**Task**: A newly established ACME Corporation has recently acquired offices in the UK, India, and the US. The number of employees in each office is 300, 200, and 100, respectively. The network resources are scarce; therefore, the network design should be as such that they are used efficiently

Each branch office has three departments i.e. IT, HR and Finance. These three departments should have different broadcast domains, and departments should communicate with each other. The company is in the process of setting up its communication and network infrastructure, computers, servers, databases, e-mail, and file sharing facilities. The company requires sharing of technology resources across all offices.

The company needs to operate in a very secure environment Their workforce is also using mobile devices to conduct their “Business as Usual” (BAU) activities. As a Network Administrator, you are assigned the responsibility of connecting different offices using networking paradigms .

A topology diagram must be created using Packet Tracer tool. Evidence of successful end-to-end connectivity must be provided and a report on your selection of technologies must be produced. The devices and protocols you chose to set up the scenario mentioned above must be clearly documented in the report, including the rationale behind choosing them.

Furthermore, the company has asked you to recommend cloud-based services (e.g. Email, File share, IIS etc.) using AWS. You are not required to setup servers on AWS but provide recommendations in your report. You are required to compare your selection with other available options, their advantages and disadvantages and give an in-depth analysis of what you have proposed.

**Topology**

**Graphical user interface, diagram

Description automatically generated**

On this topology,as a layer 3 device, I have used 2911 Integrated Services Router because it delivers highly secure data,voice,video and application service and because it has 3 ports.

Key features:

1. 3 integrated 10/100/1000 Ethernet ports (RJ-45 only)
2. 1 service module slot
3. 4 enhanced high-speed WAN interface card slots
4. 2 onboard digital signal processor (DSP) slots
5. 1 Internal Service Module slot for application services
6. Fully integrated power distribution to modules supporting 802.3af Power over Ethernet (PoE) and Cisco Enhanced PoE
7. Security
8. Embedded hardware-accelerated VPN encryption for secure connectivity and collaborative communications Integrated threat control using Cisco IOS Firewall, Cisco IOS Zone-Based Firewall, Cisco IOS IPS, and Cisco IOS Content Filtering
9. Identity management using authentication, authorization, and accounting (AAA) and public key infrastructure
10. Voice
11. High-density-packet voice DSP module, optimized for voice and video support
12. Standards-certified VoiceXML browser services
13. Cisco Unified Border Element capabilities
14. Cisco Unity Express voicemail support
15. Support for Cisco Communications Manager Express and Survivable Remote Site Telephony

As a layer 2 device I have used the Cisco Catalyst 2950-24 switch which has 24 auto-sensing and auto-negotiating Fast Ethernet ports.

Connection from the PC’s to switch and switch to router is done with Straight throught cables.

Connection between the Routers is done with Copper Cross Over Cable.

**Subnetting**

On this assignment is required that we create a network for a company with offices in three different states. The network resources are scarce and should be used efficiently, therefore I have decided to use Variable Length Subnet Masking(VLSM) to create different subnets with different number of hosts in the same network. This makes possible to use IP addresses very efficiently and not waste them by not using them and also saves on costs.

The UK Offices has the largest number of hosts (300) so we will subnet it first. I have decide to use a class B network address(176.16.0.0) as class C address can only accommodate 254 hosts. To calculate the number of subnets I have used the formula no. of subnets = 2host bits-2.

**UK Network** 172.16.0.0 255.255.0.0 /16

300 hosts 29-2=512-2=510 hosts no. of subnets =29=512 subnets

/32-9=/23 new subnet mask 255.255.254.0 /23

Jump => 256-254=2

**USA Network** 172.16.2.0

200 hosts 28-2=256-2=254 hosts no.of subnets=28=256 subnets

/32-8=/24 new subnet mask 255.255.254.0 /24

Jump => 256-255=1

**India Network** 172.16.3.0

100 hosts 27-2=128-2=126 hosts no. of subnets=27=128 subnets

/32=/25 new subnet mask 255.255.255.128 /25

Jump=>256-128=128

**Router Link UK-USA** 172.16.3.128

2 hosts 22 -2=2hosts no. of subnets=22=4 subnets

/32-2=/30 new subnet mask 255.255.255.252 /30

Jump =>256-252=4

**Router Link USA-India** 172.16.3.132

2 hosts 22 -2=2hosts no. of subnets=22=4 subnets

/32-2=/30 new subnet mask 255.255.255.252 /30

Jump =>256-252=4

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Network** | **Subnet ID** | **First Host** | **Last Host** | **Broadcast Address** |
| **UK** | 172.16.0.0 | 172.16.0.1 | 172.16.1.254 | 172.16.1.255 |
| **USA** | 172.16.2.0 | 172.16.2.1 | 172.16.2.254 | 172.16.2.255 |
| **India** | 172.16.3.0 | 172.16.3.1 | 172.16.3.126 | 172.16.3.127 |
| **UK-USA** | 172.16.3.128 | 172.16.3.129 | 172.16.3.130 | 172.16.3.131 |
| **USA-India** | 172.16.3.132 | 172.16.3.133 | 172.16.3.134 | 172.16.3.135 |

As we know we have 3 departments in each location:IT,HR and Finance. We need to create 3 Vlan’s for each location and make sure the Vlan’s communicate within each other.

Text

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The pictures above show the Vlans created and the interfaces assigned to them.

A screenshot of a computer

Description automatically generated with medium confidence

The picture above is evidence of connectivity between hosts in the same Vlan.

