A Survey of Client Server Protocol Implementation

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Abstract: -- This paper aims to summarize the client server protocol implementation. Client-server is a system that performs both the functions of client and server so as to promote the sharing of information between them. It allows many users to have access to the same database at the same time, and the database will store much information. The internet protocol TCP/IP uses computers called gateways, which provide all interconnections among physical network. The purpose of this system is to communicate between clients that are connected to different servers. This paper will provide information about client server mobile computing in terms of its paradigms, architecture, and framework.

Keywords: Mobile Environments, Client/Server mobile computing, Bit sequences, Quality of services, Crash recovery.

I. Introduction:

A server is a program or collection of cooperating programs that provides services and manages resources on the behalf of other programs. The term client-server refers to the network architecture where one or more computers are connected or the client or more sends a service request to another computer or server. A client is a single user workstation that provides presentation services, database services, connectivity along with an interface for user interaction to acquire to business needs. A server is one or more multi user processors with a higher capacity of shared memory which provides connectivity and the database services along with interfaces relevant to the business procedures.

The clients and the servers are the logical entities that work together over a network to accomplish a task. Client/server architecture is also called 2 tier architecture. A client is talking to a server which performs some services on behalf of the client. A communications protocol that provides a structure for requests between client and server in a network. For example the web browser in the user's computer (the client) employs the HTTP protocol to request information from a website on a server.
Client/server is a program relationship in which one program (the client) requests a service or resource from another program (the server). Although the client/server model can be used by programs within a single computer, it is a more important concept for networking. In this case, the client establishes a connection to the server over a LAN or WAN such as the internet. Once the server has fulfilled the client's request, the connection is terminated. The web browser is a client program that has requested a service from a server, in fact the service, resource, server provided is the delivery of this web page

a) A client typically performs the following steps:
b) Initiate connection to the cluster.
c) Authenticate.
d) Send periodic updates (Heartbeat).
e) Retrieve partition list.
f) Send operation messages and receive responses.
g) Get updates on cluster member changes.
h) Close opened connection

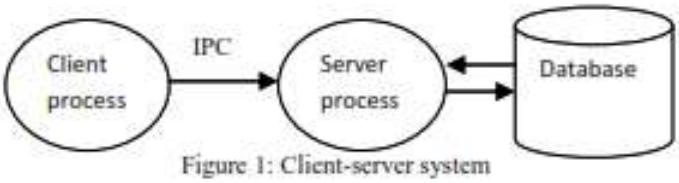

Figure 1: Client-server system

II. Related Work

Jin Jing et al. [3] have analyzed performance of BS through a simulation study that compares BS's effectiveness with that of a hypothetical optimal cache invalidation algorithm. In mobile and wireless environments, caching of frequently-accessed data is critical for reducing contention on the narrow bandwidth channels. Classical cache invalidation strategies in these environments are likely to be severely hampered by the disconnection and mobility of clients. It is difficult for a server to send invalidation messages directly to mobile clients because they often disconnect to conserve battery power and are frequently on the move. For the client, querying data servers through wireless up-links for cache invalidation are much slower than wired links because of the latency of wireless links. Also, the conventional client/server interactions cannot scale to massive numbers of clients due to narrow bandwidth wireless links.

According to Michael J. Franklin [10], Client disks are a valuable resource that is not adequately exploited by current client server database systems. The memory cache is managed through the use of a data structure containing an entry for each resident page and a list of available memory cache slots.
According to Michael J. Franklin [7], The correctness and performance issues arise when implementing logging and crash recovery in a page-server environment. The issues result from two characteristics of page-server systems: a) the fact that data is modified and cached in client database buffers that are not accessible by the server, and b) the performance and cost tradeoffs that are inherent in a client-server environment.
Networks of powerful workstations and servers have become the computing environment of choice in many application domains. As a result, most recent commercial and experimental DBMSs have been constructed to run in such environments.

