
Java™

What is new in Servlet 3.1, JSR 340?

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Servlet 3.1 Overview

- **FINAL**: Part of Java EE 7
- Upgrade from Servlet 3.0
- Scale
  - Expose Non-blocking IO API
- Support newer technologies that leverage HTTP protocol for the initial handshake
  - Support general upgrade mechanism for protocols like WebSocket
- Security enhancements

Non-blocking IO

Traditional IO Example

```
public class TestServlet extends HttpServlet
    protected void doPost(HttpServletRequest request,
 HttpServletResponse response) throws IOException,
 ServletException {
        ServletInputStream input =
 request.getInputStream();
        byte[] b = new byte[1024];
        int len = -1;
        while ((len = input.read(b)) != -1) {
            …
        }
    }
}
```

Non Blocking IO

Overview

- Add two new interfaces: **`ReadListener`**, **`WriteListener`**
- Add APIs to **`ServletInputStream`**, **`ServletOutputStream`**
- For asynchronous and upgrade only

Non-blocking IO

javax.servlet.ReadListener

```
public interface ReadListener extends EventListener {

    public void onDataAvailable() throws IOException;

    public void onAllDataRead() throws IOException;

    public void onError(Throwable t);
}
```

Non-blocking IO

javax.servlet.WriteListener

```
public interface WriteListener extends EventListener {

    public void onWritePossible() throws IOException;

    public void onError(Throwable t);
}
```

Non-blocking IO

ServletInputStream, ServletOutputStream

- **javax.servlet.ServletInputStream**
  - **public abstract boolean isFinished()**
  - **public abstract boolean isReady()**
  - **public abstract void setReadListener(ReadListener listener)**
- **javax.servlet.ServletOutputStream**
  - **public abstract boolean isReady()**
  - **public abstract setWriteListener(WriteListener listener)**

Non-blocking IO

Example

```
public class TestServlet extends HttpServlet {
    protected void doPost(HttpServletRequest req, HttpServletResponse
res) throws IOException, ServletException {
        AsyncContext ac = req.startAsync();
        …
        ServletInputStream input = req.getInputStream();
        ReadListener readListener = new ReadListenerImpl(input, output,
ac);
        input.setReadListener(readListener);
    }
}
```

Non-blocking IO

Example (cont'd)

```
public class ReadListenerImpl implements ReadListener {
    …
    public void onDataAvailable() throws IOException {
        …
        int len = -1;
        byte b[] = new byte[1024];
        while (input.isReady() && (len = input.read(b)) != -1) {
            …
        }
    }

    public void onAllDataRead() throws IOException {
        ac.complete();
    }

    public void onError(final Throwable t) {
        …
    }
}
```

Non-blocking IO

Example 2

```
public class TestServlet2 extends HttpServlet {
    protected void doPost(HttpServletRequest req, HttpServletResponse
res) throws IOException, ServletException {
        AsyncContext ac = req.startAsync();
        …
        ServletOutputStream output = req.getOutputStream();
        WriteListener writeListener = new WriteListenerImpl(output,
ac);
        output.setWriteListener(writeListener);
    }
}
```

Non-blocking IO

Example 2 (cont'd)

```
public class WriteListenerImpl implements WriteListener {
    …
    public void onWritePossible() throws IOException {
        …
        int len = -1;
        byte b[] = new byte[1024];
        while (output.isReady()) {
          …
        }
       …
    }

    public void onError(final Throwable t) {
        …
    }
}
```

Protocol Upgrade

HTTP Upgrade

- HTTP 1.1 (RFC 2616)
- Connection
- Transition to some other, incompatible protocol
  - For examples, IRC/6.9, Web Socket

Protocol Upgrade

Overview

- Allow a portable way to upgrade HTTP request
- Add API to **`HttpServletRequest`**
- Add two new interfaces
  - **`javax.servlet.http.HttpUpgradeHandler`**
  - **`javax.servlet.http.WebConnection`**
- Can use non-blocking IO API in upgrade

