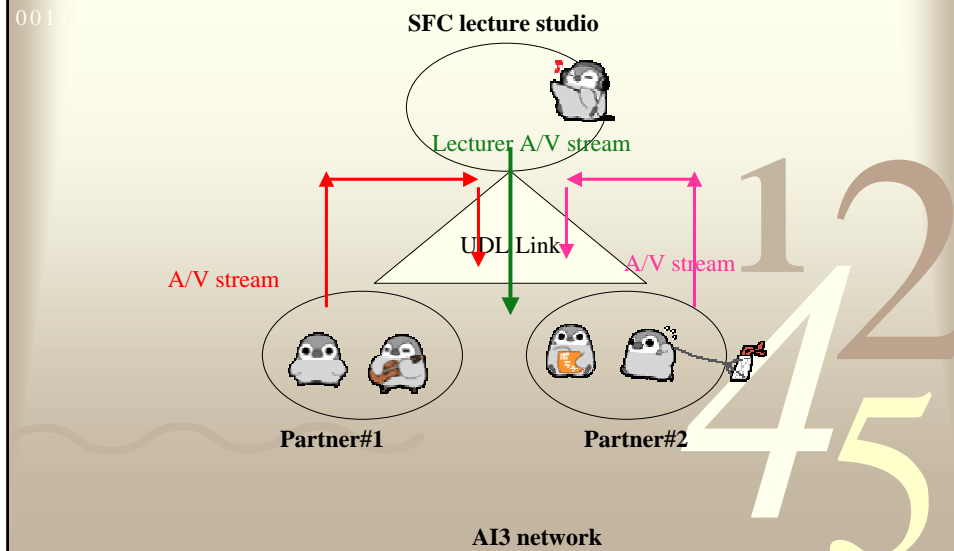
SOI Asia Workshop 2005

Unibraw, Indonesia

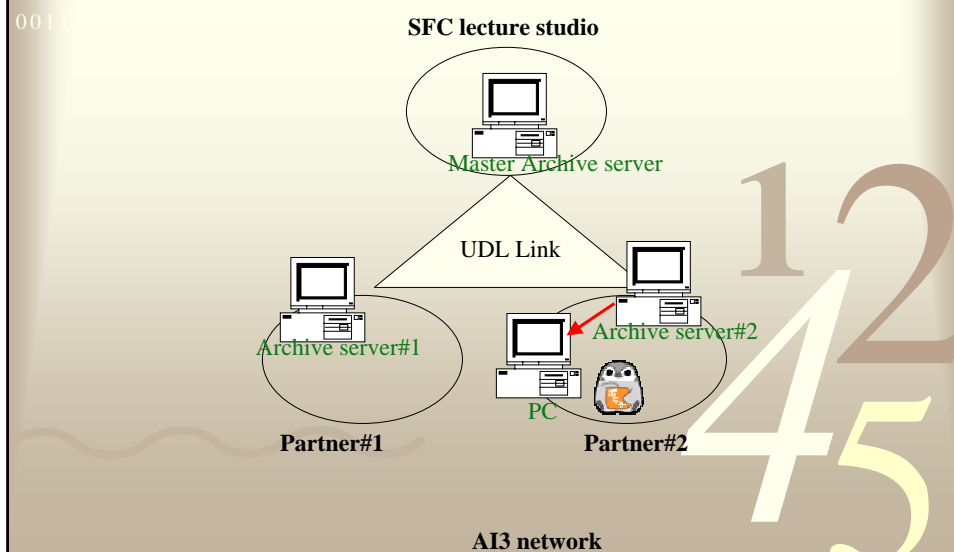
SOI Asia Learning Method

- Realtime
 - Interactive session
 - Lecturer and students
 - present at the same time
 - Not at the same place
 - Audio/Video conferencing system
 - over SOI Asia satellite (UDL)
 - Partners's network
- On-demand (Archive)
 - Lecture is recorded in video/audio, material is collected
 - Student learns at anytime

Realtime Learning Method



On-demand Learning Method



SOI Asia Learning Method

- Realtime System
 - Tomorrow
- Archive System
 - Today
 - Configure SOI Asia server
 - Archive server
 - Some other Internet services

Outline

- Server Purpose
- System Overview
- Installation

Server Purposes

- Archive Lecture and File distribution Service
 - Receive lecture video/materials/files from master server
 - Store/Display archive course content
 - HTTP server , Real Server, MTM<Multicast Tree Mirroring>
- Basic Internet Services
 - Other services may be needed by partners
 - DNS, Web cache, DHCP

Archive Lecture and File distribution

- **Content in SOI Asia system**
- Why do we have to put in local server?
- How these services serve the purposes?
 - WWW , Real Server, MTM<Multicast Tree Mirroring>

SOI Asia Content

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- Lecture Material/Handouts
 - PPT, PDF, MSWord, Video files
- SOI Asia Archive Content
 - HTML, Video , Image files

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SOI Asia Archive Content(1)

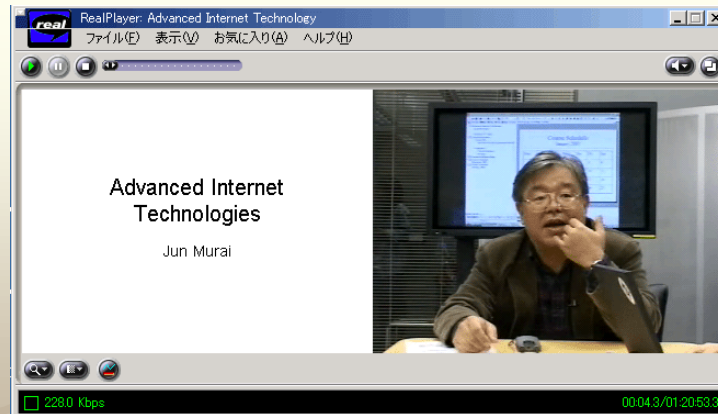
0011

The screenshot shows a web browser window with the address bar displaying <http://www.networld.jp/soi/00000000/indico01/>. The page content includes a navigation menu on the left with items like 'Questions', 'Course Info', 'Advanced Internet Technologies', and 'Copyright'. The main content area features a title 'Advanced Internet Technologies' and a large white box containing the text 'Advanced Internet Technologies' and 'Jun Murai'. A table of contents is visible on the left side of the page, listing 24 items with their corresponding page numbers.