These systems are referred to as client-server DBMSs. Recovery has long been studied in centralized and distributed database systems. Client-server DBMS architectures can be categorized according to whether they send requests to a server as queries or as requests for specific data items. Data-shipping systems can be further categorized as page-servers, which interact using physical units of data (e.g. individual pages or groups of pages such as segments) and object-servers, which interact using logical units of data (eg. tuples or objects) .There is still much debate about the relative advantages of the different architectures with respect to current technology trends Most commercial relational database systems have adopted query-shipping architectures.

Jin Jing, et al. [1], In his paper on client server computing comprises on advances in wireless networking technology and portable information appliances which have engendered a new paradigm of computing called mobile computing. Paradigms of mobile client-server computing-Existing research on mobile client server computing can be categorized into the following paradigms:-

a) Mobile aware adaptation
b) Extended client server model
c) Mobile data access

Mobile computing is distinguished from classical, fixed connection computing due to the mobility of nomadic users and their computers and the mobile resource constraints such as limited wireless bandwidth and limited battery life. Mobile computing (including mobile client server information access) is a rapidly changing research field that depends on a rapidly evolving set of technologies. Another way to characterize the client server computing in mobile environments is to examine the effect of mobility on the client server computing model.

In a client server information system, a server is any machine that holds a complete copy of one or more databases. A client is able to access data residing on any server with which it can communicate. Classic client server systems assume that the location of client and server hosts does not change and the connection among them also does not change. As a result the functionality between client and server is statically partitioned.

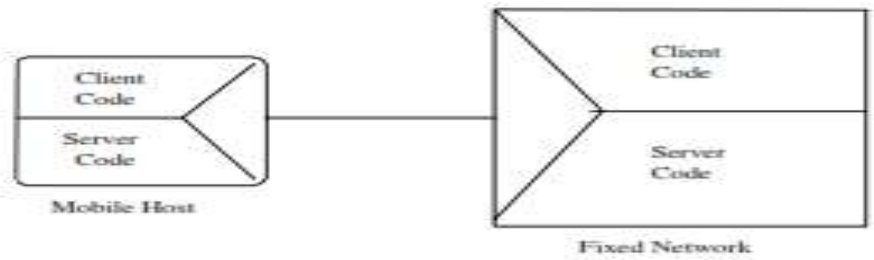

Figure: Extended client server model

Scott M. Lewandowski [2], her propose a framework for component based Client/Server computing systems which are comprised of two logical parts: a server that provides services and a client that requests services of the server. Together, the two form a complete computing system with a distinct division of responsibility. More technically, client/server computing relates two or more threads execution using a consumer/producer relationship. Clients serve as the consumer in a client/server system. That is, they make requests to servers for services or information and then use the response to carry out their own purpose. The server plays the role of the producer, filling data or service requests made by clients.
Client/Server computing attempts to leverage the capabilities of the networks used by typical corporations that are composed of many relatively powerful workstations and a limited number of dedicated servers.

Client/Server computing has gained popularity in the recent years due to the proliferation of low cost hardware and the increasingly apparent truth of the theory that a model relying on monolithic applications fails when the number of users accessing a system grows too high or when too many features are integrated into a single system.

