A new paradigm: Web 2.0 Mashup Patterns

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Abstract: -The advent of Web 2.0 drastically changes the playing field and opens a new era of platform opportunities. By opening the platform and making it remix, Google Maps changed the rules. Now, the rest of the industry is struggling to catch Google's momentum and the world of web Mashups. However, what about the conceptual heart of other popular Mashups? We focus on looking for patterns in successful Web 2.0 Mashups. We systemizes concepts from Top50 popular Mashups on ProgrammableWeb— and aim to present five collection of five Mashup Patterns: Data source Mashups, Process Mashups, Consumer Mashups, Business Mashups and Developer assembly Mashups which build platforms to foster innovation in assembly, where remixing of data and services creates new opportunities and markets. In this paper we highlight latest Mashup trends, exploration of the design principles of Mashups architecture, evaluation the most popular Mashups technology for the enterprise level, five options patterns that exist for implementation, and capture the fundamental behavioral aspects of Mashups. What we present in this paper can be generalized for other Mashups.

Key-Words: - Mashups, Web 2.0, Pattern, paradigm, Google Maps, API

1 Introduction

With Web 2.0 technologies spreading rapidly across the Internet, Mashups have recently attracted much attention as a promising approach for ad-hoc information and service integration. [16] When the Google Maps API was released in June 2005, there was an explosion of location-related software development. Craigslist apartment listings, Chicago crime data, Flickr photos, current news events, happy-hour locations, weather, historical sites, public transportation...just about any piece of content imaginable could be overlaid on a map using this API with a little JavaScript. [9]

Mashups have become an extremely popular way for developers to access and play in the Rich Internet Application world. As developers combine existing services with user experiences of their own design, entirely new applications emerge. By opening the platform and making it remix, Google Maps changed the rules. Now, the rest of the industry is struggling to catch Google's momentum and the world of web Mashups. However, what about the conceptual heart of other popular Mashups? Despite rapidly increasing interest in Mashups over the past two years, comprehensive frameworks are lacking.

Since Mashups appear to follow various kinds of patterns and each Mashup tool aims to support specific patterns, we propose that it is valuable to survey the space of Mashups and catalogue what those patterns are. The idea of patterns has been used in the past to present generalized solutions to problems that may be encountered when designing websites or writing software [5, 17]. Understanding patterns in Mashups can help drive the development of Mashup tools to support specific patterns. [7] To our knowledge, there has been very little survey of Mashup patterns. In this paper, we describe a preliminary survey we conducted and report on observed patterns.

There are some existing classifications of Mashups in various literatures available on this subject. [12] Many vendors and industry analysts talk about Mashups in various ways. In many cases,

web Mashups are categorized according to their functionality; for example, some define data Mashups, photo and video Mashups, news Mashups, and business Mashups. However, we classify web Mashups by five major categories which are often used in the enterprise. We focus on looking for patterns in successful Web 2.0 Mashups. We systemizes concepts from top50 popular Mashups—and aim to present five collection of Mashup Patterns: (1) Data source Mashups (2) Process Mashups (3) Consumer Mashups (4) Business Mashups and (5) Developer assembly Mashups which build platforms to foster innovation in assembly, where remixing of data and services creates new opportunities and markets. Although more nuanced divisions of these types of capabilities exist, this discussion and the patterns we present in this paper provide a quick method for cataloging Mashup efforts.

As of MashupFeed (http://Mashupfeed.com), a Mashup advertisement and aggregation site, is adding more than two new Mashups a day from contributors—some incredibly cool, some inane, some destined to become winners in the Web 2.0 space, and some losers. Therefore, specifically, we overview some of the most popular Mashup tools and show how they facilitate the development of rich Internet applications. In this paper we highlight latest Mashup trends, exploration of the design principles of Mashups architecture, evaluation of the most popular Mashups technology for the enterprise level, five options patterns that exist for implementation, and capture the fundamental behavioral aspects of Mashups. What we present in this paper can be generalized for other Mashups.

