



An Efficient IT-QMWFMTier Architecture for Work Flow Management through Queue Management in an IT Infrastructure

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Abstract: The term information technology or IT is used to refer to an entire industry. Information Technology is the use of computers and software to manage information. The term IT Infrastructure is defined as a combined set of hardware, software, networks, facilities, etc. (including all of the information technology), in order to develop, test, deliver, monitor, control or support IT Services. To maintain such services, we have to set up an infrastructure and also provide essential steps to maintain and manage those kinds of services. This kind of management is termed as *IT Infrastructure Management Services*. While the user wants to use this kind of IT Services, the infrastructure paves way for this by providing proper responses for the requests made by the user. These responses are provided by the IT resource persons those who managing and maintaining the services. The proposed methodology deals with this by undertaking the requests from the user and providing proper responses for the requests. The response is provided by analyzing the requests and then redirecting the requests to the resource person those who considering that kind of request. Thus proposed methodology provides proper services for the user by managing the work flow in an IT Infrastructure.

Keywords: Hardware, Information Technology, IT Infrastructure Management Services, Resource Person, Services, Software.

I. INTRODUCTION

Information Technology (IT) is the application of computers and telecommunications equipment to store, retrieve, transmit and manipulate data, often in the context of a business or other enterprise. Several industries are associated with information technology, such as computer hardware, software, electronics, semiconductors, internet, telecom equipment, e-commerce and computer services.

The Information Technology in India has gained a brand identity as a *knowledge economy* due to its IT and ITES sector.

The IT industry has two major components:

- a. IT Services
- b. Business Process Outsourcing (BPO)

The growth in the *Service sector* in India has been led by the IT-ITES sector, contributing substantially to increase in employment, exports and GDP.

In the 1960s and 1970s, the term Information Technology (IT) was a little known phrase that was used by those who worked in places like banks and hospitals to describe the processes they used to store information. With the paradigm shift to computing technology and paperless workplaces, information technology has come to be a household phrase. It defines an industry that uses computers, networking, software programming, and other equipment and processes to store, process, retrieve, transmit and protect information.

IT Infrastructure Management Services includes:

- a) Server Administration
- b) Desktop Support
- c) Managed Open Source Applications
- d) Network Monitoring and Support Services

IT Infrastructure Management is very essential to proactively safeguard the critical computing infrastructure by continuously monitoring servers and networks elements to catch problems before the users are affected; protecting

the environment from virus attacks, unauthorized users and other security threats; and backing up all data on all desktops and servers to ensure that the business critical information will never lose.

Thus, **IT Management** is the discipline whereby all of the technology resources of a firm are managed in accordance with its needs and priorities. These resources may include tangible investments like computer hardware, software, data, networks and data centre facilities, as well as the staffs who are hired to maintain them. Managing this responsibility within a company entails many of the basic management functions, like budgeting, staffing and organizing and controlling, along with other aspects that are unique to technology, like change management, software design, network planning, technical support, etc.

In that IT Company, there may be many problems that could be solved by the IT Staffs or employee. The problem can be solved by a group of people under that category. Each problem is consists of a ticket or service request. This service request is stored in a queue. From that queue, the team leader analyzes the ticket and based upon the category of the ticket, it is assigned to a member in the hierarchical organization of IT Company.

In this kind of service process, there may be situation in which the queue may become overflowed. If the queue becomes overflowed, then the user waits for a long time to process a request, even the request being simple. To avoid this kind of problem, we propose a methodology to process the service request efficiently and provide better response within a limited period of time.

II. RELATED WORK

Advance reservation of computational resources, one of the salient features in OpenNebula and Haizea, has been previously studied in the context of parallel computing [1], [2], [3] and, in the absence of suspension/resumption capabilities, was known to produce resource underutilization

due to the need to vacate resources before an advance reservation (AR) starts. By using virtual machines to implement leases, ARs can be supported more efficiently [4], [5] through resource preemption, suspending the VMs of lower-priority leases before a reservation starts, resuming them after the reservation ends, and potentially migrating them to other available nodes or even other clouds.

Medina-Mora et al. [6] categorize processes in an organization into material processes, information processes, and business processes. The scope of a *material process* was to assemble physical components and deliver physical products. That means, material processes relate human tasks that were rooted in the physical world. Such tasks include, moving, storing, transforming, measuring, and assembling physical objects.

Many commercial systems have been introduced to support WFM. The genesis of WFM software was probably in automating document-driven business processes [7]. Some of the early products were extensions to the document imaging and management software [8]. Rosy estimates of fast expanding market size from less than \$100 million in 1991 to about \$2.5 billion in 1996 [9] drew significant interest of software companies, and spawned a host of new products for WFM. Presently, commercial WFM systems for office automation can support document management, imaging, application launching, and/or human coordination, collaboration, and co-decision.

