

Data Dissemination and broadcasting System



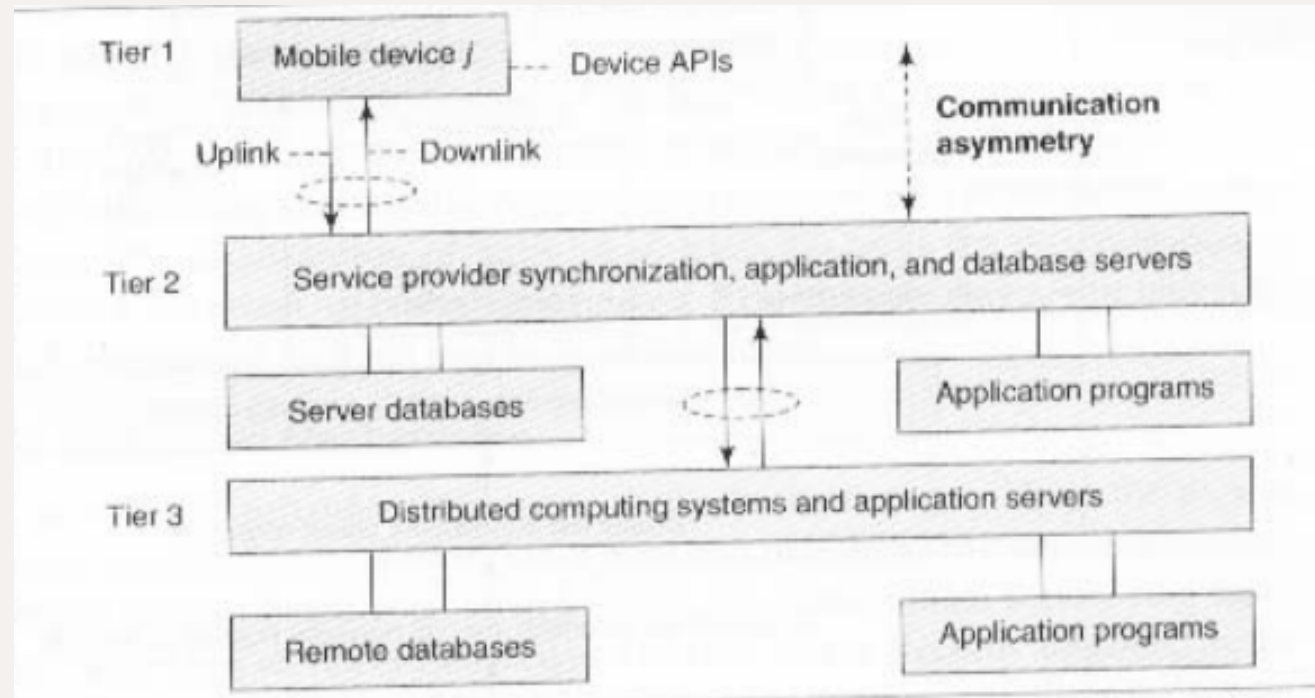
Data Dissemination

- Entails distributing and pushing data generated by a set of computing systems or broadcasting data from audio, video, and data services
- The output data is sent to the mobile devices
- A mobile device can select, tune and cache the required data items, which can be used for application programs
- Efficient utilization of wireless bandwidth and battery power are two of the most important problems facing software designed for mobile computing

