

Provisioning the IoT



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Today's goals

1. Put IoT provisioning into context
2. Demo: modular provisioning
3. Apache ACE

Provisioning spectrum

Provisioning spectrum

servers

Cloud/SaaS:

- ▶ full control
- ▶ reliable network
- ▶ VM/Containers

Provisioning spectrum

servers

Cloud/SaaS:

- ▶ full control
- ▶ reliable network
- ▶ VM/Containers

mobile

App stores:

- ▶ walled garden
- ▶ semi-reliable network
- ▶ full binaries

Provisioning spectrum

IoT

?

Provisioning?

'Just download latest binaries over FTP at system startup'



Provisioning wishlist

Modularity

Feature composition

Remotely toggle features

Efficiency

Bandwidth efficient

Avoid unnecessary updates

Automation

Manage many devices

Insight: what runs where?

Security

Not just any device

IoT != IoT

We are not talking about millions of devices:



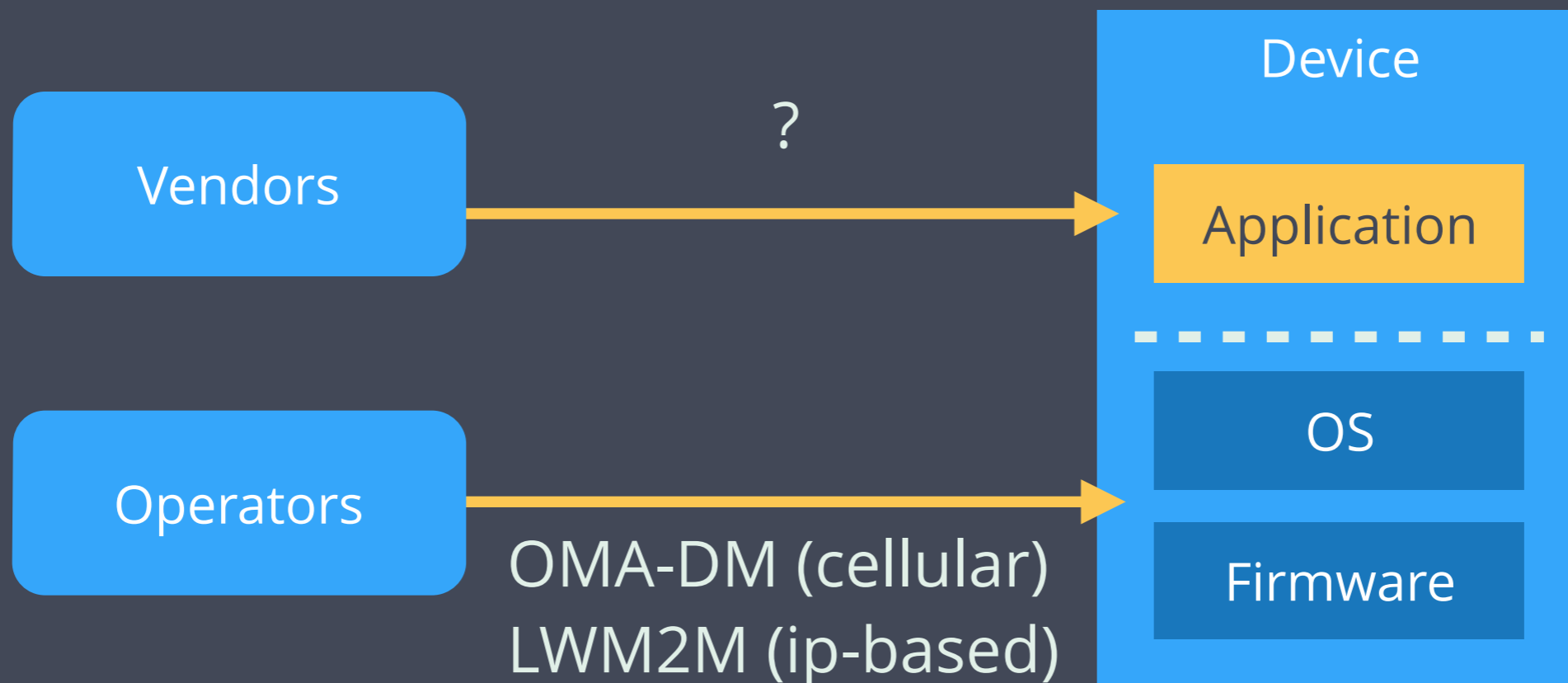
IoT != IoT

We are not talking about millions of devices:



This talk is not about *device management*

IoT Provisioning standards



Mostly about *device management*

Software Update

There is a new version of your Tesla Model S software. Schedule installation, install now or close window to postpone.

12	00	
1	10	
2	20	AM
3	30	PM
4	40	

8 hr 47 min from now

SET FOR THIS TIME

INSTALL NOW



This update will take approximately 45 min


During the update process you will not be able to drive the vehicle or use the touchscreen, and your car alarm may be disarmed for a short duration. The car must be in PARK.