Item	Page
1. Advanced Internet Technologies	1
2. Contents	2
3. Internet Architecture Operating a server	3
4. How to read this site	4
5. How to view this website	5
6. CGI 1st part	6
7. Internet protocol	7
8. Downloading certificate using net	8
9. Basics of Internet Protocol (IP)	9
10. Basics of Internet Protocol (IP)	10
11. HTTP Protocol	11
12. How Server works	12
13. IP Address	13
14. IP Address	14
15. IP Address	15
16. How to generate the server	16
17. Identify correctly important	17
18. Identity should not be mixed with	18
19. How to build a web	19
20. Challenges to develop new types of	20
21. How to build a web	21
22. How to build a web	22
23. How to build a web	23
24. How to build a web	24

2
4
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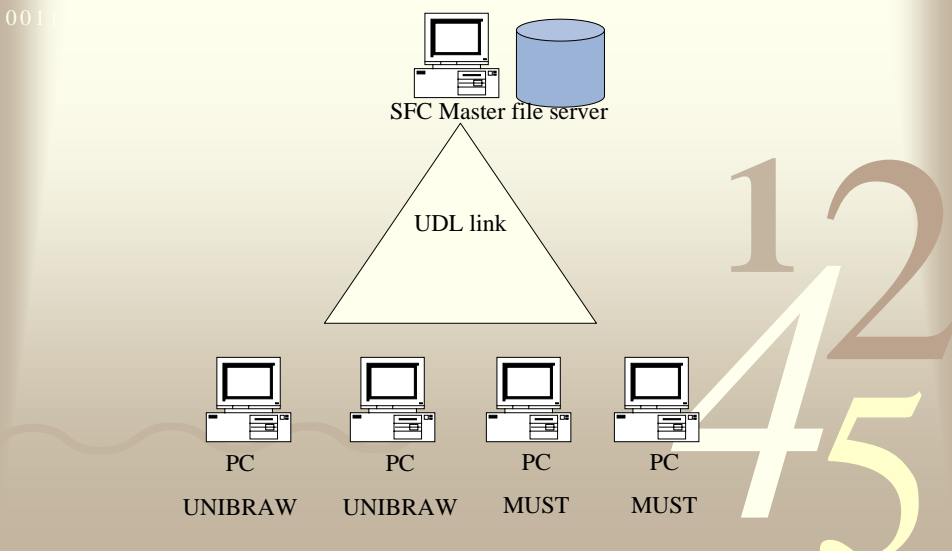
SOI Asia Archive Content(2)



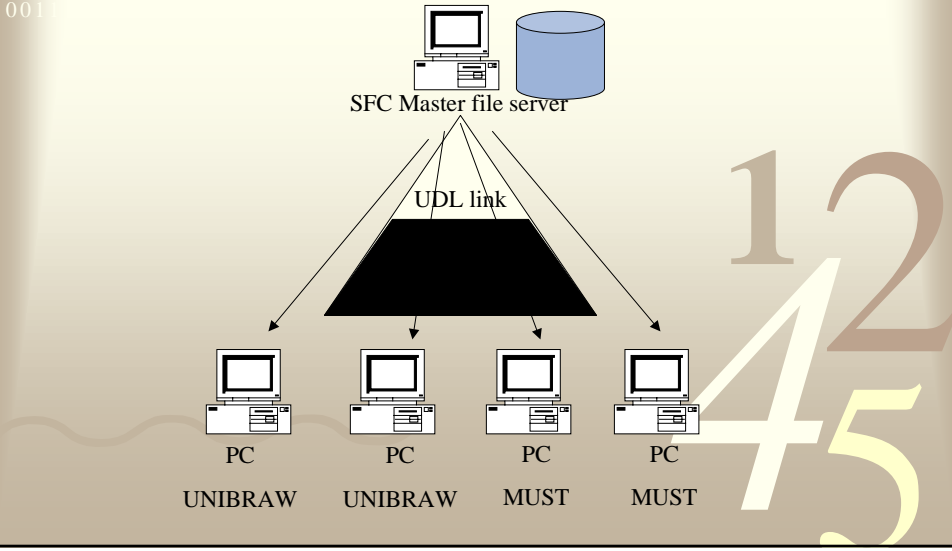
Archive Lecture and File distribution

- Content in SOI Asia system
- **Why do we have to put in local server?**
- How these services serve the purposes?
 - WWW , Real Server, MTM<Multicast Tree Mirroring>

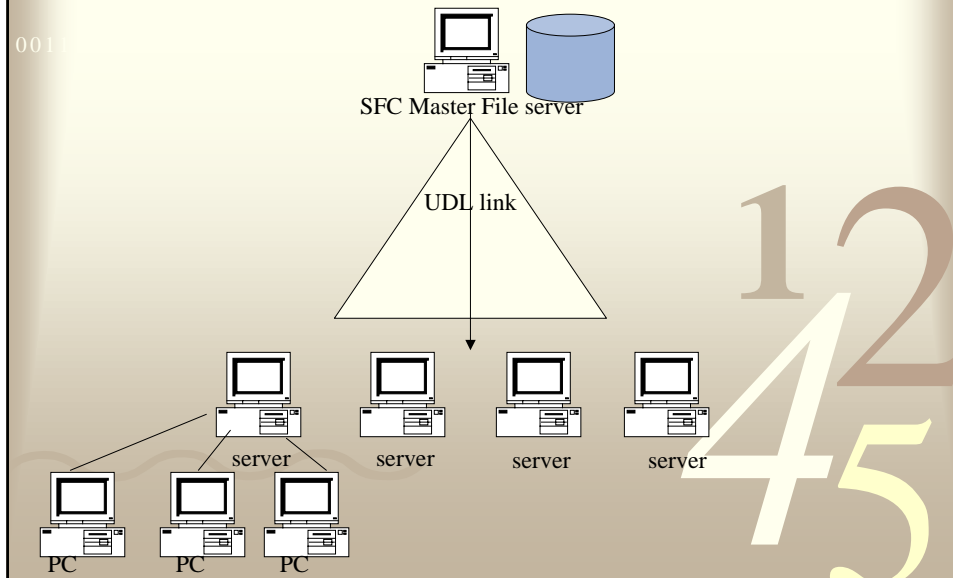
Ordinary File Transfer (1)



Ordinary File Transfer (2)



