

# **Feasibility Study into the use of Service Oriented Architecture within the Atlantis University Portal**

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## **Abstract**

Atlantis University is an ambitious e-learning project employing new pedagogical research to develop an e-learning system, currently the system has many heterogeneous applications in its portfolio that need to be integrated into one online based portal, the use of SOA is proposed to integrate the systems together. SOA is very complex to implement, it needs a completely new framework and strategy. Other more technical issues surround lack of maturity and some issues regarding performance. With regards to the Atlantis project the following needs to be considered:- What evaluation and feasibility studies can be carried out on Atlantis; An in depth analysis of the Atlantis applications and potential business processes and bottlenecks; How can the overall SOA project be managed; The project concludes that a SOA management committee be setup and distinctly more work in business process needs to be carried out.

## **Keywords**

Service Oriented Architecture, Web Services, e-learning,

## **1 Introduction**

The Atlantis University project is creating a software system in the area of e-learning to provide a learning environment based on extended blended learning.

The project involves the use of a portfolio of different applications of differing vendors and programmed using different languages and interfaces; the project needs to integrate all these applications together so that they can be used effectively.

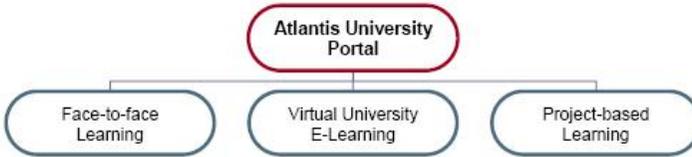
Work conducted by Huang (2006) indicates that the proposed means to do this is by SOA and has suggested that some sort of feasibility study / prototype be developed.

This paper shows shortcomings in the literature review and therefore the SOA evaluation methods are used to create a new framework for Atlantis as part of the experimental work for this project. The framework details the need to look closer at the Atlantis applications and business processes in order to give some recommendations for the way forward for Atlantis.

## 2 Atlantis University

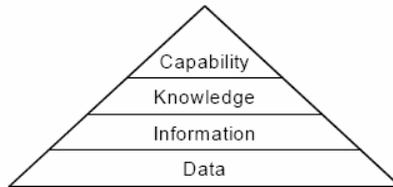
The Atlantis University Project is an international project in the area of learning; it is an ambitious and innovative project, introducing new concepts based on pedagogical research in order to provide a three tier learning package as shown in figure 1 below.

Atlantis is an international partnership involving nine universities; these include the Fachhochschule Darmstadt Germany, University of Plymouth UK and the Warsaw Technical Institute Poland.



**Figure 1: Atlantis University Portal (Bleimann, 2004)**

The learning process hierarchy, shown in figure 2, shows how a student learns, starting off at the bottom with data and information applied to this forms knowledge, soft skills such as teamwork and communication make up to capability, E-learning does not address the capability part of the pyramid.



**Figure 2: Learning Process Hierarchy (Bleimann, 2004)**

Standalone e-learning packages have failed for this reason and therefore Atlantis has come up with extended blended learning, its aims is to outweigh the advantages and disadvantages of each learning method and to help provide all four tiers of the hierarchy by blending them all together.

## 3 Integration technologies

The Atlantis portfolio of applications need to be integrated together. The intended way to do this is by SOA and using Web Services as the underlying technology to provide it.

“Service Oriented Architecture is an architectural style as opposed to a technology in order to reuse and integrate subsystems of existing systems in order to reuse them for

new systems. Such systems are kept separate but are coupled loosely to each other as needed.”

(Wada and Suzuki, 2006)

Web Services is a software system identified by a URI, whose public interfaces and bindings are defined and described using XML. Its definition can be discovered by other software systems.

These systems may then interact with the Web service in a manner prescribed by its definition, using XML based messages conveyed by Internet protocols. Web Services are frequently application programming interfaces.

(Austin et al, 2004)

#### 4 Justification for SOA

In previous Atlantis work by Huang (2006), a consideration was made as to how the Atlantis Portal can be integrated. Two architectures were proposed based on complete theory work and these appear below in figures 3 and 4.