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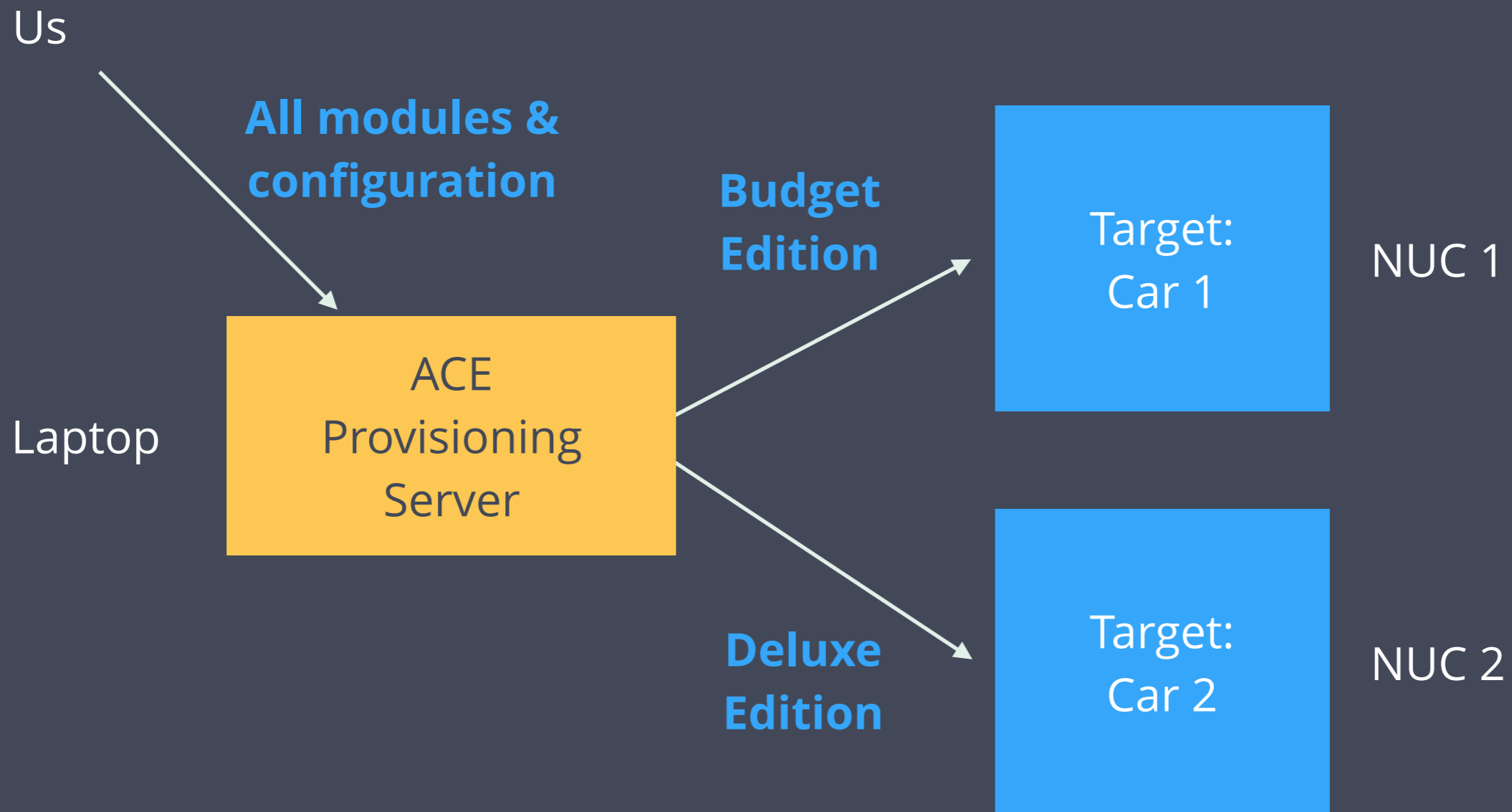
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Demo time!



