

# STANDARDS BASED CLOUD CLIENTS

## ABSTRACT

Cloud Management and Storage specifications can be used by clients such as web applications, phone, and other mobile computing devices. We explored how client devices can use standards to interact with cloud services. We developed against recent specifications which have been produced in the cloud standards space, namely Open Cloud Computing Infrastructure (OCCI) and Cloud Data Management Interface (CDMI).

## MOTIVATION

The computing industry is experiencing a huge shift in the way we use computers at home, at work, and especially in-between as we use hand-held mobile computing devices. The phone is now a computer that is part of the internet and is a first class citizen of the web. The mobile computing potential motivated us to work with standards to build a client capable of running in the web and on mobile phones.

## OUR APPROACH

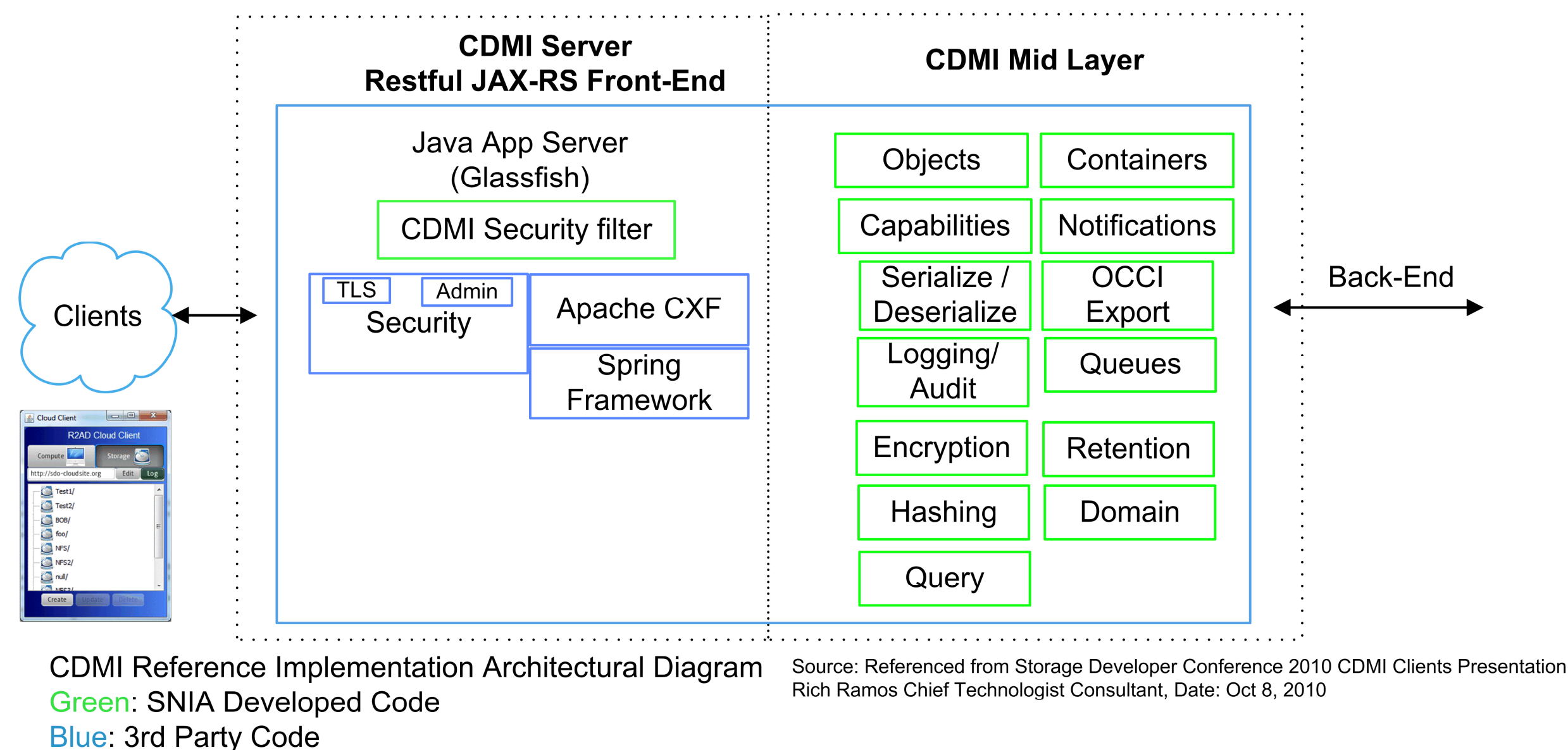
Our team worked within the Open Grid Forum (OGF) and the Storage Networking Industry Association (SNIA) standards organizations to contribute to the specifications. This provided:

- An understanding of the specifications
- Team building toward a common demo

We shall continue to work with these and other organizations such as the Distributed Management Task Force (DMTF).

