Configure Once, run everyhere!

Configuration with Apache Tamaya

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Apache incubator

About Me

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Agenda

- Motivation
- Requirements
- The API
- Configuration Backends
- Demo
- Extensions

Motivation

What is Configuration ?

Simple Key/value pairs?

Typed values?

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When is Configuration useful?

Use Cases?

How is it stored?

Remotely or locally?

Classpath, file or ...?

Which format?

All of the above (=multiple sources) ?

When to configure?

Develpment time ?

Build/deployment time?

Startup?

Dynamic, anytime?

Configuration Lifecycle ?

Static ?

Refreshing ?

Changes triggered ?

Do I need a runtime ?

Java SE?
Java EE?
OSGI?

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Requirements

Requirements

- Developer‘s Perspective
- Architectural/Design Requirements
- Operational Aspects
- Other Aspects

Developer‘s Requirements

- Easy to use.
- Developers want defaults.
- Developers don‘t care about the runtime (for configuration only).
- Developers are the ultimate source of truth
- Type Safety

Architectural/Design Requirements

Decouple code that consumes configuration from

- Backends Used
- Storage Format
- Distribution
- Lifecycle and versioning
- Security Aspects

Operational‘s Requirements

- Enable Transparency:
  - What configuration is available ?
  - What are the current values and which sources provided the value ?
  - Documentation
- Manageable:
  - Configuration changes without redeployment or restart.
  - Solution must integrate with existing environment

Other Aspects

- Support Access Constraints and Views
- No accidental logging of secrets
- Dynamic changes
- Configuration Validation

Accessing Configuration

The API

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API Requirements

- Leverage existing functionality where useful
- Only one uniform API for access on all platforms!
- Defaults provided by developer during development (no interaction with operations or external dependencies)

Existing Mechanisms

- Environment Properties
- System Properties
- CLI arguments
- Properties, xml-Properties

Dependencies - API & Core

```
<dependency>
    <groupId>org.apache.tamaya</groupId>
    <artifactId>tamaya-api</artifactId>
    <version>0.2-SNAPSHOT</version>
</dependency>
<dependency>
    <groupId>org.apache.tamaya</groupId>
    <artifactId>tamaya-core</artifactId>
    <version>0.2-SNAPSHOT</version>
</dependency>
```

Programmatic API

```
Configuration config =
                ConfigurationProvider.getConfiguration();

// single property access
String name = config.getOrDefault("name", "John");
int ChildNum = config.get("childNum", int.class);

// Multi property access
Map<String,String> properties = config.getProperties();

// Templates (provided by extension)
MyConfig config = ConfigurationInjection.getConfigurationInjector()
                  .getConfig(MyConfig.class);
```

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Dependencies – Injection SE

```
<dependency>
    <groupId>org.apache.tamaya.ext</groupId>
    <artifactId>tamaya-injection-api</artifactId>
    <version>0.2-SNAPSHOT</version>
</dependency>
<dependency>
    <groupId>org.apache.tamaya.ext</groupId>
    <artifactId>tamaya-injection</artifactId>
    <version>0.2-SNAPSHOT</version>
</dependency>
```

```
@Config(value=„admin.server“, defaultValue=“127.0.0.1“)
private String server;

@Config(value=“admin.port“,
                 defaultValue=“8080“)
private int port;

@Config(value=“admin.connections“)
private int connections = 5;

@Config(„address“)
private Address address;
```

```
MyTenant t = new MyTenant();
ConfigurationInjection
    .getConfigurationInjector()
    .configure(t);
```

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Configuration Backends

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Configuration Backends

- Support existing mechanisms OOTB
- Provide a simple SPI for (multiple) property sources
- Define a mechanism to prioritize different property sources
- Allow different strategies to combine values
- Support Filtering
- Support Type Conversion

So what is a property source ?

PropertySource

```
public interface PropertySource {

   PropertyValue get(String key);
   Map<String,String> getProperties();
   boolean isScannable();
   String getName();
   int getOrdinal();
}
public final class PropertyValue{
   public String getKey();
   public String getValue();
   public String get(String key);
   public Map<String,String> getConfigEntries();
   ...
}
```

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Are there predefined property sources ?