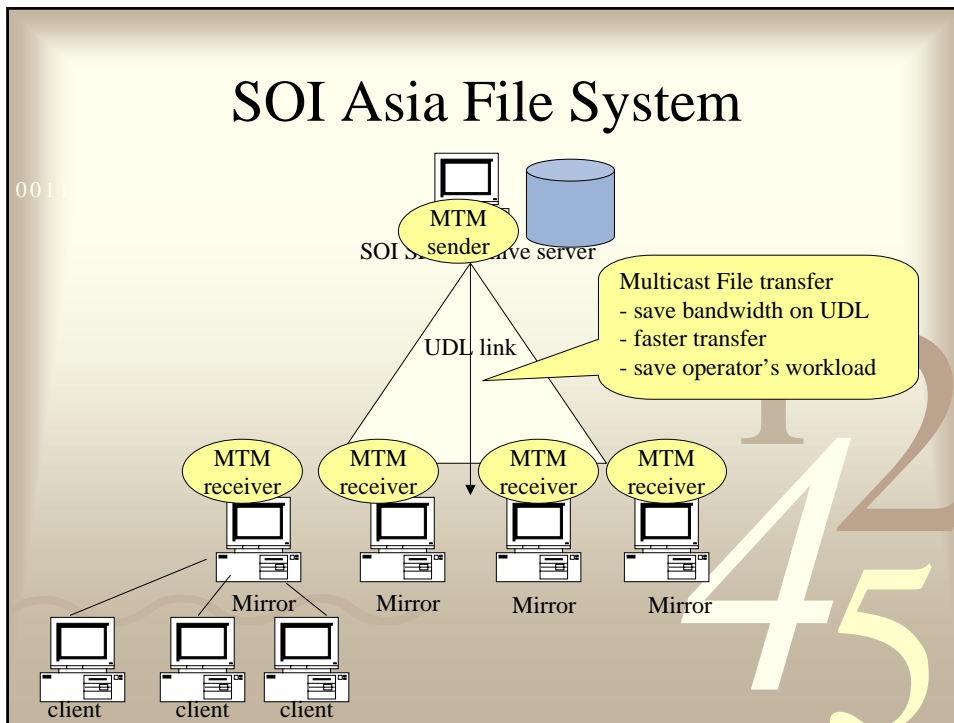
SOI Asia File Transfer



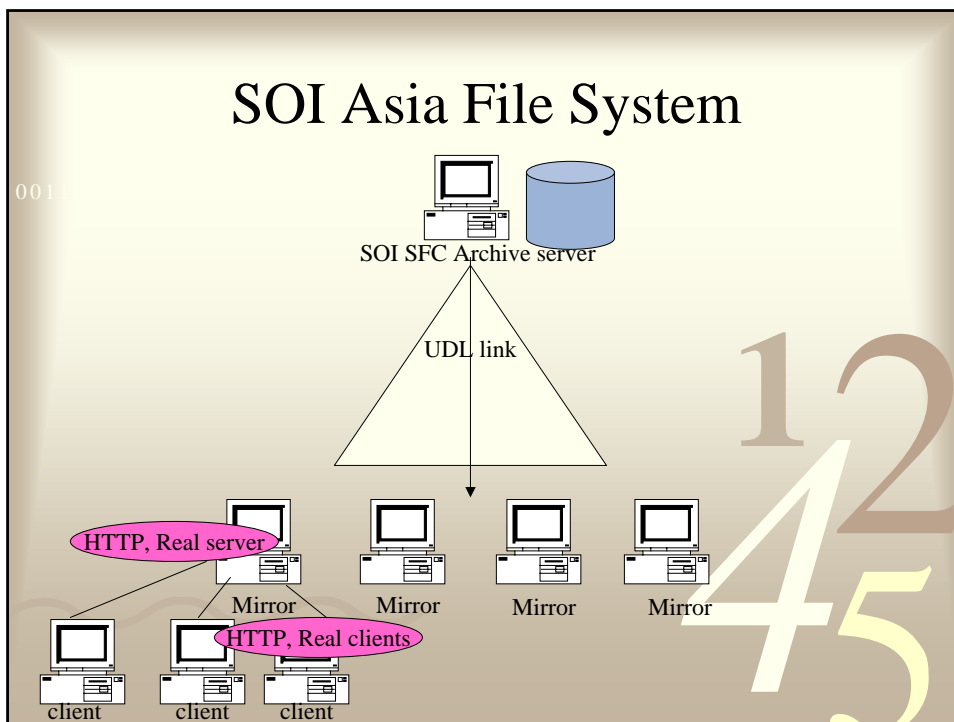
Archive Lecture and File distribution

- Content in SOI Asia system
- Why do we have to put in local server?
- How these services serve the purposes?
 - HTTP server , Real Server, MTM<Multicast Tree Mirroring>

SOI Asia File System



SOI Asia File System



Section 1

SOI Asia System Overview

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12
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SOI server system

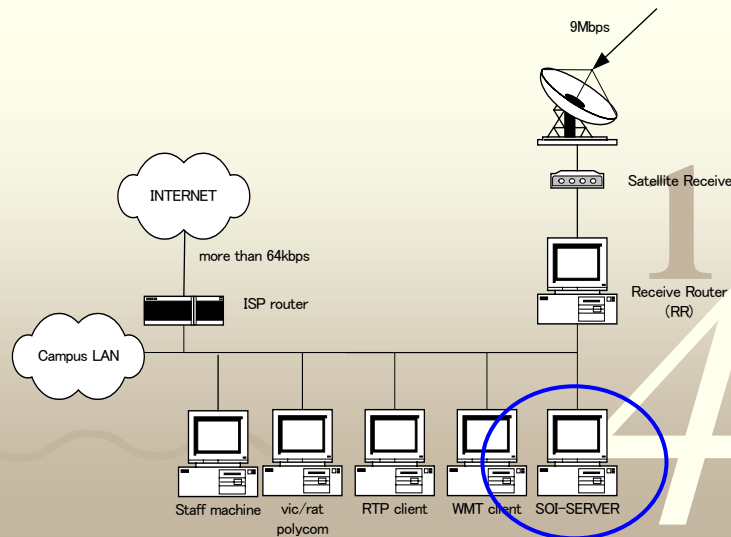
0011

- OS
 - Fedora Core 4 , <http://fedora.redhat.com/>
- HW
 - 80GB or larger HDD
 - 256MB RAM or more
 - 1GHz CPU or faster

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SOI Asia network topology

0011



IP Assignment

001 • IPv4

Example, 202.249.26.0/255.255.255.248

- RR = first IP number <202.249.26.1>
- SOI server = second IP number <202.249.26.2>
- Realtime lecture machines = other remaining IPs

• IPv6

Example, 2001:d30:10a:: /64

- RR = first IP number <2001:d30:10a::1 >
- SOI server = second IP number <2001:d30:10a::2>
- Realtime lecture machines = other remaining IPs

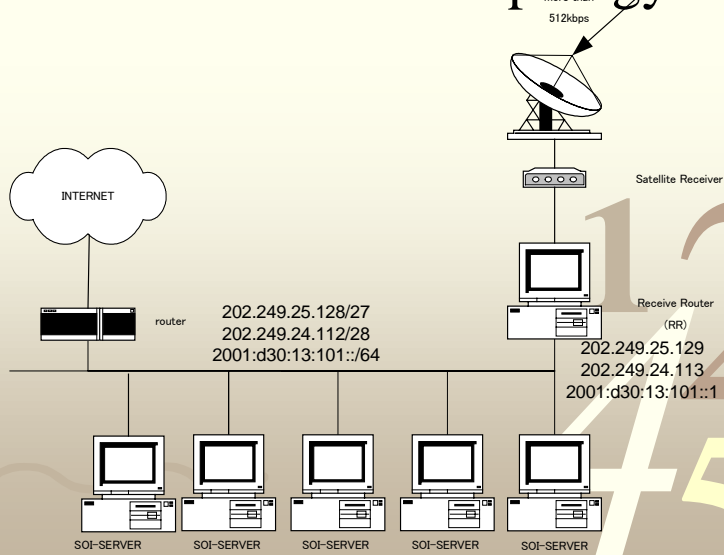
Hostname

- Hostname

<sitename>-soi.ai3.net

– example, sfc-soi.ai3.net, crma-soi.ai3.net

Classroom network topology



Classroom Network Configuration

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- Check your Hands-outs

PC num	IPv4 host address / Prefixlen	IPv4 gateway	IPv6 host address /Prefixlen	IPv6 Gateway
01	202.249.25.133 / 27	202.249.25.129	2001:d30:13:101::133 / 64	2001:d30:13:101::1
02	202.249.25.134 / 27	202.249.25.129	2001:d30:13:101::134 / 64	2001:d30:13:101::1
03	202.249.25.135 / 27	202.249.25.129	2001:d30:13:101::135 / 64	2001:d30:13:101::1

Section 2 SOI Asia Server System Installation

0011

Section2

0011

- Fedora Core 4 Installation
- Network Configuration
- System Upgrade
- Disable unused service
- Remote login permission

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45

STEP 1,2

0011

Section 2
**SOI Asia Server System
Installation**

12
45

STEP 1,2

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- Fedora Core4 Installation
– SKIP

1 2
4 5

STEP 3

0011

Section 2
**SOI Asia Server System
Installation**

1 2
4 5

Network Configuration

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- /etc/sysconfig/network

```
NETWORKING=yes  
HOSTNAME=sfc-soi.ai3.net  
GATEWAY=202.249.26.1  
NETWORKING_IPV6=yes  
IPV6_AUTOCONF=no  
IPV6_DEFAULTGW="2001:d30:10a::1"
```

