Kynetx Report

Creating Contextualized Web Experiences

Introducing Context Automation

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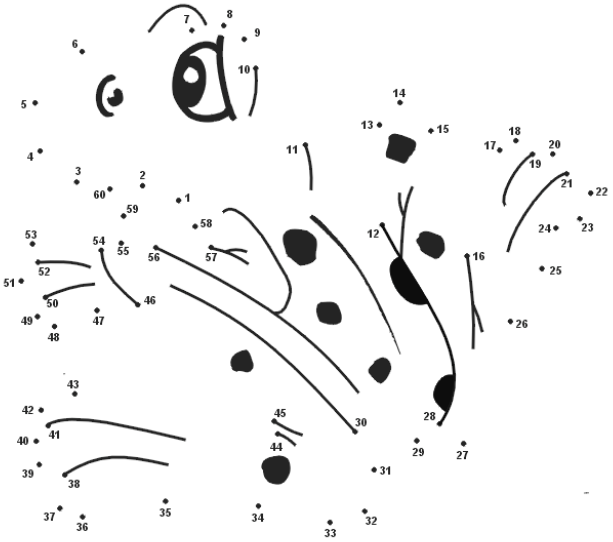
kynetx
this changes everything

Introduction

One way to keep children entertained during a long drive is with connect the dot pictures like this one:



Only by connecting the dots does the image appear[1].

Like this picture, most browsing episodes are disconnected. When people go from site to site in a browsing episode with the goal of accomplishing some task, they must connect the dots in their heads. We call the lines that connect the dots of individual Web site visits "context."

The chore of managing the context of a browsing episode usually falls to users, not their computers.

Context is all of the information relevant to a given browsing episode and can include the traits, preferences, and attributes of the user. The primary challenge of an ad hoc browsing experience is that the user must manage much of the relevant context rather than being able to turn this chore over to the machine. Browsers provide very little help with this task.

Context automation generates a browsing experience that links together formerly disconnected experiences and even modifies individual sites to automatically manage portions of the user's context and help the user achieve their goals with less effort.

This paper will first describe some recent trends that enable context automation, provide some examples of what context automation can achieve, and then describe the Kynetx system for creating contextual browsing experiences.

Recent Trends on the Web

The ability to create contextual experiences on the Web is enabled by three significant, recent trends.

1. The browser has become a platform for running applications

2. New technologies for online identity are creating a cross-site identity model
3. Cloud computing is enabling experiences that are always up to date and independent of a specific physical machine

This section discusses these in turn.

The Browser as a Platform

The Web browser has gone through a significant growth and stabilization process since its inception. As a result many computer users find that they are spending more and more of their time in the browser.

Over time, browser vendors have learned that creating a development ecosystem around their browser products is critical. Each vendor has developed an ecosystem that supports and encourages third parties to develop applications that are specific to the browser. These applications span the gamut from changing the layout and color of the browser to FTP clients and security components.

The advent of the browser as a platform is creating an opportunity for many software developers to add significant value to the browser and the browsing experience.

The browser has emerged as a viable platform for developers seeking to create new applications. Users love customizing their browsers to meet their individual needs.

To give you some idea just how healthy this ecosystem is, consider a few statistics provided at a recent browser conference hosted by Microsoft and Mozilla:

- According to Justin Scott of Mozilla[2], over 62,000 browser extensions, or add-ons as Mozilla calls them, are downloaded every hour for Firefox.
- Since 2005, over one billion add-ons have been downloaded.

At the same conference, Microsoft indicated that it too has a significant, dynamic ecosystem for browser extensions. This is significant support of the browser as a platform. For the foreseeable future, this trend is likely to continue.

The browser platform architecture allows for infrastructure to be added in an organic way that gives the customer a choice about when to add the functionality and when to use it.

In many cases, browser extensions are performing some part of the context automation task. For example, consider the case of a simple browser extension that annotates search results with information on whether or not the sites are known phishing risks. In this example, the browser extension is managing part of the security context that users would otherwise have to manage themselves.

Online Identity is Going Internet Scale

At a talk at the University of Utah in 2005, Vint Cerf[3], one of the inventors of the Internet and the developer of the TCP/IP protocol was asked what he would have changed about the design of this key protocol if he could do it over. He responded that he wished that identity had been built into the protocol from the start. As a consequence of that decision, identity on the

Internet has always been an afterthought and difficult to do. Pseudonymous activity is the norm because of the architecture of the Web.

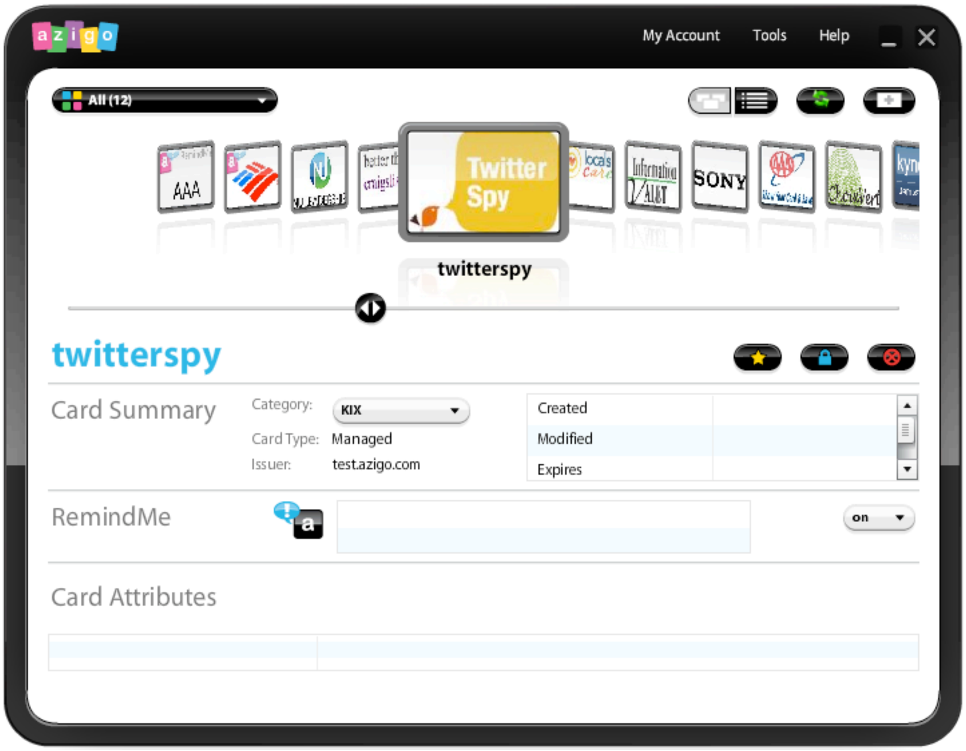
> Information cards provide—for the first time—a way for people to safely, securely, and conveniently manage their online identities independent of any particular Web site.

