Design and Implementation of Campus Network and Computing Infrastructure

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Outline of Talk

- Introduction: Requirements and Issues
- Technical Perspective
  - Users (your *raison d’etre*)
  - Storage
  - High Performance Computing
  - LAN
  - WAN
- Management Perspective
The Big Picture

Users
- Fac, Students, Staff
- Vendors/ISP
- Alumni, Outsiders

Application Software
- Res & Teaching
- Admin
  - N/w Services
  - online reg/grading payroll
- matlab/ansys
- mail/web/

System S/w
- OS, Firewall, LDAP, DNS
  - Databases
  - storage, backup, ...

Hardware
- PCs, printer, scanner, modem, switch, fibre, rj45

Infrastructure
- UPS, Space, AC, cables
Overview

- **Campus Network Infrastructure**
  - Academic Area
  - Hostels
  - Residential
  - **Hardware and Network** *(the easy part!)*
    - Gigabit L3 switches
    - 10 Mbps Internet *(4 Links)*
    - 5000+ nodes

- **Applications** *(Complex enough)*
  - Mail
  - Web Browsing/Hosting

- **Users and Management** *(Nightmare begins)*
  - MisUse *(mp3, movie, porn, hacking, fake mails, ...)*
  - CCTeam
    - We carry your Bytes
    - Our T-shirt *(cows, dogs, leopards!)*
E-mail issues

- E-mail still **most critical service**.
- Centralized vs. Distributed Solution
- Mail is not a Login Account! (Hotmail/Yahoo)
- Spam, Virus, Impostors, Harassment, Admissions/Schols

Assume your are postmaster (postbox.iitb.ac.in)

- **Who is user@iitb.ac.in?**
  - Real User (where is his mailbox?)
  - Simple Mail Alias (Dean, Head, ...)
  - Mailing List
  - **Unknown user** (can be real problem)

**From Client Side**

- AddressBook
- MailForwarding
- Choosing Unique ID
- Lifelong ID

- LDAP helps in all of above!
Web Browsing Issues

- World Wide Wait! (Bandwidth)
- What’s the good stuff?
  - Research reports
  - Books, Software, ...
- What’s the bad stuff?
  - Pirated Entertainment
  - Pornography

- Controlled access via Caching Proxy
  - Squid (the best)
- User Management Nightmare
  - A recent suicide threat!
  - Adding/Deleting
  - Locking Passwords (why?)
User Accounts

- Public Access Terminals (spread out including Hostels, Depts)
- How to create/delete logins?
- Forgotten Passwords!
- Home Directories
- Access Restrictions (Timings)
- PAM (Pluggable Authentication Modules)
- NIS and its disadvantages
- Kerberos (complex solution)
- Can LDAP help?
Static IP Mappings

- You live in Hostel 6. Room 322.
- Alloted IPs 10.6.3.22, 10.6.13.22, 10.6.23.22, ...
- What’s your netmask? (255.255.0.0)
- Who’s your gateway? (10.6.250.1)
- 64K IPs available per Hostel (400 students)
- Why fix a static IP-MAC binding?
  - Virus (bombarding proxy, mail servers etc.)
  - Who downloaded the mp3/porn?
  - Accountabiliy (CCTeam is not too popular!)
  - Chess Funda (Threat is stronger than execution!)
- But, how to do the mapping?
  - New Computer/ Change Ethernet card.
  - CCTeam should not be the bottleneck!
  - Centralize data/knowledge, not work!
  - Delegate authority (LDAP to rescue).
RFC 2196/ISO17799/BS7799

Guidelines for any organization joining Internet

1. Risk Assessment (Assets/Threats)
2. Security Policies
3. Security Architecture and Services
   - Firewalls, VPN, Encryption, ...
   - Authentication
   - Confidentiality, Integrity
   - Authorization and Access Control
   - Backups
4. Usage Monitoring and Auditing
5. Intrusion/Attack Detection
6. Security Incident Handling

No silver bullet or one time fix!

Eternal Vigilance is the price of liberty

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Design and Implementation of Campus Network and Computing Infrastructure
What is LDAP

http://www.openldap.org

- Lightweight Directory Access Protocol
- Based on X.500
- Directory service (RFC1777)
- Stores attribute based data
- Data generally read more than written to
  - No transactions
  - No rollback
- Hierarchical data structure
  - Entries are in a tree-like structure called Directory Information Tree (DIT)

user@iitb.ac.in ID (lifelong) created on day of entry into IIT.

Catch your alumni early!
What can LDAP do?

- Create and Manage User Info centrally
- Allow Access Control in Applications
- Allow a Policy Based Framework
- Caution: LDAP is only a tool
- You still need a good design/implementation.

One starting point ldapguru.org
Some Jargon

Attribute abbreviations (See RFC2256)

- uid (User id)
- cn (Common Name)
- sn (Surname)
- ou (Organisational Unit)
- dc (Domain Component)
- st (State)
- c (Country)

dc=iitb,dc=ac,dc=in
IIT LDAP Structure

Requirements Overview and Issues
Technical Perspective
Managerial Perspective

LDAP for User Management
High Performance Computing
Storage Solutions
Campus LAN Design
WAN and Internet Services

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Design and Implementation of Campus Network and Computing Infrastructure
A Typical User Entry

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Simple Mail Alias

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Centralized data (management) can become a major bottleneck!

How to avoid?

Delegate Authorities.

Use Access Control Information (ACIs).
Authority Delegation

- **CC-Stf (siva)**
  - Create, Delete New Dorms/Hostels.
  - Change Passwords, Lock Accounts for Anyone.
  - Authorise someone to be Hostel/Dept Sysad.
  - Add/Delete Students, Staff, Faculty anywhere.

- **CSE-Sysad (tevi)**
  - Add/Remove under CSE
  - Reset password for CSE ppl

- **EE-Sysad (pradip)**
  - Staff
  - Faculty

- **H1-Sysad (Deepto)**
  - EE-stud, H1-inmate (sathish)
  - Staff

- **H4-Sysad**
  - H4-inmates

- **H1-inmates**

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ACIs

- Restrict access to attributes.
- Selectively open up some attributes to some users.
- Applies to Tree below the point where ACI is defined.
- Static vs Dynamic ACIs.
  - Static - explicitly list out people(dn) and their authority.
  - Dynamic - say people belonging to Sysad Group and their authority.
What LDAP superuser can do?

<table>
<thead>
<tr>
<th>LDAP Privileges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Login: ldap_admin</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lists</th>
<th>Change Details</th>
<th>Additions</th>
<th>Manage Accounts</th>
<th>Hostel MAC-IP Modify</th>
<th>Dept MAC-IP Modify</th>
<th>Extra</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dept Sysads</td>
<td>Change Uid</td>
<td>Student Add</td>
<td>Delete User</td>
<td>View MAC-IP</td>
<td></td>
<td>Force Uid</td>
</tr>
<tr>
<td>Hostel Sysads</td>
<td>Change Password</td>
<td>Staff Add</td>
<td>Lock User</td>
<td>Add/Del MAC-IP</td>
<td>Add/Del MAC-IP</td>
<td>Modify Acc Expire</td>
</tr>
<tr>
<td>Find uid</td>
<td>Fill Details</td>
<td>Misc Add</td>
<td>Reset Password</td>
<td>View Duplicate IPs</td>
<td></td>
<td>Change Roll No.</td>
</tr>
<tr>
<td></td>
<td>Change_pwd</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Malimn Ailises</td>
</tr>
</tbody>
</table>

Please don't forget to Logout.
Static MAC-IP mappings

MAC-IPS for HOSTEL11.

