



Sun's 2004 Worldwide Java Developer Conference™

The P2P Sockets Project

Easily Create JXTA™ P2P
Applications Using Your
Java™ 2 Framework,
Enterprise Edition (J2EE™)
Technology Skills

java.sun.com/javaone/sf

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Rojo/Paper Airplane

<http://p2psockets.jxta.org>



Is This Talk for Me?

- Would you like to use your J2EE™ technology skills to create P2P programs?
- Want to experiment with network applications that work seamlessly out of the box?
- Are you interested in open-source and free technologies?

Goal of This Talk

By the end of this presentation you will be able to create P2P software using your existing J2EE technology skills

Agenda

What Is the P2P Sockets Project?

Creating P2P Applications With Sockets

Creating P2P Applications With
J2EE™ Technology

Deployment and Security

Building a P2P Sockets Application:
Paper Airplane

Summary

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Summary

What Is the P2P Sockets Project?

- Open-source P2P framework
- BSD-license
- Java™ sockets and server sockets ported to JXTA™ technology
- J2EE application ported to JXTA technology
- P2P Domain Name System (DNS)
- Browser integration
- Easy deployment

What Is JXTA Technology ?

- P2P framework and protocols
- Open-source
- Provides P2P network
 - Routing
 - Communication
 - Searching
- Overlay network

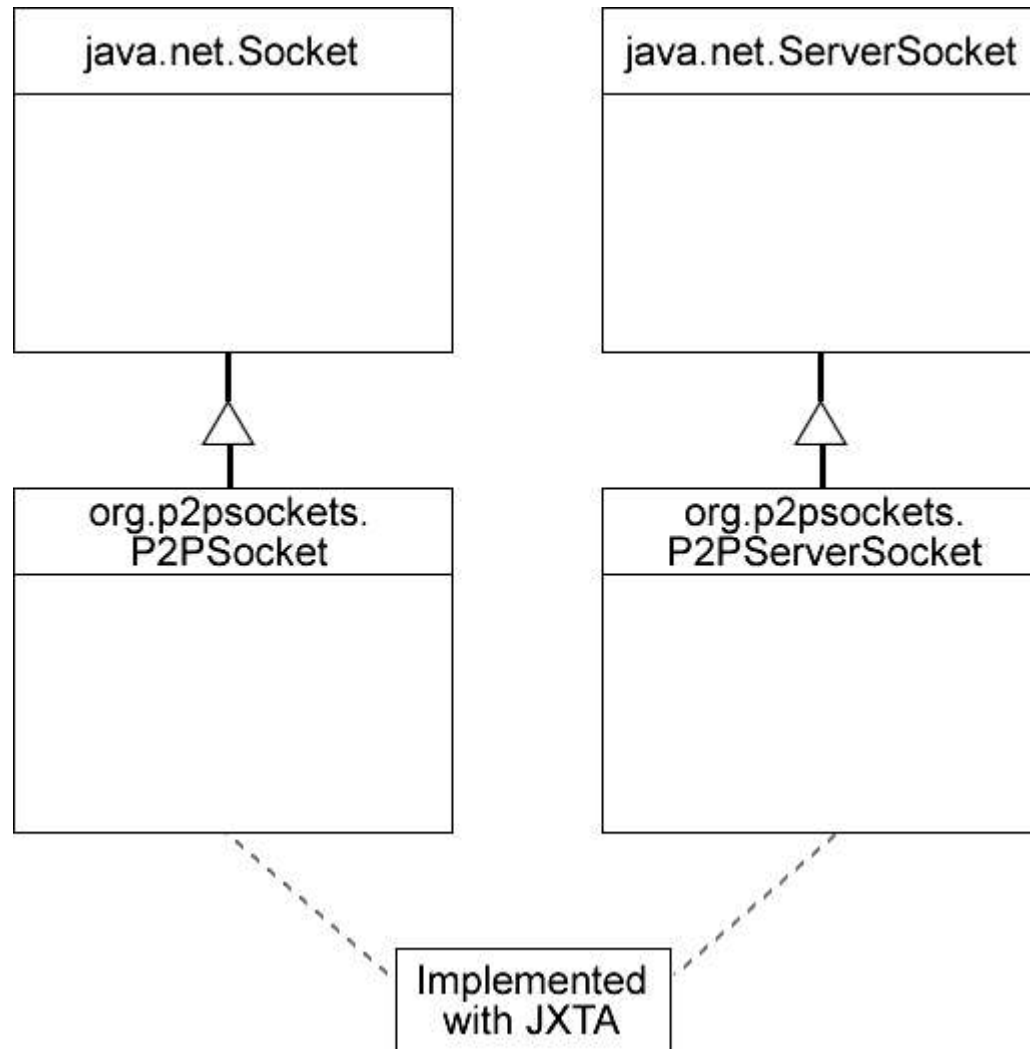
What Is JXTA Technology ?

- Why re-implement on top of JXTA technology?
 - Reach peers behind firewalls, NATs, etc.
 - Resolve domain names in a distributed way
 - P2P DNS

What Is the P2P Sockets Project?