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Network Configuration

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- /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0  
BOOTPROTO=static  
ONBOOT=yes  
IPADDR=202.249.26.2  
NETMASK=255.255.255.248  
IPV6INIT=yes  
IPV6ADDR=2001:d30:10a::2/64
```

12
45

Network Configuration

0011

- /etc/resolv.conf
search ai3.net
nameserver 202.249.24.18

12
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Network Configuration

0011

- Commands
service network restart
ifconfig
ping
ping6

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Network Configuration

- Verification
 - Interface configuration is correct
 - IPv4 and IPv6 reachability to RR

STEP 4-5

Section 2 SOI Asia Server System Installation

Installed Services and Packages

- SOI server : clean install
 - Many services running
ps -ax | more
 - Some services open network connection
netstat -an | more
 - Many packages on system
yum list installed

Security : services/packages

- Turn off unused services
 - Especially those open network connections
 - You should know all the opening ports
- Update packages (Regularly)
 - Lower security risk
- For running services
 - Limit access to only known clients

Security : services/packages

0011

- [STEP 4] Turn off unused services

```
# chkconfig servicename on/off
```

```
# .....
```

```
# .....
```

```
# reboot
```

```
# ps -ax
```

```
# netstat -an
```

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Security : services/packages

0011

- Update packages (Manually)

- How many packages you have to check?
Regularly?

```
# yum list installed
```

- How do you know what packages has an
updates?

- Big job for administrator

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Automatic Install/Upgrade

0011

- **Repository Server (In INTERNET)**
 - Keeps up-to-date packages
 - Commonly used packages
- **Fedora Machine**
 - Download new packages from the server to install or upgrade
 - Program name: yum , apt-get
 - Configured which repository server you want to use

12
45

Automatic Install/Upgrade

0011

- Convenient to install/upgrade packages
- Auto Periodical upgrade
- Risk on update problems

12
45

YUM Command

```
0011  
# yum install <package(s)>  
# yum remove <package(s)>  
# yum update  
# man yum
```

STEP 5

```
0011  
  
# mv /etc/yum.repos.d /etc/yum.repos.d.bk  
# mkdir /etc/yum.repos.d  
# cd /etc/yum.repos.d  
# wget http://ipv6.brawijaya.ac.id/~abazh/yum/fcub.repo  
# wget http://ipv6.brawijaya.ac.id/~abazh/yum/fcub-updates.repo  
# wget http://ipv6.brawijaya.ac.id/~abazh/yum/fcub-extras.repo  
# yum update ←----- SKIP  
# chkconfig yum on  
# service yum start  
# reboot ←----- SKIP (In case of kernel upgrade only)
```

STEP 6-9

Section 2 SOI Asia Server System Installation

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Security for Remote Login

- TELNET <default disable>
 - Plain text password, unencrypted session
 - Do not use
- SSH <default enable>
 - Encrypted session

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SSH Operation

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1. Always upgrade Openssh/Openssl packages on your server to the most up-to-date version.
2. Configuration
 - No Root Login
 - No Empty password <default>
3. Access Control
 - Allow known networks to connect

User

0011

