

“GARUDA” Grid Communication Fabric [TF-1]

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Agenda

- Objective and Scope
- Tasks Completed
 - Characteristics of Communication Fabric
 - Technicalities
 - SLA
- Tasks In-Hand
 - GMMC
 - Comm-Fab set-up
 - Research
- Tasks AHEAD
 - Research and Development
 - Network Operations
 - Constraints
- Summary



GARUDA Communication Fabric

- To set-up a national grid computing infrastructure interconnecting various research and academic institutions across the country through a high-speed communication fabric
- Communication Fabric Task force was formed including members from C-DAC and ERNET



Characteristics

- Ethernet based High Bandwidth capacity
- Scalable over entire geographic area
- High levels of reliability
- QoS
- Effective Network Security & Network Management

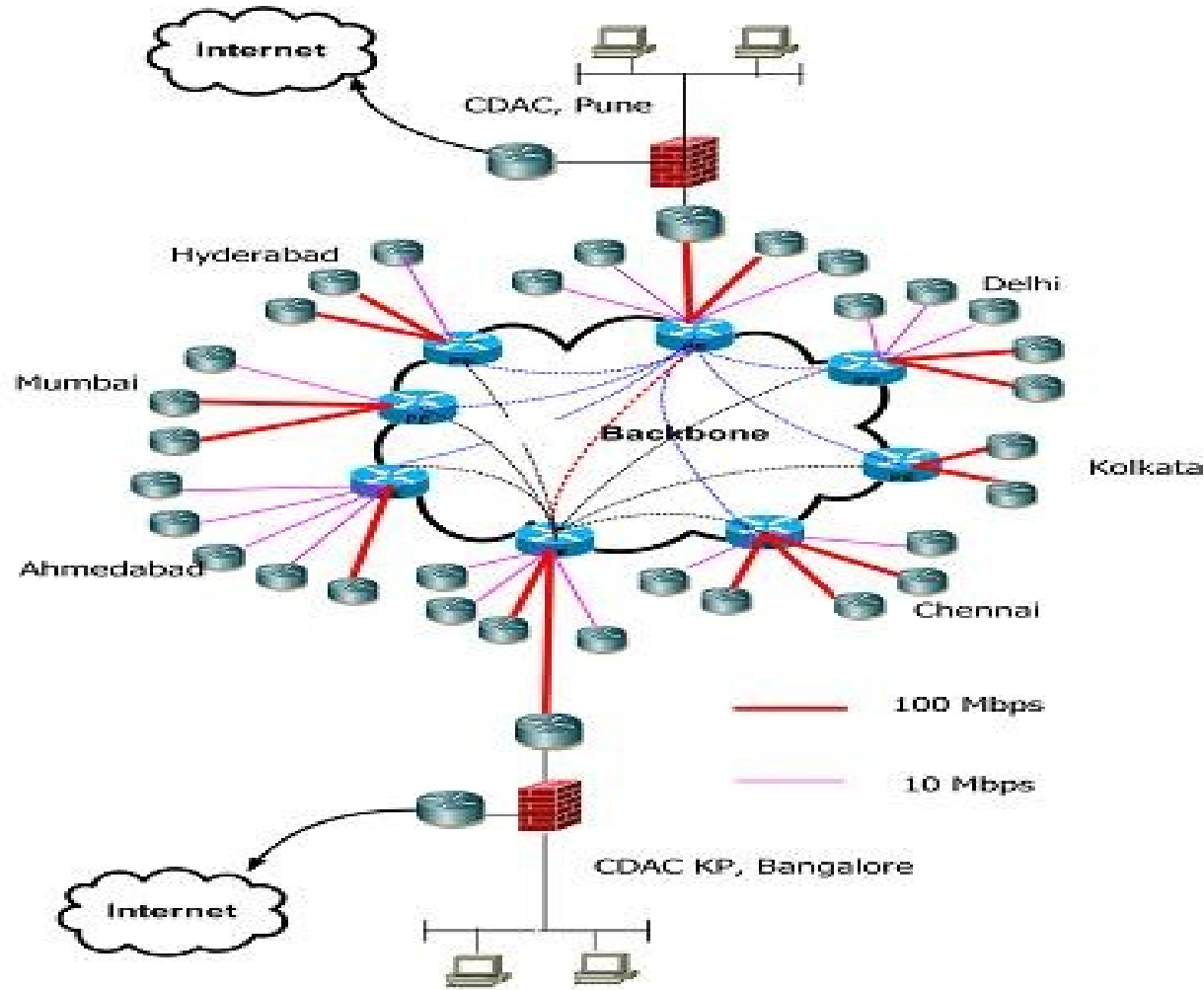


Connectivity Details

- Each location in a city will connect through Ethernet over Fiber to the Provider Edge(PE) router in the Service provider POP.
- Will be connected to layer 3 MPLS VPN from Service Provider's POP
- The access link for each location will be on a redundant/ring fiber link
- L2 VPN at 100 Mbps Connectivity between C-DAC, Pune and C-DAC, KP, Bangalore



GARUDA: A Grid Computing Initiative (Module 1 Cities)



