

**Question1:** Provide an example of a modern Distributed System not discussed in the course; discuss how this system solves certain challenges by employing distributed architecture.

**Answer NO: 01** Example OF Distributed System:

**Nationalized bank with multiple branch offices:** Here we have to study about the nationalized bank having multiple branches throughout the country in different cities in within the cities it also have different branches.

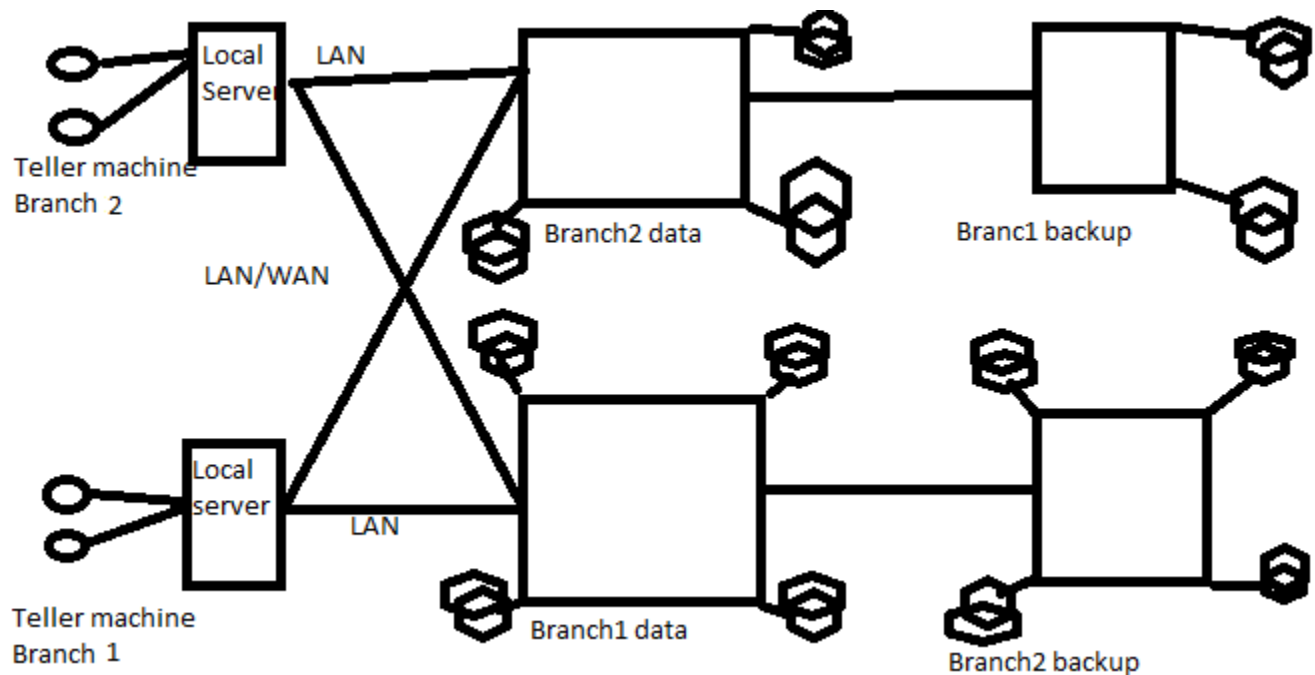


Fig 1.1 Architecture of ATM (Distributed system).

Let me take the two branches .The Teller machine with a branch1 and branch2 wether it may be present with in the city or without the city so let us take teller machine of branch2 which is connected to their own local server this local server is connected to another server through LAN called branch2 data. The same teller machine branch2 local server can also be connected to the another server called branch1 data through LAN or WAN. So the branch2 teller machine server not only connected with their respective server but also connected to the other branches server (branch1 data) of the same bank.so the server is distributed to each branch the branch2 data as well as the branch1 data. So here we are using the distributed technology that the resources are shared and at last each each bank have there own backup server which cannot be shared with each other. Now what exactly the requirement for this to implement the distributed system in this example To Implement the distributed we have to required

1. Security and Reliability: Is your system is more secure or not and also reliable.
2. Consistency of replicated data: Is your system is consistency of replicated data.
3. Concurrent transaction: It is supported the concurrent transaction or not.
4. Fault tolerance: is it able to tolerate the faults or not.

