The OpenTOSCA Ecosystem

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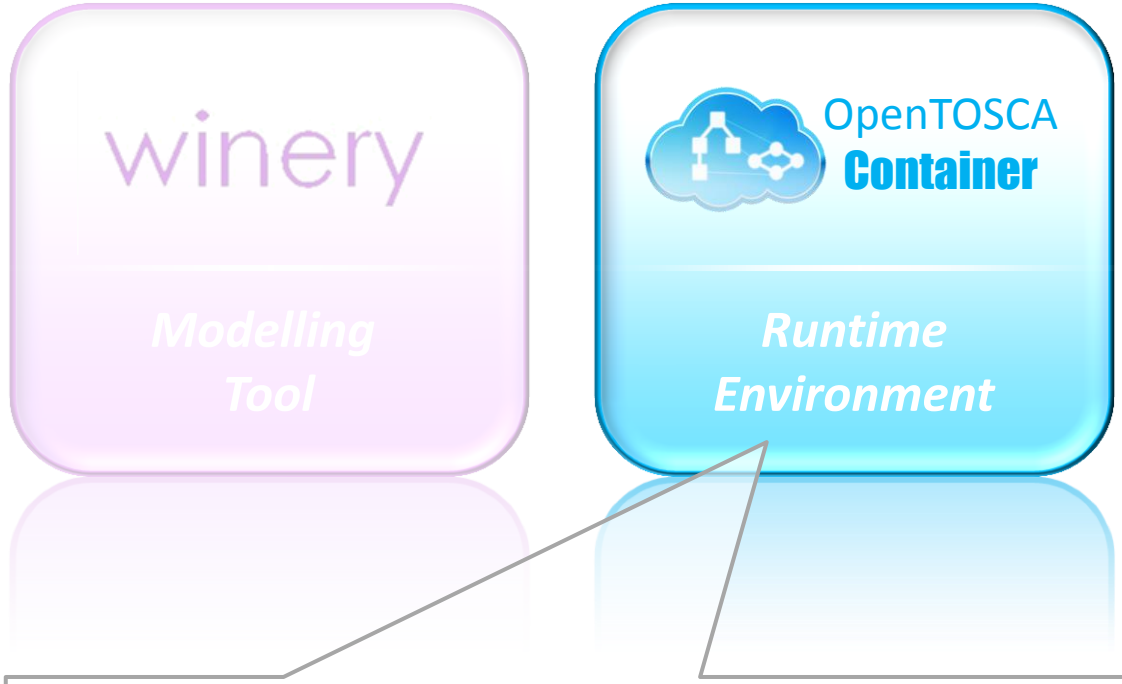
CLOUDCYCLE
Sicherheit. Standards. Services.

The OpenTOSCA Ecosystem

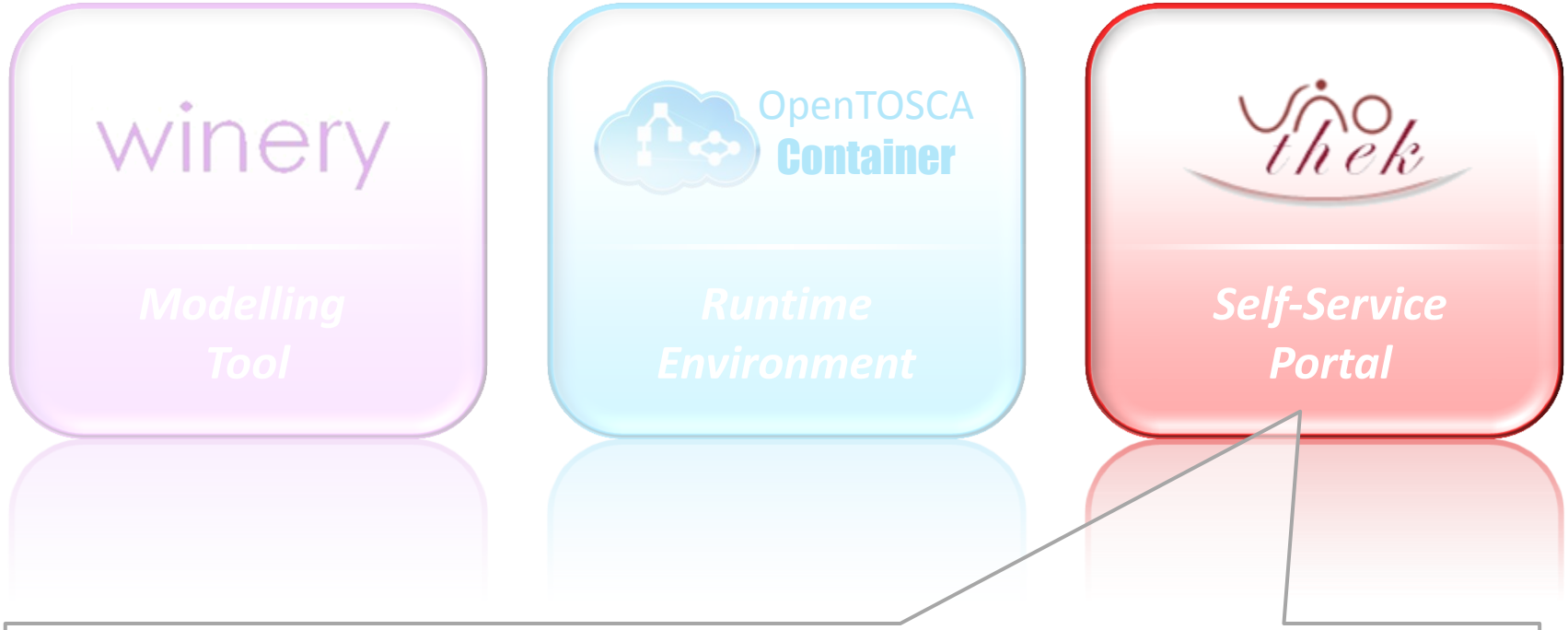
- TOSCA Modelling tool to develop CSARs
  - Graphical Topology Template Modeller
  - Template, Types, and Artifact Management Backend

