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Title of the Project:

SEMANTIC WEB IN IMPROVED DESIGN INTERPRETATION AND COMMUNICATION INTEGRITY

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Abstract

Using Semantic Web technologies (XML, RDF, OWL) can decrease design interpretation errors, promote healthy communication and increase component reuse. These benefits are accomplished by using RDF based component libraries and linking those component definitions too their compositions and QoS specification information. Once this web is designed it can be search by a reasoning engine or application to return useful information to the user about the lower level components that meet the QoS specifications and functionality desired. Sample libraries are being designed to test for the appropriate tools to accomplish these searches and research is underway to retrieve information from a few of the design team members to construct a framework on which additional definitions can be added to produce the final results.

Technologies used

1. XML – Extensible Markup Language
2. XSD – XML Schema Definition
3. RDF – Resource Description Framework
4. RDFS – RDF Schema
5. OWL – Web Ontology Language

These technologies are all XML based languages that are used to form layers underneath a document and provide context to the document. These documents can be used to create libraries of resources that can be search like a database. Using the proper tools these searches can yield accurate results by retrieving only the requested information from the document.

XML is a very strictly constructed language that is useful for creating documents that are easy for parsers to understanding and interpret. These documents may or may not be defined by XSD's. The XSD requires a document to adhere to the rules of its definition adding more control to the user over what the document can contain.

Once this first layer is created RDF is used to link the content in the document in a meaningful way. It does this using a simple format of subject, predicate, object triples. These triples can be used to link statements or words in a document to statements or definitions in other documents or within the RDF document itself.

RDFS does to RDF what XSD does for an XML document by providing a definition for what may or may not be used in the framework of the RDF document. These definitions provide control over the RDF document but are not required for the layers to work.

After the RDF layer the OWL layer provides classes to objects represented in the document. For example the document could be about a hardware component. This component can be detailed in a separate document. Using OWL the details on the

component discussed in the document can be extracted from the detailed document and arranged in the original document appropriately or the original document could be a generic layout of a component and the reader could select a function for the component and the lower level components used to create that function could be extracted from multiple other documents and placed into the original document.

All of these technologies combined with a few others for logic and security that are still in design phase create a Semantic Web. This web may be used “to transform information processing by providing a common way that data can be accessed, linked together and understood”(Passin 2004, 4). Using this common bond of XML the Semantic Web can be used to create intelligent searches that can promote communication across all design fields and improve design interpretation across the board.

