

**distributing, managing and
monitoring a large number
of devices**

“I really should think of a shorter title”

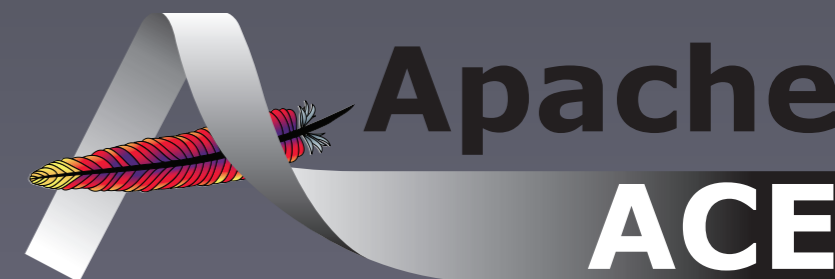
```
$ whoami
```

```
$ id karl_pauls
```

```
id: karl_pauls: no such user
```

\$ whoami

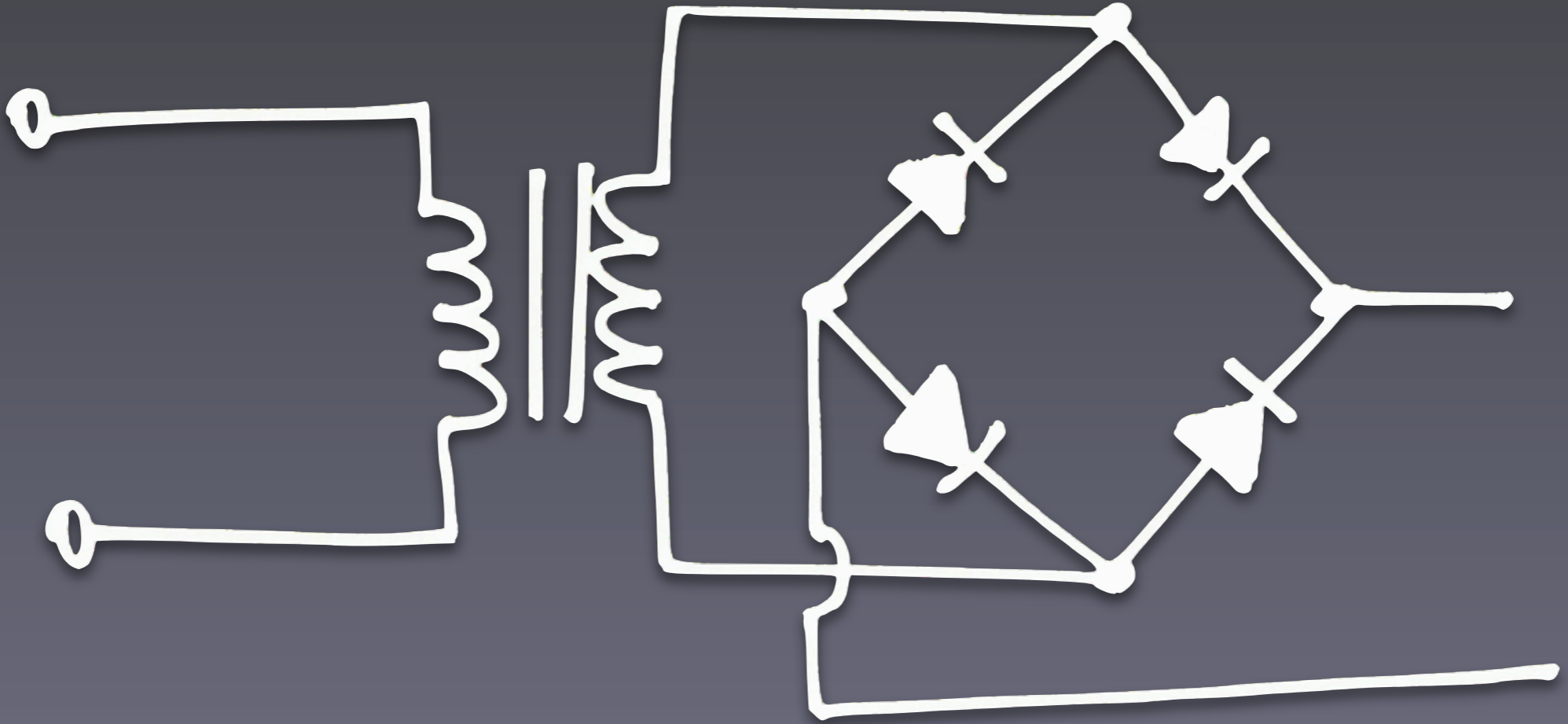
- Angelo van der Sijpt
- Committer with Apache ACE
- Software engineer at Luminis Software Development
- Buzzwords: Java, OSGi, Agile
- angelos@apache.org
- angelo.vandersijpt@luminis.eu





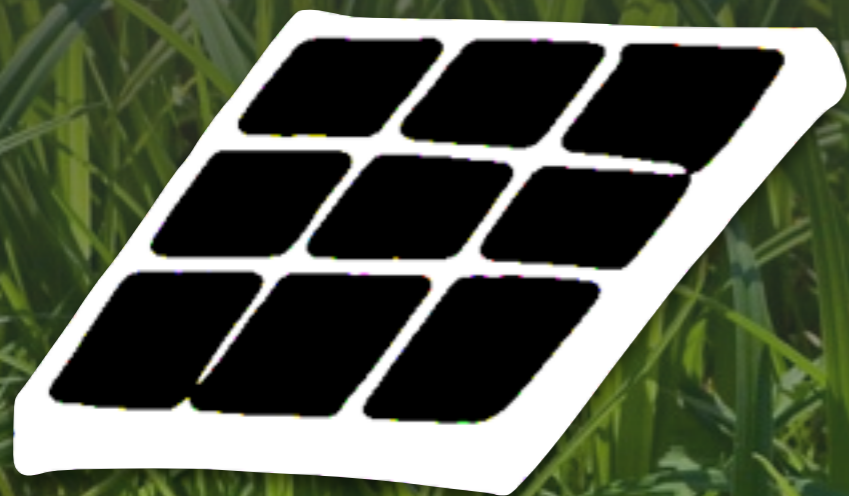
-60%

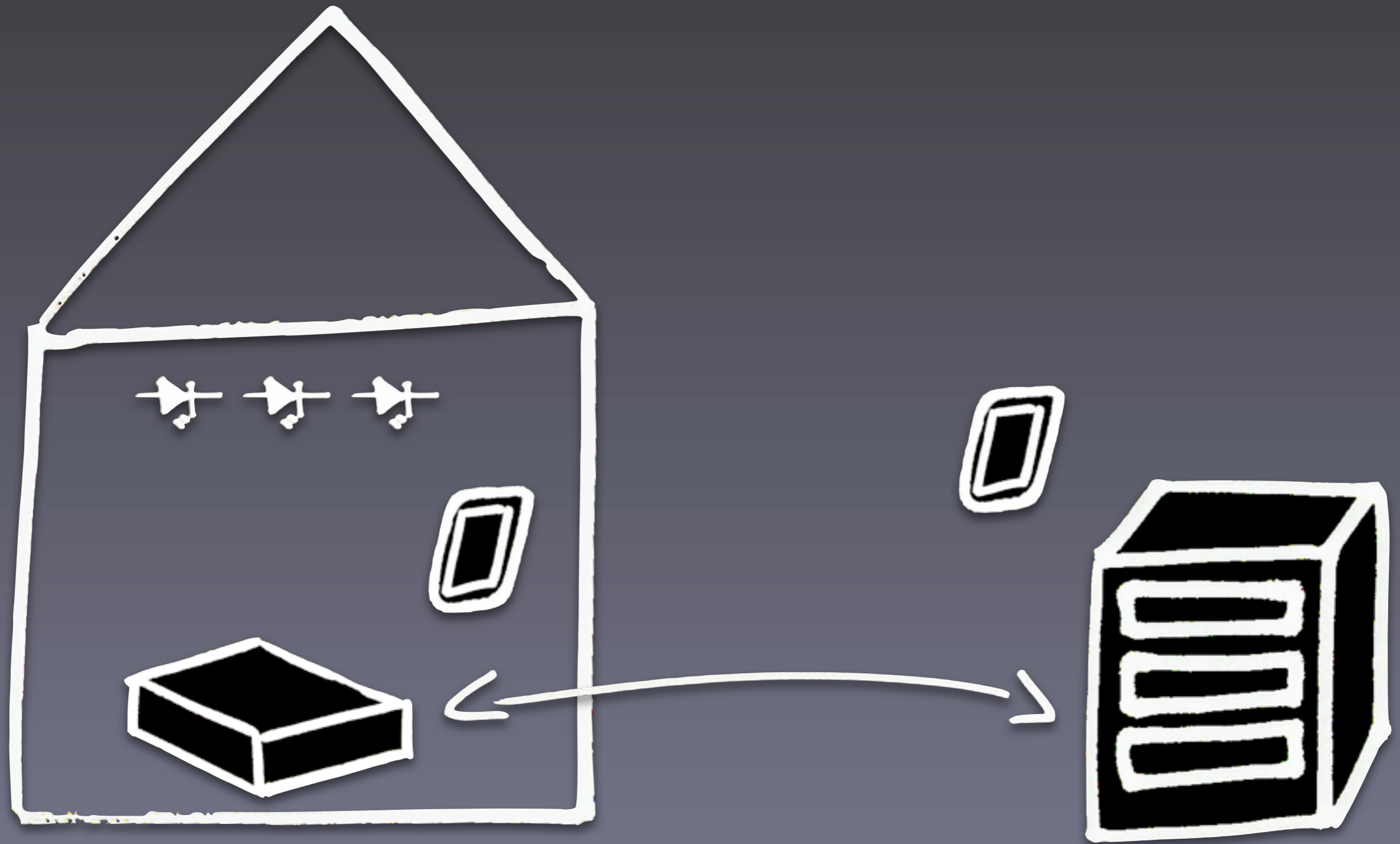






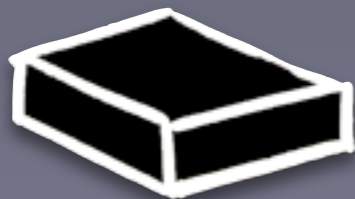
Home Energy Systems





User software:
Linux

Embedded:
ARM



Linux



OSGi

the requirements

- **Embedded device**
 - **Lots of them!**
 - **Custom hardware**
- **Remote control**
- **Data collection & synchronization**
- **Extensible**

