CDI* for Seam 2 developers

Brief migration notes
or what does CDI mean for Seam 2 developer

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* Contexts and Dependency Injection for the Java EE platform

Source available at github:

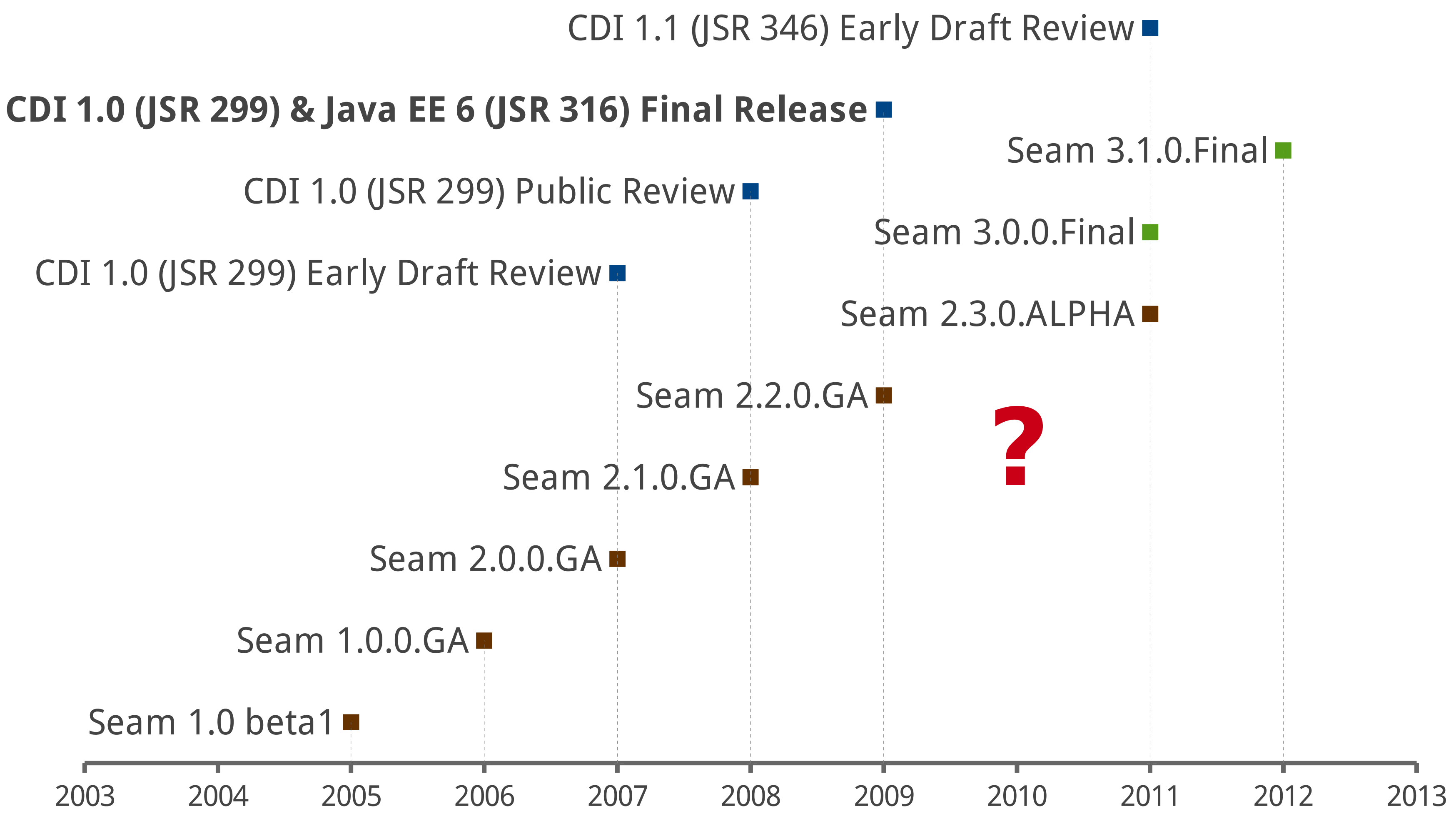
https://github.com/mkouba/cdi4seam2dev

- presentation in PDF format
- example source code

Agenda

1. In relation to... a little bit of history
2. Seam 2 vs CDI → the big picture
3. Component models
4. Bijection vs dependency injection (live demo :-)
5. Factory methods vs producers
6. Events
7. Interceptors (and decorators)
8. Questions