Web sites have always struggled with how and when to identify their customers. Registration systems allow repeat visitors to use Web sites in a more convenient manner, but initial registration requirements introduce significant friction into the process, resulting in lost transactions.

Recently, new developments in Internet scale identity systems like Information Cards[4] are changing the landscape for Web sites, credit card issuers, and most importantly Web users.

Information Cards are the product of an effort by Microsoft to solve the Internet identity problem. Based on open standards and available from several vendors, Information Card technology provides a convenient, safe, secure way for people to selectively reveal their identifying information, preferences, traits, and relationships to a Web site. The architecture of the Information Card system protects people's privacy by putting them in the driver's seat.

Information Cards provide the user with a familiar metaphor in the form of a wallet-like application called a "selector." Figure 1 shows Azigo's Information Card selector. When Web sites ask for identity information, users reach into their selector and present the Web site with an appropriate card—just like they do offline.



Category: KIX
Card Type: Managed
Issuer: test.azigo.com

Figure 1. Azigo's Information Card selector

A number of large companies, including Microsoft, Google, and PayPal are members of the Information Card Foundation (ICF), the group standardizing Information Card technology. The New York Times said[5] "The presence of PayPal, which is owned by eBay, in the group is the most significant: PayPal, with its direct access to our checking accounts, will naturally be inclined to be conservative. If it becomes convinced that these cards are more secure than passwords, we should listen."

Information Card compatible systems, including selectors, are available from several vendors including Microsoft, Novell, IBM, CA, and Azigo. There are also open source initiatives for Information Card infrastructure including the Bandit Project[6], the Higgins Project[7], and the Pamela Project[8].

Information Cards put the user in control and make fully transparent what data is being shared, and when. Consequently, users can be confident that they are granting appropriate permissions to the correct party. When this new dynamic is established, rather than being leery of personalization and customization, users will demand it.

An excellent introduction to the Information Cards ecosystem and the benefits and capabilities of Information Cards can be found in the ICF's recent whitepaper *The Information Card Ecosystem*.[9]

Cloud Computing

The cloud has long served as a metaphor for the Internet. In recent years, more and more companies have begun delivering their software services over the Internet rather than by delivering software that is run on their customer's computer equipment.

Cloud computing offers a model where services can be delivered immediately and get better over time with no effort by the user.

The advantage of cloud computing is that users get a diverse, scalable, elastic, and reliable service without incurring the upfront, capital intensive costs associated with buying hardware, housing it in a data center, and licensing software to run on it. Instead, users pay only for what they use, when they use it.

From the user's standpoint, there are two key benefits of cloud-based services:

1. The service stays up to date with new features and improved reliability and security without the user having to continually update software on their computer.
2. The service is the accessible from any platform. This provides users with a consistent experience regardless of from where they access the service.

Google Mail, or Gmail, is a perfect example of these benefits. Since it's inception it has been continuously improved without users having to perform any software installation. What's more, whether you access your mail from your own computer or the library's you get the same experience, preferences, and data.

As we'll see below, cloud based services are particularly powerful when combined with browser extensions since they make the browser extension simpler to build; the functionality of the browser extension can be changed without the user having to upgrade the extension itself. Cloud based services combined with browser extensions represent a disruptive force because new customized experiences can be easily delivered to Web users on demand and in context.

Contextual Experiences

Architectural decisions made long ago about Internet and Web architecture created a system in which machines, IP addresses, and resources (as identified by URLs) are primary and people are secondary. These decisions form the technical underpinnings of the current Web experience.

We contrast the current ad hoc situation with a new one where rich context, built on a foundation of Web site independent identity, can be used to give people enhanced browsing experiences and relationship-based interactions. At the same time, this new paradigm protects their identity, privacy, and security.

People don't usually install browser extensions merely to customize their browser. They are customizing their browser for a purpose: to impose order, form, control, and classification to the otherwise ad hoc flow of information that a stock browser provides.

The browsing experience is greatly enhanced when the browser can take advantage of rich context, built on a foundation of Web site independent identity.

In contrast to ad hoc, contextual browsing experiences are:

- Browser-aided – The browser, with the added functionality provided by structuring devices like browser extensions, serves as a tool for helping the user manage context and take action based on that context.
- Individual – Context is dependent on what is relevant to a person. Some people, for example, may care about security and others about saving money. In the case of the security-minded person, the safety of sites is relevant context. In the case of the frugal shopper, the availability of discounts is relevant context. Any system for managing context has to allow for customization at an individual level without introducing layers of burden for the developer.
- Based on identity – Individual customization is not enough. With an underlying foundation of an identity system that is designed to protect personally identifying information and secure data, context automation bolsters the privacy and security of users.
- Relationship supportive – By creating an individualized, private and secure experience, context automation supports an atmosphere of trust wherein relationships between service providers and their customers can flourish. Relationships based on trust create loyal, satisfied visitors.
- Verifiable – When the status and reputation of both service providers and their customers are verifiable, transactions can happen in an environment of trust. This can only happen when built upon the foundation of secure and private identity.

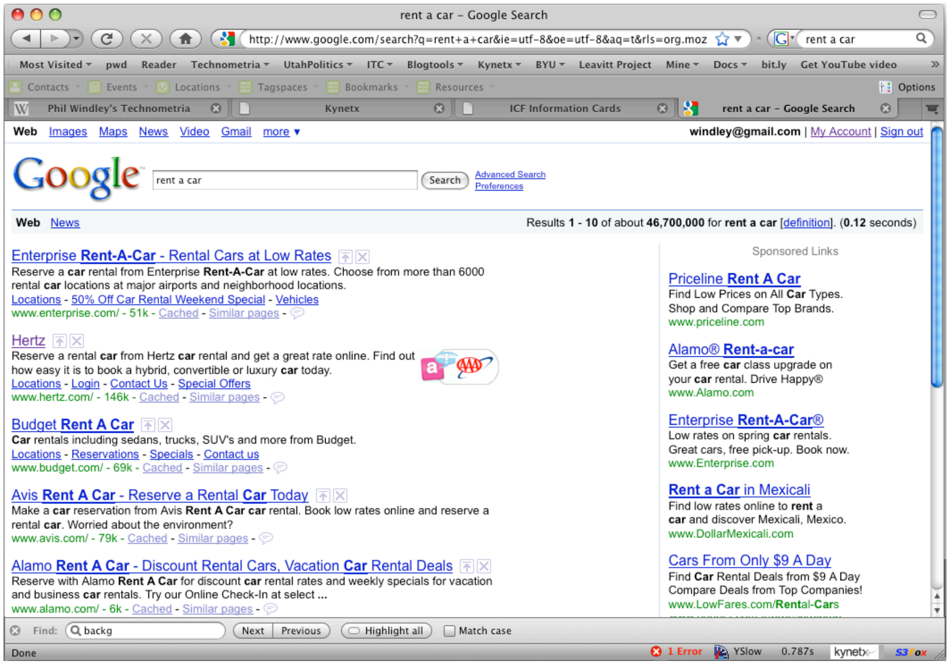
Examples of Contextual Experiences

People are already developing contextual experiences that are based on Information Card-based identity and browser extensions that use cloud-based rulesets. This section describes four of them.

