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## *The Efficient Utilisation of Environment Resources*

**Madhu Dande**

Information Technology Consultant

TCS,

Bangalore, India

*Abstract: In an Enterprise, The Efficient Utilisation of Environment Resources includes the following components: Hardware, Software, Network, Data, I/O, Memory and Storage except Man & Power Resources. Each Enterprise would be doing specific business and been divided into Portfolios for the simplification of their Business. Each Portfolio works on the different programs and the programs are further divided into projects to attain their business goal. Each project follows the Standard SDLC process to complete it. In IT Industry different environments are needed to complete a project. The timeline for the phases in the SDLC follows certain number of days. In which there is a possibility of delay in the Test execution cycles due to the defects, Network connectivity issues etc. This paper details about the environment resource utilisation in an efficient way.*

*Keywords: Cloud Computing, Vblock, Networks, Resources, SDLC phases, Environments and Servers.*

### I. INTRODUCTION

One of the biggest retail chain stores in United Kingdom has computerised system in their entire business including retail shops. Various applications are created for the customer's benefit to simplify the process of buying and selling of the quality products. Each application serves different purpose of the company and these applications follow the standard SDLC phases. Based on the Project Architecture, environment team sets up the required environment based on the project timelines which has to be shared to the development and testing teams as well other stakeholders.

This paper contains four problems defined in sections and considering the fourth problem and providing the solution to improve the effective utilisation of the network resources based on the weightage and usage on Phases and Environment which would define the importance of the network maintenance.

Section-1 defines about the network which exists in the one of the largest retail chain stores in UK.

Section-2 defines the systems which are connected via network and this section mainly concentrates on the man power resources who work in the IT section of the business.

Section-3 defines the different Environments in the organisation for develop and implement the work in the form of Project, which improves the customer service with increases in productivity of the business.

Section-4 defines the different types of the projects in the organisation as follows: New Business, New enhancements, modification of the existing project, Migration projects, decommissioning projects and data centre consolidation which consist of the Hardware, software and Networks.

### II. DIFFERENT TYPES OF NETWORKS

This enterprise is one of the oldest and richest in the culture to provide the best customer service. Technology has increased speed of business for the last three decades. For the last decade enterprise is in competition to reduce the risk and faster to market i.e. in time to market.

Consider this paper as a case study of the leading retail chain stores in the United Kingdom.

There are different types of the networks which are in the process of moving from legacy to virtual networks.

The following networks are considered.

1. Cloud environment
  - a. VMware- based on the project requirement, this cloud environment will be chosen.
  - b. AWS- Amazon Web Service.
  - c. Azure: Microsoft cloud computing.
  - d. Convergence Infrastructure- is also called as VBlock (VCE(VMware, Cisco and EMC2) uses for racks containing the components of its data center products, which is the combination of the VMware, Cisco and EMC2)
2. Legacy or Traditional Network- which is called as S-Block

The IT world is progressing towards the Cloud to reduce space constraint and risk, maintenance cost etc.

### III. DIFFERENT TYPES OF SYSTEMS

Any organization /enterprise allocate the employees for the different sectors of the business (considering the employee, working in the IT sector) who follows the standard SDLC phases to develop and test the application.

List of employee types:

1. Employees : In-House Man Power Resources
2. Contractors
3. Third party Contractors
4. External Vendors

Based on the Employee type and his roles and responsibilities, Systems or Desktop are provided.

Consider En employees are working for a company.

Where n is the total number of employees in the company.

Each employee will have a Desktop or System or Laptop i.e. there is a possibility of having more than one system per person or employee.

Number of Employees which all includes all employee types as En

Number of the Desktop considered as Dn

If the Employee is holding more than one, can be having a laptop as Ln

$En = Dn + Ln$

If we consider an employee holding two systems which has software's (OS, Office, other tools like Development tools (Which are licensed i.e. Weblogic Server, Web Sphere, Web Methods, Ab-Initio) and Testing Tools like UFT(Unified Functional Testing, Performance Center and Application Life Cycle Management etc., hardware's, Storage capacity and network (Connectivity, Bandwidth).

Note: Employee can login to the system using the Enterprise network only as a single user.

$D_n = \text{Software} + \text{Hardware} + \text{Network} + \text{Data} + \text{Memory} + \text{I/O} + \text{Storage}$

$L_n = \text{Software} + \text{Hardware} + \text{Network} + \text{Data} + \text{Memory} + \text{I/O} + \text{Storage}$

Similarly, for laptop expenses would be approximately equal to Desktop.