- **Dynamic system**
 - Changing requirements
 - Changing technology
 - Changing deployment
- **Working with hardware**
 - Using hardware
 - Updating firmware

device drivers

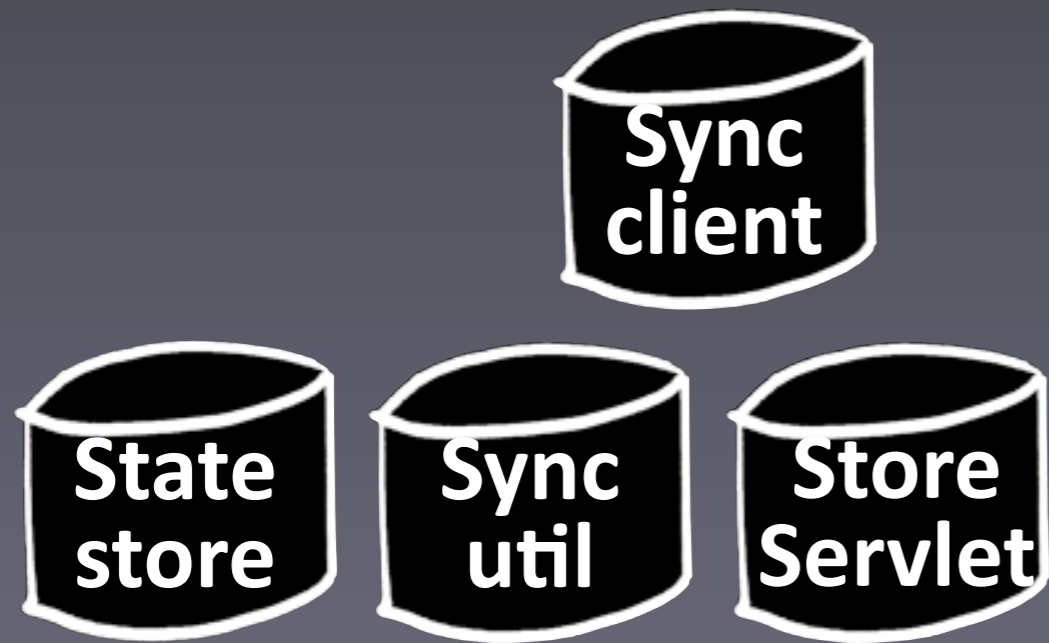


device drivers

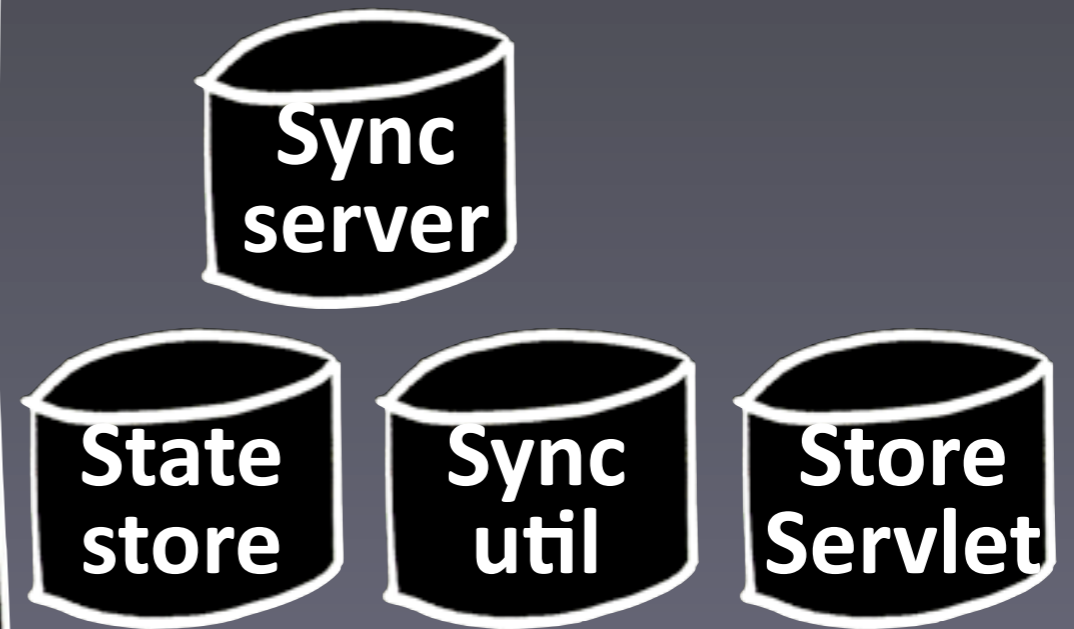
Bundle-NativeCode:

```
win32.dll; osname=WindowsXP; processor=x86 ,  
liblinux.so; osname=linux
```

reuse functionality



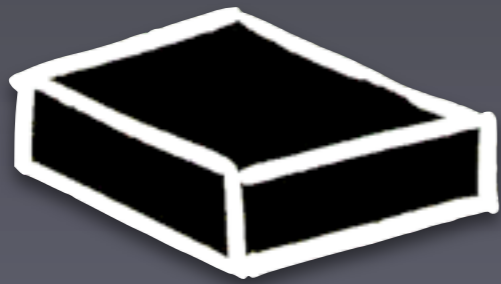
HES

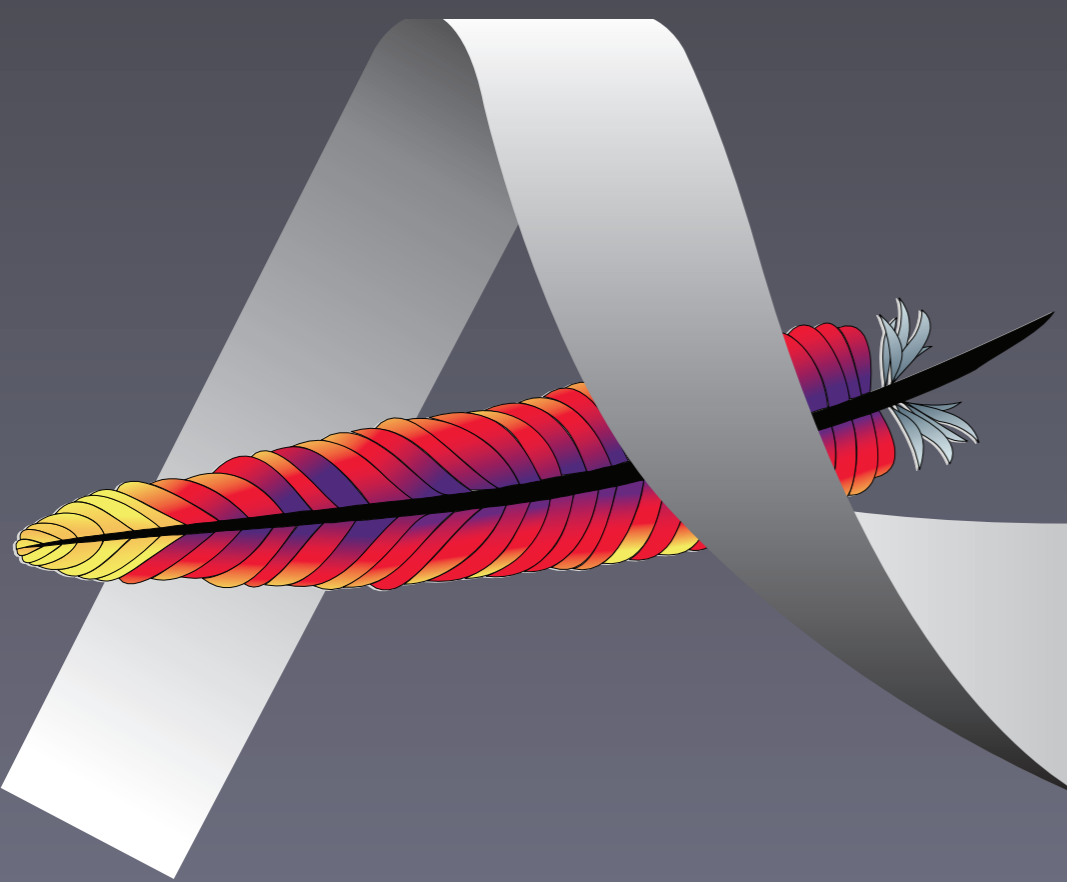


Server

Let's deploy!

