

# Pervasive Computing Architecture, Applications, Issues and Challenges

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This paper describes the recent topic of pervasive computing which focuses on the introduction of pervasive computing, the architecture of pervasive computing, applications of pervasive computing, issues and challenges of pervasive computing. The pervasive computing is the latest computing technology which computing available each and every place. The pervasive architecture rates how the end-user interacts with the pervasive network using the middleware support. The heterogeneous network-connected devices join together with the help of pervasive computing application to provide services and resources to enable context-aware integrated information. A vision of pervasive computing is described along with attributes of a new application model that support this vision to reality. Finally, it describes the future focus for the pervasive computing through the real-time applications. The work presented in this paper tackles these problems context from a design science pervasive and drivers a new concept for pervasive mobile assistance in the aforementioned scenarios.

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## 1. Introduction

Albeit Pervasive registering is presented by Weiser in the mid-1990s yet it has turned into a functioning zone of research since most recent two decades. Inescapable figuring, which consolidates current system innovations with remote registering, voice acknowledgement, Internet ability, and man-made reasoning, propelled hardware is to make a situation where the availability of gadgets is implanted.

Unavoidable registering, likewise called omnipresent processing, suggests "existing all over the place" or "around us" is the developing pattern of implanting computational capacity (for the most part as microchips) into ordinary the principal target of this is to orchestrate them to impart profitably and execute productive assignments so that it limits end client's associations with PCs. Inescapable registering gadgets are organize associated and continually accessible.

In the Pervasive condition, any gadget from anyplace can access by the client since it spreads the knowledge and availability to pretty much everything. The real advancements and unique reason figuring gadgets, for example, sensors, microchip, web, working framework, versatile conventions, inserted controllers, PDAs, Wi-Fi, WI-MAX have been originating from inescapable processing.

From these territories inescapable processing encases three things:

1. It alludes to the manner in which how individuals have a place with versatile registering gadgets and utilize them to achieve undertakings inside their surroundings.
2. It alludes to the best approach to perform different undertakings how applications are made and sent.
3. Regarding condition, it alludes to the route how with the rise and omnipresence of new data and usefulness, the earth is improved.

## II. Applications of pervasive computing

### 1. Unavoidable Computing in Classroom Environment:-

Certain issues are related with learning in present day classroom situations. Such issues incorporate a failure of understudies to comprehend and absorb all that is being instructed in the classroom, the trouble experienced by understudies in adapting new points in classrooms, the powerlessness of understudies to hold what has been realized in the classrooms, and the dynamic idea of the present day training syllabus, among others.

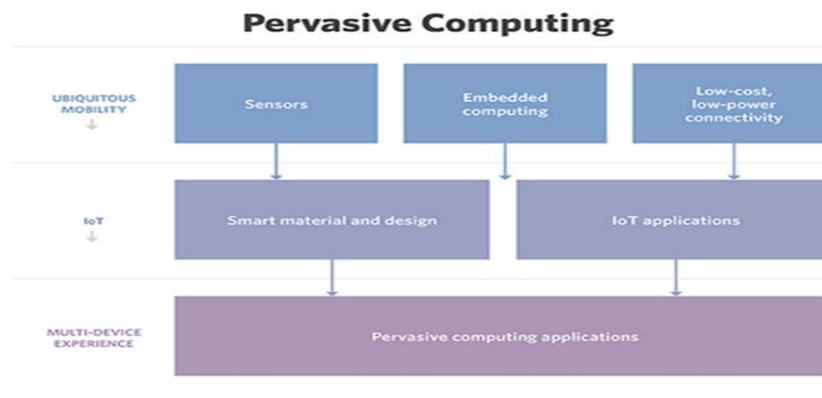


Fig 1: Pervasive computing.

## CURRENT TRENDS OF PERVASIVE COMPUTING IN CLASSROOM ENVIRONMENTS

The check more astute can be proposed three:- fundamental types of unavoidable figuring frameworks to be specific: tabs (wearable gadgets), cushions (hand-held gadgets) and sheets (show gadgets). He likewise proposed substantially more helpful scopes of inescapable gadgets, for example, cleans, skin, and dirt. Precedents of the present patterns of unavoidable figuring advances were featured.

