NYU | TANDON SCHOOL OF ENGINEERING

CS-GY 6834: Computer Networking

VITA PHARMA-NETWORK REDESIGN

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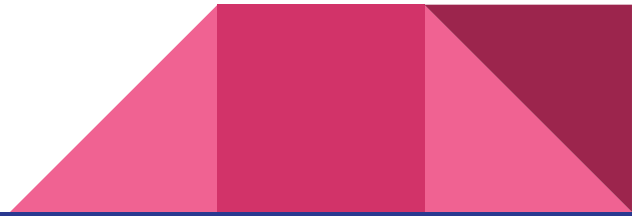
Professor Rafael Portnoy
Akshat Tyagi | Avaiyang Garg | Binal Modi | Rajeev Joshi | Shrey Gupta

Introduction

- Need for a robust network in today’s market.
- Ubiquity of Internet has enabled globalization of the market.



VITA PHARMA GLOBAL OFFICES

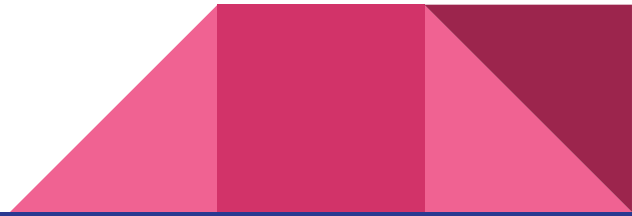
Vita Pharma

Vita Pharma is a global pharmaceutical company, and has its main office in New Brunswick, New Jersey.

- 1 HQ, 3 regional HQ
  - 7 departments
- 3 Global Research center
- 6 manufacturing and distribution facilities
- Mobile sales organization
- 3 software development centre

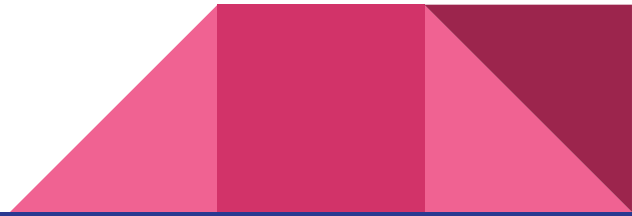
Problem

- Currently the company is facing critical issues in the network and there have been complaints about:
  - Slow access to files
  - Slow email delivery
  - Poor voice quality
  - Application crashing



Objective

- Develop a protocol stack
- Develop an IP addressing schema
- Identify the data centers
- Provide security mechanism
- Analyzing Bandwidth requirements

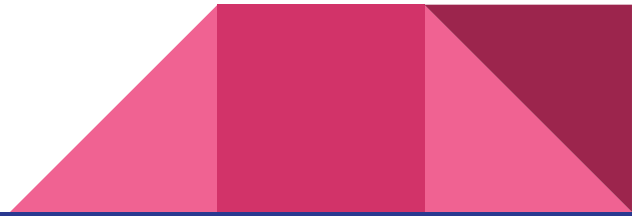


IP Address Schema

- Expected growth rate of 15% per year
- 80% growth in workforce over a period of 4-5 years.
- DHCP for assigning IP addresses
- Used private network IP of 172.20.x.x over varying subnet ranging between 22-26
- Used public network IP of 156.1.1.x , with a router to employee ratio of 1:40

Data Center

- Data is a commodity, and crucial part of the company
- It needs to be collected and stored in safe environment
- Used for the purpose of analysis and research development
- Data centers are core component for the company’s architecture



Data Center (cont…)

Factors for selecting an appropriate location:

- Easy access by the IT staff
- Geographical stable place
- Easy access to power grid
- Cost efficient, (local or national taxes and other regulations)
- Secure checkpoints and monitoring system