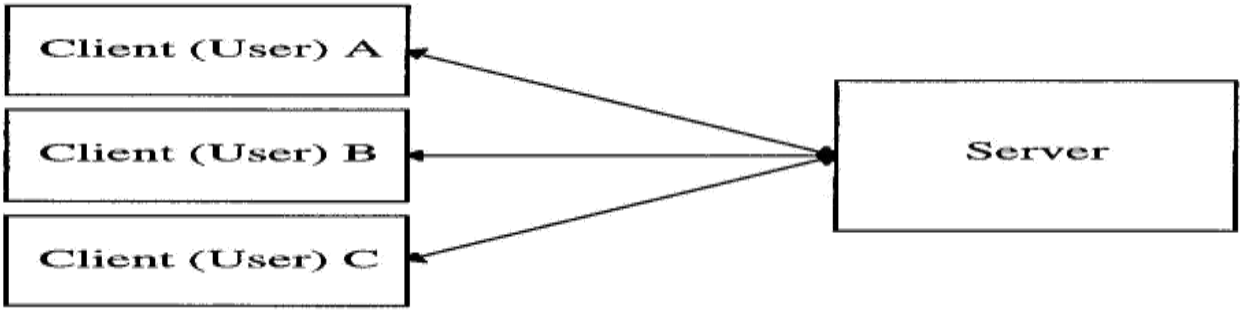

Figure: - A Traditional client/server system

a) Client
b) Server
c) Middleware
d) Fat servers vs fat client
e) N-tiered systems
f) Functions and benefits of client/server system

Distributed objects promise to revolutionize the stagnant client/ server market. CORBA's object references provide a clean way of gaining an object's inter-face. Callbacks allow servers to control clients and allow clients to receive new content to add to compound documents. In addition to its speed, the CORBA ORB is interoperable with objects and integrates smoothly with Java.

By supporting a three-tier client/server system, CORBA allows data from multiple sources to be encapsulated and pools of servers to be created.
Jin Jing et al [3], presents Bit-Sequences (BS) as a adaptive cache invalidation algorithm for client/server mobile environments. The algorithm uses adaptable mechanisms to adjust the size of the invalidation report to optimize the use of a limited communication bandwidth while retaining the effectiveness of cache invalidation. Three optimization technique:
First, for applications where cached data items are changed less often on the database server, we use the bit-sequence naming technique to reference data items in the report. In the bit-sequence naming, each bit in a bit-sequence (or bit-vector) represents one data item in the data-base. Second, instead of including one update timestamp for each data item, we use an update aggregation technique to group a set of data items and associate the set with only one timestamp in the report. The client disconnected after the timestamp can use the bit-sequence to identify the updated items. Third, we use a hierarchical structure of bit-sequences technique to link a set of bit-sequences so that the structure can be used by clients with different disconnection times. In this paper, we present a new algorithm called Bit-Sequences (BS) that uses these three techniques.
To reference data items in the database, a technique called bit-sequence naming is applied in the BS algorithm. The server broadcasts a set of bit sequences. Each bit in a bit-sequence represents a data item in the database. The position of bits decides the indexes of numbered data items

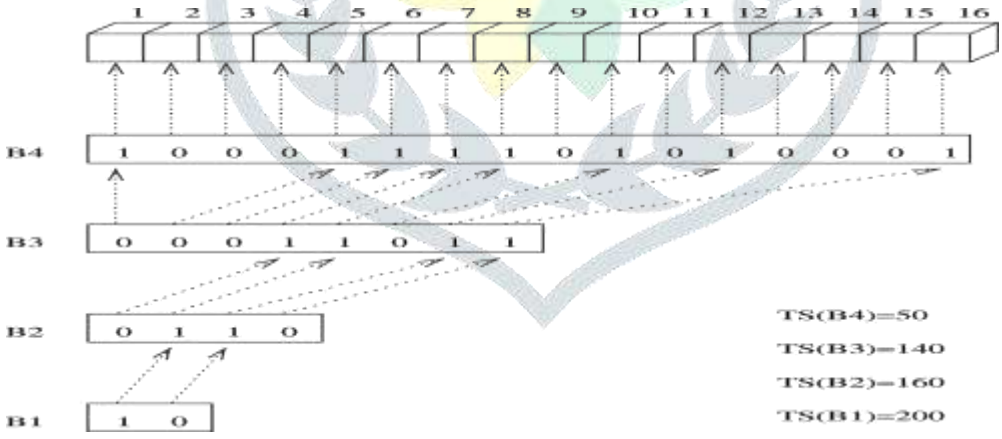

Figure: Bit Sequences

as a new cache invalidation algorithm called the Bit-Sequences (BS), in which a periodically broadcast invalidation report is organized a set of binary bit sequences with a set of associated timestamps
Nigel Davies et al [4], propose a distributed systems platform for mobile computing where there have been three significant research efforts aimed at producing general purpose distributed systems platforms for mobile environments. Mobile computing environments increasingly consist of a range of supporting technologies offering a diverse set of capabilities to applications and end-systems. Such environments are characterized by sudden and dramatic changes in the quality-of-service (QoS) available to applications and users. Resulting systems and commonalities applications and shortcomings