$D_n = L_n$

Currently in the business world, all organizations and industries use electronic devices to complete the work within time. Similarly in the retail market industry, time to market plays a crucial role. For that reason all the employees in the organization either will have a desktop or laptop. In some conditions each employee may have more than one system. To avoid the unauthorized access into the network using the double system login on either desktop or laptop. Due to the double systems login which will cause an unnecessary usage of network bandwidth, Software License eg. Operating Systems and Microsoft office similarly for Hardware like Hard disk, RAM etc.

In present days the working environment resource uses the thin client to reduce the cost of the system maintenance.

#### IV. DIFFERENT TYPES OF ENVIRONMENTS

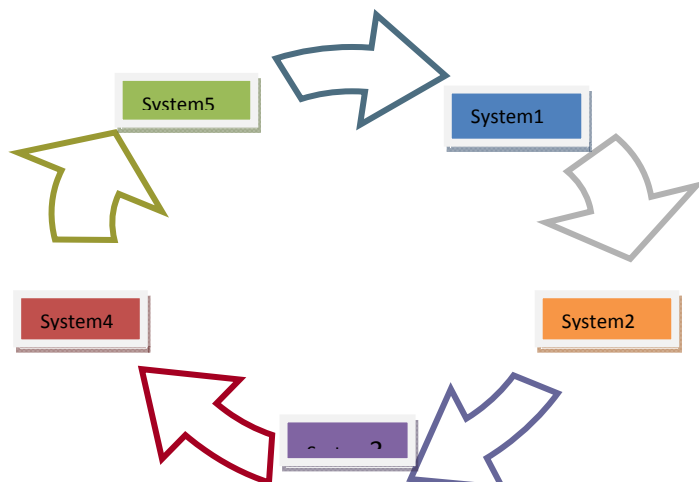
Each application goes through the list of following phases for application deployment.

1. Development, Unit Testing (Code Review)
2. Integration Testing (Module Level Testing/Card Level Testing)
3. Deployment Options Testing (where the both old and new code of the application should run on the both old and new systems i.e. Vice Versa)
4. Factory Acceptance Testing (will be carried out by the Business to accept the third party product usage)
5. System Testing (Business team will ensure the System Functionality of the third party product/current in-house development)
6. System Integration Testing (Team will ensure the functionality of the system and check the end to end testing)
7. User Acceptance Testing (Business users will validate the business scenarios)
8. Performance Testing (Volume & Performance Testing) Consider this environment as mirror image of the Production.
9. Service Acceptance Testing and Implementation Validation Testing (Team will check any change in the service (Network, Hardware, Web Services etc as well in IVT will check the developed code can be deployed in any box without any issues)

#### V. DIFFERENT TYPES OF PROJECTS

Consider a project which works on multiple systems/products. In which each system/product consist of the both Middleware (Application Web server) and Backend (Database server). Assuming, these systems follow the data flow in certain direction which communicate between the neighbor systems.

Eg: System-1 communicates with System-2 and System-5. Where System-2 is considered as down-stream and System-5 is up-stream.



Fig(a)

- 2-Tier application architecture which as client/server application also called as Thick client.
- 3-Tier application Architecture which called as Web application.
- 4-Tier/N-Tier application Architecture which called as Distributed applications

In End to End Environment of an Enterprise project which consists of five different systems/products.

Each system has multiple environments before moving on to the Production. Which means software development life cycle follows the standard SDLC phases either water fall/Agile methodology or any other process. In this case,

Let's consider the project with five different systems.

Sl:No	Project	Systems	Server Details	Technology	Code Change	Connectivity
1	Project Name	System-1	Database Server : Ab-initio	Oracle	Yes	System-1, System-2 and System-5
			Web Server B2B Configuration	Weblogic	Yes	
		System-2	Database Server	MS SQL Server	No Change	System-1 and System-2
			Web Server	Web Sphere	No Change	
		System-3	Database Server	MySQL Server	No Change	No need
			Web Server	Tomcat	No Change	
		System-4	Database Server	MS SQL Server	No Change	No need
			Web Server	Weblogic	No Change	
System-5	Database Server	MS SQL Server	No Change	System-1 and System-5		
	Web Server	Weblogic	No Change			

Table-1

In this project there are different Systems/Products in the network. Each System/Product will have server details for Database and Middleware and Technology. Basically, different systems/products/applications which we used in our project need to be tested and deployed into production. As discussed each system will have the different server which consists of the Application server which can be called as middleware servers and data is stored in the data base servers which called as Backend.