<table>
<thead>
<tr>
<th>IP Address</th>
<th>MAC</th>
<th>Interface</th>
<th>Type</th>
<th>User</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.11.0.0</td>
<td>6f6f6f6f6f</td>
<td>HOSTEL11</td>
<td>Local</td>
<td>NOBODY()</td>
</tr>
<tr>
<td>10.11.0.4</td>
<td>00:0d:75:00:a6:95</td>
<td>HOSTEL11</td>
<td>Static</td>
<td>Pritee Sharma(<a href="mailto:pritee_sharma@iitb.ac.in">pritee_sharma@iitb.ac.in</a>)</td>
</tr>
<tr>
<td>10.11.0.11</td>
<td>00:08:e1:32:4f:6b</td>
<td>HOSTEL11</td>
<td>Static</td>
<td>NOBODY()</td>
</tr>
<tr>
<td>10.11.0.12</td>
<td>4c:00:10:35:18:a3</td>
<td>HOSTEL11</td>
<td>Static</td>
<td>NOBODY()</td>
</tr>
<tr>
<td>10.11.0.14</td>
<td>00:0c:76:0c:59:05</td>
<td>HOSTEL11</td>
<td>Static</td>
<td>Dr. Jyoti Prasad Maharana(<a href="mailto:jyoti@iitb.ac.in">jyoti@iitb.ac.in</a>)</td>
</tr>
<tr>
<td>10.11.0.21</td>
<td>00:01:02:03:04:05</td>
<td>HOSTEL11</td>
<td>Static</td>
<td>Rupashree Baral(<a href="mailto:rupashree@iitb.ac.in">rupashree@iitb.ac.in</a>)</td>
</tr>
<tr>
<td>10.11.0.22</td>
<td>00:0e:4c:00:0c:2b</td>
<td>HOSTEL11</td>
<td>Static</td>
<td>Shruti Sharma(<a href="mailto:shruti.sharma@iitb.ac.in">shruti.sharma@iitb.ac.in</a>)</td>
</tr>
<tr>
<td>10.11.0.24</td>
<td>00:0d:75:00:a8:e</td>
<td>HOSTEL11</td>
<td>Static</td>
<td>Aparna Shetel(<a href="mailto:aparna@iitb.ac.in">aparna@iitb.ac.in</a>)</td>
</tr>
<tr>
<td>10.11.0.25</td>
<td>00:0c:6e:1b:01:81</td>
<td>HOSTEL11</td>
<td>Static</td>
<td>Priti Thankar (<a href="mailto:pritithankar@iitb.ac.in">pritithankar@iitb.ac.in</a>)</td>
</tr>
<tr>
<td>10.11.0.28</td>
<td>00:0c:6e:1b:57:ba</td>
<td>HOSTEL11</td>
<td>Static</td>
<td>MUGDHA JAIN(<a href="mailto:mugdha@iitb.ac.in">mugdha@iitb.ac.in</a>)</td>
</tr>
</tbody>
</table>
# Adding a Student

Please fill in all the fields.

Data entry fields marked with * are required. Data entry fields marked with * contain errors or are empty.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FirstName+*</td>
<td>Firstname and middle name</td>
</tr>
<tr>
<td>LastName+*</td>
<td>Last Name</td>
</tr>
<tr>
<td>newPassword1+*</td>
<td>Enter Password</td>
</tr>
<tr>
<td>newPassword2+*</td>
<td>Once Again Enter the same name</td>
</tr>
<tr>
<td>RollNumber+*</td>
<td>Roll Number</td>
</tr>
</tbody>
</table>

**Notes:**
- If name is 'Ram Kumar Verma' then firstname is 'Ram Kumar'
- If name is 'Ram Kumar Verma' then lastname is 'Verma'
- Passwords Don't Match

**Department:**
- Aerospace Engineering
- ASI
- BioSchool
- Environmental Engineering (CESE)
- Chemical Engineering

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Design and Implementation of Campus Network and Computing Infrastructure
High Performance Computing

Users in Physics, Chemistry, Civil, Mechanical, BioSciences, Aeronautical, ...
Long running programs with high memory and CPU usage.
Two broad approaches

- SuperComputer (brahma.cc.iitb.ac.in)
- Cluster (galaxy.iitb.ac.in)

Second one much more cost effective today.
Compaq Alpha HPC System (brahma.cc.iitb.ac.in 10.100.100.1)

HPC Alpha Configuration:

HPC 160 With 833 MHz ALPHA SYSTEMS consisting:

- 16 nos 833 MHz Alpha Processors
- 32 GB Memory
- 1 Terrabyte Disk space
- 4 X Six slot Disk Drive Cage
- 4 X Single Channel LVD adapter
- 4 X PCI SE Ultra SCSI
- 4 X 10/100 Ethernet

Software:

1. TruCluster Production Server for TRU64 UNIX License + doc
2. Tru64 UNIX Media and documentation on CD ROM
3. INDIA Special Educational bundle of compilers and Libraries with C, C++, FORTRAN, PASCAL
4. Complete parallel software development environment available from Compaq and its ISV, includes:
   (a) Compilers and debuggers
   (b) Message passing Libraries
   (c) Performance monitoring and optimization utilities
   (d) Scientific and mathematical libraries
**Galaxy Cluster**

**Configuration**

The cluster comprises of total 34 dual-processor nodes; it's a 64-CPU cluster.

- CPU: Intel(R) Dual Processor Xeon(R) CPU 3.2GHz
- RAM: 2GB per node
- HDD: 40GB IDE
Linux Cluster

Galaxy Cluster

Software

The cluster is based on Fedora Core 3 distribution. All essential software are installed on the cluster.

- Intel C++ Compiler (8.1)
- Intel Fortran Compiler (8.1)
- Intel Math Kernel Library (7.0)

Following parallel programming software comes with the cluster:

- LAM MPI (7.0.6)
- PVM (3.4.4)

In addition to the basic packages following softwares are also available:

- Gromacs (3.2.1) - Molecular Dynamics Software
- Gaussian (98) - Electronic Structure Software
- Fluent (6.1) - CFD software

Following job management and cluster management:

- Torque - Batch System
- Maui Scheduler
**Galaxy Cluster**

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**Current Status**

- galaxy.aero.iitb.ac.in:
  - Job ID | Username | Queue | Jobname | SessID | NDS | TSK | Req’d Memory | Req’d Time | Elap Time
  - 670 | galaxy.aero mahendra | batch | job2 | 26585 | 1 | - | - | 120:0 R 25:05
  - 703 | galaxy.aero dipankar | batch | job | 28244 | 1 | - | - | 120:0 R 22:45
  - 704 | galaxy.aero deepa | batch | job1 | 28279 | 1 | - | - | 120:0 R 22:45
  - 708 | galaxy.aero vntom | batch | run122 | 29158 | 1 | - | - | 120:0 R 19:27
  - 709 | galaxy.aero vntom | batch | run123 | 26972 | 1 | - | - | 120:0 R 19:26
  - 710 | galaxy.aero vntom | batch | run124 | 26497 | 1 | - | - | 120:0 R 19:27
  - 711 | galaxy.aero vntom | batch | run125 | 26510 | 1 | - | - | 120:0 R 19:27
  - 712 | galaxy.aero vntom | batch | run126 | 26532 | 1 | - | - | 120:0 R 19:27
  - 716 | galaxy.aero sadhana | batch | H300 | 27571 | 4 | - | - | 120:0 R 18:48
  - 726 | galaxy.aero mahendra | batch | job1 | 26525 | 1 | - | - | 120:0 R 12:44
  - 730 | galaxy.aero sadhana | batch | t300 | 27381 | 4 | - | - | 120:0 R 11:41
  - 731 | galaxy.aero deepa | batch | job1 | 26135 | 1 | - | - | 120:0 R 11:28
  - 734 | galaxy.aero sudani | batch | v300 | 27335 | 4 | - | - | 120:0 R 11:18
  - 735 | galaxy.aero dipankar | batch | job | 29507 | 1 | - | - | 20:00 R 01:08
  - 730 | galaxy.aero vntom | batch | job1 | 26532 | 1 | - | - | 120:0 R 19:27