a) Mobile DCE
b) The most platform
c) Rover

d) Discussion

Dan Chalmers et al [5], focuses on the quality of service in mobile computing environment availability of light-weight, portable computers and wireless communications has made mobile computing applications practical. An ever more mobile workforce,

home working, and the computerization of inherently mobile activities are driving a need for powerful and complex mobile computer systems and applications integrated with fixed systems. Mobile cellular telephony is widely available and computers are being integrated with these telephones to form mobile computing devices. Many businesses are dependent on distributed, networked computing systems and are beginning to rely on high-speed communications for multimedia interactions and Web-based services.

Users are now requiring access to these services while travelling. In addition new multimedia applications are emerging for Web-enabled telephones and mobile computers with integrated communications. Multimedia applications require more sophisticated management of those system components, which affect the Quality of Service (QoS) delivered to the user, than for simpler voice or data-only system. Mobile Computing Applications :- There are many potential applications of mobile computing which will become important in the future, as the power of portable computing devices increases and the cost of wireless communications decreases Mobile systems can be categorized depending on whether they use fixed or radio communication services . Quality of Service :- Management of QoS includes various aspects, relating to the nature of perceived quality. This section provides an overview of QoS.

QoS defines non-functional characteristics of a system, affecting the perceived quality of the results. In multimedia this might include picture quality, or speed of response, as opposed to the fact that a picture was produced or a response to stimuli occurred. QoS management is defined as the necessary supervision and control to ensure that the desired quality of service properties are attained and sustained which applies both to continuous media interactions and to discrete interactions. It can be considered a specialized area of distributed systems management.

Michael J Franklin et al [9], Categorize Client-server DBMS architectures according to whether they send requests to a server as queries or as requests for specific data items. The system of the former type as query- shipping systems and to those of the latter type as data-shipping systems.

The client server version of the EXODUS storage manager. The client-server EXODUS Storage Manager (ESM-CS) is a data-shipping system which employs a page-server architecture. The implementation of recovery in ESM-CS involves two main components. The logging subsystem manages and provides access to an append-only log on stable storage. The recovery subsystem uses the information in the log to provide transaction rollback (e.g., abort) and system restart (i.e., crash recovery). The implementation of recovery also involves close cooperation with the buffer manager and the lock manager. The recovery algorithm is based on ARIES .

ARIES was chosen because of its simplicity and flexibility, its ability to support the efficient STEAL/NO FORCE buffer management policy, its support for save points and nested-top-level actions, and its ability to support fine-grained concurrency control and logical Undo. However, the algorithm as specified in cannot be directly implemented in page-server architecture because the architecture violates some of the explicit and implicit assumptions upon which the original algorithm is based. In this paper we describe our recovery manager, paying particular attention to the modifications to the ARIES method that were required due to both the correctness and efficiency concerns of recovery in a page-server system.

The architecture of client server environment has a clear division of labor between the server and clients. The server is the main repository for the database and the log and provides support for lock management, page allocation and reallocation, and recovery/rollback. Clients perform all data and index manipulation during normal (i.e., non-recovery or rollback) operation.

Each client process (i.e., each application that is linked with the client library) has its own buffer pool and lock cache and runs a single transaction at a time.

Patrica Serrano Alvarado et al [11], highlight the fact that Transaction support is crucial in mobile data management. Specific characteristics of mobile environments (e.g. variable bandwidth, disconnections, and limited resources on mobile hosts) make traditional transaction management techniques no longer appropriate. To manage data correctly, support for traditional properties of transactions—atomicity, consistency, isolation and durability—is needed or should be revisited with respect to the specificities of these mobile.