```
# adduser username  
# passwd username
```

SSH configuration

0011

- /etc/ssh/sshd_config

PermitRootLogin no

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Access Permission

0011

- /etc/hosts.allow

Allow access from WIDE Project

ALL:203.178.136.0/255.255.248.0

ALL: 202.249.25.10

#Allow access inside SOI Local network

ALL: [2001:d30:10a::]/48

ALL: 202.249.26.0/255.255.255.248

- /etc/hosts.deny

ALL: ALL

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Configuration

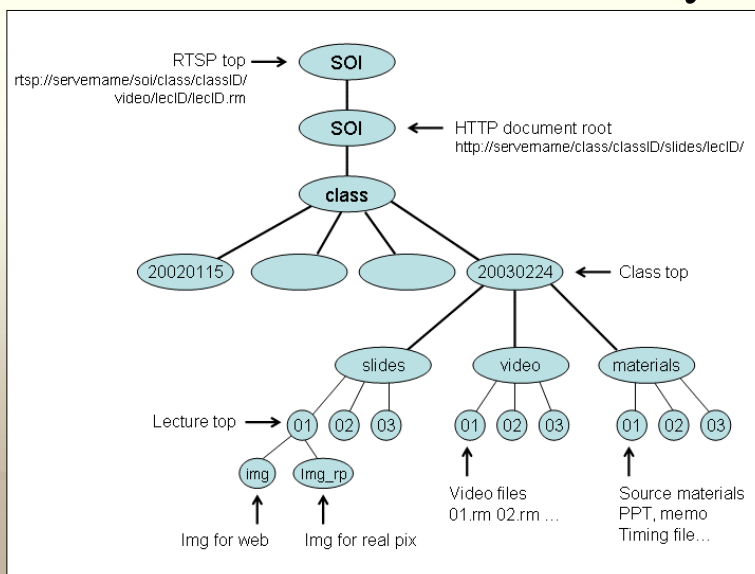
- Follow STEP 6-9 in text book

Section 3 SOI Asia archive server Installation

Section3

- SOI Asia directory structure
- HTTP Installation
- Real server Installation
- MTM Installation

SOI Asia Archive Directory

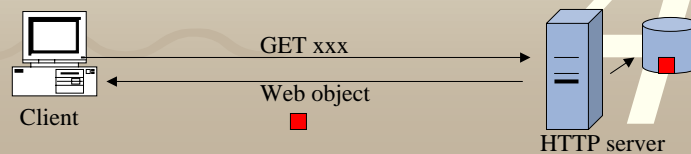


STEP 1-2

Section 3 SOI Asia archive server Installation

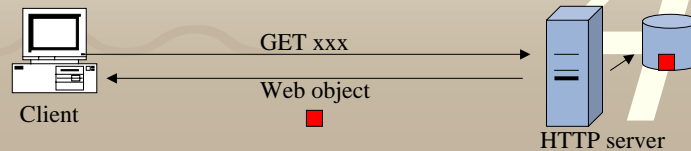
HTTP Service

- HTTP server
 - Store Web contents, HTML files, images, etc.
 - Want to show web contents
- HTTP client
 - Want to see web content
 - Web browser (IE,Firefox,etc.)



HTTP Procedure

1. HTTP server waits at port 80
2. HTTP client connect to port 80
3. HTTP client sends a request to get a Web content using HTTP protocol
4. HTTP server sends requested web content back.
5. Web content displayed on browser



HTTP Content Directory

- A particular directory that contains html files
- Not showing whole system directory because of information security
 - /etc – system information, user information
- HTTP server will show content starting from that directory

HTTP content directory

Example. Content directory : /soi/soi

1. File : /soi/soi/hello.html
http://server_ip/hello.html
2. File : /soi/soi/class/20030014/lecture.html
http://server_ip/class/20030014/lecture.html
3. File : /home/yoo/test.html

CANNOT BE ACCESSED

It is not under HTTP content directory

HTTP Installation (STEP 1)

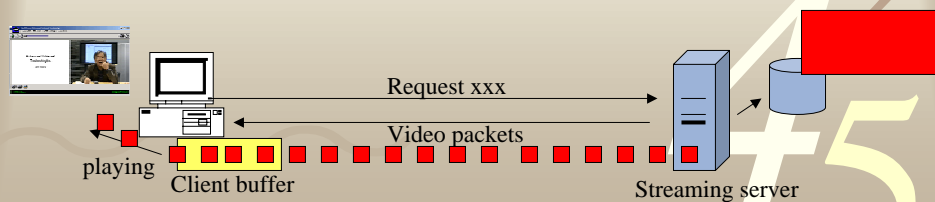
- Create web content directory /soi/soi
- Install HTTPD
- Configure HTTPD to know that its content directory is /soi/soi (DocumentRoot parameter)
- Start service
- Verification
 - Create small HTML file in root directory
 - Notice that you access /soi/soi/index.html file by URL
http://soi_server_ip/index.html
 - Use 2 Windows machines at back of classroom to access your server
- Follow [STEP 1] instructions

Video/Audio Streaming service

- Streaming server
 - Store video/audio file
 - Want to display video/audio file
- player
 - Want to play audio/video
 - Window media player, Realplayer

Streaming Concept

- Video/Audio file is divided into small packets and deliver from streaming server to player
- Player has a buffer to store video/audio packets
- Player start playing video/audio from buffer without waiting for a whole file to be downloaded.
- At the playing time, buffer is filled with coming packets.



Real Streaming Server

- Install Real streaming server
