Development of a Framework for Applying ASYCUDA System with N-Tier Application Architecture

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Abstract. N-Tier architecture considered as a comprehensive and integrated solution for designing, creating, developing and maintaining the large scale applications. Each application is a set of several physical and logical components. If we want an enterprise application, we should design these components as a well formed layout. N-Tier application architecture provides a model for developers to create a flexible and reusable application. By breaking up an application into tiers, developers only have to modify or add a specific layer, rather than have to rewrite the entire application over. There should be a presentation tier, a business or data access tier, and a data tier. [1]

Using N-Tier architecture would improve flexibility, reliability and extensibility software applications.

ASYCUDA¹ is the client/server application which performs customs declaration and clearance in some countries. ASYCUDA should assist Customs Administrations’ modernization and reforms, by supporting both facilitation of legitimate trade and efficiency of Customs clearance controls [2]. It has implemented as a national project in Islamic Republic of IRAN Customs administration since 14 years ago. Nowadays, more than 90% of IRAN Customs processes are done with this system [11].

In this paper we analyze and adapt ASYCUDA application with the N-Tier architecture. We present the integration and validation of ASYCUDA application's tier with the N-Tier architecture and we propose a framework for applying it with the N-Tier application architecture. Then we evaluate some results about our proposed framework and finally we found that, it will make ASYCUDA more flexible and scalable.

Keywords: ASYCUDA, N-Tier Architecture, Customs Application, Scalability, Availability, Integrity.

¹The Automated System for Customs Data is a computerized system designed by the UNCTAD to administer a country's customs. [2].
1 Introduction

Software application is a product which design and create by the software engineers. The processes of design and create a software application are depend on the architecture which they used. Wherever we face to high complexity and large size application, it is necessary to use special architecture. All of the software architectures include the structure of components, relations between components and principles guidance which manage the design and develop of a system [3].

N-Tier architecture is a contemporary model in software engineering. Whenever we use N-Tier model, the modification of the application is easier than other monolithic tier. In N-Tier architecture, the entire core of an application divides into some parts. When we break up an application into tiers, programmers and developers could alter or add a specific layer, rather than the entire application. An application is a set of some parts. Each application must provide ability to store and access data in a consistent manner with a well formed model and it must use a standard graphical user interface and functional processes. A tier is a reusable part of code in an application which performs a specific task. With N-Tier architecture we achieve a flexible and scalable application in a cost effective way [4]. These advantages of this model are caused to choose N-Tier architecture as a goal of this article, indeed.

ASYCUDA is an automated system for customs data and it is a successful application in the field of the optimizing customs duties.

In this paper, we investigate on the corresponding of ASYCUDA system and N-Tier architecture. The reminder of this paper arranged as follows. The principles of the N-Tier architecture are described in the next section. Comparing ASYCUDA with three types of N-Tier architectures is described in section 3. Proposed framework for applying ASYCUDA with N-Tier architecture is shown in section 4 and evaluation of this framework is described in 5th section. Section 6 illustrates the results and conclusion and the future work are addressed in section 7.

2 N-Tier Architecture

In software engineering, N-Tier architecture is a client-server model in which the presentation, the application processing and the data management are separate logical processes. The most widespread types of N-Tier architecture are the three, four and five-tier architecture.

2.1 Three-Tier Architecture

It was developed by John J. Donovan in Open Environment Corporation (OEC) and it is intended to allow any of the three tiers to be upgraded or replaced independently as requirements or technology change [1]. It has the following tiers:

- **Presentation Tier**, This is the top level of the application and interacts with the users. It means that the end users only work with this tier. It communicates with other tiers via the SOAP, XML and RPC protocols and technologies [5].