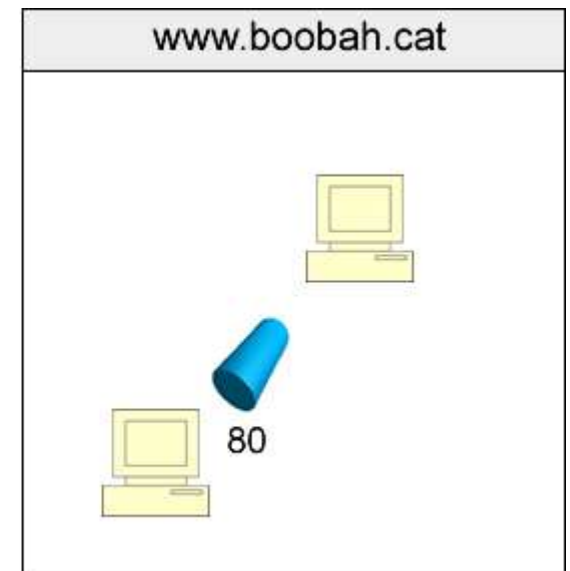
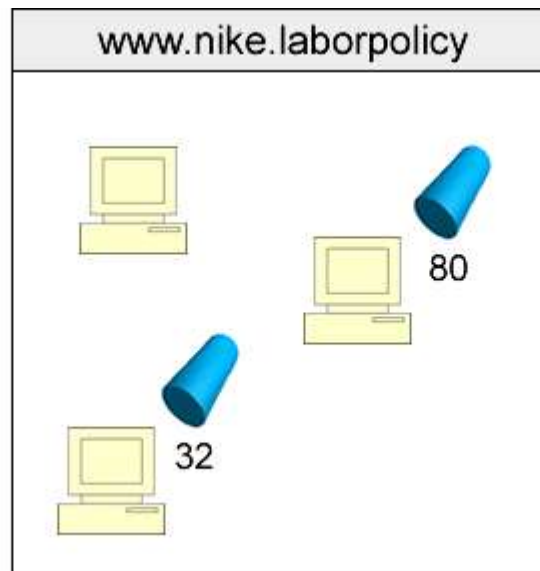
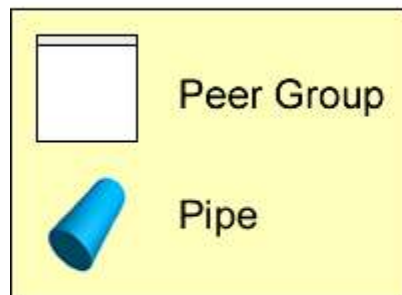


What Are P2P Sockets?



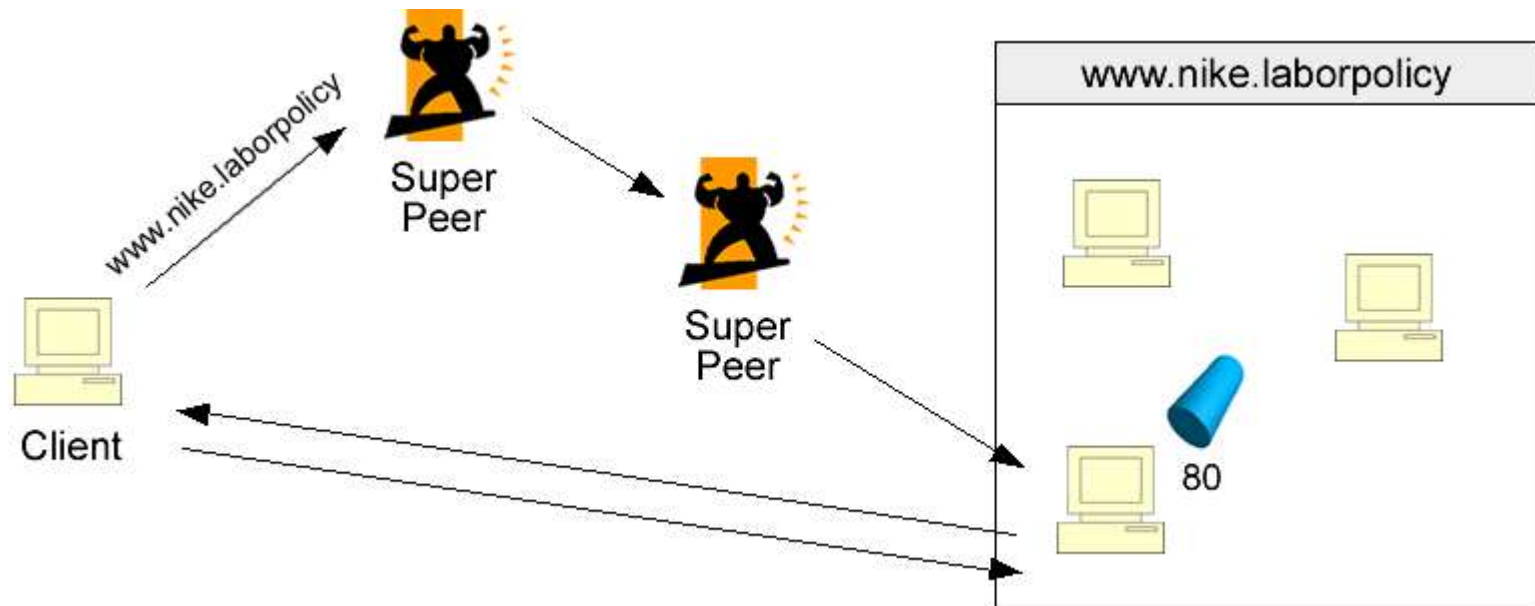
What Are P2P Sockets?

- Overlay TCP/IP on P2P network
- **Domain Names/IP Addresses** become **Peer Groups**
- **Ports** become **Pipes** within this peer group



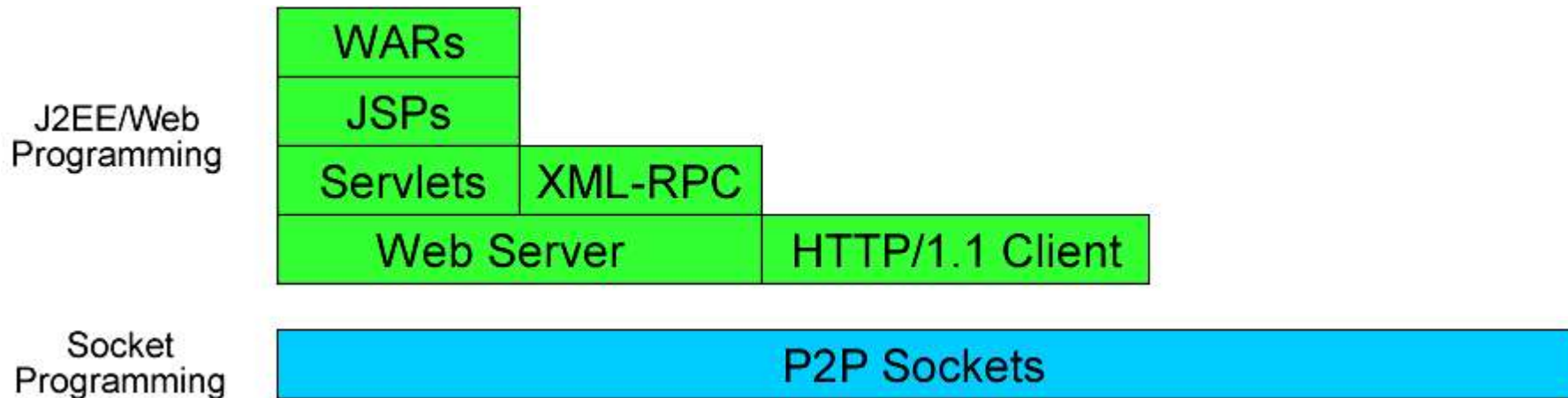
What Are P2P Sockets?

