Java EE 8 finally final! And now Jakarta EE?

JPoint

April 2018

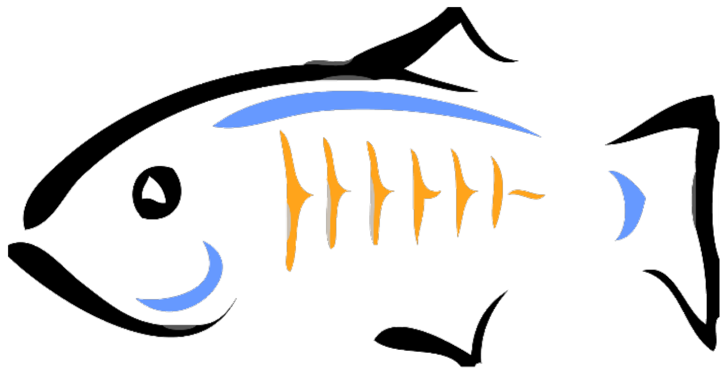
Давид Делабассее
@delabassee
Oracle

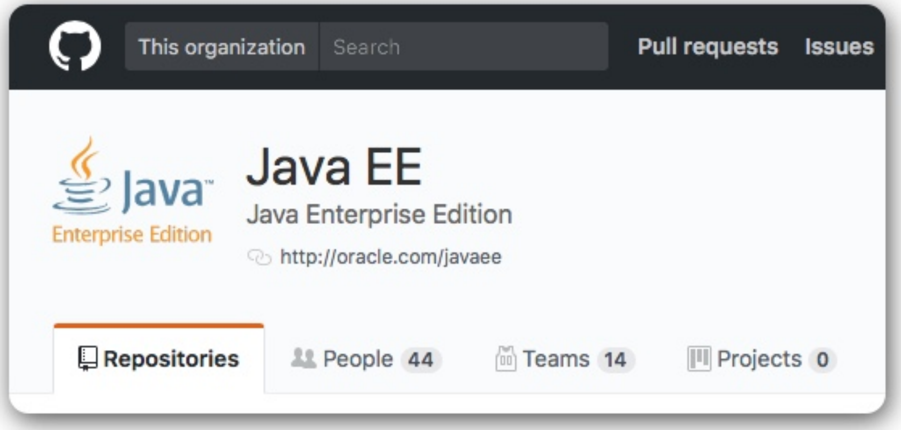
JavaYourNext (Cloud)

Safe Harbor Statement

Today – Java EE 8

- Released!
- GlassFish 5 - Open Source RI
  - https://javaee.github.io/glassfish/
  - https://hub.docker.com/r/oracle/glassfish/
- Open
  - https:/github.com/javaee/
  - https://javaee.groups.io/





Java EE
Java Enterprise Edition
http://oracle.com/javaee

Tomorrow – Jakarta EE

Moving Java EE to Eclipse Foundation

Technology

Community
and
Vendors

Sponsorship

Jakarta EE

✓ Nimble
✓ Flexible
✓ Open
✓ Compatible

On Naming…

EE4J	Top level Eclipse project name
Jakarta EE	© Eclipse
Java EE	© Oracle
~~EE.Next~~	

Jakarta EE

Goal

- Evolve the platform and its technologies
  - Nimble
  - Flexible
  - Open
  - Compatible

Jakarta EE

Goals – Short Term

- Ship a Java EE 8 compatible release as quickly as possible!
  - Eclipse GlassFish
- Demonstrate that the EE4J projects are fully functional
- Foster an ecosystem around the EE4J code base

Jakarta EE

Goals – Mid Term

- Opening up TCK’s
- Jakarta EE WG charter
  - https://www.eclipse.org/org/workinggroups/eclipse_ee_next_charter.php
- Define processes to evolve Jakarta EE technologies
  - Inc. Governance and IP flows
- Define compatibility rules and branding process to ensure portability
- Working groups
  - IBM, Tomitribe, Oracle, Fujitsu, Red Hat, Payara, Webtide, Lightbend, Pivotal