## CLOUD STORAGE WITH CDMI

The Cloud Data Management Interface (CDMI) is developed by Storage Network Industry Association (SNIA). It provides a RESTful API set to manage storage in the cloud.



From a storage access perspective, CDMI also supports various standard protocols: CIFS, NFS, iSCSI, and its own standardized RESTful data path

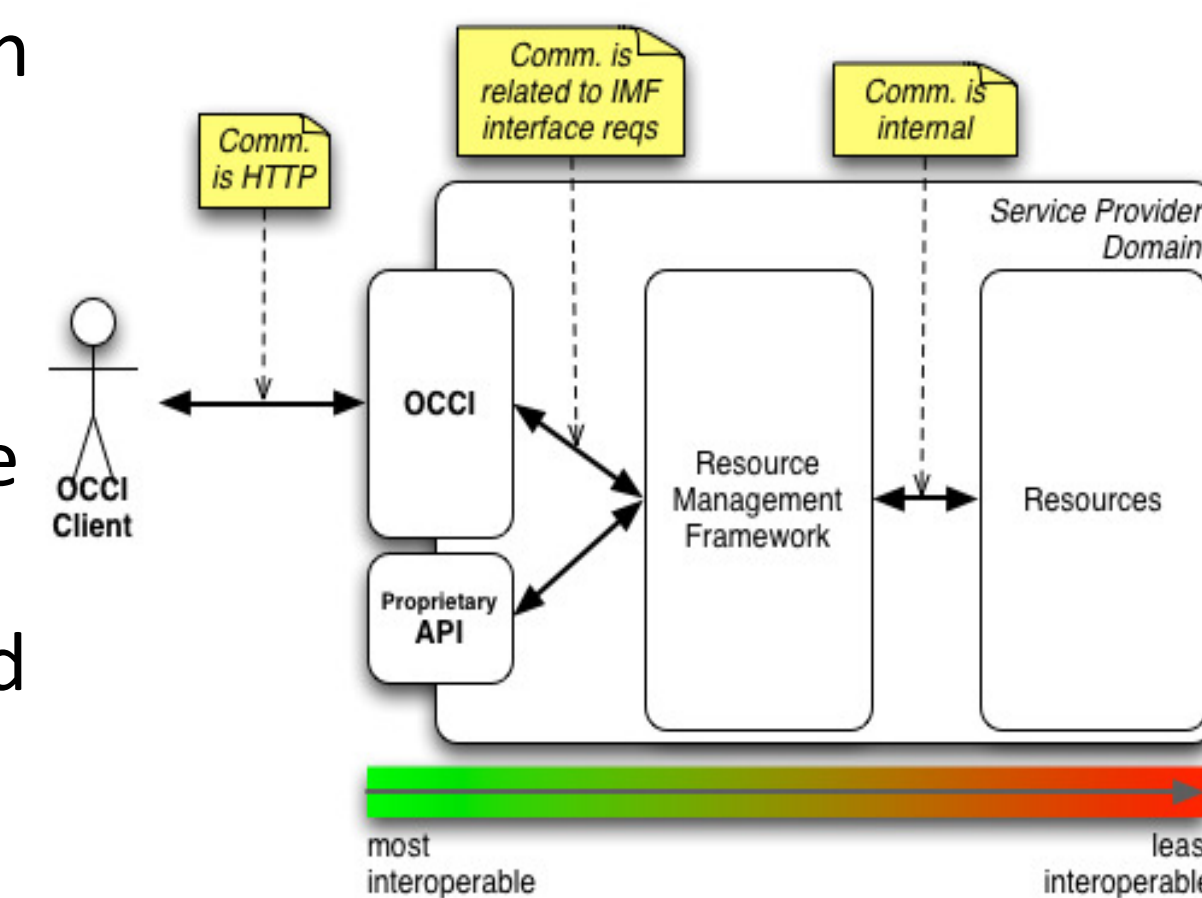
## CLOUD COMPUTING WITH OCCl

The OCCl specification is developed by the Open Grid Forum (OGF) Standards Development Organization (SDO). OCCl is a boundary protocol/API that acts and fronts as a service front-end to your current internal infrastructure management framework.

OCCl consists of a set of specifications (Core and models, HTTP header rendering, Infrastructure models, and an XHTML5 rendering).