2 Related work

2.1 What is Web 2.0

Web 2.0, refers to a perceived or proposed second generation of Internet-based services—such as social networking sites, wikis, communication tools, Mashups and folksonomies—that emphasize on online collaboration and sharing among users. [10] Web 2.0 has also been called the social web, because its content can be more easily generated by users, as well as the collective intelligence of users. Users are not the passive consumers of content, but co-producers. Interaction plays an important role in Web 2.0 to create shared information.

Web 2.0 is not a uniform concept, but a generic term or metaphor for new Internet technologies and applications. Web 2.0 can be seen as a revival, intensification, renewal in which user generated content has a central place. [8] Osimo and Burgelman [11] state that Web2.0 is about both technology and attitude. There is some debate how new Web 2.0 really is. Tim Berners-Lee for one, the founder of the WWW, views Web 2.0 merely as the logical further development. In that sense there is no new software or application with the name of Web 2.0. And yet what we observe with Web 2.0 Mashup is a paradigm shift how users use the web, a development that questions everything that has been developed and applied so far.

In the world of Web 2.0, web sites are no longer stand-alone entities. Instead of simply displaying their wares to passing visitors, they become data centers—feeding information to other applications on the web. The information is not only shared, it is enriched. Users of shared data are encouraged to add to it, to annotate it. They identify points of interest on Google Maps, add tags to photos on Flickr, and write book reviews on Amazon.com. Users help identify connections between pieces of data—they place their photos on maps of the world, they tag related links in del.icio.us and they create lists of related items on Amazon.com. [1]

1.2 Web Mashups

A web Mashup is a new type of web application that uses data and services from one or more external sources (usually from the Internet) to build entirely new and different web applications.[2] Data feeds such as RSS and ATOM feeds have been around for a while, making information available for anyone to re-use in another application. What's so different about web Mashups? The answer is that while older data and service aggregation technologies aggregate and integrate in a fashion, a true web Mashup creates a completely different and new function out of the existing content and services, driving different purposes and objectives. [1]

A Mashup is a Web page that uses Web 2.0 technologies, which may include JavaScript, PHP [13], and XML, to present information from a variety of sources or in a variety of ways where the presentation enhances the information. [15] The idea behind web Mashups is creativity and innovation in new data and services, not just aggregation of existing ones, which most of the older technologies focus on. [1] Mashups, more specifically called web application hybrids by Wikipedia, have been an exciting trend in web applications in recent years. [2] Web Mashups represent a new way of developing software and along with any new development techniques and coming opportunities.

3. SURVEY METHODOLOGY

To come up with some Mashup patterns, we qualitatively surveyed the most popular Mashups from ProgrammableWeb. [14] (ProgrammableWeb lists over 4200 Mashups as of 2009-07-15). For each Mashup, we looked at what APIs were used, what context were involved, what tag is it and what websites each Mashup used. We also attempted some guesses at what purpose the Mashup might serve or how each Mashup improved on existing websites either functionally or in terms of user experience. In order to make this study feasible and reduce the number of bad Mashups, we took samples of the top50 Mashups by popularity ranking on Programmable Web. (Due to the limit of space, we only list 20 of them, please see selected Mashups and patterns in Appendix A)

3.1 The API Scorecard

Yahoo, Google, Amazon, eBay, and Microsoft have published application programming interfaces (APIs) based on web standards that allow you to utilize their complicated functionality without being a programming expert. Dozens more companies, big and small, have followed in the same way, creating a Mashup explosion of API mixing and matching. New, sometimes strange, Mashup creations pop up all the time. This is help to understand how the web itself is becoming the next development platform. On the X axis are 5 major API vendors, the first 5 are sometimes referred to as GAMeY. There is also an Other column. On the Y axis are the primary types or categories of APIs being offered. If at any Vendor/Type intersection there is an API, it will display a checkmark and show the number of Mashups using that API as cataloged at ProgrammableWeb. As with the Mashup stats, it is not all Mashups for every API but is the subset cataloged here. (See Fig. 3)

3.2 Most popular API ranking by Mashups

The following are the Top 10 APIs for Mashups:

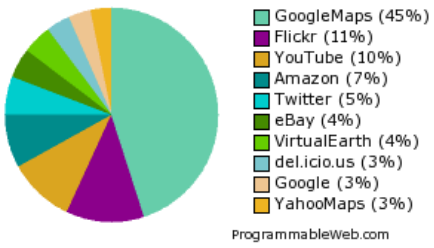

Fig.1 Top10 APIs for Mashups [14]

A tally of tags for Mashups recorded on programmableweb indicates recent Mashup trends. (See Fig. 2)

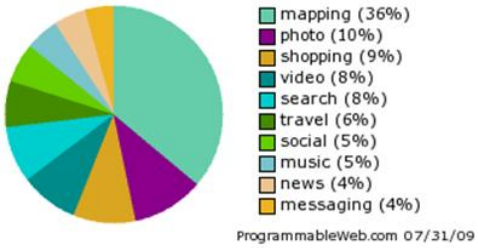

Fig. 2 Top Mashup Tags

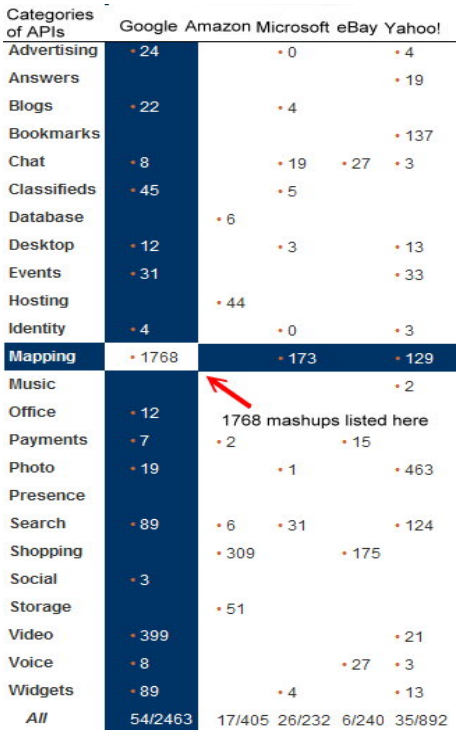

Fig. 3 The API Scorecard

Table 1 APIs are ranked based on their popularity

API	Description	Category	Mashups
Google Maps	Mapping services	Mapping	1768
Flickr	Photo sharing service	Photos	463
YouTube	Video sharing and search	Video	399
Amazon eCommerce	Online retailer	Shopping	308
Twitter	Microblogging service	Social	235
eBay	Online auction marketplace	Shopping	175
Microsoft Virtual Earth	Mapping services	Mapping	173
del.icio.us	Social bookmarking	Bookmarks	137
Google Search	Search services	Search	134
Yahoo Maps	Mapping services	Mapping	129
Yahoo Search	Search services	Search	124

4. SURVEY FINDINGS

Our patterns come from how Mashups make use of other websites and various APIs. A Mashup can be viewed as being composed of three different participants, which are usually physically separated too. They are (1) Content providers (2) Mashup site and (3) Client's browser. Please refere to our findings in Appendix A, where APIs categories of Mashups as well as the tags can be taken as Mashup patterns. Our survey provides five major Mashup patterns which are often used in the enterprise:

Pattern1: Data source Mashups

Data source Mashups combine similar types of media and information from multiple sources into a single representation, such as combining the data from multiple RSS feeds into a single feed with a graphical front end. An example of a data Mashup is the travel site http://www.kayak.com. Kayak is a comprehensive travel search engine which gets its data from over 100 other travel sites. Kayak therefore does not sell directly to customers but serves as a portal through which customers can be directed to travel agencies that can serve their needs. An enterprise data source Mashup usually integrates data from internal and external sources. For example, it could create a market share report by combining an external list of all houses sold in the last week with internal data about which houses one agency sold.

There are many tools on the market that allow data Mashups to be created in a simple manner. For example, Yahoo Pipes [18] is a web application that permits users to build aggregate web feeds by integrating data from different sources using a very intuitive graphical user interface. Microsoft offers a very similar application, called Microsoft PopFly [4]. The Google Mashup Editor [6] is another on-line application used for creating such Mashups.