Jakarta EE

Report card

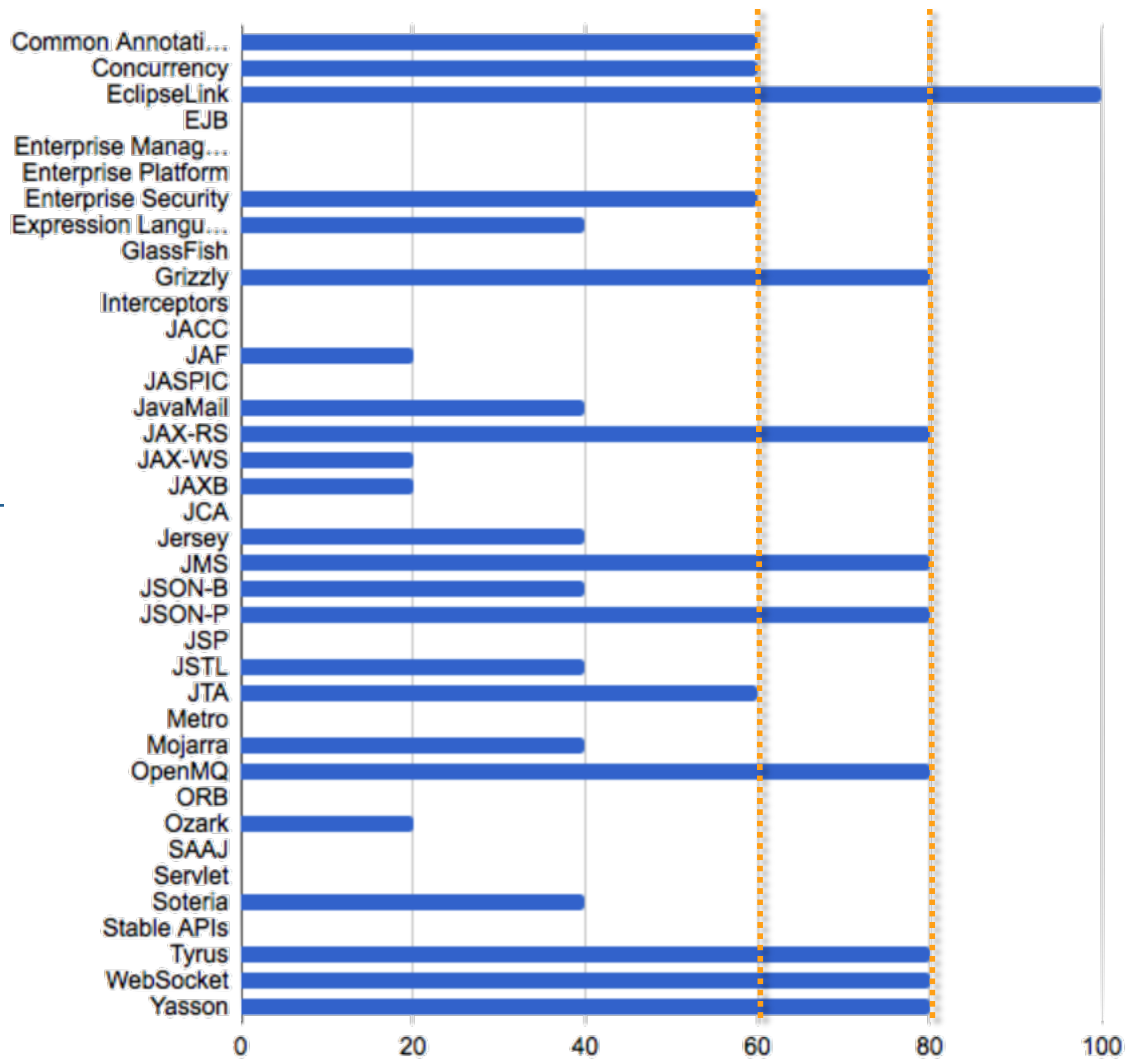
- Jakarata EE WG charter ✓
- PMC ✓
  - Ivar Grimstad, IBM, Oracle, Payara, Red Hat, Tomitribe & Eclipse
- Branding
  - Jakarta EE ✓
  - Logo soon!
- Code ?