Protocol Upgrade

HttpUpgradeHandler, WebConnection

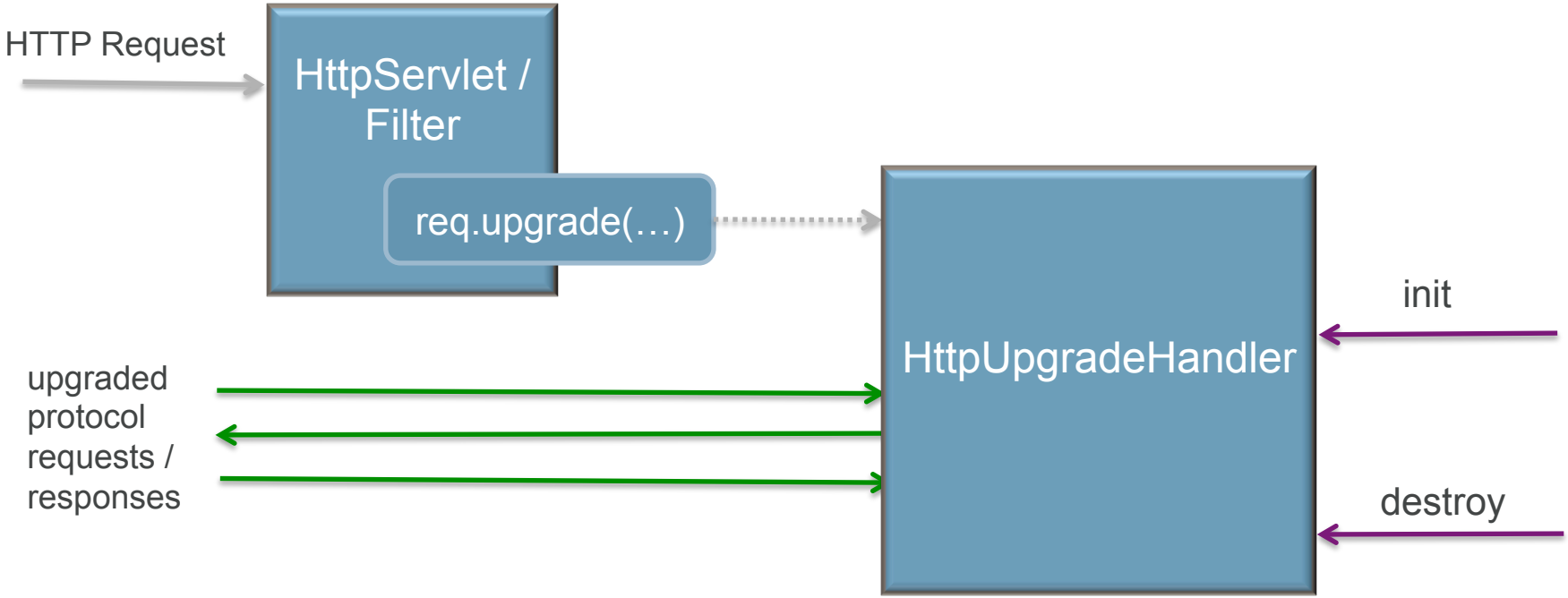
- New interface **`javax.servlet.http.HttpUpgradeHandler`**
  - **`void init(WebConnection wc)`**
  - **`void destroy()`**
- New interface **`javax.servlet.http.WebConnection`** extends **`AutoClosable`**
  - **`ServletInputStream getInputStream() throws IOException`**
  - **`ServletOutputStream getOutputStream() throws IOException`**

Protocol Upgrade

HttpServletRequest

- Add a method to **`HttpServletRequest`**
  - **`<T extends HttpUpgradeHandler>`**
    `T upgrade(Class<T> handlerClass)`
    `throws IOException, ServletException`

Protocol Upgrade



Protocol Upgrade

Example

```
public class UpgradeServlet extends HttpServlet
    protected void doGet(HttpServletRequest request,
 HttpServletResponse response) throws IOException,
 ServletException {
        …
        if (decideToUpgrade) {
            EchoHttpUpgradeHandler handler =
 request.upgrade(EchoHttpUpgradeHandler.class);
        …
    }
}
```

