Apache Karaf in the enterprise

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Who am I ?

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- Software Architect/Fellow at Talend
- Member of the Apache Software Foundation
- PMC member and committer for ~ 20 Apache projects (Karaf, Camel, ActiveMQ, Felix, Aries, Beam, Incubator, ...)

Apache Karaf ?

- Application runtime
- Lightweight & modular
- Very customisable
- Several packaging (standalone, custom distribution, docker)
- Static (immutable) or dynamic (mutable) bootstrapping
- Executable on premise, on cloud (docker, cellar)
- Bunch of features and extensions (including Karaf subprojects)

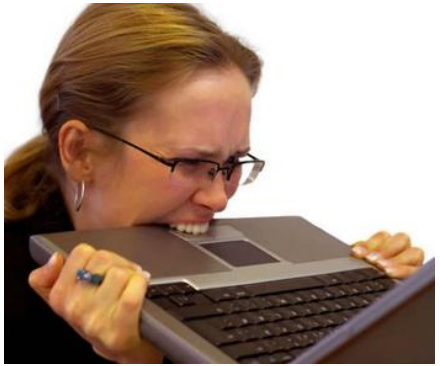
Apache Karaf in the enterprise

Different perspectives and needs:

- Developers
  - Features
  - Easy & fun
  - Tools (debugging, profiling, ...)
- DevOps
  - Packaging
  - Management (installing/updating containers, runtime, applications) & monitoring
  - Scaling
  - Integration in the ecosystem
- End users
  - Business ready tools
  - Insight in the business activity

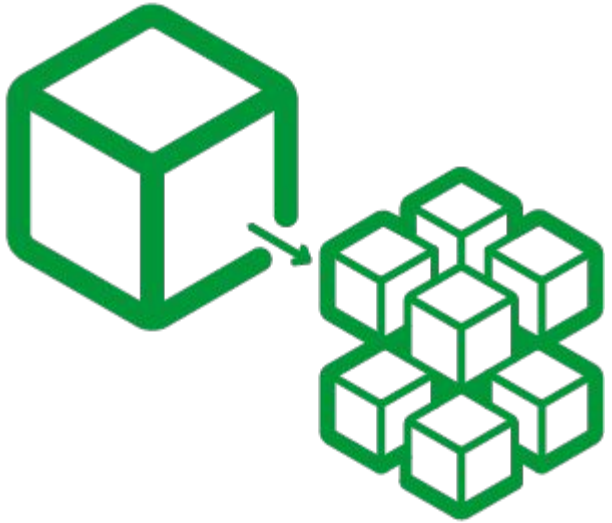
Karaf for the devs

- Business applications
- Programming models
- Packaging
- Specifications & features
- Tools (debug, watcher, ...)
- Examples, documentation, karaf-boot
- Active user mailing list



Devs: business applications

- Backend, service/microservice approach
- Frontend
- IoT & Integration (with Apache Camel)



Devs: programming models

- WebApp/WAR

```
karaf@root()> feature:install war
karaf@root()> bundle:install -s webbundle:mvn:my/app/1.0/war?Web-ContextPath=my
```

- Spring (any version from 3 to 5)

```
karaf@root()> feature:install spring
karaf@root()> bundle:install -s wrap:mvn:my/app/1.0
```

- CDI (OpenWebBeans & Weld)

```
karaf@root()> feature:install pax-cdi-weld
karaf@root()> bundle:install -s wrap:mvn:my/app/1.0
```

- OSGi (pure & native)

```
karaf@root()> bundle:install -s mvn:my/bundle/1.0
```

- Blueprint (Aries & Gemini)

```
karaf@root()> feature:install aries-blueprint
karaf@root()> bundle:install -s mvn:my/bundle/1.0
```

- SCR

```
karaf@root()> feature:install scr
karaf@root()> bundle:install -s mvn:my/bundle/1.0
```

Devs: artifacts packaging

- Regular jar (wrapping)

```
karaf@root()> bundle:install -s wrap:mvn:my/app/1.0
```

- Regular war

```
karaf@root()> bundle:install -s webbundle:mvn:my/app/1.0/war?Web-ContextPath=my
```

- OSGi bundles

```
karaf@root()> bundle:install -s mvn:my/app/1.0
```

- Blueprint XML

```
karaf@root()> bundle:install -s blueprint:mvn:my/app/1.0/xml
```