Another example is RMI(Remote method Invocation). It is an API which can provide a mechanism to create distributed application in java. It allows in object to invoke methods on an object running in another Java virtual machine.

**Question2: Among the trends of Distributed Systems discussed in C1-Lec2, which trend in your opinion will be most dominant in the future and why?**

**Answer No 2:** According to my opinions the distributed utility computing is the best trend for the future. As we know that the distributed computing a user can access sophisticated data centers or indeed computational infrastructure using the sort of services now provided by different companies. User may actually be provided with services by a virtual (virtual operating system) rather than a physical node. Users need different software and services which is available on this trends every users want to have access more services virtually rather have their physically nodes which can only be provided by the cloud computing technology as we know a cloud computing is a set of internet based applications, storage computing services sufficient to support most users needs, thus enabling them largely or totally dispense with local data storage and application software.

A user cannot have the capacity to store as much software or resources they want they needs a virtual world through which they can access their desired software or resources by paying rent of that. Cloud computing giving such services for example a user need storage they can go the cloud technology and pay rent of that and use the storage rather have to physically available so it's a future demand every user want to have a virtual world every user want all the services available in their own computer which is physically impossible so the cloud computing is the only trend to fulfill this need of the users.

**Question3: Among the challenges of Distributed Systems discussed in C1-Lec2, which problem in your opinion will accompany distributed systems into the future and why?**

**Answer No 03:** According to my opinion openness will accompany distributed system in future because we know that in openness new resource sharing services can be added and made available for use by a variety of client program. As we know that as we forward user need more and new features so openness is more important in future. As we see the facebook new features and more thing is added in recent era due to the user demand. Openess can be achieved when the specification and documentation of a key software or feature/services are published.Thus through openness in future we can extend the hardware level by addition of computer to the network and at the software level by

introducing new feature/services and replacement of old one. Because any time we can manage/replace the technology according to the user demand or our needs.

**Question4:** The design of distributed systems can be described and discussed in three ways i.e Physical Model, Architectural Model and Fundamental Model. Describe the example of distributed system in Question1 with respect to these three models.

**Answer No 04:**

**physical model:** As we know a physical model is a representation of the underlying hardware element of a distributed system. It is a extensible set of computers nodes interconnected b a computer network.

So according to physical model different ATM machine can be connected to their own local server using local area network (LAN).these local server component than connected to their respective branches using wide area network or local area network.

**Architectural model :** As we know architectural model is known as the structure of a system interm of sepearatly specified component and their relationship. Banking system different ATM component that connected to their server resulting the fetching the data and make their transaction for the clients the whole servers and branches and ATM have their inter relationship through which they can work and make the work effeciently.

ATM consist of communication entity that communicate in distributed system. Object to enable and encourage the use of object oriented approach .component is also included to reduce the problems. ATM service also include web technology to make their work easy it also of inter process communication, remote invoation, request reply protocol.

**fundamental model :** The purpose of fundamental model is to make explicit all the releavent assumption about the system. By making the system the important assumption of distributed system, interaction model, failure model, security model.

An ATM must include failure model beacause failure model is more important because every user want a failure free services In ATM if a fail stop failure occure the process of ATM halt and remain halted other process may also detect this sites incase of crash occur the system halted and the other process may not be able to detect.

ATM security can be achieved by securing the process channel uses for their interaction and by protecting the object that they encapsulate against un authorized access. Also secured it from threats.

ATM interaction have seem to built like that two process might have different time value more importantly their drift rate differ from each other ATM has the following performance characteristics related to latency , bandwidth , jitter.

