Putting Labs Online with Web Services

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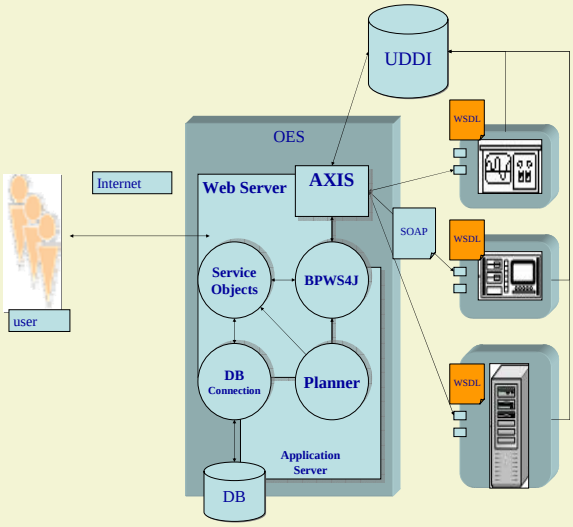
1. Motivation

Online experimentation allows students from anywhere to operate remote instruments at any time.

Existing online experiment systems commonly use classic client-server architecture and off-the-shelf middleware for communication.

Web Services (WS) enable inter-operability across platforms and programming languages. It has an extendable architecture for security, messaging and transport protocols.

2. Framework

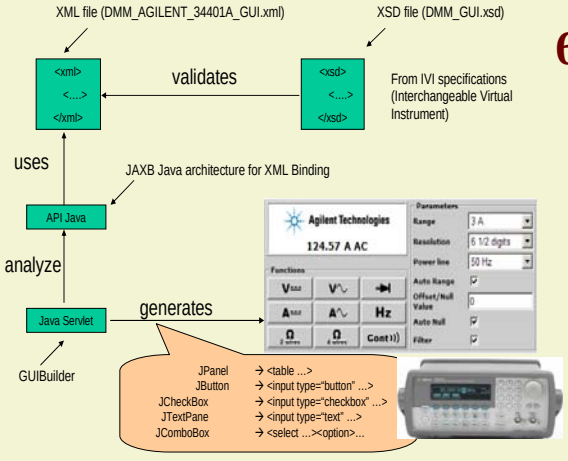


3. GUIs Rendering

GUIs for the eight Interchange-able Virtual Instrument (IVI) standard types of instruments are serialized in an XML file. A light-weight client interprets the XML and displays the GUIs.

Instrument I/O Standards

- Virtual Instrument Software Architecture (VISA)
- Interchangeable Virtual Instruments (IVI)

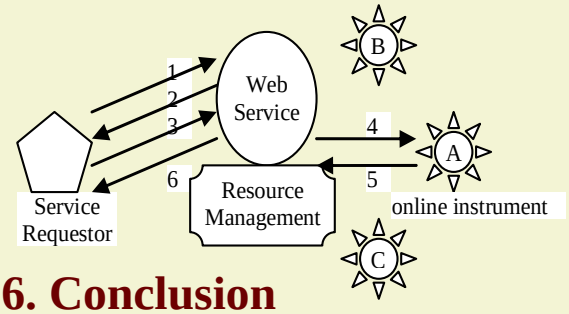


4. Wrapping the Instrument's Functions

1. Design standard WSDL interface for each IVI/VISA instrument
2. Invoke instrument functions via SOAP messages

5. Managing Stateful Instrument WS

1. The client sends the request to the Web service.
2. The Web service returns the resource's ID.
3. The client always contacts the service using the resource ID.
4. The instrument conducts the online experiment.
5. The instrument returns the results to the Resource Management.
6. The Web service records the results and returns them to the client.



6. Conclusion

WS brings interoperability and Internet accessibility for Online Experiment Systems. Future work can be

- Optimize SOAP message communication
- Search online Experiment resources in UDDI based on ontology and semantic matching

We published our work successively in

- IEEE IT Professional (Mar/Apr, 2006)
- IEEE Int. Conf. on Web Services (2005)
- Int. Conf. on CSCWD (2005, LNCS)
- Ed-media 05

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