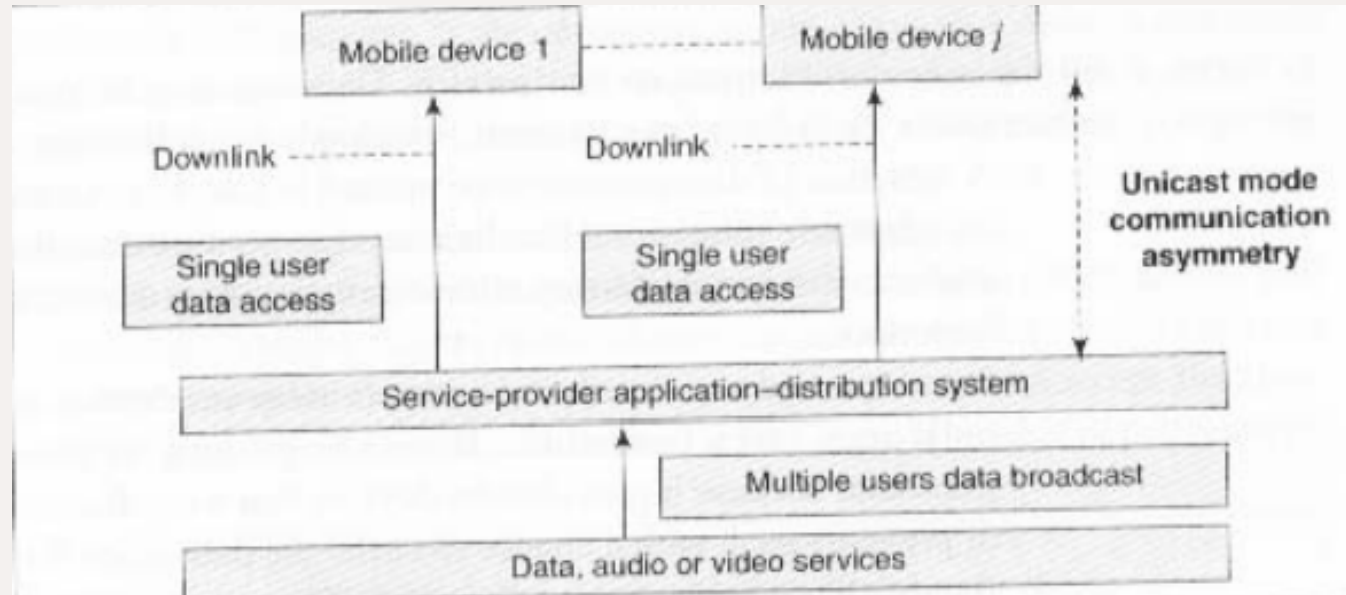
Communication Asymmetry

- Communication capacity or data volume in the downstream direction is much greater than that in the upstream direction
- Mobile communication between a mobile device and a static computer system is asymmetric

Communication Asymmetry



Communication Asymmetry



Data- Delivery Mechanisms

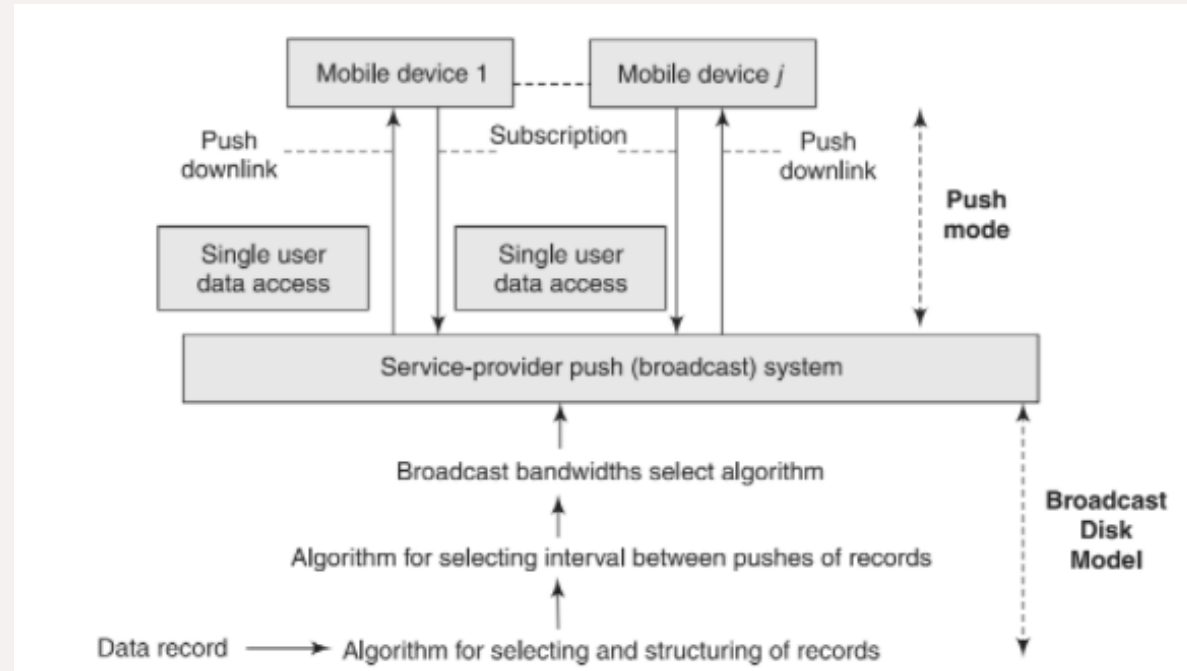
There are two fundamental information delivery method for wireless data application