Firewall



Layer-3 MPLS Tunnels



Layer-2 MPLS Tunnel



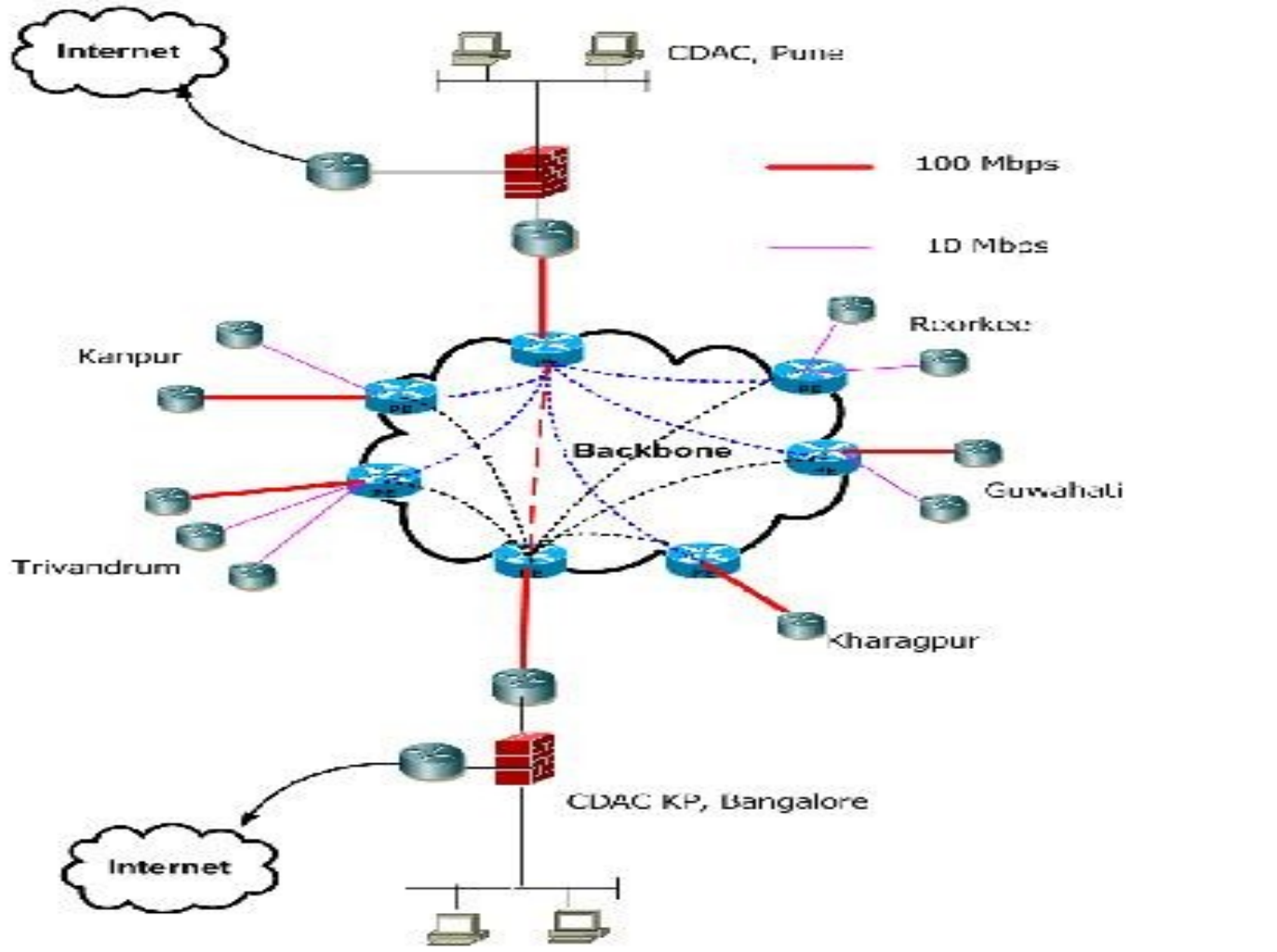
CPE Router



Provider Edge (PE) Router

Backbone: 2.43Gbps

