Distributed Systems

COMP90015 2018 Semester 1
Tutorial 11

Things to cover today

Questions about Security and Distributed File Systems

Example questions in examination

Questions

1. What are the different security threats and methods of attacks in a distributed system?
2. What are some key design issues for distributed file systems?
3. Name and explain three transparencies that should be addressed by distributed file systems.
4. What are the advantages and disadvantages of using absolute names as a naming strategy?
5. What are the advantages and disadvantages of a naming strategy based on mount points?
6. What are the advantages and disadvantages of using a global name space naming strategy?

1. What are the different security threats and methods of attacks in a distributed system?

Security Threats

Three broad Classes:

Leakage: Acquisition of information by unauthorised recipients

Tampering: Unauthorised alteration of information

Vandalism: Interference with the proper operation of systems

Method of Attacks

Eavesdropping - A form of leakage obtaining private or secret information or copies of messages without authority.

Masquerading – A form of impersonating assuming the identity of another user/principal – i.e, sending or receiving messages using the identity of another principal without their authority.

Message tampering- altering the content of messages in transit man in the middle attack (tampers with the secure channel mechanism)

Replaying- storing secure messages and sending them at a later date

Denial of service - Vandalism flooding a channel or other resource, denying access to others

2. What are some key design issues for distributed file systems?

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- Effective use of client caching to achieve performance
- Maintain consistency between multiple copies of cached files
- Recovery after client or server failure
- High throughput for reading and writing files of all sizes
- Scalability

3. Name and explain three transparencies that should be addressed by distributed file systems.

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Access transparency

• Client programs don’t know if the file is local or remote (file access operations are the same)

Location transparency

• Client programs don’t know where the file is stored

• Files can be relocated without changing their pathname

Mobility transparency

• Neither client programs nor system administration tables in client nodes need to be changed when files are moved

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Performance transparency

• Maintain acceptable performance while the load on the service varies within a specified range

Scaling transparency

• Service can be expanded without loss of performance

4. What are the advantages and disadvantages of using absolute names as a naming strategy?

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Absolute name

• provides a complete address to a file including both the server and path names: <machine name: path name>

Advantages

• Trivial to find a file once the name is given
• No additional state must be kept since each name is self contained (No global state)
• Greater scalability
• Easy to add and delete new names

Disadvantages

• No location transparency
• File is location dependent and cannot be moved
• Less resilient to failure

5. What are the advantages and disadvantages of a naming strategy based on mount points?

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Mount Points (used by Sun's Network File System - NFS)

- The client machine creates a set of "local names" which are used to refer to remote locations: mount points
- At boot time, the local name is bound to the remote name
- The operating system must maintain a table to maintain the mapping of what server and path are mapped to each mount point

Advantages:

- Names do not contain information about the file location
- Remote location can change between reboots

Disadvantages:

- Hard to maintain
    - What happens when machines fail?
    - What happens when files are migrated?
- Can lead to confusion since two different local names may map to the same file on a remote system

6. What are the advantages and disadvantages of using a global name space naming strategy?

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Global Name Space

• All nodes have an identical name space: the path and name of a file on one machine will be the same on every other machine, regardless of where the file is actually stored
• Dedicated file servers
• Client contacts one of the servers and receives the layout of the distributed file system
• When a user accesses a file, the server sends a copy of it to the client machine where it is cached

Advantages

• Location transparency
• Naming is consistent across all clients
• Storage servers are able to seamlessly move files around because clients always contact the server to learn where files are located

Disadvantages

• Files are cached by clients = challenges in keeping files consistent
• Can lead to performance problems, particularly when the scale of the system grows