EE4J

Project Bootsrtaping

https://www.eclipse.org/ee4j/status.php

https://github.com/eclipse-ee4j/



Java EE 8

Modernization - Simplification

JAX-RS

JavaYourNext

(Cloud)

JAX-RS Client API

javax.ws.rs.client.Client interface

- Fluent API
  - Client Builder ➔ Client ➔ Web Target ➔ Request building ➔ Response

```
List<Forecast> forecast = ClientBuilder.newClient()
                                       .target("http://weath.er/cities")
                                       .request()
                                       .accept("application/json")
                                       .header("foo","bar")
                                       .get(new GenericType<List<Forecast>>() {});
```

JAX-RS Client API

Asynchronous invocation

```
Future<String> fCity = client.target("http://locati.on/api")
                             .queryParam("city", "Paris")
                             .request()
                             .async()
                             .get(String.class);

String city = fCity.get();
```

JAX-RS Client API

InvocationCallback

```
WebTarget myResource = client.target("http://examp.le/api/read");
Future<Customer> future = myResource.request(MediaType.TEXT_PLAIN)
        .async()
        .get(new InvocationCallback<Customer>() {
            @Override
            public void completed (Customer customer) {
                // do something with the customer
            }
            @Override
            public void failed (Throwable throwable) {
                // Oops!
            }
        });
...
```

JAX-RS Client API

New JAX-RS Reactive Invoker

```
// JAX-RS 2.0
Response response = client.target(recommandationService)
        .request()
        .get();

Future<Response> futureResponse = client.target(recommandationService)
        .request()
        .async()
        .get();

// JAX-RS 2.1
CompletionStage<Response> completionStageResp = client.target(recommandationService)
        .request()
        .rx()
        .get();
```

JAX-RS 2.1

```
CompletionStage<JsonObject> cfIp = client.target("http://api.ipify.org/")
                .queryParam("format", "json").request()
                .rx()
                .get(JsonObject.class);

Function<JsonObject, CompletionStage<JsonObject>> function = ip
                -> client.target("https://ipvigilante.com")
                        .path(ip.getString("ip")).request()
                        .rx()
                        .get(JsonObject.class);

cfIp.thenCompose(function)
    .thenAccept(System.out::println);
```

JAX-RS 2.1 – Client API

	Sync	Async	RX
Performance and scalability	✗✗	✓	✓
Easy to develop and maintain	✓	✗	✓
… complex workflow	✗	✗	✓
… error handling	✗	✗	✓
Leverage new Java SE feature	✗	✗	✓

JAX-RS 2.1 – RX Invoker

- Implementations **MUST** support an invoker for **CompletionStage**
- Implementations **MAY** support other reactive APIs
- Jersey
  - CompletionStageRxInvoker (Default)
  - RxListenableFutureInvoker – Guava
  - RxObservableInvoker – RxJava
  - RxFlowableInvoker – RxJava2

```
client.register(RxFlowableInvokerProvider.class);
client.target(...)...
        .rx(RxFlowableInvoker.class)
        .get();
```

https://github.com/jersey/jersey/tree/master/ext/rx

Server-Sent Events

- WHATWG standard
- Supported in all modern browsers
- Persistent, one-way communication channel
- Text protocol, special media type "text/event-stream"
- Server can send multiple messages (events) to a client
- Can contain id, name, comment, retry interval

Server-Sent Events

- javax.ws.rs.sse.**SseEvent** interface
- **OutboundSseEvent**
  - Server-side representation of a Server-Sent event
  - OutboundSseEvent.Builder()
- **InboundSseEvent**
  - Client-side representation of a Server-Sent event

Server-Sent Events

Server-side

- **SseEventSink**
  - Outbound Server-Sent Events stream

```
@GET
@Path ("sse")
@Produces(MediaType.SERVER_SENT_EVENTS)
public void eventStream(@Context SseEventSink eventSink, @Context SSE sse) {
    ...
    eventSink.send( sse.newEvent("an event") );
    eventSink.send( sse.newEvent("another event") );
    ...
    eventSink.close();
}
```

Server-Sent Events

Client side

- **SseEventSource**
  - Client for processing incoming Server-Sent Events

```
WebTarget target = client.target("http://…");
try (SseEventSource source = SseEventSource.target(target)
                                  .reconnectingEvery(5, SECONDS)
                                  .build()) {
   source.register(System.out::println); //InboundSSEvent consumer
   ...
   source.open();
}
catch (InterruptedException e) {
   // Ooops
}
```