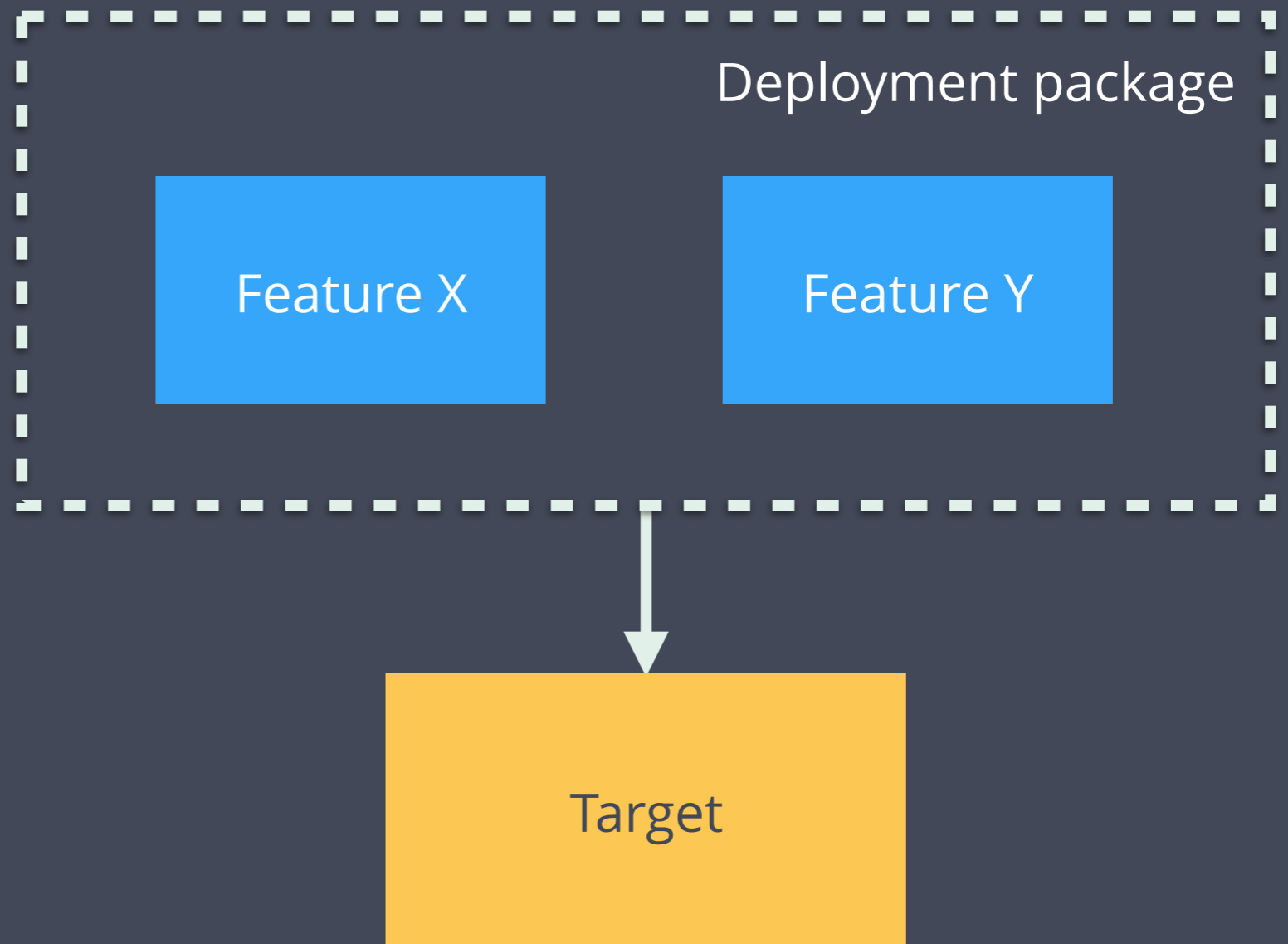
Provisioning demo

ACE Car Entertainment



Modular systems

Monolithic deployment: installation

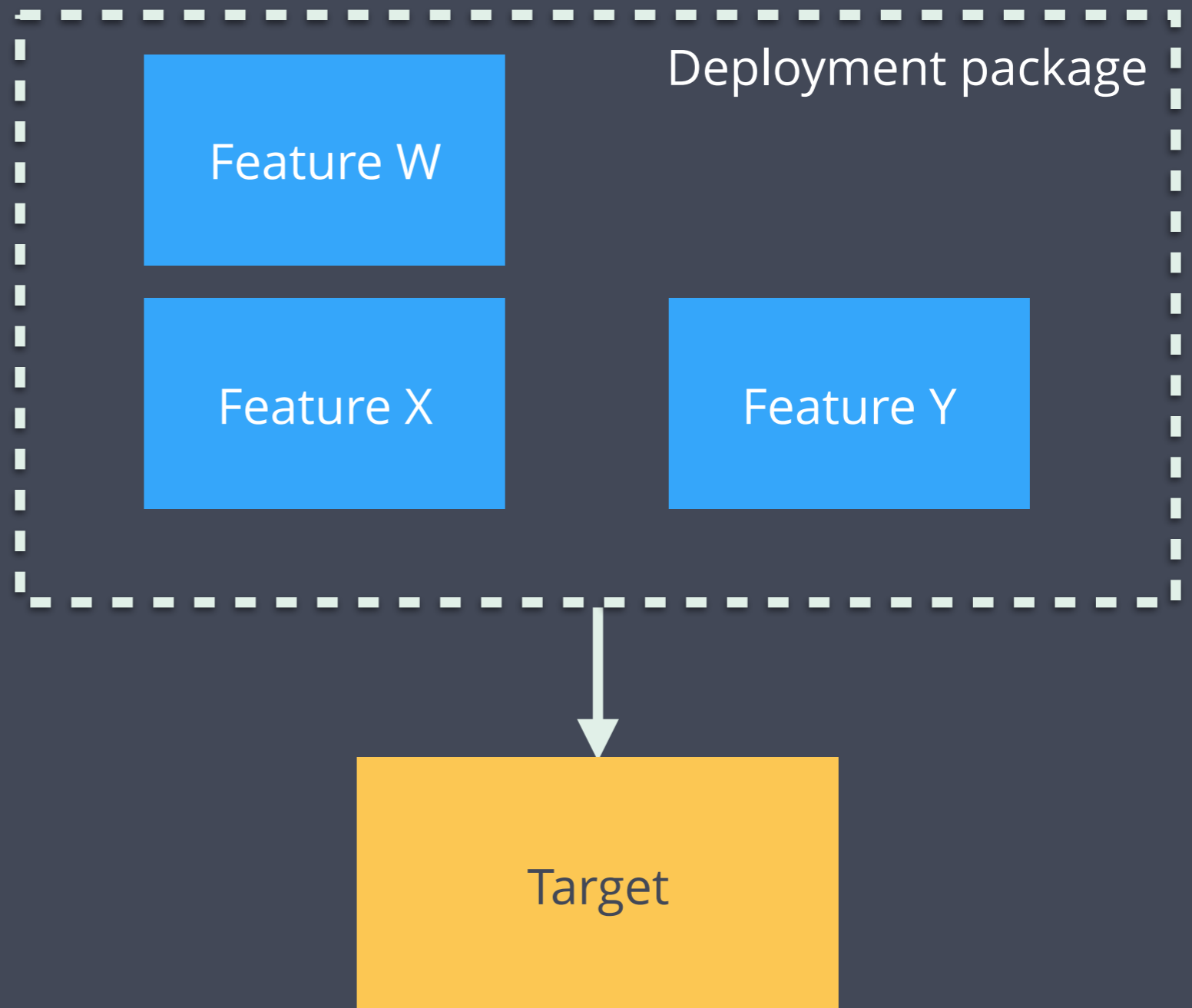


Modular systems

Monolithic deployment: update

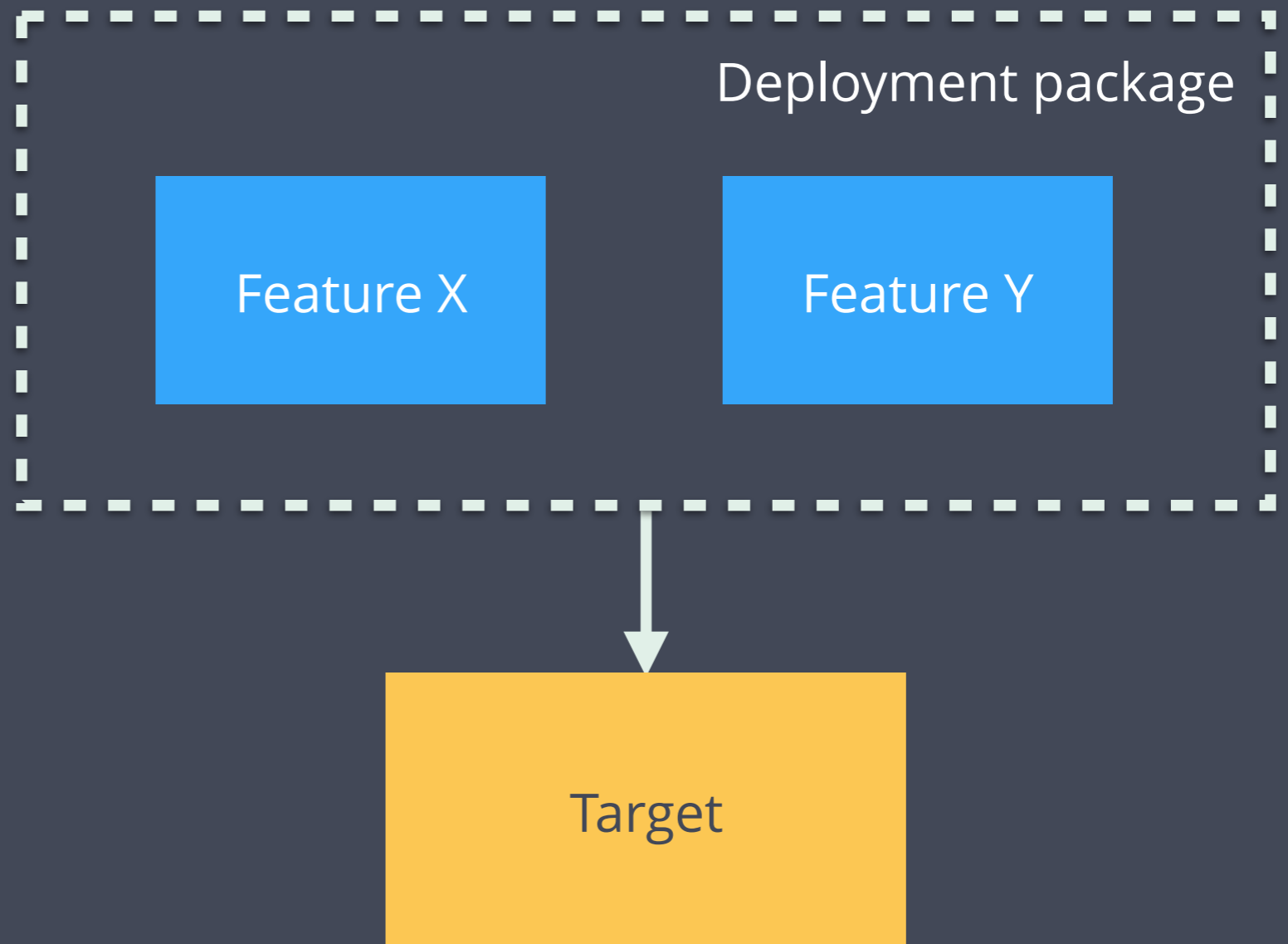


