LSR-Adèle

A Conceptual Comparison of Avalon, Fractal and Gravity

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Comparison

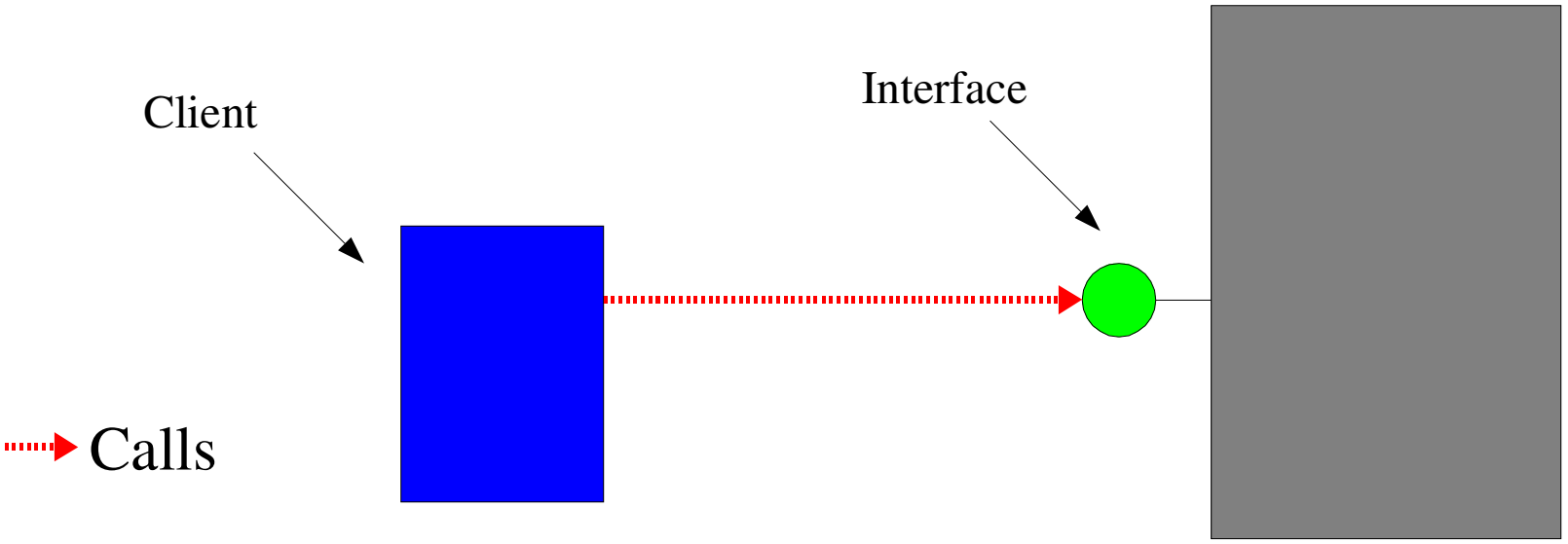
- Fractal
  - “The Fractal composition framework is both a conceptual and a software framework that supports component-based programming -- including components definition, configuration, composition and administration -- according to the Fractal component model.”
- Avalon
  - “Avalon is a framework that allows components of varying scale to be created, managed via a specific set of lifecycle methods, and used in an application. While Avalon is geared towards server-side applications, it is not limited to such, and is quite flexible.”
- Gravity
  - “A framework that supports composing applications out of components that exhibit dynamic availability.”
- Comparison along two main axes
  - Framework / Implementation

Framework

- Collection of abstract classes
  - Component model
    - Components
    - Management entities (controllers,...)
- Imposes a set of design patterns
  - Separation of interface and implementation
  - Factory
  - Inversion of control
  - Interceptor
  - Service registry

