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IIT Bombay's Network: Role of GNU/Linux

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Outline of Talk

- IIT Bombay's Network Infrastructure
- Setup of Critical Services
- Complexity of Network, Services and User Management
- Key Role of **Swatantra** software

Swatantra Software



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MRTG MULTI ROUTER TRAFFIC GRAPHER
Tobias Oetiker <oetiker@ee.ethz.ch> and Dave Rand <slir@bungie.com>





Structure of Talk

- **Campus Network Infrastructure**
 - Academic Area
 - Hostels
 - Residential
 - **Hardware and Network** (the **easy** part!)
 - * Gigabit L3 switches
 - * 10 Mbps Internet (4 Links)
 - * 5000+ nodes
- **Applications and Security** (**Complex** enough)
 - Mail
 - Web Browsing/Hosting
- **Users and Management** (**Nightmare** begins)
 - **Mis**Use (mp3, movie, porn, hacking, fake mails, ...)
 - **CC**Team
 - * **We** carry your Bytes
 - * Our T-shirt (cows, dogs, leopards!)
 - * More about this at the end.

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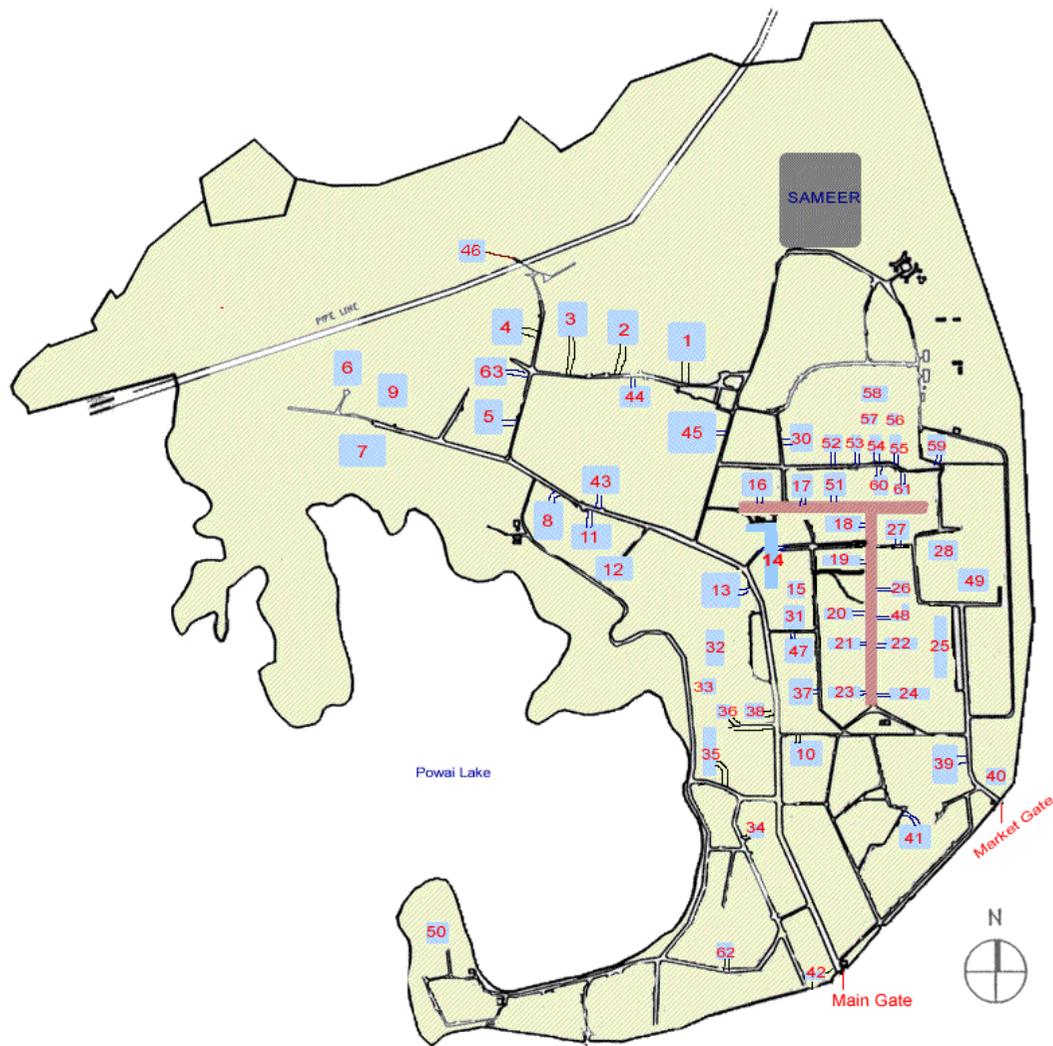
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- | | | | | |
|-------------------|-----------------------------|----------------------------|-------------------------|-------------------------|
| 1. HOS TEL NO - 1 | 14. MAIN BUILDING | 27. IDC | 40. POST OFFICE | 53. HYDRAULICS LAB |
| 2. HOS TEL NO - 2 | 15. LECTURE THEATRE | 28. STORES & ESTATE OFFICE | 41. CAMPUS SCHOOL | 54. HEAVY STRUCTURE LAB |
| 3. HOS TEL NO - 3 | 16. CENTRAL LIBRARY | 29. SHORT CIRCUIT LAB | 42. STATE BANK | 55. HEAT TRANSFER |
| 4. HOS TEL NO - 4 | 17. MATHEMATICS | 30. RSIC | 43. STUDENTS GYM KHANA | 56. STEAM POWER LAB |
| 5. HOS TEL NO - 5 | 18. MECHANICAL ENGG. | 31. S.O.M. & I.R.C.C. | 44. NCC OFFICE | 57. CENTRIFUGAL LAB |
| 6. HOS TEL NO - 6 | 19. CIVIL ENGG. | 32. HOSPITAL | 45. SAC / SWIMMING POOL | 58. VIHAR HOUSE |
| 7. HOS TEL NO - 7 | 20. ELECTRICAL ENGG. | 33. STAFF CLUB | 46. SEWAGE PLANT | 59. POWER HOUSE |
| 8. HOS TEL NO - 8 | 21. METALLURGICAL ENGG. | 34. DIRECTOR'S BUNGLOW | 47. COMPUTER CENTRE | 60. I.C. ENGINE LAB |
| 9. HOS TEL NO - 9 | 22. HUMANITIES & SOCIAL SCI | 35. GUESTHOUSE | 48. EARTH SCIENCE | 61. SOLAR LAB |



