



SD16837

From Desktop to the Cloud with Forge Platform

Fernando Malard
Ofcdesk, LLC.

Learning Objectives

- Understand web paradigms and challenges
- Learn how to efficiently move to the cloud
- Explore Forge Platform
- Learn how to use Viewer and Design Automation services

Description

This class will introduce the Forge platform from the perspective of an early adopter – starting with business aspects, paradigm shift, cloud concepts, and the future of Autodesk cloud platform strategy. We will cover some of the technical challenges with web programming from the perspective of someone migrating from a desktop programming environment to the cloud, and discuss how to overcome them. We will then walk through some simple yet representative code samples helping you to get started with the Forge platform through the Viewer, Model Derivative API and Design Automation APIs. This session features Forge.

Your AU Expert(s)

Fernando Malard is a civil engineer who has worked with AutoCAD software and ObjectARX technology since 1996 and with Revit software since 2009. He has also been an Autodesk Developer Network member since 1997. He has worked on several AutoCAD and Revit software applications for civil engineering, architecture, interior design, and geographic information system using ObjectARX technology, C++, Microsoft .NET, JavaScript, Cocoa, databases, and Forge Platform. Malard has had extensive experience teaching AutoCAD software, Revit software, C++, Microsoft Foundation Class, Microsoft .NET, and ObjectARX technology over the last years. Today he continues to apply his skills to the design and implementation of complex industry solutions in desktop, web, and cloud environments. Malard has also worked with Autodesk, Inc., user communities, and he maintains a blog about ObjectARX technology. He holds a master's degree in structural engineering from the Federal University of Minas Gerais, Brazil.

Twitter: @fpmalard

Email: fpmalard@yahoo.com.br



Introduction

Through all the information technology history we always had transition moments where challenges and paradigm shifts were essential for a relevant and substantial evolution. Recently we are experiencing a huge wave of different technologies shared across the Internet, the so called Cloud, being broadcasted and used on several professional areas. Maybe this wave wasn't so strong and devastating due infrastructure problems, lack of technical skills and the natural consolidation of companion technologies.

If we compare the Internet as it was some years ago with the current desktop systems, it would be fairly easy determine that most of those software would never be able to be run and be used entirely in the web. The reasons were, among several, low data transfer speed, poor page processing speed, excessive information transfer, vulnerability, limited and expensive storage space, no mobile solutions or weak signal strength, remote blind spots and many others. Nowadays the reality is completely different, the Internet has evolved itself but we also had a substantial evolvement of the infrastructure, desktops and mobile devices.

It was just a matter of time that traditionally exclusive desktop solutions start to be made available through the Internet and hosted on robust servers with almost theoretical infinite storage, all this accessible globally. Facing all this tech wave, the Cloud became an attractive place for current businesses expansion, new businesses creation and user base expansion for companies traditionally focused on desktop solutions.

Autodesk couldn't play a different game. Traditionally focused on desktop solutions, Autodesk was testing Internet solutions for a while. The Forge platform emerged to respond to all mobility, portability, flexibility and expansion needs from all desktop products. The Forge platform started with several services that can be consumed via web services having the Internet browser as the only requirement. From the technology point of view, this platform brings several challenges but, in other hand, provides a powerful and revolutionary opportunity for existing companies regardless their size and revenue. In fact, the Cloud levels companies with different revenues and sizes while offering products and services to end users. During the following pages we will present the technology behind this platforms, challenges, impact and all benefits for migrating existing products and services or even create new ones on the Cloud.