- Domain resolution goes through JXTA technology super-peers



Getting Started

- Two entry points:



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When to Use

- Use if you want to port over an existing library that uses sockets, such as:
 - SOAP libraries
 - Java RMI libraries
 - Tomcat servlet engine

Example Server Peer

- Creating a P2P server socket:

```
// start a server socket for the domain
// "www.nike.laborpolicy" on port 80
ServerSocket server = new
    P2PServerSocket("www.nike.laborpolicy", 80);

// wait for a client
Socket client = server.accept();
InputStream in = client.getInputStream();
OutputStream out = client.getOutputStream();
```


Example Client Peer

- Creating a P2P socket:

```
// create a socket to connect to the domain
// "www.nike.laborpolicy" on port 80
Socket socket = new
    P2PSocket("www.nike.laborpolicy", 80);

// communicate
InputStream in = socket.getInputStream();
OutputStream out = socket.getOutputStream();
```

Initializing the Network

- Sign in and initialize the network:

```
// sign into the peer-to-peer network
P2PNetwork.signin("serverpeer",
    "serverpeerpassword", "TestNetwork", true,
    true);
```

- *TestNetwork* is a unique name that will be given to your P2P network

Demo

P2P Client Socket Accessing
P2P Server Socket



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Creating P2P Applications With J2EE Technology

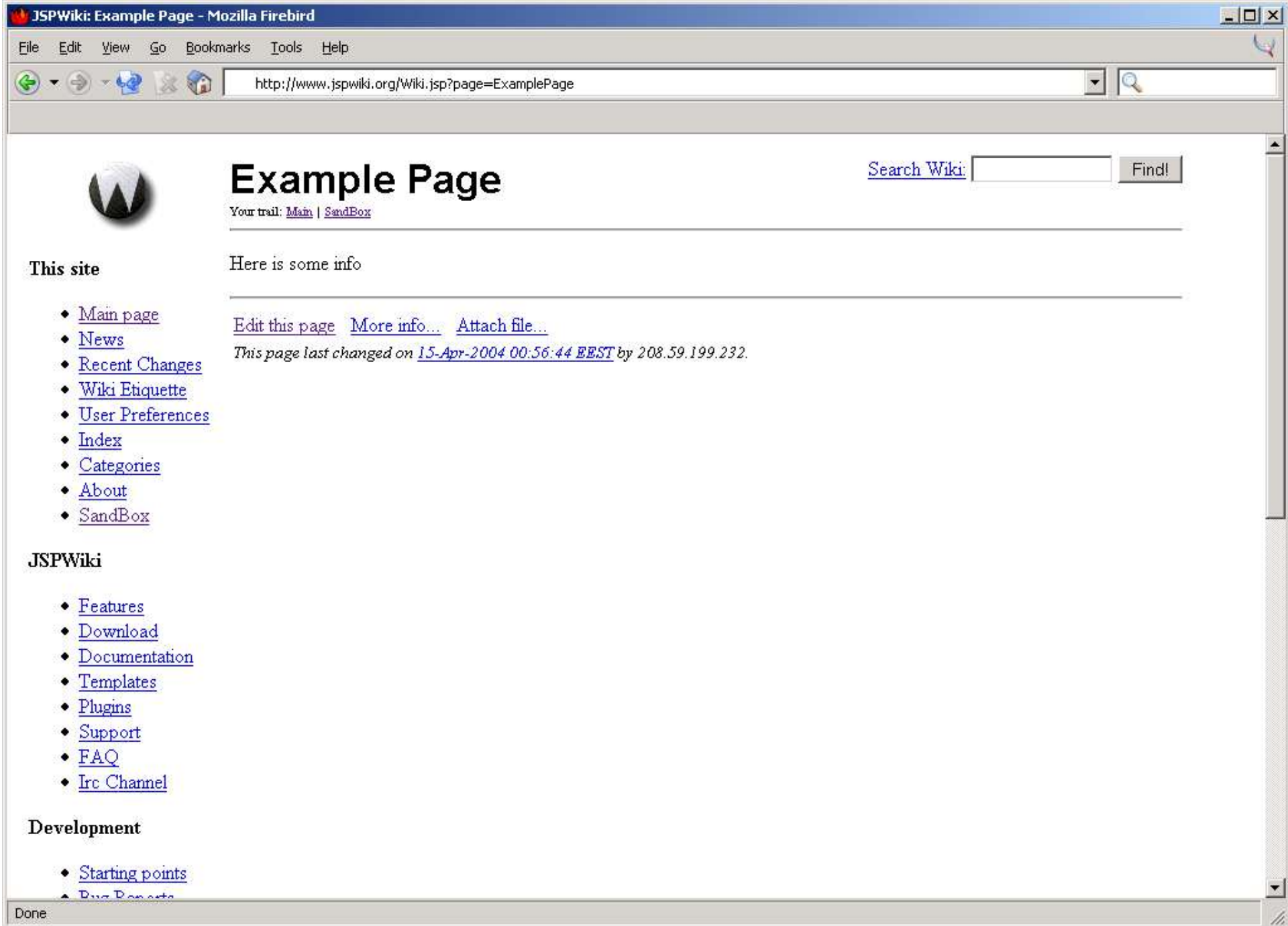
- Use when:
 - Socket API is too low-level
 - Porting existing JSP™ and Servlet code
- Most servlets, JSP, and WARs will automatically work