Deal Reminders

People maintain multiple relationships with companies that promise some advantage from the relationship. AAA is a good example. AAA members, in addition to the obvious automobile related services, also receive discounts on numerous products and services. The problem is that most people forget about them—if they ever knew about them in the first place.

Azigo has created a RemindMe service that allows AAA members to link the relationship they have with AAA to any relationships that AAA has that might benefit them. In Figure 2 we see the user's search results annotated to remind them of the discount they are entitled to at Hertz.



Results **1** - **10** of about **46,700,000** for **rent a car** [definition]. (**0.12** seconds)

Enterprise **Rent-A-Car** - Rental Cars at Low Rates
Reserve a **car** rental from Enterprise **Rent-A-Car** at low rates. Choose from more than 6000 rental **car** locations at major airports and neighborhood locations.
Locations - 50% Off Car Rental Weekend Special - Vehicles
www.enterprise.com/ - 51k - Cached - Similar pages -

Hertz
Reserve a rental **car** from Hertz **car** rental and get a great rate online. Find out how easy it is to book a hybrid, convertible or luxury **car** today.
Locations - Login - Contact Us - Special Offers
www.hertz.com/ - 146k - Cached - Similar pages -

Budget **Rent A Car**
Car rentals including sedans, trucks, SUV's and more from Budget.
Locations - Reservations - Specials - Contact us
www.budget.com/ - 69k - Cached - Similar pages -

Avis **Rent A Car** - Reserve a Rental **Car** Today
Make a **car** reservation from Avis **Rent A Car car** rental. Book low rates online and reserve a rental **car**. Worried about the environment?
www.avis.com/ - 79k - Cached - Similar pages -

Alamo **Rent A Car** - Discount Rental Cars, Vacation **Car** Rental Deals
Reserve with Alamo **Rent A Car** for discount **car** rental rates and weekly specials for vacation and business **car** rentals. Try our Online Check-In at select ...
www.alamo.com/ - 6k - Cached - Similar pages -

Sponsored Links

Priceline **Rent A Car**
Find Low Prices on All **Car** Types.
Shop and Compare Top Brands.
www.priceline.com

Alamo® **Rent-a-car**
Get a free **car** class upgrade on your **car** rental. Drive Happy®
www.Alamo.com

Enterprise **Rent-A-Car®**
Low rates on spring **car** rentals.
Great cars, free pick-up. Book now.
www.Enterprise.com

Rent a Car in Mexicali
Find low rates online to **rent** a **car** and discover Mexicali, Mexico.
www.DollarMexicali.com

Cars From Only $9 A Day
Find **Car** Rental Deals from $9 A Day
Compare Deals from Top Companies!
www.LowFares.com/**Rental-Cars**

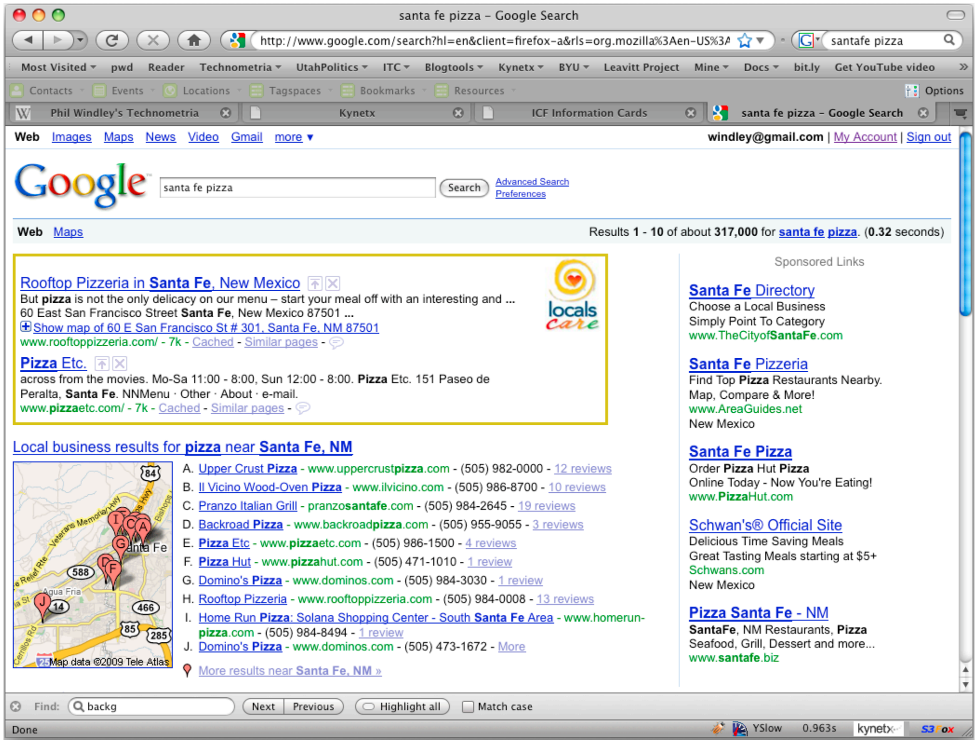
Figure 2. The Azigo RemindMe service highlights the user's relationship with AAA in Google.

This example shows how a contextualized experience—one managing the context about the user's discount entitlements—not only provides a better experience for the user, but also makes Hertz's discount offer more likely to result in a customer for Hertz and makes the discount program more valuable to AAA. Everyone wins.

Buy Local First

LocalsCare is an organization in northern New Mexico that promotes local buying among community members. These efforts are often hampered online by the inability of search engines to highlight truly local businesses as opposed to national chains with a local outlet.

LocalsCare has created a contextual experience that allows their users to see search results from member businesses on the first page of results—even when the entry may be buried many pages down. These entries are percolated to the top and shown with a distinctive golden box and the LocalsCare logo as shown in Figure 3.