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TORQUE (Tera-scale Open-source Resource and QUEue manager) is a resource manager providing control over batch jobs and distributed compute nodes.

**Benefits:**
- Initiate and manage serial and parallel batch jobs remotely (create, route, execute, modify and/or delete jobs)
- Define and implement resource policies that determine how much of each resource can be used by a job
- Apply jobs to resources across multiple servers to accelerate job completion time
- Collects information about the nodes within the cluster to determine which are in use and which are available

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Goals of Shared Storage

- Increased flexibility in deploying and managing storage,
- Improved quality of service, and
- Increased operational efficiency.

using the following elements

- Physical Storage Devices (disk drives, disk arrays, controllers, tape libraries, ...)
- Logical Storage Resources (volumes, files)
- Interconnection Network (many choices)
- Host Computers (equipped with Host Bus Adaptors, Network Cards)
Requirements Overview and Issues
Technical Perspective
Managerial Perspective
LDAP for User Management
High Performance Computing
Storage Solutions
Campus LAN Design
WAN and Internet Services

Logical View of Storage

SNIA Education
Application

Users – Applications

Applications – Files System
Records

tuples \rightarrow tables

File System – Volumes
Metadata

tables \rightarrow tablespaces

I/O Subsystem

Logical View of Storage
Storage Virtualization

SNIA Education
Logical Disks

Virtualized LUNs
1 x 1GB
1 x 4GB
1 x 5GB

SCSI LUNs
4 x 1GB
2 x 3GB

Physical Disks
10 x 1GB

Host A
Drive D (5GB)

Host B
Drive D (1GB)
Drive E (4GB)

SAN

SCSI ID 2
1GB
1GB
1GB
3GB

SCSI ID 0
4GB
5GB
1GB
1GB

SCSI ID 1

Volume Manager
HBA Utility
Virtualization Software
RAID Configuration Utility

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Direct Attached Storage (DAS)

- Storage is captive *behind* server CPU
- Data access is file system and platform dependant.
- Server CPU must handle user I/O requests also.
- Costly to scale; complex to manage
Scalability and Performance

- Storage Expansion  No impact on servers
- Server Expansion  No impact on storage
- Load Balancing & Failover  Active parallel paths
- Bandwidth on Demand  Robust topology
- Offload/Remote Backup
Network Attached Storage (NAS)
A Sun StorEdge NAS server (2 Terabytes disk) at IIT.

- 300 MB for students, 500 for faculty.
- Mountable from anywhere in campus
- Across platforms (Linux/Windows)
- `smbd` server
- LDAP authentication
- Backed-up using AMANDA
- Also Provides homepages for all
  (http://homepages.iitb.ac.in/~user)
Internally *bighome* has a *fibre channel* connected set of disks (Hitachi and Seagate)

```bash
bash-2.03# df -k
Filesystem  kbytes  used  avail capacity Mounted on
/dev/vx/dsk/rootvol 4032504 2873271 1118908 72% /
/dev/vx/dsk/usr 4032504 1633010 2359169 41% /usr
/proc 0 0 0 0% /proc
fd 0 0 0 0% /dev/fd
mnttab 0 0 0 0% /etc/mnttab
/dev/vx/dsk/var 4032504 944525 3047654 24% /var
swap 21775512 32 21775480 1% /var/run
swap 21838944 63464 21775480 1% /tmp
/dev/dsk/c5t2d0s4 1016122 148331 806824 16% /nsr
/dev/vx/dsk/opt 2734129 1025099 1654348 39% /opt
/dev/vx/dsk/data3/vol03 571785216 92363100 449516693 18% /data3
/dev/vx/dsk/data1/vol01 571785216 176296565 370778827 33% /data1
/dev/vx/dsk/data4/vol04 500312064 181497552 298889755 38% /data4
/dev/vx/dsk/data2/vol02 500312064 162779319 316436950 34% /data2
```
User Distribution

bash-2.03# ls /data1/
1994 2000 2004 alumni.old_batches misc quotas
1997 2001 TT_DB deleted other quotas
1998 2002 acre fac prjstf rs
1999 2003 admin lost+found quotadir stf
bash-2.03# ls /data1/2004/
btech dd im mdes mm msc mtech rs
bash-2.03# ls /data1/2004/mtech/
aero cese civil cse ese ieor me re
bioschool che cor ee geos it met sce
bash-2.03# ls /data1/2004/mtech/cse/z4305
z4305001 z4305015 z4305024 z4305028 z4305802 z4305807 z4305905
z4305011 z4305020 z4305025 z4305029 z4305804 z4305813
bash-2.03# ls -ld /data1/2004/mtech/cse/z4305*
drwxr-xr-x 2 aniketpkate 104305 96 Jul 21 18:18 /data1/2004/mtech/cse/z4305001
drwxr-xr-x 2 dheren 104305 96 Jul 21 18:19 /data1/2004/mtech/cse/z4305011
drwxr-xr-x 2 vamshi 104305 96 Jul 21 18:19 /data1/2004/mtech/cse/z4305015
drwxr-xr-x 5 z4305020 104305 1024 Sep 30 01:53 /data1/2004/mtech/cse/z4305020
drwxr-xr-x 2 z4305024 104305 96 Jul 21 18:19 /data1/2004/mtech/cse/z4305024
drwxr-xr-x 2 sheetal_sonare 104305 96 Jul 21 18:19 /data1/2004/mtech/cse/z4305025
drwxr-xr-x 2 sr_anilk 104305 96 Jul 21 18:19 /data1/2004/mtech/cse/z4305028
drwxr-xr-x 2 sreekanth 104305 96 Jul 21 18:19 /data1/2004/mtech/cse/z4305029
drwxr-xr-x 2 nadesai 104305 96 Jul 21 18:19 /data1/2004/mtech/cse/z4305802
drwxr-xr-x 2 sjagdhesh 104305 96 Jul 21 18:19 /data1/2004/mtech/cse/z4305804
drwxr-xr-x 2 amruta 104305 96 Jul 21 18:19 /data1/2004/mtech/cse/z4305807
drwxr-xr-x 2 vselot 104305 96 Jul 21 18:19 /data1/2004/mtech/cse/z4305813

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Design and Implementation of Campus Network and Computing Infrastructure
Administering Bighome

Automagically when LDAP accounts are added.