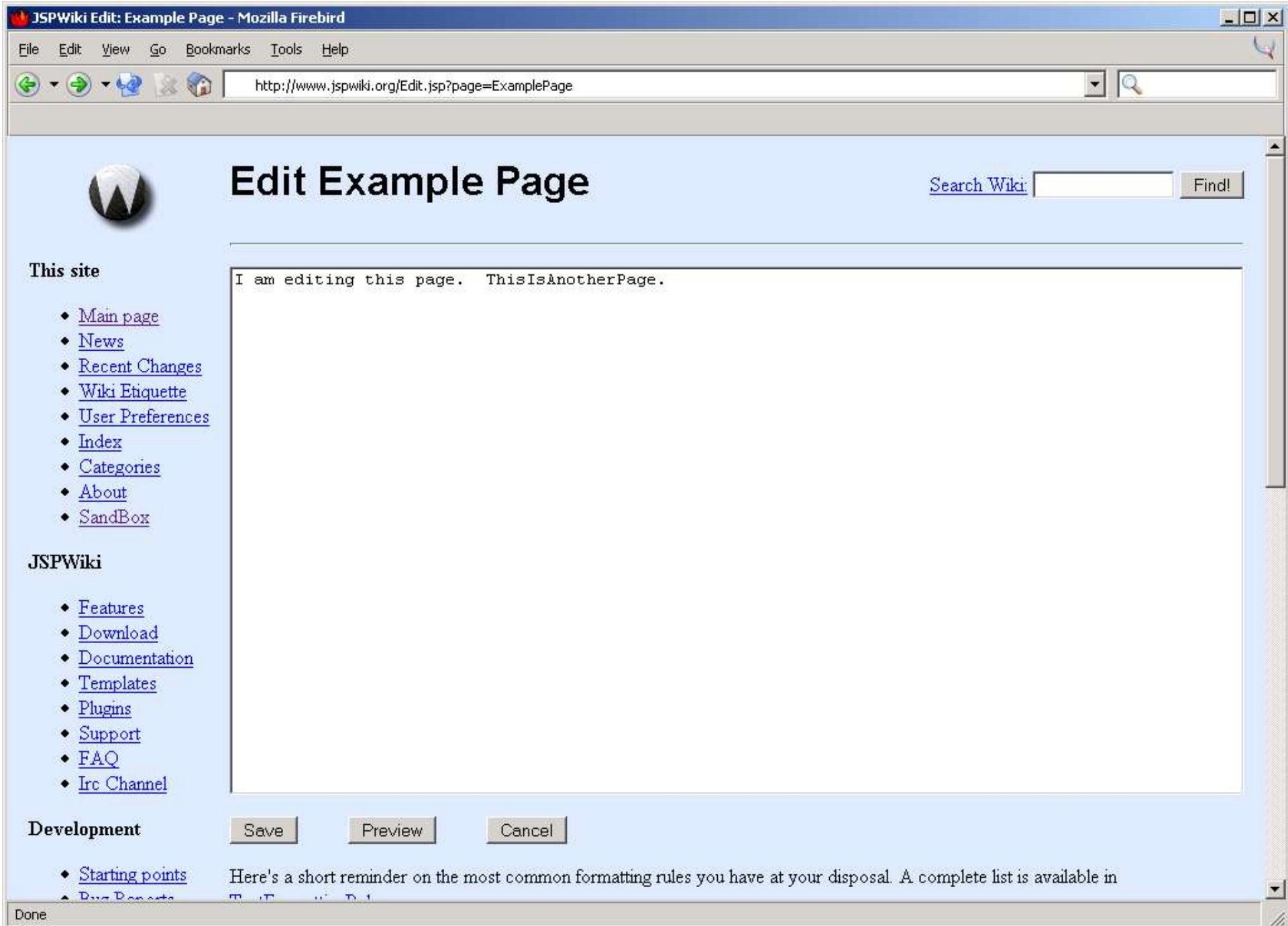
Creating P2P Applications With J2EE Technology

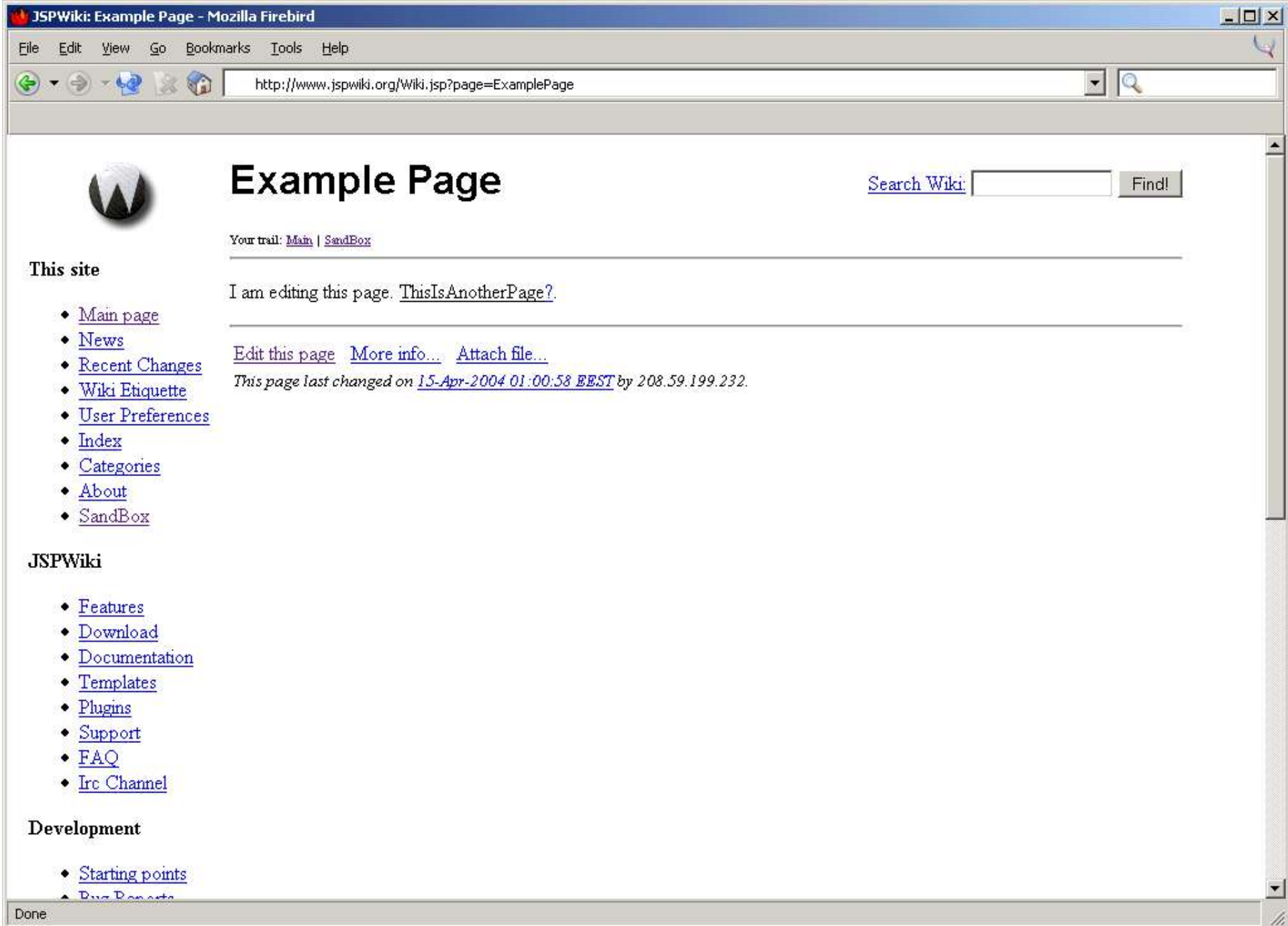
- P2P Sockets has ported the following to JXTA technology:
 - Jetty Web server/servlet engine
 - Jasper JSP engine
 - Apache Commons HTTP/1.1 Client
 - Apache XML-RPC client and server
 - SmartCache web proxy/gateway