**Network Routing**

We are required to connect all 3 offices with each other using network paradigms.I have chosen to use EIGRP routing protocol.EIGRP is an advanced distance vector routing protocol. It can determine the shortest path distance vector using metrics like bandwidth, load and delays to calculate the shortes optimal network route.To exchange information the routers need to become neighbors to EIGRP than EIGRP uses the multicast address to share the information.Benefits of this protocol are:

1-Converges at fast rapid times for the changes in network topology.

2-It makes use of links more effectively through Equal Cost Multipath and unequal cost load sharing.

3-Supports both Ipv4 and Ipv6 networks.

4-It provides encryption for security.

Graphical user interface, diagram, application

Description automatically generated

The picture above shows connectivity between hosts on different networks that aren’t part of any Vlan.

A picture containing text

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Description automatically generated

**Security Measures**

On all the routers I have set a banner and I have created passwords for console line and enable line.The enable line password is encrypted 5 level of security.

I have also created a telnet password so that users can access the router from any device no only the device connected via console cable.

**UK Router**

**Text

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**USA Router**

**Text

Description automatically generatedText

Description automatically generatedGraphical user interface, text

Description automatically generated**

**INDIA Router**

**Graphical user interface, application

Description automatically generated with medium confidenceA computer screen capture

Description automatically generated with medium confidenceGraphical user interface, text, application

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To set the security measures I have referred to the lectures from Dr.Ikram.

**Web Services Recommandation**

We are required to recommend a web services platform for the company.I have decided to recommend Amazon Web services because it provides us with a wide range of applications useful to the organization.

1-Amazon Simple Email Service

Aamazon Simple Email Services is a cost-effective,flexible and scalable email service thet enables employees to send email from within any application. It can be configured quickly to support a lot of email use cases including transactional, marketing, or mass email communications. Amazon SES uses flexible IP deployment and email authentication options to have higher deliverability and to protect the sender’s reputation. DNS protocolos like SPF or DKIM validate senders identity.

Through this service we can keep track of statistics on email deliveries ,bounces,and feedback loop results which help to measure the reach of each email. Other insights like email open or click-through rates measure how engaged the costumers or staff are in the email communications.

Another benefit is that regardless of use case or sending volume,we pay only for what you use with Amazon SES.

2-AWS S3 (Simple Storage Service)

S3 is the most widely used object storage service from startups to enterprise-level companies because of its scalability,data availability, security and performance. Any data stored over S3 is protected, secure and always available with 99.99999999999% durability.We can store data of any type and size such as web app, mobile app, bacup archive and analytics.

3-Amazon RDS (Relational Database Service)

Amazon RDS is one of the distributed and relational database services provided by Amazon. It is fully supported via using the web services and it is managed with SQL database services. RDS supports the database engines to store and organize data to help with the management of databases, migration, backup , recovery and data patches.This database handles failure detection and repair aswell. RDS makes it easier to scale the relational databases in the cloud and is the cost efficient solution that can be resized with any capacity.AWS is responsible for infrastructure and task maintenance. AWS provides complete control over the server to manage the databases. Users can manage and control the Network and security, Database options, and Encryption depending upon the data classification.

4-Mobile

Amazon provides two ways for mobile access-AWS Mobile SDK and AWS Mobile Hub.

Mobile SDK supports Android, IOS, Unity, Web ect.With the help of this feature is possible to access different Amazon Web Services such as DynamoDB and AWS S3.

Mobile Hub supports access to the appropriate and compactible feature for applications.It is possible to develop, test and monitor the application using the console wich is present in it.Other features are message push notification and content delivery.

5-Security

AWS provides a standard and secure infrastructure where the user has to pay only for the services they use and has a wide range of security services.

Identity Access and Management (IAM) is a service where the admin manages access to users for using AWS services.

AWS has tools in place the assess security risks automatically.It also provides tools with encryption(hardware and software),Transport Layer Security certificates,security against DDos attacks, and filter of harmful traffic against applications.Amazon Inspector tool is used to to assess a user’s AWS cloud deployment automatically in order to identify security threats and deficiencies.AWS uses Key Management Service to manage encrypted keys and Guard Duty to detect threats intelligently to protect AWS accounts.

These are some of the few of the wide range of tools AWS provides.Pay per Use, Scalability and Location backups are some of the main features that makes me recommend these services.Cloud computing saves costs on hardware and software.There is no need to maintain a server and all licenses and renewals are taken care of by cloud providers. Data is accessible anywhere anytime and there is no need to put extra security in costumer’s data as the cloud providers will take care of that. AWS has a wide range of Developer Tools aswell to create, build and deply software applications.

AWS offer more services than any other providers and is trusted by many big companies like NASA, Netflix, Volkswagen, Coca Cola ect. AWS spans in 84 availability zones with 26 geographic regions around the world and another 24 more zones and 8 regions to come.AWS operates already in USA and they are coming to London and India soon so that is one other reason to why I recommend it.

AWS also provides detailed information for each service and it also has AWS training and Certification programs which makes learning and understanding of AWS simple. AWS Certifications are some of the most valued certification on the market. Due to high-quality services which are regularly updated, 24x7 support, detailed documentation for each service and lower price compared to other web services providers and traditional infrastructure it has the highest market cap. Also from this Amazon makes huge investments to expand its network and introduce more technologically advanced yet easy to use services.

REF: www.educba.com