- Features

```
karaf@root()> feature:repo-add mvn:my/app/1.0/xml/features
karaf@root()> feature:install my-feature
```

- KAR

```
karaf@root()> kar:install mvn:my/app/1.0/kar
```

- Custom artifacts (deployer and URL services)

Devs: specifications & features

- JNDI service (`InitialContextFactory` as service, names on services)

```
karaf@root()> feature:install jndi
```

- JDBC service (`DataSource` as service, pooling DBCP, C3P0, transx, narayana, ...)

```
karaf@root()> feature:install jdbc
```

- JMS service (`ConnectionFactory` as service, pooling DBCP, C3P0, transx, narayana, ...)

```
karaf@root()> feature:install jms
```

Possible to install ActiveMQ broker directly in Karaf

```
karaf@root()> feature:repo-add activemq
karaf@root()> feature:install activemq-broker
```

- JPA service (`EntityManager` as service, abstracting OpenJPA, Hibernate, EclipseLink)

```
karaf@root()> feature:install jpa
karaf@root()> feature:install openjpa
```

- JTA (`TransactionManager` as service, abstracting Narayana, ...)

```
karaf@root()> feature:install transaction
```

- JMX (MBean whiteboard pattern or MBean services)

```
karaf@root()> feature:install management
```

- CDI (possible to use OSGi services as CDI injection)
- HTTP (`HttpService` service, servlet whiteboard pattern)
- JAXRS (CXF or Aries JAXRS whiteboard)
- JAXWS (CXF)
- Integration (Camel)

Devs:additional features & tooling

- Scheduler (executable runnable service or command as a cron)

```
karaf@root()> feature:install scheduler
```

- Instances (create/clone Karaf instances)

```
karaf@root()> instance:create myinstance
```

- Logging (abstract logging frameworks, centralized and dynamic configuration)
- Configuration (dynamic and centralized configuration)
- Hot deployment & deployer (extensible)
- Shell console (extensible)
- Maven plugin
  - Build and verify distribution
  - Run a distribution
  - Client and deploy on a running instance
  - Create docker image (WIP)

Devs: runtime tooling

- Remote debugging

```
bin/karaf debug
```

- Developer commands

```
karaf@root()> bundle:diag
karaf@root()> bundle:load-test
karaf@root()> bundle:tree-show
karaf@root()> system:framework -debug
...
```

- Artifacts watcher (automatically update SNAPSHOT)

```
karaf@root()> bundle:watch *
```

- Shell scripting
- Complete dump on demand (heapdump, threaddump, log, env, ...)

```
karaf@root()> dev:dump-create
```

Devs: easy start and support

- Turnkey examples directly in the distribution

  https://github.com/apache/karaf/tree/master/examples
- Very active community
- Commercial support available
- Towards karaf-boot (WIP) providing annotations

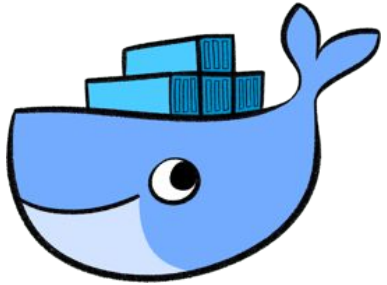
Karaf for DevOps

- Packaging, provisioning & custom distribution
- Docker (image & feature)
- Security (JAAS, Syncope)
- Cellar cluster and distributed configuration
- Decanter for monitoring & alerting
- Cave for artifacts repository
- Cave for farm deployer
- Administration over SSH
- Toolkit for administration like auto diagnostic and dump creation

DevOps: Packaging, provisioning, custom distributions

- Mutable runtime provisioning options:
  - Hot deployment (deployer services)
  - Installing single artifact & bundle
  - Installing features
  - Installing KAR
- Immutable runtime provisioning options:
  - Static profile
  - Custom distribution (boot features, configuration; ...)
- Hybrid runtime provisioning options:
  - Custom distribution
  - Update the custom distribution on the fly

DevOps: docker



- Create docker image with provided tool

  vanilla: `assembly/docker/build.sh --from-release --karaf-version 4.2.1 --image-name karaf`

  custom: `assembly/docker/build.sh --from-local-dist --archive /path/mykaraf.tar.gz --image-name my-karaf`
- `docker` feature to manipulate Docker daemon from Karaf
  - `docker:search, docker:ps, docker:run, docker:pull, docker:push, docker:tag`
- `docker` feature can create a Docker image using your running Karaf instance