GARUDA: A Grid Computing Initiative (Module 2 Cities)

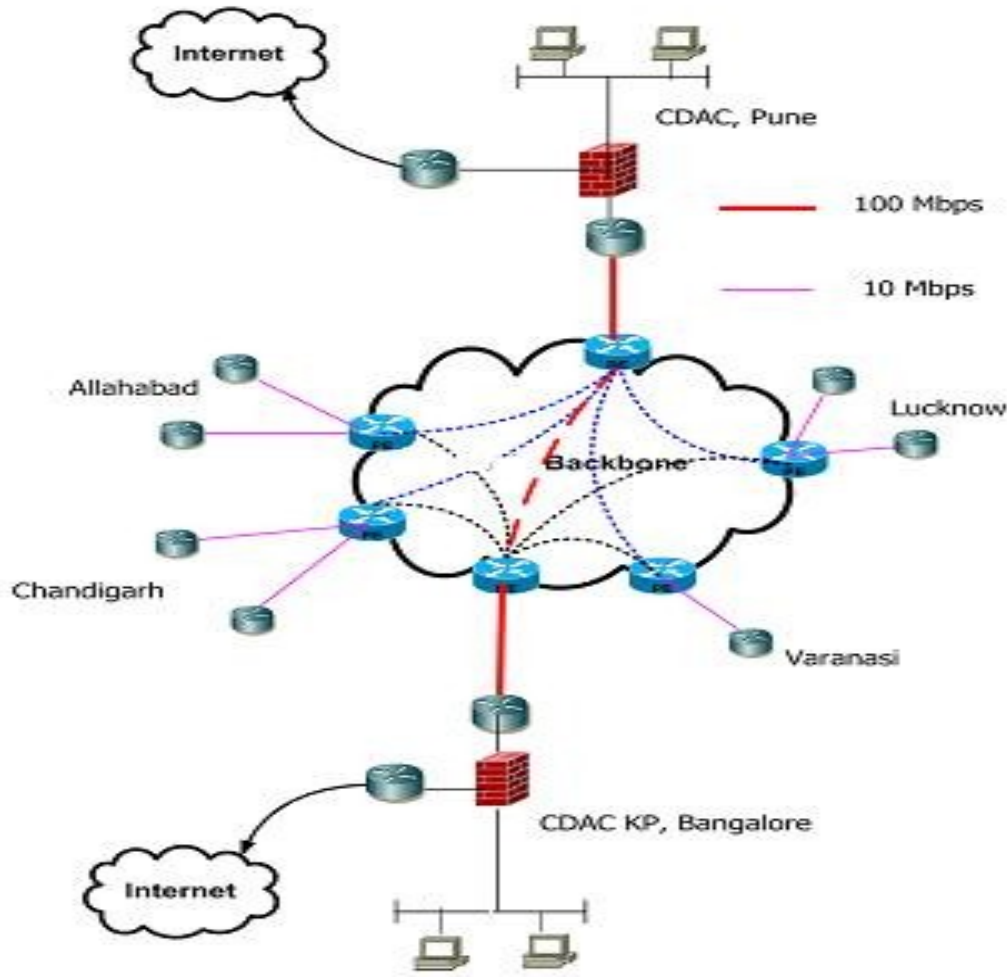


— 100 Mbps
— 10 Mbps



Backbone: 2.43Gbps

GARUDA: A Grid Computing Initiative (Module 3 Cities)