From desktop to the Cloud

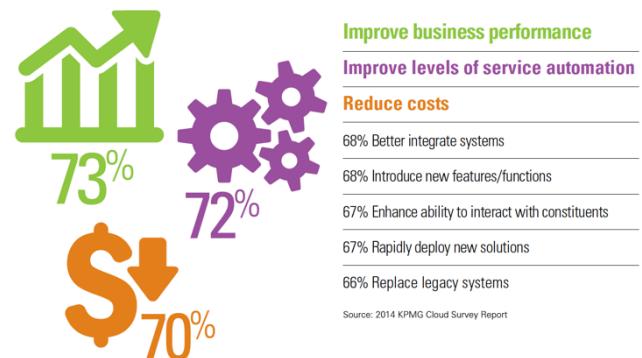
The business

We can clearly see, through several studies, that the pioneer companies to migrate to the Cloud business model did it primarily focusing on a substantial cost reduction. In other hand, we can also verify that the most of these companies that stood at the Cloud didn't have the cost reduction as their most important reason. In fact, these companies were able to use the whole process of migrating to the Cloud to reinvent their entire businesses.

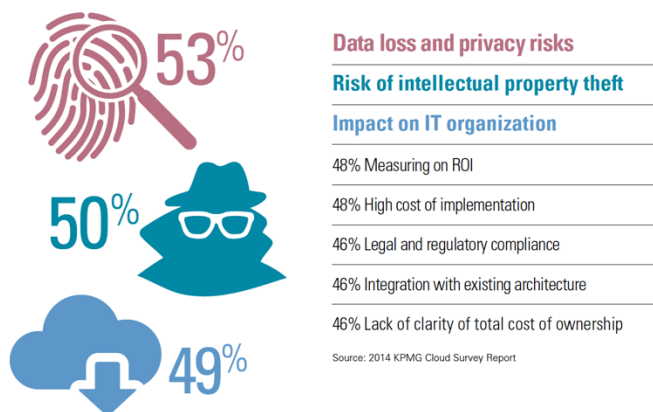
The following illustrations and statistics illustrate how companies were distributed on this migration process back in 2014. The data is not that recent but it is still perfectly valid for today and can show the big picture of how companies tackled this process:



Most successful areas of business improvement as a result of cloud implementation



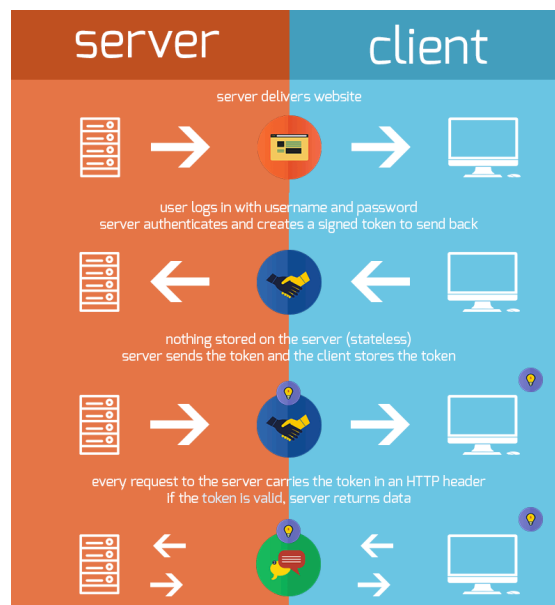
Most challenging areas when adopting cloud



We can clearly note the challenges to be tackled, paradigms to be shifted, problems with data security but notably the benefits of migrating to the Cloud are quickly perceived and valued. The cost factor is certainly much more attractive specially if when we think about small businesses without power to initially invest substantial amount of money to build their expensive IT infrastructure with extremely high demand for physical space and specialized staff.



The data vulnerability, a problem while flowing information between the client and server parties, required the creation of technologies to protect the access to confidential information residing on exchanged data packages through the Cloud. Several customers initially think about the Cloud as an unsafe place where their company information will be easily obtained by any user with access to the Internet. With the social media expansion and its large user base nowadays, users are getting used to the Internet environment and sharing personal and business data like photos, videos, documents, etc. The Internet vehicles found themselves obligated to create mechanisms to protect all this information so users don't get afraid of using online services. Further, new strong and sophisticated encryption methods were invented to guarantee user's safety. Additional login checks using mobile phones, tokens and many other mechanisms were added to the web routine in a way that even the most capable hackers are not able to hack most of the systems.