The OCCl specification, while written to address a standard interface for cloud computing, are in fact directly applicable to any distributed computing architecture. They represent the “State of the Art” in terms of internet computing today. They support Rich Internet Application Development, Service Oriented computing, and offer a scalable and dynamic approach to creating semantic oriented services.

The OCCl specifications refer to this architecture as a Resource Oriented Architecture (ROA). It defines RESTful [3] interfaces based on the Hypertext Transfer Protocol (HTTP). Each resource (a computer, or storage element, etc) is identified by a URI.



## LESSONS LEARNED

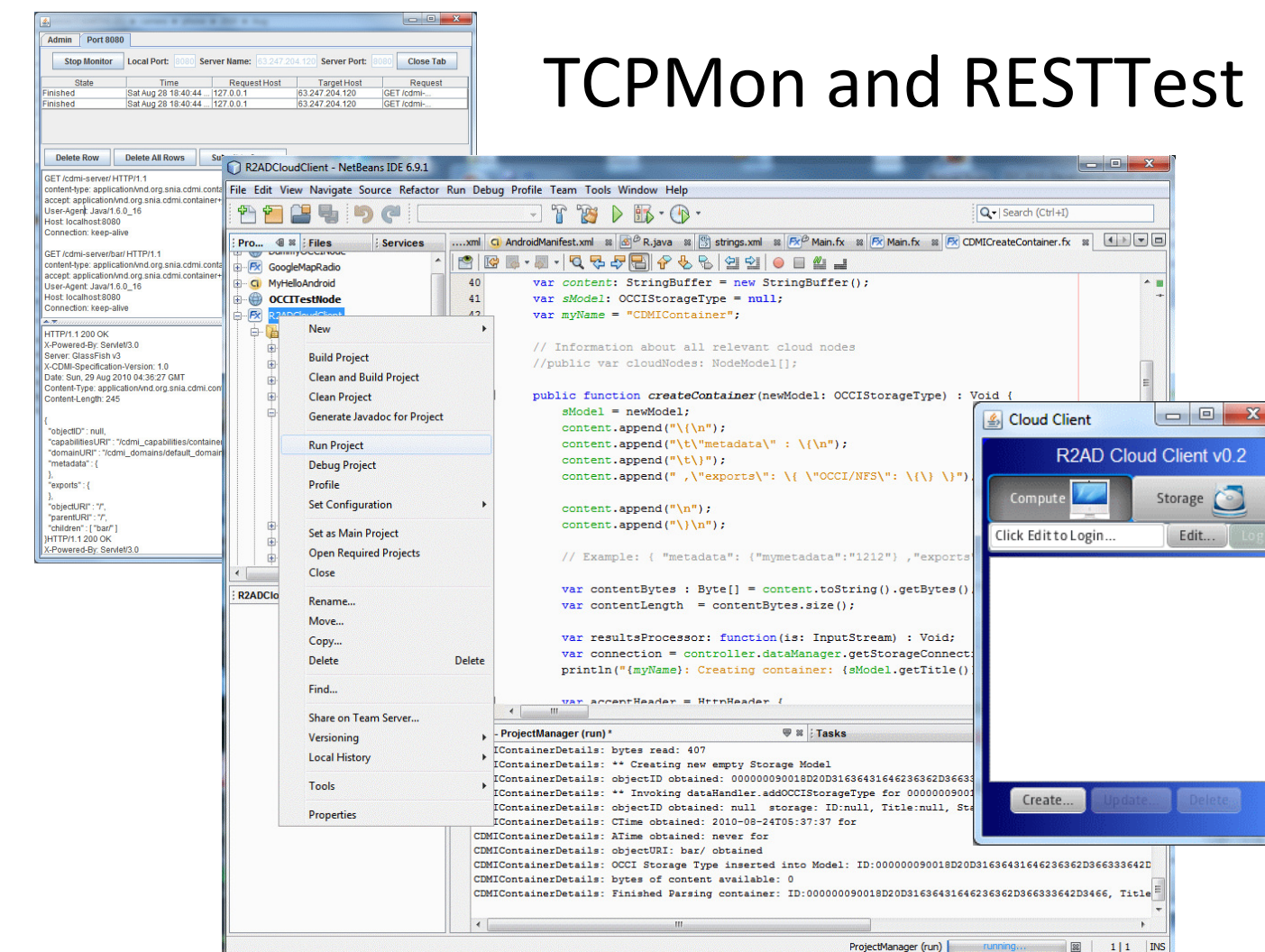
Lessons learned during the development and testing of the client:

- The network is not always present. A recommendation for cloud storage standards would be to add support for cache synchronization.
- Remote administration tools were valuable. These included the obvious tools such as SSH access, but also included tools with provided full screen remote desktop access such as Oracle’s Secure Global Desktop.
- Share code earlier for additional development support and promote standards

## REFERENCES

- Open Cloud Computing Infrastructure (OCCI), <http://forge.ogf.org/sf/projects/occi-wg>
- Storage Networking Industry Association, “Cloud Data Management Interface (CDMI)”, 2010 [Online]. Available: <http://snia.org/cloud>

## DEVELOPMENT ENVIRONMENT



TCPMon and RESTTest (FireFox Plugin)

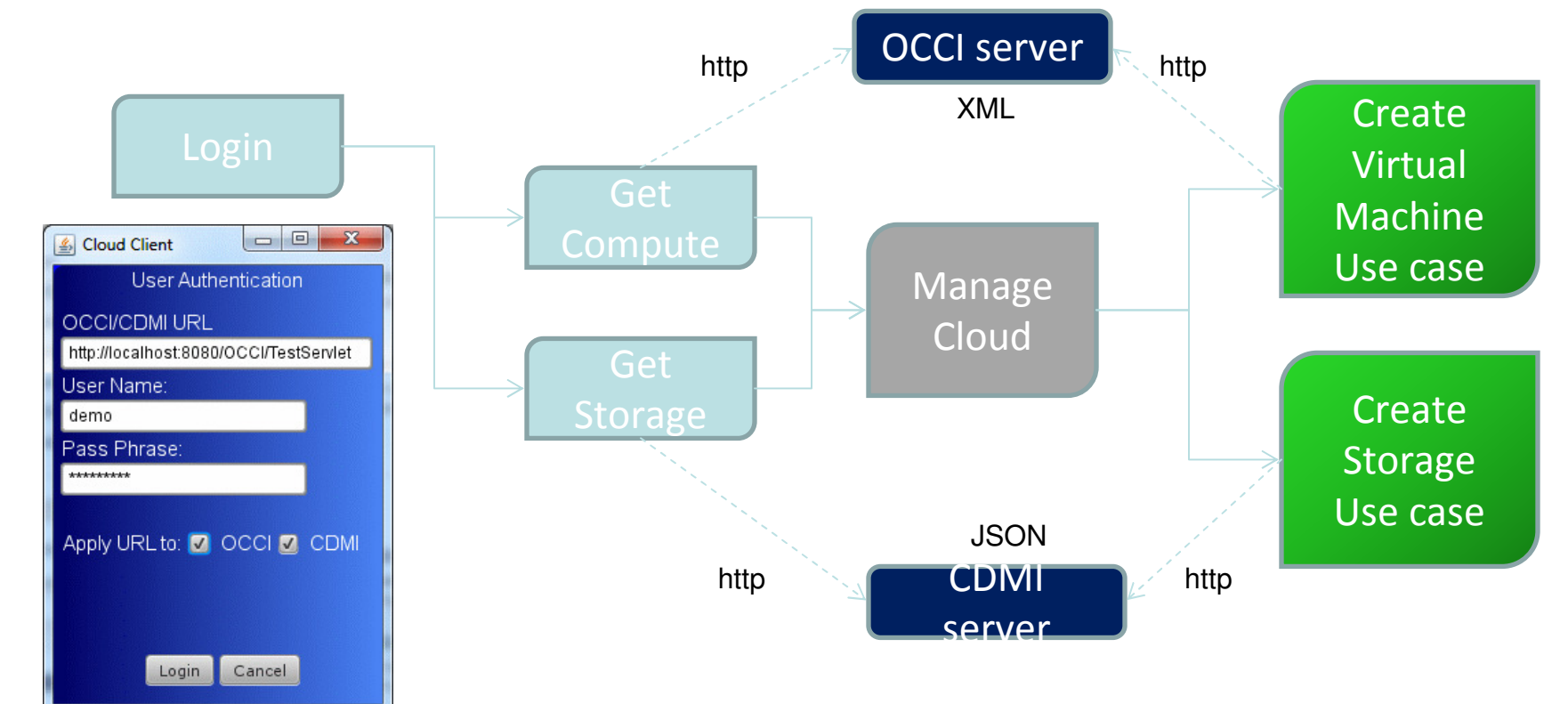
Client side development interacted with servers hosted at the SNIA lab in Colorado. Client information and Source Code is shared and available from : <http://cloud.r2ad.net>

NetBeans 6.9.1 with JavaFX and Glassfish

## INTERACTIONS

The design of the application developed included a login component, a presentation layer, and parsers for both XML and JSON documents that are received from the cloud based services.