Physical View of LAN

Academic Area- A is CSE, B is CC, C is Aero

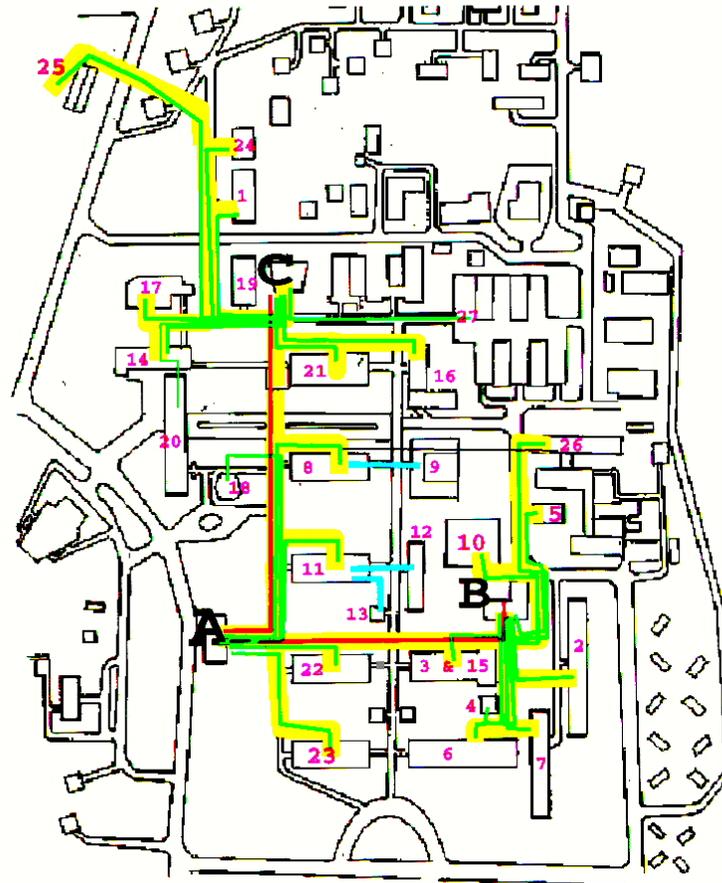


Figure 4

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Fibre Rack at CC



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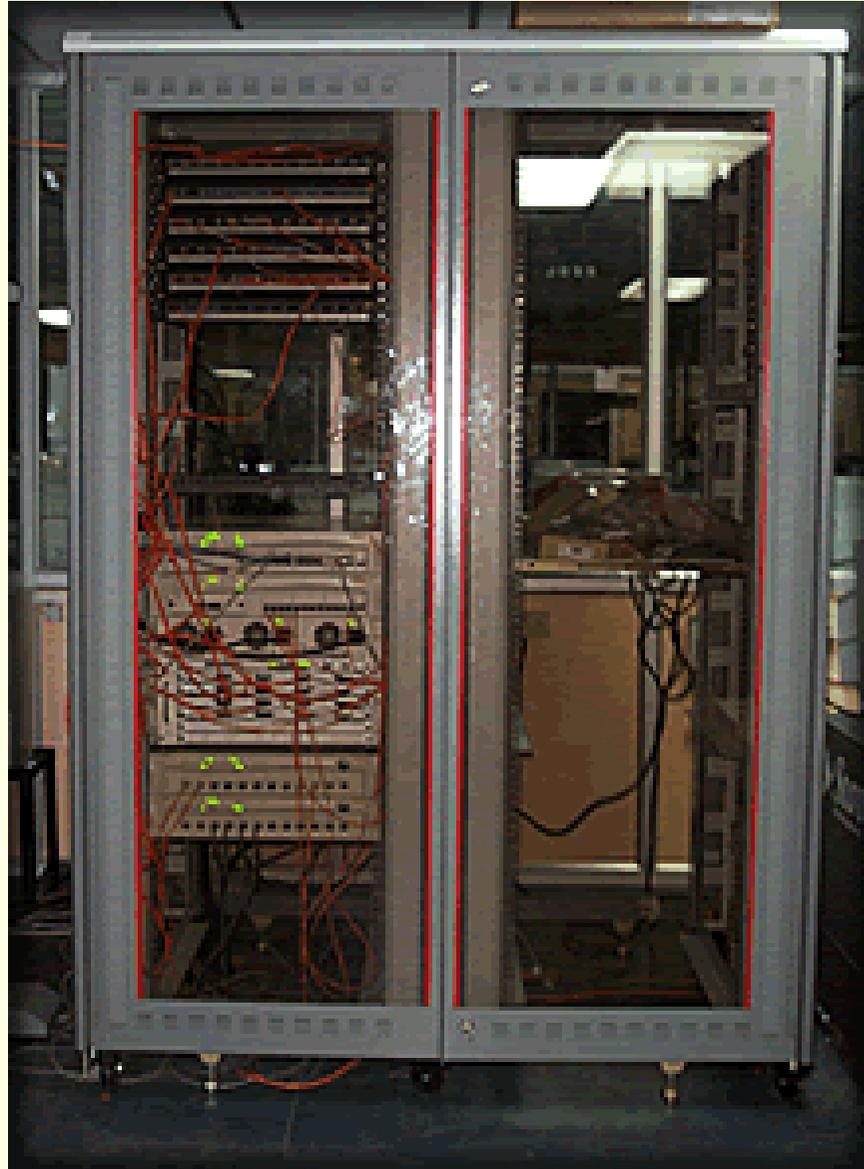
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Logical View of LAN