Example P2P Web Site

- Start up a web site that can be accessed through P2P network
- Can be started on peer that normally can't host web sites
 - Firewalled, NATed, etc.
- JSPWiki—JSP technology-based WikiWiki
- WikiWiki
 - Browser based collaboration system







JSPWiki

- Contained as a Web Application Archive (WAR)
- No changes necessary
- Just drop into modified P2P web application engine

Starting JSPWiki

1) Define shell variables:

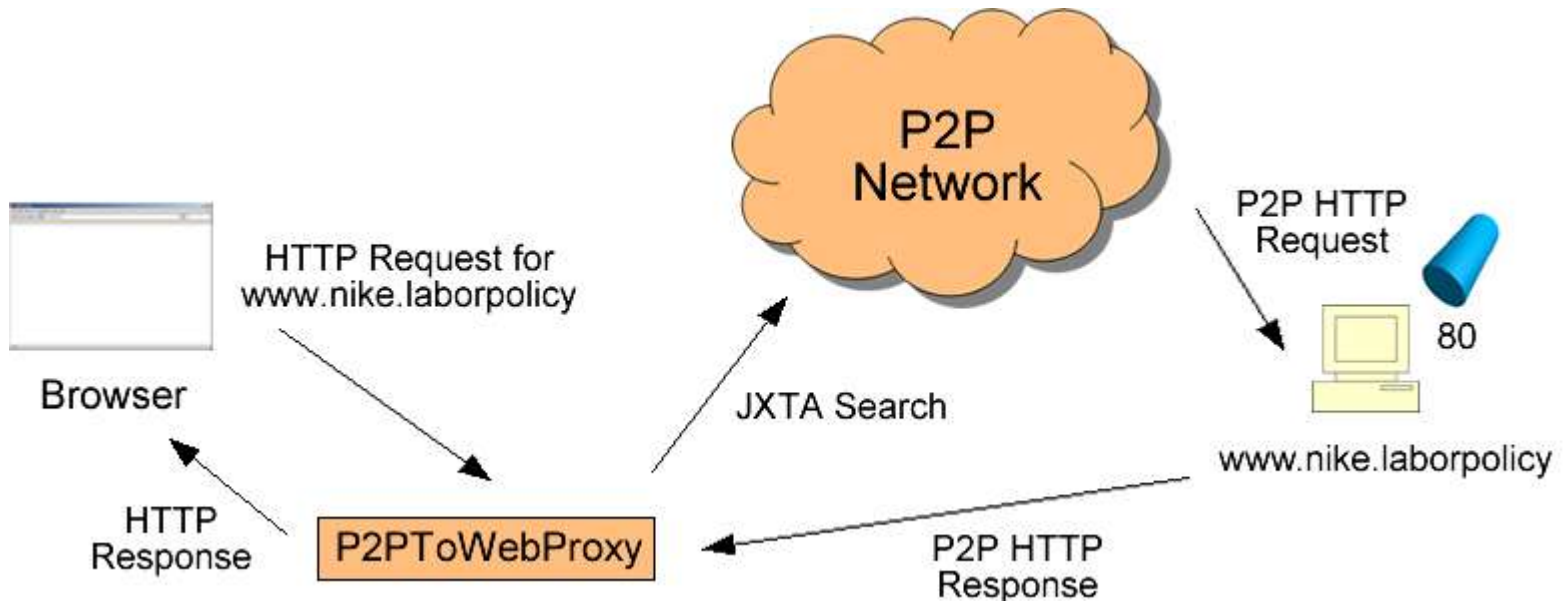
```
set p2psockets_home=c:\p2psockets  
set JAVA_HOME=c:\jdk1.4.1
```

2) Start JSPWiki

```
ant example-webserver-run
```

Accessing Web Site Through Browser

- P2PToWebProxy
 - Local proxy
 - Tricks browser into thinking it's talking to normal web sites
 - Gateways HTTP into and out of the P2P network



Starting P2PToWebProxy

1) Define shell variables:

```
set p2psockets_home=c:\p2psockets  
set JAVA_HOME=c:\1.4.1
```