- Create directory “soi” under real server’s content root to point to /soi/soi
- Start service
- Verification
 - Use real player to play an example video with URL `rtsp://(your SOI server’s IP)/real9video.rm`
- Follow [STEP 2] instructions

STEP 3

Section 3 SOI Asia archive server Installation

Multicast Tree Mirroring(MTM)

- Developed by SOI Asia project
- Distribution of a directory tree or a file
- SOI master server - > partners' servers
- Reliable Multicast Transport Protocol<RMUS from AIT>
- IPv4/IPv6

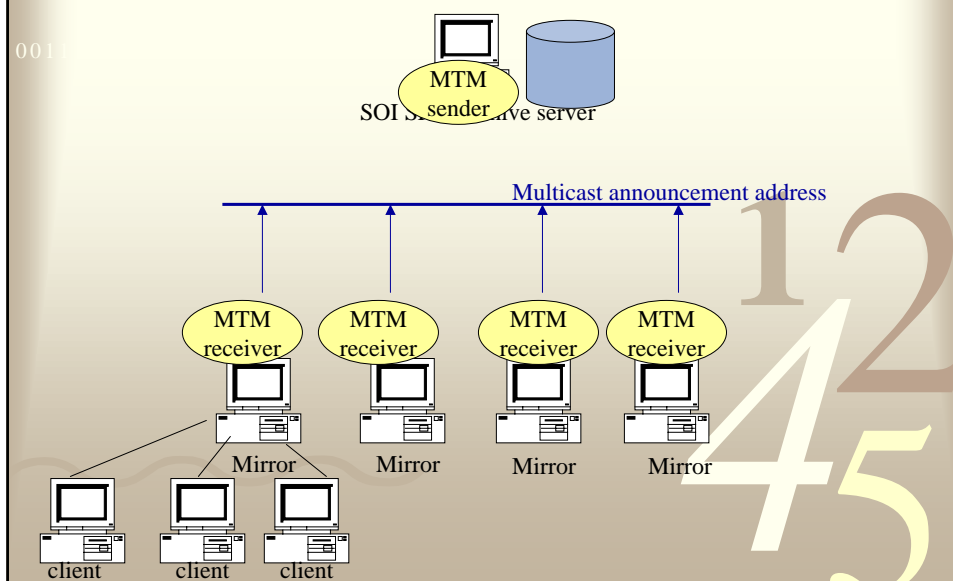
MTM (1)

- Multicast is bandwidth saving
 - Send a 1-Mbytes file to 21 partners in same UDL link
 - Unicast : send 21 times, use UDL to transfer 21 Mbytes
 - Multicast : send 1 time, use UDL to transfer 1 Mbytes
- Multicast is not reliable
 - Packets loss
 - Packets out of order
- MTM – develop Reliable Multicast Protocol for a transfer session

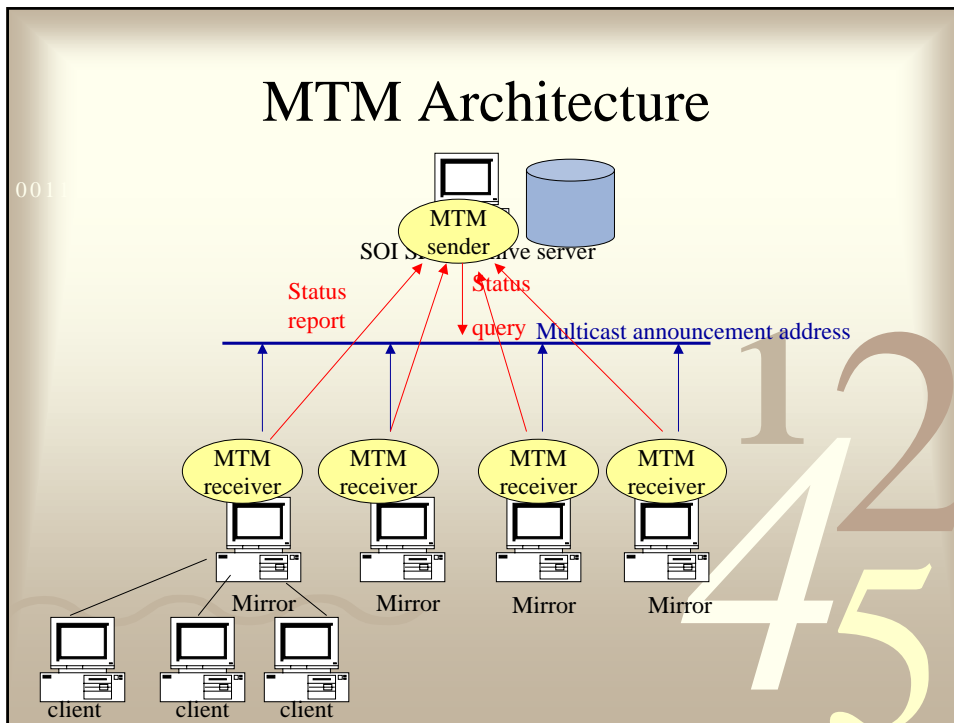
MTM (2)

- If some targeted servers have problem
 - Network down
 - Server down
 - Normal case in SOI Asia environment
- Ordinary transfer
 - Has small timeout < 1 min
 - Transmission failed, not continued
 - Operator has to manually try to transfer later
- MTM keeps retransmit to targeted servers (no timeout) – except cancelled manually

MTM Architecture



MTM Architecture

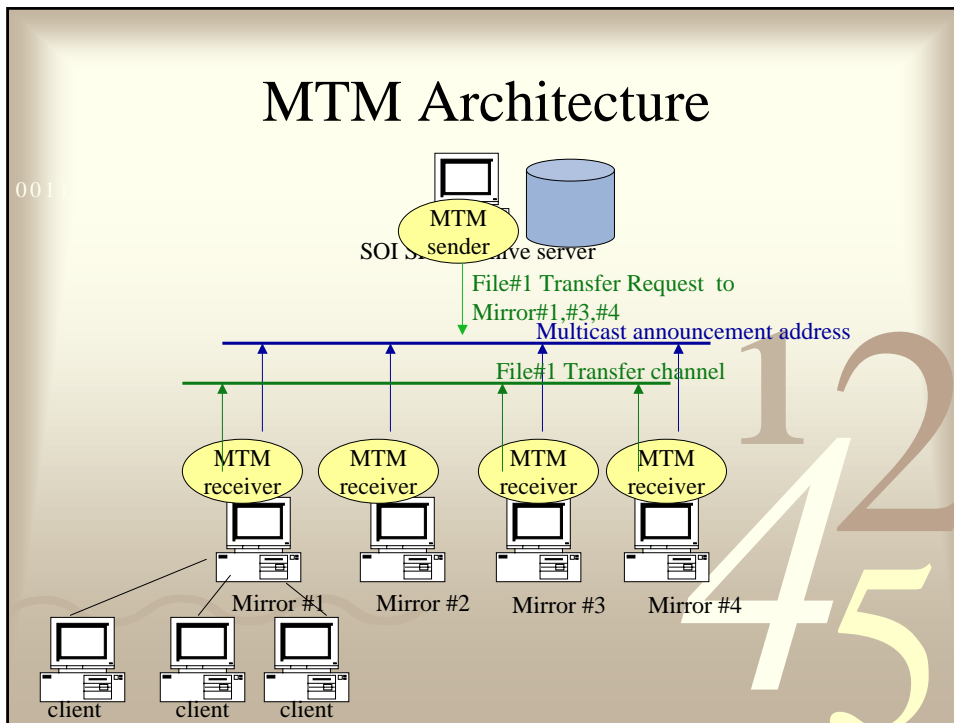


MTM Receiver Status

- http://sfc-mtm.ai3.net/soiasia_mirror/

Site	IP	Status	Duration (D days H:M:S)
CRMA	2001:d30:115:0:20d61ffe07:959a	UP	0days(1:2:19)
SFC_RO1_1	2001:d30:10a::2	UP	0days(4:9:5)
SFC_RO2_1	2001:d30:10b::10b:2	UP	0days(4:9:5)
UNIBRAW	2001:d30:111:2:20c76ffe27:c163	UP	0days(0:4:31)
UNSRAT	-	DOWN [IPv4 Loss = 0%] [IPv6 Loss = 0%]	-

MTM Architecture



MTM Distribution Status

- http://sfc-mtm.ai3.net/soiasia_mirror/

JobID	Time (JST)	Directory	Course	Status
1	02August2005-17:55:59	/soi/soi/class/20060070/materials/01	MTM Test Course	FINISH
2	05August2005-17:51:07	/soi/soi/class/20060070/materials/01/xM	MTM Test Course	FINISH
3	05August2005-17:51:46	/soi/soi/class/20060070/materials/01/xxM	MTM Test Course	FINISH
4	05August2005-17:52:33	/soi/soi/class/20060070/materials/01/xxxM	MTM Test Course	FINISH
5	05August2005-18:03:16	/soi/soi/class/20060070/materials/01/xG	MTM Test Course	FINISH
6	07August2005-11:17:57	/soi/soi/class/20060070/materials/01/xG	MTM Test Course	FINISH
7	07August2005-11:19:15	/soi/soi/class/20060070/materials/01/xM	MTM Test Course	FINISH
8	07August2005-11:19:39	/soi/soi/class/20060070/materials/01/xxM	MTM Test Course	FINISH
9	07August2005-11:20:06	/soi/soi/class/20060070/materials/01/xxxM	MTM Test Course	FINISH
10	07August2005-12:12:02	/soi/soi/class/20060070/materials/01/xG	MTM Test Course	FINISH
11	07August2005-12:12:33	/soi/soi/class/20060070/materials/01/xM	MTM Test Course	FINISH

MTM Configuration

- /usr/local/mtm6/mtm.conf
- ```
MTM_MULTICAST_ADDRESS=FF05::1151
MTM_MULTICAST_PORT=49998
```

RECEIVER\_ID=**SFC**