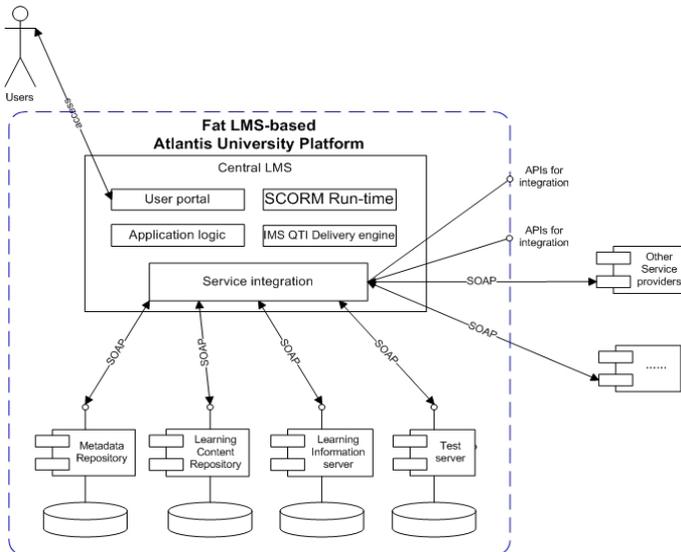
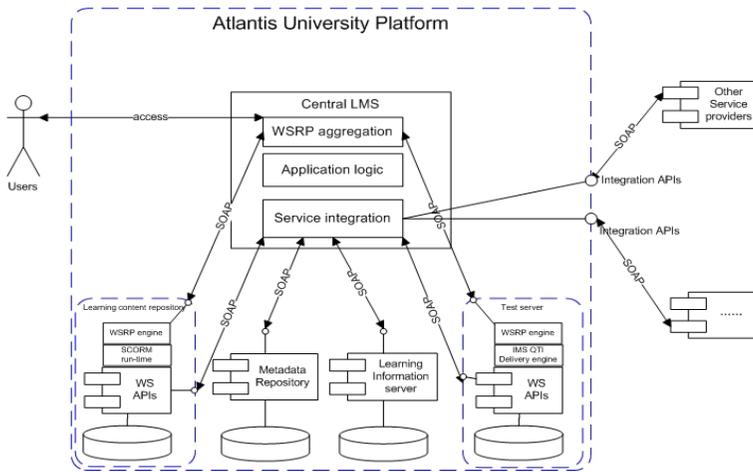


Figure 3: Fat LMS (Huang 2006)



**Figure 4: Thin LMS (Huang 2006)**

The problem with the work of Huang is the fact that the thesis appears to be very descriptive and lacks critical justification through evaluation for the decisions.

The architectures and service platforms proposed by Huang also do not seem to resemble the project as it stands at the present time, and looks more to a futuristic outlook to the system in several years to come.

## 5 Technical Testing

Other work in this area concerned another Masters thesis which uses an experimental approach to investigate the readiness of web service standards to be applied to business processes. The work reveals many issues and concludes that such technology needs time to mature before they can be used realistically plus services seem to work best based around automatic tasks such as travel agent scenarios.

In the early stages of the project the idea was put forward to create some sort of technical testing of the use of SOA within Atlantis. The problem with doing this is the fact that some sort of analysis on the current Atlantis setup was needed before it can be established what exactly to test, a different approach is needed.

## 6 SOA Evaluation Methods

It was decided to give more thought about where this project is heading and a decision was made to look at some in depth research into how to evaluate and manage a SOA project.

Four main frameworks were investigated:-

- Evaluation framework

“The Evaluation framework is a conceptual framework for evaluating the applicability and viability of Web Services, examining economic, technical and organizational contexts.” (Estrem, 2003)

- SOA project plans

Balzer (2004) presents a SOA Governance model which looks at the need for more management based skills as well as technical skills, the Governance model defines

- What to do
- How to do it
- Who should do it?
- How should it be measured?

- B2B Web Services design

This focuses issues regarding process-based integration of services, dependable integration of services, support of standardized interactions security and privacy.

(Hogg et al, 2004)

- Migrating to SOA

Channabasavaiah et al (2003) discusses how organizations can better understand the value of SOA, how to evaluate the current infrastructure in order to develop a plan for migration to SOA.

Additionally Oracle (2005) looks at SOA Governance and Orchestration including the need for a SOA Strategy; it reveals a SOA Life Cycle and looks at consideration for the more challenging aspects of SOA.

Overall these frameworks look at very much the same sort of thing. The problem with them is they reflect the use of SOA on corporate based projects whereby formally Atlantis is a University research project; therefore, as part of the experimental work these frameworks have been translated into a usable model for Atlantis.

The use of the frameworks has established the need for the following:-

- The need for a Governance / Management Strategy
- Using the SOA Life Cycle and an Evolutionary Strategy
- Defining the SOA Architecture
- Definition of APIs

Plus looking at benefits predicted vs. those gained, Quality of Service Issues, defining Critical success factors, Security, Functional and Non Functional requirements

## **7 Atlantis Applications**

The research above revealed that more awareness is needed about the current Atlantis applications before work on how to manage and evaluate the Atlantis SOA begins; this work is based on the following questions.