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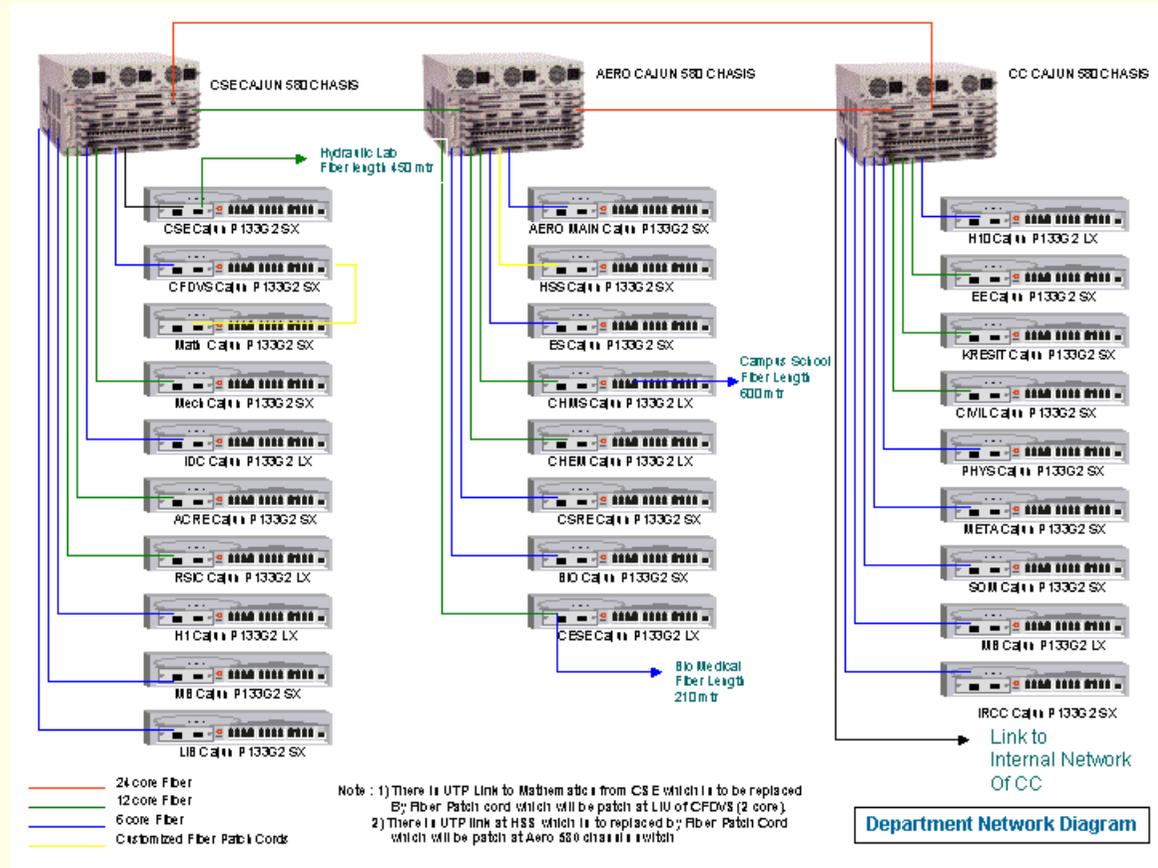
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IIT-B's WAN Links

10 Mbps total (increasing to 12 soon) **Asymmetric** requirements/usage!

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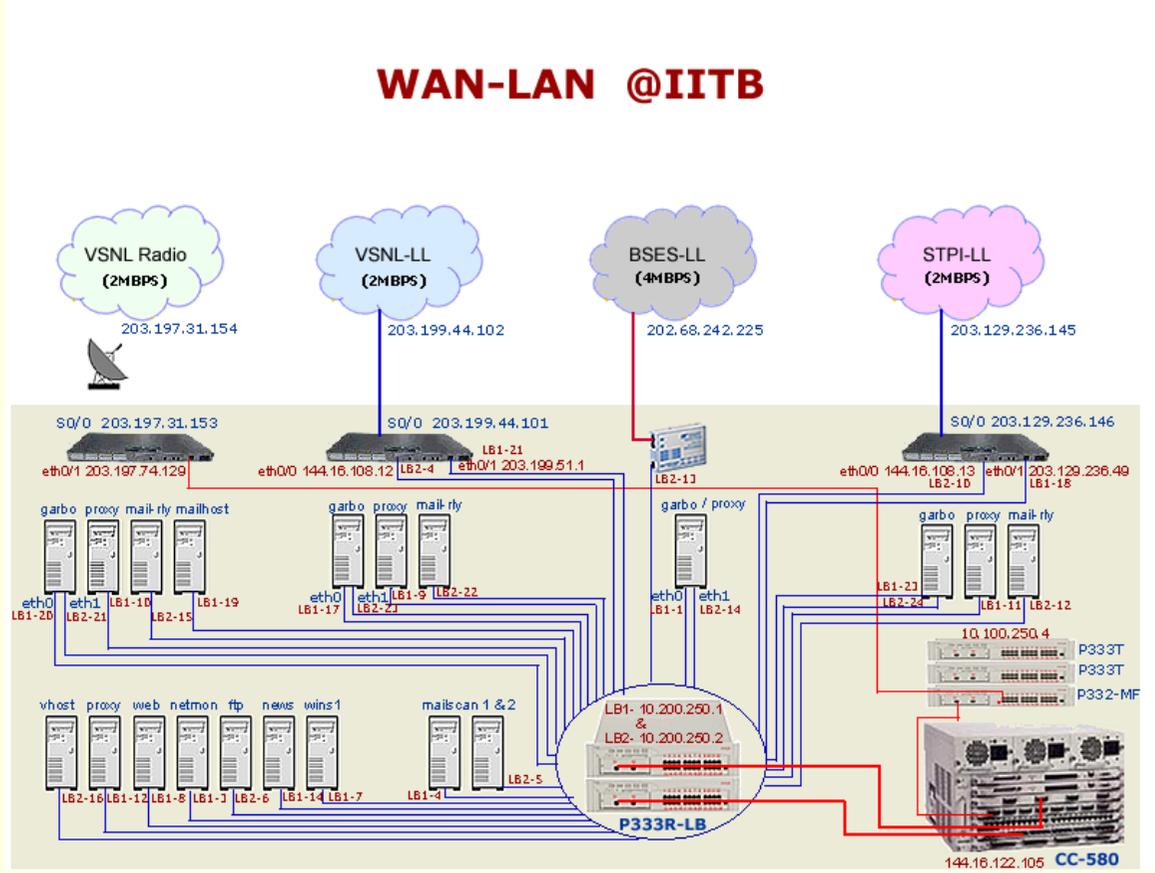
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Critical Network Services



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- Firewall (Security **sine qua non**)
- Domain Name Service (DNS) <http://cr.yip.to/djbdns/>

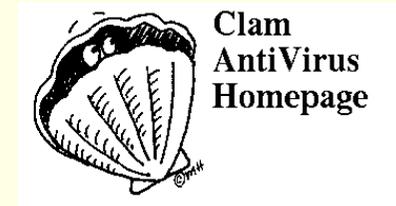
www.netfilter.org and www.iptables.org

Free firewall software distributed under [GNU General Public License](http://www.gnu.org/licenses/gpl.html)

- Directory Services (LDAP)



- Virus Scanning clamav.elektropro.com



- E-mail (www.qmail.org)



- Newsgroups (**inn**)

www.squid-cache.org
Squid Web Proxy Cache



- Web Proxy
- WWW Servers (<http://httpd.apache.org>)