  `karaf@root()> docker:provision mykaraf`
- Karaf HTTP proxy service to proxy Docker container port in Karaf

  `karaf@root()> http:proxy-add /elasticsearch http://localhost:9200`
- Official Apache Karaf Docker image (WIP)

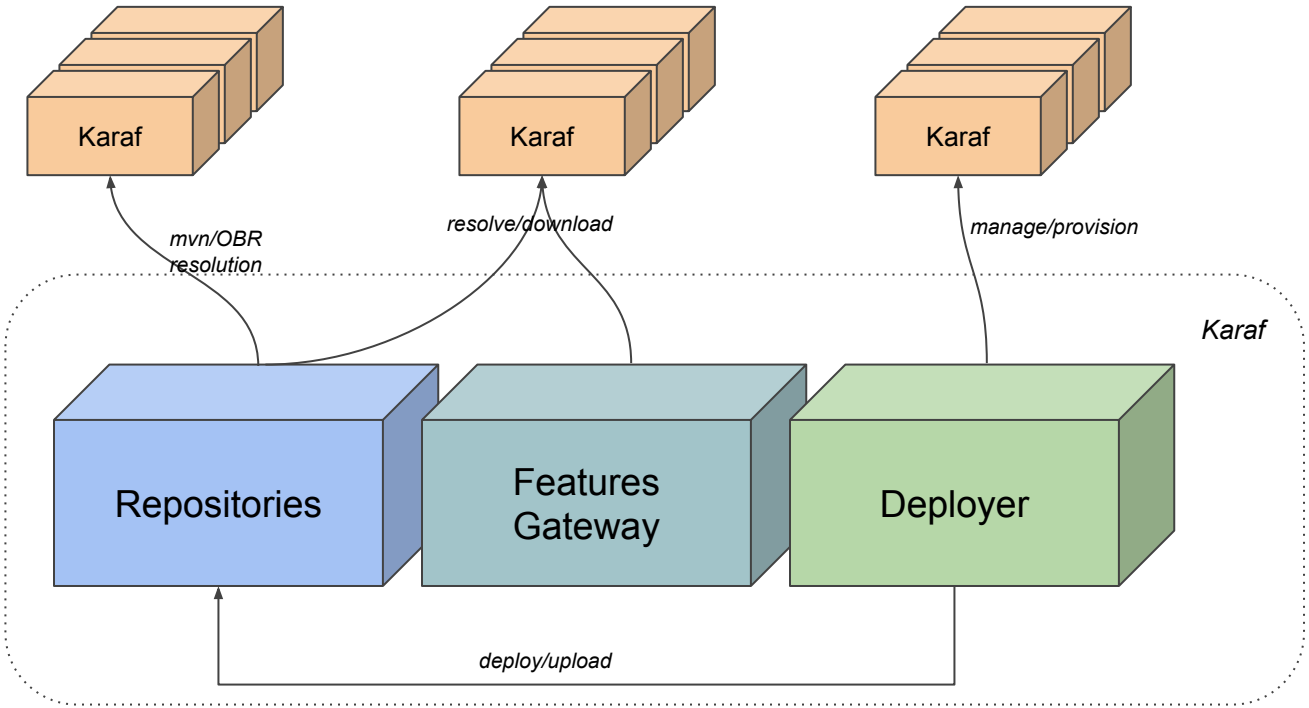
DevOps: security

- Dynamic keystore loading
- Complete RBAC for commands, MBeans, services
- Auditing of all actions performed in Karaf
- JAAS Realms with dedicated commands
- Provided LoginModules
- Support Apache Syncope

DevOps: Karaf Cave

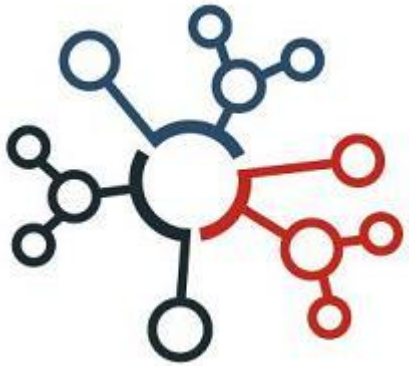
- Artifacts repository
  - Bundles Repository
  - Maven Repository
  - Docker hub (WIP)
- Easy to install
- Karaf Features Gateway
- Deployer to manage Karaf instances farm
- REST API