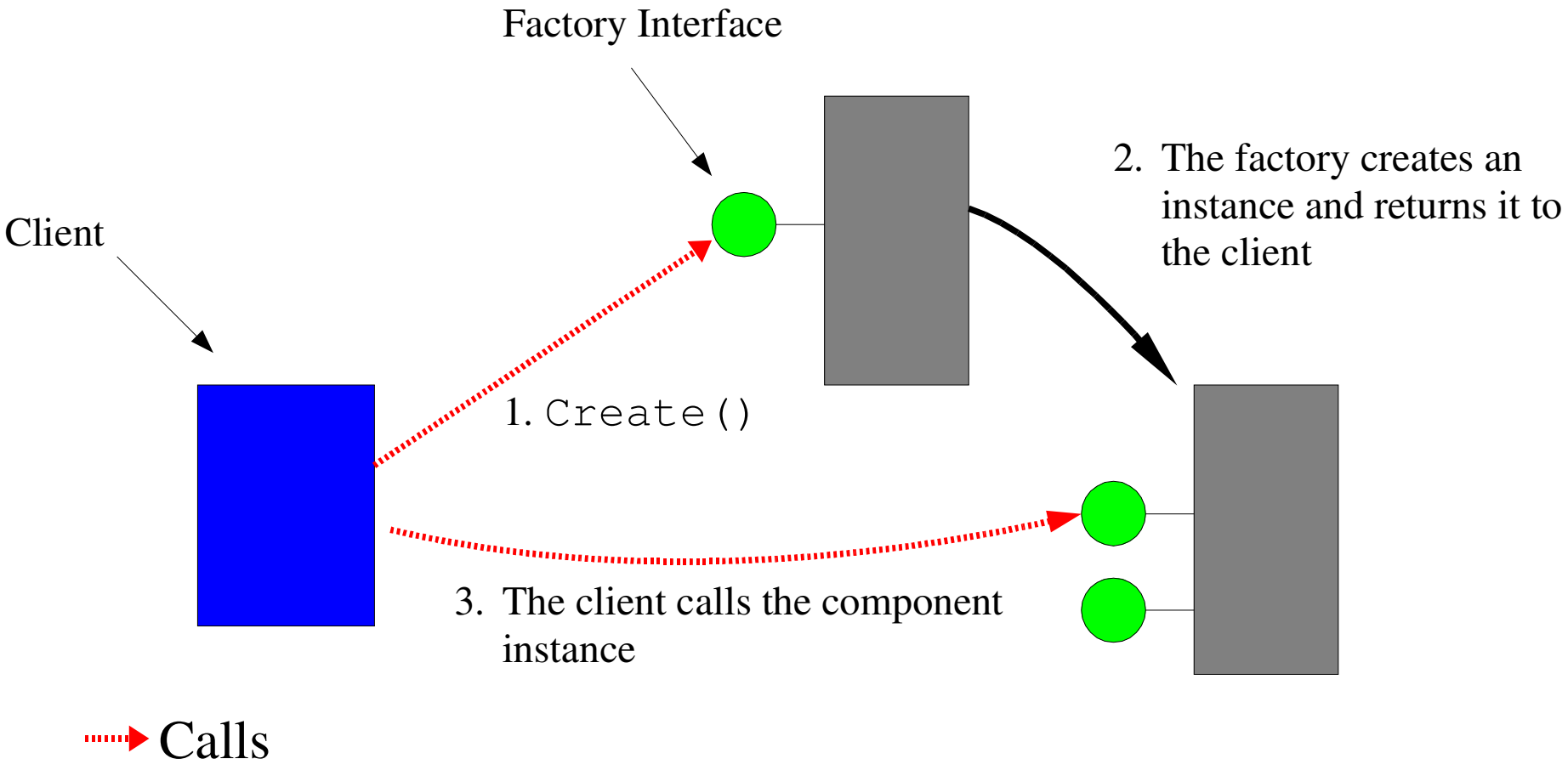
Interfaces and Implementations

- Clients communicate with component instances only through well defined interfaces
- Different implementations can implement the same interface