Firewall



Layer-3 MPLS Tunnels



Layer-2 MPLS Tunnel



Tunnel



CPE Router



CPE Router



Provider Edge (PE) Router

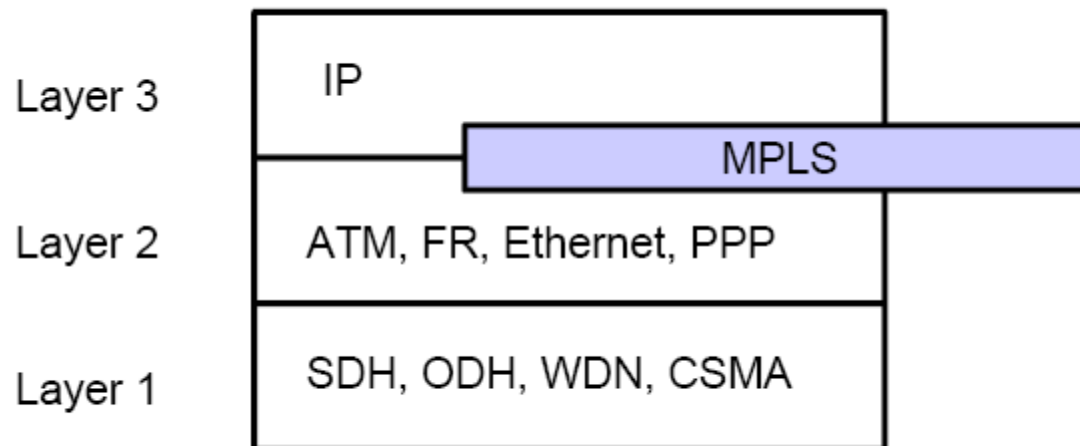


Provider Edge (PE) Router

Backbone: 2.43Gbps

MPLS

- Specified by IETF
- Multi Protocol Label Switching is arranged between Layer 2 and Layer 3



MPLS Details

- In MPLS, data transmission occurs on label-switched paths (LSPs)
- Forward Equivalence classes (FEC) is a group of IP packets taking same path with same treatment
- QoS and TE

MPLS Domain



MPLS Domain

Research Opportunity

- Is an Infrastructure for varied application domains
- Platform for experimenting network technology and protocol research
- Implements standard technologies and upcoming protocols
- Envisaged simulation experimentations using tools like OPNET, NS, Qualnet etc.,

Service Level Agreement

- Operation of Network - 24x7x365 basis
- Latency – 80 ms (CPE – CPE)
- MTTR link failures – less than 3 hours
- Packet loss – less than 0.1 %
- Each Circuit Uptime % on Monthly basis - 99.5%
- Link fail over – within 50 ms
- Average Maintenance outage – 1 hour with prior notice

Tasks In-Hand

Current Activities

- GMMC
- Security
 - Define policies and procedures (AUP)
 - Perimeter security
 - Middleware & Application security
 - Encryption of traffic
- Network Management
 - Real time monitoring and offline analysis
 - Policies and procedures for configuration changes like Provisions for bandwidth variance, queuing, protocols, routing etc,
 - Usage of effective network management solutions
 - Effective recovery mechanisms



Discussion with Provider

- After PO discuss and conclude
 - Network architecture
 - IP addressing scheme
 - Policies for trouble shooting and problem escalation
 - Regular reporting and validation
 - Define QoS
 - Network traffic analysis

Research Activities being carried out

- Participation in Planet-Lab
 - an initiative from Princeton University, is a network test bed scaled at internet level
 - carry out various research experiments related to Grid Computing, Peer-to-Peer information systems
 - advantage of planet lab networking test bed is, applications can be deployed and tested
 - C-DAC participation and experiments
- Experiments using Mobile agents
 - Network management using mobile agents

Tasks AHEAD

Activities foreseen

- Research and Development
 - GMMC
 - SLA ratification mechanisms and probes
 - Simulation activities
 - Network traffic analysis (protocol, application, trend analysis, statistical analysis)
 - Set-up Gigabit network test-bed and experimentation and protocol engineering
- Network Operation
 - GMMC
 - Trouble shooting, configuration control and event handling
 - GARUDA CERT
- Constraints
 - Man-power, Time-line and budget

Summary

- Gain experience towards conceptualize, design, set-up, operate and manage HPN
- Towards automatic bandwidth allocation
- Understand traffic patterns and application drivers
- Grid research user community
- Simulation results and live experimentation statistics



Thank You