```
CMD_RUN_PASSWORD=SOI-seCREt
RUN_DIR=/usr/local/mtm6/run/
LOG_DIR=/usr/local/mtm6/log/
HTML_DIR=/usr/local/mtm6/html/
TMP_DIR=/tmp/mtm
```

## MTM

- Install MTM receiver
- RECEIVER\_ID set as **PC1**
- Start service
- Verification
  - Check if your RECEIVER\_ID is listed on [http://sfc-mtm.ai3.net/soiasia\\_mirror/](http://sfc-mtm.ai3.net/soiasia_mirror/)
- Follow [STEP 3] instructions

## SOI Asia mirror system

- Sender side
  - Manage File Transfer for SOI Asia courses
    - Issue a Transfer
    - Monitor Transfer status
  - Report receiver status
- Receiver side
  - Register to receive course content
    - Material
    - Archive
    - Both
  - Check transfer history and receiver status

## SOI Asia procedure to receive class materials and archive lectures

## procedure

0011

1. Install HTTP,Real,MTM service on SOI server. After done, report following information to operator mailing list.  
SOI server's IPv4  
SOI server's IPv6  
RECEIVER\_ID setting in mtm.conf

## procedure

0011

2. SOI Asia staff registers partner to MTM system

| SOI ASIA Project |           |                                  |                                                |                         |
|------------------|-----------|----------------------------------|------------------------------------------------|-------------------------|
| Mirror System    |           |                                  |                                                |                         |
| Receiver Status  | Site      | IP                               | Status                                         | Duration (D days H:M:S) |
| » Sites          | CRMA      | 2001:d30:115:0:20d:61ffe:07:959a | UP                                             | 0days(0:0:5)            |
| » CRMA           | SFC_RO1_1 | 2001:d30:10a:2                   | UP                                             | 0days(4:46:8)           |
| » SFC RO1 1      | SFC_RO2_1 | 2001:d30:10b:10b:2               | UP                                             | 0days(4:46:8)           |
| » SFC RO2 1      | UNIBRAW   | 2001:d30:111:2:20c:76ffe:27:c163 | UP                                             | 0days(0:41:33)          |
| » UNIBRAW        | UNSRAT    | -                                | DOWN<br>[IPv4 Loss = 0% ]<br>[IPv6 Loss = 0% ] | -                       |
| » UNSRAT         |           |                                  |                                                |                         |

## procedure

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3. For each SOI Asia course, there is an announcement asking partner's interest to receive content.
4. Operator checks technical readiness of SOI Asia server

## procedure

0011

5. Operator registers receiving choice at [http://sfc-mtm.ai3.net/soiasia\\_mirror/](http://sfc-mtm.ai3.net/soiasia_mirror/).

\*\* Affect from the day you register

## procedure

0011

### 6. Notification mail for each transfer

---

An MTM file transfer has been started with the following details.

File Type : Lecture material  
Course : [20060070] MTM Test Course  
Lecture No. : 01  
Lecture Date : 4 August 2005  
Job ID : 5  
Directory : /soi/soi/class/20060070/materials/01  
SOI Servers : SFC\_RO1\_1,CRMA,  
[DOWN servers]: SFC\_RO1\_1  
URL Local : [http://YOUR\\_SOI\\_SERVER\\_IP/](http://YOUR_SOI_SERVER_IP/)  
URL Staff Page: <http://sfc-mtm.ai3.net/mtm/mtm6/rs.html>

1 2  
4 5

## procedure

0011

### 7. Operator check job status at

[http://sfc-mtm.ai3.net/soiasia\\_mirror/](http://sfc-mtm.ai3.net/soiasia_mirror/) .

- download local content at

[http://YOUR\\_SOI\\_SERVER\\_IP/](http://YOUR_SOI_SERVER_IP/) .

1 2  
4 5

## Finish Archive server installation :D

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## Basic Internet Services

0011

- DNS
- Web cache
- DHCP

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# STEP 1

## Section 4. SOI Asia Internet Service Installation

# DNS

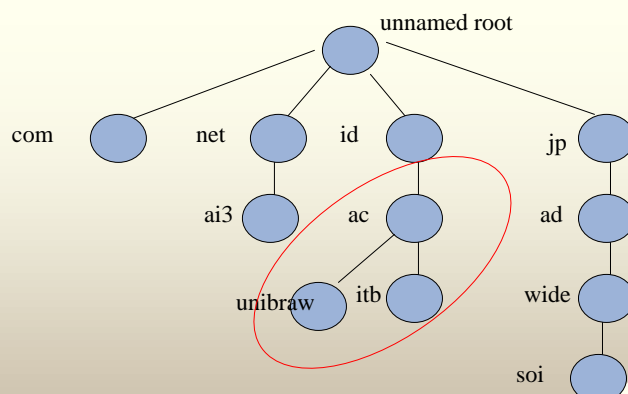
## DNS - Domain Name System

- A system to translates domain names into IP addresses
- Domain name(Alphabetic) is easier to remember than IPv4(32 bits), IPv6(128 bits)

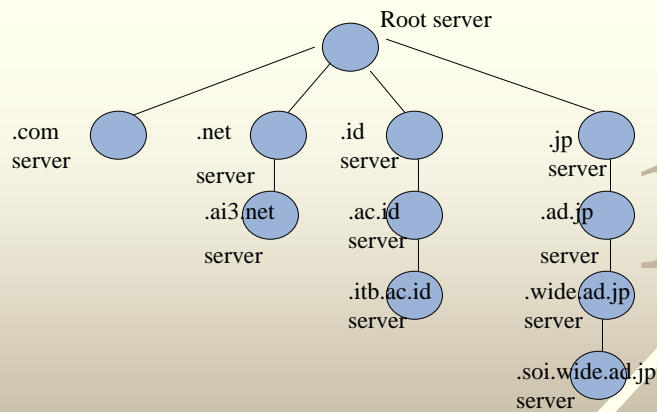
## Domain name

- mail.ai3.net  
mail.ai3.net is under .ai3.net domain  
.ai3.net is under .net domain  
.net is top-level domain

## Domain name structure



## DNS Authoritative Servers



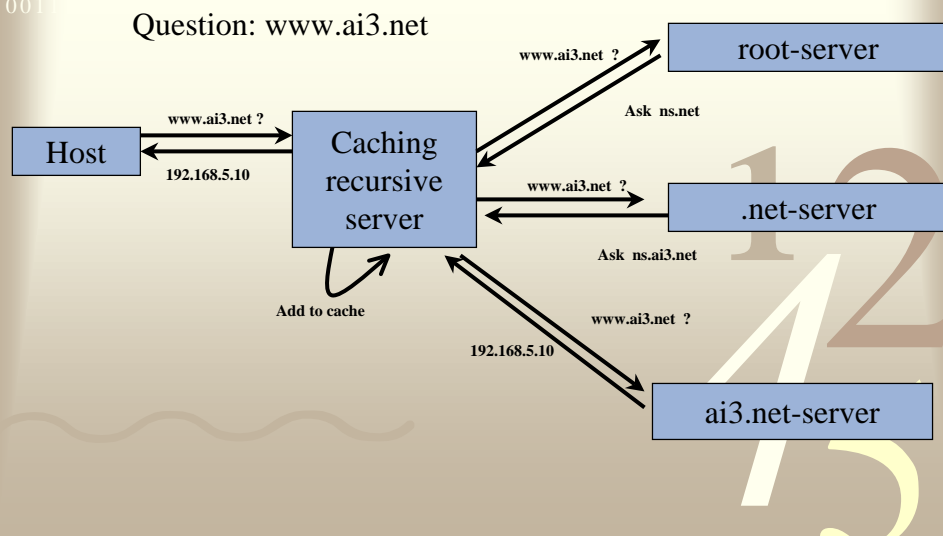
## Authoritative server role

- 0011
- Take care of its own domain
    1. Keep records of Name -> IP
    2. Keep links to servers of subdomains
- 12  
45

# DNS Server

- Two main types of DNS server
  - Authoritative server
    - Take care of a domain
      1. Keep records of Name -> IP
      2. Keep links to servers of subdomains
  - (Caching) recursive server
    - Do not have a domain
    - Do the name resolve

# Resolving process



## SOI Asia DNS

0011

- Caching Only Name Server
- Bind 9



## SOI Asia DNS

0011

- `/var/named/chroot/etc/named.conf`