**A. Flipped Classrooms:** - The flipped classroom is a present pattern in the use of unavoidable registering to learning conditions. It enhances the customary showing techniques to deliver online guidelines in brilliant classrooms. To a few specialists, the flipped classroom is viewed as another encouraging model which gives imaginative methods for giving learning to understudies in the classroom [11]. A few specialists have directed are as yet leading investigations on flipped classrooms. Bergmann and Sam's displayed flipped classrooms as a methods for connecting with each understudy. An expanding the accessibility of online recordings flipped classroom models and expanded simple access by the understudy.

**B. Learning Analytics:** - Learning investigation is additionally a present pattern that utilizes propelled devices to enhance the instructive experience and the execution estimation of understudies. It enhances the learning background of the understudy can be gaining from the past information and existing models of the classrooms framework. It has likewise refined classroom learning objectives and methodologies. Learning investigation has likewise been connected in the zone of perception and proposal. Learning investigation has been connected to build understudies' prosperity rate.

**C. Tablet Computing:-** Tablet processing is a part of figuring that applies portable PCs to take care of every day genuine issues. Tablet figuring is a part of processing that applies versatile PCs to tackle day by day genuine issues.

**D. Gigantic Open Online Courses (MOOCs):-** Massive Open Online Courses (MOOCs) speaks to courses that are open and taken by various members dispersed in various areas over the web; course materials are additionally conveyed. MOOCs speak to a way to stretch out mechanical abilities and learning to an expansive level of the world. It likewise goes about as an inspiration for advancing on the web training.

## 2. Pervasive Computing in Classroom Environment:-

Certain problems are associated with learning in modern classroom environments. Such problems include an inability of students to understand and assimilate all that is being taught in the classroom, the difficulty experienced by students in learning new topics in classrooms, the inability of students to retain what has been learned in the classrooms, and the dynamic nature of the present day education syllabus, among others.

## FUTURE TRENDS OF PERVASIVE COMPUTING IN CLASSROOM ENVIRONMENTS

Future patterns of unavoidable figuring innovation that will be connected inside classroom conditions in the following two (2) to three (3) years incorporate 3D printing advances, diversions and gamification, virtual colleagues and measured self.

**A. 3D Printing:-** 3D printing utilizes demonstrating programming to plan physical questions in the three-dimensional shape. A portion of the worries and research issues of 3D Printing include:

(i) Cost

- (ii) Inability to effectively print different materials on a similar machine
- (iii) Availability
- (iv) Printing to the best goals
- (iv) the printing procedure is moderate
- (vi) Legal issues.

**B. Games and gamification:** - Gamification is the utilization of the components and ideas of diversion outline and amusement thinking in a non-gaming setting. It can fill in as a way to incite innovative and basic reasoning, create critical thinking abilities and advance communitarian work.

**C. Quantified self Quantified:-** self applies innovations that screen information to enable individuals to monitor their day by day exercises. Security concerns, high costs of devices and inaccessibility of hardware are a portion of the difficulties presently confronting evaluated self.

**D. Virtual Assistants:-** Virtual associates apply the learning of man-made consciousness to help individuals in their various day by day exercises. It upgrades profitability by giving helpful applications to the scholarly world and industry. The Language obstruction, time distinction, trust issues, installment and trade rates are a portion of the worries related with virtual associates.

### 3. Unavoidable Computing to Enterprise Information Enquiry Service:-

The unavoidable registering advancements used to make request stage incorporate setup of WAP site for the server end, use of administration Chang Wu ShanHua Carpet Group Co., Ltd. Weihai, Shandong Province, PR. China, 264209 given by China Mobile to Nokia66 10, a setup of CMWAP benefit for the cell phone end and Java advancement innovation for the specialized gadget. Taking the online business of ShanHua Carpet Group Co, Ltd. as a foundation, the clients' questions to cover pictures and phone directory on the stage is executed.

1. Condition Configuration: The main route said above is presented in this segment. Along these lines, it can bolster the portable enquiry just if the WAP site which is on the server end is designed.