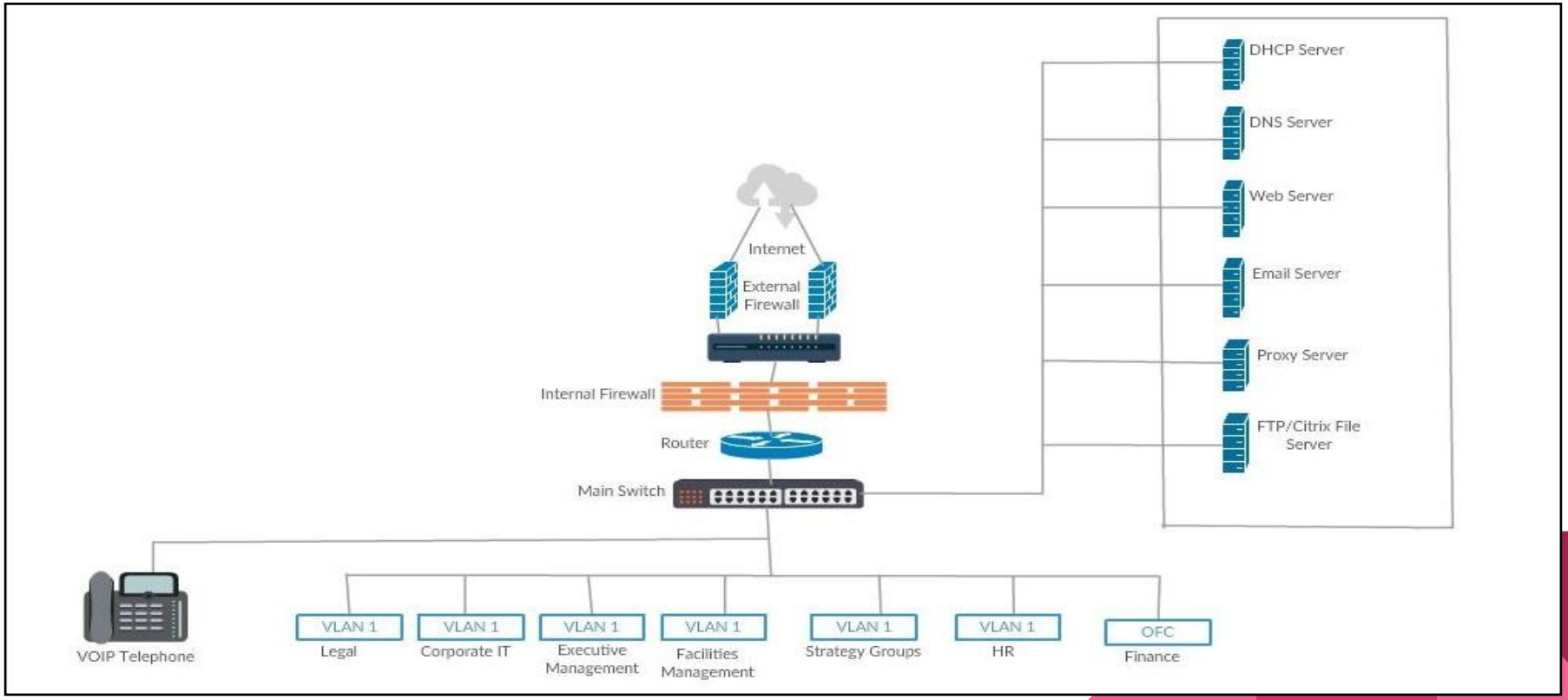
Data Center (cont…)

Data Center (cont…)

The locations for our data centers are:

- **Netherland:**
  - Abundant renewable and green energy
  - Connects whole of Europe and neighbouring regional offices
- **Iowa:**
  - Abundant power supply and low tax rates.
  - Connects whole of America
- **Singapore:**
  - World class infrastructure, with support from government
  - Submarine cable system offers customers scalability and low cost connectivity.
  - Connects Russia, Asia and Pacific regions.

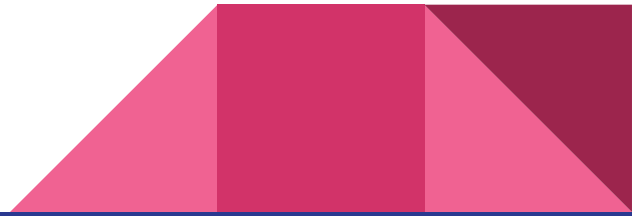
Main Office


DHCP Server
DNS Server
Web Server
Email Server
Proxy Server
FTP/Citrix File Server
Internet
External Firewall
Internal Firewall
Router
Main Switch
VOIP Telephone
VLAN 1
Legal
VLAN 1
Corporate IT
VLAN 1
Executive Management
VLAN 1
Facilities Management
VLAN 1
Strategy Groups
VLAN 1
HR
OFC
Finance