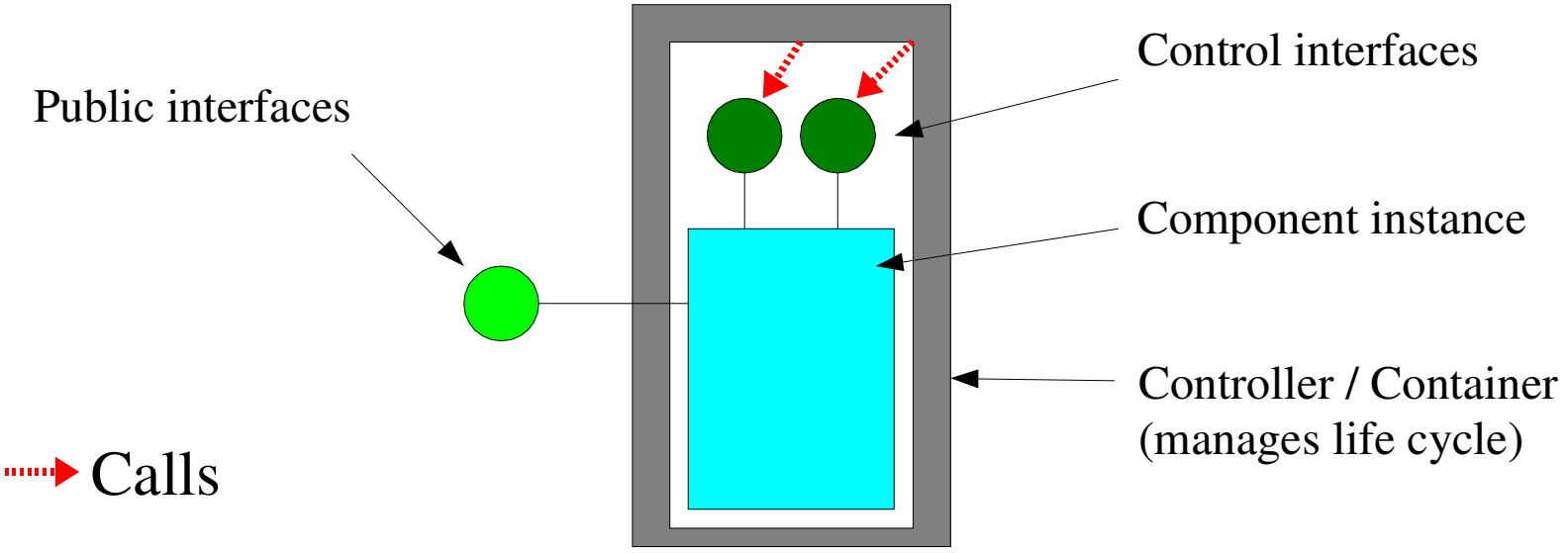
Factory

- Provide and indirect instantiation mechanism



Inversion of Control (IOC)

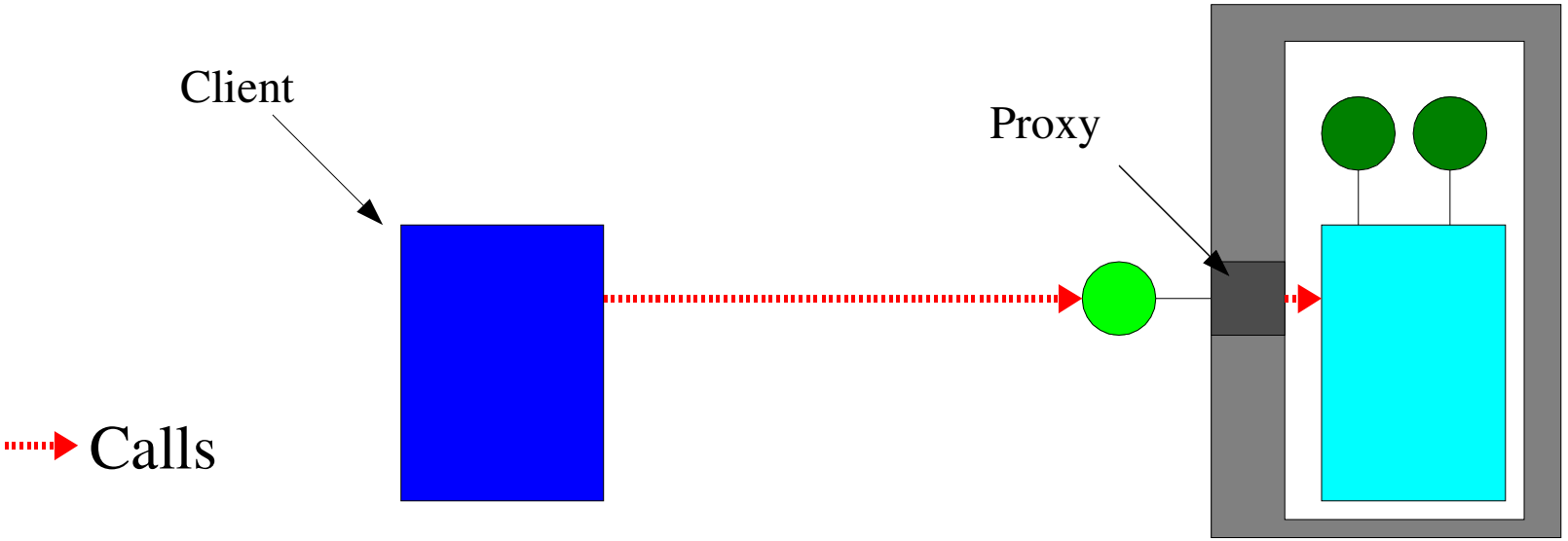
- A component instance is always externally managed through a set of control interfaces that provide life cycle methods