2. An arrangement on the Server End: First, ensure that the server has a legitimate IP address in the scope of the Internet and can give WWW benefit also. Second, introduce the documents required and arrange the WAP site to ensure that the administration can be acknowledged and reacted. The essential working framework and parts on the server end are:

- (1) Windows 2000 Server
- (2) Internet Information Server 6.0 (IIS6.0)
- (3) Active Server Page (ASP)

The design on the Mobile Phone End: Taking Nokia6610 and related administration given by China Mobile, for instance, the arrangement is as he pursues.

(1) Access "Administration" interface of the cell phone, select "Setting" alternative. For the most part, the cell phone has arranged administrations suppliers' settings which are normally utilized.

(2) Access the "Alter Service Setting" Option. Clients can set gathering name and landing page uninhibitedly, however, for the most part, the cell phone has set the gathering's name as "Portable Dreaming Network GPRS" and default landing page is <http://wap.monternet.com>. It'll be simply alright in the event that you would prefer not to alter them. The sort of association is delegated "constancy association" or "impermanent association". The Default esteem is "steadiness association". Association compose implies the association method for GPRS. Perseverance association is that it is keeping associated whenever and the transitory association is that it would interface with the GPRS when there is the demand sent by telephone. There is no love for the inquiries. The distinctions are that constancy association produces more information. In the event that the flag isn't powerless, it would e be able to set to "brief association" so as to decrease the information movement stream.

(3) Choose GPRS (General Packet Radio Service, GPRS ) as an information change technique. China Mobile gives two sorts of administrations. One is CMWAP which is the versatile entryway mode. It investigates the WAP site just through HTTP convention and it is shabby. Another administration is CNET. CNET can get to any administration without constraint and it is more costly. Here, the CMWAP can fulfil the demand of data benefit.

(4) Input GPRS association settings to CMWAP. IP Address is "10.0.0.172". Approval compose is "normal". Login compose is "mechanization". Username and secret key can be invalid. So it completes the cell phone design.

#### 4. Provenance-mindful Pervasive Computing in Clinical:

The selection of inescapable processing innovations in human services space is consistently ascending due to slanting in medicinal services cost and absence of clinical experts. Indeed, patient's condition should screen consistently in unavoidable innovations which guarantee a promising future in the advancement of clinical applications. The cutting-edge thingamajigs, for example, current ease and low influence cell phones, propelled correspondence innovations and versatile remote sensors give a chance to assemble rich clinical information about the patient( e.g. patients' conduct, physiological parameters, social elements, and so forth) to develop an inescapable human services framework. The data that is gathered is additionally transmitted to the concentrated clinical data framework which adds to the patient's electronic human services record. For basic choice taking the utilization and legitimacy of setting is a significant test for human services framework and to accumulate quality information from traceable individual gadgets. To address these difficulties, ebb and flow work in provenance look into the provenance standard W3C PROV is utilized. The principal root of provenance is expressive arts and recorded history of some craftsmanship. Following the historical backdrop of individual bits of information is in principle worry of provenance in PC frameworks.

In this paper, we survey to help information gathering, approval and incorporation form how ebb and flow building arrangements and past research endeavours are underwriting in clinical applications. We propose nonexclusive provenance-mindful inescapable framework engineering that permits recording not just clinical actualities about patients at the purpose of consideration (the present best in class) yet in addition important provenance data.

### III.ADVANTAGES AND CHALLENGES FOR PERVASIVE COMPUTING IN CLINICAL APPLICATIONS

The inescapable adjustment of ICT has drastically changed the social insurance scene in the course of the most recent decade. The accessibility and availability of patient's hardware records has enormously enhanced because of the wide arrangement of data framework innovation in human services focuses. The nature of social insurance administrations is enhanced with the developing volume of medicinal services data which offers help in the quick basic leadership for the treatment of illness and pandemic control fast basic leadership and more broad clinical research. Clinical research incorporates understanding focused research contemplates on human subjects. To encourage securing and joining of medicinal data into clinical research as of late a few ICT application ventures have developed. The principle point of these activities is to give a help to clinical research by creating foundations for incorporating dispersed and regularly heterogeneous information sources. For instance, there is the Electronic Health Records for Clinical Research (EHR4CR) venture which gives controlled and directed access to doctor's facility medicinal services and research data frameworks by proposing an incorporated stage, for example, Electronic Health Records (EHRs) and Clinical Research Information Systems (CRISs). In numerous nations these might be conveyed all through various clinics.