Results **1** - **10** of about **317,000** for **santa fe pizza**. (**0.32** seconds)

Rooftop Pizzeria in **Santa Fe**, New Mexico
But **pizza** is not the only delicacy on our menu – start your meal off with an interesting and ...
60 East San Francisco Street **Santa Fe**, New Mexico 87501 ...
Show map of 60 E San Francisco St # 301, Santa Fe, NM 87501
www.rooftoppizzeria.com/ - 7k - Cached - Similar pages -

Pizza Etc.
across from the movies. Mo-Sa 11:00 - 8:00, Sun 12:00 - 8:00. **Pizza** Etc. 151 Paseo de Peralta, **Santa Fe**. NNMenu · Other · About · e-mail.
www.**pizza**etc.com/ - 7k - Cached - Similar pages -

Local business results for **pizza** near **Santa Fe, NM**

A. Upper Crust **Pizza** - www.uppercrust**pizza**.com - (505) 982-0000 - 12 reviews
B. Il Vicino Wood-Oven **Pizza** - www.ilvicino.com - (505) 986-8700 - 10 reviews
C. Pranzo Italian Grill - pranzo**santafe**.com - (505) 984-2645 - 19 reviews
D. Backroad **Pizza** - www.backroad**pizza**.com - (505) 955-9055 - 3 reviews
E. **Pizza** Etc - www.**pizza**etc.com - (505) 986-1500 - 4 reviews
F. **Pizza** Hut - www.**pizza**hut.com - (505) 471-1010 - 1 review
G. Domino's **Pizza** - www.dominos.com - (505) 984-3030 - 1 review
H. Rooftop Pizzeria - www.rooftoppizzeria.com - (505) 984-0008 - 13 reviews
I. Home Run **Pizza**: Solana Shopping Center - South **Santa Fe** Area - www.homerun-**pizza**.com - (505) 984-8494 - 1 review
J. Domino's **Pizza** - www.dominos.com - (505) 473-1672 - More

More results near **Santa Fe, NM** »

Sponsored Links

Santa Fe Directory
Choose a Local Business
Simply Point To Category
www.TheCityof**SantaFe**.com

Santa Fe Pizzeria
Find Top **Pizza** Restaurants Nearby.
Map, Compare & More!
www.AreaGuides.net
New Mexico

Santa Fe Pizza
Order **Pizza** Hut **Pizza**
Online Today - Now You're Eating!
www.**Pizza**Hut.com

Schwan's® Official Site
Delicious Time Saving Meals
Great Tasting Meals starting at $5+
Schwans.com
New Mexico

Pizza Santa Fe - NM
SantaFe, NM Restaurants, **Pizza**
Seafood, Grill, Dessert and more...
www.**santafe**.biz

Figure 3. The LocalsCare service augments the search with results relevant to the user's buying preferences.

LocalsCare members have expressed a preference to see local companies first in their search results. This example shows how they get an experience customized to their context and based on relationships that are important to them.

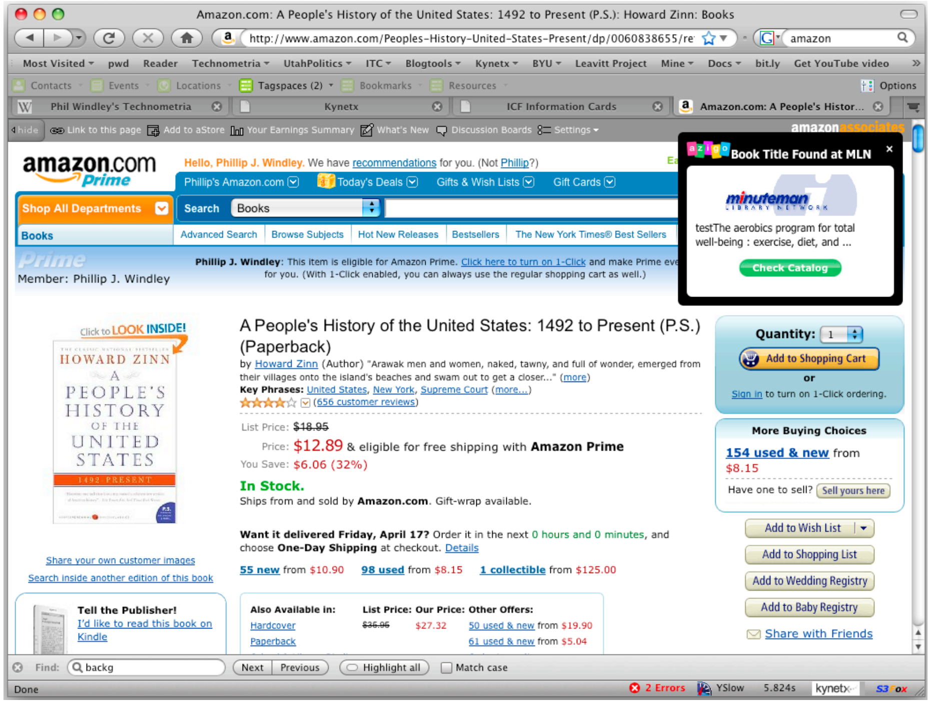
Don't Buy That Book!

Contextualized experiences don't have to be limited to search results. Indeed many of the most powerful uses of context automation occur elsewhere.

Book readers often turn to online bookstores to find a book they want to read. Many, however, are also patrons of the local library and in many cases would love to check out the book there if it were available. Certainly, one can visit the online bookstore and the local library's Web site separately, but the experience is easier when these two visits are combined into one.

The Minuteman Library Network of Boston, in association with Azigo, has created a contextualized experience that does just that. As shown in Figure 4, when a member of that network visits Amazon, Barnes and Noble, or

Borders online, a notification is placed on the page when the book they're looking at is available at their local library.



Hello, Phillip J. Windley. We have recommendations for you. (Not Phillip?)

Phillip J. Windley: This item is eligible for Amazon Prime. Click here to turn on 1-Click and make Prime eve for you. (With 1-Click enabled, you can always use the regular shopping cart as well.)

Member: Phillip J. Windley

testThe aerobics program for total well-being : exercise, diet, and ...

A People's History of the United States: 1492 to Present (P.S.) (Paperback)

by Howard Zinn (Author) "Arawak men and women, naked, tawny, and full of wonder, emerged from their villages onto the island's beaches and swam out to get a closer..." (more)

Key Phrases: United States, New York, Supreme Court (more...)

(656 customer reviews)

List Price: ~~$18.95~~

Price: $12.89 & eligible for free shipping with Amazon Prime

You Save: $6.06 (32%)

In Stock.

Ships from and sold by Amazon.com. Gift-wrap available.

Want it delivered Friday, April 17? Order it in the next 0 hours and 0 minutes, and choose One-Day Shipping at checkout. Details

55 new from $10.90 98 used from $8.15 1 collectible from $125.00

or

Sign in to turn on 1-Click ordering.

154 used & new from $8.15

Have one to sell?

Share your own customer images

Search inside another edition of this book

Tell the Publisher!

I'd like to read this book on Kindle

Also Available in:	List Price:	Our Price:	Other Offers:
Hardcover	~~$35.95~~	$27.32	50 used & new from $19.90
Paperback			61 used & new from $5.04

Figure 4. The Minuteman Library Network provides a service that tells their members when a book they're viewing at an online bookstore is available for checkout.

Linking the data from multiple Web sites and then placing the result in a place that is convenient for the user makes the overall task of "finding a book" simpler and easier.