- Point-to-point access
- Broadcast

There are three kinds of broadcast models

- Push based broadcast
- On-demand or pull based broadcast
- Hybrid Broadcast

Push-based Mechanisms



Push-based Mechanisms

Push-based mechanisms function in the following manner:

1. A structure of data records to be pushed is selected. An algorithm provides an adaptable multi-level mechanism that permits data items to be pushed uniformly or non-uniformly after structuring them according to their relative importance
2. Data is pushed at selected time intervals using an adaptive algorithm.
Pushing only once saves bandwidth. However, pushing at periodic interval is important because it provides the devices that were disconnected at the time of pervious push with a chance to cache the data when it is pushed again

Push-based Mechanisms

3. Bandwidths are adapted for downlink using an algorithm. Usually higher bandwidth is allocated to records having higher number of subscribers or to those with higher access probabilities.
4. A mechanism is also adopted to stop pushes when a device is handed over to another cell.

Push-based Mechanisms

Advantages

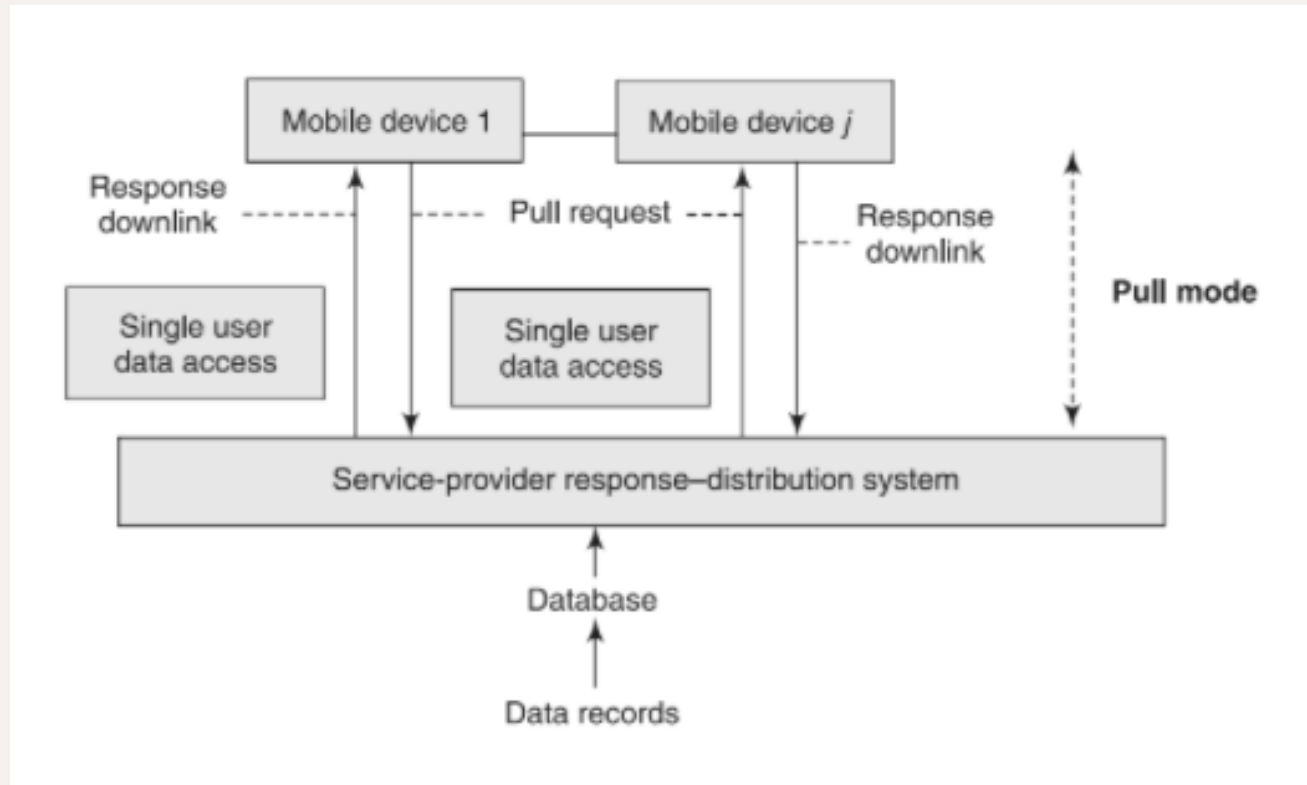
- Enables broadcast of data services to multiple devices
- The server is not interrupted frequently by requests from mobile devices
- These mechanisms also prevent server overload, which might be caused by flooding of device requests
- Also, the user even gets the data he would have otherwise ignored such as traffic congestion, forthcoming weather reports etc