10^0

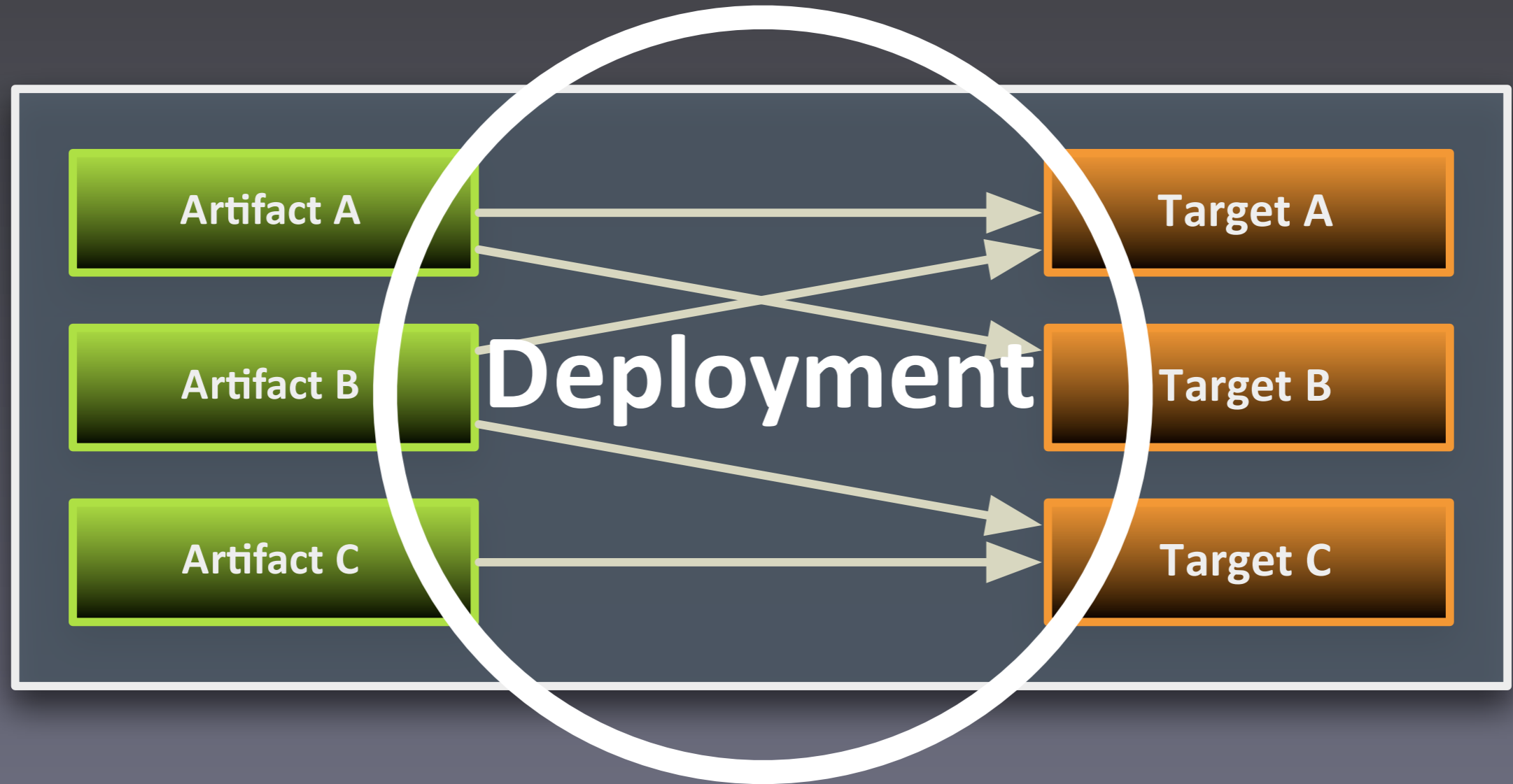


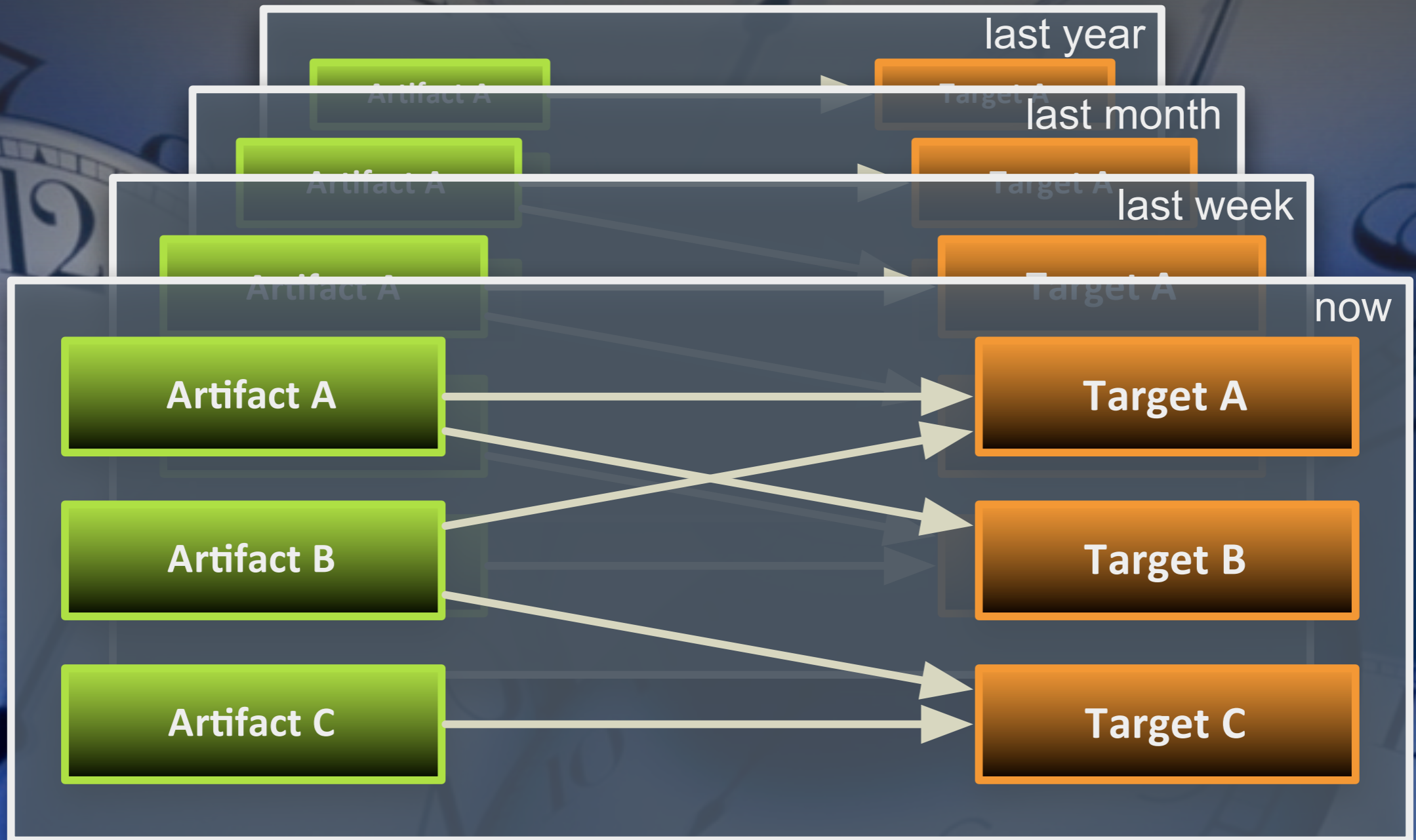


Apache

ACE

- **Started in incubator on april 24th 2009**
- **Software distribution framework based on OSGi**
- **12 committers**
- **working codebase**
- **<http://incubator.apache.org/ace/>**



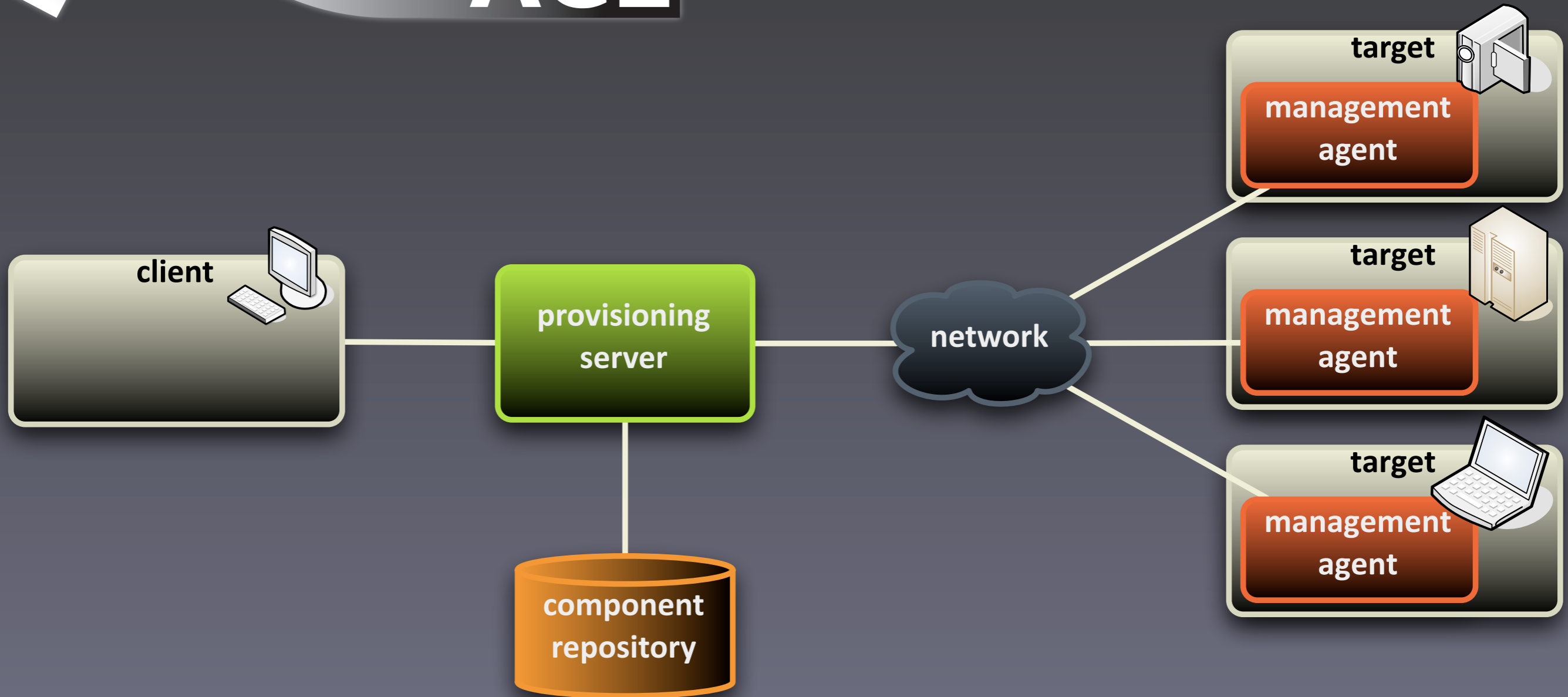


why?