Of course.

- System & Environment Properties
- (CLI Arguments)
- Files:

```
${configDir}/*.properties
```

- Classpath Resources:

```
/META-INF/javaconfiguration.properties
```

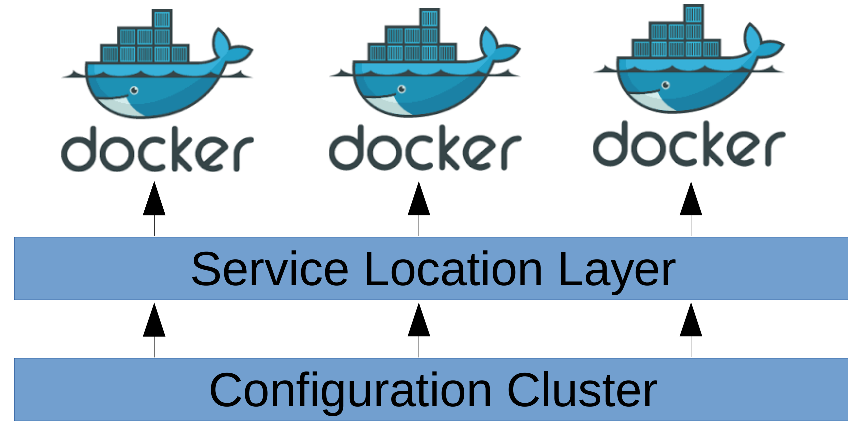
And how about remote configuration…?

Especially with Containers?

Remote configuration

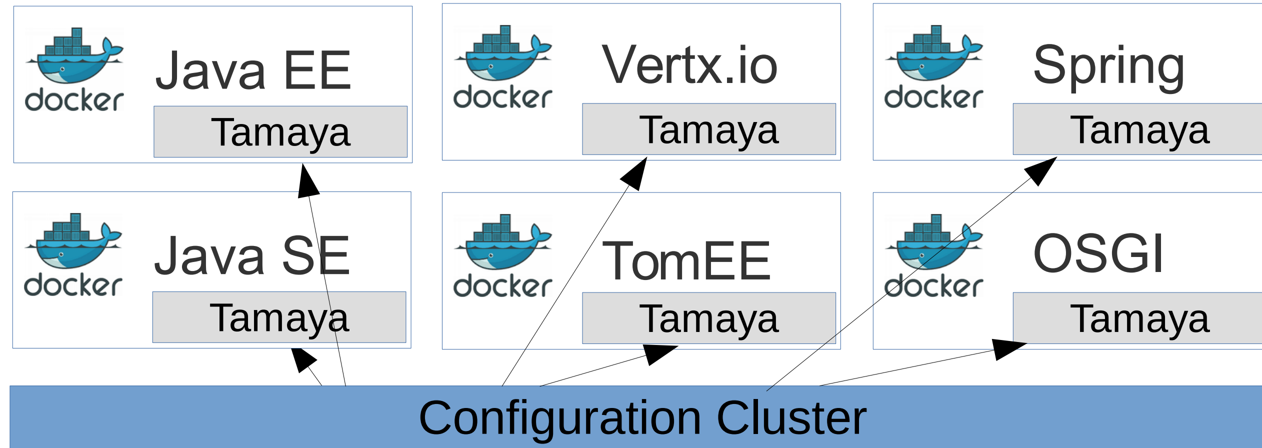
```
<dependency>
    <groupId>org.apache.tamaya.ext</groupId>
    <artifactId>tamaya-etcd</artifactId>
    <version>...</version>
</dependency>
```

- Configuration is read from remote source, e.g.
  - Etcd cluster
  - Consul cluster
  - Any Web URL
  - ...

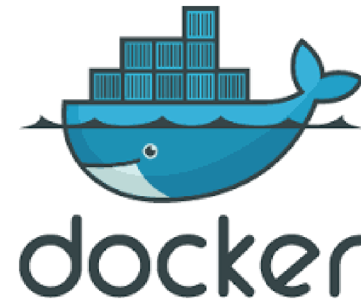


What kind of runtime I need ?

