

MOBILITY, PORTABILITY, REPLICATION AND CLUSTERING

Lesson 06 File Systems and CODA

FEATURES OF A FILE SYSTEM

- Hierarchical organization
- Storage
- Modification
- Navigation
- Access
- Retrieval of files
- Easy search and access of files

FEATURES OF A FILE SYSTEM

- Maintenance of physical location of files on a storage device (e.g., memory stick, or hard disk)
- The system functions use the data from the file server software in response to client requests
- Technology similar to that of databases

MOBILE FILE SYSTEM

- Designed for a mobile device, phone or smart card
- File system— a basic middleware which glues applications to an OS
- Defined as a method of organizing and storing files on a storage device at computer or a mobile device

MOBILE FILE SYSTEM

- For the files, which may not be present on a single storage device
- Files may be distributed as in case of a distributed file system
- Present at different nodes in a network system

FILE SYSTEM FOR SMART CARDS

- Consists of a master file which is the root directory
- Master file Stores all file headers
- A header contains description about a file

FILE SYSTEM FOR SMART CARDS

- The second layer after the master file consists of dedicated files (directories) at the branches
- Dedicated file holds file groupings
- Each dedicated file may further have dedicated files and/or elementary files as branches

FILE SYSTEM FOR SMART CARDS

- The elementary files are at third layer
- The elementary file holds the file header and the file data

REQUIRED FEATURES IN FILE SYSTEM FOR A MOBILE COMPUTING SYSTEM

1. Scalability (scalability in case of mobile file system means that the system should adjust the limits of file sizes and the number of files in the storage device as per the available memory capacity)
2. Support for defined semantics for sharing of files even in case of network failure

REQUIRED FEATURES IN FILE SYSTEM FOR A MOBILE COMPUTING SYSTEM

3. Support for disconnected operations and provision for reintegration of data from disconnected clients or server
4. High performance through client-side persistent caching

REQUIRED FEATURES IN FILE SYSTEM FOR A MOBILE COMPUTING SYSTEM

5. Provision for replication at server
(Replication is defined as a process of repeating, making and offering a new copy of earlier ones)
 - Replication by server means that server repeats and offers (broadcasts) the set of records using broadcast disk model)
5. Security, access control, authentication, and encryption