- **Storage Server Administration**
  - LDAP Administration
  - EMail Administration

- **Storage Server Administration**: (bighome.iitb.ac.in)

- When you add / delete a user home-directories are automatically created / deleted
- Even the `changeuid` script takes care of renaming the home directories.
- If one has to do something manually take care of the following:
  1. Attribute `*homeDirectory*` on ldap has the correct current value.
  2. It has the format `/home/dept/group/username` where `dept`=(cse, aero, cc, etc ...) Note: dept name in lower case, group = (fac, sd, pjsdf, rs, misc) and for students: group = (bt01, mb02, dd01 ...etc ...) For exact details on this read the scripts `*addstudent.cgi` `*addstaff.cgi` etc ...on web.iitb.ac.in
  3. Administration Scripts on bighome.iitb.ac.in are: 1. `delhomedir.pl` 2. `mkhomedir.pl` 3. `renamehomedir.pl` in `/usr/local/bin`
  4. Usage is shown when you run the script. For detailed logic you can read the scripts.
  5. The directories are actually created randomly on the four partitions data1 ...data4 and appropriate link is created in `/home/...` as given above.

- Quotas are specified for users u:gtu, pg:gtu, rs:gtu, fac:gtu, s:gtu, prj:gtu, mis:gtu. Depending on the categories, the appropriate quota is copied for a user.
How Home Directories Created

```perl
if ($status eq "misc" || $status eq "stf" || $status eq "prjstf" || $status eq "fac") {
    $data = "/data"."$data/$dirs[2]/$dirs[3]/$user"; } else {
    $data = "/data"."$data/$dirs[2]/$dirs[3]/$dirs[4]/$user";
}

# print LOG "mkhomedir.pl @dirs[2] @dirs[3]\n"
print LOG "mkhomedir.pl link_name=$dir real_homedir=$data\n"
my $basedir = join '/', @dirs;
if (!chdir ($basedir)) {
    system ('/usr/bin/mkdir -m u=rwx,og=rx -p $basedir') && die "Couldnt create $basedir";
}

system ('/usr/bin/mkdir -m u=rwx,og=rx -p $data") && die "Couldnt create $data";
system ('/usr/bin/chown $uid:$gid $data") && die "couldnt set permissions for $data";
system ('/usr/bin/ln -fs $data $dir") && die "Cant set symlink to $dir";
system ('/opt/VRTSvxfs/sbin/vxedquota -p $qta $user") && die "couldn’t set quotafor $user";
```
bash-2.03# less /usr/local/lib/smb.conf
# Samba config file created using SWAT
# from pitta.cc.iitb.ac.in (144.16.106.14)
# Date: 2002/09/30 16:42:17

# Global parameters
[global]
  workgroup = COMPUTER-CENTRE
  netbios name = BIGHOME
  interfaces = ge0
  encrypt passwords = Yes
  os level = 65
  preferred master = True
  domain master = True
  wins server = 10.200.1.21
  ldap server = ldap.iitb.ac.in
  ldap port = 389
  ldap suffix = ou=people,dc=iitb,dc=ac,dc=in
  ldap admin dn = cn=sambaproxy,ou=people,dc=iitb,dc=ac,dc=in
  ldap ssl = no

[homes]
  read only = No
Mounting Bighome from Windows

- Open any folder, on your desktop, and left click the tool menu above.
- Choose Map Network Drive....
- The Map Network drive Dialog box comes up. Windows automatically chooses an available drive letter for this network drive. In the folder box, type...

  `\bighome.iitb.ac.in\LDAP-id`

- Click on Finish button. Now an authentication dialog box will come up, asking for LDAP username and password.
- YOU ARE DONE! Your storage server drive will open up...
Mounting Bighome from Linux

- Create a directory where you want to mount the bighome files.
- `mount -t smbfs -o username=sumitk,port=139 //bighome.iitb.ac.in/sumitk /home/cms/big`

Here `sumitk` is to be replaced by your LDAP ID and `/home/cms/big` by the directory where you want to mount your bighome files.

It will prompt for authentication.

To automatically mount your homedirectory:
- Add this entry in `fstab`: ...
- Or, put a shell script in `/etc/profile.d` ...
Homepages for all

- Create `public_html` folder in your bighome homedir.
- Copy all web pages in public_html
- Change file permissions to allow read...
- `http://home.iitb.ac.in/~userid` will be URL for your homepage.

Remember this happens *automagically* for any user added via LDAP by any sysad!
Backing up Data

http://www.amanda.org/

The Advanced Maryland Automatic Network Disk Archiver

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WHAT IS AMANDA

AMANDA, the Advanced Maryland Automatic Network Disk Archiver, is a backup system that allows the administrator of a LAN to set up a single master backup server to back up multiple hosts to a single large capacity tape drive. AMANDA uses native dump and/or GNU tar facilities and can back up a large number of workstations running multiple versions of Unix. Recent versions can also use SAMBA to back up Microsoft Windows hosts.

The most recent stable release is version 2.4.4p4, released on October 22, 2004. Download here!

Have a look at the BETA-release of the upcoming AMANDA-docs here!
AMANDA Backup Status

Tue Feb 8 11:30:00 IST 2005

Using /export/home/amanda/databases/merged.cc/andump.1 from Tue Feb 8 03:00:00 IST 2005

dvl.iitb.ac.in/etc
  1  13k finished (5:52:32)
dvl.iitb.ac.in/home
  1  992k finished (5:48:50)
dvl.iitb.ac.in/root
  1  7k finished (5:53:12)
dvl.iitb.ac.in/var
  0  no estimate

d2.iitb.ac.in/etc
  1  8117k finished (5:44:48)
d2.iitb.ac.in/home
  1  50k finished (5:51:12)
d2.iitb.ac.in/root
  1  943k finished (5:48:53)
d2.iitb.ac.in/var
  1  4k finished (5:53:18)

garbol.iitb.ac.in/etc
  1  804k finished (5:44:45)
garbol.iitb.ac.in/home
  0  no estimate

garbol.iitb.ac.in/root
  0  no estimate

garbol.iitb.ac.in/usr/local
  0  no estimate

garbol.iitb.ac.in/var
  0  no estimate

garbol.iitb.ac.in/etc
  1  16k finished (5:52:26)
garbol.iitb.ac.in/home
  1  16k finished (5:52:31)
garbol.iitb.ac.in/root
  1  12k finished (5:52:50)
garbol.iitb.ac.in/usr/local
  1  8k finished (5:53:10)

1gargo.iitb.ac.in/etc
  2  16520k finished (5:46:12)
garbol.iitb.ac.in/etc
  1  95k finished (5:50:50)
garbol.iitb.ac.in/fac.mailboxes
  1  11725k finished (5:47:19)
garbol.iitb.ac.in/home
  1  33k finished (5:51:29)
garbol.iitb.ac.in/misc.mailboxes
  1  11648k finished (5:03:15)
garbol.iitb.ac.in/prjstf.mailboxes
  1  10034k finished (5:46:48)
garbol.iitb.ac.in/root
  1  45k finished (5:51:23)
garbol.iitb.ac.in/stf.mailboxes
  2  159242k finished (5:52:09)
garbol.iitb.ac.in/usr
  1  675k finished (5:48:58)
garbol.iitb.ac.in/var
  2  187609k finished (5:42:31)

garbol.iitb.ac.in/etc
  1  26k finished (5:51:50)
garbol.iitb.ac.in/home
  1  3403k finished (4:53:48)
garbol.iitb.ac.in/ul
  1  1k finished (5:53:45)
Requirements Overview and Issues
Technical Perspective
Managerial Perspective
LDAP for User Management
High Performance Computing
Storage Solutions
Campus LAN Design
WAN and Internet Services