Frameworks intended for identifying and organizing issues associated with offshore outsourcing of software development have focused on project or site selection. Existing frameworks were not comprehensive because they do not fully address one or more of the following issues: (1) the relationship between project characteristics and site suitability, (2) financial and intellectual property issues in the context of software development, and (3) the role of agents outside the outsourcing and vendor firms in the offshore outsourcing process. To overcome these limitations, Michael et al proposed in paper [10], a more comprehensive framework that links projects and sites. It also includes environmental agents whose actions affect resource availability at the sites. The framework serves as an useful tool to systematically address the issues that arise in the context of offshore outsourcing of software development.

The software development industry employs millions of workers throughout the world. Until recently, almost all of them lived in the industrialized West, especially in the United States, which has dominated software development since the creation of the industry. Beginning in the late 1980s, several articles have appeared in trade journals warning of the loss of jobs in software development to “offshore outsourcing” [11], [12], [14].

III. PROPOSED FRAMEWORK FOR IT WORKFLOW MANAGEMENT BY QUEUE MANAGEMENT

The aim of the proposed work is to develop a framework to manage the service request made by the user by maintaining the work flow in the queue.

The summary of the proposed methodology is as follows: The IT organization comprises of several level of programmers and several kinds of process to be undertaken in order to manage the IT Infrastructure. One of the

processes carried out in an IT field is to process the user request submitted to it. The user request is termed as Service Request or Ticket. Once the user submitted the Service Request, it is stored into the queue maintained by the Team Leader. The team leader acts as a reviewer, reviews the request, analyzes the request and then allocates the request to the team member who can able to process that kind of request.

In this type of request handling, there may be a chance to occur overflow in the queue while storing the request. In that situation, the user has to wait for a long time to process their request; even it may be a simple one. To avoid this drawback, the proposed methodology handles it efficiently by managing and maintaining the queue properly. The queue is maintained properly by splitting the queue into sub-queues with respect to the priority for the service request. The service request, upon submitted by the user has been stored in the main queue. The request in the queue is continuously monitored by the team leader. The request may be stored along with the user-assigned priority for processing the request. Based on the user-assigned priority and the SLR time bound calculated for processing the request, by the team leader or reviewer, the request is assigned to the sub-queue. The reviewer maintains three kinds of sub-queues: one for request with high priority, one for request with medium priority and another one for request with low priority.

Upon calculating the time bound, the request is transferred to one of these sub-queues. While transferring the request, if the user assigned priority for the request, it may also be considered. Thus the reviewer upon reviews the request in the main queue, transfers the request to one of the sub-queues. The queue management is shown in Fig.1.

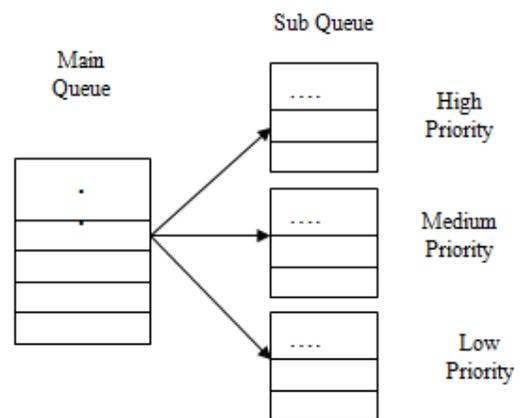


Figure.1 Queue Management for Workflow Maintenance

After assigning the request to the sub-queues, the reviewer searches for the team member to assign the request for processing. The time bound is calculated by the starting time and the maximum and minimum time to complete the process. Based on the time bound calculated, the request is allocated to the sub-queue. If the calculated time bound is very less, then the request is transferred to the queue with high priority. If the calculated time bound is normal, then the request is transferred to the queue with medium priority. If the calculated time bound is more, then the request is transferred to the queue with low priority.

The request in the high priority queue is processed first, since the requests have been processed in a less time period.

Likely, upon processing the request in high priority, then the request in medium priority queue is processed and finally, the low priority queue has been processed. By processing the request based on the priority, the user can able to get the response in a very efficient time period. The user submitting the request with less time period is processed first rather than processing the request with more time period. Thus the queue is managed efficiently and the work flow is maintained successfully.

IV. FRAMEWORK ARCHITECTURE

The proposed methodology consists of a framework architecture which is a Tier Architecture. The proposed framework architecture is shown below in fig.2.

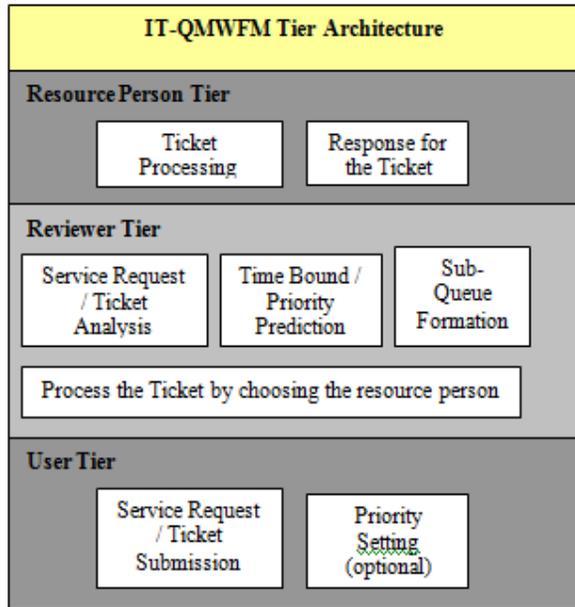


Figure.2 Framework Tier Architecture

The methodology in the proposed framework consists of a 3-Tier Architecture named as IT-QMWF (IT-Queue Management for Work Flow Management).