- Control interfaces can be discovered at run time

Interceptor (Proxy)

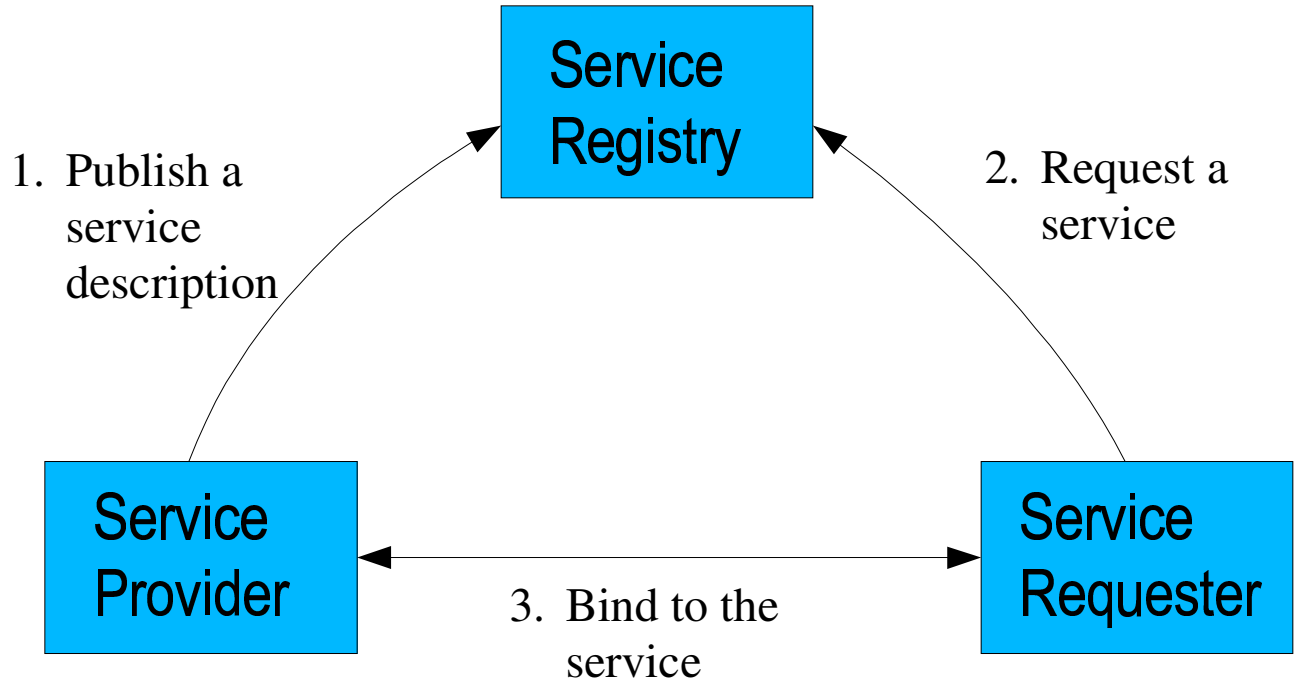
- Clients do not communicate directly with the component instance, calls are received by a proxy