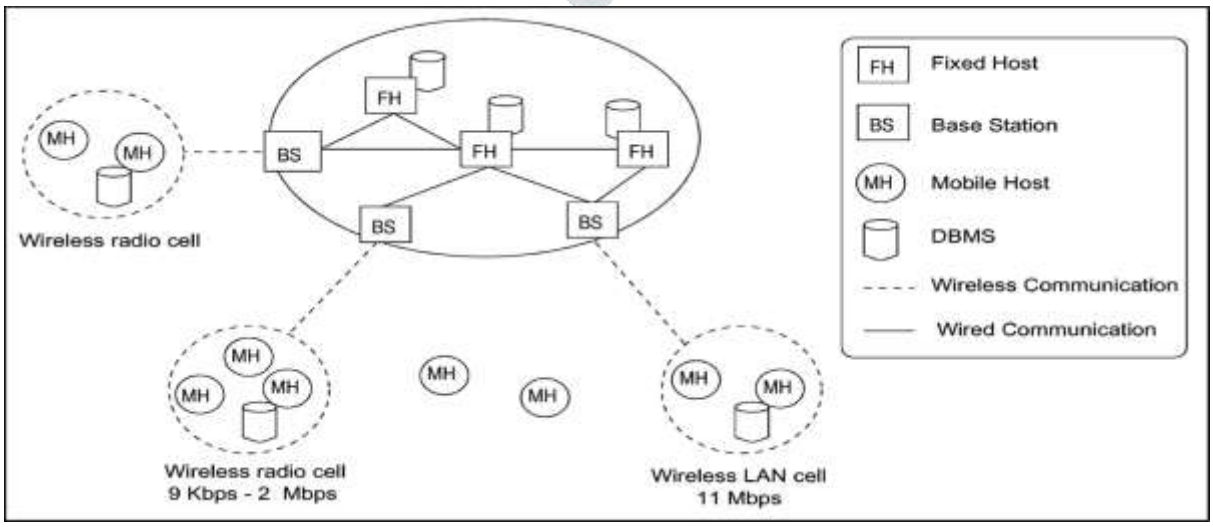

Figure: Mobile Environment Global Architecture

A Schill et al [12], In their paper suggest a Design and implementation of support platform for mobile communication facilities which enables a computer system to communicate independent of its location. Typically this requires wireless communicate support based on digital cellular communication systems, transparent roaming and handover radio between cells and higher-level protocols for reliable data communications and location management. From the basic networking point of view, current approaches can be classified as follows:
Cellular WANs, Wireless LANs, Access to conventional networks. The area of mobile computing is concerned with software support of distributed applications on top of mobile communication and computer infrastructure. Conventional networks, workstations and PCs are integrated into such overall environments. In many cases mobile computing applications implement cooperative tasks such as workflows support for distributed service engineers or joint computer aided design. Typically such applications are based on the client/server model and are using Remote Procedure Call (RPC) as their basic communication mechanism. Email is a rather traditional kind of application that has been use for several decades. Context of mobile computing a number of interesting new aspects and requirements are associated.

S S Riaz Ahamed et al [13], In this paper The Universal Mobile Telecommunication System (UMTS) is a third generation (3G) mobile communications system that provides a range of broadband services to the world of wireless and mobile communications. The UMTS delivers low-cost, mobile communications at data rates of up to 2 Mbps. It preserves the global roaming capability of second generation GSM/GPRS networks and provides new enhanced capabilities. The UMTS is designed to deliver pictures, graphics, video communications, and other multimedia information, as well as voice and data, to mobile wireless subscribers. UMTS also addresses the growing demand of mobile and Internet applications for new capacity in the overcrowded mobile communications sky. The new network increases transmission speed to 2 Mbps per mobile user and establishes a global roaming standard.

