

Review on Crowd Computing

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Abstract

The intensity of crowd consistently has brought ponders and same thing applies to the computing too. The amassed inactive cycles of CPU in large number gadgets owned by different people are fit for creating immense computing limit. We have named it as crowd computing. The author expect to exhibit swarm figuring in an advanced methodology. Reader will have the option to increase a reasonable perception of the different parts of crowd computing. The attributes, advantages, concerns, execution difficulties, applications, and instances of crowd computing are depicted extravagantly. To dispel any confusion, crowd computing has been noticeably contrasted with different closely resembling computing frameworks, for example distributed computing, Peer to Peer computing and supercomputing. The business estimations of crowd computing and extent of providing crowd computing as an assistance have additionally been investigated.

1.1 Introduction

History has seen numerous insurgencies affected by the power of the large group of people. Recently, we are encountering another crowd upset – crowd of PCs. Crowd of people can be told physical in the event that they are altogether situated in a solitary spot and virtual on the off chance that they interact with one another on some kind of stage to achieve an undertaking utilizing shared feelings. While Crowd Computing is characterized barely as being PC intervened computing utilizing an immense number of PCs carrying on as a crowd to achieve one objective of improving the computation. A Complex Computing job is disseminated over various geological and regulatory space, possessed by various individuals. It has been seen that more often than not these open claimed processing gadgets stay inert in this manner squandering an incredible number of cycles. It is much pondered that little PCs when cooperate, cooperatively give tremendous computation ability that is very similar a supercomputing foundation. Purchasing and keeping High Performance Computing Systems are exceedingly expensive undertakings. Assortment of open PC can give us a prudent option High Performance Computing alternative. Grid Computing has imagined this methodology and it has been effectively executed for a few activities. In spite of the fact that the idea isn't undoubtedly new in the time of cell phones, Crowd Computing has contacted another stature and become important more than ever^[1]. These cell phones are getting incredibly ground-breaking and reasonably asset escalated. Because of their broad utilization, an omnipresent High Performance Computing facility can be profited from anyplace and whenever. With another rush of digitization crosswise over industry and shopper portion, we are encountering an information storm in each computing condition which in the long run has required the handling of this information to separate the important data at constant. Crowd computing that offers a universal and practical High Performance Computing facility on request can adequately subside the regularly expanding interest and supply hole of computing power^[2].

In attempting to reinforce the communication and coordinated effort among machine and human, the term 'Crowd Computing' has been utilized in many contexts. It has been alluded to conceptualize in different manners through human computation, social computing, Crowd sourcing, mobile computing and distributed computing (Parshotam, October 2013)^[1,3]. Without a doubt, it speaks to various undertone on alternate points of view. Thus, individuals have characterized and portrayed Crowd Computing in various viewpoints in writing. In this chapter, we are referring to Crowd Computing is about practically identical to the Volunteer Grid Computing. We characterize it as a distributed system where many personally owned gadgets meet up offering the no cost computing cycles to complete a processing task. A more extensive meaning of crowd computing envelops usage of a colossal number of PCs with different limits conveyed topographically, having an alternate system space, distinctive administering specialists which energetically work together to achieve a major calculation issue that would somehow or another require a gigantic calculation asset to achieve the assignments. In a perfect world, the crowd offers their system wilfully^[4].

1.2 Different Perspectives of Crowd Computing

1.2.1 Crowd of Personal Computers and Mobiles/Gadgets

The crowd is a distinct assortment or gathering of individuals with shared reason and feelings. The vast majority have depicted crowd regarding size, similar to a huge number or gathering of individuals. The crowd, physical or virtual, shows conduct of a human crowd as indicated by their size, measurements, and qualities. The crowd can likewise be delegated open or shut dependent on the sorts of participation it bolsters^[5]. Each Crowd Computing movement is performed^[5] by a foreordained reason characterized by an initiator of the action; commonly, an application. The reason impacts the jobs of the members in question.