In relation to
… a little bit of history



Seam 2 vs CDI → the big picture

- Seam 2
  - is an **application framework**
  - built to “fix holes/fill gaps” in specification (Java EE 5)
  - the idea of **“Reinvesting in Java EE”** → fixes should find way back into the next revision of the standards

- CDI
  - is a **JCP specification**
  - originally Web Beans
  - version 1.0 (JSR 299) is a part of Java EE 6 (JSR 316)
  - implementations include:
    - Weld (RI)
    - Apache OpenWebBeans
    - CanDI
  - Seam 3 is a set of modules which extend CDI

Seam 2 vs CDI → the big picture

Seam 2 functionalities

Core

- components
- scopes and contexts
- bijection
- events
- interceptors...

Integration stuff

- Java EE (JSF, EJB, JAX-WS, ...)
- JBoss projects (RESTEasy, jBPM, ...)
- Third party projects (iText, Quartz Scheduler, ...)

Tools

- seam-gen

Out of the box solutions

- security
- i18n
- e-mail, ...

Seam 2 vs CDI → the big picture

CDI covers

Core

- components
- scopes and contexts
- bijection
- events
- interceptors…

Integration stuff

- Java EE (JSF, EJB, JAX-WS, …)
- ~~JBoss projects (RESTEasy, jBPM, …)~~
- ~~Third party projects (iText, Quartz Scheduler, …)~~

~~Tools~~

- ~~seam-gen~~

~~Out of the box solutions~~

- ~~security~~
- ~~i18n~~
- ~~e-mail~~

Seam 2 vs CDI → the big picture

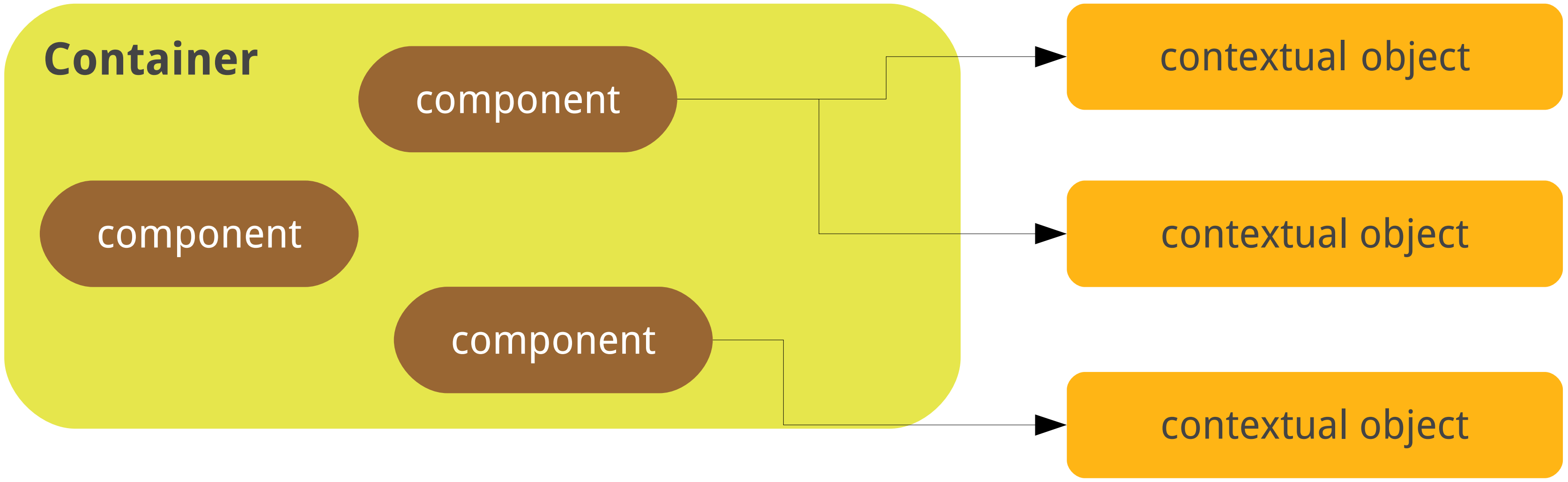
- Summary:
  - CDI covers most of Seam 2 core functionalities in a **standardized**, **typesafe** and **extensible** way

And now for something completely different...

Component models

What is a component?