Based on the project, need to work on the

5 Systems/Products = 5 Different Environments is used in development, testing and Implementation of the project.

Total number of Environments = 5\*5 = 25 Environments

Note: At any point of time all the environments may/may not be utilised.

Sl:No	Environments	Full Setup	Prod Data
1	Development	Not needed	Not Needed
2	Unit/Integration Testing	Not needed	Not Needed
3	Factory Acceptance Testing	Not needed	Not Needed
4	System Testing	Not needed	Not Needed
5	Deployment Option Testing	Not needed	Not Needed
6	System Integration Testing	Needed	Needed
7	User Acceptance Testing	Needed	Needed
8	Volume and Performance Testing	Needed	Needed
9	Service Acceptance Testing/Implementation Verification Testing.	No Needed	No Needed
10	Production		

Table-2

Each system has the following list of environments in IT of UK largest retail chain stores.

Based on the project architecture the environments are created and allotted to the specific project for their usage. Which will be continued to utilise until the project completes their activities. As well it doesn't have fixed time to release the systems from the environments. Main reason to run the project with specific task is defined the timeline with cost. Most of the projects will overrun the timelines.

In an Agile Methodology, the 3-Amigo process where Business Analyst, Development Team and Testing Team work together to complete the project. Development and Testing team needs the resources to work on the project. So the development team requires the basic development environment. Test Manager should be the right person to decide the project requirements what to test and what not to test.

**Test Manager will give the weightage or usage of each environment and phase.**

Environment Values Range	Phases Value Range
<ul style="list-style-type: none"> <li>• 100% usage of all Environments</li> <li>• 80% usage of all Environments.</li> <li>• 60% usage of all Environments.</li> <li>• 40% usage of all Environments.</li> <li>• 20% usage of all Environments</li> <li>• Not utilised all Environments.</li> </ul>	<ul style="list-style-type: none"> <li>• 5 weightage of the each phase</li> <li>• 4 weightage of the each phase</li> <li>• 3 weightage of the each phase</li> <li>• 2 weightage of the each phase</li> <li>• 1 weightage of the each phase</li> </ul>

Table-3

Test manager will be entering the values for each environment. Based on the weightage, this table will decide the importance of the environment and phases.

Phase: total weightage = 30 table will calculates the total value, decides the range and importance of the phase.

$IF(SUM(M3:M12)>=25,"IMP",IF(SUM(M3:M12)>=20,"High",IF(SUM(M3:M12)>=15,"Medium",IF(SUM(M3:M12)>=10,"Low",""))))$

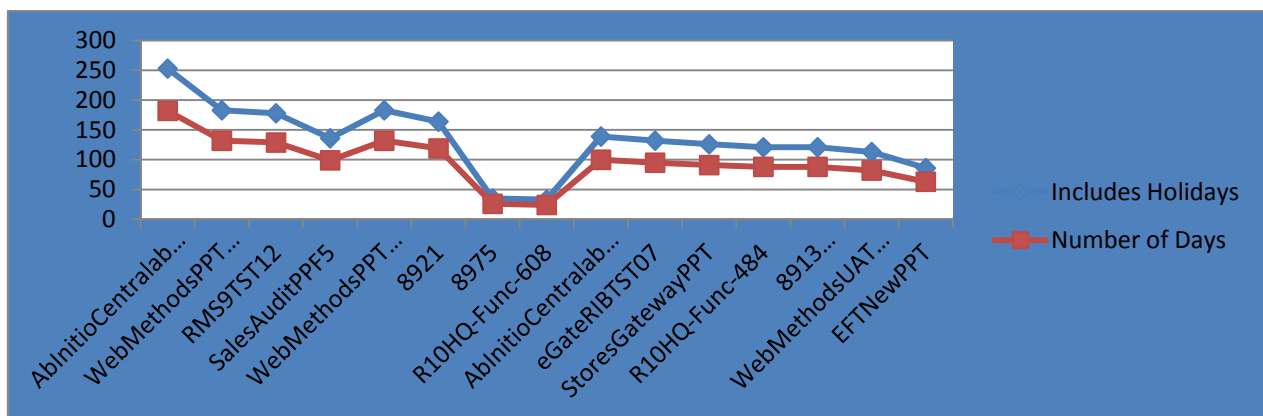
Similarly for the environments also decide the range and importance of the Environment.