IIT Bombay

Layout Plan, Indian Institute of Technology, Bombay

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Design and Implementation of Campus Network and Computing Infrastructure
Physical View of LAN

Academic Area- **A** is CSE, **B** is CC, **C** is Aero
Campus Backbone

iIT Bombay’s Backbone Connectivity

- 12 core MM fiber
- 24 core MM fiber
- 6 core MM fiber

- Computer Science Dept.
  - Avaya – P580

- Hostel 1 - Active Patch
  - P133G2

- Core - Computer Centre
  - Extreme BlackDiamond - 6808

- Aero Dept.
  - Avaya – P580

- Hostel 3
  - Avaya – P580

- Hostel 5 - Active Patch
  - P133G2

- Hostel 8
  - Avaya – P580

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Design and Implementation of Campus Network and Computing Infrastructure
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Detailed Lan Layout

Design and Implementation of Campus Network and Computing Infrastructure
Logical View of LAN

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Design and Implementation of Campus Network and Computing Infrastructure
Fibre Rack at CC
Requirements Overview and Issues
Technical Perspective
Managerial Perspective

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Hostel 13

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Design and Implementation of Campus Network and Computing Infrastructure
Residential Network

IIT Bombay's Residential Area Connectivity

To IIT Bombay's Backbone Network

Residential Router Specifications:
- CPU – Intel 3 Ghz
- Memory – 1 GB RAM
- HDD – 40 GB
- Network Cards – 6 100Mbps fiber cards
- OS – Fedora core 2
- Packages – IPTables, Bandwidthh, Ntop, Tcptrack

100Mbps Fiber Links

Segment – 10.161.x.x Area – Lakeside
Segment – 10.162.x.x Area – Central Area1
Segment – 10.163.x.x Area – Central Area2
Segment – 10.164.x.x Area – HillSide1
Segment – 10.165.x.x Area – HillSide2
Important Issues

Important Considerations

- Virus, Spyware
- Wrong IP addresses
- Wireless Access (guest house, conference halls)
- Static MAC-IP mapping
- Software Piracy
- Illegal Content (pornography, ...)
- ...

Good LAN design can help a lot with this...
IIT-B’s WAN Links and Firewall

WAN-LAN @IITB

VSNL1 2Mbps
VSNL2 2Mbps
BSES 3.6Mbps
VSNL3&4 2.2 Mbps

WAN
50/0:203.199.67.9
50/0:203.199.44.101
203.129.236.145
50/0:203.197.31.189, 50/1201.199.90.217

DMZ2
Wum1 Wum2

Garbo1 Garbo2 Garbo3 Garbo4

DMZ1
Mailly 1&2
Dv1&2 Ldns1,2&3 Smp1&2 cpl,cpl,cpl3

10.209.251.1
Critical Network Services

- Firewall (Security *sine qua non*)
  - www.netfilter.org and www.iptables.org
  - Free firewall software distributed under GNU General Public License

- Domain Name Service (DNS) http://cr.yp.to/djbdns/

- Directory Services (LDAP)
  - OpenLDAP®
  - http://www.OpenLDAP.org
  - Community developed LDAP software

- Virus Scanning clamav.elektrapro.com
  - Clam
  - AntiVirus
  - Homepage
Critical Network Services

- E-mail (www.qmail.org)
- Newsgroups (inn)
- Web Proxy
- WWW Servers (httpd.apache.org)
Network Servers Rack

- All **Vanilla** Intel Boxes running GNU/Linux
- Most services **load balanced. Hot Swappable** (at the machine level itself)
Firewall

- Inside IIT we have 50 IP subnets.
- Over 5000 nodes.
- All Private addresses 10.x.y.z
- 4 Different WAN subnets
  - 128, 64, 32, 32 address only!
- `iptables` (www.iptables.org) to the rescue.
- Selective services/machines opened up
  - Incoming `ssh` to different dept. servers.
  - Outgoing `ssh`, Yahoo/MSN chat
  - Outgoing port for SciFinder
  - Outgoing `ftp` from select machines

Making a good policy is the hardest!
Domain Name Service

DJBDNS (www.djbdns.org) tinydns and dnscache
E-mail Service
Web Browsing

Requirements Overview and Issues
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Web Browsing

INTERNET

VSNL RADIO LINK

VSNL LL LINK

STPI LL LINK

PROXY VSNL RADIO

PROXY VSNL LL

PROXY STPI LL

IITB PUBLIC NETWORK

IITB INTERNAL NETWORK

PROXY

NETMON

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Design and Implementation of Campus Network and Computing Infrastructure


**Squid Features**

- **Authentication and Filtering** at Layer 1
- **Caching and Ad-blocking** and **Bandwidth shaping** at Layer 2
- Several **load balancing** controls available
  - Journal sites and **good** sites via fast link!
  - **zebra**, **ripd** for link failure tolerance!
Iptables

Stateful firewalling. See [www.netfilter.org](http://www.netfilter.org)

**IP Filter**
- Used to filter packets
- The command to enter a rule is called *iptables*
- The framework inside kernel is called Netfilter
- Full matching on IP, TCP, UDP and ICMP packet headers
- Lesser matching on other packet headers possible
Basic Functionalities

- **NAT** (Network Address Translation)
  - **DNAT** - Destination Network Address Translation
  - **SNAT** - Source Network Address Translation
  - Requires *connection tracking* to keep states and expectations

- **Packet Mangling**
  - Strip all IP options
  - Change TOS values
  - Change TTL values
  - ...
  - Mark packets/connections within kernel
Packet Traversal Diagram

Kernelspace Structure

PREROUTING  FORWARD  POSTROUTING

INPUT  LOCAL PROCESS  OUTPUT
Example of NAT

How to get into a IIT-Bombay machine actually using *private address*.

siva@stdwww: hostname
stdwww.iimahd.ernet.in
siva@stdwww: host login.iitb.ac.in
login.iitb.ac.in has address 203.197.74.149
siva@stdwww: telnet login.iitb.ac.in 10623
Trying 203.197.74.149...
Connected to login.iitb.ac.in.
Escape character is ..