2) Start P2PToWebProxy

```
ant p2pproxy-run  
    -D--network=TestNetwork  
    -D--port=81  
    -D--defaultuser=true
```

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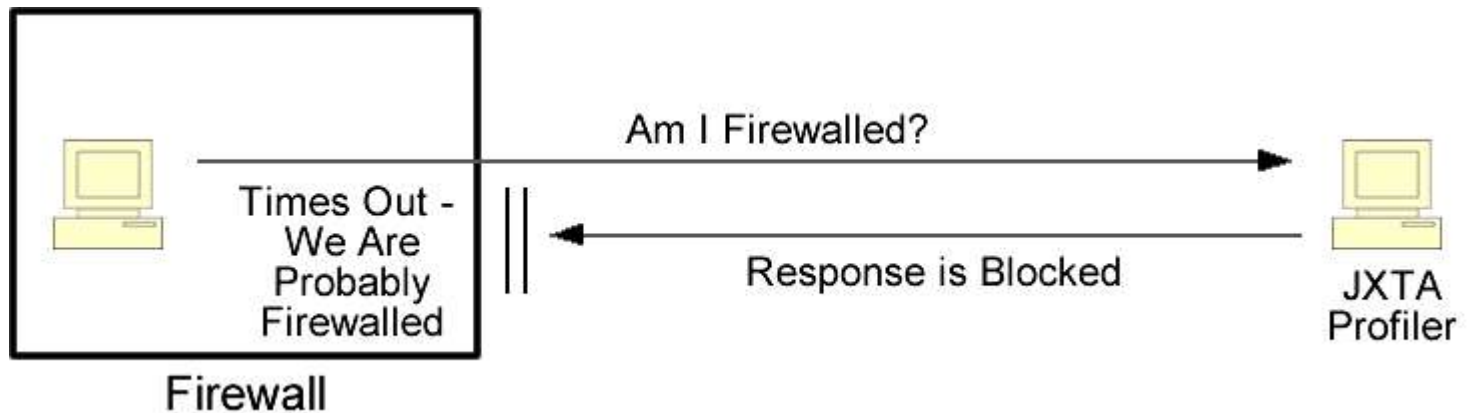
Deployment and Security

Building a P2P Sockets Application:
Paper Airplane

Summary

Deployment

- JXTA Profiler detects network environment
- Peer is auto-configured



Security

- P2P domain names are spoofable
- Can layer signed certificates onto domain system
 - Client peer opens socket to a server peer
 - Demands signed certificate from server peer to prove identity
 - Requires public-key infrastructure
 - No one has done this yet with P2P Sockets

Security

- Be careful about deploying JSP engine onto edge peers
 - Provides network path to Java compiler

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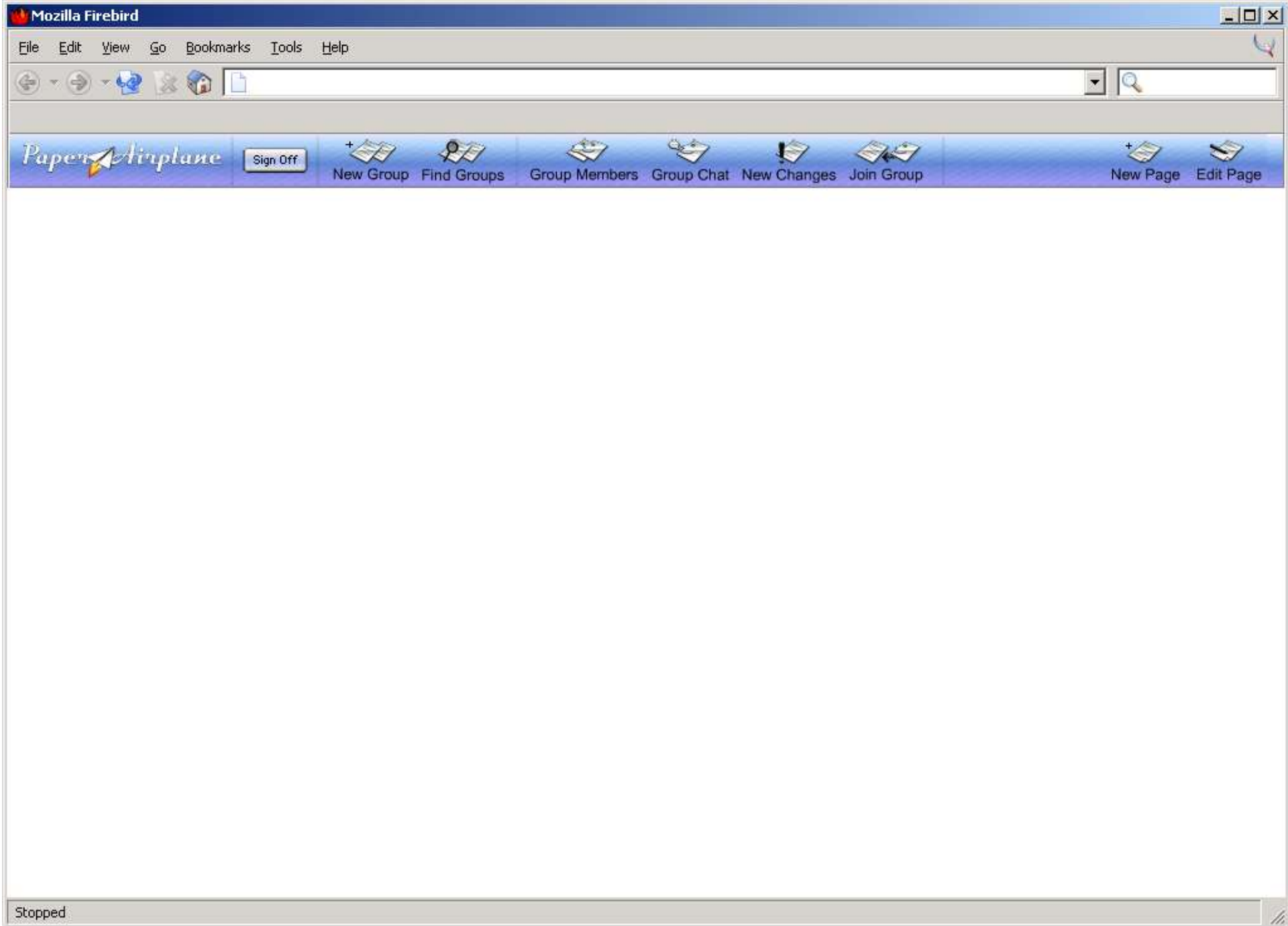
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Case Study: Paper Airplane