- In fact, it doesn‘t matter ! **Configure once, run everywhere !**



Excourse: Configuring Containers



- Configuration on deployment by **environment properties**:

```
docker run -e stage prod  -d -n MyApp user/image
```

or **Dockerfile/Docker Image**:

```
FROM java:8-jre
...
ENV stage prod
```

How to add custom configuration ?

Other files...

Or resources…

My self-written super fancy config database ?

Whatever I like ?

Use the SPI !

PropertySource

Property sources

- Mostly map to exact one file, resource or backend
- Have a unique name
- Must be thread safe
- Can be dynamic
- Provide an ordinal
- Can be scannable

PropertySource – Example

```
public class MyPropertySource extends BasePropertySource{
    private Map<String,String> props = new HashMap<>();
    public SimplePropertySource() throws IOException {
        URL url = getClass().getClassLoader().getResource(
                   “/META-INF/myFancyConfig.xml“);
        // read config properties into props
        ...
    }

    @Override
    public String getName() { return “/META-INF/myFancyConfig.xml“; };

    @Override
    public Map<String, String> getProperties() { return props; }
}
```

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PropertySource - Registration

- By default, register it using the `java.util.ServiceLoader`

```
→ /META-INF/services/org.apache.tamaya.spi.PropertySource

MyPropertySource
```

PropertySource Provider

Property source provider

- Allow *dynamic* registration of *multiple* property sources
  - E.g. all files found in a config directory
- Are evaluated once and then discarded
- Are also registered using the `ServiceLoader`.

PropertySourceProvider

```
public interface PropertySourceProvider{

    public Collection<PropertySource> getPropertySources();

}
```

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More SPI artifacts

Furthermore Tamaya uses

- Filters for filtering values evaluated (remove, map, change)
- Converters for converting String values to non-String types
- A `ValueCombinationPolicy`
  - determines how values evaluated are combined to a final value (defaults to overriding)

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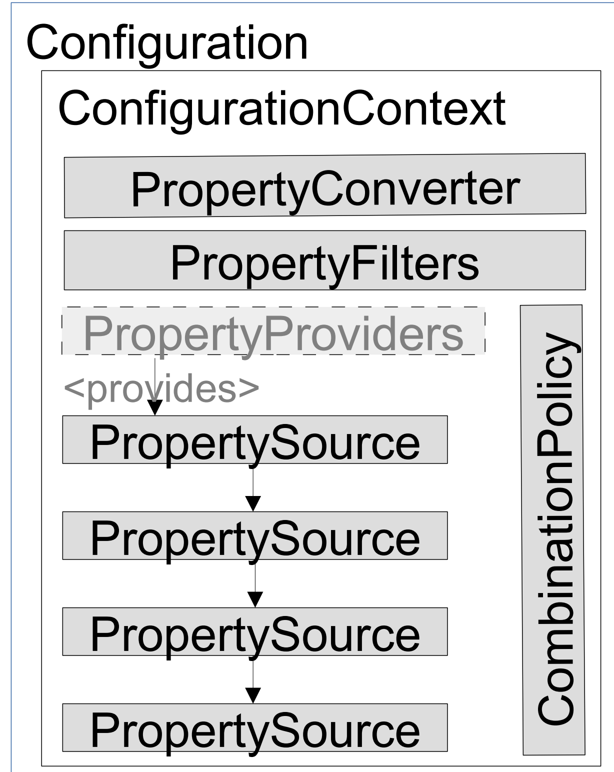
And how these pieces all fit together ?

Apache Tamaya in 120 seconds...

1. **`Configuration`** = ordered list of **`PropertySources`**
2. Properties found are **combined** using a `CombinationPolicy`
3. Raw properties are **filtered** by `PropertyFilter`
4. For typed access `PropertyConverters` have to do work
5. **Extensions** add more features (discussed later)
6. **Component Lifecycle** is controlled by the `ServiceContextManager`



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So we have:

files, resources, sys- and env-properties

& an SPI to implement and register them ?

What else do we need ?

Easy Configuration:

„Meta“-Configuration !

Meta-Configuration

DRAFT !