Network Servers Rack

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



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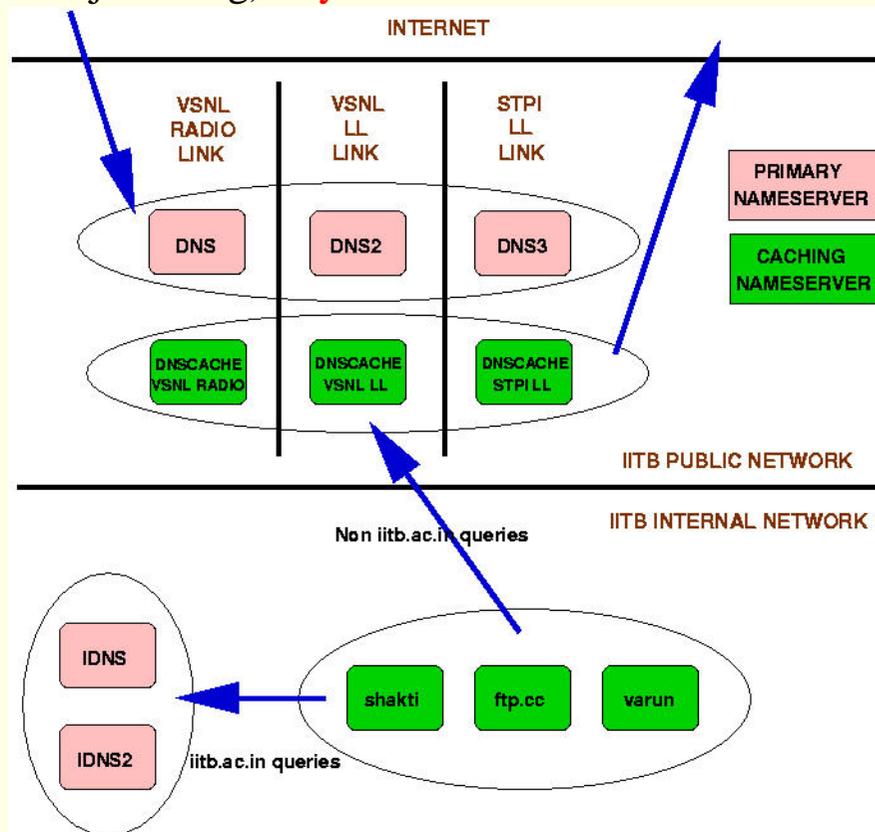
Firewall

- 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](http://www.iptables.org) (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**



Why internal and external? (Hint: **MX records**, **Reverse proxy** for WWW servers)

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What is LDAP

- 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!

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IIT LDAP Structure



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Navigation buttons: back, forward

Navigation buttons: left, right

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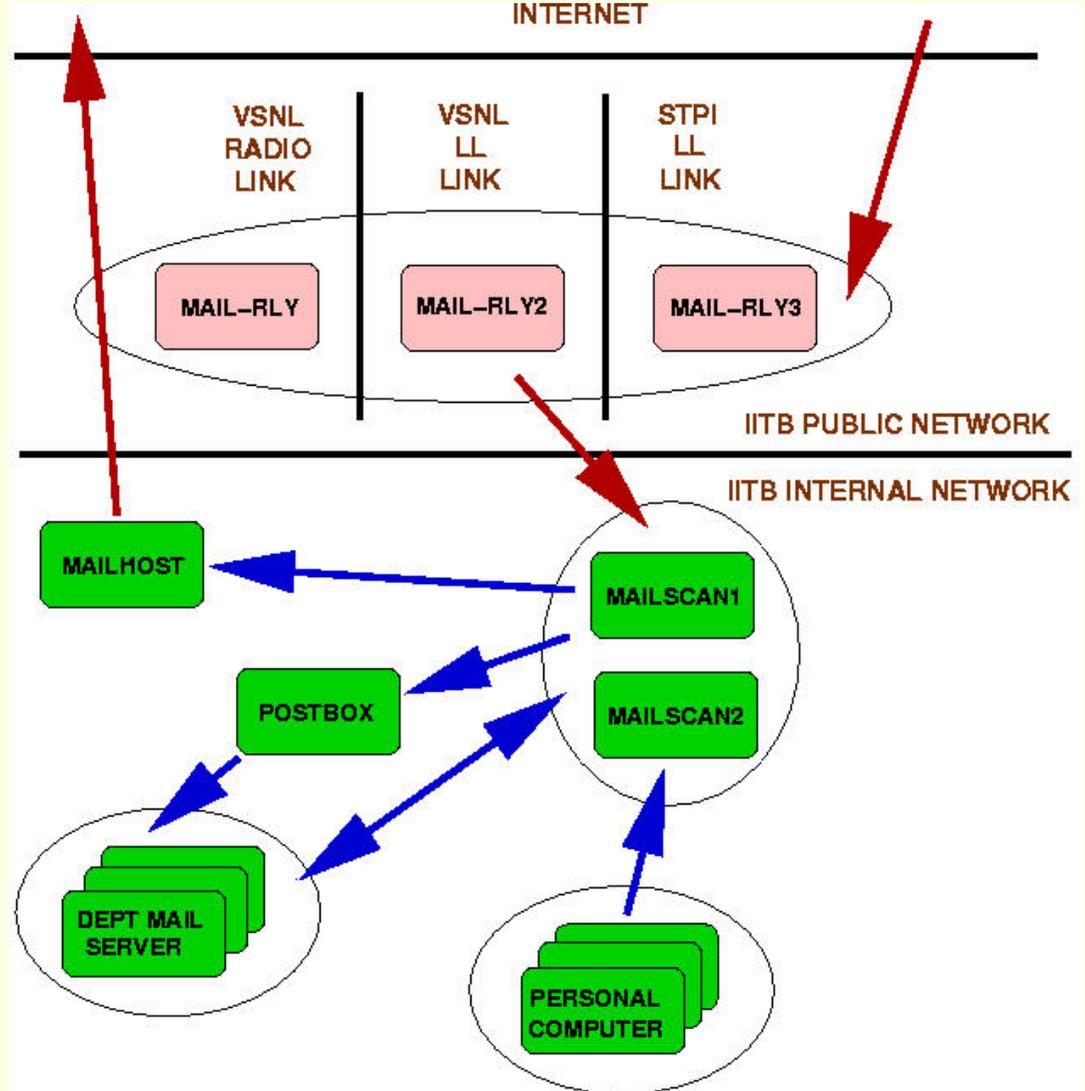
The screenshot shows an LDAP browser interface with a tree view on the left and a details pane on the right. The tree view shows the hierarchy: localhost > nmonldap > iit > dc=iitb,dc=ac,dc=in > ou=People > ou=CC > uid=ambrish. The details pane shows the following attributes and values:

dn	uid=ambrish,ou=STF,ou=CC,ou=People
objectClass	person organizationalPerson inetOrgPerson account posixAccount shadowAccount sambaAccount top solarisuserattr
sn	Kumar
cn	Ambrish Kumar
description	
seeAlso	
telephoneNumber	
userPassword	<input type="text"/> Clear
destinationIndicator	
facsimileTelephoneNumber	
internationalISDNNumber	
l	
ou	
physicalDeliveryOfficeName	
postOfficeBox	
postalAddress	
postalCode	
preferredDeliveryMethod	
registeredAddress	

Entire CCTeam shown above!