Protocol Stack

APPLICATION LAYER:

- HTTP
- HTTPS
- DNS
- SMTP
- IMAP
- DHCP
- SNMP
- Citrix/VDI
- SSH



Protocol Stack (cont…)

TRANSPORT LAYER:

- TCP
- UDP

Protocol Stack (cont…)

NETWORK LAYER:

- IP
- IPSEC
- ICMP
- OSPF
- BGP

Protocol Stack (cont…)

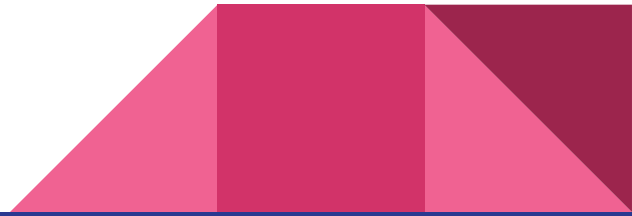
DATA LINK LAYER:

- MAC
- VPN
- ARP

Protocol Stack (cont…)

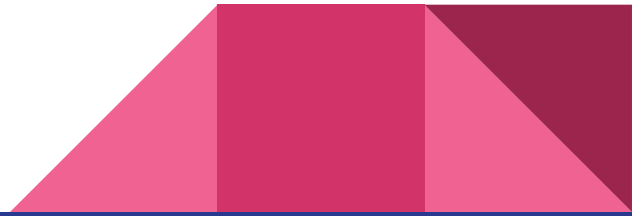
Physical Layer:

- Wired connections uses twisted pair of copper wires
- Treasury department, uses fibre optics



Access Technologies

- DSL (Digital Subscriber Line)
- Twisted Pair Cable
- Fibre Optics
- Wifi (Ethernet 802.11)



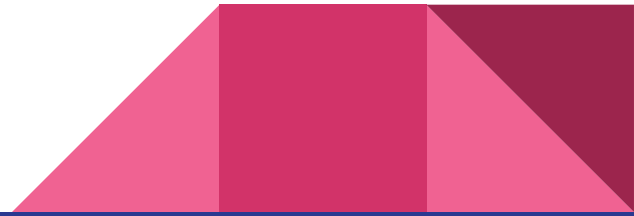
Security

Personally identifiable information like social security numbers, customer specification data, financial data of organization and confidential analytics product development softwares need to be kept secure and kept as top priority.

Network Perimeter Security

Stateful Firewalls

- IPtables in access control list will block packets coming from unknown network sources.
- Keep track of state of network connections, it can detect the IP addresses which have reported with repetitive attacks and block those IP addresses.

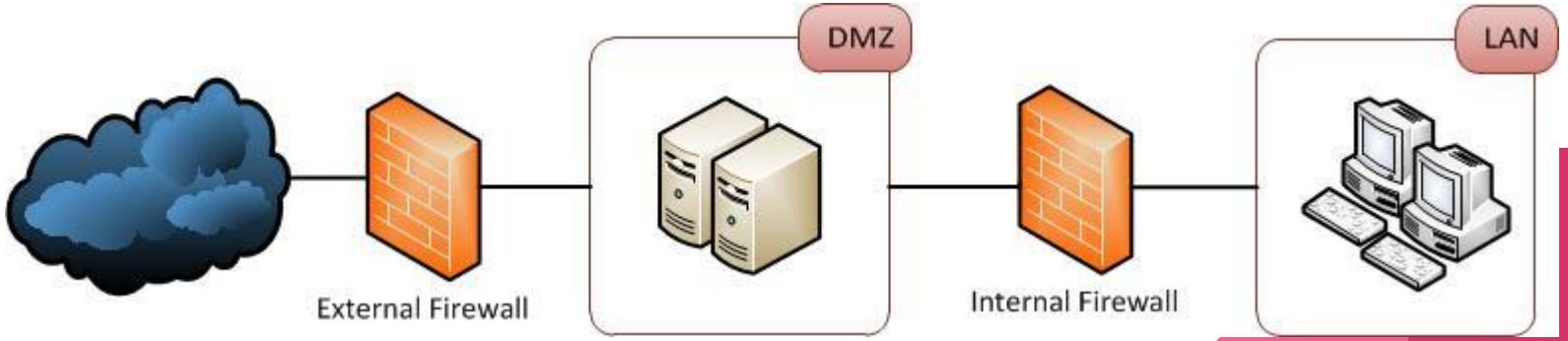


Network Perimeter Security (cont...)