SunOS 5.8
+ * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + **
   pawan.cc.iitb.ac.in
Intranet Server for
   C O M P U T E R C E N T R E
+ * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + * + **
   login:
NAT Rules on login.iitb.ac.in

#
# Incoming servers (telnet+ssh)
#
# AERO
iptables -t nat -A PREROUTING -p tcp -i eth1
  -d $IP1 --dport 1022 -j DNAT --to 10.101.1.1:22
iptables -t nat -A PREROUTING -p tcp -i eth1
  -d $IP1 --dport 1023 -j DNAT --to 10.101.1.1:23

# CHE
iptables -t nat -A PREROUTING -p tcp -i eth1
  -d $IP1 --dport 3022 -j DNAT --to 10.102.1.1:22
iptables -t nat -A PREROUTING -p tcp -i eth1
  -d $IP1 --dport 3023 -j DNAT --to 10.102.1.1:23

Of course, ssh is the preferred option.
Opening up services for machines inside IIT

Use the netfilter machine as *default route*
It will decide what to allow, what to filter...

```bash
# *** Telnet
iptables -t nat -A POSTROUTING -p tcp
 -s 10.0.0.0/8 --dport 23 -j SNAT --to $IP1

# *** MSN
iptables -t nat -A POSTROUTING -p tcp
 -s 10.0.0.0/8 --dport 1863 -j SNAT --to $IP1

# *** Yahoo, SciFinder, ssh, telnet
```
Shaping the Traffic

Use `tc` (traffic control) in Linux Kernel. Different types of traffic such as web, mail, ssh and so on. We want to make sure that any particular traffic does not dominate our WAN link so we need to limit rate for different types of traffic. This can be achieved as follows:

1. select a base queueing discipline that we want to use.
2. create classes for different types of traffic that we want to shape.
3. create filters to classify different types of traffic
Hierarchical Token Bucket (HTB) queuing discipline

tc qdisc add dev eth0 root handle 1: htb default 15

## CEIL = 75% of your upstream bandwidth

tc class add dev eth0 parent 1: classid 1:1 htb rate ${CEIL}mbit ceil ${CEIL}mbit

tc class add dev eth0 parent 1:1 classid 1:10 htb rate 0.8mbit ceil 0.8mbit prio 0

tc class add dev eth0 parent 1:1 classid 1:11 htb rate 0.8mbit ceil ${CEIL}mbit prio 1

We have just created a htb tree with one level depth.

```
+---------+
| root 1: |
+---------+

| +-----------------------+ |
| | class 1:1 | |
| +-----------------------+ |

| +----+ +----+ +----+ |
|1:10| |1:11| |1:12|
```
Now Mangle Packets

```sh
# Http packets
iptables -t mangle -A PREROUTING
    -p tcp --dport 80 -j MARK --set-mark 0x2

# Mail packets
iptables -t mangle -A PREROUTING
    -p tcp --dport 25 -j MARK --set-mark 0x3

# ssh packets
iptables -t mangle -A PREROUTING
    -p tcp -m tcp --sport 22 -j MARK --set-mark 0x1
```

and queue accordingly!

Above is quite simplistic. Complex variations with dynamic shaping is possible.

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Virtual Server as frontend. Real Servers as backend. Explanation by example.

```bash
# Ldirectord will periodically connect to each real server
# and request a known URL. If the data returned by the server
# does not contain the the expected response then the
# test fails and the real server will be taken out of the available
# pool. The real server will be added back into the pool once the
# test succeeds. If all real servers are removed from the pool then
# localhost is added to the pool as a fallback measure.
#
# Based on the sample ldirectord.cf provided with ldirectord
#
# Prepared: March 2003
#
# Global Directives
checktimeout=100
checkinterval=60
autoreload=yes
logfile="/var/log/ldirectord.log"
logfile="local0"
quiescent=yes
#
# Virtual Server for HTTP
virtual=203.197.74.160:80
gate
##virtual=203.197.74.161:80
gate
##virtual=203.197.74.162:80
gate
##virtual=10.209.4.1:80
masq 1
##virtual=10.209.4.2:80
masq 1
service=http
scheduler=wrr
##scheduler=rr
persistent=600
protocol=tcp
checktype=connect
##checktype=negotiate
```

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Design and Implementation of Campus Network and Computing Infrastructure
Ultramoney Config

# Virtual Server for SMTP
virtual=203.197.74.141:25
    #fallback=127.0.0.1:25
    real=10.209.3.1:25 masq 1
    real=10.209.3.2:25 masq 1
    service=smtp
    scheduler=wrr
    #persistent=300
    protocol=tcp
    checktype=connect

# Virtual UDP Server for DNS
virtual=203.197.74.159:53
    #fallback=127.0.0.1:53
    real=10.209.4.1:53 masq 1
    real=10.209.4.2:53 masq 1
    service=none
    scheduler=wrr
    #persistent=600
    protocol=udp
    checktype=on

# Virtual TCP Server for DNS
Load Balancing

[root@wum2 root]# ipvsadm -L -n
IP Virtual Server version 1.0.9 (size=65536)
Prot LocalAddress:Port Scheduler Flags
   -> RemoteAddress:Port Forward Weight ActiveConn InActConn
TCP  203.197.74.141:25 wrr
   -> 10.209.3.1:25          Masq  1   7   23
   -> 10.209.3.2:25          Masq  1   7   26
TCP  203.197.74.159:53 wrr
   -> 10.209.4.2:53          Masq  1   0   0
   -> 10.209.4.1:53          Masq  1   0   0
UDP  203.197.74.159:53 wrr
   -> 10.209.4.2:53          Masq  1   0   528
   -> 10.209.4.1:53          Masq  1   0   526
TCP  203.197.74.160:80 wrr persistent 600
   -> 10.209.4.2:80          Masq  1   8   57
   -> 10.209.4.1:80          Masq  1  11   68
### Load Balancing

```bash
[root@wum2 root]# ipvsadm -L -n --stats
IP Virtual Server version 1.0.9 (size=65536)

<table>
<thead>
<tr>
<th>Prot</th>
<th>LocalAddress:Port</th>
<th>RemoteAddress:Port</th>
<th>Conn</th>
<th>InPkts</th>
<th>OutPkts</th>
<th>InBytes</th>
<th>OutBytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP</td>
<td>203.197.74.141:25</td>
<td></td>
<td>314557</td>
<td>6310573</td>
<td>6306136</td>
<td>3546M</td>
<td>339093K</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10.209.3.1:25</td>
<td>198754</td>
<td>4132343</td>
<td>4109182</td>
<td>2409M</td>
<td>220332K</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10.209.3.2:25</td>
<td>122884</td>
<td>2423641</td>
<td>2422927</td>
<td>1345M</td>
<td>130739K</td>
</tr>
<tr>
<td>TCP</td>
<td>203.197.74.159:53</td>
<td></td>
<td>128</td>
<td>167</td>
<td>139</td>
<td>8832</td>
<td>5648</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10.209.4.2:53</td>
<td>53</td>
<td>68</td>
<td>57</td>
<td>3604</td>
<td>2280</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10.209.4.1:53</td>
<td>53</td>
<td>67</td>
<td>56</td>
<td>3580</td>
<td>2240</td>
</tr>
<tr>
<td>UDP</td>
<td>203.197.74.159:53</td>
<td></td>
<td>1247665</td>
<td>5274880</td>
<td>408240</td>
<td>345279K</td>
<td>49825999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10.209.4.2:53</td>
<td>623895</td>
<td>2611849</td>
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<td>13015422</td>
<td>17511823</td>
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<td>9812M</td>
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</table>
```
### Load Balancing

```bash
[root@wum2 root]# ipvsadm -L -n --rate
IP Virtual Server version 1.0.9 (size=65536)

<table>
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<tr>
<th>Prot</th>
<th>LocalAddress:Port</th>
<th>CPS</th>
<th>InPPS</th>
<th>OutPPS</th>
<th>InBPS</th>
<th>OutBPS</th>
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<td>0</td>
<td>0</td>
</tr>
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<td>12</td>
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<td>7</td>
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<td>10</td>
<td>12</td>
<td>1000</td>
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</tbody>
</table>
```
Putting it all together

Using **free** tools, one can achieve all the following.

- Security (Firewall)
- Harnessing Multiple WAN links seamlessly
- Shaping the traffic for each application reliably
- Achieving reliability using virtual services

Challenging, but exciting job.