E-mail Service



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Sample 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!

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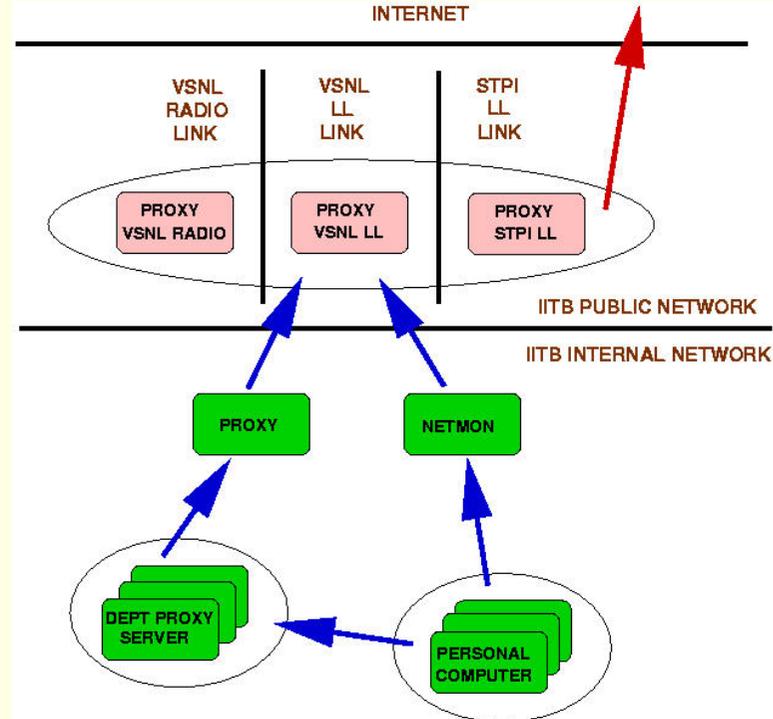
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Web Browsing



- **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!

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Web Browsing Issues

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

Welcome to squidGuard

An ultrafast and free filter, redirector and access controller for Squid
By [Pål Baltzersen](#) and [Lars Erik Håland](#)
Copyright © 1999-2000, [Tele Danmark InterNordia](#)
Visitors: 298433 (Since 2002-01-08 19:54:05 MET)



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



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Network, Services and User Management

Eternal vigilance is the price of liberty!

- How is network doing?



SMOKE PING



MRTG MULTI ROUTER TRAFFIC GRAPHER
Tobias Oetiker <oetiker@ee.ethz.ch> and Dave Rand <dlr@bunzl.com>



Nagios[®]

Copyright © 1999-2002 Ethan Galstad
nagios@nagios.org

- Are all services up?
- How much email in/out? How many viruses?
- Who's using Web proxy? For what?



The Webalizer
What is your web server doing today?

- Are User's happy? www.gnu.org/software/gnats

MRTG

IITB WAN Links



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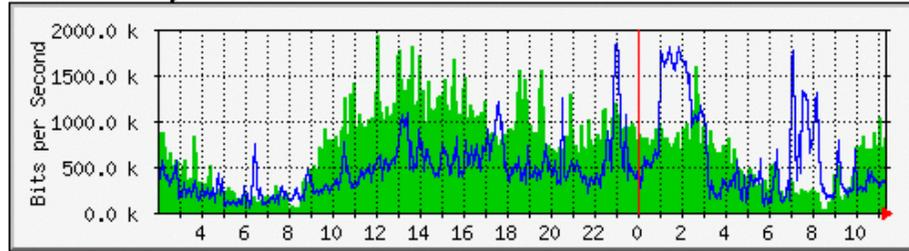
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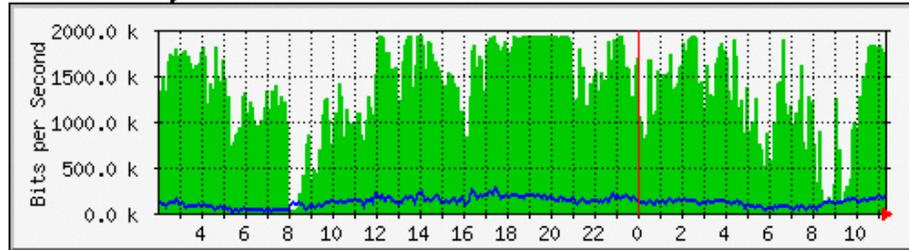
Close

Quit

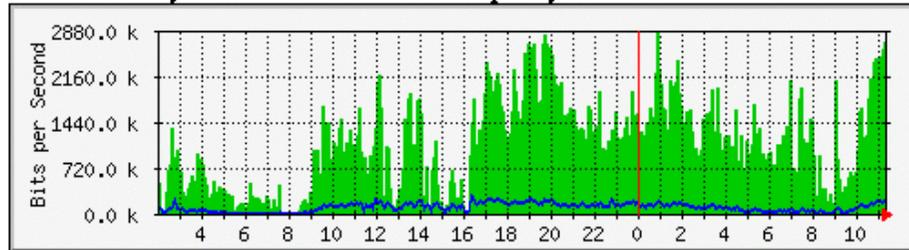
Traffic Analysis for 203.197.31.153 -- router-vsnl-radio.iitb.ac.in



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.