The inquiries might be then connected on the clinical research information by clinical analysts for the multi-site contemplate, for example, some arrangement of criteria ought to be set for the qualification of clinical preliminaries and distinguish the quantity of patients who effectively meet the prerequisites determined in the criteria.

For the individuals who are fascinating in setting up and leading clinical preliminaries such frameworks brought monetary (e.g. by diminishing expenses) and non-monetary (e.g. by decreasing choice occasions) benefits. A clinical research finding specifically relies upon finish and precise information. In the clinical research ventures, clinical research information has a to a great degree significant impact.

Ordinarily, this procedure is absolutely subject to paper-based documentation which is the most tedious and more inclined to blunders. In any case, because of innovative work, this is totally supplanted by early types of inescapable processing applications for catching information by utilizing PCs, for example, remote information catch (RDE) and electronic information catch (EDC). Inferable from the nonattendance of versatile equipment for information accumulation the acknowledgment of automated information gathering approaches were not propelled.

Unavoidable figuring is progressively achievable to assume control over the customary information gathering strategies in the social insurance area with the change in versatile equipment and correspondence advances. Simultaneously, there are some huge difficulties remain obstructions, for example, information traceability and approval in mechanized information gathering for clinical applications. Rather than impediments of paper-based information gathering (tedious and blunder inclined), it very well may be generally utilized for further approvals and examinations. In any case, the absence of

provenance limit is scarcely in electronic information accumulations. Albeit clinical information is spared in incorporated data frameworks, for different approval and examination occasion purposes still need to reply from where, how, by whom and in what conditions this information has been gathered.

### A TRIAL IN CLINICAL SCENARIO RAISING ISSUES AND CHALLENGES:

The survey of the current unavoidable social insurance arrangements recommends there is an absence of hotspots for the obtaining of usefulness to interestingly address different issues of information quality, honesty and approval. While incorporating information from various sources (e.g. from a few purposes of consideration) or taking a few estimations in various settings (e.g. sugar level with or without fasting of the patient) the real issue raises how information has been gathered, changed and checked for the pivotal spaces in a social insurance framework. For instance, there is an error in information gathering strategies in clinical frameworks like some can store patient's age others can store date of birth, these imbalances which lead reality bending which may produce extreme issues when a patient is chosen for clinical preliminaries and furthermore influences look into discoveries. In the accompanying passages, we propose a provenance-mindful figuring exceptionally intended to address named issues. To help it we present a running model which portrays information gathering methodology in a clinical preliminary and furthermore delineates for the upgrades in the nature of information how cutting-edge unavoidable figuring advances utilized. In this situation, right off the bat test is led to quantify the security of another medication. For that, a trial is completed in some doctor's facility on somewhere around 20 patients, execution strategies are like talked about in the past segment. All patients need to wear radio recurrence recognizable proof (RFID) labels for ID. The compact imperative sign screen is conveyed to a focal information server utilizing wired or remote systems are instrumented in a patient's room. The remote PDAs ready to transfer and download information from and to brought together information server is given to webpage experts.

#### Pervasive Computing used for Recovery Mechanisms for Context-Aware:

**Introduction:** The principal application part of unavoidable registering applications is setting mindfulness, which depicts the capacity to oblige execute assignments in light of current setting conditions. The most well-known case of setting incorporates an area of individual, closeness of individuals, contiguity of individual to a gadget or a question, gadget being utilized by an individual, the movement in which individual is included and some more. The processing situations for supporting setting mindful applications give administrations to setting data administration, asset revelation, area free naming, and approval and access control. We composed and actualized a job-based programming structure for building such setting mindful applications in which different clients might be engaged with communitarian exercises [16, 17, 11]. In this structure, the primary capacity of a job is to demonstrate set of benefits to execute application undertakings for clients. One of the vital qualities of setting mindful applications is their capacity to adjust under changing setting conditions. Setting-based adjustment requires dynamic reconfiguration of the apply-This work was bolstered by National Science Foundation awards 0411961 and 0708604 cation to incorporate assets and administrations in light of the present setting conditions. When we manufacture programming system our first spotlight is on giving helpful instruments to planning setting based versatile highlights. Be that as it may, our encounters with the sent applications uncovered different vigour issues that emerge because of the dynamic idea of such applications and furthermore because of the dynamic idea of the conditions in which the applications are conveyed. We understood that the nonappearance of use level customized blunder recuperation systems inside this structure prompted delicate applications, which were not able to adapt to different disappointment conditions. There are following three expansive classes of strength issues that we encountered: The dynamic reconfiguration instruments incorporated in an application for setting based adjustment would themselves be able to end up a reason for heartiness issues, if not appropriately outlined. In a few circumstances, an application may neglect to work accurately because of disappointments in finding the required assets and administrations amid a reconfiguration. Besides, the request of restricting different administrations to an application amid reconfigurations and simultaneous preparing of setting occasions can influence the rightness of the application.