Push-based Mechanisms

Disadvantages

- This mechanism disseminate of unsolicited, irrelevant, or out-of-context data, which may cause inconvenience to user

Pull based mechanisms



Pull based mechanisms

Pull-based mechanisms function in the following manner:

1. The bandwidth used for the uplink channel depends upon the number of pull requests
2. A pull threshold is selected. This threshold limits the number of pull requests in a given period of time. This controls the number of server interruptions
3. A mechanisms is adopted to prevent the device from pulling from a cell, which has handed over the concerned device to another cell. On device handoff, the subscription is cancelled or passed on to the new service provider cell

Pull based mechanisms

Advantages

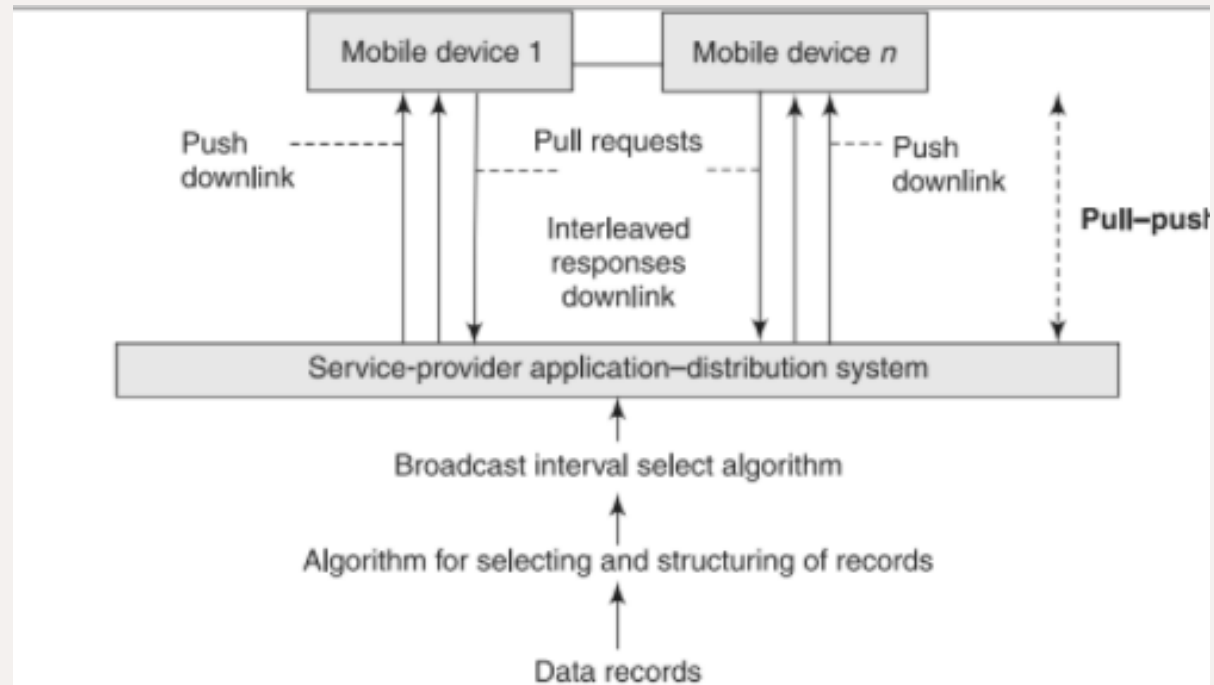
- With pull-based mechanisms, no unsolicited or irrelevant data arrives at the device and the relevant data is disseminated only when the user asks for it
- Pull-based mechanisms are the best option when the server has little contention and is able to respond to many device requests within expected time interval