DevOps: Karaf Cave architecture

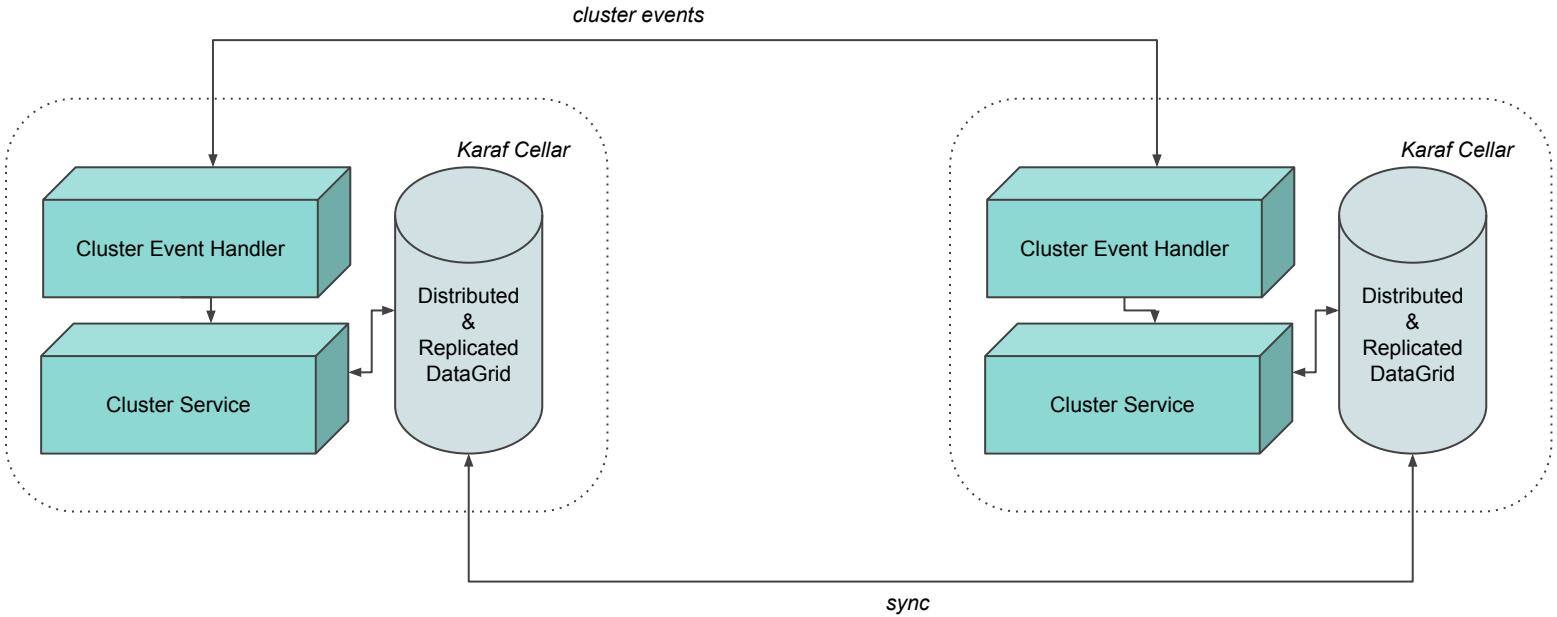


DevOps: Karaf Cellar

- Clustering deployment solution
- Distributed configuration
- Distributed administration (bundles, features, ...)
- Replication policies (no SPOF)
- Cluster HTTP Load balancing
- Cluster log service
- Distributed OSGi & Cluster RPC