1.2.2 Working Principle

Crowd computing is, on a very basic level, a dispersed computing system where a major non-minor errand is isolated into various autonomous nuclear activities that are circulated over different computing gadgets for preparing. These nuclear errands are now and then alluded to as miniaturized scale assignments which are kept prepared in a job pool^[6,7]. Accessible crowd labourer are being scanned for and a lot of appropriate crowd labourers is chosen. Each miniaturized scale task from the activity pool is allotted to an alternate crowd labourer from that set. These smaller scale errands are given as straightforward projects to the crowd specialist with no logical data. After execution of these autonomous miniaturized scale undertakings, each crowd specialist presents the yield to the brought together ace where all the small scale results are accumulated, checked for blunders and collected to get the conclusive outcome.

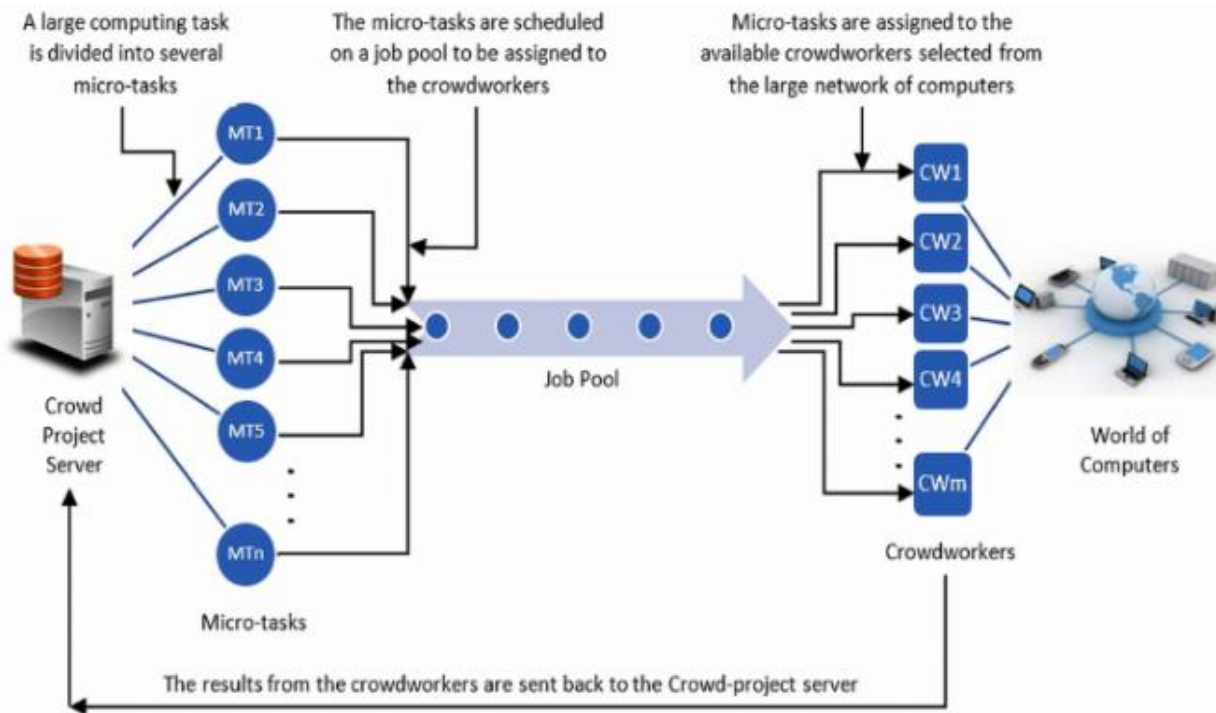


Fig 1.2.1 Fundamental Architecture of Crowd Computing

1.2.3 Components

- **Requester:** Person who want High Performance Computing and will submit the job for get processed on various systems.
- **Crowd Worker/Labourer:** Those who will lend their gadgets for executing the small activities of Requester.
- **Platform:** Middleware with server and client application to do the management. It create the job, identify suitable crowd workers, assign job to the worker and then after the execution collect the results, combine them and submit to the requester. It also handle the failure if occur. For doing all this first of all client application need to be installed in crowd workers gadgets which is actually responsible for CPU cycle stealing from the crowd worker device whenever it is free^[8].
- **Network:** All the devices should be connected through internet either using mobile data or Wi-Fi.