JAX-RS 2.1

- Resource method can return a CompletionStage
- @PATCH
- JSON-P & JSON-B support
- New ClientBuilder methods
  - #connectTimeout(long, TimeUnit);
  - #scheduledExecutorService(ScheduledExecutorService);
- Application provided providers priority

…

JSON

JavaYourNext (Cloud)

JSON-P 1.1

- Standard API to parse, generate, transform, query JSON
- Update JSON-P spec to stay current with emerging standards (RFC 7159)
  - **JSON Pointer** (RFC 6901)
  - **JSON Patch** (RFC 6902)
  - **JSON Merge Patch** (RFC 7396)
- Add editing/transformation operations to JSON objects and arrays
- Support JSON Collectors
- Support for processing big JSON

JSON Pointer

- IETF RFC 6901
- String syntax for identifying a specific value
  - Token(s) separated by "/"
    - specify key in object
    - or index into array
  - Ex. "/event/location", "/conferences/0"
- Special cases
  - Escape "/" with "~1" and "~" with "~0"
  - "/" points to the "" key in the root
  - "-" refers to the end of an array

JSON Pointer

```java
JsonStructure jsonEvents = …

JsonPointer pt = Json.createPointer("/1/venue");

JsonValue preEvt = pt.getValue(jsonEvents);
// "Hilton"

JsonStructure newEvt = pt.replace(jsonEvents,
                   Json.createValue("Moscone West"));


// + add, remove & containsValue
```

```json
[
   {
       "event": "OpenWorld",
       "venue": "Moscone North"
   },
   {
       "event": "JavaOne",
       "venue": "Hilton"
   }
]
```

```json
[
   {
       "event": "OpenWorld",
       "venue": "Moscone North"
   },
   {
       "event": "JavaOne",
       "venue": "Moscone West"
   }
]
```

JSON Patch

- IETF RFC 6902
- Modify Parts of JSON document
- Patch is a JSON document itself
- Operations
  - Add, replace, remove, move, copy & test
- HTTP PATCH method (application/json-patch+json)

JSON Patch

```
[
    {
        "op": "replace",
        "path": "/0/venue",
        "value": "Moscone West"
    },
    {
        "op": "add",
        "path": "/0/previousVenue",
        "value": "Hilton"
    }
]
```

```
[
    {
        "event": "JavaOne",
        "venue": "Hilton"
    }
]
```

JSON Patch

```
[
    {
        "op": "replace",
        "path": "/0/venue",
        "value": "Moscone West"
    },
    {
        "op": "add",
        "path": "/0/previousVenue",
        "value": "Hilton"
    }
]
```

```
[
    {
        "event": "JavaOne",
        "venue": "Moscone West"
    }
]
```

JSON Patch

```
[
    {
        "op": "replace",
        "path": "/0/venue",
        "value": "Moscone West"
    },
    {
        "op": "add",
        "path": "/0/previousVenue",
        "value": "Hilton"
    }
]
```

```
[
    {
        "event": "JavaOne",
        "venue": "Moscone West",
        "previousVenue":"Hilton"
    }
]
```

JSON Patch

```
JsonArray previousJ1 = …
JsonArray patch = …
JsonPatch jpVenue = Json.createPatch(patch);
JsonArray currentJ1 = jpVenue.apply(previousJ1);


JsonPatch patch2018 = Json.createPatchBuilder()
                .copy("/0/previousVenue","/0/venue")
                .replace("/0/venue", "Moscone North & South")
                .add("/0/days", 6)
                .build();
JsonArray nextJ1 = patch2018.apply(previousJ1);
```

JSON-P 1.1

Misc.

- JSON Merge Patch
- Merge & Merge Patch Diff
- JSON-P collectors
- Support for processing big JSON
  - Filters to JSON parsing : skipArray(), skipObject()
- …

JSON Binding

- API to serialize/deserialize Java objects to/from JSON documents
  - Similar to JAX-B
  - Standard API for existing framework (ex. Genson, Gson)
- Default mapping between classes and JSON
- Customization APIs
  - Annotations (@JsonbProperty, @JsonbNillable)
  - Runtime configuration builder
- Natural follow on to JSON-P
  - Closes the JSON support gap
  - Allows to change providers