DevOps: Karaf Cellar architecture



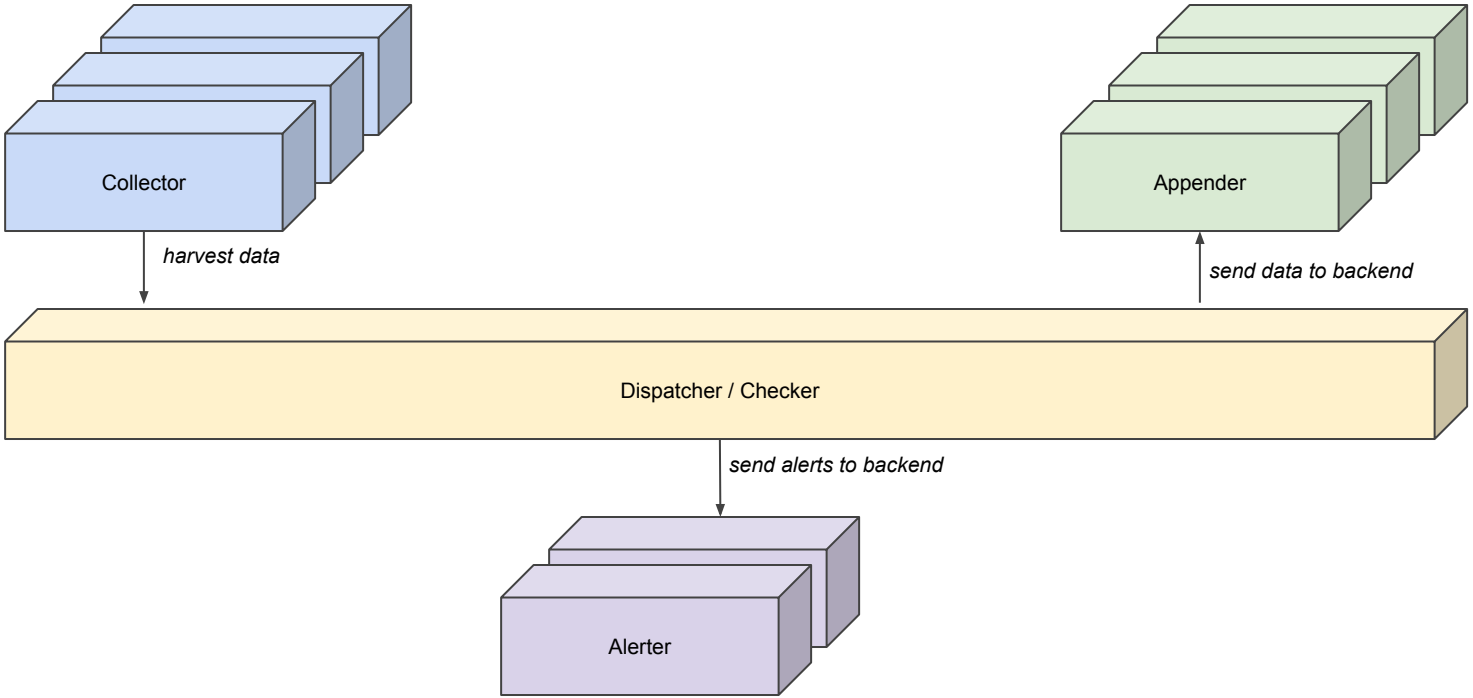
DevOps: management

- SSH
- Remote management (MBean server with RBAC)
- Remote debugging
- WebConsole

DevOps: Karaf Decanter (monitoring & alerting)

- Multipurpose
  - Activity data collection (metrics, log, ...)
  - Auditing
  - Alerting
  - BAM (business users)
- Collect data sent to a dispatcher
- Dispatch and check data (alerting)
- Append data to a backend
- Easy to install
- Dynamic
- Extensible