Different sorts of disappointments can emerge amid the clients' associations with the administrations bound to the application. These incorporate disappointments because of system disturbances, benefit crashes, and access denials by administrations, which may prompt interruptions of any intuitive client sessions. A reconfiguration activity could likewise upset a continuous intuitive session, Symposium on Reliable Distributed Systems 1060-9857/08 \$25.00 © 2008 IEEE DOI 10.1109/SRDS.2008.13 13 making it end rashly.

An application that requires an undertaking to be executed just while some predefined encompassing setting conditions hold is inclined to disappointments when such conditions are abused. This is alluded as the setting nullification issue

**Programming Framework Overview:**

A context-aware application is programmed using an abstraction called activity. An activity defines a namespace for roles, objects, and reactions. The object abstraction is provided in the activity for accessing various resources and services required by the application. Under different context conditions an object is obligatory to perform different services.

Objects defined in an activity's namespace are shared by all the roles defined in the activity. Each role defines a namespace for objects and role operations. Objects defined within the scope of a role are private to that role; a separate instance of such an object is created for each role member. Such objects are required because within a multi-user application we may want different members of a role to access different instances of a service type based on their individual context. A role operation represents a task that is explicitly invoked by the role members. A role operation consists of two parts: a precondition and an action. A role operation precondition must be satisfied before the action can be executed. For coordination purpose, two types of events, start and finish, are defined for a role operation. An operation's precondition may be based on predicates involving counts of start/finish events of various role operations, role membership predicates, and predicates involving ambient conditions queried from context services.

When an operation commences the set of methods may be invoked as an interactive session on shared or private objects. An interface component is called as user coordination interface which is dynamically build and transferred to the user's device for each user. For role operations, users contact with a role manager through the UCI. Figure 1 illustrates the user services based on role.

**Pervasive Computing support Collaborative Work and Simulation:**

The PC upheld shared work (CSCW) space is likely a standout amongst the most dynamic research fields of late years. To be sure, because of the helps brought by PCs and savvy gadgets it is relatively difficult to discover individuals working without them. In this paper, rather than retelling the historical backdrop of CSCW we will look next difficulties and propose a unique engineering in view of promising points of view. Among the ongoing advancements and standards, one has an exceptional enthusiasm for us: the inescapable registering. This idea portrays the "basic" thought that gadgets of client's condition ought to have the capacity to impart and communicate to adjust their conduct to client's needs. Given this viewpoint our work has quickly centred around the manner in which we could incorporate the inescapable processing inside CSCW. Such coordination could bring different focal points: asset and efficient for organizations, work disentanglement and undertaking computerization for specialists. In a "green" thought it could likewise enable decreasing to work's lively effect by going with clients' in utilizing lighter gadgets and administrations. On the long street toward this achievement we have just sowed a few seeds. Thus as we will depict in the following segments we have proposed the PCSCW demonstrate (see beneath) which is intended to locally bolster unavoidable figuring for community oriented errands.

**PCSCW MODEL & SIMULATION:**

As our examination intrigue has concentrated on the coordination of the inescapable registering viewpoint in the PC upheld shared work, we have proposed in a past work [1] a unique model which goes for influencing shrewd gadgets to participate consistently to enhance and encourage the joint effort of clients. This model, named PCSCW for Pervasive Computing Supported Collaborative Work, depends on some basic yet basic "sub-models":

- A Task Model predominantly has two ideas:

1. Undertaking: speaks to an important procedure to be performed by at least one clients to accomplish a particular objective, for example, "making a website page", can be made out of an arrangement of subtasks or activities;
2. Activity: depicts a nuclear advance of an undertaking, it has no oppressive importance as it can't be comprehended outside of an errand. To show it we can consider the activity "opening an internet browser" that doesn't pass on a particular significance however can be incorporated into errands, for example, "looking through the web" or "browsing messages".
3. A Role Model worked over the assignment show, it broadens it by giving one more idea and a few refinements about undertakings.