JSON-B

JSON-B

```java
// public Event(String name, int edition, String venue)

List<Event> events = new ArrayList<>();
h2.add(new Event("JavaOne", 2017, "SFO"));
h2.add(new Event("OpenWorld", 2017, "SFO"));
h2.add(new Event("Devoxx", 2017, "Antwerp"));

Jsonb jsonb = JsonbBuilder.create();
String nextUp = jsonb.toJson(events);
```

```json
[
  {
    "edition": 2017,
    "name": "JavaOne",
    "venue": "SFO"
  },
  {
    "edition": 2017,
    "name": "OpenWorld",
    "venue": "SFO"
  },
  {
    "edition": 2017,
    "name": "Devoxx",
    "venue": "Antwerp"
  }
]
```

JSON-B

```java
String q1Confs = "…";
Jsonb jsonb = JsonbBuilder.create();
Event event = jsonb.fromJson(q1Confs, Event.class);
```

```json
{
  "edition": 2018,
  "name": "Oracle Code",
  "venue": "Global",
  "cost" : 0
}
```

JSON-B Customizations

- Annotation
  - @JsonbProperty
- Scope
  - Field
  - Getter/Setter
  - Parameter

```
public class Event{
    private int edition;
    @JsonbProperty("conference")
    private String eventName;
}

public class Customer {
    public int edition;
    public String venue;
    @JsonbProperty("conference")
    public String getEventName() {
        return eventName;
    }
}
```

JSON-B Customizations

- Naming strategies
  - IDENTITY : myProp
  - LOWER_CASE_WITH_DASHES : my-prop
  - LOWER_CASE_WITH_UNDERSCORES : my_prop
  - UPPER_CAMEL_CASE : MyProp
  - UPPER_CAMEL_CASE_WITH_SPACES : My Prop
  - CASE_INSENSITIVE : myprop
  - Or a custom strategy
- Property ordering
  - Any, Lexicographical, Reverse
- Binary Data Strategies
  - Base64, Base64 URL, Byte

JSON-B Customizations

- Property to ignore
- Null handling
- Custom instantiation
- Fields visibility
- Date/Number Formats
- ...

JSON-B Customizations

```
//Ordering, naming strategy, encoding, Locale, …
JsonbConfig config = new JsonbConfig()
                            .withFormatting(true)
                            .withAdapters(new CarAdapter());

Jsonb jsonb = JsonbBuilder.create(config);



Jsonb jsonb = JsonBuilder.newBuilder("anotherProvider");
```

Web

JavaYourNext

(Cloud)

Servlet 4.0

- Support for HTTP/2
  - Request/response multiplexing
  - Server push
  - Upgrade from HTTP 1.1
- Smaller community-requested improvements
  - Allow setting the default context-path without resorting to container specific config
  - Allow setting the jsp-file programmatically
  - Allow encoding to be set from deployment descriptor
  - Servlet Mapping API

HTTP/2

- Binary Framing over single TCP connection
- Request/Response multiplexing
- Stream Prioritization
- Server Push
- Upgrade from HTTP 1.1
- Header Compression
- Preserve HTTP semantic
- Flow Control

Servlet 4.0

```
PushBuilder builder = myRequest.newPushBuilder();

builder.addHeader("X-Pusher", …);

builder.path("resource")
       .push();
```

JSF 2.3

- HTTP/2 Server Push
- Better CDI Integration
  - Way more things are injectable
- Java Time support
- WebSocket Integration
- Ajax Method Invocation
- Class Level Bean Validation
- UIData and UIRepeat improvements

CDI 2.0 & BV 2.0

JavaYourNext
(Cloud)

CDI 2.0

- Define behavior of CDI outside of a Java EE container
  - Inc. API to bootstrap a CDI container in Java SE
- Spec split into 3 parts
  - CDI Core
  - CDI for Java SE
  - CDI for Java EE
- Apply Interceptor on Producer
- Observers ordering
- Asynchronous events
- Alignment with Java SE 8, …

CDI 1.2

```
@Inject
Event<PaymentEvent> debitEvent;

// producer
debitEvent.fire(somePayload);


// consumer
public void anObesrver(@Observes Payload p) {
…
}
```

CDI 1.2

```
// consumer A
public void anObserver(@Observes Payload p) {
…
}

// consumer B
public void anotherObesrver(@Observes Payload p) {
…
}
```