- Configuration that configures configuration
- E.g. at `META-INF/tamaya-config.xml`
- Allows easy and quick setup of your configuration environment
- Allows dynamic enablement of property sources
- ...

```
<configuration>
    <context>
        <context-param name="stage">DEV</context-param>
    </context>
    <sources>
      <source type="env-properties" enabled="${stage=TEST || stage=PTA || stage=PROD}" ordinal="200"/>
      <source type="sys-properties" />
      <source type="file">
          <observe period="20000">true</observe>
          <location>./config.json</location>
      </source>
      <source type="resources" multiple="true">
          <multiple>true</multiple>
          <location>/META-INF/application-config.yml</location>
      </source>
      <source type="ch.mypack.MyClassSource">
          <locale>de</locale>
      </source>
      <source type="includes" enabled="${context.cstage==TEST}">
          <include>TEST.properties</include>
      </source>
    </sources>
</configuration>
```

DRAFT !

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Demo

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Demo

- 1 Microservice
- Running on Java EE 7 (Wildfly)
- Multiple Configuration Sources:
  - Environment Properties
  - System Properties
  - Classpath
  - Files
  - Etcd Server

There is more!

Tamaya Extensions

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```xml
<dependency>
    <groupId>org.apache.tamaya.ext</groupId>
    <artifactId>tamaya-resolver</artifactId>
    <version>...</version>
</dependency>
```

Property resolution...

java.home=/usr/lib/java

compiler=${ref:java.home}/bin/javac

```xml
<dependency>
    <groupId>org.apache.tamaya.ext</groupId>
    <artifactId>tamaya-resources</artifactId>
    <version>...</version>
</dependency>
```

Resource expressions…

```java
public class MyProvider extends AbstractPathPropertySourceProvider{
  public MyProvider(){
    super("classpath:/META-INF/config/**/*.properties");
  }
  @Override
  protected Collection<PropertySource> getPropertySources(URL url) {
      // TODO map resource to property sources
      return Collections.emptySet();
  }
}
```

And more: a topic on its own!

- *Tamaya-**spi-support**:* Some handy base classes to implement SPIs
- *Tamaya-**functions**:* Functional extension points (e.g. remapping, scoping)
- *Tamaya-**events**: Detect and publish ConfigChangeEvents*
- *Tamaya-**optional**: Minimal access layer with optional Tamaya support*
- *Tamaya-**filter**: Thread local filtering*
- *Tamaya-**inject-api**: Tamaya Configuration Injection Annotations*
- *Tamaya-**inject**:* Configuration Injection and Templates SE Implementation (lean, no CDI)
- *Format Extensions:* yaml, json, ini, … including formats-SPI
- Integrations with **CDI, Spring, OSGI*, Camel, etcd**
- *Tamaya-**mutable-config***: Writable ConfigChangeRequests*
- *Tamaya-**model****: Configuration Model and Auto Documentation
- *Tamaya-**collections****: Collection Support
- *Tamaya-**resolver**:* Expression resolution, placeholders, dynamic values
- *Tamaya-**resources**:* Ant styled resource resolution

…

Summary

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Summarizing...

- A Complete thread- and type-safe Configuration API
- Compatible with all major runtimes
- Simple, but extendible design
- Extensible
- Small footprint
- Base for current Java EE 8 spec ?

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You like it ?

It is your turn !“

- *Use it*
- *Evangelize it*
- *Join the force!*

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Links

Project Page: http://tamaya.incubator.apache.org
Twitter: @tamayaconfig
Blog: http://javaeeconfig.blogspot.com
Presentation by Mike Keith on JavaOne 2013:
https://oracleus.activeevents.com/2013/connect/sessionDetail.ww?SESSION_ID=7755
Apache Deltaspike: http://deltaspike.apache.org
Java Config Builder: https://github.com/TNG/config-builder
Apache Commons Configuration: http://commons.apache.org/proper/commons-configuration/
Jfig: http://jfig.sourceforge.net/
Carbon Configuration: http://carbon.sourceforge.net/modules/core/docs/config/Usage.html
Comparison on Carbon and Others:
http://www.mail-archive.com/commons-dev@jakarta.apache.org/msg37597.html
Spring Framework: http://projects.spring.io/spring-framework/
Owner: http://owner.aeonbits.org/

Q&A

Thank you!

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