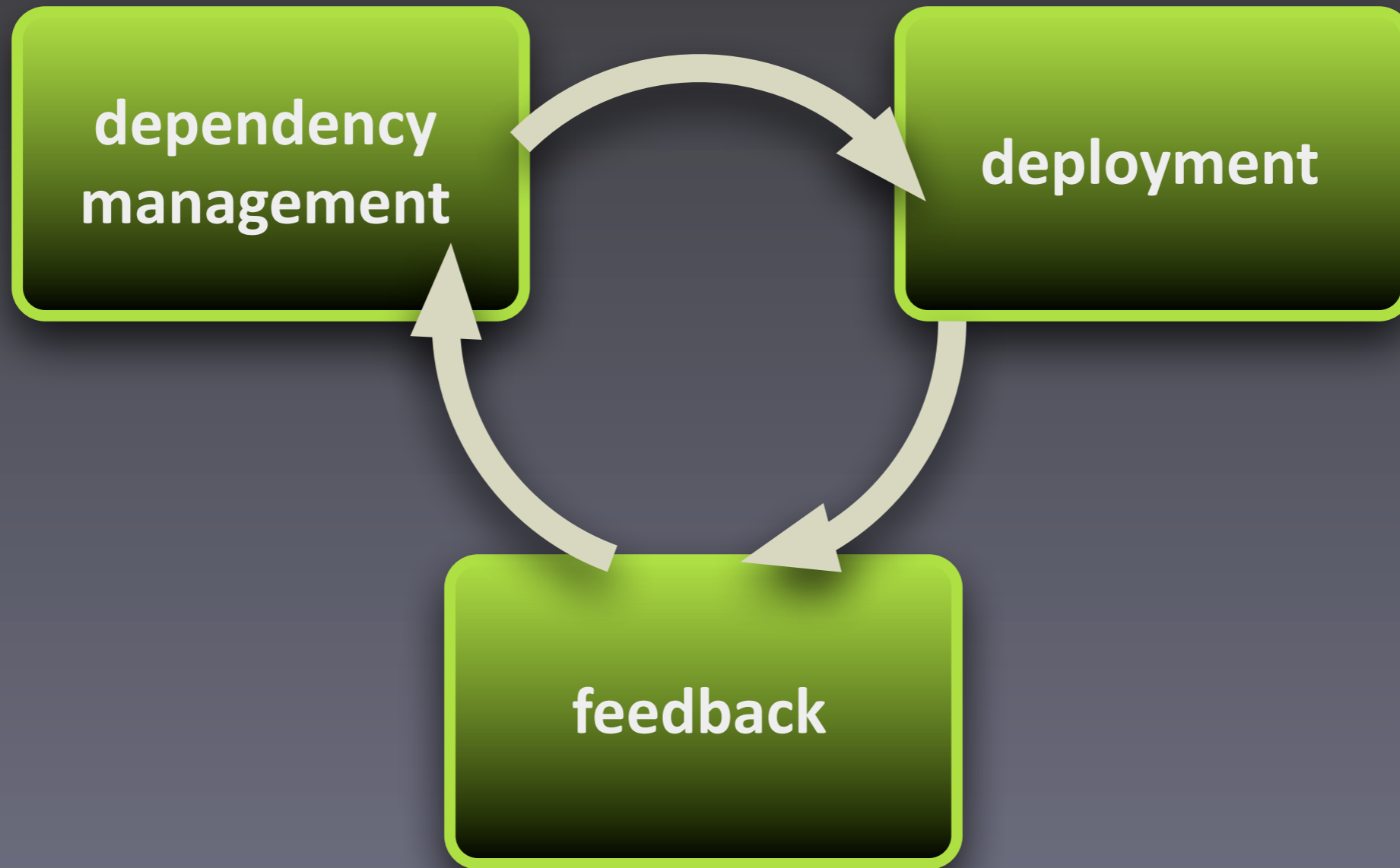
- Automate deployment
- Insight into who uses what
- History of each system
- Consistent development, testing, production
- Basis for several possible extensions



Topology



High level overview

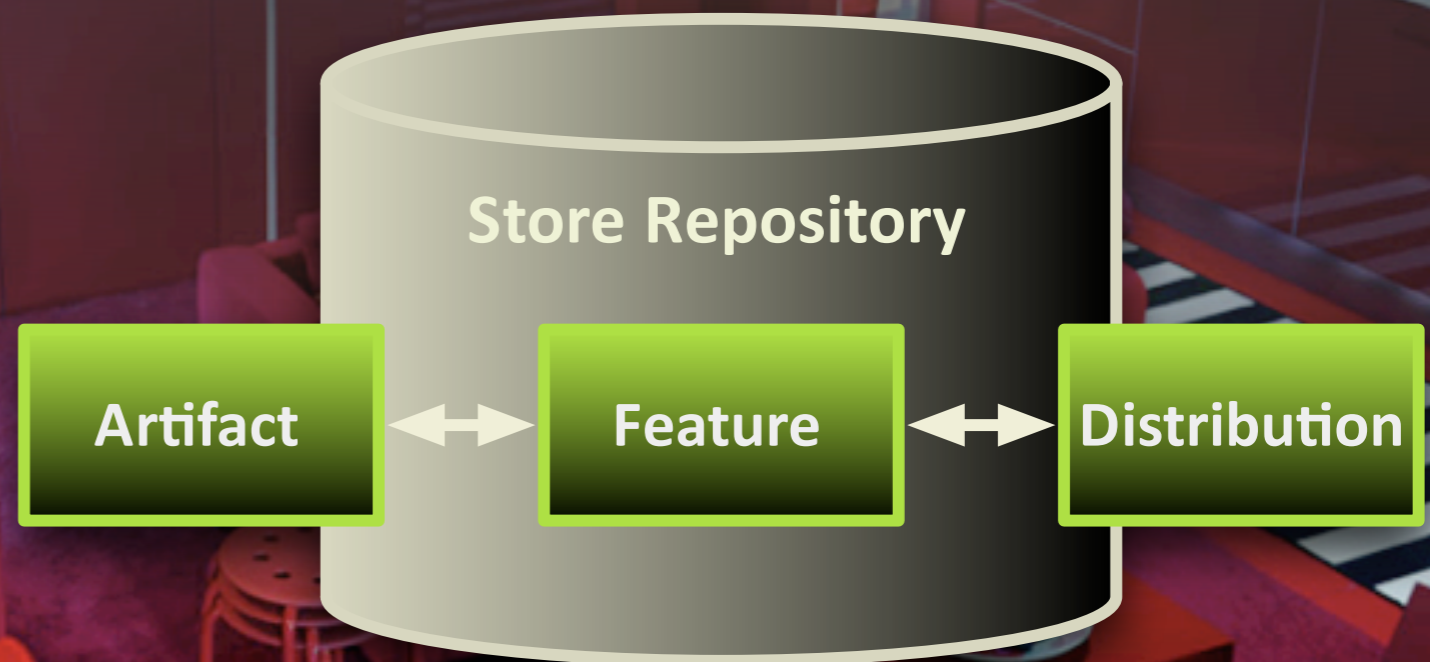


High level overview

**dependency
management**

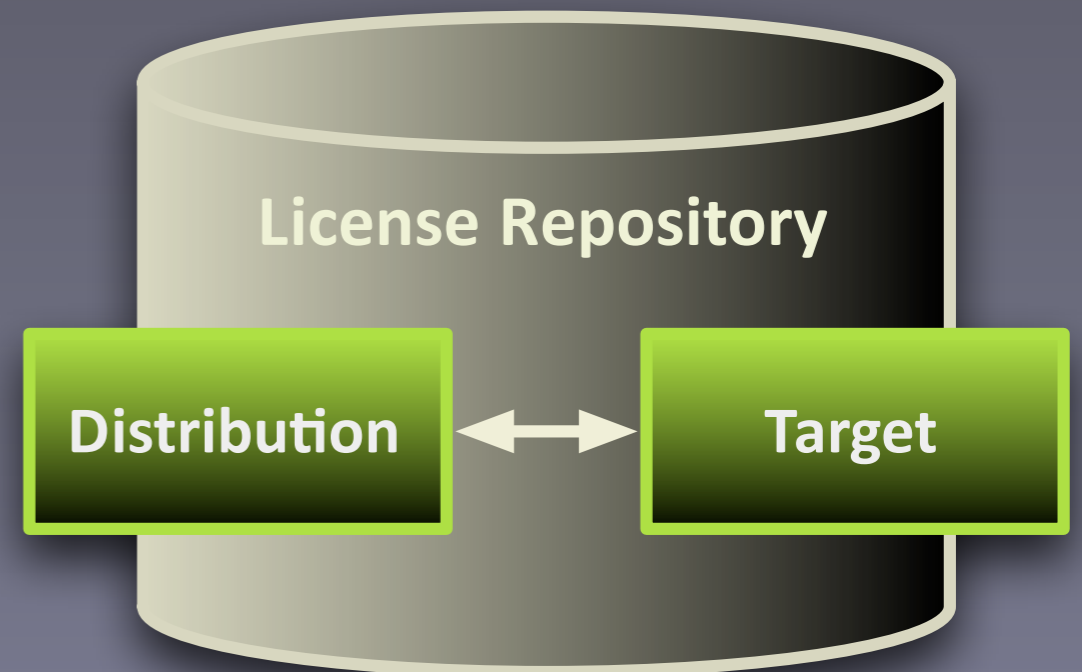
Organizing artifacts

- group artifacts: makes them manageable
- two levels: feature and distribution
- Analogy: IKEA catalog
- data is kept in “store repository”