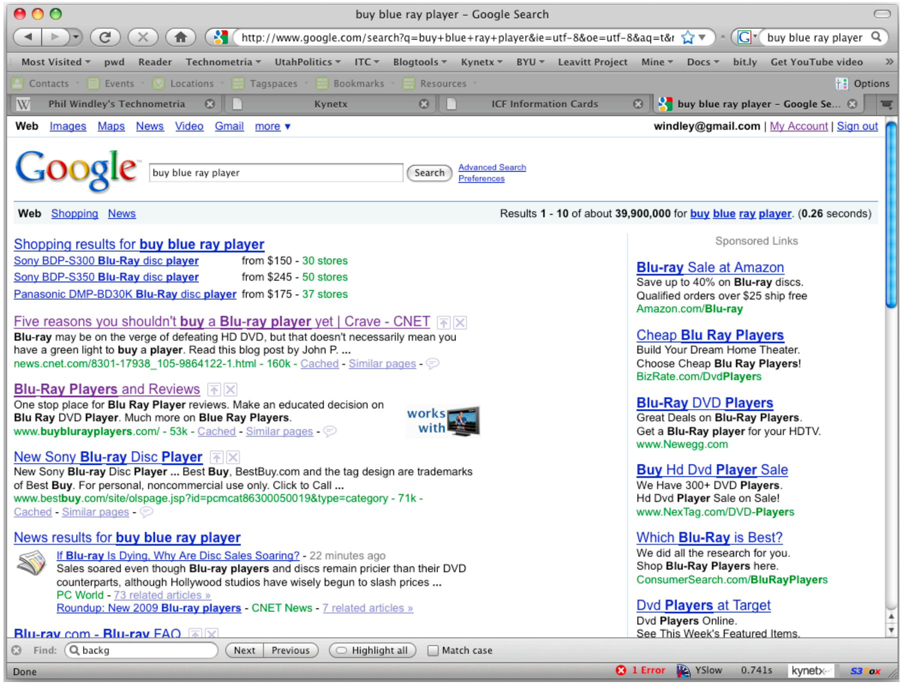
Brand Promotion

Many people are loyal to particular brands. Unfortunately, brand managers are often at the mercy of distribution partners or—even more frustrating—the vicissitudes of the Web itself.

This example, built as a demonstration, shows how a brand manager can contextualize search and specific sites to help brand enthusiasts find products that work together and promote the direct-to-consumer channel.

In this scenario, assume that the user is a Sony user who has just bought and registered a new LCD TV and is now looking for a Blue Ray player that works well with that TV. The Sony brand manager has created a contextualized experience on search and in specific sites to promote the Sony brand.

Figure 5 shows a search annotation that highlights a Web site that discusses Blue Ray players that will work with the Sony LCD TV that the user owns. The site was chosen because it is applicable and also ranks high in search results on the keywords "buy blue ray player."



Results **1** - **10** of about **39,900,000** for **buy blue ray player**. (**0.26** seconds)

Shopping results for buy blue ray player

Sony BDP-S300 **Blu-Ray** disc **player** from $150 - 30 stores
Sony BDP-S350 **Blu-Ray** disc **player** from $245 - 50 stores
Panasonic DMP-BD30K **Blu-Ray** disc **player** from $175 - 37 stores

Five reasons you shouldn't **buy** a **Blu-ray player** yet | Crave - CNET
Blu-ray may be on the verge of defeating HD DVD, but that doesn't necessarily mean you have a green light to **buy** a **player**. Read this blog post by John P. ...
news.cnet.com/8301-17938_105-9864122-1.html - 160k - Cached - Similar pages -

Blu-Ray Players and Reviews
One stop place for **Blu Ray Player** reviews. Make an educated decision on **Blu Ray** DVD **Player**. Much more on **Blue Ray Players**.
www.**buyblurayplayers**.com/ - 53k - Cached - Similar pages -

New Sony **Blu-ray** Disc **Player**
New Sony **Blu-ray** Disc **Player** ... Best **Buy**, BestBuy.com and the tag design are trademarks of Best **Buy**. For personal, noncommercial use only. Click to Call ...
www.best**buy**.com/site/olspage.jsp?id=pcmcat86300050019&type=category - 71k - Cached - Similar pages -

News results for **buy blue ray player**
If **Blu-ray** Is Dying, Why Are Disc Sales Soaring? - 22 minutes ago
Sales soared even though **Blu-ray players** and discs remain pricier than their DVD counterparts, although Hollywood studios have wisely begun to slash prices ...
PC World - 73 related articles »
Roundup: New 2009 **Blu-ray players** - CNET News - 7 related articles »

Blu-ray.com - Blu-ray FAQ

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Blu-ray Sale at Amazon
Save up to 40% on **Blu-ray** discs.
Qualified orders over $25 ship free
Amazon.com/**Blu-ray**

Cheap **Blu Ray Players**
Build Your Dream Home Theater.
Choose Cheap **Blu Ray Players**!
BizRate.com/Dvd**Players**

Blu-Ray DVD **Players**
Great Deals on **Blu-Ray Players**.
Get a **Blu-Ray player** for your HDTV.
www.Newegg.com

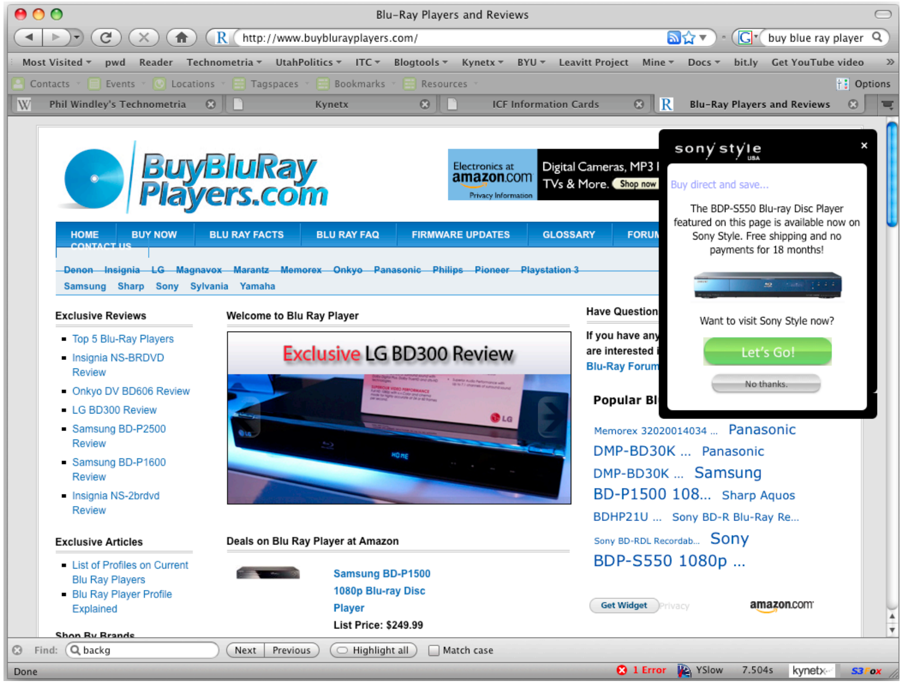
Buy Hd Dvd **Player** Sale
We Have 300+ DVD **Players**.
Hd Dvd **Player** Sale on Sale!
www.NexTag.com/DVD-**Players**

Which **Blu-Ray** is Best?
We did all the research for you.
Shop **Blu-Ray Players** here.
ConsumerSearch.com/**BluRayPlayers**

Dvd **Players** at Target
Dvd **Players** Online.
See This Week's Featured Items.