Limited connectivity
Bandwidth inefficient



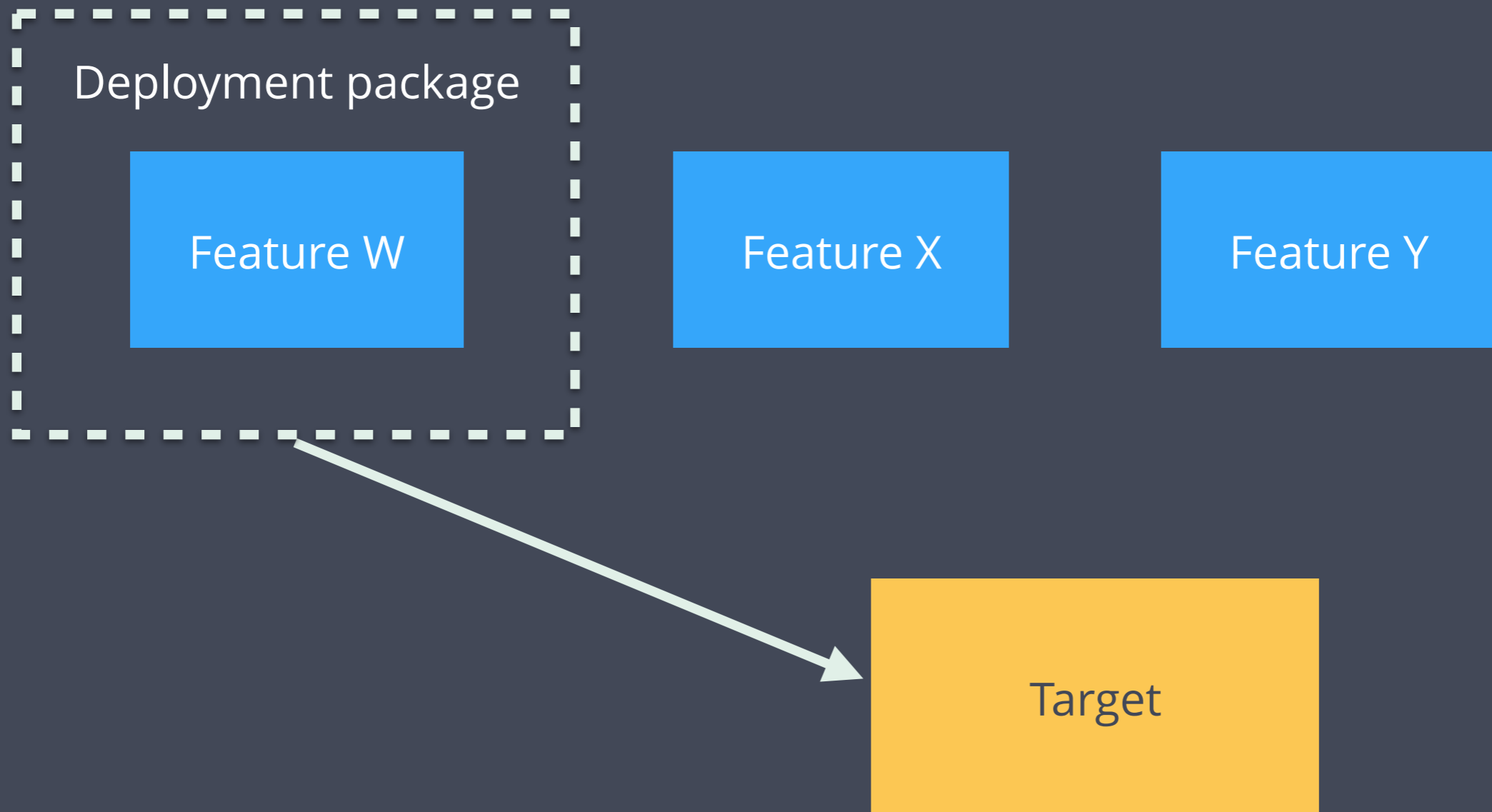
Modular systems

Modular deployment: installation



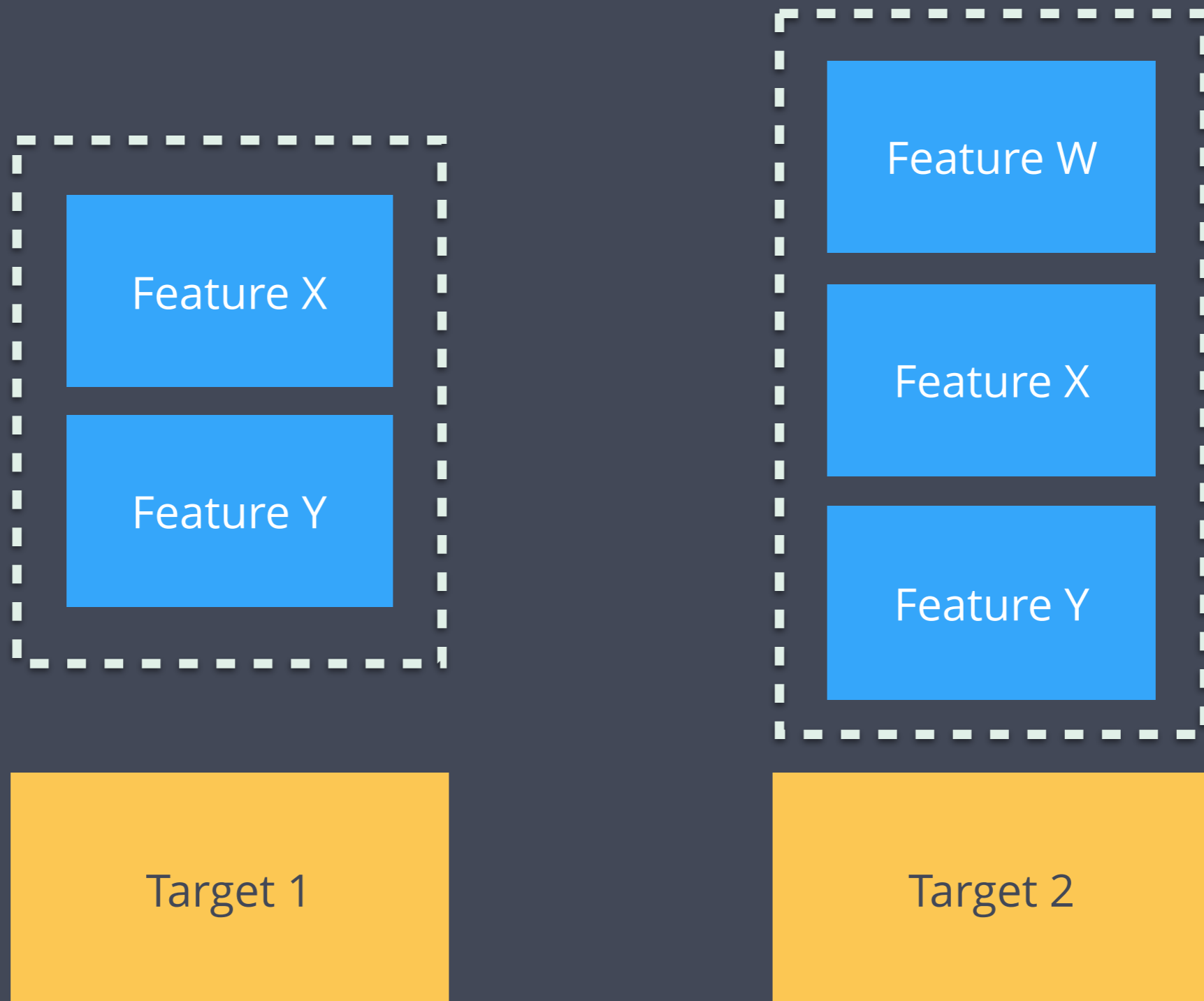
Modular systems

Modular deployment: update



Modular systems

Differentiate with ease