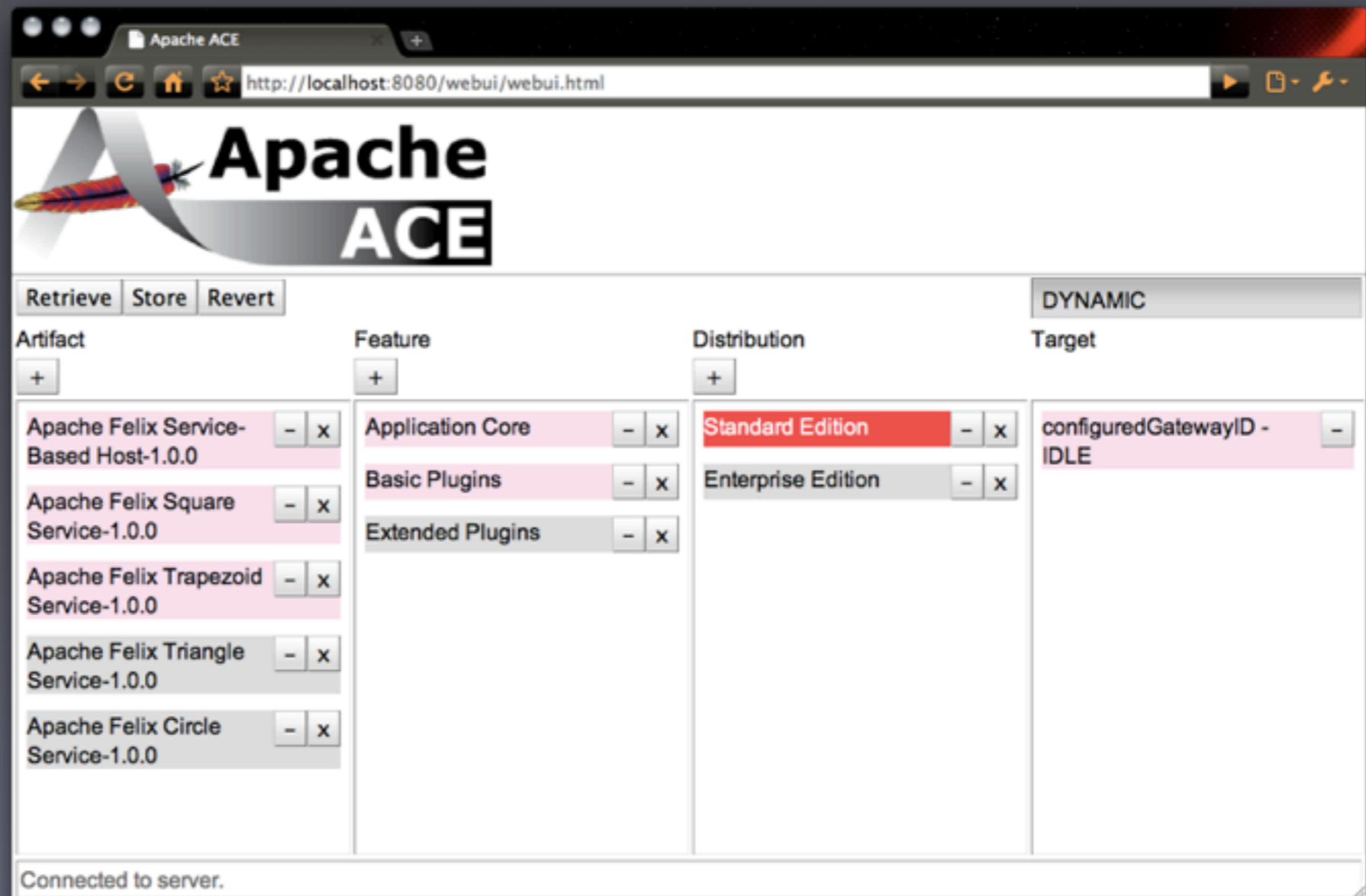
Mapping them onto targets

- mapping distributions to targets
- sometimes done by an external system
- data kept in “license repository”