Figure 5. The Sony brand manager has created a "works with" campaign that targets popular keywords related to Sony products.

Once the user clicks through to the site, the brand manager has placed a notification on the page that tells the user that the model at which they are looking on this highly ranked site is available from Sony's direct-to-consumer store *Sony Style* as shown in Figure 6.



Buy direct and save...

The BDP-S550 Blu-ray Disc Player featured on this page is available now on Sony Style. Free shipping and no payments for 18 months!

Want to visit Sony Style now?

Exclusive Reviews

- Top 5 Blu-Ray Players
- Insignia NS-BRDVD Review
- Onkyo DV BD606 Review
- LG BD300 Review
- Samsung BD-P2500 Review
- Samsung BD-P1600 Review
- Insignia NS-2brdvd Review

Exclusive Articles

- List of Profiles on Current Blu Ray Players
- Blu Ray Player Profile Explained

Shop By Brands

Welcome to Blu Ray Player

Deals on Blu Ray Player at Amazon

Samsung BD-P1500 1080p Blu-ray Disc Player
List Price: $249.99

Have Question
If you have any
are interested i
Blu-Ray Forum

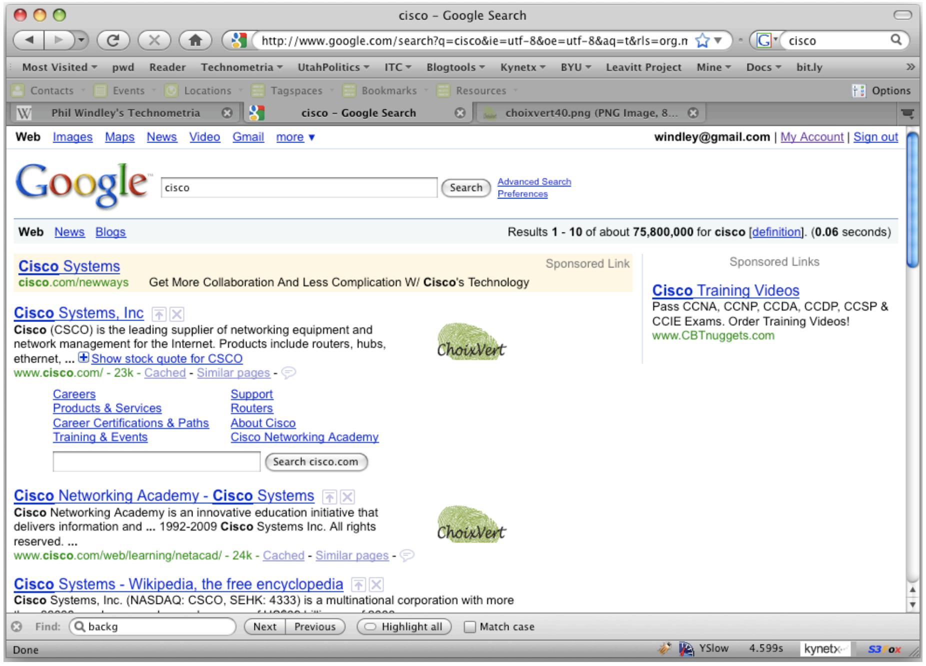
Popular Bl

Memorex 32020014034 ... Panasonic DMP-BD30K ... Panasonic DMP-BD30K ... Samsung BD-P1500 108... Sharp Aquos BDHP21U ... Sony BD-R Blu-Ray Re... Sony BD-RDL Recordab... Sony BDP-S550 1080p ...

Figure 6. The Sony Brand manager has messaged brand enthusiasts on a popular Blue Ray player site that the model they are looking at is available from Sony's direct-to-consumer store Sony Style.

Promoting Social Responsibility

Project ChoixVert is a non-profit organization with the goal of promoting social responsibility. They have created a contextual experience that rewards companies for being socially responsible by flagging their entries in search engines as well as displaying badges on the home pages of companies with a good track record.



Results **1** - **10** of about **75,800,000** for **cisco** [definition]. (**0.06** seconds)

Sponsored Link

Cisco Systems
cisco.com/newways Get More Collaboration And Less Complication W/ **Cisco**'s Technology

Cisco Systems, Inc
Cisco (CSCO) is the leading supplier of networking equipment and network management for the Internet. Products include routers, hubs, ethernet, ... Show stock quote for CSCO
www.**cisco**.com/ - 23k - Cached - Similar pages -

Careers
Products & Services
Career Certifications & Paths
Training & Events
Support
Routers
About Cisco
Cisco Networking Academy

Search cisco.com

Cisco Networking Academy - **Cisco** Systems
Cisco Networking Academy is an innovative education initiative that delivers information and ... 1992-2009 **Cisco** Systems Inc. All rights reserved. ...
www.**cisco**.com/web/learning/netacad/ - 24k - Cached - Similar pages -

Cisco Systems - Wikipedia, the free encyclopedia
Cisco Systems, Inc. (NASDAQ: CSCO, SEHK: 4333) is a multinational corporation with more

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Cisco Training Videos
Pass CCNA, CCNP, CCDA, CCDP, CCSP & CCIE Exams. Order Training Videos!
www.CBTnuggets.com

Figure 7. The ChoixVert logo is displayed next to the search engine entries of companies that display socially responsible behavior.

ChoixVert is a good example of a project with high emotional appeal and one that provides users with information about issues important to them—all without having to visit multiple sites or remember long lists of data.

Kynetx Network Services and Context Automation

Each of the examples in the preceding section were created using Kynetx Network Services (KNS). KNS is designed to make it easy to create context-aware browsing sessions that respond to user context to deliver better, more customized experiences. KNS provides an abstraction layer on the Internet for creating cross-site transactional context in support of context automation.

KNS has several important features that make context automation easy and effective:

- KNS is Web site independent. KNS is designed from the ground up to work with any Web site.
- KNS works across Web sites. KNS responds to user context, even when that context includes information the user collected at another site.