- The interceptor may insert, block or replace the component's functionalities

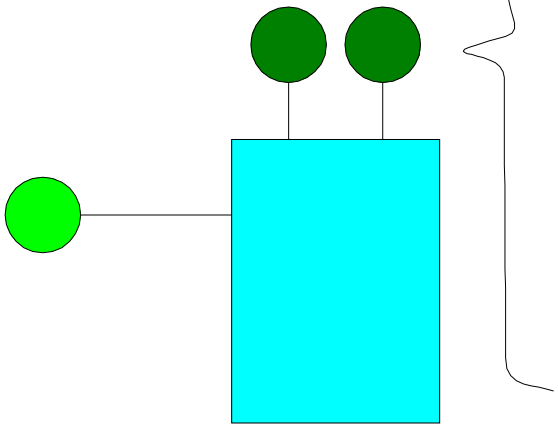
Service Registry

- Services are well defined interfaces



Design Patterns in Fractal

- Separation of interface and implementation
- Factory
- Interceptor
- Inversion of control

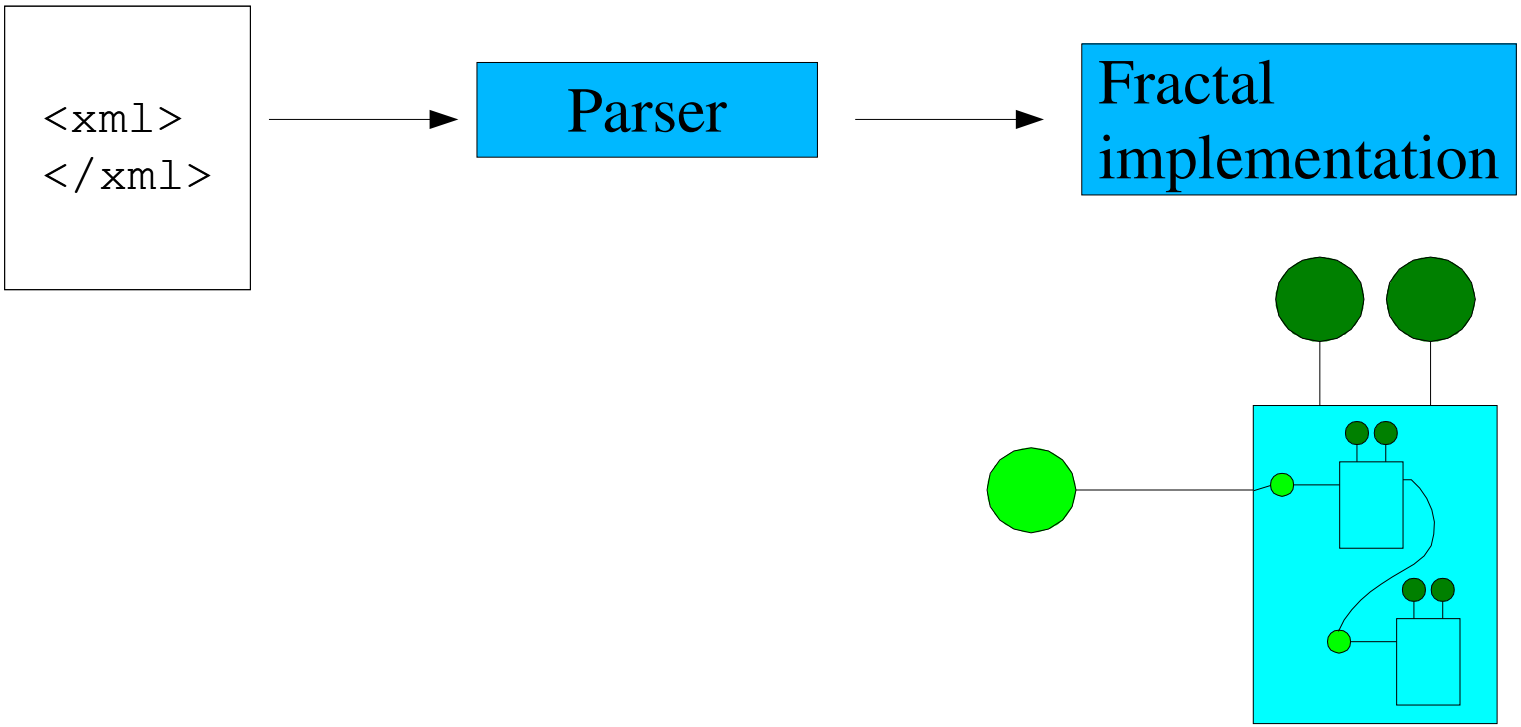


`fractal.api.control` package

- `BindingController`
- `UserBindingController`
- `AttributeController`
- `LifeCycleController`: `start()`, `stop()`
- `ContentController`