Project	Systems/Products	Phases	Environments	Status	Usage	Weightage		Measure by Phase	Weightage		Measure by Env
						plan	Actual		plan	Actual	
Project EMS	System-1	Dev	Development	Yes	40	5	5	High	5	2	Medium
		Unit/Integration Testi	Unit/Integration Testing		40				5	2	
			System Testing		80				5	4	
		System Testing	Deployment Option Testing		0				5	0	
		Connectivity/Smoke T	Factory Acceptance Testing	Yes	60	5	1		5	3	
			System Integration Testing		100				5	5	
		SIT	User Acceptance Testing	Yes	100	5	5		5	5	
		V&P	Volume and Performance	Yes	100	5	5		5	5	
		Pre-Production	Service Acceptance Testing/Implementation Verification Testing.		40	5	2		5	2	
		Production	Production	Yes	80	5	5		5	4	
	System-2	Dev	Development	Yes	80	5	5	Medium	5	4	Medium
		Unit/Integration Testi	Unit/Integration Testing		20				5	1	
			System Testing		80				3	4	
		System Testing	Deployment Option Testing		0				5	0	
		Connectivity/Smoke T	Factory Acceptance Testing	Yes	80	5	0		3	4	
			System Integration Testing		100				5	5	
		SIT	User Acceptance Testing	Yes	20	5	4		5	1	
		V&P	Volume and Performance Testing	Yes	100	5	5		5	5	
		Pre-Production	Service Acceptance Testing/Implementation Verification Testing.		40	5	0		4	2	
		Production	Production	Yes	80	5	5		5	4	
	System-5	Dev	Development	Yes	80	5	3	Low	5	4	High
		Unit/Integration Testi	Unit/Integration Testing		60				5	3	
			System Testing		80				3	4	
		System Testing	Deployment Option Testing		0				5	0	
		Connectivity/Smoke T	Factory Acceptance Testing	Yes	80	5	1		3	4	
			System Integration Testing		100				5	5	
		SIT	User Acceptance Testing	Yes	100	5	0		5	5	
		V&P	Volume and Performance	Yes	100	5	3		5	5	
		Pre-Production	Service Acceptance Testing/Implementation Verification Testing.		60	5	0		4	3	
		Production	Production	Yes	100	5	5		5	5	

Table-4

Automatically the excel template calculates the importance of the phase and environments and displays the colours as shown in the table-4.

With the help of Cimera environment tool, data extracted for an existing one system within a project. Based on the available data, this graph is generated.



Fig(B)

Based on the above graph, the number of days which includes holidays/network days Vs the systems data extracted for a Project from Cimera environment tools.

Data collected for this project by the Environment Team from the tool (Cimera), where it can be recorded the details of the applications and it server details like data base Server and Middleware (Web Logic server, Web Methods, Web Sphere, Apache etc.).

As mentioned this project consists of the five different systems (products) and each system considered as one server at high level but it has two or more servers in the system.

Total number of days to complete the project (Tdc<sub>p</sub>) = Total number of days required for per Environment (Td<sub>pe</sub>).

Total Cost of the each Environment = Tce

Td<sub>cp</sub> = Td<sub>pe</sub> \* 5

Tce = Td<sub>cp</sub>

Eg: Considered the data has been collected for one Test Environment (SIT) which will be continued to use this for UAT test environment as well.

Td<sub>cp</sub>=Phase-1 + Phase-2 i.e. 150 days around 5 months which includes holidays.

If you consider only the working days is 132 days to complete the Phase-1 and Phase-2.

Environment	Status			Number of working days			
	Excluded	Need	No need	Excluded	Need	No need	Grand Total
8913			1			88	88
8921		1			119		119
8975	1			26			26
AbInitioCentralabtsit11			1			100	100
AbInitioCentralabtsit9		1			182		182
EFTNewPPT			1			63	63
eGateRIBTST07			1			95	95
R10HQ-Func-484			1			88	88
R10HQ-Func-608	1			24			24
RMS9TST12		1			129		129
SalesAuditPPF5			1			99	99
StoresGatewayPPT			1			91	91
WebMethodsPPT81(B2B)		1			132		132
WebMethodsPPTtn81(B2B)		1			132		132
WebMethodsUAT52			1			82	82
Grand Total	2	5	8	50	694	706	1450

Table-5

As mentioned in the above table(5) which states the number of applications needed for testing System-1 where there is a code change needed system-2 and System-5 is needed to validate the inflow and out flow of the data. Based on the following details each application is divided into Excluded, Not needed, Needed.