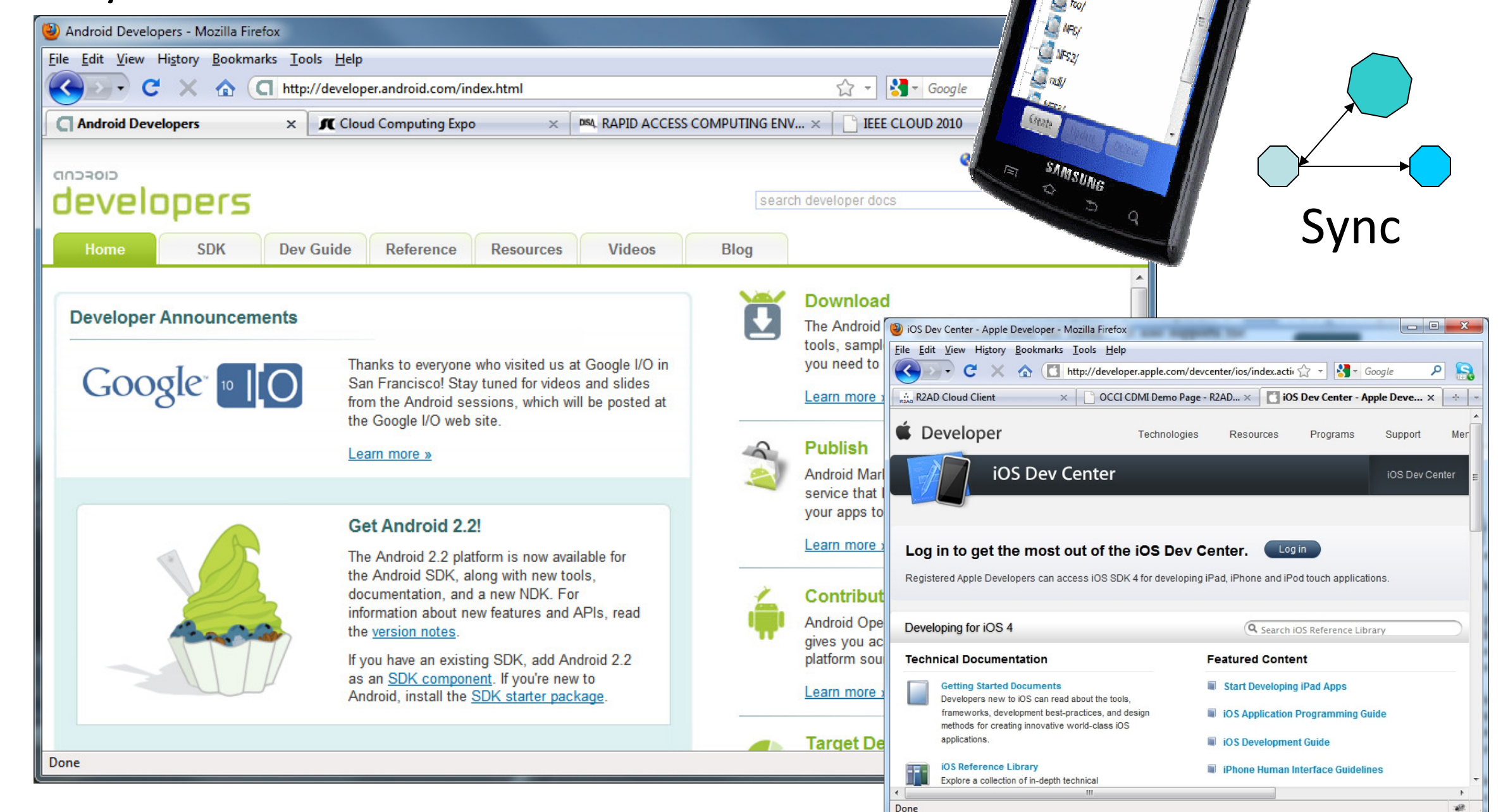
Using both CDMI and OCCl together, the client performs a mashup of the data for presentation to the user.



Users can create and assign storage to compute resources.

## MOBILE CLOUD COMPUTING

More and more users are utilizing services from their mobile computing devices. Storage is a huge requirement as users exchange email, images, video, and documents of various kinds. Mobile devices are not always connected – and therefore the use of cached data with synchronization support is needed. Next, we’ll port the JavaFX client to an Android and/or an iPhone device.



## ACKNOWLEDGEMENTS

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