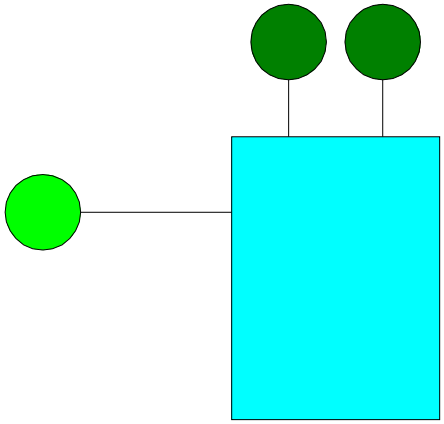
Composition in Fractal

- Fractal provides an API to define and instantiate templates and their components
- Hierarchical composition is supported



Design Patterns in Avalon

- Separation of interface and implementation
- Service registry
- Inversion of control



- **LogEnabled:** `enableLogging(Logger)`
- **Contextualizable:** `contextualize(Context)`
- **Serviceable:** `service(ServiceManager)`
- **Configurable:** `configure(Configuration)`
- **Parametrizable:** `parametrize(Parameters)`
- **Initializable:** `initialize()`
- **Startable:** `start(),stop()`

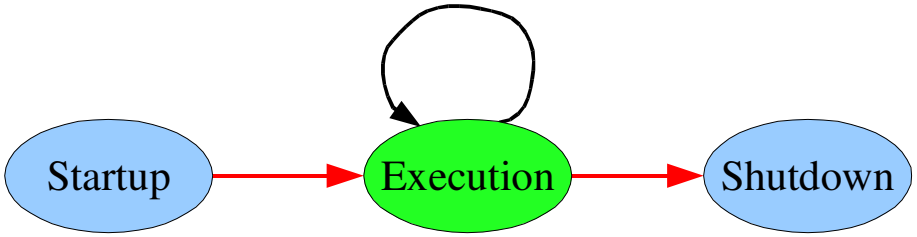
- **Suspendable:** `suspend(),resume()`
- **Recontextualizable:** `recontextualize()`
- **Reconfigurable:** `reconfigure()`
- **Reparametrizable:** `reparametrize()`

- **Disposable:** `dispose()`

Control Method-Call Sequence

Startup Phase:

1. constructor (as a consequence of instantiation)
2. contextualize
3. service
4. configure
5. parameterize
6. initialize
7. start



At various or repeated times after startup:

1. suspend
2. recontextualize
3. recompose
4. reconfigure
5. reparameterize
6. resume

Legend:

Called only once during life cycle
Called at least once but possibly more
Optionally called

Shutdown Phase:

1. stop
2. dispose
3. finalize (at some indeterminate moment by the garbage collector)

Composition in Avalon

- Avalon is a service oriented component model
- Instances of components that provide services must be registered in a `ServiceManager` (service registry)
- A client to a service must implement the `Serviceable` interface to lookup for services
  - `service(ServiceManager mgr)`
- Request a service
  - `myService=(SomeService)mgr.lookup (SomeService.ROLE);`
- Services must be released
  - `mgr.release(myService);`

Instance Creation in Avalon

- The container instantiates the components and register its roles with a `ServiceManager`
- The same role can be registered multiple times through a *selector*
  - The client selects the service by passing a key that identifies a service
- Different kinds of “lifestyles”
  - Single threaded: only serves 1 client
  - Thread safe: serves multiple clients
  - Poolable: serve 1 client, reusable

Implementation of Fractal

- Julia is France Telecom's implementation of the Fractal specification
- Julia code organized in 3 parts
  - Core Runtime Classes: this part contains the minimum classes that are needed at runtime
  - Code Generator Classes: this part contains the classes that are used to generate application specific classes that are needed by Julia
  - Tools: this part contains classes that are not needed at runtime