- Open-source
- Browser-based toolbar
- P2P groupware
- Users create Paper Airplane Groups that are stored on their own machine
- Groups are really just web sites/WikiWikis
- Every group has a domain name







Wizard - New Group Wizard

01. Begin > 02. Group Name > 03. Creating Group

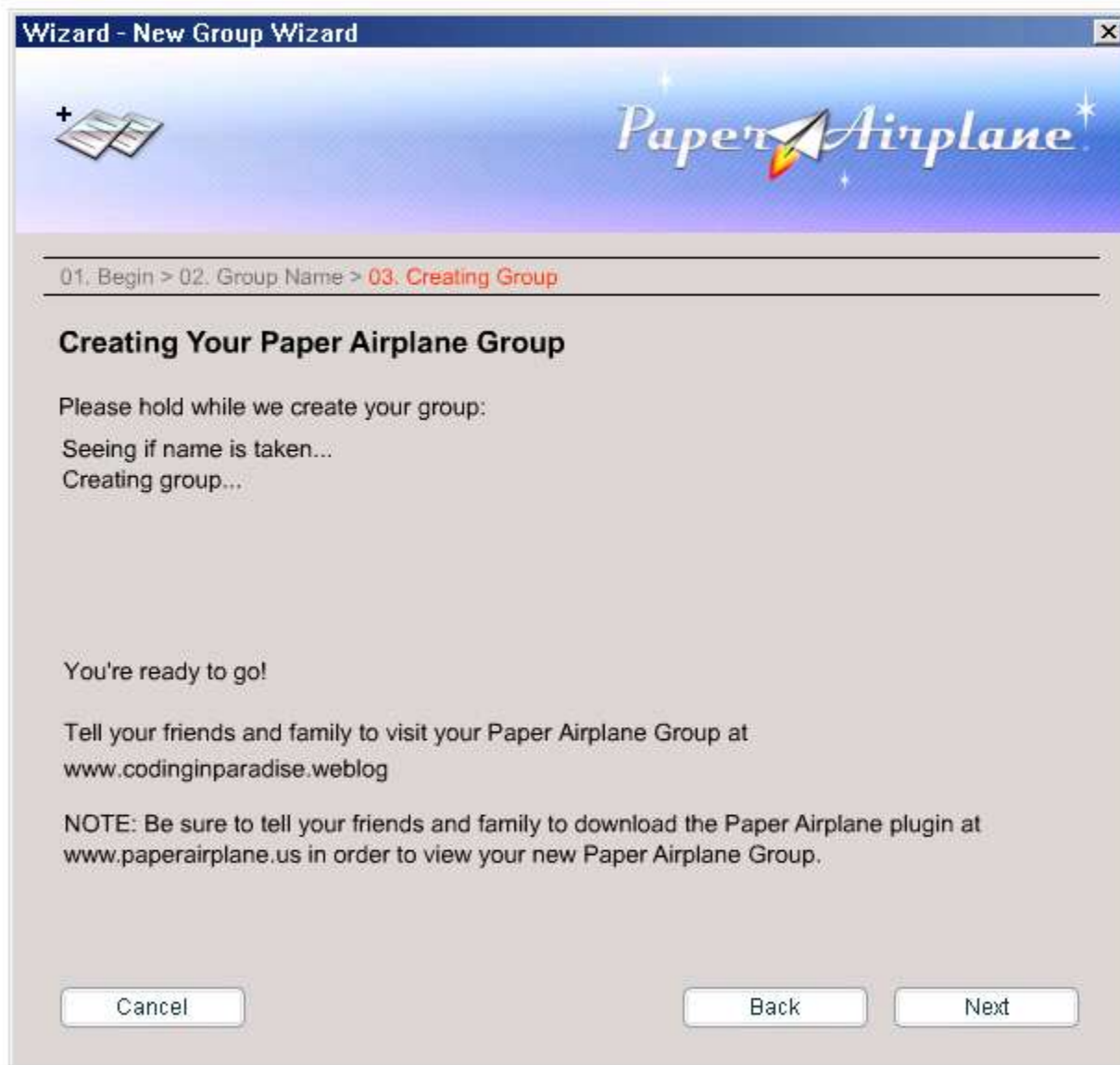
Naming Your Paper Airplane Group

You must choose a name and domain ending for your group, just like a web site.

Enter a name for your group:

Choose a domain ending for your group: ▼

Cancel Back Next



Application Requirements

- Host groups on edge peers
- No DNS registration
- Don't slow browser startup
- Reach groups just like web sites
- Should “just work”
- Use cross-platform and browser technologies
 - First-release for Windows and Mozilla