One of the most interesting of these technologies is the Token. Token technology allows users to identify themselves first through an authentication server that recognize their identities. After this authentication, the user receives a token with expiration defined. This token is then used to access its compatible services. This process is widely used today on the online banking systems across the world where they created token generators to reinforce the bank account access through Internet thus increasing security and protecting from identity theft.

The great challenges for software developers coming from desktop environment are related to the new development tools, new testing procedures, debugging (a browser needs to be used) and the deployment once there isn't any media distribution nor software installation. The concept of hotfixes or patches are not valid for a Cloud environment where users are all accessing the software at the same location and running the same version. Once an update of your Cloud service is published it is considered in use so any changes may affect current users. This will require additional procedures like staging servers, backup servers, planned maintenance, balanced access and many other procedures to make sure the system is always running and available 24/7.

Cloud resources

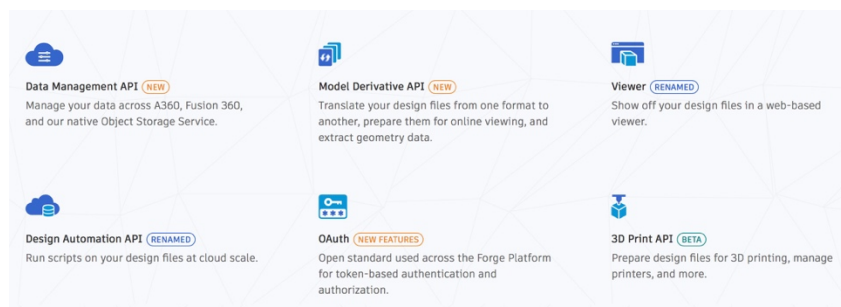
The Cloud resources are in constant evolution. New Technologies for website hosting emerge all the time. The so called server farms are being created everywhere providing access balancing, geographical optimization, smart routing and data accessibility to provide a smooth and fast user experience while consuming these services.

There were several Internet shared systems in the recent past like project SETI@home but only recently we had a robust and fast infrastructure to support high demand systems through the Internet. Today we have full services that could be contracted with a really low initial investment, easily scalable and available 99,99% of the time. **Amazon AWS** and **Microsoft Azure** are two good examples of those services being by far the most used these days. They allow companies to easily build or port their entire IT infrastructure to the Cloud thus allowing the company to reach new markets and niches through the Internet.

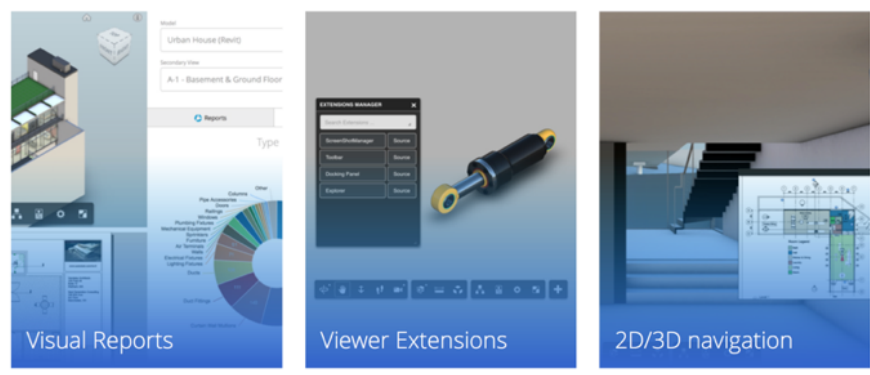
Forge resources

The Forge platform uses powerful web services based on the cores of some important Autodesk products like AutoCAD. Exactly for being web services the end user doesn't need to install anything and the only requirement is a compatible web browser (the most used are) and a reasonable good Internet access. The Design Automation service is a good example of this approach once it provides the resources of a full desktop product like AutoCAD without requiring the user to have a deep knowledge of it. This service runs a sandbox version of AutoCAD in a restricted prompt environment (something similar to the **AcCoreConsole** application installed with regular AutoCAD desktop product). Another essential e universal resource is the Viewer service which implements a graphical viewer that allows several drawing files to be visualized through the web browser.