- component is a source of contextual objects
- contextual objects define application state and/or logic
- components are usually configured with metadata (annotations, XML)



Component models
Diff #1 - terminology

- Seam → components
- CDI → beans

Component models
Diff #2 – metadata definition

- Seam
  - define metadata via annotaions and XML

- CDI
  - define metadata via annotaions and programmatically in portable extension (during app initialization)
  - XML configuration is not covered by spec → use JBoss Solder [1]

[1] http://seamframework.org/Seam3/Solder

Component models
Diff #3 – component types

- Seam
  - Session bean
  - JavaBean
  - Factory method
  - restricted:
    - Message-driven bean
      - may not be bound to a Seam context
    - Entity bean
      - do not support bijection or context demarcation

- CDI
  - Session bean
  - Managed bean
  - Producer method/field
  - Resource
    - represents a reference to a Java EE resource
  - **a portable extension may provide other kinds of beans**

Component models
Diff #4 – component names

- Seam
  - each component **must have the name defined explicitly** via `@Name` or XML descriptor,
  - name is string-based and unique across the application,
  - name is **involved in bi-jection lookup** mechanism,
  - component is automatically available in EL expressions
- CDI
  - beans **have no name by default** (typesafe resolution),
  - though may have name defined via `@Named` (EL name resolution – suitable only for UI),
  - and if so, they are available in EL

Component models
Diff #5 – registration process

- Seam
  - scans archives which contain `seam.properties` or `components.xml` at specified location
  - each component has to be marked **explicitly** in order to be recognized by the container (`@Name` or XML descriptor)
- CDI
  - scans archives and folders on the classpath which contain `beans.xml` at specified location
  - every Java class in the bean archive that meets certain conditions is **implicitly** recognized as a bean - no special declaration is required[1]

[1] CDI 1.0 doesn't solve explicit exclusion (either use some extension like JBoss Solder or wait for CDI 1.1 :-)

Component models
Diff #6 – scopes and contexts

- Seam
  - **fixed set of contexts**[1],
  - the concept of contextual variables
  - `@Scope` annotation with values of the `ScopeType` enumeration,
  - contexts are accessible for clients directly (rw)

- CDI
  - **set of built-in contexts**[1],
  - this set may be extended
  - each scope has its own annotation
  - no built-in business process, page, method and stateless scope
  - dependent pseudo-scope
  - CDI contexts cannot be modified by clients

[1] http://seamframework.org/Seam3/Seam2ToSeam3MigrationNotes

Component models
Diff #7 – basic metadata

- Seam
  - name → `@Name`
  - scope → `@Scope`
  - roles → `@Roles`
    - single Java class to act as a base for multiple components (comprises name and a scope)
  - conditional installation → `@Install`

- CDI
  - name (optional) → `@Named`
  - scope → `@RequestScoped`, …
  - set of bean types
  - set of qualifiers
    - used to distinguish between multiple components sharing the same bean type
  - conditional installation → `@Alternative`, `@Specializes`, `@Veto`[1], `@Requires`[1]

[1] CDI 1.1 (JSR 346)

Component models
Diff #8 – asynchronicity

- Seam
  - supports asynchronous method invocation via `Dispatcher` component
    - EJB TimerService,
    - or Quartz Scheduler implementation
- CDI
  - does not specify asynchronous method invocation
    - try using EJB `@Asynchronous` observer methods