CDI 2.0

```
// consumer A
public void anObesrver(@Observes @Priority(10) Payload p) {
…
}

// consumer B
public void anotherObesrver(@Observes @Priority(20) Payload p) {
…
}
```

CDI 2.0

```
@Inject
Event<PaymentEvent> debitEvent;

// async producer
CompletionStage<Payload> cs = debitEvent.fireAsync(somePayload);


// async consumer
public void anObesrver(@ObservesAsync Payload p) {
…
}
```

Bean Validation 2.0

- Embrace Java SE 8
  - Support for new Date/Time API
  - Constraints applied to collection elements
  - Optional wrappers
  - Repeatable annotations
- Introduce new constraints
  - @NotEmpty, @NotBlank, @Email
  - @PastOrPresent, @FutureOfPresent
  - @Positive, @PositiveOrZero, @Negative, @NegativeOrZero
- …

Security

JavaYourNext
(Cloud)

Identity Store

- Provide a storage system where caller credentials and data are stored
  - LDAP, DataBase, ...
- Perform caller validation and details retrieval
  - In : Valid caller name & password
  - Out : (Possibly different) caller name and/or associated group(s)
- Does not interact with the caller!

Identity Store

```
@DatabaseIdentityStoreDefinition(
   dataSourceLookup = "${'java:global/MyDS'}",
   callerQuery = "#{'select password from caller where name = ?'}",
   groupsQuery = "select group_name from caller_groups where caller_name = ?",
   hashAlgorithm = Pbkdf2PasswordHash.class,
   priorityExpression = "#{100}",
   hashAlgorithmParameters = {
          "Pbkdf2PasswordHash.Iterations=3072", "${applicationConfig.dyna}"
   }
)
```

Authentication Mechanism

- CDI enabled version of **ServerAuthModule** that complies to the JASPIC Servlet Container Profile
- Encouraged to use an **IdentityStore**
  - Caller credential validation
  - Caller details retrieval
- Built-in
  - @BasicAuthenticationMechanismDefinition
  - @FormAuthenticationMechanismDefinition
  - @CustomFormAuthenticationMechanismDefinition

Authentication Mechanism

- New **HttpAuthenticationMechanism** interface (javax.security.enterprise.authentication.mechanism.http)
  - void **cleanSubject**(HttpServletRequest, HttpServletResponse, HttpMessageContext)
  - AuthenticationStatus **validateRequest**(Req ,Resp, MCtx) throws AuthException;
  - AuthenticationStatus **secureResponse**(Req ,Resp, MCtx) throws AuthException;

Security API for Java EE

```
@WebServlet("/protectedServlet")
@ServletSecurity(@HttpConstraint(rolesAllowed = "foo"))
public class ProtectedServlet extends HttpServlet {
   ...
}


@ApplicationScoped
public class myAuthMech implements HttpAuthenticationMechanism {

   @Inject
   private IdentityStoreHandler myIdentityStore;

   AuthenticationStatus status validateRequest(HttpServletRequest req,
         HttpServletResponse res, HttpMessageContext ctx) throws AuthenticationException {
         ...
```

Maintenance Releases

- Java Persistence 2.2
- JavaMail 1.6
- Common Annotations 1.3
- Interceptors 1.2 rev A
- Web Socket 1.1

- Maintenance Releases completed for Java SE 9
  - JAX-WS, SAAJ, JAX-B & JAF

Wrap-up

JavaYourNext (Cloud)

Today - Java EE 8

JAX-RS 2.1	Reactive Client API, Server-Sent Events, …
Servlet 4.0	HTTP/2, Server Push, …
JSON-B 1.0 (*)	Java <-> JSON binding
JSON-P 1.1	Updates to JSON standards, JSON Collectors, …
CDI 2.0	Async Event, Observers ordering, SE support, …
Bean Validation 2.0	Embrace Java SE 8, new constraints, …
JSF 2.3	Improved CDI, WebSocket, SE 8 integration, …
Security 1.0 (*)	Portable Identity Store, Authentication & Security Context

Tomorrow – Jakarta EE

- Evolve the platform and its technologies
  - Java EE 8 as baseline
- Join the community
  - https://dev.eclipse.org/mhonarc/lists/ee4j-community/

благодаря!

ORACLE®