```
options {
 directory "/var/named";
 dump-file "/var/named/data/cache_dump.db";
 statistics-file "/var/named/data/named_stats.txt";
 allow-query { 202.249.26.0/29; localhost;
 2001:d30:10a::/48; ::1/128; fe80::/10;};
 allow-recursion { 202.249.26.0/29; localhost;
 2001:d30:10a::/48; ::1/128; fe80::/10;};
 allow-transfer { none;};
 listen-on-v6 { any; };
};
```



## Step 1

0011

- Install Bind
- Configuration
- Service start
- Verification command

```
nslookup www.soi.wide.ad.jp ::1
```

DNS server you ask

DNS name you want to resolve

## STEP 2

0011

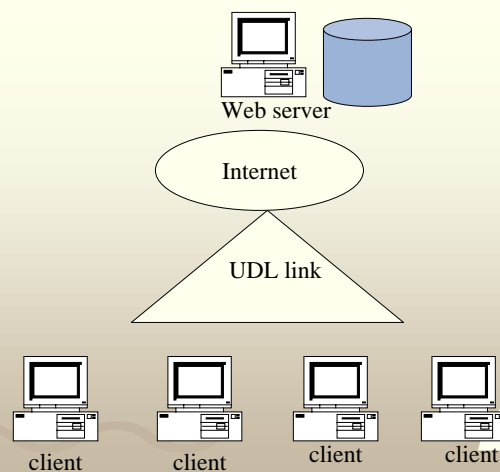
**Section 4. SOI Asia Internet  
Service Installation**

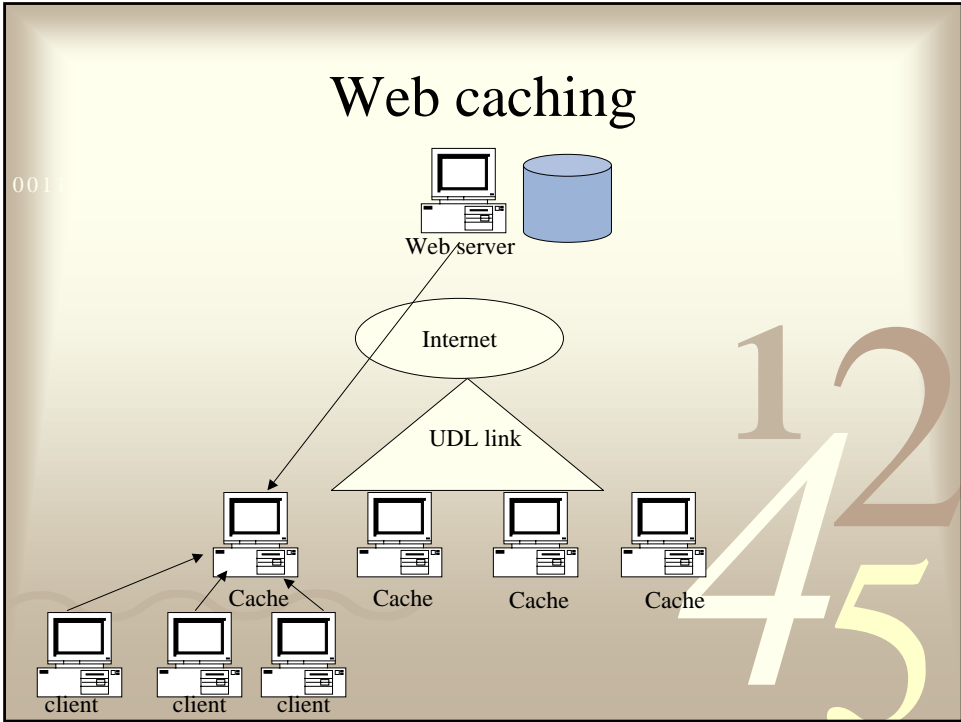
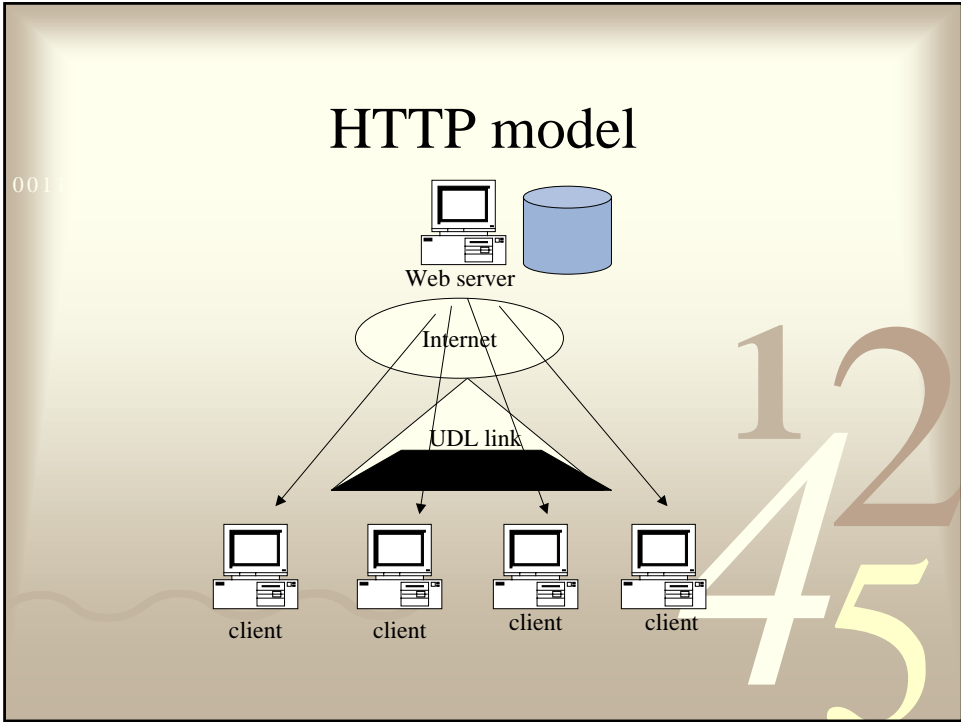
## HTTP cache proxy

### Concept

- User shares same interests in accessing WWW
- Keeps web objects closer to users
- Reduce bandwidth usage
- Improve access time

## HTTP model





## Web cache mechanism

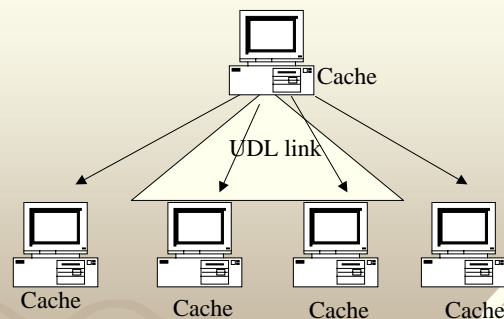
0011

- HTTP client sends HTTP request to a web cache instead of HTTP server
- Web cache checks if the required URL is in local storage or not
- If yes<cache hit>, send this local object to client
- If no<cache miss>, get object on HTTP server and keep it in local disk

## SOI Asia Cache peering

0011

Parent cache: sfc-cache.ai3.net



## SOI Asia Cache Structure

0011

- Partner setups a web cache on SOI server
- Ask all HTTP clients to use web cache
- Together helps reduce bandwidth on UDL

1 2  
4 5

## SOI Asia Web Cache

0011

- Squid
- Additional Configuration

**visible\_hostname pc33.ai3.net**

1 2  
4 5

## Squid logfile analyzer

- Squid-graph script
  - Parsing access.log
  - Web/Image report of usage
  - Run every hour

## STEP 3

### Section 4. SOI Asia Internet Service Installation

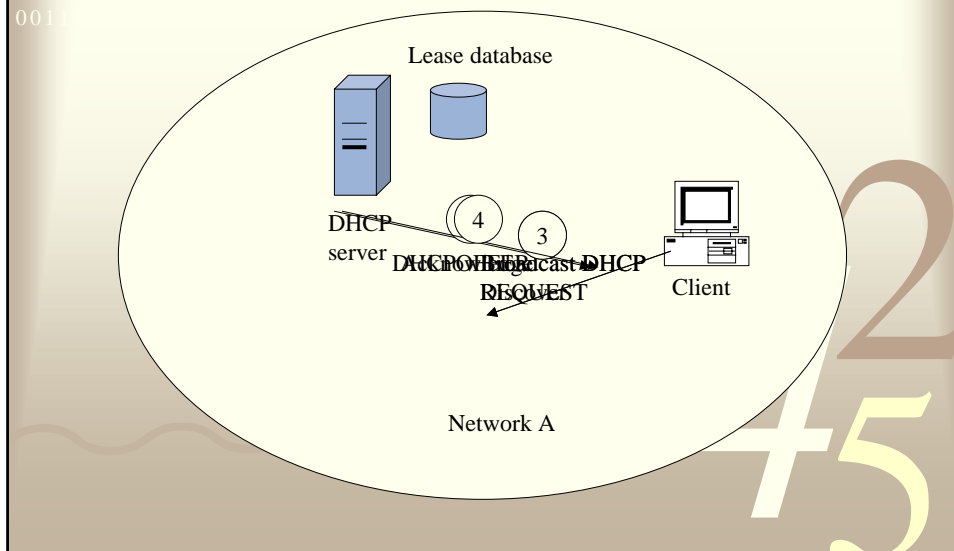
# DHCP

- Dynamic Host Configuration Protocol
  - enable individual computers on an IP network to extract their configurations from a server  
IP, netmask, domain, default route
- Motivation
  - reduce the work necessary to administer
  - Temporary clients shares limited number of IP addresses

# DHCP

- DHCP server
  - Keep pool of IP address
  - When requested, lease a network configuration for a specific period<lease time>
  - Keep tracks of currently used IP
  - Network parameters are all set by administrator

## DHCP Lease Mechanism



## DHCP Configuration

default-lease-time : lease time server gives to client  
maximum-lease-time: limitation of client's lease time request  
range : pool of IPs to be dynamically assign  
others: network information

Follow instructions in [STEP 3]

PC#01-#26

range 202.249.25.130 202.249.25.131;

PC#27-#33

range 202.249.24.125 202.249.24.126;