**Excluded-** These applications not needed in our Development/Testing Environment

**Not Needed-** These application are not needed to test because there is no code change

**Needed-** This application has code change which needs to be tested with data which has to be considered both in-flow and out-flow.

Based on the above data,

Excluded days-50

Not needed days-706

Needed days-694

Total number of days for all the applications servers required is 1450 days.

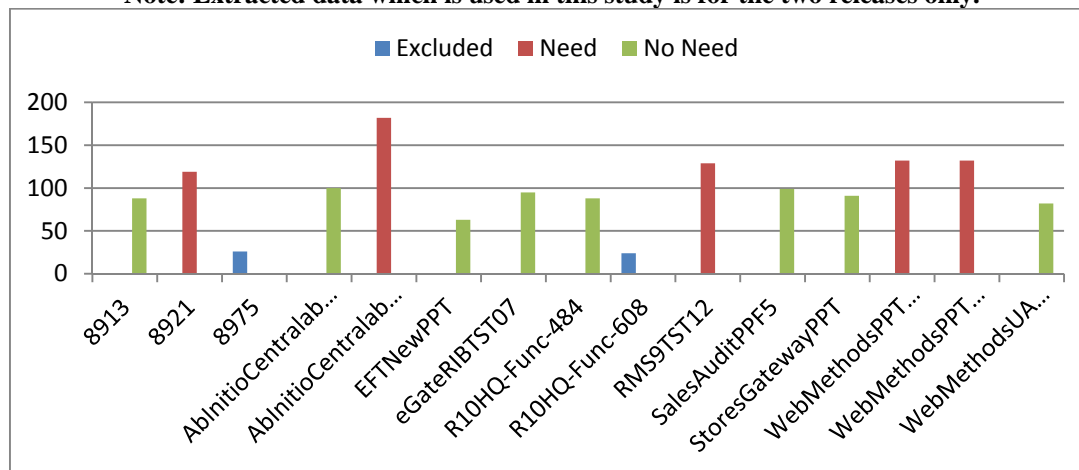
Current Environment is occupied for total Number of Days: 132 days for one application

If you consider the both SIT and UAT environment which has to be should be less than 132 days.

**Average number of days using the application environment is 96.67 days.**

**Each project will be booking the environment based on the project requirement with number of days to complete it. There is no charge for the existing environment, as well No time limit to block. Because of that, each project will book the entire environment before starting of the project and deadline with extended period.**

**Note: Extracted data which is used in this study is for the two releases only.**



Fig(C)

Project has different systems updated with Excluded, Need, No-Need status. This bar graph developed, based on the extracted data from the Cimera environment tool. The Test manager needs to check the code changes and scope of the work to be tested for the project to reduce the cost and time.

## VI. DIFFERENT TYPES OF PROJECTS

With consideration of the problems in utilisation of resources which includes environment provision, establishing sensible working practices and expectations with the environment teams to make a significant improvement in environments availability.

You may also need to invest more as an organisation into environments to reduce the cost by delivering it within SLA. Need to understand the application architecture and minimize the servers to increase the test coverage of the functionality as well in one full-fledged environment where it can test end to end and Volume & Performance Testing.

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**AUTHOR(S) PROFILE**

**Madhu Dande**, received the M.Tech degree in Computer Science & Engineering from Visvesvaraya Technological University in 2001 to 2003, as well done his B.Tech in Electrical & Electronics Engineering from Sri Venkateswara University in 1995 to 1999 respectively. In his Graduation submitted national level technical symposium on various topics like Artificial Intelligence and Neural Networks, Artificial Intelligence with Fuzzy Logic, Bio-Medical Engineering – A perspective, Acquaintance of Bio-Medical Engineering, Efficient methodology of Substation design. He has worked in Centre for Development of Telematics (C-DOT), Banagalore, where he has implemented Voice of Ethernet project successfully. Later he has joined TCS as Automation Test Lead in the year-2003. He has shown his skills design and development of the Automation Framework. Recently USPTO has granted a Patent on Generic Unit and Integration Automation Framework Testing. Designed and developed a Framework on Robust Automation Testing tool for functional testing and Demon Web UI Utility to validate the broken and orphan links at run time of the business critical applications. Currently working on Human Vs System Resources utilization in Production Environment, based on this reduces the utilization of power.