



Session Tracking

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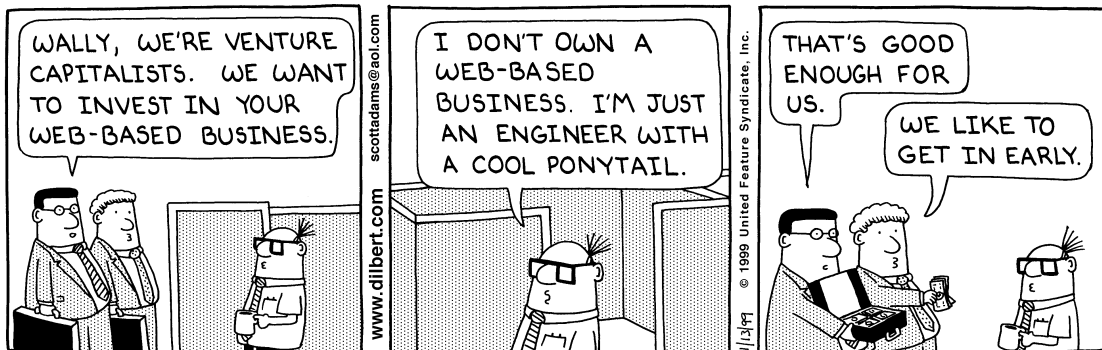
Agenda

- **The purpose of session tracking**
- **Rolling your own session tracking**
- **The session tracking API**
- **Per-client access counts**
- **Shopping carts and online stores**

Session Tracking and E-Commerce

- **Why session tracking?**

- When clients at on-line store add item to their shopping cart, how does server know what's already in cart?
- When clients decide to proceed to checkout, how can server determine which previously created cart is theirs?



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3

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Rolling Your Own Session Tracking: Cookies

- **Idea: associate cookie with data on server**

```
String sessionId = makeUniqueString();
Hashtable sessionInfo = new Hashtable();
Hashtable globalTable = findTableStoringSessions();
globalTable.put(sessionID, sessionInfo);
Cookie sessionCookie =
    new Cookie("JSESSIONID", sessionID);
sessionCookie.setPath("/");
response.addCookie(sessionCookie);
```

- **Still to be done:**

- Extracting cookie that stores session identifier
- Setting appropriate expiration time for cookie
- Associating the hash tables with each request
- Generating the unique session identifiers

4

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Rolling Your Own Session Tracking: URL-Rewriting

- **Idea**
 - Client appends some extra data on the end of each URL that identifies the session
 - Server associates that identifier with data it has stored about that session
 - E.g., `http://host/path/file.html;jsessionid=1234`
- **Advantage**
 - Works even if cookies are disabled or unsupported
- **Disadvantages**
 - Lots of tedious processing
 - Must encode all URLs that refer to your own site
 - Links from other sites and bookmarks can fail

Rolling Your Own Session Tracking: Hidden Form Fields

- **Idea:**

```
<INPUT TYPE="HIDDEN" NAME="session" VALUE="...">
```
- **Advantage**
 - Works even if cookies are disabled or unsupported
- **Disadvantages**
 - Lots of tedious processing
 - All pages must be the result of form submissions

The Session Tracking API

- **Session objects live on the server**
- **Automatically associated with client via cookies or URL-rewriting**
 - Use `request.getSession(true)` to get either existing or new session
 - Behind the scenes, the system looks at cookie or URL extra info and sees if it matches the key to some previously stored session object. If so, it returns that object. If not, it creates a new one, assigns a cookie or URL info as its key, and returns that new session object.
- **Hashtable-like mechanism lets you store arbitrary objects inside session**
 - `setAttribute` (`putValue` in 2.1) stores values
 - `getAttribute` (`getValue` in 2.1) retrieves values

7

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Accessing Session Data

```
HttpSession session = request.getSession(true);
ShoppingCart cart =
    (ShoppingCart) session.getAttribute("shoppingCart");
if (cart == null) { // No cart already in session
    cart = new ShoppingCart();
    session.setAttribute("shoppingCart", cart);
}
doSomethingWith(cart);
```

8

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HttpSession Methods

- **getAttribute (getValue in old servlet spec 2.1)**
 - Extracts a previously stored value from a session object. Returns null if no value is associated with given name.
- **setAttribute (putValue in ver. 2.1)**
 - Associates a value with a name. Monitor changes: values implement HttpSessionBindingListener.
- **removeAttribute (removeValue in ver. 2.1)**
 - Removes values associated with name.
- **getAttributeNames (getValueNames in 2.1)**
 - Returns names of all attributes in the session.
- **getId**
 - Returns the unique identifier.