UMTS stands for Universal Mobile Telecommunications System. UMTS is one of the emerging mobile phone technologies known as third-generation, or 3G. Third-generation systems are designed to include such traditional phone tasks as calls, voice mail, and paging, but also new technology tasks such as Internet access, video, and SMS, or text messaging.
One of the main benefits of UMTS is its speed. Current rates of transfer for broadband information are 2 Mbits a second. The services are divided into four main classes:

a) Bearer Services
b) Tele services
c) Supplementary Services
d) Service Capabilities

Anupam joshi et al [14], propose that Mobile computing (or ubiquitous computing as it is sometimes called) is the use of computers in a non-static environment. This use may range from using notebook-type computers away from one's office or home to the use of handheld, palmtop-type PDA-like devices to perform both simple and complex computing tasks. The two primary information services were DIALOG Information Services and the World Wide Web.
The DIALOG service is an "electronic library/" accessible with a personal computer (or terminal) and modem through teleconununications networks such as MCI Data Services or SprintNet. International access is also available and coverage is offered in most areas of business, legal & government, news, science, reference, social sciences & humanities, and general information. The World Wide Web (WWW, Web) is a hyperlinked information repository on the global Internet. Information located on information servers is hyperlinked to other related pieces of information to form a giant infosphere called the Web.
In addition to convenient graphical browsers to navigate the Web, there are several searching tools that are available to search the Web based on keywords. We applied these search engines.

Viahnu Swaroop et al [15], In their paper state that Recent advances in wireless communication networks and portable computers have led to the emergence of a new research area called mobile computing systems. Many current researchers in the mobile computing arena share the same vision: ubiquitous access to information, data, and applications.
Mobile computing is a revolutionary technology, born as a result of remarkable advance in the development of computer hardware and wireless communication. It enables us to access information anytime and anywhere even in the absence of physical network connection. The mobile computing environment is observed as a distributed computing.
The complete database may be distributed among wired components as in mobile switching stations. The mobility of clients (host-MH) and disconnection between hosts and servers is very difficult to predict.
Data management for mobile wireless networks is really a challenging task. The challenges of data management system includes

a) How to ensure data availability in spite of disconnections.
b) How to manage weekly connected mobile wireless links between clients and server.
c) How to support constant resources availability to complete the applications

The necessary networking infrastructure for wireless mobile computing combines various wireless networks including cellular, wireless LAN, private and public radio, satellite services, and paging. Wireless networks communicate by modulating radio waves or pulsing infrared light. Wireless communications add new challenges in several areas of distributed computing. In general, wireless networks are more expensive, offer less bandwidth, and are less reliable than wire line networks.
Michael J Franklin [17], prove that The caching of data and/or locks at client workstations in an effective technique for improving the performance of a client/server database system. The paper is a re-examination heuristics for deciding dynamically between propagating changes or invalidating remote copies of data pages in order to maintain cache consistency.
The second is a study of the “callback locking” family of caching algorithms. These algorithms are of interest because they provide an alternative to the optimistic techniques and because they have recently begun to find use in commercial systems.
According to Archana Sharma et al [18], In this paper Mobile computing technology has developed rapidly due to the advantages of information access through mobile devices

and the need to retrieve information at remote locations. Improved storage and processing capability of mobile handheld devices and qualitative data services of mobile networks enabled read write transactions, possible in mobile devices. So mobile transactions obtain or retrieve information from a storage device either in connected or disconnected mode. Thus, it is expected to improve data availability while a disconnection. Mobile commerce is electronic commerce over wireless devices. It is often referred to as m-commerce. There are three basic types of m-commerce transactions which may be classified according to the type of payment effected and based on the technology adopted to implement the solution. There are a variety of combinations of these frameworks – technology adopted and mode of payment. Wireless network access has been used for communication by Mobile devices/Mobile Computers.