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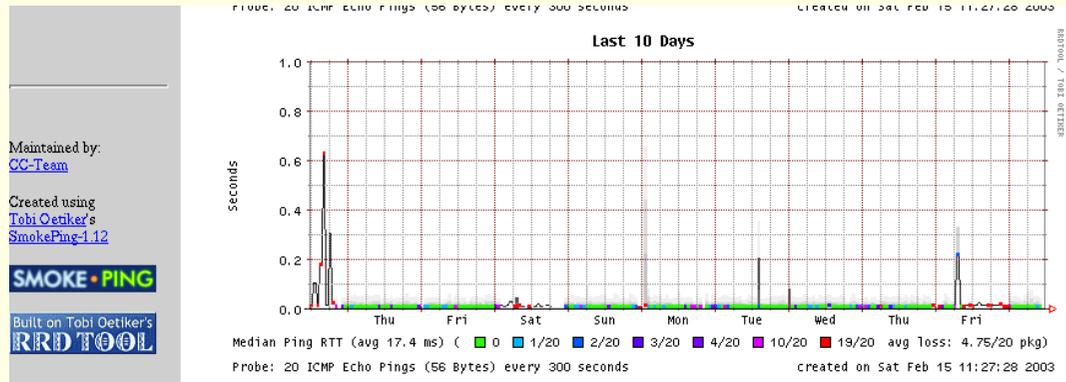
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Nagios

Nagios®

General

- Home
- Documentation

Monitoring

- Tactical Overview
- Service Detail
- Host Detail
- **Status Overview**
- Status Summary
- Status Grid
- Status Map
- 3-D Status Map
- Service Problems
- Host Problems
- Network Outages
- Comments
- Downtime
- Process Info
- Performance Info
- Scheduling Queue

Reporting

- Trends
- Availability
- Alert Histogram
- Alert History
- Alert Summary
- Notifications
- Event Log

Configuration

- View Config

Current Network Status

Last Updated: Sat Feb 15 11:34:19 IST 2003
 Updated every 90 seconds
 Nagios® - www.nagios.org
 Logged in as guest

- [View Service Status Detail For All Host Groups](#)
- [View Host Status Detail For All Host Groups](#)
- [View Status Summary For All Host Groups](#)
- [View Status Grid For All Host Groups](#)

[AVAYA switches \(backbone-switches\)](#)

Host	Status	Services	Actions
aero-580	UP	1 OK	 
cc-580	UP	1 OK	 
cse-580	UP	1 OK	 
dmz-lb	UP	1 OK	 
h3-580	UP	1 OK	 
h8-580	UP	1 OK	 
wan-lb	UP	1 OK	 

[DNS Servers \(dns-servers\)](#)

Host	Status	Services	Actions
dns	UP	3 OK	 
dns2	UP	3 OK	 
idns1	UP	3 OK	 
idns2	UP	3 OK	 



Nagios (ctd.)

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Status Summary For All Host Groups

Host Group	Host Status Totals	Service Status Totals
AVAYA switches (backbone-switches)	7 UP	7 OK
Cisco Routers (cisco-routers)	3 UP	3 OK
Department Caching DNS servers (dept-dns-servers)	2 UP	6 OK
DNS Servers (dns-servers)	4 UP	12 OK
DNSCACHE Servers (dnscache-servers)	5 UP	5 OK
FTP servers (ftp-servers)	1 UP	3 OK
NAT boxes (garbo-servers)	4 UP	8 OK
LDAP servers (ldap-servers)	2 UP	4 OK
Mail servers (mail-servers)	9 UP	25 OK
met.iitb.ac.in servers (met-servers)	2 UP	10 OK
News servers (news-servers)	2 UP	5 OK
Proxy servers (proxy-servers)	5 UP	10 OK
RESNET Embedded Servers (resnet-pico-servers)	40 UP	40 OK
RESNET Web Servers (resnet-web-servers)	9 UP	14 OK 2 CRITICAL
Web servers (web-servers)	2 UP	6 OK
WINS servers (wins-servers)	1 UP	1 OK



Virus Detection

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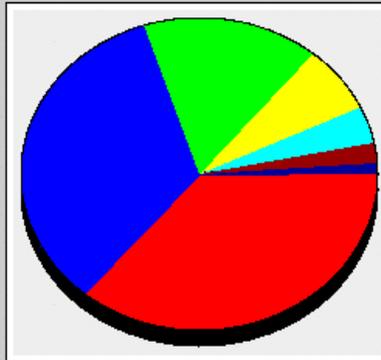
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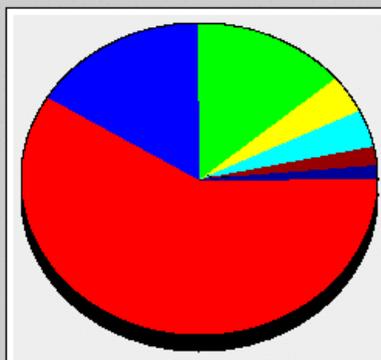
Jan 2003	0.00 →	0 →	0 →	0 →
Feb 2003	2.00 ↗	7 ↗	11 ↗	56 ↗

Viruses



36%	Worm/Klez.H
34%	Exploit.IFrame.HTML
16%	W32/Ninda.html
7%	VBS.Red1of.Encoded
4%	Worm.Sobig.A
2%	Lirva-B
2%	W97/Marker

Sources



59%	
16%	India
14%	Commercial
4%	
4%	Unknown
2%	
2%	

Mail Usage Statistics



Email Logs for January 2003

	Incoming		Outgoing		
Date	Count (K)	Size (MB)	Count (K)	Size (MB)	Top 25
1	34	534	17	451	Top 25
2	33	548	12	381	Top 25
3	33	522	11	373	Top 25
4	27	373	8	259	Top 25
5	21	255	6	154	Top 25
6	33	463	13	345	Top 25
7	36	495	14	375	Top 25
8	-	-	-	-	-
9	79	1140	24	800	Top 25
10	38	672	12	463	Top 25
11	28	376	6	273	Top 25
12	23	257	5	198	Top 25
13	39	813	25	429	Top 25
14	41	615	12	318	Top 25
15	38	743	12	419	Top 25
16	39	518	12	254	Top 25
17	38	516	12	372	Top 25
18	31	394	9	254	Top 25
19	24	314	8	281	Top 25
20	31	453	13	576	Top 25
21	39	673	23	450	Top 25
22	40	560	12	425	Top 25
23	40	612	13	345	Top 25
24	-	-	-	-	-