- a. The lower tier is the User Tier, in which the user can submit the request with user-defined priority.
- b. The middle tier is the Reviewer Tier. In this tier, the reviewer can analysis the request, then calculate the time bound and then assign the request to one of the sub-queues based on the request priority or time bound calculation. Finally, the reviewer selects a resource person to process the ticket.
- c. The upper tier is the Resource Person Tier, in which the allocated resource person handles the request and provides the response to the user.

V. IMPLEMENTATION ALGORITHM

Start
 Categorize the resource person,(rplist)
 Get the Service Request from the user(sr)
 The service request, sr stores in the main queue, MQ
 Create 3 sub-queues
 Q1 – for High Priority Request
 Q2 – for Medium Priority Request
 Q3 – for Low Priority Request

Reviewer analyzes the request, sr in MQ
 Calculate the time bound for the request, sr
 $Time_Bound = (Starting_Time - Min_Time) \text{ to } (Starting_Time - Max_Time)$
 Check out the range of time bound.
 If $Time_Bound < 15 \text{ min}$ then
 Transfer sr from MQ to Q1
 Else if $Time_Bound > 15 \text{ min}$ and $Time_Bound < 30 \text{ min}$ then
 Transfer sr from MQ to Q2
 Else if $Time_Bound > 30 \text{ min}$ then
 Transfer sr from MQ to Q3
 End if
 If Q1 not empty then
 Process the request in Q1 by assigning it to resource person,
 rplist
 Else if Q1 empty and Q2 not empty then
 Process the request in Q2 by assigning it to resource person,
 rplist
 Else if Q1 empty and Q2 empty and Q3 not empty then
 Process the request in Q3 by assigning it to resource person,
 rplist
 End if
 Send response to the user submitting the request, sr
 End

VI. EXPERIMENTAL RESULTS

The proposed framework to maintain the work flow in an IT organization by queue management is experimented successfully and the result has been verified. The experimental setup is carried out in an IT organization by taking set of requests and set of resource persons. First, the request is organized in a common queue and it is assigned to the resource person to solve it. The maximum time period required to complete the request in a queue has been identified and noted. Also, the time to solve each user request has been noted.

After this, the next step to experiment the proposed framework is carried out, by calculating the time bound to process the request. Based on the time bound calculated, the service request has been separated and organized into 3 sub-queues based upon the priority. Upon transferring the request from the main queue to the sub-queues, the request has been processed and the time period to complete the process has been identified and noted.

Comparing these two periods, the proposed framework seemed to be performing well and the request has been processed successfully and efficiently.

The sample data related to banking information is shown in the following table-1 to table-6.

Table – 1: Resource Person List (rplist)

RP ID	Status
RP1001	Free
RP1002	Allocated
RP1003	Allocated
RP1004	Free
RP1005	Free
RP1006	Free
RP1007	Free

Table – 2: Tickets

Ticket No	User Name	Request
T101	ABC	Account Creation
T102	XYZ	Net Banking Request
T103	SKV	Recover Password
T104	MNP	Senior Citizen FD Details
T105	VND	Account Details Updation
T106	SSD	Account Information
T107	PQR	Online Transfer

Table – 3: Priority Setting

Ticket No	Time Bound	Priority
T101	30 – 40	Low
T102	45 – 50	Low
T103	10 – 15	High
T104	10 – 15	High
T105	20 – 25	Medium
T106	10 – 15	High
T107	25 – 30	Medium

Table – 4: Queue-1 (with High Priority)

Ticket No	Status
T103	RP1001 (Processing)
T104	RP1004 (Processing)
T106	RP1005 (Processing)

Table – 5: Queue – 2 (with Medium Priority)

Ticket No	Status
T105	RP1007 (Processing)
T107	Waiting (until RP free)

Table – 6: Queue – 3 (with Low Priority)

Ticket No	Status
T101	Waiting (until RP free)
T102	Waiting (until RP free)

These tables' shows the proposed framework by splitting the request from the main queue into sub-queues based on time bound. Thus the proposed framework performs well and the aim of the paper has been successfully implemented.

VII. CONCLUSION

To manage the work flow in an IT organization by maintaining the Queue is implemented successfully and also the experimental setup has been carried out to verify the efficiency of the proposed framework. The methodology to maintaining the queue based on the priority and time bound to complete the process, provides better responses for the user submitting the request. Since, the request with less time bound is processed first, the waiting time for the user those who submitting the simple request has been responded earlier, by avoiding the unnecessary waiting time. Thus the proposed framework performs efficiently to satisfy the aim of the paper.

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