Protocol Upgrade

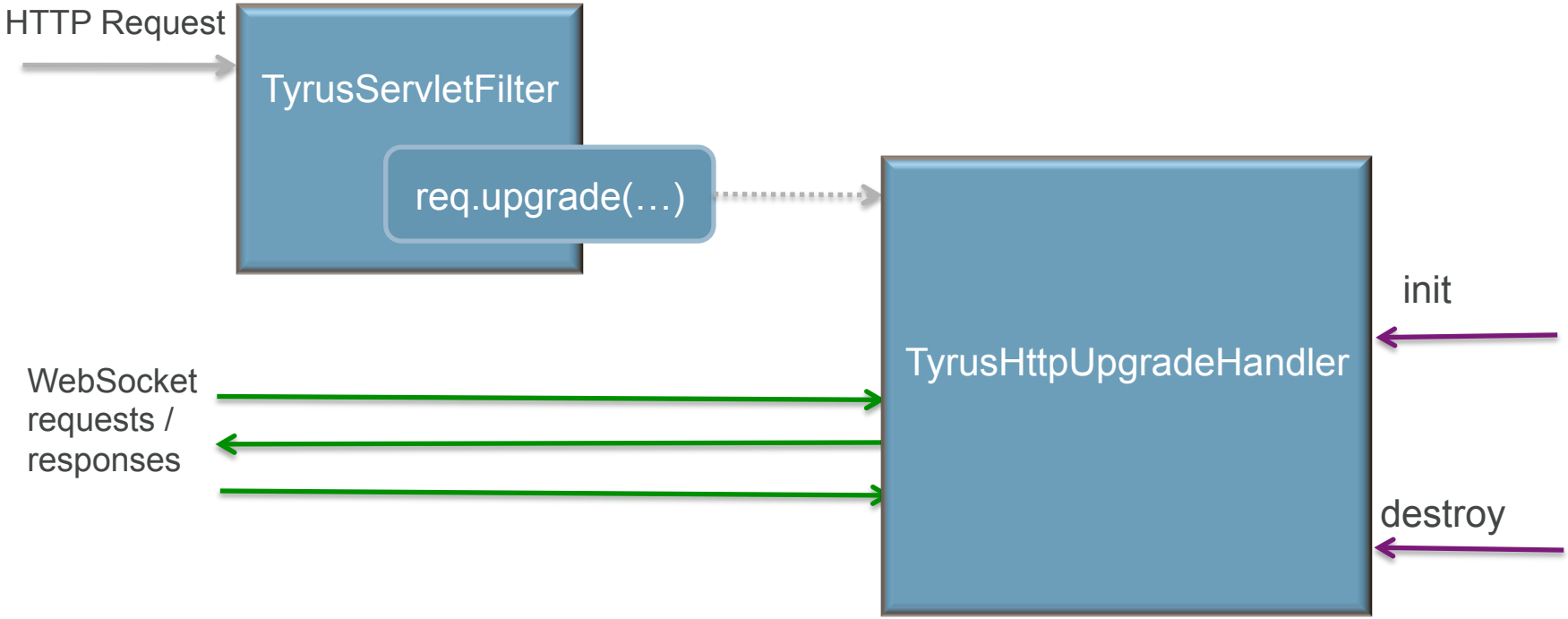
Example (cont'd)

```
public class EchoProtocolHandler implements HttpUpgradeHandler {
     public void init(WebConnection wc) {
          try {
               ServletInputStream input = wc.getInputStream();
               ServletOutputStream output = wc.getOutputStream();
               ReadListener readListener = …;
               input.setReadListener(readListener);
          …
     }

     public void destroy() {
          …
     }
}
```

Protocol Upgrade

Example 2: Reference Implementation of JSR 356, Java API for WebSocket



Security Enhancements

Session Fixation Attack

- Emails or web pages from hackers containing
  - http://abank.com?SID=ABCDEFGHIJ
- Change Session id on authentication
  - Add to interface **`HttpServletRequest`**
    - **`public String changeSessionId()`**
  - New interface **`javax.servlet.http.HttpSessionIdListener`**
    - **`void sessionIdChanged(HttpSessionEvent se, String oldSessionId)`**

Security Enhancements

Any authenticated users

- Roles “**”, any authenticated users
- For example,
  - `@WebServlet(“/foo”)`
    `@ServletSecurity(@HttpConstraint(rolesAllowed={“**”}))`

Security Enhancements

Others

- **`deny-uncovered-http-methods`** in **`web.xml`**
- Clarification on run-as
  - **`Servlet#init`**, **`Servlet#destroy`**

Miscellaneous

Overview

- **`ServletResponse#reset`** and **`#setCharacterEncoding`**
- **`HttpServletResponse#sendRedirect`**
  - //anotherhost.com/b/a.jsp (Network Path Reference)
- Add Generic
  - **`ServletRequestWrapper#isWrapperFor(Class<?> c)`**
  - **`ServletResponseWrapper#isWrapperFor(Class<?> c)`**
  - **`HandlesTypes#value`** return **`Class<?>[]`**

Miscellaneous

Overview (cont'd)

- Add method `javax.servlet.http.Part#getSubmittedFileName()`
- Add method `ServletContext#getVirtualServerName()`

- Add method `ServletRequest#getContentLengthLong()`
- Add method `ServletResponse#setContentLengthLong(long len)`

Resources

- JavaOne Shanghai 2013, CON 1387,
  What is new in JSR 340, Servlet 3.1?
  - Tue. July 23, 4:30 pm - 5:30 pm, Expo Centre – Room 430
  - Wed. July 24, 10:15 am – 11:15 am, Expo Centre – Room 422/423
- Spec and Javadoc
  - http://jcp.org/en/jsr/detail?id=340
  - http://servlet-spec.java.net
- GlassFish 4.0
  - http://glassfish.java.net
  - webtier@glassfish.java.net
- My blog
  - http://www.java.net/blog/swchan2

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