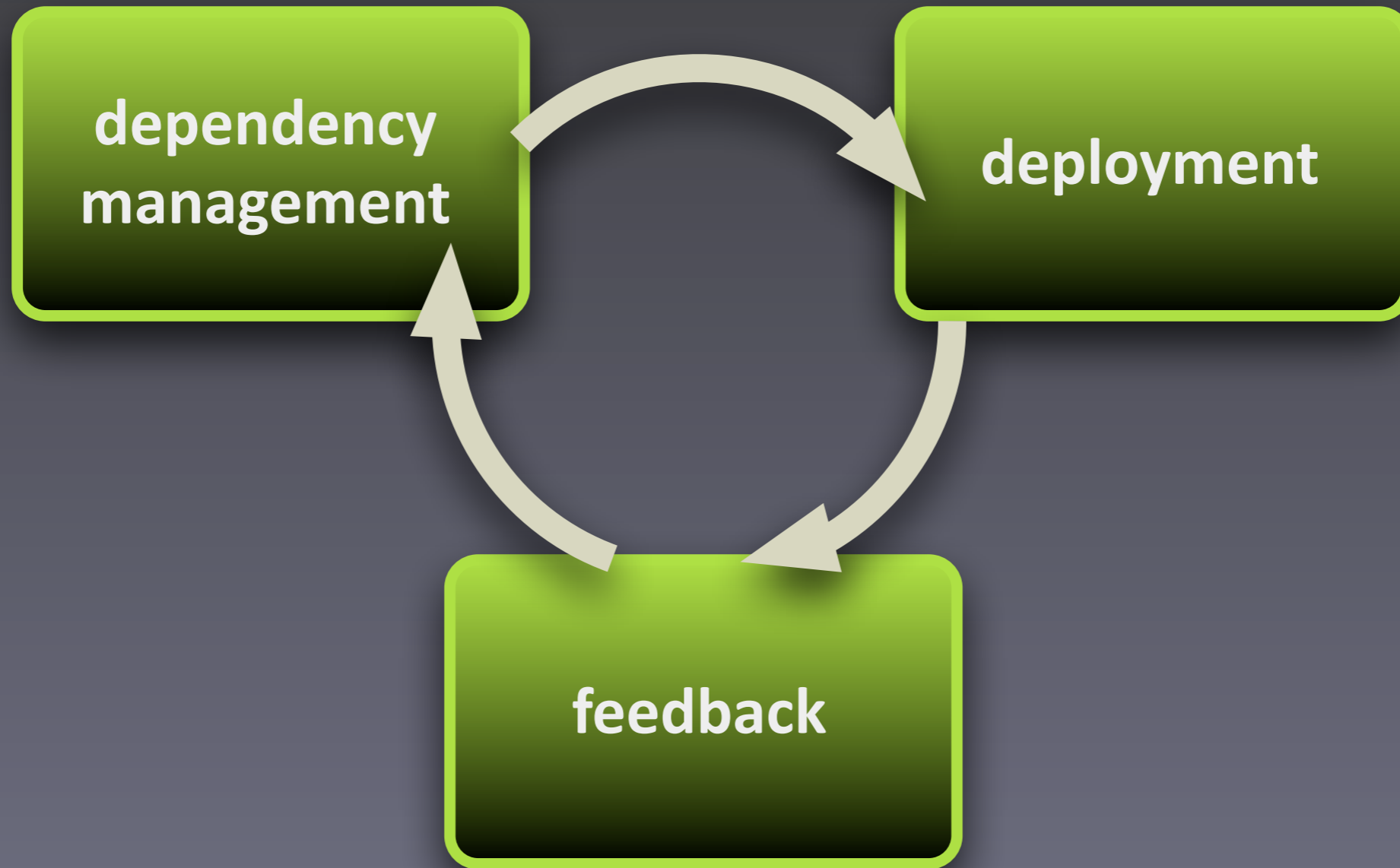


User Interface

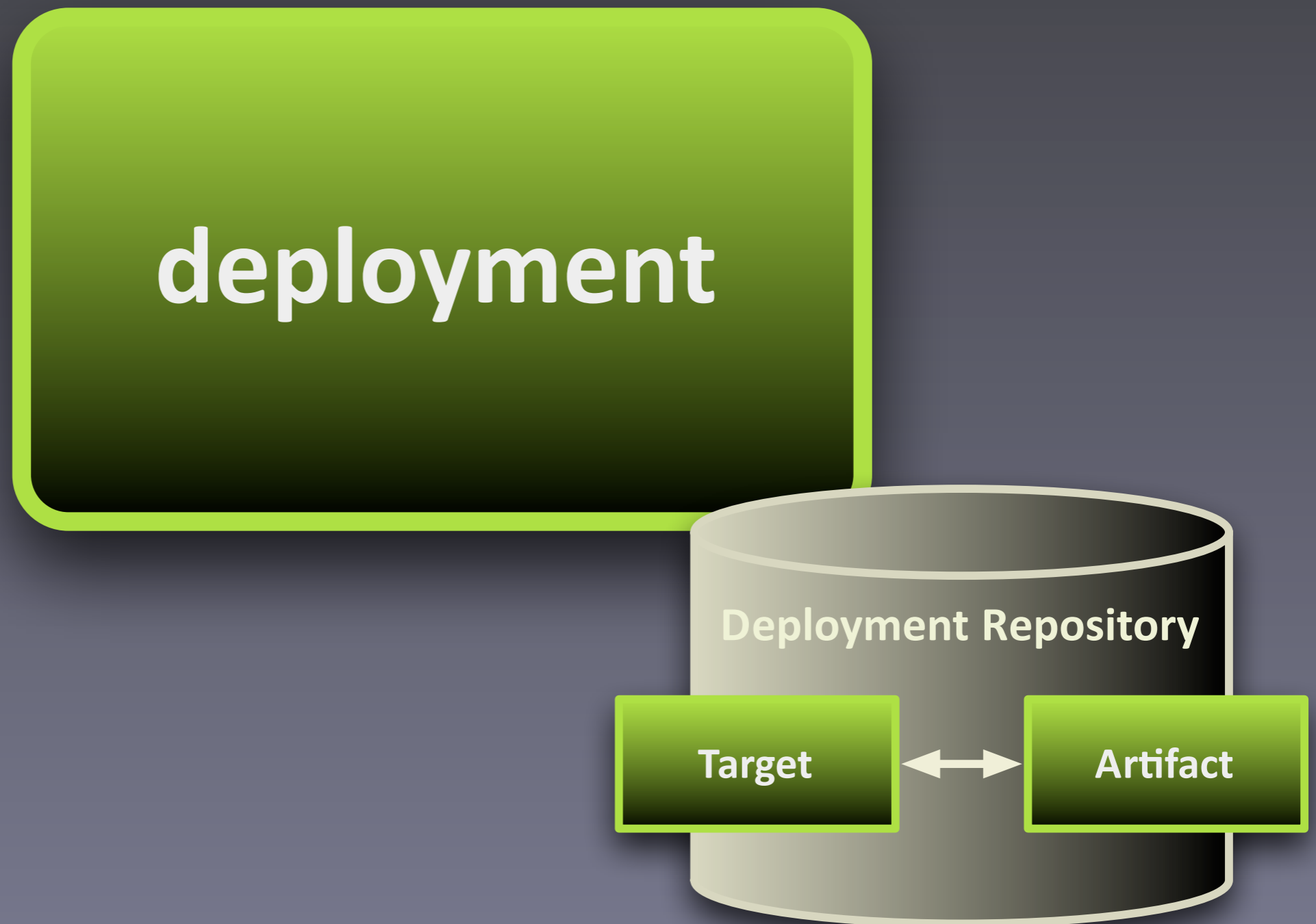
- retrieve, modify and store
- interact with OBR