- What they do
- What data and information they communicate
- Potential bottlenecks / issues
- What other applications they interact with
  
- Plans for the future

The following is a list of Atlantis applications

- Learning design – Learning based on telling a story
- Collaborative Content Manipulation – Collaborative based Presentation Client
- Document Management System
- XML database
- Semantic Wiki
- LDAP
- Portal
- VOIP
- Generic Storytelling Engine
- Plus other applications

The work revealed that Learning Design is the strongest candidate for business processes and most applications will need to interface with the DMS and LDAP.

## **8 Integration of Diverse applications into a new Portal Based on SOA**

A thesis by Reinbold (2007) looks at how to integrate the Atlantis applications into a new portal, research work was carried out into the business processes of Atlantis, evaluation of portal software and an architecture proposal.

Analysing the work conducted in this thesis reveals many flaws; first of all it is not believed that the business process work has been done properly the survey was very small and in itself was flawed due to the fact that the Learning Design system was omitted.

Because the work on Learning design was omitted, which we have learned is a key element of Atlantis it meant that a conclusion was made that there is little business processes happening in the system and therefore an architecture was proposed which

was purely to integrate. Functionality to provide business processing was missing from the architecture.

## 9 Business Processes

The work by Reinbold and the experimental work on SOA management shows serious shortcomings with regards to Business Process work and it is learned that this work is vital in ensuring success of a SOA system.

Work carried out into analysing the applications of Atlantis have revealed some potential business processes, particularly within Learning Design that has potential for reengineering and automation.

## 10 Atlantis SOA Architecture

The work on the Atlantis SOA Architecture by Reinbold shows some major shortcomings in the analysis carried out and therefore the proposal for the new Atlantis SOA architecture is not accurate particularly with regards to Learning Design

Figure 5 below illustrates a new proposal for the Architecture along with the Business Process flows, compared to the diagrams Reinbold created with respect to the Business process work flow engines it differs slightly in that these are missing; further research is needed to decide if a separate technology such as workflow or BPEL is needed to orchestrate these as it is unclear at this time. Additionally any interactions between the XML database and the other systems are not present simply because the research is not ready for this area yet.

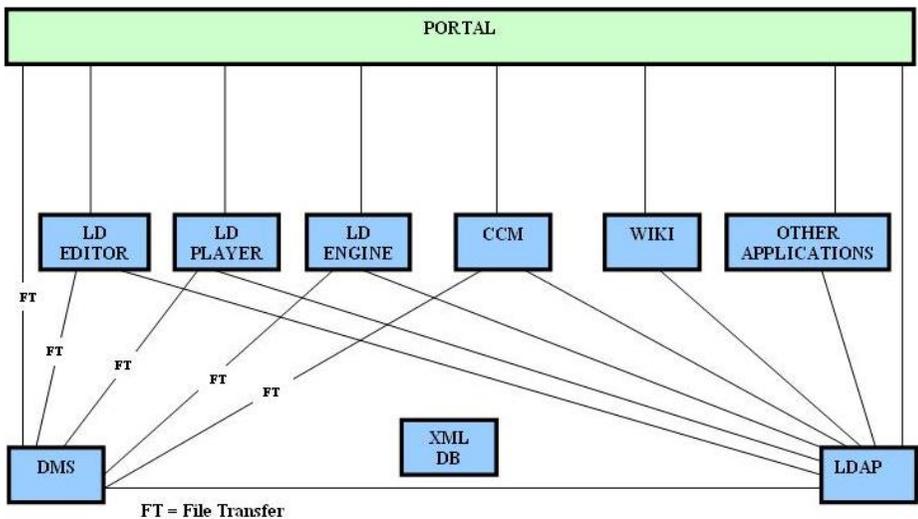


Figure 5: Proposed Atlantis Architecture

## 11 Recommendations and Conclusion

The initial idea of the project was to perform a feasibility study into the use of SOA within Atlantis.

It was quickly realised that as long as the fundamental reasons for having SOA are present, such as the need to integrate a set of heterogeneous applications, then SOA should in general be used. The real question is how to go about creating a SOA and this paper has revealed that this is a huge task and this paper has merely skimmed the surface.

Experimental work in the literature review was used to establish a SOA evaluation framework for use with Atlantis and therefore there are several recommendations that Atlantis should strongly adopt in the next semester of the project and these are listed below in order of importance.

A separate sub topic should be setup examining the Atlantis business processes more thoroughly with respect to the Atlantis SOA

Each development team for each sub system should support this team by producing process maps for them

The work on evaluating each Atlantis application needs to be completed, particularly for the new systems such as the XML database.

A SOA Management Committee should be setup

Findings in the work has revealed many shortcomings to parts of the Atlantis project that need to be completed, ideally before any more work is stated on the project.

Participating in the Atlantis project has been a huge experience in terms of communication and team work and the experience of cross boarder interactions. In the past university projects have been based on mock up of a business IT scenario but as Atlantis is a real life scenario it has given a more realistic experience in this area.

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