Pull based mechanisms

Disadvantages

- The server faces frequent interruptions and queues of requests at the server may cause congestion in case of sudden rise in demand for certain data record
- In on-demand mode, another disadvantage is the energy and the bandwidth required for sending the requests for hot items and temporal records

Hybrid mechanisms



Hybrid mechanisms

Hybrid mechanisms function in the following manner

1. There are two channels, one for pushes by front channel and the other for pulls by the back channel
2. Bandwidth is shared and adapted between the two channels depending upon the number of active device receiving data from the server and the number of devices requesting data pulls from the server
3. An algorithm can adaptively chop the slowest level of the scheduled pushes successively. The data records at lower level where the records are assigned lower priorities can have long push intervals in a broadcasting model.

Hybrid mechanisms

Advantages

- The number of server Interruptions and queued requests are significantly reduced

Disadvantages

- PP does not eliminate the typical server problems of too many interruptions and queued requests

Selective Tuning Methods

Why selective tuning?

- Purpose of pushing and adapting to a broadcast model is to push records of greater interest with greater frequency in order to reduce access time or average access latency
- Mobile device does not have sufficient energy to continuously cache the broadcast records and hoard them in its memory
- Device dissipates more power if it gets each pushed item and caches it
- Therefore, it should be activated for listening and caching only when it is going to receive the selected data records or buckets of interest

Selective Tuning Methods

- Selective tuning is a process by which client device selects only the required pushed buckets or records, tunes to them, and cache them
- Tuning means getting ready for caching at those instants and intervals when a selected record of interest broadcasts.

Directory Method

- One of the methods for selective tuning involves broadcasting a directory as overhead at the beginning of each broadcast cycle
- If the interval between the start of the broadcast cycles is T , then directory is broadcast at each successive intervals of T
- A directory is broadcast along with the data records, it minimizes tune and access.

Hash Based Method

- Hash is a result of operations on a pair of key and record.
- Advantage of broadcasting a hash is that it contains a fewer bits compared to key and record separately
- The operation are done by a hashing function
- From the server end the hash is broadcasted and from the device end a key is extracted by computations from the data in the record by operating the data with a function called hash function. This key is called hash key

Index Based Method

- Indexing is another method for selective tuning.
- Indexes temporarily map the location of the buckets. At each location, besides the bits for the bucket in record of interest data, an offset value may also be specified there
- Indexing is a technique in which each bucket, record, or record block of interest is assigned an index at the previous data bucket, record or record block of interest to enable the device to tune and cache the bucket after the wait as per the offset value

Distribute Index based method

- It is an improvement on the index method.
- In this there method, there is no need to repeat the complete index again and again.
- Instead of replicating the whole index m times, each index segment in a bucket describes only the offset I of data items which immediately follow

Alternate Methods

- Temporal addressing
- Broadcast addressing

Flexible Indexing method

- The number of bits in a local index is much smaller than that required when each record is assigned an index
- This method proves to be beneficial