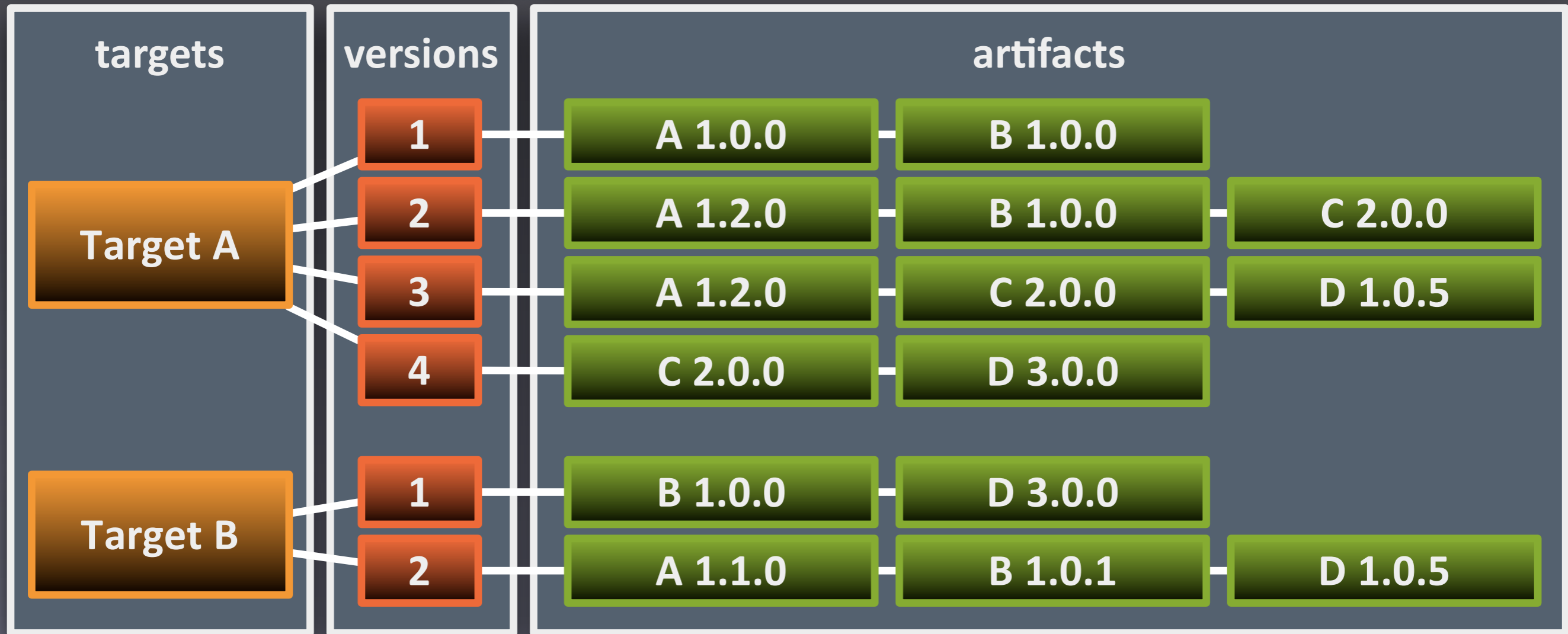
High level overview



High level overview

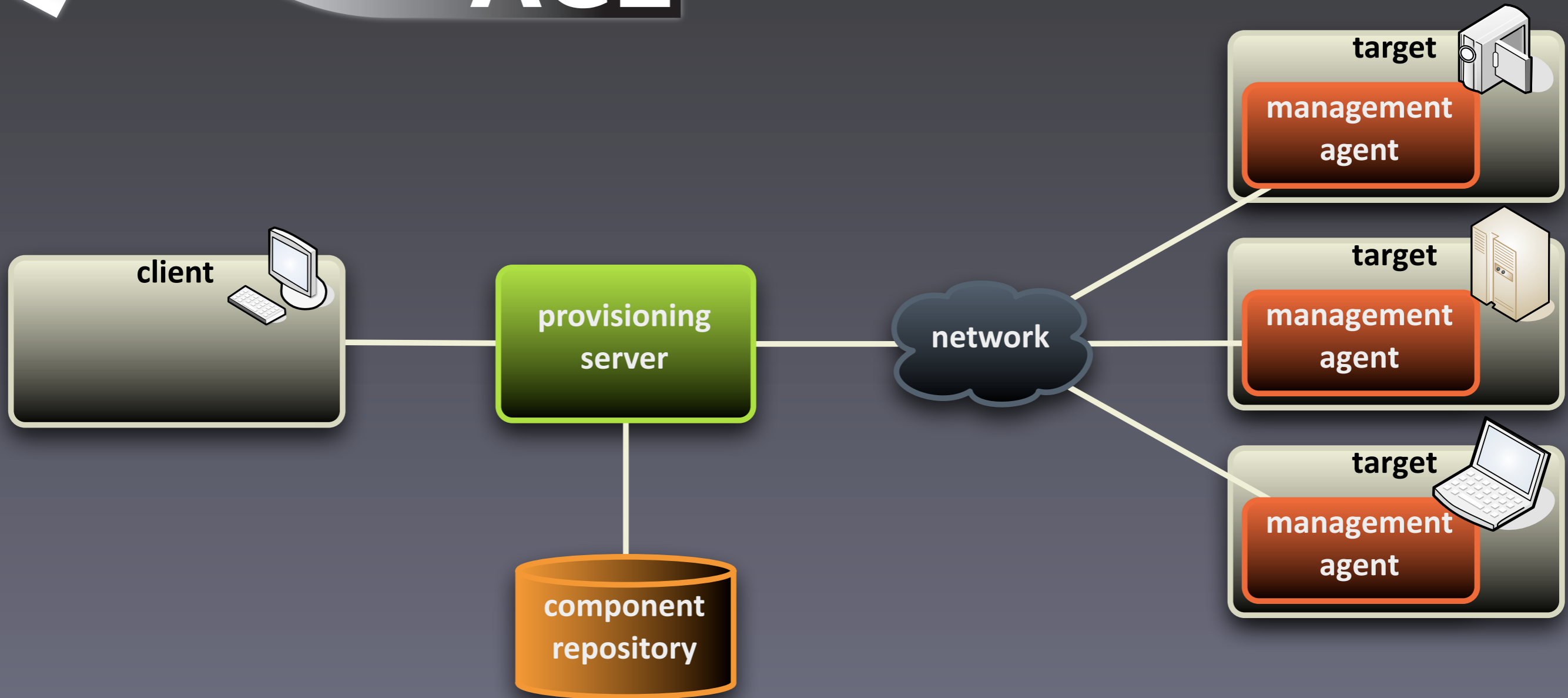


Deployment Repository





Topology



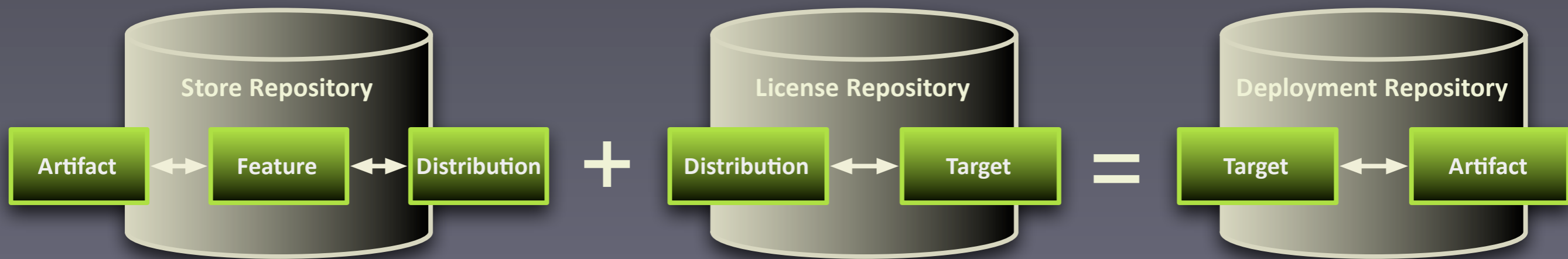
Management Agent



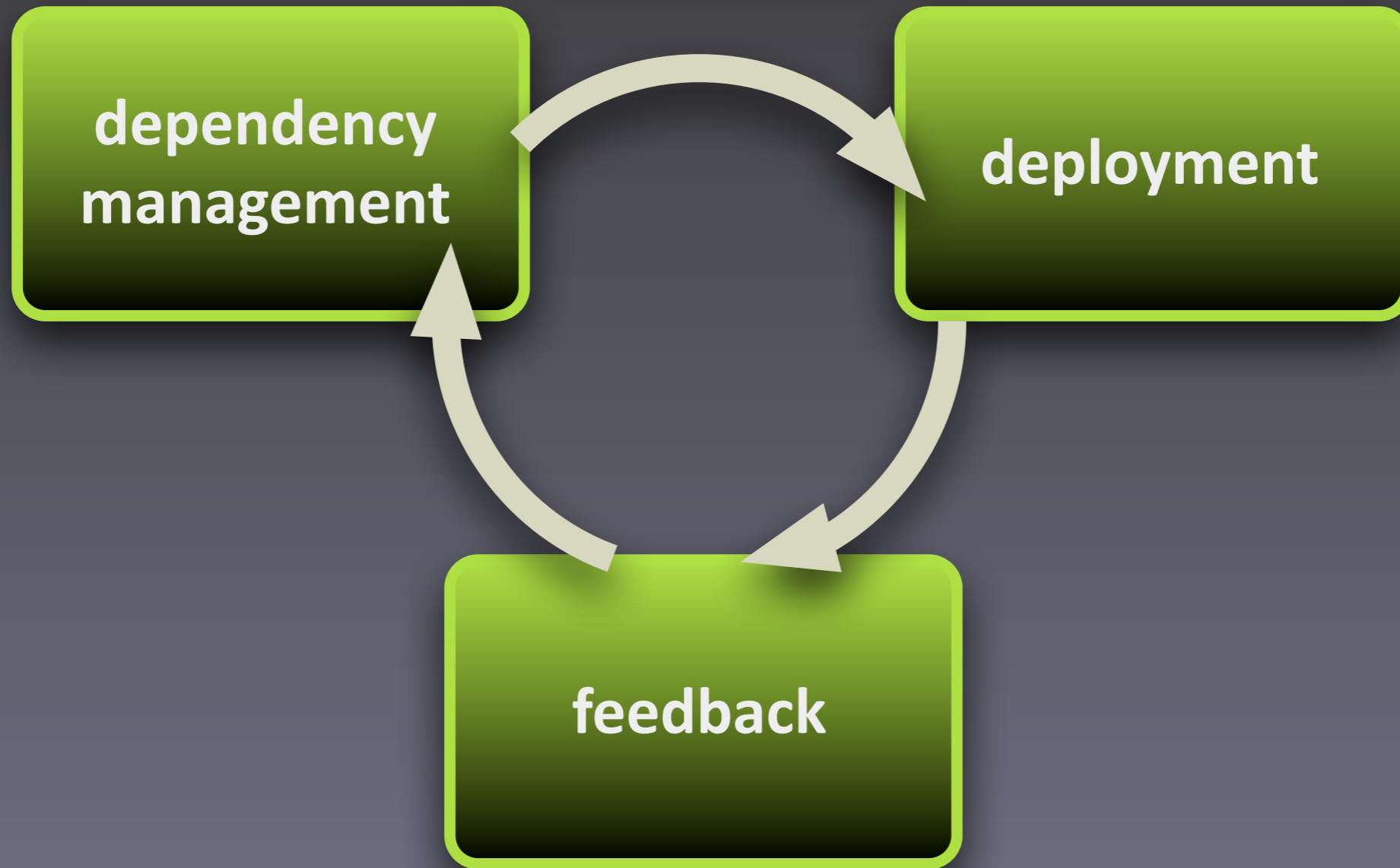
Deployment Admin

- deployment packages
- versioned set of artifacts
- transactional install/update
- fix packages provide deltas
- signing makes them secure
- extensible through resource processors
 - AutoConfig defines configuration admin data