Modular systems

How?



OSGi

De facto standard for Java modularity

Small footprint

Dynamic service model



OSGi

music
v1.0.0

dashboard
v1.0.0

phone
v1.0.0

OSGi runtime (it's just Java!)

JVM



OSGi

Hot-swap bundles

music
v1.0.0

dashboard
v1.0.0

phone
v2.0.0

OSGi runtime (it's just Java!)

JVM



OSGi

Dependencies explicit
in bundle metadata





OSGi

Service registry

App?

PhoneApp

music
v1.0.0

dashboard
v1.0.0

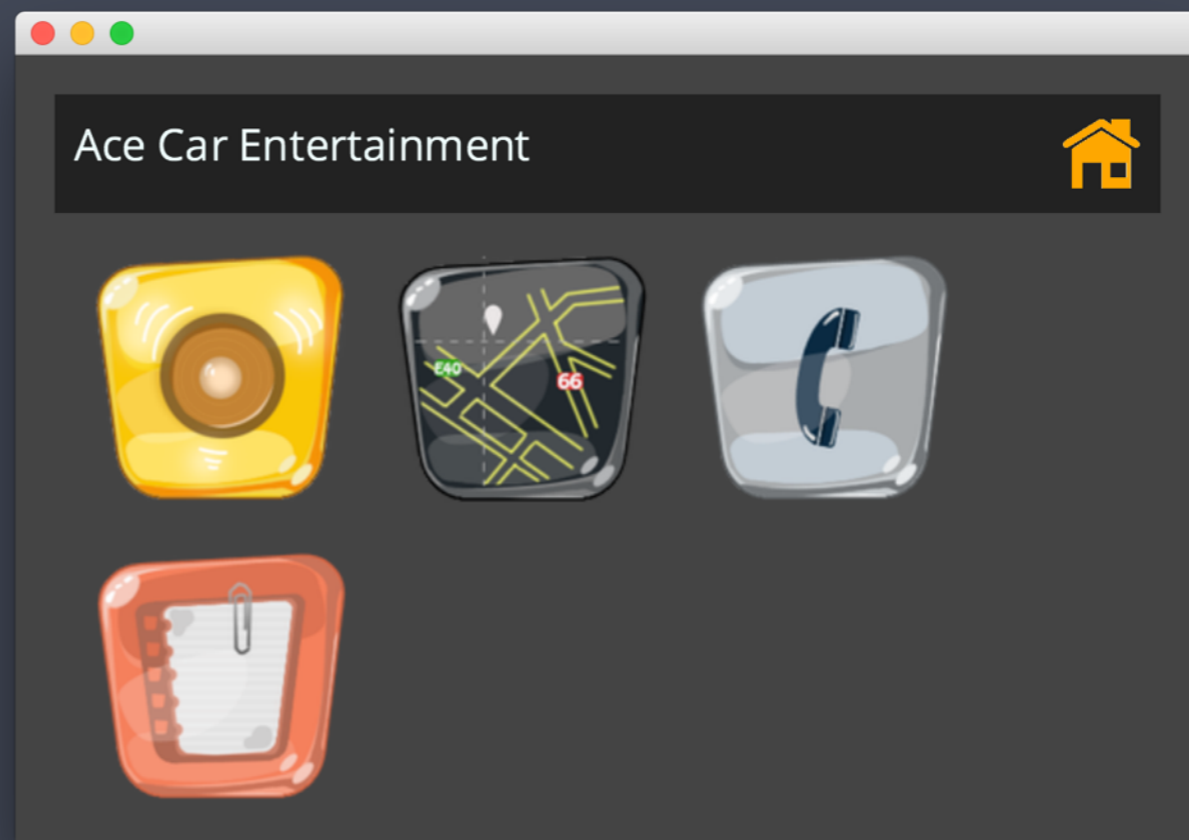
phone
v2.0.0

OSGi runtime (it's just Java!)