The visualization resources, also running right inside the web browser, are based on the **WebGL** platform (OpenGL for the web) which runs natively on the web browser thus working totally integrated and with high performance. For the client side programming, we wouldn't expect anything different than the most used web client language, **JavaScript**. This allows the usage of all JavaScript packages and libraries created for the web, most of them for free, providing good resources for empowering the solutions created around the Forge platform.



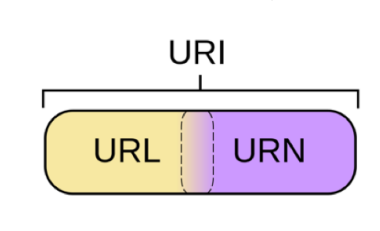
Some of the platform services are still in beta (experimental) but others are already available and in full production stage. All services are protected by OAuth layer that guarantees users and services safety. Several code samples can be used as a start point. Access Forge website to see further documentation and samples: <http://forge.autodesk.com>.



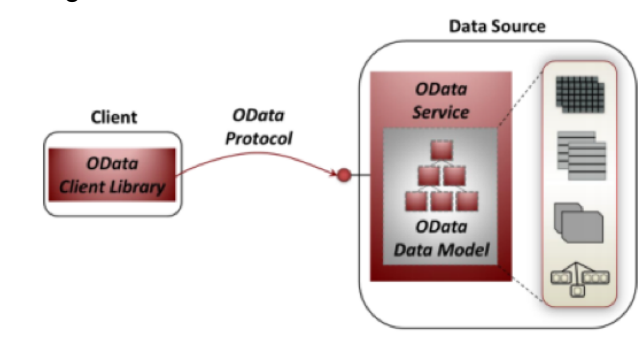
Technologies

The Forge platform is based on some specific Internet technologies which are essential requirements for understanding the platform and also to consume all services. Among these technologies, we have some to emphasize:

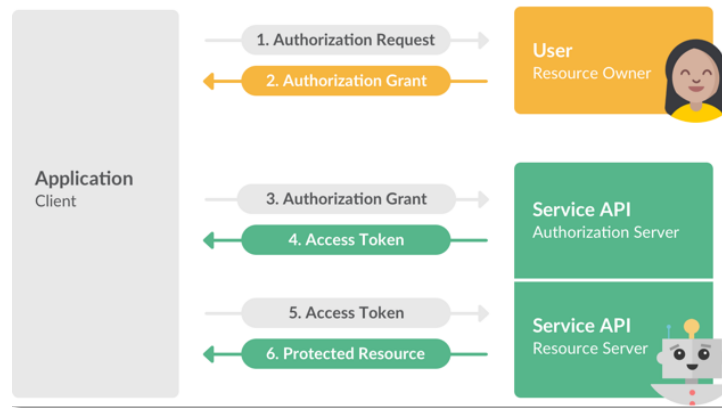
- **REST** (*Representational State Transfer*): Internet standard communication protocol based on resources (URI composed by URL and/or URN) executed through standard calls such as: PUT, GET, POST and DELETE; also receiving standard HTTP responses;



- **OData** (*Open Data Protocol*): Protocol to simplify service access procedures thus allowing a client development regardless the device/machine used to access the services;



- **OAuth** (*Open Standard for Authorization*): Based on issued tokens from a server capable of identifying and authorizing users returning an authorization token with defined scope and expiration defined. It does support authentication on two (2-legged) or three levels (3-legged).