Controller Generation

- Controllers and interceptors are generated by following a *mixin* technique
- Julia is configured through files with a Lisp syntax
  - These configuration files allow for the addition of interceptors at different levels in the component hierarchy

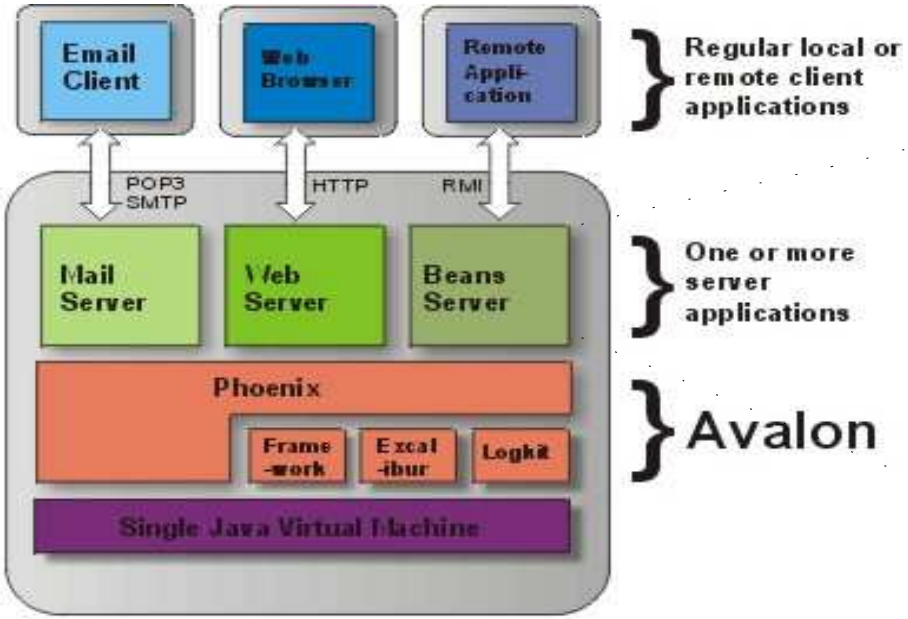
Implementation in Avalon

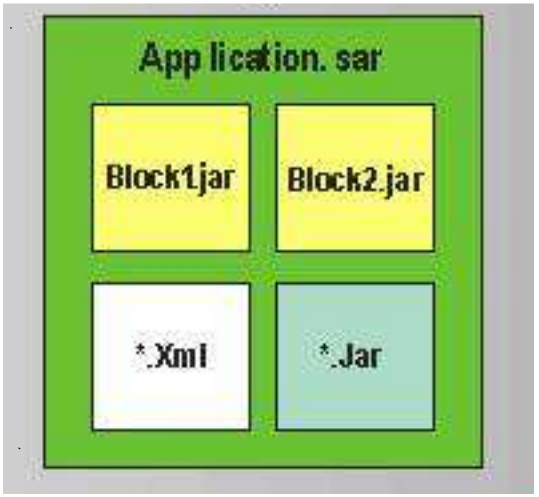
- Several subprojects
  - Framework: defines the component model
  - Excalibur: implements framework
  - Phoenix: micro-kernel to manage apps
  - Cornerstone: component repository
  - LogKit: logging toolkit

- Excalibur offers different types of containers
  - Fortress: extensible life cycle
  - Merlin: hierarchical container, automated assembly, candidate resolution
  - Tweety: learning purposes

Phoenix

- “Phoenix is a micro-kernel designed and implemented on top of the Avalon framework. It provides a number of facilities to manage the environment of server applications. Such facilities include log management, class loading, thread management and security.”





Conclusions

- Fractal and Avalon have similar goals
  - Infrastructure for “bigger” projects
    - Apache HTTP server, ...
    - OpenCCM, JOnAS, ...
- Fractal is a hierarchical component model
  - API to define types, compositions...
- Avalon is a service-oriented component model
  - Server-side orientation

Conclusions (2)

Avalon	Fractal	Gravity
Framework	Framework	Framework
Excalibur	Julia	Gravity
Phoenix	?	OSGi

- OSGi could be used as an equivalent to Phoenix in Fractal
- OSGi has successfully been used as an infrastructure in Gravity