The following are features to make a data source good for relevant web mapping applications:

- Useable data: (1) The data is free and open. (2) The data's license does not limit its use.
- Community data: (1) All users can contribute new data. (2) All users can modify existing data.
- Organized data: (1) The data's explicit structure conveys its meaning. (2) The data's structure unifies the whole collection.
- Accessible data: (1) The data source has a web-based query interface. (2) The data source tracks and publishes all changes.
- A forseeable future: (1) The company running the service has funding. (2) The service is built on scalable technology.

Pattern2: Process Mashups

It is about a level of agility into the process of stringing together services into an application, or Service-oriented business applications (SOBAs).

Pattern3: Consumer Mashups

The most common type of Mashup is the consumer Mashup, aimed at the general public. Mashups combine visual elements and data from multiple sources. An example of a consumer Mashup is http://www.housingmaps.com which gets rental listings from Craigslist and displays these listings on a Google Map by using Google Maps' API.

Pattern4: Business Mashups

Similar to consumer Mashups, but solve business problems. Many enterprises are embracing Mashups for various reasons. Some need their software systems to change often to keep up with the rapid rate at which their business needs change. Business Mashups must be able to access the back-end business systems—such as finance, HR, and CRM—on which organizations run. With business Mashups, domain experts use interfaces to back-end systems to build smaller point applications.

Pattern5: Developer assembly Mashups

Mashups are built using different programming languages such as Perl, PHP, .Net, and others to call URL-based or web-based Representational State Transfer/Plain Old XML (REST/POX–based) services and link them together.

We found that all APIs described the functionality provided, the messaging formats supported, the protocols and the programming languages they support (known as programming language bindings), for examples, the Most Popular Mashup APIs— **Google Maps.** The Google Maps API allow for the embedding of Google Maps onto web pages of outside developers, using a simple JavaScript interface or a Flash interface. The API includes language localization and geocoding, and has mechanisms for enterprise developers who want to utilize the Google Maps API within an intranet.

Highlights (Google Maps):

Summary: Mapping services Category: Mapping
Tags: mapping Protocols: JavaScript
Data Formats: XML, VML, JSON
API home:
http://code.google.com/apis/maps/index.html
This is 1 of 54 APIs by Google

Functionality (Google Maps):

- API Groups: Uses a JavaScript object model
- Example API Methods: GMap2, GMarker, GPolyline, GIcon, GEvent, GBounds, GSize, GClientGeocoder

A tally of protocols Usage by APIs indicates recent Protocol trends. (See Fig. 4)

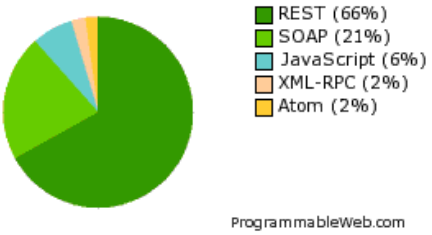

Fig.4 Protocol Usage by APIs

5. Conclusions

We have presented five interesting patterns that we have observed so far in this study. This paper describes preliminary work in the uncovering of Mashup patterns in order to find new directions for the design of Mashup tools. Our patterns come from how Mashups make use of other websites and various APIs. It is possible that there are more patterns in the Mashups we have encountered so far. Future work may examine the APIs and data that Mashups use more closely. These instances represent end-users efforts towards customizing their web experiences.

With this overview of Top50 popular of Mashups, we argue that not only is the web itself become a platform, individual web sites are becoming platforms and platform components as well. Platform solutions and ecosystems exist for the purposes of sharing information. Each connection made is stored away—an extra data point is created. By encouraging both the sharing and the enhancement of data, the overall value of those data is increased. We present the main Mashup patterns behind the concepts of web2.0. The most popular Mashups and the most popular APIs are summarized and recent protocol trends are introduced. What we observe with Web 2.0 Mashup is a paradigm shift how users use the web, a development that questions everything that has been developed and applied so far. This calls for more research that can improve our knowledge on the Mashup strategies, business models and relevant technologies involved.