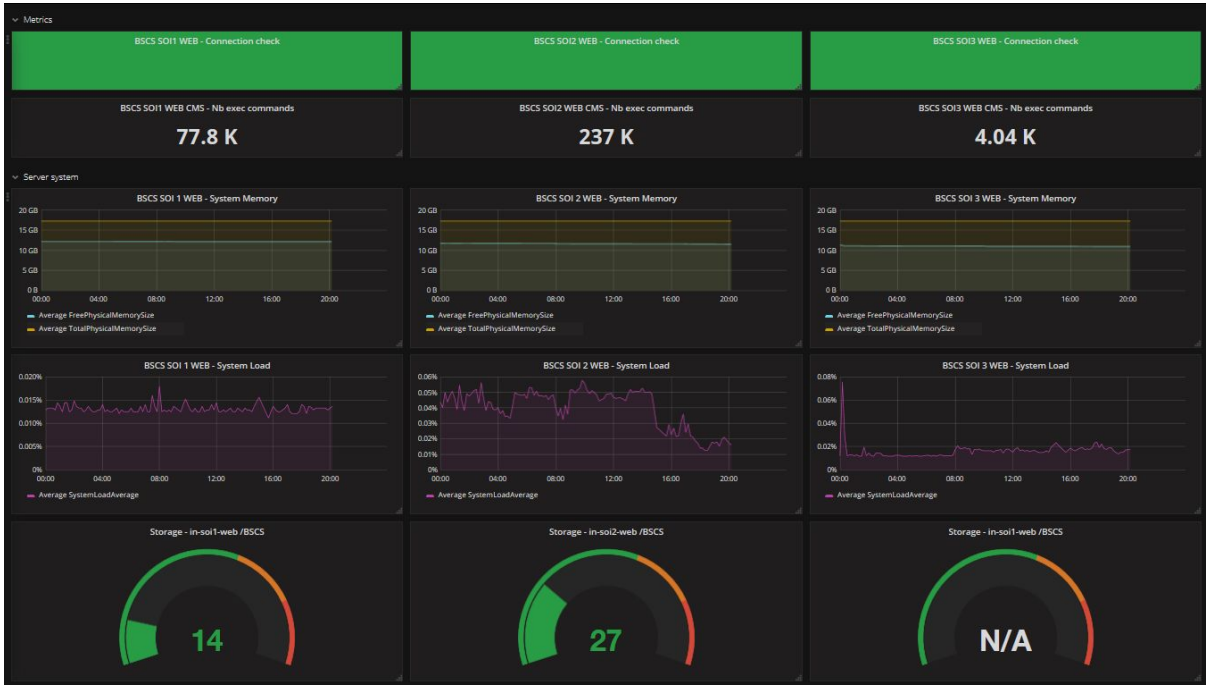
DevOps: Karaf Decanter architecture



DevOps:Karaf Decanter collectors/appenders/alerters

Collectors	Appenders	Alerters
Camel	Camel	Camel
Dropwizard	Cassandra	Email
EventAdmin	Dropwizard	Log
File, Log, Log4j Socket	Elasticsearch	… any appender
JDBC	File, Log	
JMS, MQTT, Kafka	JDBC	
JMX	JMS, MQTT, Kafka, Redis	
System	MongoDB, OrientDB	
REST, Socket	REST, Socket	

DevOps:Karaf Decanter

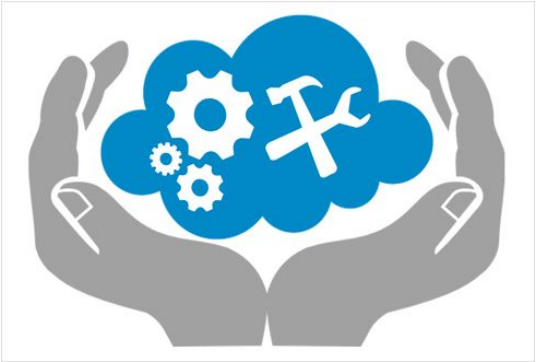


DevOps: cloud ready

- Docker support
- Apache jClouds features supporting several providers (blobstore service, ...)
- Karaf Cellar supports jClouds and Kubernetes discovery
- Karaf Cellar is able to distribute applications and configuration on instances located on premise or on cloud
- Karaf Cave Deployer with jClouds can provision instance on cloud providers (WIP)
- Karaf Cave Deployer with jClouds can provision applications and configurations on a running Karaf instance on cloud (WIP)

DevOps: cloud management

- SSH/JMX to any cloud instance
- Interact with Docker directly from Karaf
- Use a local Karaf Cellar instance to manage remote cloud instances
- Karaf Decanter can monitor (harvesting JMX, gathering log, ...) on premise or cloud instances