JVM

Modular systems

Demo code

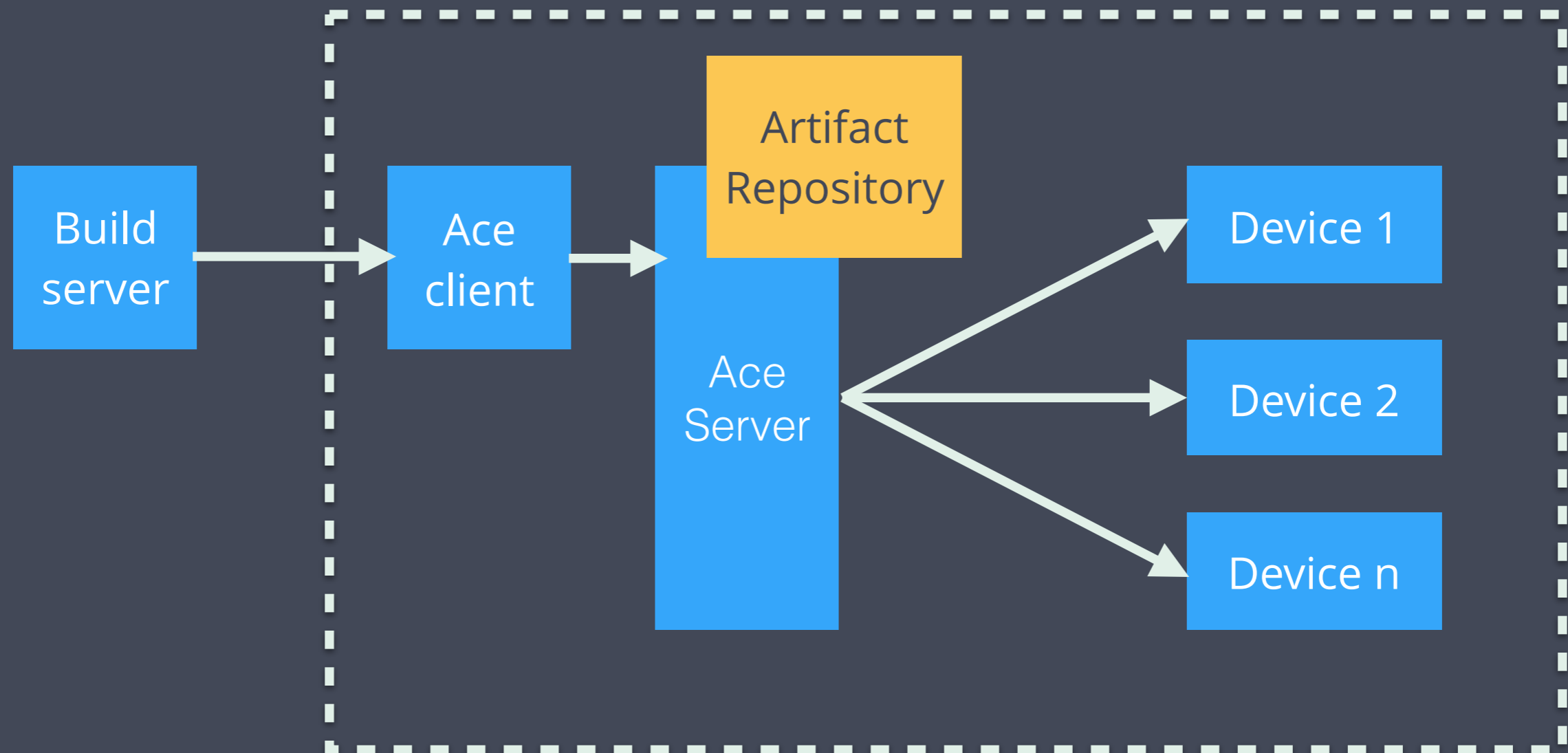


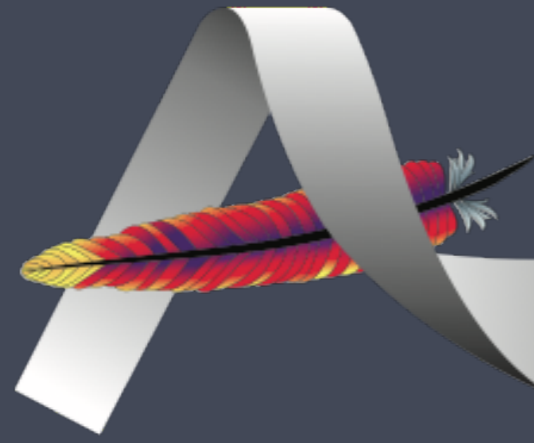
Code @ bit.ly/carprou





Apache ACE Architecture

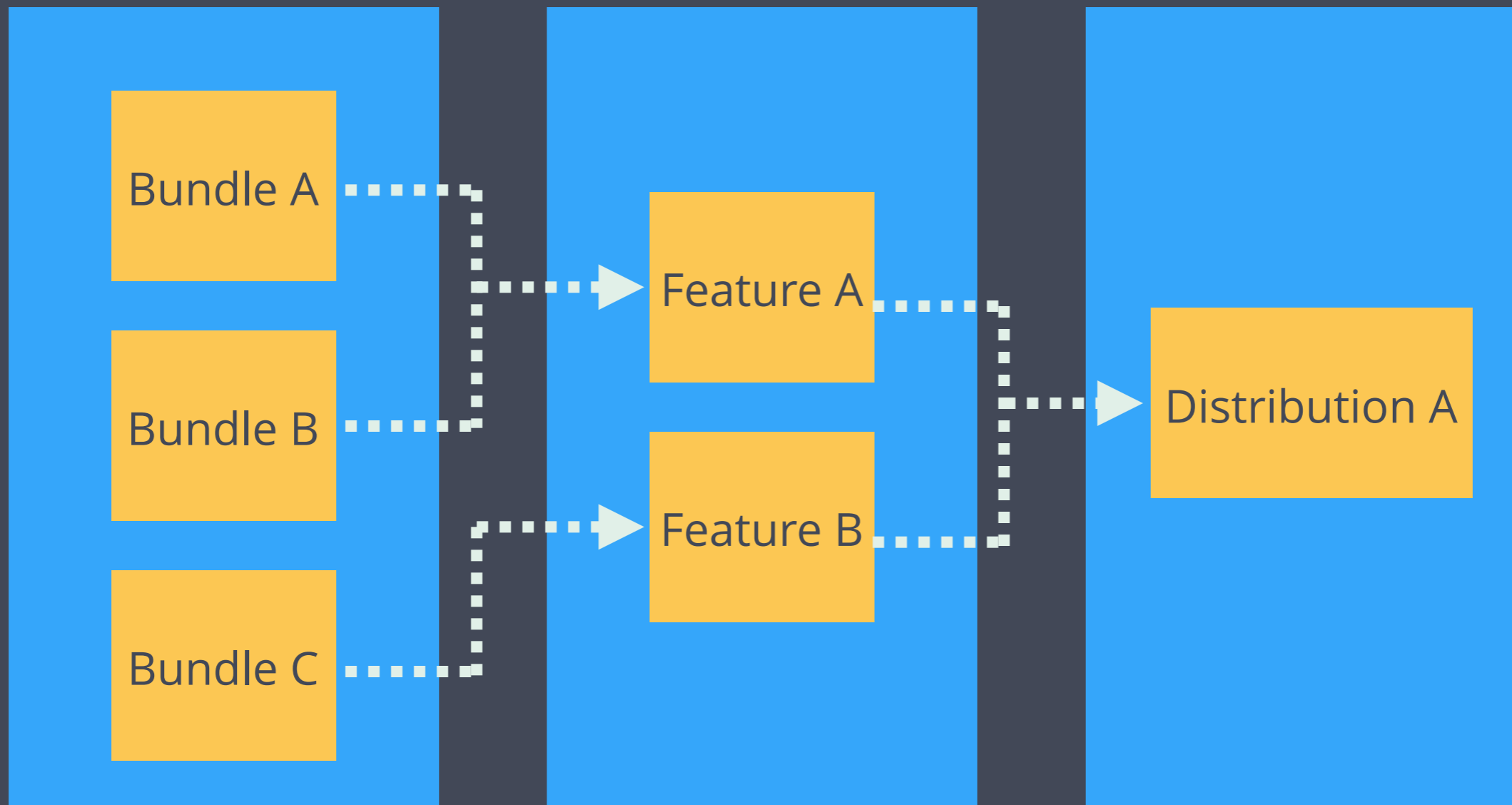




Apache

ACE

Model





Apache ACE

Targets



Polls ACE server for updates

Management agent bundle

Deployment packages sent back

JVM/OSGi framework

Operating System

- ▶ Any JVM capable device
- ▶ Target has unique id
- ▶ Configure server location

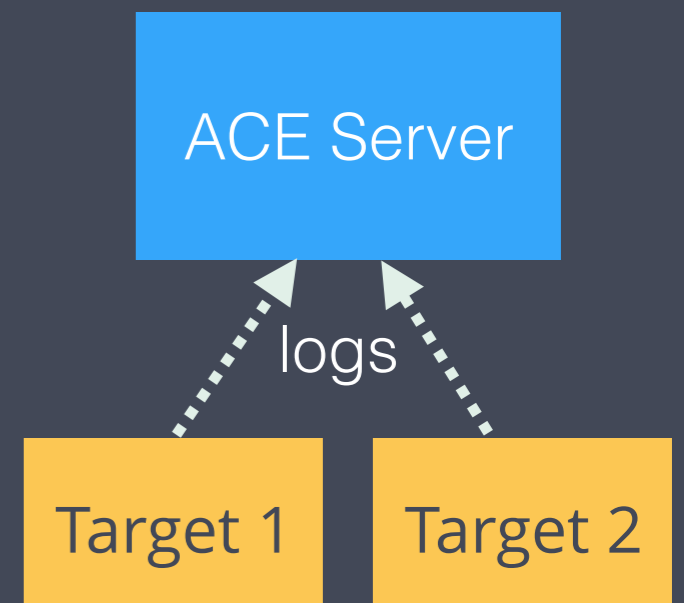


Security:

- ▶ Explicit target registration
- ▶ HTTP auth or SSL Client Certificates

Process:

- ▶ Manual update approval
- ▶ Custom properties
- ▶ Audit logs





REST

GET /work/{id}/feature

Java API

workspaceMgr.cw().lf()