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Mail Usage Statistics

Email Logs for January 23, 2003

No	Incoming Top 25 by Count			Incoming Top 25 by Size		
	Count	Size	Email	Count	Size	Email
1	162	6757771	upadhyay@me	12	14932933	hvs@it
2	147	1104446	bhati@cse	32	13523092	krithi@cse
3	137	1079126	n9311012@ccs	4	10061910	amitgangrade@iitb
4	125	673293	ranoo@ee	18	6854607	sudarsha@cse
5	125	1051961	n8002025@ccs	11	6434209	kulkarni@admin
6	121	894408	agarg@me	8	6415804	aknur@admin
7	121	1144970	kadam7ue@ccs	3	6390252	jadhav@admin
8	117	935533	rajeev@me	6	5968048	gaur@som
9	114	902965	sach7ue@ccs	12	5546487	sudarsha@cse
10	110	782916	jaywant@cse	16	4986539	vikram@met
11	109	822038	pyush7dl@ccs	10	4448193	subodh@che
12	106	781754	mtpbr8pc@ccs	1	4391040	gazala@cc
13	106	772337	ac_pradhan@idc	1	4391040	bmanu8888@iitb
14	104	1489737	gracias@cse	11	4249557	kapil@me
15	99	723276	n9512009@ccs	2	4054800	ashpuri@cse
16	98	771955	n8d02010@ccs	1	3725463	felix0us@iitb
17	98	765575	n8004021@ccs	3	3706312	harshad@it
18	97	687013	puneets@me	1	3606614	shubha@cese
19	95	394031	shivaji@ee	5	3100016	sri@ee
20	95	1260585	lakshmi@cse	7	3058951	sudhakar@aero
21	94	577376	ganeshk@ee	12	3030999	dbp@it
22	93	660940	bhure@me	2	2925456	z2004014@online
23	93	576049	m1sayyad@civil	9	2774134	mvmhalgi@che
24	93	575850	muralikrishna@iitb	2	2765009	ss@iitb
25	93	574543	prasad@iitb	12	2658090	raven@ee



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Top 10 of 2768 Total Sites By KBytes

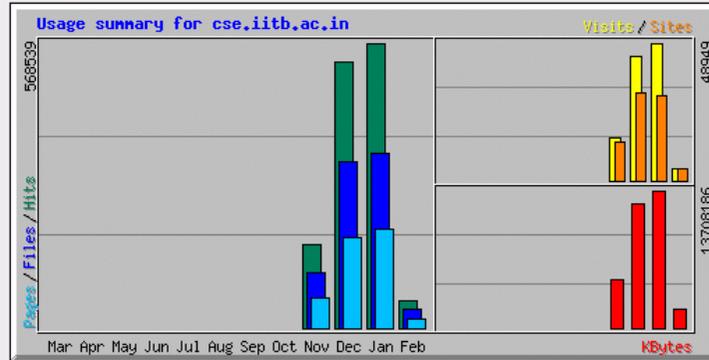
#	Hits		Files		KBytes		Visits		Hostname
1	2300204	3.92%	1954967	7.61%	9000096	2.82%	35	0.03%	sunfire.cc.iitb.ac.in
2	49016	0.08%	20596	0.08%	5061216	1.58%	84	0.07%	10.4.1.39
3	54506	0.09%	24700	0.10%	4870457	1.52%	70	0.06%	10.9.3.91
4	1487290	2.54%	12092	0.05%	2680488	0.84%	108	0.09%	10.9.3.83
5	18507	0.03%	12992	0.05%	2483632	0.78%	82	0.07%	brainpower.it.iitb.ac.in
6	49110	0.08%	34427	0.13%	2446135	0.77%	50	0.04%	10.1.1.69
7	1322118	2.26%	11960	0.05%	2421988	0.76%	95	0.08%	10.2.1.91
8	23451	0.04%	11526	0.04%	2229159	0.70%	68	0.06%	mastersgrace.it.iitb.ac.in
9	32531	0.06%	18997	0.07%	2184972	0.68%	122	0.10%	10.7.26.61
10	24981	0.04%	12278	0.05%	2173792	0.68%	108	0.09%	10.2.2.50

Top 50 of 3498 Total Usernames

#	Hits		Files		KBytes		Visits		Username
1	130008	0.22%	129338	0.50%	451413	0.14%	35	0.03%	mecmca
2	107859	0.18%	65692	0.26%	241420	0.08%	62	0.05%	bhupelpp
3	106038	0.18%	43537	0.17%	362243	0.11%	83	0.07%	atish0um
4	95258	0.16%	44446	0.17%	342904	0.11%	98	0.08%	n9010017
5	82716	0.14%	49001	0.19%	513423	0.16%	131	0.11%	deepak_singh
6	78798	0.13%	55019	0.21%	319437	0.10%	77	0.07%	loverofmaths
7	73376	0.13%	31503	0.12%	402674	0.13%	86	0.07%	mittaln
8	71457	0.12%	52494	0.20%	596424	0.19%	114	0.10%	gagankaul
9	70301	0.12%	59964	0.23%	268065	0.08%	85	0.07%	kvaroon
10	69004	0.12%	23446	0.09%	205399	0.06%	80	0.07%	kdkariya
11	67278	0.11%	39453	0.15%	519232	0.16%	127	0.11%	kartikgupta
12	65738	0.11%	43658	0.17%	885925	0.28%	86	0.07%	san_munde



Web Server Hits



Summary by Month										
Month	Daily Avg				Monthly Totals					
	Hits	Files	Pages	Visits	Sites	KBytes	Visits	Pages	Files	Hits
Feb 2003	13853	9488	4889	1111	4136	1847693	4445	19556	37952	55413
Jan 2003	18339	11260	6374	1579	30388	13708186	48949	197621	349072	568539
Dec 2002	17121	10661	5811	1418	31184	12374276	43966	180158	330495	530769
Nov 2002	16729	10952	5952	1539	13922	4867510	15391	59521	109526	167296
Totals						32797665	112751	456856	827045	1322017

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Web Server Hits



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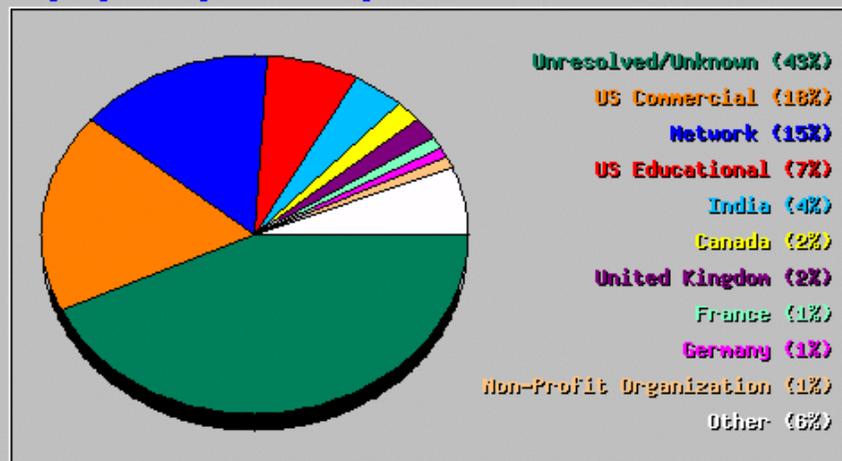
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Usage by Country for February 2003



Top 30 of 74 Total Countries

#	Hits		Files		KBytes		Country
1	23929	43.18%	16099	42.42%	758414	41.05%	Unresolved/Unknown
2	10171	18.35%	6022	15.87%	343139	18.57%	US Commercial
3	8194	14.79%	6071	16.00%	252256	13.65%	Network
4	3951	7.13%	3038	8.00%	84918	4.60%	US Educational
5	2434	4.39%	1689	4.45%	98633	5.34%	India
6	848	1.53%	661	1.74%	48709	2.64%	Canada
7	845	1.52%	735	1.94%	23325	1.26%	United Kingdom
8	588	1.06%	474	1.25%	11324	0.61%	France
9	421	0.76%	340	0.90%	18535	1.00%	Germany
10	372	0.67%	288	0.76%	44921	2.43%	Non-Profit Organization
11	271	0.49%	154	0.41%	26841	1.45%	Netherlands
12	226	0.41%	161	0.42%	4710	0.25%	Italy
13	218	0.39%	187	0.49%	3513	0.19%	Mexico
14	192	0.35%	22	0.06%	29897	1.62%	China
15	189	0.34%	149	0.39%	2534	0.14%	Japan



Gnats: Are your Users Happy?