HttpSession Methods (Continued)

- **isNew**
 - Determines if session is new to *client* (not to *page*)
- **getCreationTime**
 - Returns time at which session was first created
- **getLastAccessedTime**
 - Returns time at which session was last sent from client
- **getMaxInactiveInterval, setMaxInactiveInterval**
 - Gets or sets the amount of time session should go without access before being invalidated
- **invalidate**
 - Invalidates the session and unbinds all objects associated with it

A Servlet Showing Per-Client Access Counts

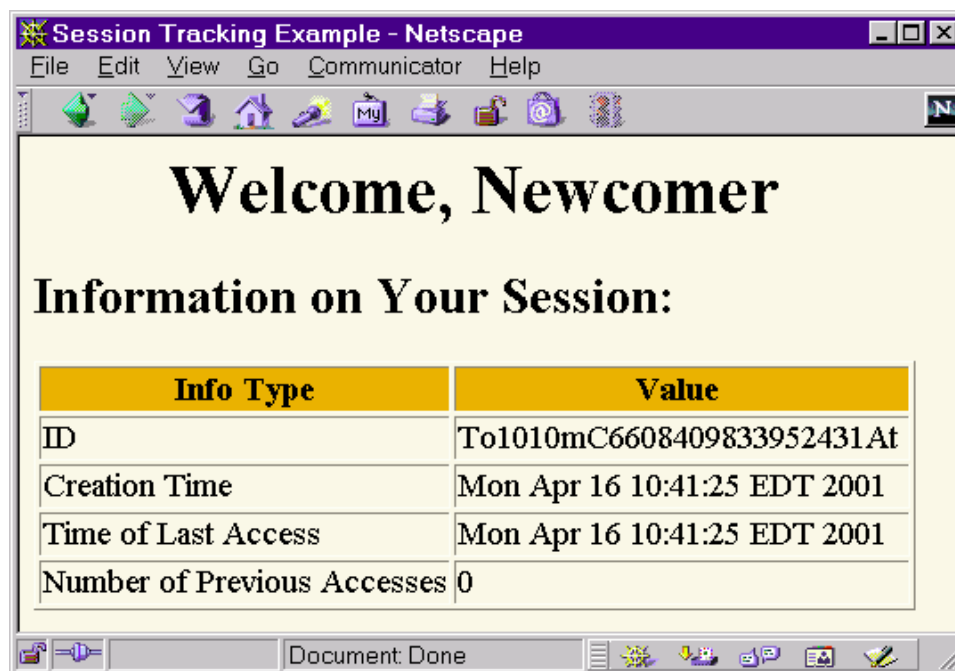
```
public void doGet(HttpServletRequest request,
                  HttpServletResponse response)
    throws ServletException, IOException {
    response.setContentType("text/html");
    PrintWriter out = response.getWriter();
    String title = "Session Tracking Example";
    HttpSession session = request.getSession(true);
    String heading;
    Integer accessCount =
        (Integer) session.getAttribute("accessCount");
    if (accessCount == null) {
        accessCount = new Integer(0);
        heading = "Welcome, Newcomer";
    } else {
        heading = "Welcome Back";
        accessCount = new Integer(accessCount.intValue() + 1);
    }
    session.setAttribute("accessCount", accessCount);
}
```

11

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First Visit to ShowSession Servlet



The screenshot shows a Netscape browser window titled "Session Tracking Example - Netscape". The browser's address bar is empty, and the page content is as follows:

Welcome, Newcomer

Information on Your Session:

Info Type	Value
ID	To1010mC6608409833952431At
Creation Time	Mon Apr 16 10:41:25 EDT 2001
Time of Last Access	Mon Apr 16 10:41:25 EDT 2001
Number of Previous Accesses	0

The browser's status bar at the bottom indicates "Document: Done".

12

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Eleventh Visit to ShowSession Servlet

The screenshot shows a Netscape browser window titled "Session Tracking Example - Netscape". The address bar is empty. The main content area displays "Welcome Back" in a large font, followed by "Information on Your Session:". Below this is a table with two columns: "Info Type" and "Value".

Info Type	Value
ID	To1010mC6608409833952431At
Creation Time	Mon Apr 16 10:41:25 EDT 2001
Time of Last Access	Mon Apr 16 10:44:54 EDT 2001
Number of Previous Accesses	10

The browser's status bar at the bottom shows "Document: Done".

13

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Session Tracking and Shopping Carts

The image shows two side-by-side browser windows. The left window is titled "All-Time Best Children's Fantasy Books" and lists three books with descriptions and "Add to Shopping Cart" buttons. The right window is titled "All-Time Best Computer Books" and lists two books with descriptions and "Add to Shopping Cart" buttons.

All-Time Best Children's Fantasy Books

The Chronicles of Narnia by C.S. Lewis (\$19.95)
The classic children's adventure pitting Aslan the Great Lion and his followers against the White Witch and the forces of evil Dragons, magicians, quests, and talking animals wound around a deep spiritual allegory. Series includes *The Magician's Nephew*, *The Lion, the Witch and the Wardrobe*, *The Horse and His Boy*, *Prince Caspian*, *The Voyage of the Dawn Treader*, *The Silver Chair*, and *The Last Battle*.