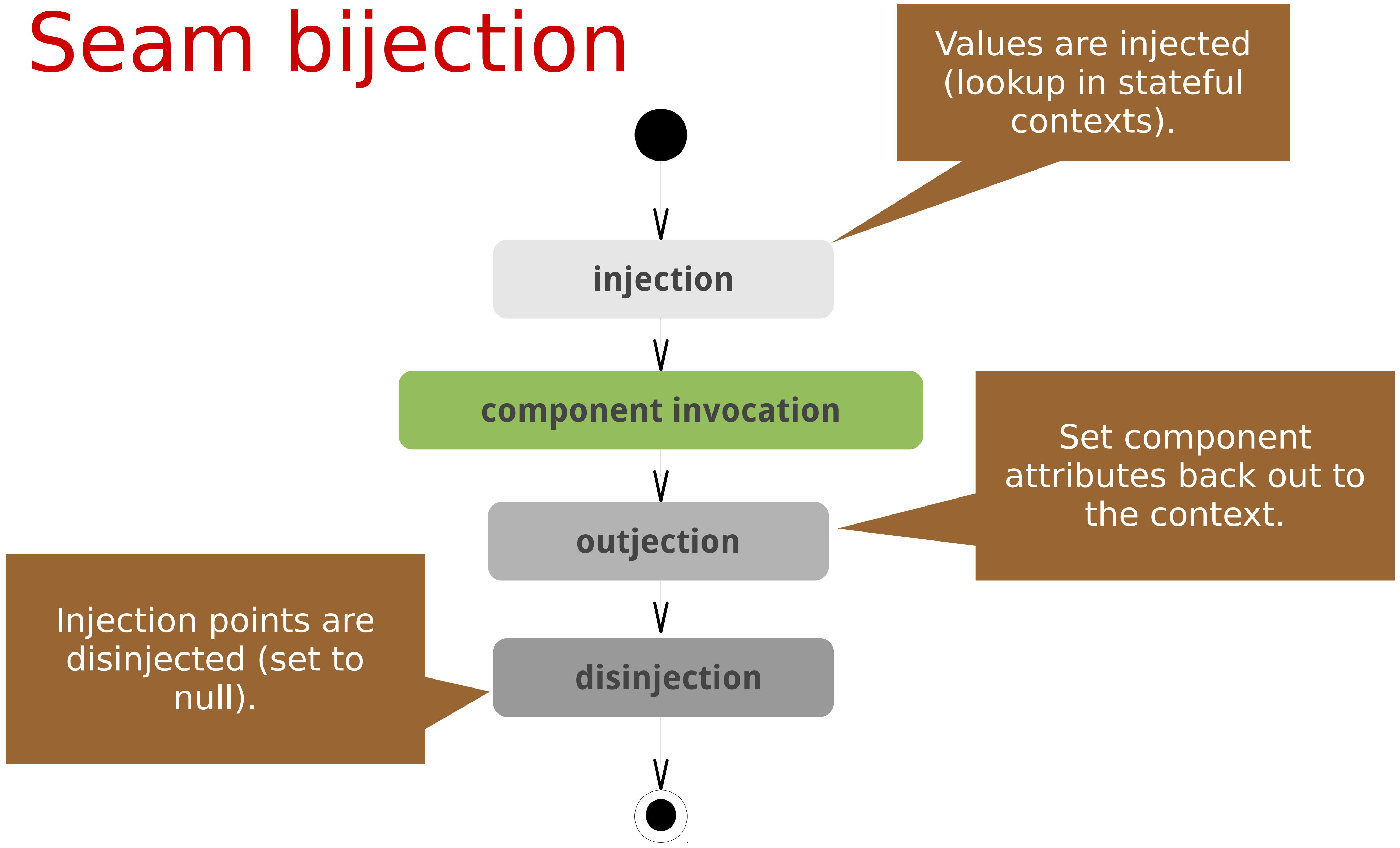
Inversion of Control

Seam bijection vs CDI dependency injection

Seam bijection

- bijection is performed dynamically via an interceptor **every time a component method is invoked**
  - bidirectional → injection and outjection
  - injection points: setter method and instance variable
  - **component name is always involved in lookup (!)**
  - `null` may be a result of Seam bijection **(!)**
  - components are not initialized automatically
    - `@In(create=true)`, `@AutoCreate`
- Seam uses also static injection configuring components via property settings

IoC
Seam bijection


Values are injected (lookup in stateful contexts).
injection
component invocation
outjection
Set component attributes back out to the context.
disinjection
Injection points are disinjected (set to null).

IoC
CDI approach

- static injection - performed only **once per component lifecycle**
  - when creating contextual objects
  - injection points: constructor, field, initializer method
  - typesafe resolution - the process of matching a bean to an injection point
    - bean is assignable to a given injection point if it **has a bean type that matches the required type has all the required qualifiers**
  - ambiguous and unsatisfied dependency is an error
  - no outjection and disinjection
  - beans are initialized automatically

IoC

Programmatic lookup

- Seam 2
  - static method `Component.getInstance()` is often used
    - for optimization → `@BypassInterceptors` is not suitable everywhere
    - in integration code
- CDI
  - is possible via built-in bean `Instance`[1] (requires injection though)
  - or `BeanManager`[2]
  - should not be needed in application code anyway :-)

[1] `javax.enterprise.inject.Instance`

[2] `javax.enterprise.inject.spi.BeanManager`

IoC

Seam bijection vs CDI injection

- time for a very simple live demo!