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default User: siva. Access: edit

MAIN PAGE CREATE QUERY ADV. QUERY LOG OUT HELP

Main Page

Create Problem Report:

Edit Problem Report: #

View Problem Report: #

Query Problem Reports:

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Chats: Are your Users Happy?

default User: siva Access: edit

MAIN PAGE CREATE QUERY ADV. QUERY LOG OUT HELP

Query Problem Reports

submit query

Category: ldap - LDAP Issues

Confidential: any

Responsible: ajit - Ajit K Jena

State: open

Submitter-Id: any
cc - CC Internal
acre - ACRE

Ignore Closed

Synopsis Search:

Multi-line Text Search:

Originated by You

Column Display: category
synopsis
confidential
responsible
state

Display Current Date

submit query



Gnats: Are your Users Happy?

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Query Results

5 matches found

(Query executed Sat Feb 15 11:16:55 2003)

Number	Category	Synopsis	Cont
1242 edit	pending	Faculty-notices@iitb.ac.in mailing list reminder (fwd)	no
1333 edit	pending	Improper display of disk usage on bighome..	no
1367 edit	pending	Https via the netmon proxy in Netscape	no
1369 edit	pending	not able to log in	no
1370 edit	pending	Net Problem	no

[View for bookmarking](#)

Remember this query as:

Gnats: Are your Users Happy?



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MAIN PAGE CREATE QUERY ADV. QUERY LOG OUT HELP

Edit Problem Report: 1369

submit edit or reset or [send email to interested parties](#)

Reporter's email:

CC these people on PR status email:

Category: What area does this PR fall into?

Synopsis: One-line summary of the PR

Confidential: Yes/no flag indicating if the PR contents are confidential

Responsible: The user responsible for the PR

Reason Changed:

State: The current state of the PR

Reason Changed:



Leopards at IIT

MIT vs IIT comparison!

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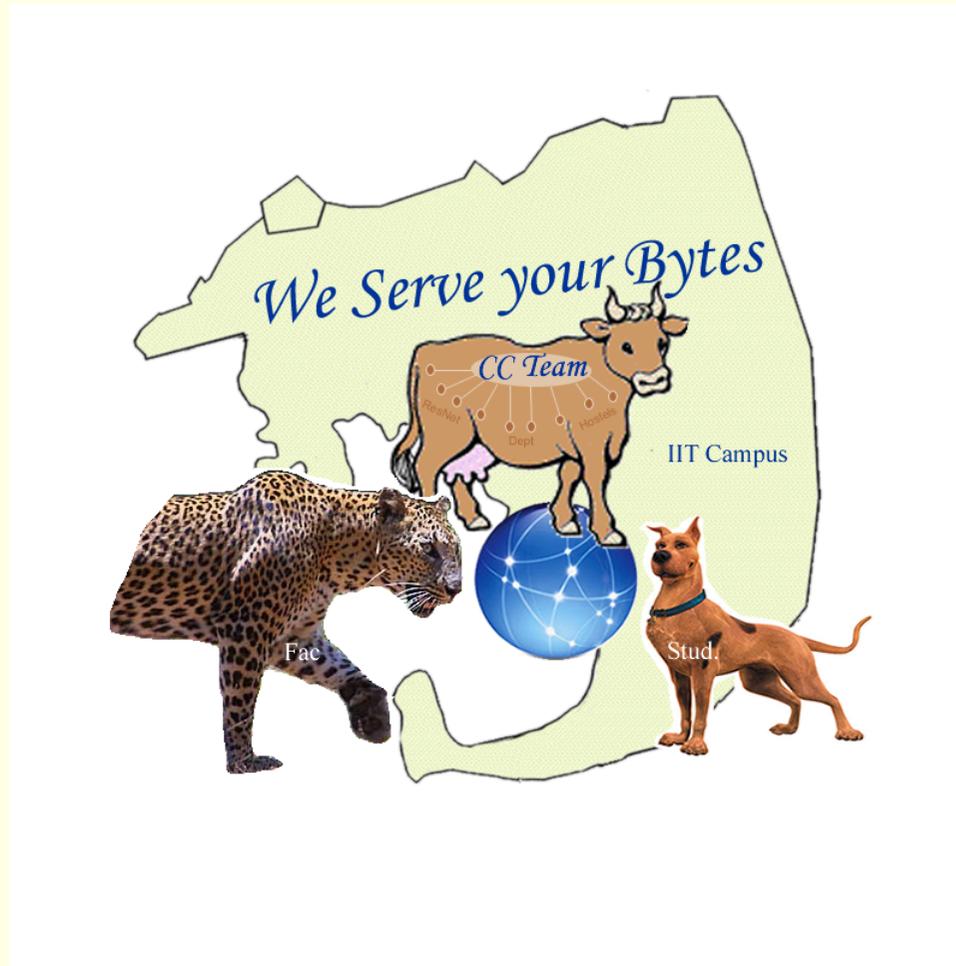
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Is IIT-B only a consumer?

Primarily a **consumer** of **swatantra** software so far. But, the tide is turning...

- **Varta**

- Authenticated access to IITB newsgroups for our alumni!
- A very valuable source of input (Chirag Kantharia)
- Sophisticated HTTP to NNTP gateway

- **Secure Online Polls/Surveys**

- UGs can vote on next Film Society movie.
- 3rd year Btechs can rank Institute Electives
- Hostel 5 students can decide on picnic venue

- **Streaming Audio/Video**

- Based on ffmpeg and Palnatir and mplayer.
- World Cup better incentive than my lectures!

- **MTech Projects**

- HyperSuit (Document Object Model)
- Arrowsmith (Network Discovery and Performance Measurement)

Thanks much! **Questions?**

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