The Prydain Series by Lloyd Alexander (\$19.95)
Humble pig-keeper Taran joins mighty Lord Gwydion in his battle against Arawn the Lord of Annwfn. Joined by his loyal friends the beautiful princess Eilonwy, wannabe bard Fflewddur Fflam, and fiery half-man Gurgi, Taran discovers courage, nobility, and other values along the way. Series includes *The Book of Three*, *The Black Cauldron*, *The Castle of Llyr*, *Taran Wanderer*, and *The High King*.

The Harry Potter Trilogy by J.K. Rowling (\$25.95)
The first three of the popular stories about wizard-in-training Harry Potter topped both the adult and children's best-seller lists. Series includes *Harry Potter and the Sorcerer's Stone*, *Harry Potter and the Chamber of Secrets*, and *Harry Potter and the Prisoner of Azkaban*.

All-Time Best Computer Books

Core Servlets and JavaServer Pages by Marty Hall (\$39.95)
The definitive reference on servlets and JSP from Prentice Hall and Sun Microsystems Press. Nominated for the Nobel Prize in Literature.

Core Web Programming, Java2 Edition by Marty Hall, Larry Brown, and Paul McNamee (\$49.95)
One stop shopping for the Web programmer. Topics include

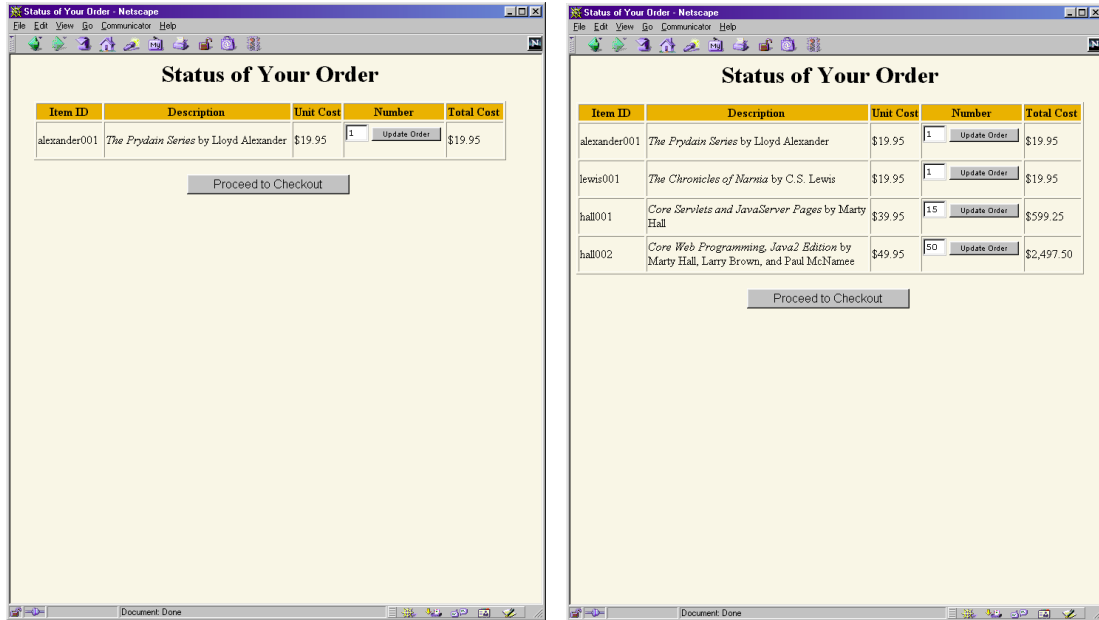
- Thorough coverage of Java 2, including Threads, Networking, Swing, Java2D, and Collections
- A fast introduction to HTML 4.01, including frames, style sheets, layers, and Netscape and Internet Explorer extensions
- A fast introduction to HTTP 1.1, servlets, and JavaServer Pages
- A quick overview of JavaScript 1.2

14

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Session Tracking and Shopping Carts (Continued)



15

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What Changes if Server Uses URL Rewriting?

- **Session tracking code:**
 - No change
- **Code that generates hypertext links back to same site:**
 - Pass URL through `response.encodeURL()`.
 - If server is using cookies, this returns URL unchanged
 - If server is using URL rewriting, this appends the session info to the URL
 - E.g.:

```
String url = "order-page.html";  
url = response.encodeURL(url);
```
- **Code that does `sendRedirect` to same site:**
 - Pass URL through `response.encodeRedirectURL()`

16

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Summary

- **Although it usually uses cookies behind the scenes, the session tracking API is higher-level and easier to use than the cookie API**
 - If server supports URL-rewriting, *your* code unchanged
- **Session information lives on server**
 - Cookie or extra URL info associates it with a user
- **Obtaining session**
 - `request.getSession(true)`
- **Associating values with keys**
 - `session.setAttribute` (or `session.putValue`)
- **Finding values associated with keys**
 - `session.getAttribute` (or `session.getValue`)
 - Always check if this value is null

17

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18

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