- KNS is browser independent. The KNS system works with all modern browsers.
- KNS is context-aware. KNS makes use of permissioned, personal information that the user supplies as well as ambient data about current and past browsing episodes.
- KNS is real time. KNS is constantly working in the background to provide context-aware interactions that are customized to user, page, and moment.
- KNS is secure. Because KNS is based on Information Cards, KNS provides a secure, private environment where context is shared under user control.

Using KNS, Web sites can easily respond to visitor context and provide a customized, structured experience.

KNS provides better, personalized experiences to users and at the same time allows Web sites to be more responsive to user needs. This is the basis for a relationship between visitor and Web site that engenders trust and loyalty. KNS does not mediate that relationship, but enables it by providing a richer foundation upon which mutual reputation, trust, and loyalty can be built.

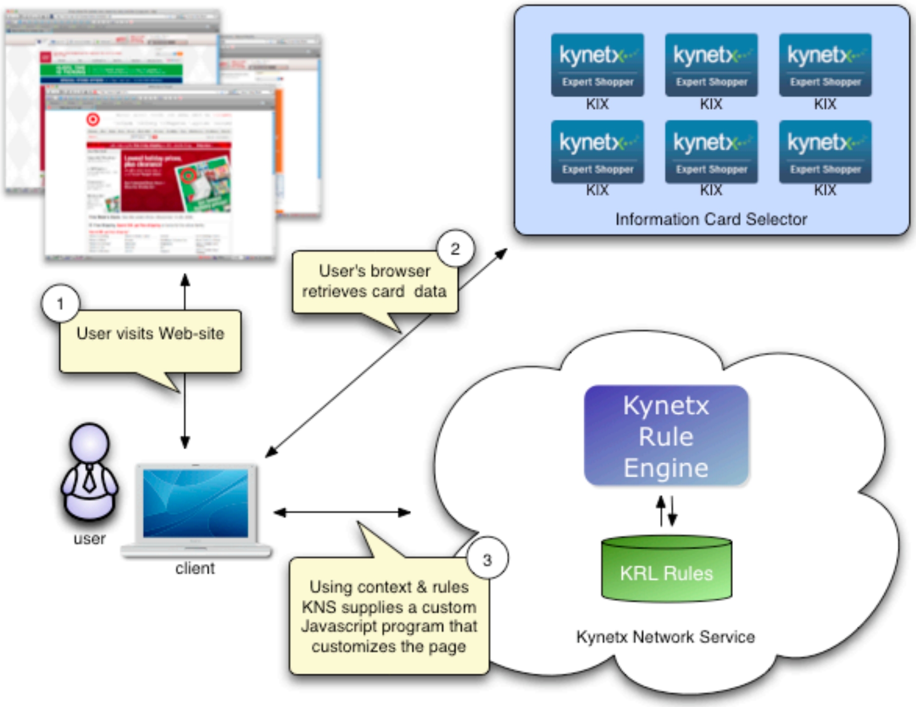
How Kynetx Works

KNS depends on three inter-related technologies to accomplish its work.

- **Kynetx Information Cards** (KIX) provide Web site independent identity. Specific cards, through the claims they contain, activate functionality inside the browser. KIX are simply any Information Card with appropriate metadata.
- **Kynetx Rule Language** (KRL) is a domain specific language that provides an abstract, linguistic means of specifying contextual experiences by customizing browser content.
- **Kynetx Rule Engine** (KRE) evaluates KRL rules in response to requests from the browser and responds with custom JavaScript code to be executed in the browser.

The interaction of these three technologies provides a means for companies, developers, and even individuals to create contextual experiences on the Web.

As shown in Figure 8, without KNS, users only interact with the Web site (1). Kynetx adds two critical components to generate structured browsing: the KIX in the information card selector (2) and the cloud service, KNS, that customizes the page based on the user context (3).


kynetx Expert Shopper KIX
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kynetx Expert Shopper KIX
Information Card Selector
2 User's browser retrieves card data
1 User visits Web-site
user
client
Kynetx Rule Engine
KRL Rules
Kynetx Network Service
3 Using context & rules KNS supplies a custom Javascript program that customizes the page

Figure 8: KNS customizes the page the user is viewing.

Kynetx Information Cards

KIX are standard Information Cards that also contain data about an associated ruleset. The Information Card Foundation has given the moniker "action cards" to Information Cards as used by KNS.

KIX are an abstract representation of desired functionality. When a person chooses a KIX, the functionality associated with that card is enabled in their Web browser.

Before a card can affect the browser, the user will download and install a card selector[10] and a browser extension that allows the browser to respond to the card selector and KNS. That one installation of a card selector provides the user with what amounts to a universal browser extension. After that single install, users gain additional functionality by putting small (< 3k) cards into the selector—a simple, secure, and friction-free experience.

KIX represent particular functionality and allow users to easily and safely manage their personal information along with their Web experience.

The card selector allows the user to easily manage their KIX, including sorting, searching, arranging, enabling, disabling, and deleting cards. Disabling or deleting a card is easy and instantly removes the functionality associated with it from future browsing experiences.

The contextual experiences described in the previous section are all enabled through importing a card into the selector as shown in Figure 1.

Kynetx provides a directory of some of the available cards called the KIX Directory. [11] This directory lists cards that people have chosen to share.

Kynetx anticipates a need to certify cards in some way. One proposed method is to create a certification program that would certify that the functionality associated with a KIX is safe, private, and secure.

Another proposed method would use a combination of information about a card based on an automatic analysis and a distributed reputation system driven by users to create a risk profile. Neither of these have been implemented yet.

Developers might offer KIX for free or for sale depending on the desire of the developer

Because KIX are based on the Information Card standard, supporting infrastructure is available from a number of vendors and their safety and security is based upon 15 years of research and development.

Kynetx Rule Engine

KRE provides an API[12] that allows Kynetx rulesets to be stored, retrieved, analyzed and, most importantly, evaluated.

When a request to evaluate a ruleset is made to KRE, that request contains information such as which cards are installed, what claims they contain, the current state of the browser, and other session information. Based on this request, KRE responds with a small JavaScript program customized to the request. That JavaScript program, running in the browser, customizes the user's experience.

KRE includes a callback mechanism by which rules can communicate success and failure messages back to KNS. KRE provides A/B testing for rules and an analytics subsystem for monitoring rule actions and activity. A/B testing provides developers with the means for testing rules to determine their effectiveness and fitness for purpose. Analytics allows rule developers to see detailed data about how rules are being used and track which rules work and which do not.

The primary delivery mechanism for KRE is a cloud based software infrastructure service that responds to ruleset evaluation requests. Kynetx charges for ruleset evaluations on a CPM basis or on a monthly flat rate per installed card. Kynetx is also willing to license KRE to companies wishing to run a private or semi-private KNS system behind their firewall or for their customers.

Kynetx Rule Language

KRL is the heart of the Kynetx system and the source of its tremendous flexibility and power.