From dependency to deployment



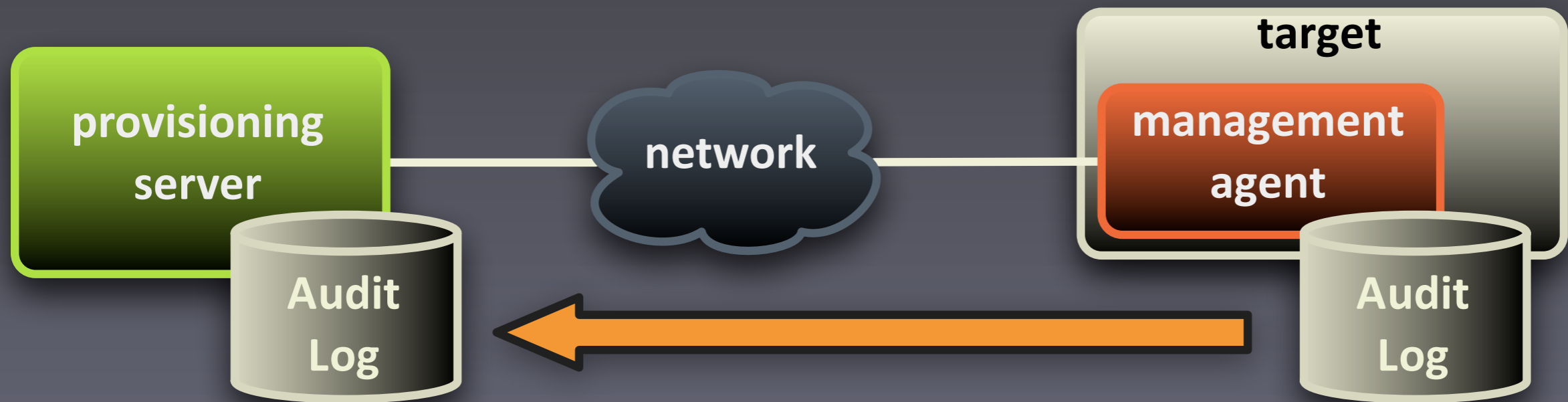
High level overview



High level overview

feedback

Feedback

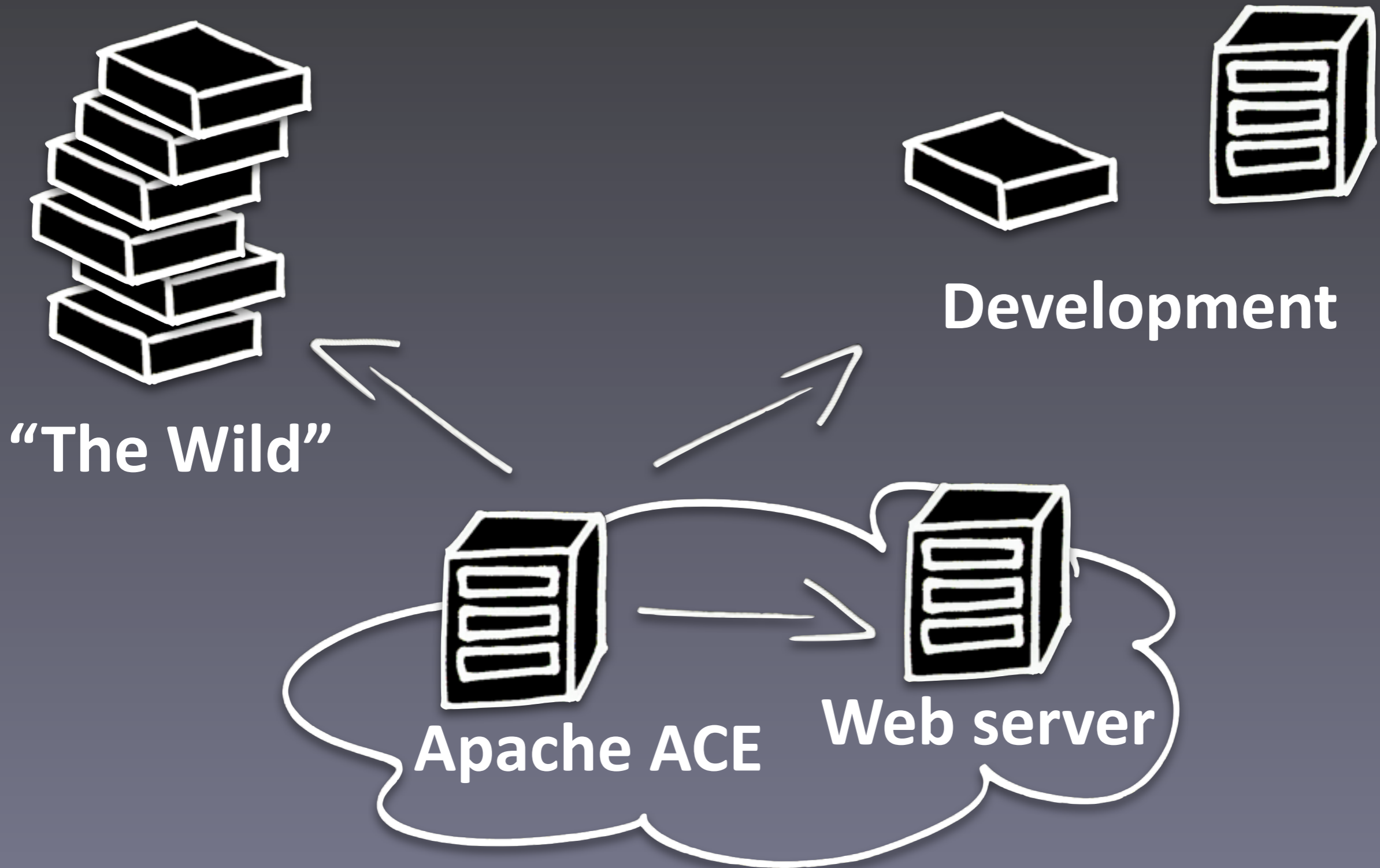


```
17:34 Checked for updates. none found
1 23:20 Bundle 23 stopped
1 2 13:23 Target started
2 2 13:24 Starting update from version 5 to 8
2 0 13:24 Bundle 37 updated
0 13:25 Update to version 8 succeeded
14:25 Target stopped
```

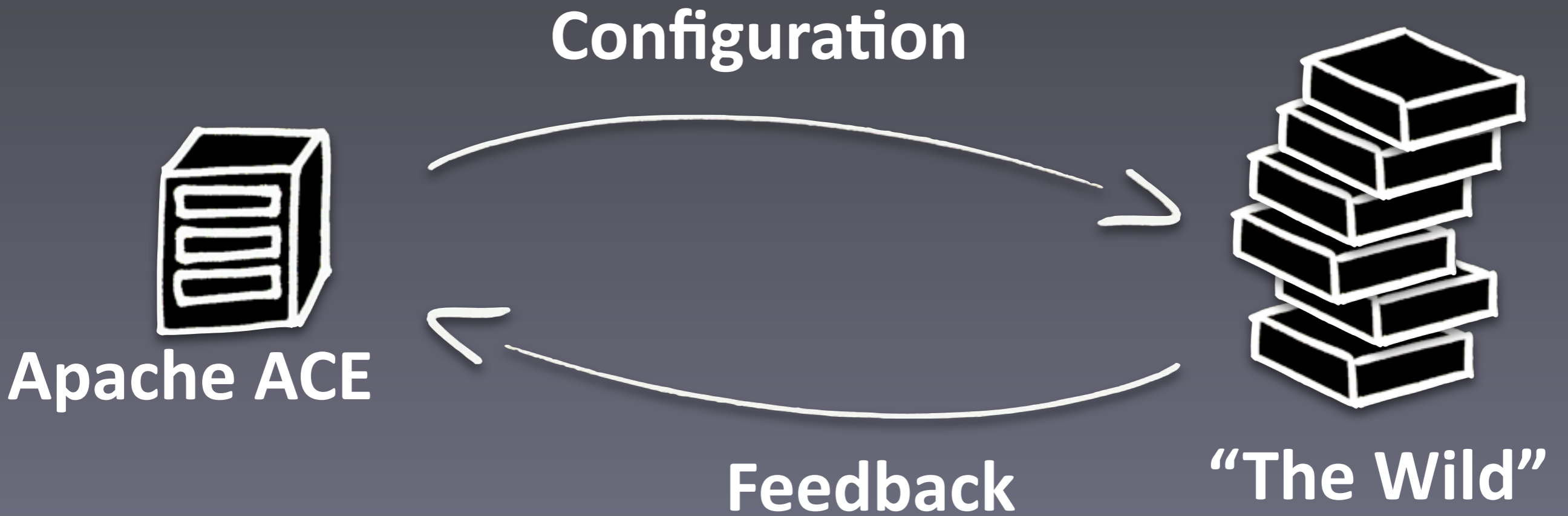
```
13:23 Target started
13:24 Starting update from version 5 to 8
13:24 Bundle 37 updated
13:25 Update to version 8 succeeded
14:25 Target stopped
```

Demo? Demo!

10^1



10^1



10²

- **Deployment information**
 - **No more version numbers to remember!**
- **Remember the additional devices?**
 - **Software on the fly**

10²

- **Some numbers**
 - **100 bundles of 10MB total**
 - **300 targets**
 - **4 minutes**

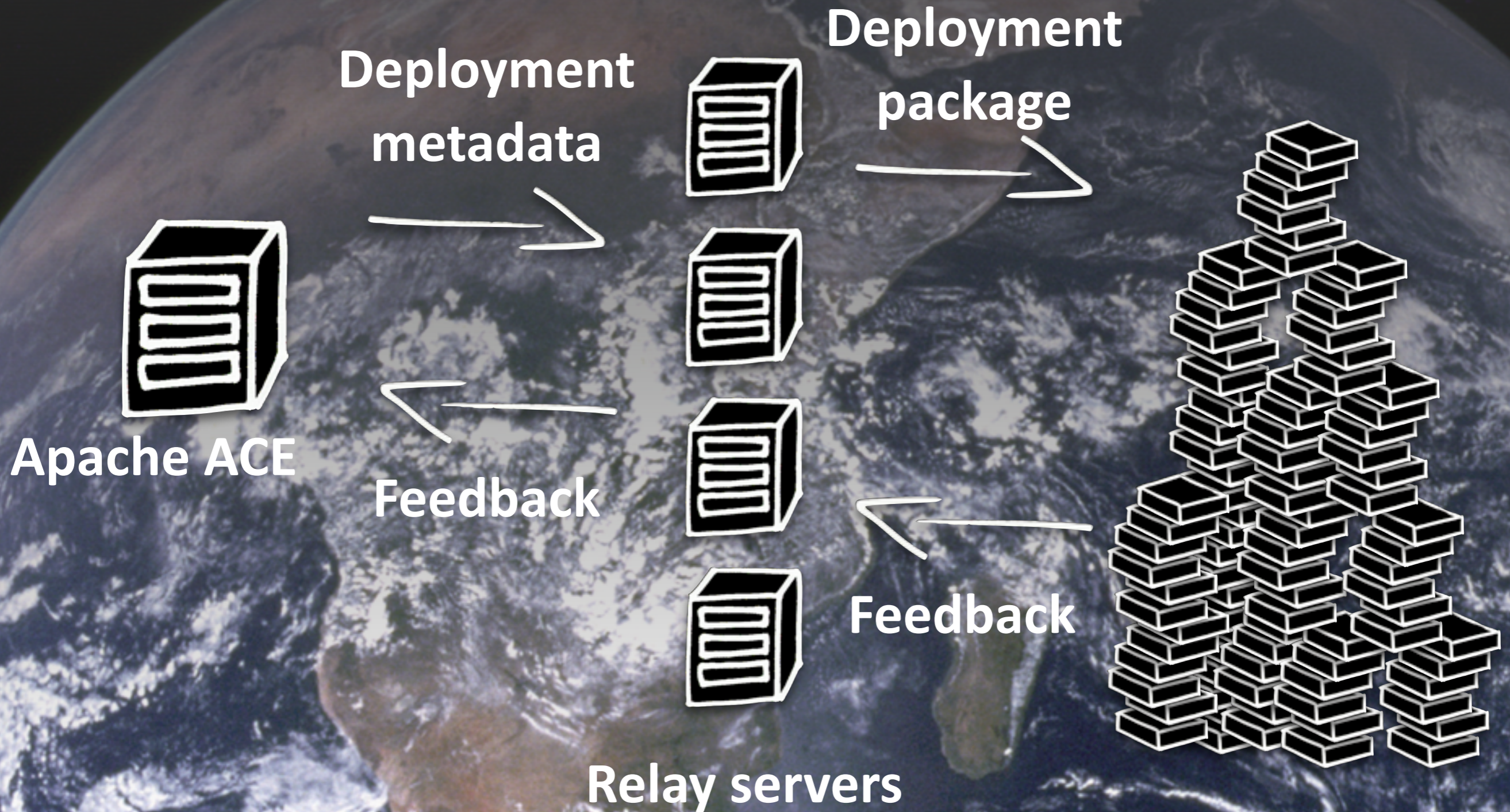
10^3

10^4

- **Many devices**
- **New features**

10^3

10^4



- <http://incubator.apache.org/ace>
- <http://felix.apache.org>

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