IoC
Java EE integration

- Seam
  - only Seam components support bijection
- CDI
  - all Java EE 6 components supporting injection[1] may inject beans via the dependency injection service,
  - however their lifecycle is not managed by CDI;
  - components supporting injection include: servlets, servlet filters and listeners, JSP tag handlers, JAX-WS endpoints, ...

[1] See JSR 316 – EE.5.2.5 Annotations and Injection

Factory methods vs producer methods/fields

Factory methods vs producer methods/fields
Diff #1 - names

- Seam
  - component name required
    - use `@Factory.value()` ,
    - if not specified → derived from method name
- CDI
  - name not required
    - typesafe resolution :-)
    - may be assigned via `@Named`

Factory methods vs producer methods/fields
Diff #2 – parameter injection

- Seam
  - not available
- CDI
  - producer method → all parameters are injection points

Factory methods vs producer methods/fields
Diff #3 - outjection

- Seam
  - instead of returning value, factory method may have `void` return type and use outjection to set variables into the context
- CDI
  - not available

Factory methods vs producer methods/fields
Diff #4 – producer fields

- Seam
  - not available
- CDI
  - a producer field is a simpler alternative to a producer method
  - usefull for Java EE component environment injection

Events

Events
Diff #1 – event type

- Seam
  - type is string-based
  - parameters are optional
- CDI
  - event is an instance of a concrete Java class
    - the event types include all superclasses and interfaces of the runtime class of the event object → observer resolution is typesafe

Events
Diff #2 – raising/firing an event

- Seam
  - raise via Events component,
  - or declaratively
    - use an annotation `@RaiseEvent`
    - navigation rules configuration; `pages.xml`
- CDI
  - fire via an instance of the `Event`[1] interface,
  - or `BeanManager`
  - it's not possible to fire declaratively

[1] `javax.enterprise.event.Event`

[2] `javax.enterprise.inject.spi.BeanManager`

Events
Diff #3 – features

- Seam
  - asynchronous and timed events via `Dispatcher` component
    - EJB TimerService,
    - or Quartz Scheduler impl
  - transaction aware events
- CDI
  - does not specify asynchronous events
    - try using EJB `@Asynchronous` observer methods
  - does not specify timed events
  - transaction aware events

Interceptors

Interceptors
Diff #1 – the concept

- Seam
  - much of the functionality of Seam is implemented as a set of built-in Seam interceptors[1]
  - Seam defines
    - its own API to create custom interceptor for JavaBean components,
    - and EJB 3.0 "adaptation layer"
- CDI
  - follows Interceptors 1.1 specification
    - part of EJB 3.1 spec[2]
  - defines a typesafe mechanism for associating interceptors to beans using **interceptor bindings**

[1] See `org.jboss.seam.core.Init#DEFAULT_INTERCEPTORS`

[2] JSR 318

Interceptors
Diff #2 – binding and enablement

- Seam
  - bind to a component **with custom annotation**
  - interceptors are registered and enabled automatically
  - order is defined via `@Interceptor` annotation
    - around, within attributes

- CDI
  - bind to a bean **with custom annotation**
  - an interceptor must be **explicitly enabled** by listing its class under the `<interceptors>` element of the `beans.xml` file for each bean archive[1]
  - the order of the interceptor declarations determines the interceptor ordering

[1] https://issues.jboss.org/browse/CDI-18

~~Interceptors~~
Diff #3 – decorators

- Seam
  - no such functionality is supported

- CDI
  - similar to interceptors[1],
  - but don't have the generality of an interceptor,
  - intercept invocations only for a certain interface,
  - and directly implement operations with business semantics

[1] See JSR 299 - Chapter 8. Decorators

Questions?

The End

Thanks for listening

Resources:

- Seam 2 documentation: http://docs.jboss.org/seam/latest/reference/en-US/html/
- Seam 2 to Seam 3 Migration Notes: http://seamframework.org/Seam3/Seam2ToSeam3MigrationNotes
- CDI Specification (JSR 299): http://jcp.org/en/jsr/summary?id=299
- Weld documentation: http://docs.jboss.org/weld/reference/latest/en-US/html/
- Java EE 6 Specification (JSR 316): http://jcp.org/en/jsr/summary?id=316
- Weld, CDI and Proxies: https://community.jboss.org/blogs/stuartdouglas/2010/10/12/weld-cdi-and-proxies