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Appendix A:

Selected Top20 Mashups and Patterns (Due to the limit of space, we only list 20 of them)			
Mashup	**APIs**	**Notes**	**Tags**
Wii Seeker	Amazon eCommerce+eBay+Google Maps	A Mashup to help consumers locate a Nintendo Wii. Provides retail addresses, locations, shipment dates, and local ebay auctions.	auction, mapping, shopping
Flash Earth	Google Maps+Microsoft Virtual Earth+ NASA+OpenLayers+ Yahoo Maps	Zoomable Mashup of Google Maps, Virtual Earth and other satellite imagery through a Flash application. Try rotating the compass or building a permanent link to a location.	mapping
Celebrity Sexy Video Finder	Google Ajax Search+ YouTube	Not safe for work, NSFW. Search and find all sexy YouTube and Google videos of your favorite female and male celebrities. Contains adult content.	celebrity, movies, search, sex, video
Weather Bonk	Google AdWords+ Google Maps+ hostip.info+ Microsoft Virtual Earth+ NASA+ NOAA Weather Service+ WeatherBug+Yahoo Geocoding+ Yahoo Maps+ Yahoo Traffic	Rich Mashup with live weather, forecasts, webcams, and more on a Google Map.	mapping, weather, webcams
Beam Me Up, Hottie	HotOrNot	Uses the HotOrNot API to find girls and guys in your by location	dating, mapping, search
Google Maps Flight Simulator	Google Maps	Goggle is a very fun and creative flight simulator built on top of Google Maps. Pick from one of five cities and go. Change altitude and direction using the arrow keys.	games, mapping
LivePlasma	Amazon eCommerce	A visually rich application that combines the Amazon API to show the relationship between movies, bands, actors, etc. You can go straight from interacting to making purchases.	search, shopping
1001 Secret Fishing Holes	Google Maps	Over a thousand fishing spots in national parks, wildlife refuges, lakes, campgrounds, historic trails etc.	mapping, sports
BidNearBy	eBay+ Google Maps	Search local auctions and classified listings (craigslist) and see where they are located on a map view.	auction, craigslist, mapping, shopping
Where's Tim Hibbard?	Google Maps	See where Tim is now: he always carries a GPS-enabled mobile phone and data gets plotted on a Google Map (also uses Cloudberry and his own EnGraph).	gps, mapping
25 Unsafest US Cities	GoogleMaps	A look at the 25 most unsafe cities in America.	crime, mapping, trivia
Sad Statements	YahooTerms+Twitter+ Flickr	Sad tweets are grabbed from Twitter and illustrated via pictures from Flickr. Sometimes the pictures and the text are not a perfect match. Other times the matches seem profound.	blog, messaging, microblogging, photo, ruby, widgets
Goocam	GoogleMaps	A Google map of unprotected/open camera streams obtained from Google searches. The IP addresses for each camera's url have been mapped to its Geo-location. Sometimes loads slowly. Some cams NSFW.	mapping, webcams
Famous London Barristers	GoogleMaps	View the 10 most famous London barristers, as listed by thelawyer.com.	law, london, mapping, uk
Celebrity Photos Gallery	Yahoo+YahooImages	A dyanamic collection of celebrity photo galleries. Data comes from Yahoo Image Search and Yahoo Search.	celebrity, movies, photo, television
BBC News Map	GoogleMaps+BBC	See where the latest news is happening in the UK.	mapping, news, uk
FlickrSudoku	Flickr	Mashup of a popular online sudoku player and Flickr. Sudoku player courtesy sudoku.com.au.	games, photo
Adactio Elsewhere	Amazon+del.icio.us+Flickr+Upcoming	J. Keith combines a variety of personal information from across the web in one place via Ajax scripting.	bookmarks, events, photo, shopping
Twitter Top News Trends	YahooTerms+Twitter+Google+GoogleCustomSearch+AmazonS3	Top terms often appear on Google Trends before the story people are searching for gets indexed. Googling these terms often leads to stale news. TTNT attempts to explain breaking news by gathering relevant information from Twitter.	news, search, Twitter
50 Top US Medical Schools	GoogleMaps	Map of the top US medical schools are reported by US News. Pop-up markers show MCAT scores and average tuition.	education, mapping