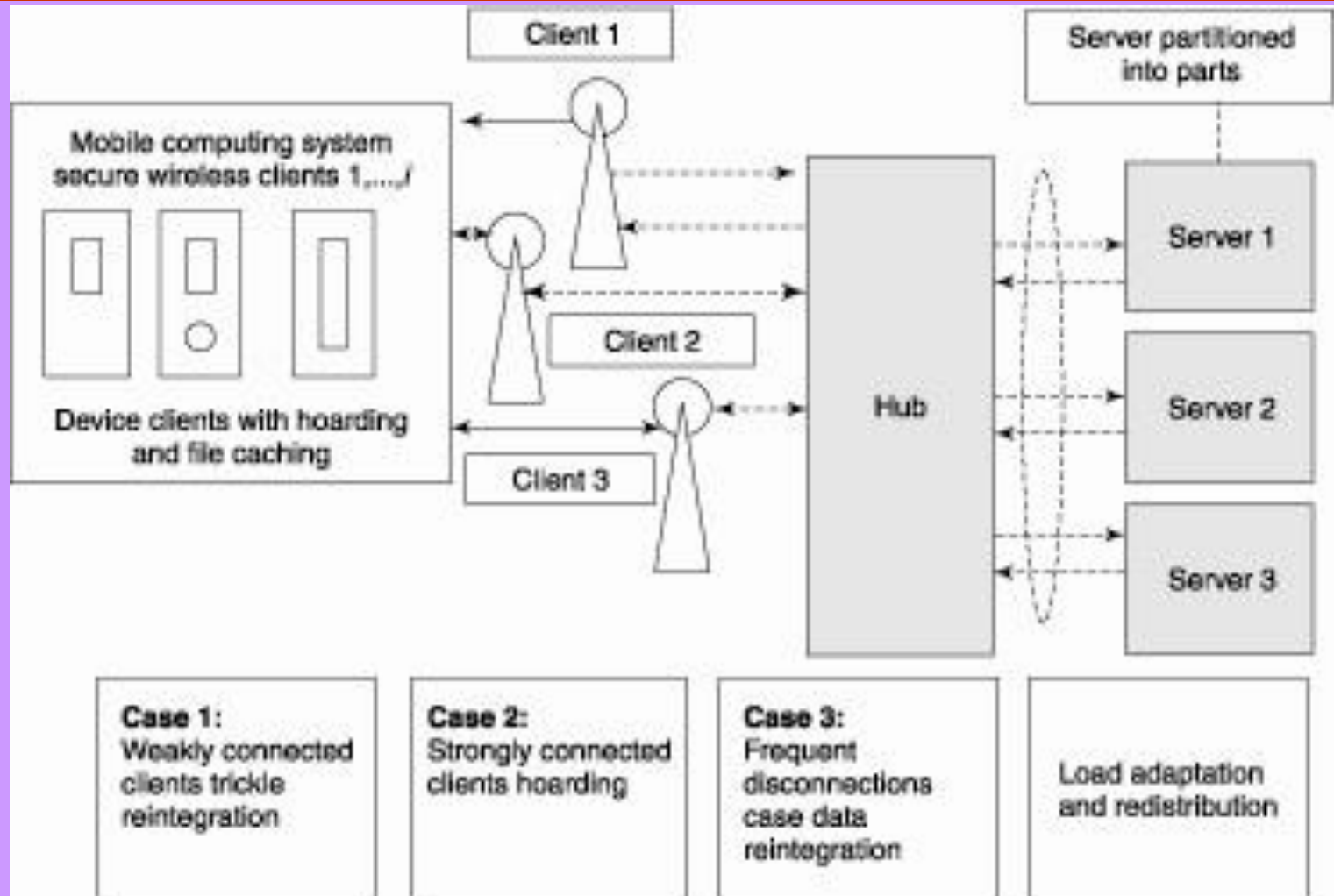
REQUIRED FEATURES IN FILE SYSTEM FOR A MOBILE COMPUTING SYSTEM

7. Continuous operation even in case of partial failure of network connectivity (Partial failure means disconnection between server and a few clients)
8. Network which adapts to the bandwidth available at a given instant
 - An application performance improves if the file system adapts to the bandwidth variations

CODA

- A distributed file system developed at CMU (Carnegie Mellon University)
- It possesses all the features of a file system for the mobile devices and computing systems

CODA FILE SYSTEM ARCHITECTURE



FILES ON A CODA SERVER

- Organized by server partitioning
- These partitions will contain files, which are grouped into volumes
- The volume is a logical unit of files
- A single server would have some hundreds of volumes

FILES ON A CODA SERVER

- Files in each volume have a directory structure, that is, a tree-like structure
- There is a root directory for the volume
- The root has the branches

FILES ON A CODA SERVER

- Similarly, root directory has subdirectories at the branches
- Each branch has several further branches and the last branch is called leaf

FILES ON A CODA SERVER

- The volume is much smaller than a partition but bigger than a single directory
- Its size is chosen as per the manageable file data

THREE STATES OF CONNECTION FOR DISTRIBUTION BY A SERVER TO CLIENTS

- Disconnection
- Weak (low bandwidth) connection
- Strong (large bandwidth) connection

INTEGRATION

- Takes place in case of disconnection
- Means merging objects received from a connection at different instants
- The server sends the data repeatedly in broadcast disk model
- Therefore, the data which could not be cached earlier gets cached later and integrates with the previously received file records

TRICKLE REINTEGRATION

- Takes place in case of weak connection
- Means adding the objects received at smaller bandwidth
- The data trickles and integrates into a large file and continuously reintegrates

HOARDING

- Takes place in case of strong connection
- Means collecting objects received at large bandwidth
- This helps in the eventuality of disconnection

SOME DEFICIENCIES OF CODA

- It assumes that mostly one user writes the data into a file
- Each change is not tracked
- It detects at an instant the conflicts only when a different user is changing a file, this facilitates reintegration of the file data from users

SOME DEFICIENCIES OF CODA

- There is inconsistency if a file is being read at the same time when reintegration is taking place
- Hoarding is not permitted in case of a weak connection

SUMMARY

- File system enables hierarchical organization, storage, modification, navigation, access and retrieval of files
- Easy search and access of files
- Mobile file system special requirements due to disconnections and weak connections
- CODA File system

End of Lesson 06

File Systems and CODA