There are three different models available for m-transaction solutions on the basis of payment:

a) Bank account based
b) Credit card based
c) Telecommunication company billing based

Margaret H Dunham et al [19], focuses on Location Dependent Data whose value depends on its location. In traditional ways of managing data, the relation-ship between the data and the geographical location of the organization it represents is usually ignored. In wireless computing this property of \location transparency" is in fact often replaced by a \location de-pendency" property. Furthermore, the mode of issuing queries (the geographical location where the queries originate, the way they are issued, etc.) on such data determines the outcome. Location Dependent Data (LDD) refers to data whose values depend on location.

Query Processing of LDD

Data Alone: Store data in such a way that when a query is executed it is routed to the correct data to be examined. Thus the query is not modified, but the data (somehow) is stored and accessed in such a way that different instances of the database will be used to give different results.

Query Alone: Augment each query (transaction request) with location information. Thus when the data is accessed the correct answer will be generated. This may require extra location information to be added to the data, but the placement and access of data is handled as if the queries were location transparent. Only the query changes.

Both Data and Query: This approach requires both changes to how the data is stored and how queries are executed. This is the approach that we propose

Michael J Franklin et al [7], In his paper says that Database systems intended for a workstation environment are implemented using a client server software architecture. Client processes execute on workstation and provide interaction with user applications. Server processes typically execute on shared server machines and provide access to the database in response to requests from multiple clients.

According to Michael J Franklin et al [10], Client disks are a valuable resource that are not adequately exploited by current client server database systems. Caching enables the use of client disks without incurring the problem associated with giving ownership of data to client. The use of client disks as extended cache provides qualitative change in the utility of caching at client workstations compared to memory based caching strategies.

Friday and N [6], proposes extensions to emerging distributed systems standards to support mobile computing. These extensions are designed to allow the development of adaptive or reactive applications which are able to tailor their behavior based on changes in their communications infrastructure a key characteristic of mobile computing environments is that end systems experience differing degrees of connectivity during typical operational cycles. In particular, systems are expected to function when connected to a range of networks including high- speed networks (fully connected operation) and low-speed wireless networks (weakly connected operation), and when totally disconnected (disconnected operation). A fixed network environment can provide relatively reliable communications with a bandwidth of between 1 and 100 Mbps. Such characteristics make it possible to design applications and operating systems services with little regard for optimizing network traffic. Indeed, latency is often the overriding factor in determining the performance of fixed distributed systems while bandwidth is in plentiful supply.

Yongdong wang et al [8], the results of a simulation study of database concurrency control and application program cache consistency Algorithms in a distributed computing system. This work was motivated by the recent development of persistent programming languages and object-oriented database systems and client kver database architectures. In client/server architecture, the database resides on the server. Objects in the database are accessed by application programs running on client workstations. Objects are cached in the application to reduce the time required to access art object. Consequently, several copies of a shared object can exist in more than one application cache at the same time.

Mechanisms must be provided to guarantee that concurrent transactions accessing the cached objects and the database do not interfere. The efficiency of the application caching mechanisms is very important to the performance of the applications and the database system.

III. Conclusion

a) In this article, client –server computing in mobile environments, framework for component based, distributed system platform, quality of services is discussed. In the first section of the paper client performs the steps and mobile client server computing paradigm.
b) Bit sequences in which a periodically broadcast invalidation report is organized as a set of binary bit sequences with a set of associated timestamps. A mobile computing environment consists of two distinct set of entities: mobile hosts and fixed hosts. Some of the fixed hosts, called mobile support stations (MSSs), are augmented with a wireless interface order to communicate with the mobile hosts, which are located within a radio coverage area called a cell. The performance of BS's is analyzed through a simulation study that compares BS's effectiveness with that of a hypothetical optimal cache invalidation algorithm.
c) Quality of service, the specification and management of quality of service is important in networks and distributed computing system, particularly to support multimedia applications. The advent of portable lap top computers, palmtops, and personal digital assistants with integrated communication capabilities facilities mobile computing.

d) Second part discusses about the resulting systems, applications and shortcomings. Different optimization techniques are used in bit sequences.

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