KRL, as its name implies, is a rule language that specifies what actions should be taken when a specific set of conditions is met[13]. A ruleset is a collection of rules meant to provide a particular structured experience. The KIX that are in the user's card selector, along with the Web page that the user is viewing, determine which rulesets are used. Specific rules fire based on the context contained in the request.

The Kynetx Rule Language provides a powerful abstraction for creating and delivering contextual experiences on the Web.

KRL gives any developer the power to deliver contextual experiences. This gives developers incredible leverage that drastically reduces their development effort in several ways:

First, because KNS provides a kind of universal browser extension that works across operating systems and browsers, developers are freed from writing complex code in multiple languages. This represents the great bulk of the current browser extension development effort. Instead, they can concentrate on what they really care about: building the functionality they want to deliver.

Second, because KRL generates JavaScript code that has been tested to work in all modern browsers, developers can largely ignore browser compatibility—one of the great obstacles to writing a widely used browser extension.

Third, because of the power of its abstractions and its design for the specific task of building structured experiences on the Web, KRL gives developers a compact and easily used notation that provides real intellectual leverage. In short, one line of code can replace dozens of lines in a more general-purpose language. Changes to browsers or Web sites can be recognized and fixed in KRE once instead of in hundreds or thousands of individual programs.

Kynetx provides a simple interactive development environment (IDE) called AppBuilder[14] for writing and publishing rulesets. Kynetx anticipates that others will also build tools that support KRL.

A simple provisioning process allows developers to create a new ruleset and associated KIX. Then, using AppBuilder, developers add rules to the ruleset to create the structured experience. Developers can distributes cards in a number of ways, including online, in email, or even using social networking tools like Twitter or Facebook.

The Benefits of KNS

KNS reduces risk and increases leverage for businesses wishing to offer their customers a contextual browsing experience. In addition, Kynetx supports users seeking better, more contextual browsing. Lastly, Kynetx gives developers an easy to user and powerful took for customizing the browser experience.

The following lists some specific benefits:

- KIX, KRL, and KRE provide an abstract means of adding functionality to the browser giving developers tremendous leverage.
- A Kynetx contextual experience is cross-platform and multi-browser without effort by the developer.
- A Kynetx contextual experience is more secure than one delivered by a typical browser extension. The only software running on the user's machine—with access to the user's private data—is the card selector and a single, simple, easily analyzed browser extension.

- The architecture of Information Cards is designed to put users in a position where they can control the release of their private data including any claims that are associated with their KIX.
- Security and privacy are built-in to the underlying technology.
- Context automation generates a trusted, secure environment where high value relationships can be built and maintained at lower cost.
- Users are freed from managing episode context and can turn much of that chore over to the browser.
- Users can customize and enhance their browsing experience using small, easy to manage tokens in the form of KIX rather than through large, bulky code-based browser extensions.

Summary

People who experience contextual browsing will wonder why it hasn't always been this way.

Reshaping the browsing experience to allow people to use the Web in a way that preserves episode context across multiple sites will transform the Web beyond what we can imagine. As we've discussed, three important trends are making this possible:

1. The browser becoming a viable platform
2. Cloud computing
3. The advent of Internet identity

By themselves, these trends will not change the Web. But when they are combined so that their individual strengths play off each other and wrapped in an abstraction like KNS, they promise to change the way people use the Web and increase the value they derive from it.

Context automation is a compelling shift in the world of computing. People who experience contextual browsing compared to the traditional ad hoc experience will wonder why it hasn't always been this way. As an individualized, real-time service that operates across multiple Web sites, context automation offers people freedom from the tedious chore of connecting the "context dots" between multiple sites and, as a consequence, streamlines browsing episodes.

KNS significantly reduces the risk that businesses must undertake to provide contextual experiences for their customers.

As a platform, KNS provides an abstraction layer on the Web, making it easy to create context-aware, structured browsing experiences. Our vision is one that allows existing methods of using the Web to co-exist with context automation, increasing opportunity and decreasing risk for all participants.

KNS allows businesses to provide contextual experiences for their Web visitors by leveraging the context of individual browsing episodes. KNS gives developers a low-risk avenue for extending the browser with context-aware services that interplay with Web sites.

Kynetx offers a low-friction way for users, businesses, and developers to participate in this coming transformation of the Web.

Lexicon

ad hoc browsing—browsing without context.

AppBuilder—the interactive development environment (IDE) that developers use to create KRL rulesets.

browser extension—a small program that is run inside the browser to modify the browsing experience in some way.

browsing episode—the browsing activities performed by a user in connection with accomplishing a given task.

claims—data elements stored in an information card.

context—all of the information relevant to a given browsing episode.

context automation—changing the browsing experience programmatically across multiple Web sites through the use of a browser extension.

information card—a small cryptographically-enabled data file that represents an entity's identity.

KIX directory—the directory of KIX that are available. The directory allows users to find cards that provide the functionality they desire.

Kynetx Information Cards (KIX)—information cards used inside KNS.

Kynetx Network Service (KNS)—the cloud service presented by the KRE executing KRL rulesets in response to browser requests.

Kynetx Rule Language (KRL)—a domain specific language that provides an abstract, linguistic means of specifying structured experiences through customization of browser content.

Kynetx Rule Engine (KRE)—evaluator for KRL rules that accepts requests from the browser and responds with custom JavaScript code that is executed to customize the experience.

selector—a container or wallet-like software application that runs on the user machine; used to manage information cards.

structured browsing—browsing in context using KNS.

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Endnotes

[1] If you're wondering, this is a frog.
[2] One Billion Add-On Downloads, Justin Scott, Mozilla, http://blog.fligtar.com/2008/11/19/1-billion-add-on-downloads/
[3] Internet Challenges, April 19, 2005, http://www.windley.com/archives/2005/04/vint_cerf_on_in.shtml
[4] Information Card Foundation, http://informationcard.net/
[5] Goodbye, Passwords. You Aren't a Good Defense, New York Times, 9 Aug 2008, http://www.nytimes.com/2008/08/10/technology/10digi.html
[6] Bandit Project, Novell. http://www.bandit-project.org/
[7] Higgins Project, The Eclipse Foundation. http://www.eclipse.org/higgins/
[8] Pamela Project. http://pamelaproject.com/
[9] *The Information Card Ecosystem*, Information Card Foundation, April 2009 http://www.informationcard.net/white-papers/ecosystem
[10] Currently KNS works with the Azigo selector because of it's unique support for metadata. Kynetx has the goal of being selector agnostic and supporting a variety of selectors.
[11] KIX Directory: http://kix.kynetx.com/
[12] The API is described online: http://wiki.kynetx.com/pages/Kynetx_Network_Services_(KNS)_API
[13] KRL is documented online: http://wiki.kynetx.com/pages/Kynetx_Rule_Language_(KRL)_Documentation
[14] Kynetx AppBuilder, Kynetx, Inc. http://appbuilder.kynetx.com