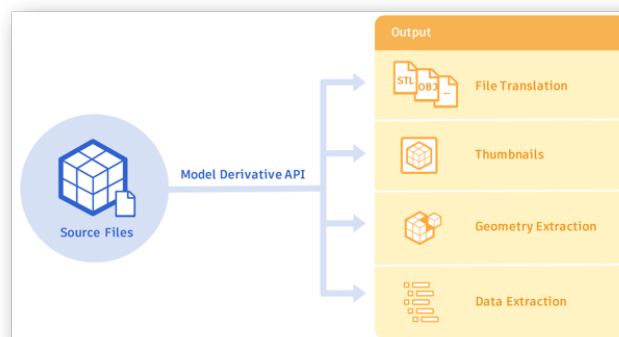
Viewer and Design Automation

We are going to explore two of the most important services available at this time on the Forge platform. The first one, called **Viewer**, allows the visualization of SVF files using the WebGL API present on current web browser engine running with client machine's resources. The second, called **Design Automation**, allows the manipulation of AutoCAD DWG files.

Viewer

The Viewer service allows the visualization of **SVF** files using a viewer canvas running natively into the web browser. This viewer uses the browser WebGL engine and a layer written in JavaScript through three.js library. Once created, the viewer requires an input URN, so the client can receive a data streaming that can be shown through this viewer inside the browser. The displayed model can be either 2D or 3D. The 3D models can also contain cameras, lights, shadows, reflection, textures and other features that are all natively available through the WebGL API.

Just by running natively over WebGL, which is supported in most of the web browsers, the viewer doesn't require any software installation nor web plugins. The browser itself takes care of any configuration and optimization necessary making the best use of client's machine available resources like GPU processors. The SVF file can be created by accessing the other Forge service called **Model Derivative**. This service can process most of known CAD files converting them into other formats like SVF. The result of this translation can be a simple individual drawing or even a complex Inventor Assembly.





Design Automation

The **Design Automation** service allows users to process, create or read data from DWG files through the Forge platform. This service actually executes a simplified “prompt” version of AutoCAD, pretty much a **AcCoreConsole.exe** running in a sandbox. The user can send an AutoCAD script that runs native AutoCAD commands (only those that don’t require any UI interaction) or even run his own commands present into a custom application available through his Design Automation application account.

The process will be configured through activities (**Activity**) previously created with input/output parameters. These activities may access previously application packages (**AppPackage**) so they may construct complex processes hidden from end users. Each activity may access one or more application packages at once. To execute those activities, the user’s input data should be collected at the frontend, format them as AutoCAD scripts and then call one activity by sending a **WorkItem** which is basically a call to the Activity with parameters defined. These application packages can (and should) also be versioned so the developer can better handle updates and bug fixes once the service should never stop. The high availability is one of the fundamental Cloud pillars and should always be strongly considered.

Conclusions

We can clearly see that the market trend these days is a mass adoption of Cloud based solutions and services. Some companies already have an installed customer base running their products on a desktop environment. Migrating these customers to a new environment is certainly a big challenge and several aspects would push as pros while others as cons.

In other hand, simplifying the access to high complex products and services always bring tremendous benefits for both customers and solution providers. Costs are substantially lower, system stability is way higher, Internet make everything more accessible and scalability is off charts.

Services that don’t require desktop applications like AutoCAD could be running already on the Cloud but several companies didn’t migrate their services due the lack of desktop class functionalities on available web resources. The Forge platform was created exactly to fill this lack by providing a simplified access and use of desktop like resources, hosted on the Cloud secured, fast and accessible globally.

We will see many Forge new services being released during the next months and this will allow many other companies to migrate to the Cloud. Several new companies will also be created entirely on the Cloud which is indeed a revolutionary environment for modern thinking businesses.

The main goal of all these Cloud technologies is leverage company businesses through a consistent, modern and scalable way. The cost reduction can initially be the main reason but in fact it is just the tip of the iceberg. Certainly the cost reduction won’t be the most important reason to keep companies on the Cloud.