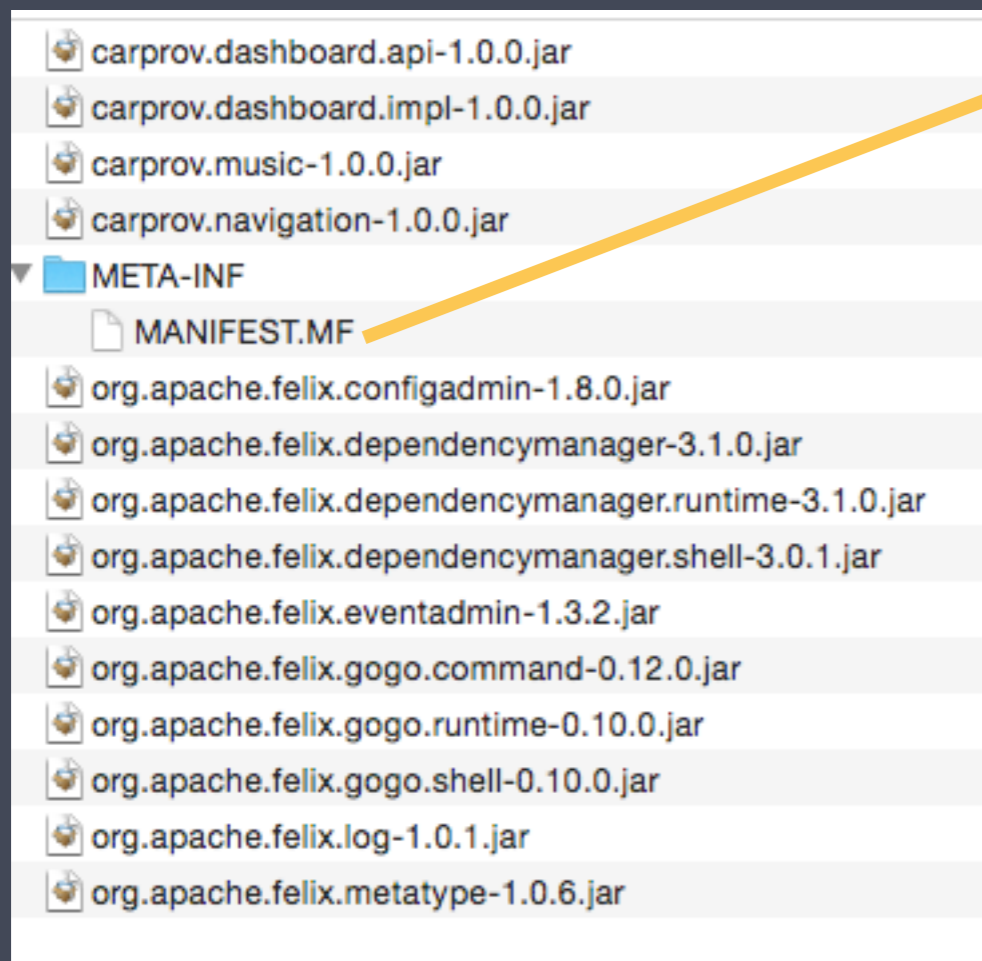
Gogo script

scriptable OSGi shell, calls (low-level) Java API

Deployment packages

Structure

GET /deployment/car1/versions/3.0.0



META-INF/MANIFEST.MF

Manifest-Version: 1.0

DeploymentPackage-SymbolicName: car1

DeploymentPackage-Version: 3.0.0

Name: carprov.dashboard.impl-1.0.0.jar

Bundle-SymbolicName: carprov.dashboard.impl

Bundle-Version: 1.0.0

Name: org.apache.felix.dependencymanager-3.1.0.jar

Bundle-SymbolicName:

org.apache.felix.dependencymanager

Bundle-Version: 3.1.0

...

Deployment packages

Installation on target

- ▶ Transactional: retries and rollback
- ▶ Installation status in audit log
- ▶ Unreliable networks:
 - ▶ Download instead of stream
 - ▶ Resumable downloads
 - ▶ Custom update strategies

ACE Extensibility

- ▶ Built on modular OSGi architecture
- ▶ Different repository implementations
- ▶ Custom update strategies on targets
- ▶ Multiple topologies (e.g. relay server)
- ▶ ResourceProcessors for new artifact types

ACE Extensibility

ResourceProcessor

- ▶ Recognizes your artifact type
- ▶ Handles installation on target
- ▶ Upload ResourceProcessor to ACE

ACE Extensibility

Configuration ResourceProcessor

- ▶ Handles XML (MetaType) configs
- ▶ Placeholders replaced with target tags

On server:

```
...  
<Value>${context.mySpecificProperty}</Value>  
...
```

On target:

```
...  
<Value>mySpecificValue</Value>  
...
```

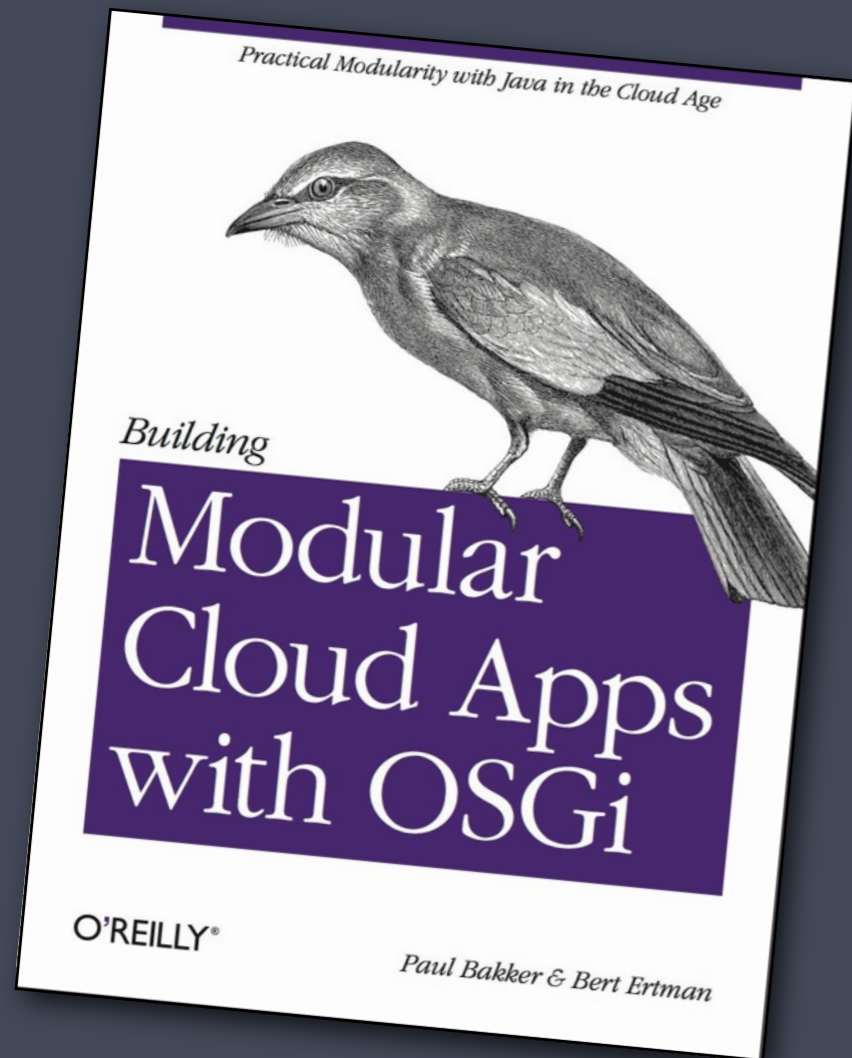
In summary

Apache ACE simplifies IoT deployments

Modular applications rock!

Modular deployment is worth your while

Thank you!



Code @
bit.ly/carprou

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