1.3 Crowd Computing Techniques

- **Desktop Crowd Computing:** When Device is immobile and have internet connection.
- **Mobile Crowd Computing:** Devices which are movable like smart mobile phones and tablets with internet connection. These days, these gadgets are getting astoundingly incredible and genuinely practically identical to their non-versatile partners like laptops and desktops. Henceforth, an adequate number of associated cell phones may give a significant computation limit^[9,10].

Table 1.3.1 Comparison between Desktop and Mobile Crowd Computing

Parameters	Desktop Crowd Computing	Mobile Crowd Computing
Availability	Less Available	More Available as number of smart phones increased
Scalability	Less Scalable	More Scalable
Flexibility	Immobile	Movable
Reliability	More Reliable	Less Reliable
Computing Capacity	More	Less if compared with same number of devices

1.4 Comparison of Crowd Computing with other Computing Approaches

- **Comparison with Peer to Peer Computing**

Table 1.4.1 Showing Similarities and differences between Peer to Peer and Crowd Computing.

Parameters	Crowd Computing	Peer to Peer Computing
Participants	Multiple	Multiple
Centralized Control	Yes	No
Level of Participants	All are on same level	All are on same level
Shared Resource Type	CPU	Files and Data
Connection	Dynamic	Dynamic
Mutual Benefit	Not Always	Always
Redundancy	Maintained for reliability	Maintained for reliability
Relationship Type	Many to One	Many to Many

- **Comparison with Super Computing**

Table 1.4.2 Showing Similarities and differences between Super Computing and Crowd Computing^[11].

Parameters	Crowd Computing	Super Computing
Availability	Not always	Always
Cost	Very Low	Very High
Security	Less Secure	Very Secure
Reliability	Not Reliable	Reliable
Energy Consumption	Very Low	Very High

- **Comparison with Cloud Computing**

Table 1.4.3 Showing Similarities and differences between Cloud Computing and Crowd Computing^[12].

Parameters	Crowd Computing	Cloud Computing
Availability	Not always	Always
Cost	Very Low	Very High
Resource Location	Highly scattered	Integrated
Reliability	Not Reliable	Reliable
Energy Consumption	Very Low	Very High

1.5 Feature of Crowd Computing

- **Computing Based on Demand:** User not required to acquire or purchase a powerful system. Whenever he require he can submit the job on Crowd Computing application through which job will be allocated to the available crowd workers or labourers.
- **Aggregate Efforts:** The excellence of Crowd Computing is that the aggregate effort of various little, fair size and enormous PCs in achieving a huge computing issue. Be that as it may, the intriguing point is that these supporters or the crowd workers regularly are blankness to one another. All things considered, this strategy of accepting little and divided help from the general population works out a broad undertaking cleansing the prerequisite of purchasing enormous supercomputers^[13,14].
- **Opportunistic:** Beauty of Crowd Computing is that it is opportunistic in nature. First, when a person submit the job on server, it will search for crowd workers and allocate the job opportunistically to those who were free at that time. Secondly Client application which is installed on client system steal the CPU cycles as it found it free.
- **Scalable:** In Crowd Computing crowd worker can be anywhere in the world, so it become easy to scale the crowd in crowd computing. If a computing job requires more system then easily server application can found the systems or crowd workers and scale the network.
- **Client Server Model:** In Crowd computing we follows client server model. Middleware with server and client application to do the management. It create the job, identify suitable crowd workers, assign job to the worker and then after the execution collect the results, combine them and submit to the requester. It also handle the failure if occur. For doing all this first of all client application need to be installed in crowd workers gadgets which is actually responsible for CPU cycle stealing from the crowd worker device whenever it is free. Clients are the crowd workers which will do the job computation^[15,16].
- **No Human Required:** No human intervention required on the client and server end in crowd computing as server will automatically divide the task, allocate it to the client machines and then collect the results. On the other end at client side, application will automatically steal the CPU cycles without the interference of any human. The majority of the preparing occurs out of sight without the information on the client. The job handling occurs without pestering any application.

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