Swatantra Software. Resource Centre. (OSSRC)
Network, Services and User Management

Eternal vigilance is the price of liberty!

- How is network doing?
- Are all services up?
- How much email in/out? How many viruses?
- Who’s using Web proxy? For what?
- Are User’s happy?

www.gnu.org/software/gnats

G. Sivakumar  
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Indian Institute of Technology, Bombay  
Mumbai 400076, India  
siva@iitb.ac.in

Design and Implementation of Campus Network and Computing Infrastructure
IITB WAN Links

Traffic Analysis for 203.197.31.153 -- router-vsnl-radio.iitb.ac.in

Traffic Analysis for 203.199.44.101 -- router-vsnl-ll.iitb.ac.in

Traffic Analysis for 202.68.142.226 -- proxy-bses-ll
Smokeping

Performance of Link to Hostel 5.

G. Sivakumar  
**Computer Science Department**  Indian Institute of Technology, Bombay  Mumbai 400076, India  siva@iitb.ac.in

Design and Implementation of Campus Network and Computing Infrastructure
Design and Implementation of Campus Network and Computing Infrastructure

G. Sivakumar  Computer Science Department  Indian Institute of Technology, Bombay  Mumbai 400076, India  siva@iitb.ac.in
### Status Summary For All Host Groups

<table>
<thead>
<tr>
<th>Host Group</th>
<th>Host Status</th>
<th>Service Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVAYA switches (backbone-switches)</td>
<td>7 UP</td>
<td>7 OK</td>
</tr>
<tr>
<td>Cisco Routers (cisco-routers)</td>
<td>3 UP</td>
<td>1 OK</td>
</tr>
<tr>
<td>Department Caching DNS servers (dept-dns-servers)</td>
<td>2 UP</td>
<td>1 OK</td>
</tr>
<tr>
<td>DNS Servers (dns-servers)</td>
<td>4 UP</td>
<td>12 OK</td>
</tr>
<tr>
<td>DNSCACHE Servers (dnocache-servers)</td>
<td>5 UP</td>
<td>5 OK</td>
</tr>
<tr>
<td>FTP servers (ftp-servers)</td>
<td>1 UP</td>
<td>1 OK</td>
</tr>
<tr>
<td>NAT boxes (garbo-servers)</td>
<td>4 UP</td>
<td>4 OK</td>
</tr>
<tr>
<td>LDAP servers (ldap-servers)</td>
<td>2 UP</td>
<td>2 OK</td>
</tr>
<tr>
<td>Mail servers (mail-servers)</td>
<td>9 UP</td>
<td>25 OK</td>
</tr>
<tr>
<td>Met lhb as in servers (net-servers)</td>
<td>2 UP</td>
<td>10 OK</td>
</tr>
<tr>
<td>News servers (news-servers)</td>
<td>2 UP</td>
<td>5 OK</td>
</tr>
<tr>
<td>Proxy servers (proxy-servers)</td>
<td>5 UP</td>
<td>10 OK</td>
</tr>
<tr>
<td>RESNET Embedded Servers (resnet-pico-servers)</td>
<td>46 UP</td>
<td>43 OK</td>
</tr>
<tr>
<td>RESNET Web Servers (resnet-web-servers)</td>
<td>8 UP</td>
<td>14 CRITICAL</td>
</tr>
<tr>
<td>Web servers (web-servers)</td>
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<td>2 OK</td>
</tr>
<tr>
<td>WINS servers (wino-servers)</td>
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<td>1 OK</td>
</tr>
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</table>
## Mail Usage Statistics

### Email Logs for January 2003

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<td>Count (K)</td>
<td>Size (MB)</td>
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<td>17</td>
<td>38</td>
<td>516</td>
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<td>18</td>
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<td>394</td>
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*Top 25*
### Email Logs for January 23, 2003

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<tr>
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<td>1</td>
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<td>675771</td>
<td>upadhyay@me</td>
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<td>nvs@it</td>
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<td>32</td>
<td>13523092</td>
<td>krithi@cse</td>
</tr>
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<td>n9311012@ccs</td>
<td>4</td>
<td>10061910</td>
<td>amitgangrade@iitb</td>
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<tr>
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<td>ranoo@ee</td>
<td>18</td>
<td>6854607</td>
<td>sudarsha@cse</td>
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<td>6415804</td>
<td>aknur@admin</td>
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Mail Server Statistics

Health check for ldms1
Thu Feb 3 18:28:00 IST 2005

Disk space Occupancy

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<th>1k-blocks</th>
<th>Used</th>
<th>Available</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2016016</td>
<td>601592</td>
<td>1412012</td>
<td>32%</td>
<td>/</td>
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<td>none</td>
<td>1979094</td>
<td>0</td>
<td>1979094</td>
<td>0%</td>
<td>/dev/shm</td>
</tr>
<tr>
<td>/dev/hda3</td>
<td>4632124</td>
<td>1370244</td>
<td>3251884</td>
<td>30%</td>
<td>/usr</td>
</tr>
<tr>
<td>/dev/hda5</td>
<td>34265732</td>
<td>697348</td>
<td>31887944</td>
<td>2%</td>
<td>/var</td>
</tr>
<tr>
<td>/dev/hda6</td>
<td>34589976</td>
<td>1129944</td>
<td>33479432</td>
<td>4%</td>
<td>/home</td>
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</table>

Memory Usage

<table>
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<tr>
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<th>total</th>
<th>used</th>
<th>free</th>
<th>shared</th>
<th>buffers</th>
<th>cached</th>
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</thead>
<tbody>
<tr>
<td>Mem:</td>
<td>3940808</td>
<td>3742492</td>
<td>198316</td>
<td>0</td>
<td>329604</td>
<td>873992</td>
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<td>-/- buffers/cache:</td>
<td>2538896</td>
<td>3401912</td>
<td>0</td>
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<tr>
<td>Swap:</td>
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<td>2048276</td>
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<td></td>
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</table>

Routing Table

10.200.0.0/16 dev eth0 scope link
127.0.0.0/8 dev lo scope link
default via 10.200.250.1 dev eth0

QMAIL Status

/service/qmail: up (pid 27924) 17279 seconds
/service/qmail/log: up (pid 1259) 1823829 seconds
/service/smtpd: up (pid 27930) 17279 seconds
/service/smtpd/log: up (pid 1269) 1823829 seconds
messages in queue: 3
messages in queue but not yet preprocessed: 0

Recipients for pending Mails are in the following domains:

1 mitra.iitb.ac.in
1 cse.iitb.ac.in
1 cese.iitb.ac.in

Results of last 20 mail delivery successes:

2005-02-03 18:27:15.857625000 delivery 13288: success: 10.200.1.65 accepted message /Remote_host_said::250 ok 1107435435 ap_15783_by TableCell

G. Sivakumar  Computer Science Department  Indian Institute of Technology, Bombay  Mumbai 400076, India  siva@iitb.ac.in

Design and Implementation of Campus Network and Computing Infrastructure
Mail Server Statistics

Mail stats since: Nov 22 04:02:07
Total mail scanned: 2790643
Total viruses stopped: 330817
Total spam found: 270
Spam percentage: 0.01
Page last generated: Thu Feb 3 12:48:19 2005
Scan starts every 5 minutes.