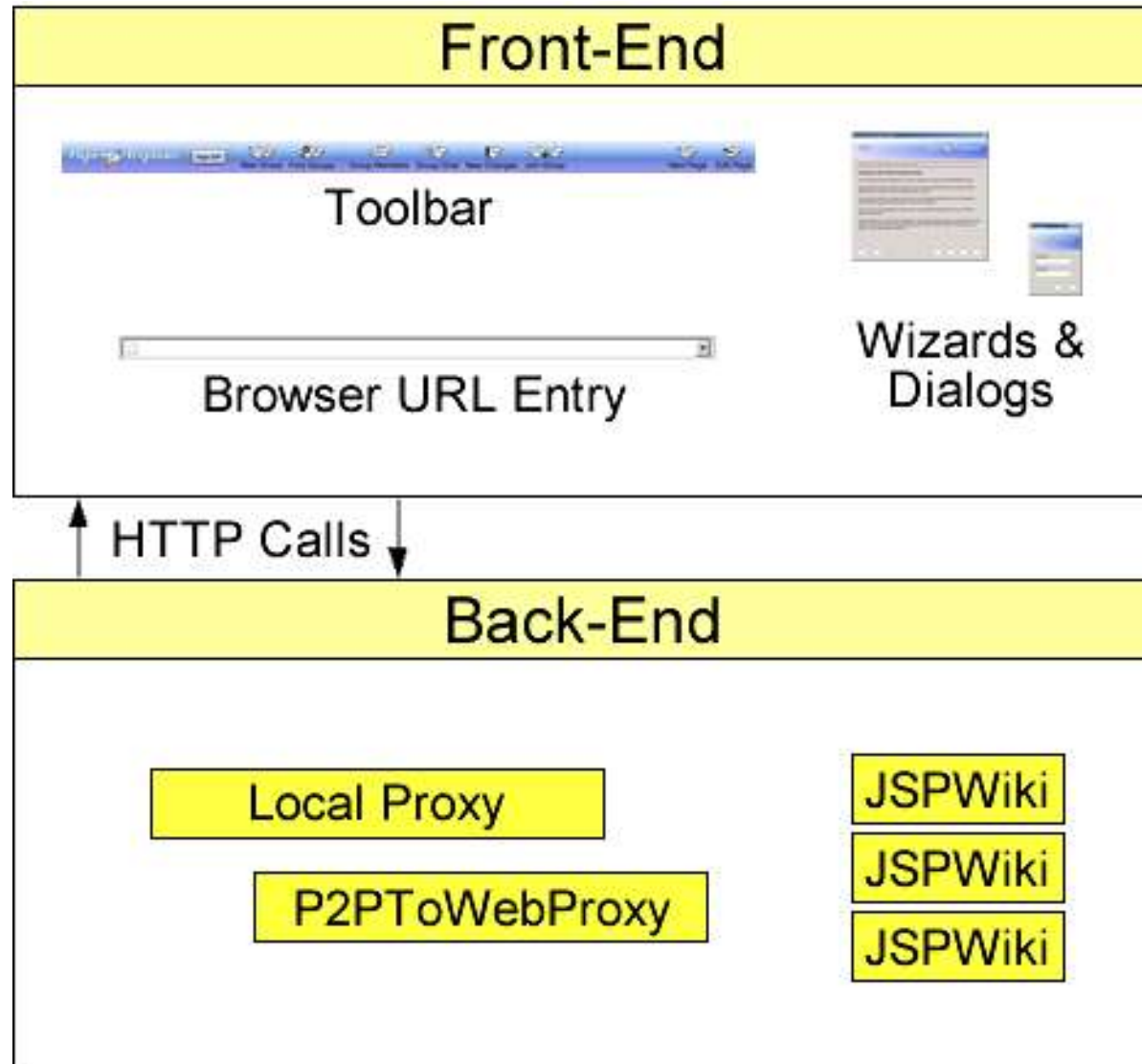
Application Requirements

- Focused on creative, political, and hobbyist use
- One-click installation
- Groups are completely open
 - Just like WikiWikis

Architecture and Design

- Use P2P
 - Reach edge peers
 - No DNS registration needed
 - No server administration needed
- Use P2P Sockets
 - Spoofing is okay
 - Re-use existing JSP pages

Architecture and Design



Front-End and Back-End

- Front-end is built using Flash MX 2004
 - Starts quickly
 - Cross-platform and cross-browser
 - Good development tools
 - Strong control over visual appearance
- Back-end is built using Java, P2P Sockets, and JSPWiki technology

Front-End and Back-End Integration

- We don't start the Java back-end until user signs in
 - JRE startup feels like normal network overhead
 - Browser starts up quickly

Front-End and Back-End Integration

- Front-end makes HTTP calls to back-end

```
http://localhost:7474/paperairplane?command=sign  
in&username=BradNeuberg&password=somepassword
```

```
http://localhost:7474/paperairplane?command=crea  
te_group&name=www.nike.laborpolicy
```


Browser Integration

- We wrap the toolbar with Mozilla XUL
- Modify browser to use our P2PToWebProxy
- Use Proxy AutoConfiguration (PAC) file
 - Simple JavaScript™ programming language file
 - Scans host name to determine whether to use DNS or P2P Sockets
- Point browser to PAC file using XPCOM

Back-End

- We use JSPWiki for WikiWiki functionality
- Change JSPWiki templates
- Don't want JSP engine on end-user's machine
 - Security issues
 - Needs Java compiler
- Pre-compile JSP engine into servlets

Installation and Deployment

- Provide one-click installation using Mozilla's XPInstall
 - Determines dependencies and installs JRE and Flash if necessary
- Peer autodetects its network environment
 - JXTA Profiler
 - No configuration necessary

Status of Paper Airplane

- Paper Airplane still in construction
- Flash and Java programmers needed to help finish

Lessons Learned

- Difficult juggling so many technologies
 - Java, Flash, Mozilla, etc.
- Back-end easy
 - P2P Sockets easy to use
- Front-end hard
 - Bulk of development

Lessons Learned

- Seamless installation is hard
 - Difficult on Linux
 - Hard to “probe” environment
- If only JRE startup was quicker
 - Could completely use Java platform

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- Is P2P Sockets right for your application?
- Why P2P Sockets?
 - Very easy to use
 - Simple
 - Free and open-source
 - Can create custom namespaces extremely quickly
- Why not P2P Sockets?
 - Domain names can be spoofed
 - Not proven on a wide-scale yet
 - Point-to-point oriented
 - No distributed searching

Bottom Line

- P2P Sockets currently appropriate for
 - Quick and easy prototyping
 - Applications where spoofing is okay
 - Experimental and consumer applications
 - Applications with large amounts of legacy J2EE code

Status of P2P Sockets

- Beta 1.1.2 release available
- Needs to be ported to JXTA 2.3

Call to Action

- Help increase **security** and **reliability** of P2P Sockets
 - Competition for Verisign and existing DNS
 - Can be used for business applications
- Help finish Paper Airplane
 - Easy to use, open-source collaboration without servers

For More Information

- P2P Sockets
 - *<http://p2psockets.jxta.org>*
- Paper Airplane
 - *<http://www.paperairplane.us>*

Q&A





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