Demilitarized Zone

Functions as an isolated network positioned between the external network and the enterprise network.

To protect the internal servers and resources from being exposed to the untrusted network, we put web and mail servers in the DMZ zone.

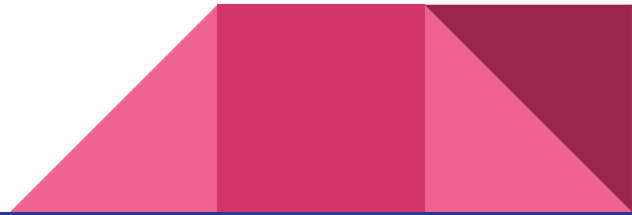


Virtual Private Network

- IPsec VPN utilizes tunnel mode for creating VPN tunnels and provides enhanced level of security on VPN connections by default by providing
  - authentication
  - encryption
  - compression services.
- Finance & Accounting, Treasury and R&D department have high security needs, employing IPsec VPNs will provide them with secure and always on network connectivity.

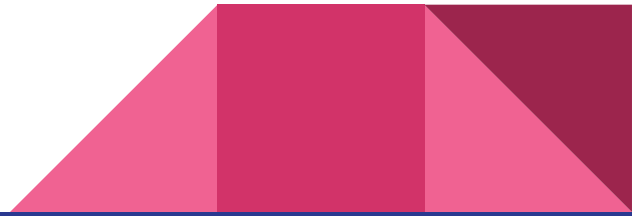
Secure Socket Layer

SSL is a cryptographic protocol that provides communications security over a network. It establishes an encrypted link between a server and a client, thus avoiding eavesdropping and tampering of information. Using HTTPS over SSL/TLS will ensure privacy, integrity and authentication.



Data Security

For data security and data transmission security we employ encryption techniques such as AES and RSA. This will ensure confidentiality of data. We also add S/MIME (Secure/Multipurpose Internet Mail Extensions) protocol in communicating end systems, for sending digitally signed and encrypted messages.



Wireless Security

- WPA2 (Wi-fi Protected Access-2) will be used for ensuring wireless security. It uses AES, which is a very strong block cipher.

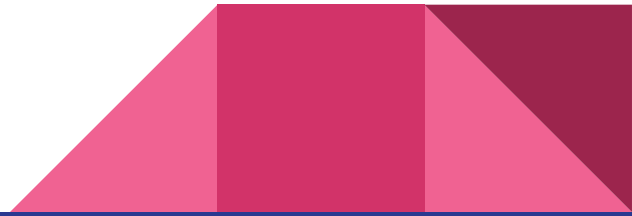
- Has 4 way handshake between the host and access point, thus providing strong authentication. It also allows connections to be modified or revoked by administrators at anytime.

Calculations

- Throughput is the key measure for the network performance. It tells us the amount of successful data that can be transferred through the network per unit of time over a communication channel.Throughput is essential for various application types, like real time big data services, VoIP, video-streaming, etc.

Acceptable Delay

- Headquarter : <= 1000 ms
- Finance : <= 100 ms
- Software and Development: <= 800 ms
- Sales : <= 1500 ms
- Manufacturing and Distribution: <= 2000 ms
- Global Research Centre: <= 500 ms



Bandwidth Calculation

Office	Minimum Bandwidth	Recommended Bandwidth
Headquarter	231 Mbps	461 Mbps
Finance	338 Mbps	680 Mbps
Software and Development	231 Mbps	461 Mbps
Sales	21 Mbps	40 Mbps
Manufacturing and Distribution	310 Mbps	615 Mbps
Global Research Centre	246 Mbps	615 Mbps

Thank you

Happy Holidays