TOP 10 viruses
Worm.SomeFool.P : 7897
Worm.Zafi.D : 2893
Trojan.Downloader.Small-165 : 483
Worm.SomeFool.AA-2 : 272
Disallowed characters found in MIME headers : 221
Worm.Lovgat.X : 150
Worm.Mydoom.Gen-mp : 144
Disallowed breakage found in header name - potential virus : 139
HTML.Phishing.Bank-1 : 138
Worm.SomeFool.Gen-1 : 134
### Web Proxy Usage

#### Top 10 of 2768 Total Sites By KBytes

<table>
<thead>
<tr>
<th>#</th>
<th>Hits</th>
<th>Files</th>
<th>KBytes</th>
<th>Visits</th>
<th>Hostname</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2308204</td>
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<td>900096</td>
<td>35</td>
<td>sunfire.cc.iitb.ac.in</td>
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<tr>
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<td>49016</td>
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<tr>
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#### Top 50 of 3498 Total Usenames

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Web Server Hits

Summary by Month

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<tr>
<td>Totals</td>
<td>32297566</td>
<td>111761</td>
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</table>
Web Server Hits

Usage by Country for February 2003

Unresolved/Unknown (45%)
US Commercial (18%)
Network (15%)
US Educational (7%)
India (4%)
Canada (2%)
United Kingdom (2%)
France (1%)
Germany (1%)
Non-Profit Organization (1%)
Other (5%)

Top 30 of 74 Total Countries

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<th>KBytes</th>
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<td>10</td>
<td>372</td>
<td>288</td>
<td>44921</td>
<td>Non-Profit Organization</td>
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Gnats: Are your Users Happy?

Main Page

Create Problem Report: create
Edit Problem Report: edit
View Problem Report: view
Query Problem Reports: query advanced query
Log Out / Change Database: logout
Get Help: help

 Gnatsweb v3.99.3, Gnats v4.0-beta1
Complaints Reporting Form:

Data entry fields marked with * are required.

<table>
<thead>
<tr>
<th>Field</th>
<th>Data Entry</th>
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</thead>
</table>
| Username    | Ldap Login  
|             | abhinav    |
| Password    | Ldap Password  
|             | * * * * * * |
| Field       | May Belong to following field  
|             | bighome    |
| Subject     | Subject of the Report  
|             | Not able to login to bighome |
| Problem Description | Sir,  
|                   | I am not able to log in to bighome to access my files.  
|                   | Please look into this matter.  
|             | Thanks  
|             | Abhinav   |

Report:

G. Sivakumar  
Computer Science Department  
Indian Institute of Technology, Bombay  
Mumbai 400076, India  
siva@iitb.ac.in  
Design and Implementation of Campus Network and Computing Infrastructure
Gnats: Are your Users Happy?

Query Problem Reports

- Category: Idap - LDAP Issues
- Confidential: any
- Responsible: ajit - Ajit K Jena
- State: open
- Submitter-Id: cc - CC Internal, acre - ACRE
- Ignore Closed
- Synopsis Search:
- Multi-line Text Search:
- Originated by You
- Column Display: category, synopsis, confidential, responsible, state
Gnats: Are your Users Happy?

Query Results

52 matches found

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<tr>
<th>Number</th>
<th>Category</th>
<th>Synopsis</th>
<th>Priority</th>
<th>Responsible</th>
<th>State</th>
<th>Class</th>
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<td>var-bug</td>
<td>2004-12-20 16:43:00 IST</td>
<td>Sushmita Pavamanika <a href="mailto:sushmita@iitb.ac.in">sushmita@iitb.ac.in</a></td>
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<tr>
<td>6321</td>
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<td>HELP Needed</td>
<td>medium</td>
<td>admin</td>
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<td>6501</td>
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<td>Regarding my PGMAIL ID</td>
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<td>2004-11-24 17:11:00 IST</td>
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<td>6625</td>
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<td>medium</td>
<td>prank</td>
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<td>2005-01-10 17:45:02 IST</td>
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<td>6675</td>
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<td>2005-02-03 15:05:00 IST</td>
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Educating Users: Mailing Lists

lists.iitb.ac.in Mailing Lists

Welcome!

Below is a listing of all the public mailing lists on lists.iitb.ac.in. Click on a list name to get more information about the list, or to subscribe, unsubscribe, and change the preferences on your subscription. To visit the general information page for an unadvertised list, open a URL similar to this one, but with a ‘/’ and the list name appended.

List administrators, you can visit the list admin overview page to find the management interface for your list.

If you are having trouble using the lists, please contact mailman@iitb.ac.in

<table>
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<th>List</th>
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<tr>
<td>Abaqus-users</td>
<td>ABAQUS user group</td>
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<tr>
<td>Aeromodelling-club</td>
<td>Aeromodelling Enthusiasts</td>
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<td>Ansys-users</td>
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<td>cande</td>
<td>Control and Computing</td>
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<td>Discuss-faculty</td>
<td>Discussion group for faculty and scientists</td>
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<td>Hpc-users</td>
<td>Users of Compaq</td>
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<td>Kernel-list</td>
<td>Discussion about OS Kernels</td>
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<td>Linux-faq</td>
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<td>Mathematica-users</td>
<td>MATHEMATICA user group</td>
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<td>Matlab-users</td>
<td>Interaction forum for MATLAB users</td>
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<td>Phd</td>
<td>Research Scholars’ Electronic Discussion Forum</td>
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<td>Proc-users</td>
<td>PRO-E users group</td>
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<td>Programme’s Club</td>
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<td>Channel for Announcing Seminars/Events</td>
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version 2.1.5
Educating Users: Newsgroups

fastest linux supercomputer
From: Kashyap Paidimarri <kashyapp@cs.ee.iitb.ac.in>
Date: Mon, 31 Jan 2005 18:23:03 +0530
Subject: fastest linux supercomputer

Columbia, installed at NASA's Mountainview Center is the world's second fastest supercomputer and the fastest Linux supercomputer. It has a whopping 12400 Intel Itanium 2 processors, 20 terabytes of RAM and 440 terabytes of RAID storage and has achieved 51.87 teraflops.

Built by SGI as a 20 node cluster of their Altix 3000 systems, this was the fastest until IBM's Blue Gene took over.

And to top it all, it was built in a mind-blowing period of only 120 days!

http://www.top500.org/publist/System_plm027a?side=288
http://www.nasa.nasa.gov/About/Projects/Columbia/Columbia.html
Who will do all this?

Sysad-giri is a thankless job!

Skill sets needed

- Hardware Engineers (PC/Network/Printers ...)
- System Software (OS, mail, database...)
- Programmers (LDAP, web-based services, ...)
- Managers (Making and enforcing policies, User Interaction)
- Purchase (Vendors, ISPs, AMC, Rate Contract, ...)

How many such superwomen are available to you?

If you pay peanuts, you can only hire monkeys!

G. Sivakumar Computer Science Department Indian Institute of Technology, Bombay Mumbai 400076, India siva@iitb.ac.in

Design and Implementation of Campus Network and Computing Infrastructure
Leopards at IIT

MIT vs IIT comparison!

G. Sivakumar  Computer Science Department  Indian Institute of Technology, Bombay  Mumbai  400076, India  siva@iitb.ac.in

Design and Implementation of Campus Network and Computing Infrastructure
CCTeam@IITB

We Serve your Bytes

CC Team

IIT Campus

Design and Implementation of Campus Network and Computing Infrastructure