**A Service-Oriented Business Rule-Based Application Platform in Pervasive Computing Environments:**

The quick advancement of unavoidable figuring has made both new business events and new difficulties for the modern undertakings. For dynamic related endeavor agreeably providing business administrations to their clients, for example, a relationship of urban open transport organizations or a supposed Virtual Transport Enterprise, the intrinsic necessities for the none base camp organization instrument has been a key issue for their applications incorporating into the inescapable registering condition. Absolutely in light of the fact that their business objectives are not represented by a helpful procedure, but rather some community directions or contracts to straightforwardly and also co-complementally give uniform administrations of same or comparable sorts to their clients. These prerequisites tested the coordinated application stage both in engineering outline and application advancement. The blend of Service-Oriented Architecture (SOA) and Business Rules Management (BRM), as two programming building strategies being sufficient development in both hypothesis and practice for business associations to adjust IT to the business objectives, will be a ground-breaking empowering influence to accomplish this end.

**The Motivation Scenario and necessities: -**

In the inspiration situation, the PTA said above comprises of a few transport organizations, for example, BUS Corporation, BRT (Bus Rapid Transit) Corporation and LRT (Light Rail Transport) Corporation, et cetera. Every enterprise in PTA can offer their vehicle administrations of same or comparative sorts yet in various rush hour gridlock modes freely, including purchasing tickets, arranging course, questioning movement data, and so forth. To accomplish the objective of straightforwardly giving the uniform administrations in unavoidable registering condition, we right off the bat present the judicious fundamental suppositions for the modern application as pursues:

1. There as of now exists a system for unavoidable figuring, and travelers can acquire transport administrations of assorted variety through the system at anyplace and whenever.
2. Smartcard is utilized for different purposes, for example, to recognize a traveler, to pay for tickets, to record a purchased e-ticket, et cetera.
3. E-ticket mode is received rather than conventional ticket to diminish cost and improve the technique of using the vehicle office, and an e-ticket recorded in smartcard can be perused with the smartcard scanner introduced on the transports or in stations.

In the inspiration situation, the PTA requests a development application example to help their individual business administrations to be coordinated into an application stage. The key difficulties of necessities for the application stage are portrayed as pursues:

1. Among the related endeavors, there is none central station to oversee the business to accomplish the versatility, and all ventures are self-ruling and of correspondence. Every undertaking may powerfully consent to or withdraw from the relationship because of the concurred directions.
2. Within an individual undertaking, an incorporated structure might be received to help unavoidable administrations coordinating and oversee and control every one of the administrations of their own.
3. Each brought together self-ruling system can be similarly coordinated together into a decentralized engineering of utilization stage to straightforwardly supply the bound together administrations for their shoppers by means of the joint effort conventions and component consulted among the related ventures.
4. Each administration execution must be business lead upheld in order to dexterously adjust to the quickly changed markets, on account of modifying some passage concession principles to draw in more travelers using their vehicles, for instance.
5. A system in the business rules administration must exist for helpful purposes, for example, the case that BUS Corporation distributed another ticket compose named BusPlusTicket that permits the travelers utilizing this sort of ticket to travel in both Bus and Rail modes.

**CONCLUSION:** This is a beginning time look into, we foreordained to actualize it in certifiable application and attempt to assemble a model of the framework and also utilize provenance devices proposed in this paper, for example, the EHR4CR venture. While executing we will distinguish various difficulties that exists in creating provenance-mindful unavoidable arrangements. The principle thought process of this paper is to prescribe a few strategies which are helpful for building unavoidable registering stage by utilizing present day innovation implies. The paper additionally executes an application on the stage by which representatives and clients of the organization can ask for cover pictures and phone directory administrations at whenever and anyplace. Alongside more research on the inescapable registering, it will convey more business opportunities to the endeavor in future.

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