**Question5: What is the purpose of Inter Process Communication (IPC) in distributed systems? Given the choice which protocol out of UDP and TCP will you use for your own distributed system and why?**

**Answer No 5:**

**purpose of inter process communication:** As we know that in inter process communication message passing between pair of processes can be supported by two message communication operations send and receive. One process sends a message to a destination and another process at the destination receives the message this activity may involve the synchronization of the two processes.

The purpose of inter process communication is to provide a mechanism to make sure that signals or remote procedure call get answered properly. Think of it this way, I say to you, I am going to transmit, you say "okay, ready to copy" I then transmit. You can say "message received and understood". I then knew that everything is good and can go back to doing the ironing or whatever.

Now, this is not how the world works all the time. So we have inter process communication to say things like "nope, didn't get that...what was the last bit again".

It is a fairly broad term; it applies to a protocol between distinct processes (although, in a multiprocessor/core or hyperthreaded environment we call these processes 'threads'). It does not apply to communication inside processes threads.

According to my opinion the TCP protocol is best because the TCP protocol uses an acknowledgment scheme for reliable delivery of message. It cannot truncate the message on arrival because message size can vary. It has a flow control. It reorders the message that don't arrive in sender order. First they create a connection to the destination host then communicate. If one process writes an int followed by a double to a stream then the reader at the other end must read an int followed by double. TCP uses checksums to detect and reject corrupt packets and sequence numbers to detect and reject duplicate packets.

**Question6: The following are some of the threats and attacks on Distributed Systems. Provide potential solutions as how may be these threats and attacks be mitigated?**

1. Leakage
2. Tampering
3. Vandalism
4. Eavesdropping.

**Answer No 06:** There are some following threats in distributed system we must know this and write its solution to prevent from such types of threats.

1. **Leakage:** you can use standard security tool to defend against data loss and leakage. For example an intrusion detection system (IDS) can alert about attacker attempts to access to sensitive data. Antivirus software can prevent attackers from compromising sensitive system. A firewall can block access from any unauthroized party to the system storing sensitive data.

Componenets of data loss solutions;

- a. securing data in motion
- b. securing end point
- c. securing data at rest
- d. securing data in use
- e. data identification
- f. data leak detection

2. **Tampering :** Data tampering is the act of deliberately modifying data through unauthorized channel data exist in two state in transit or at rest in both instance data could be intercepted and tempered with. digital communication is all about data transmission.

Prevention: data tampering is all about successful illicit system intrusion so the first line of defence is handling the 'getting in' part. However there are other of the system vulnerability that are also addressed

- a. Firewall: Important file, databases program and application have to be lock down behind firewall in parallel with operating A firewall is in electronic barrer to a system and its program it may be hardware or software designed for network security and uses various preset criteria to control incoming and outgoing traffic.
- b. Authorization: every system or program comprises resources which have be access by various entity however like in any organization structure not everyone has to access to every thing by virtue of their rank and responsibility some people are more privilaged than other. The same is true with computer resources. Authorization in a computer system or application program is the process of granting access right to program or user of a system to the different resources the system hold. It directly restrict or allow what and how much a resources is made accessible to different users. The wrong user with the right to perform certain certain function or access certain resources could pose a big problem for the system.

the next potential solution is the security mechanism of public key and secret key cryptography. Encrcyption and decryption of data in which no one is no the secrete key of the data through

which they can encrypt the data. user can send data encrypted data which can only be decrypted through secret key. so data will be authenticated.

2. **Vandalism:** The updated Anti-malware software is a vital role in defending your computer, Mobile devices and data against computer vandalism, viruses, worms, trojans and other malware kaspersky has anti malware solution that deliver world class protection for a wide range of computer and other devices. Use your firewall active anytime to prevent from vandalism.

4. **Eavesdropping :** In this case the attacker simply need to replace a receiver with the same radio frequency of the wireless network within in the communication range of the network.

Solution: There is no way to stop eavesdropping in public network. To counter eavesdropping the best defense mechanism is to encrypt data. Mean use chromatography technique to prevent. Use public or secret key chromatography through secret key encrypt and decrypt the data is the best option.