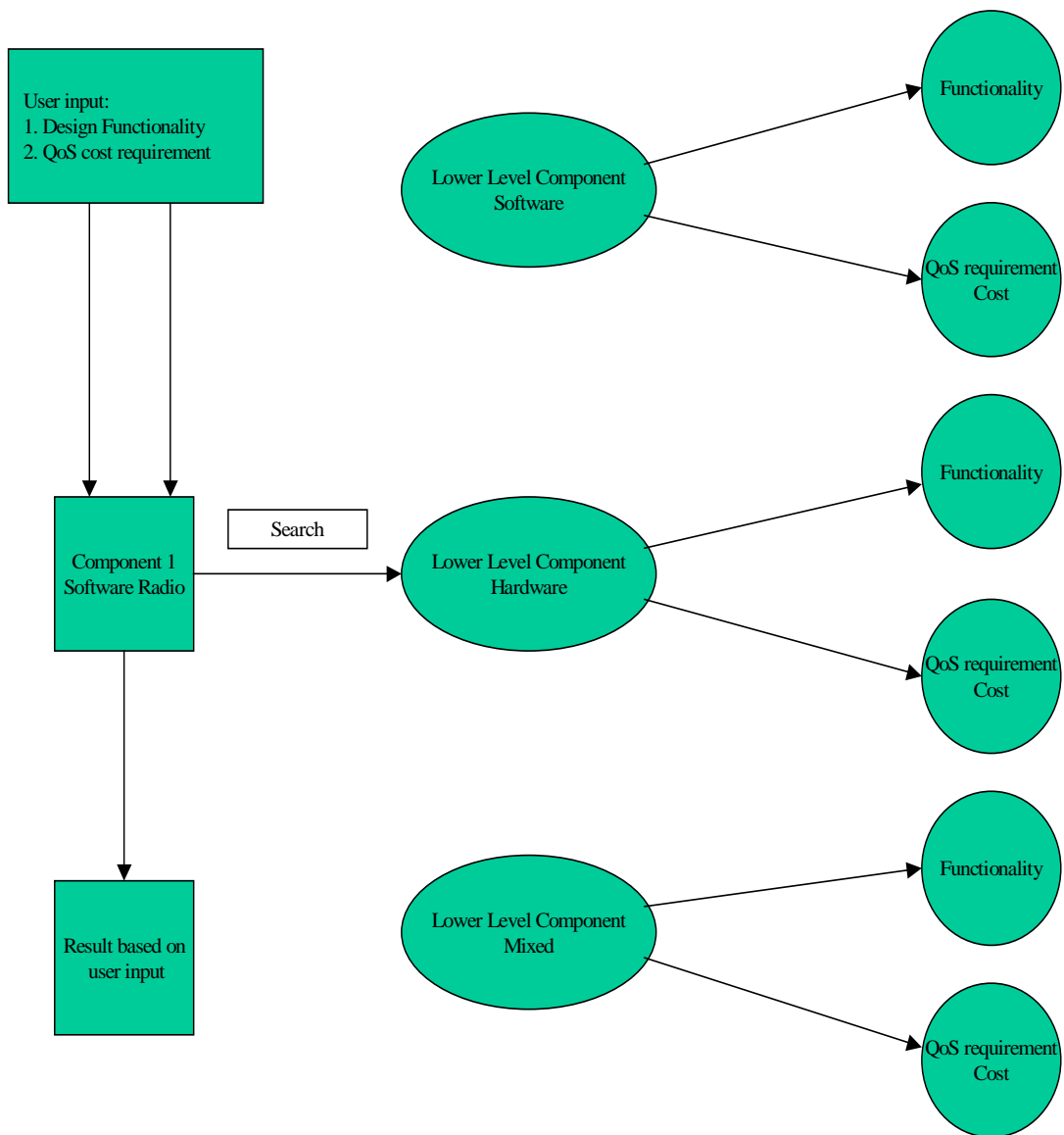
Objective

The objective of this project is to design a Semantic Web based ontology application for use in design interpretation and project communication. This ontology would encompass high level component design by creating OWL based definitions for all design components from hardware and software to mixed and UML based models. Utilizing these definitions a components based library can be designed and intelligent searches may be carried out on it. The results of these searches can be used across all design sections to extract component composition that meets functionality and QoS specifications. These searches can be narrowed or expanded by the user and insure that component design is only interpreted in one way.

Future work on this objective could add software coding, user notation, hardware component imaging, and many more features to these definitions. The goal to allow all necessary component design information to be gathered efficiently from multiple sources and displayed in one search and presented in a manner that is consistent with the users needs.

Completed tasks

All of the relevant technologies have been isolated and research into them and their interoperability has begun. Models of some simple design requests to be implement have been made.



A sample table describing some of the RDF triples representation of this example in plain English:

Component 1	Has a (choose 1)	Software Component
Component 1	Has a (choose 1)	Hardware Component
Component 1	Has a (choose 1)	Mixed Component
Software	Has a	QoS Cost
Software	Has a	Function 1
Hardware	Has a	QoS Cost
Hardware	Has a	Function 1
Mixed	Has a	QoS Cost
Mixed	Has a	Function 1
QoS Cost	Is a	RDF Datatype
Function 1	Is	Function 1 description

Future Work

Because many of these technologies are still in some level of development support for them varies and it is difficult to find applications that can utilize all of the layers together to create a working web. The future work of the project is to find or create an application that fits into the objectives. Within two months the example above will be operational and then preliminary documentation will be gathered from team members to create definitions for some basic components used in their work. After this information is gathered a sample ontology can be created based off of the example and tested to insure all the objectives are being meet. With this sample ontology in place as a base for growth additional definitions can be added easily.

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