Karaf for business/end users

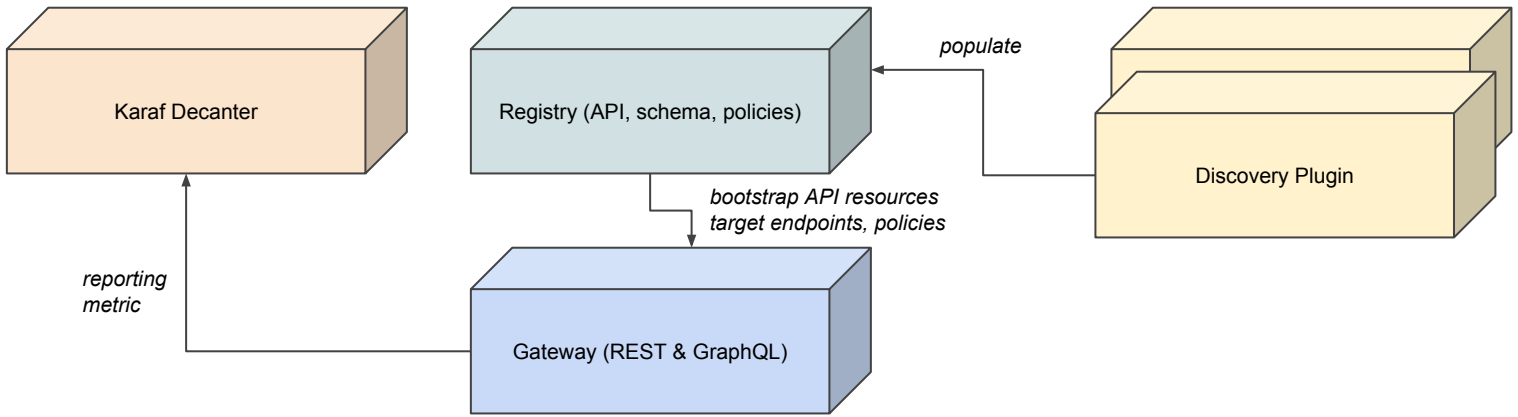
Karaf provides solution customizable for business/end users

- Karaf Decanter as BAM solution (optionally with big data analytics)
- Karaf Vineyard as API Management solution

Business users: Karaf Vineyard (API Management)

- API Management
- Gateway, dual API: REST & GraphQL
- Registry (resources, schema, policies)
- Policies (security, QoS, ...)
- Discovery (OpenAPI, Swagger, GraphQL, ...)

Business users: Karaf Vineyard architecture

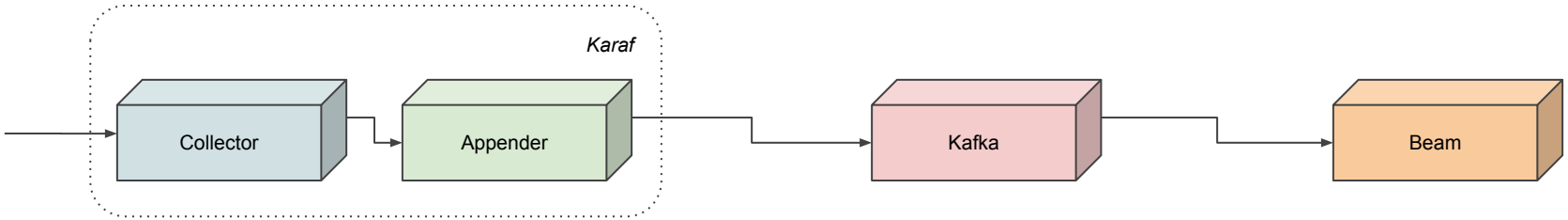


Business users: Karaf Decanter as BAM

- Karaf Decanter can use custom data or log to follow business activity
- Easy way do business activity reporting and analytic
- Support alerting on business activity (fraud detection, ...)

Business users: Decanter with big data analytics

- Karaf Decanter can collect any kind of data on the fly
- Appender can be used to send data to big data backend (Kafka, HDFS (WIP))
- Marshaller can be used to transform internal data Map as CSV
- Use to distributed execution engines on the collected data (Apache Beam, Apache Spark, Apache Flink, ...)



Karaf Community

- **WELCOME** to Karaf !
- We love **contributions** and ideas !
- Updated website
- Periodical release cycle (~ every 3 months)

Stories - Powered by Karaf

Apache

http://karaf.apache.org

GitHub mirrors:

- https://github.com/apache/karaf
- https://github.com/apache/karaf-cellar
- https://github.com/apache/karaf-cave
- https://github.com/apache/karaf-decanter
- https://github.com/jbonofre/karaf-boot
- https://github.com/jbonofre/karaf-vineyard

Mailing Lists:

- users@karaf.apache.org
- dev@karaf.apache.org