The OpenTOSCA Ecosystem



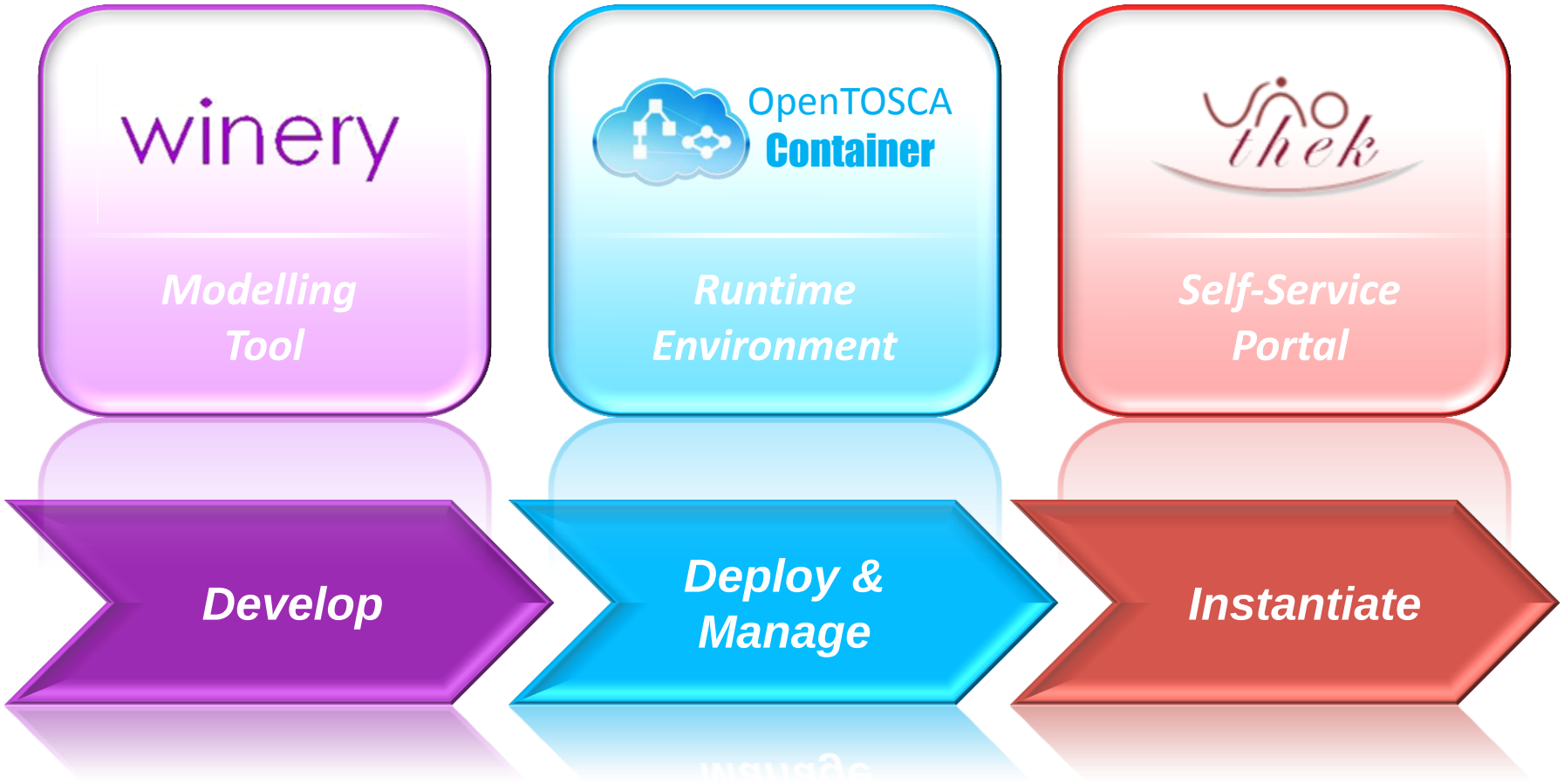
- TOSCA Runtime Environment
  - Supports imperative processing based on BPEL
  - Supports Java- and Script-Implementation Artifacts

The OpenTOSCA Ecosystem



- Self-Service Portal for OpenTOSCA
  - Provides easy graphical interface for users
  - Currently supports the provisioning of applications

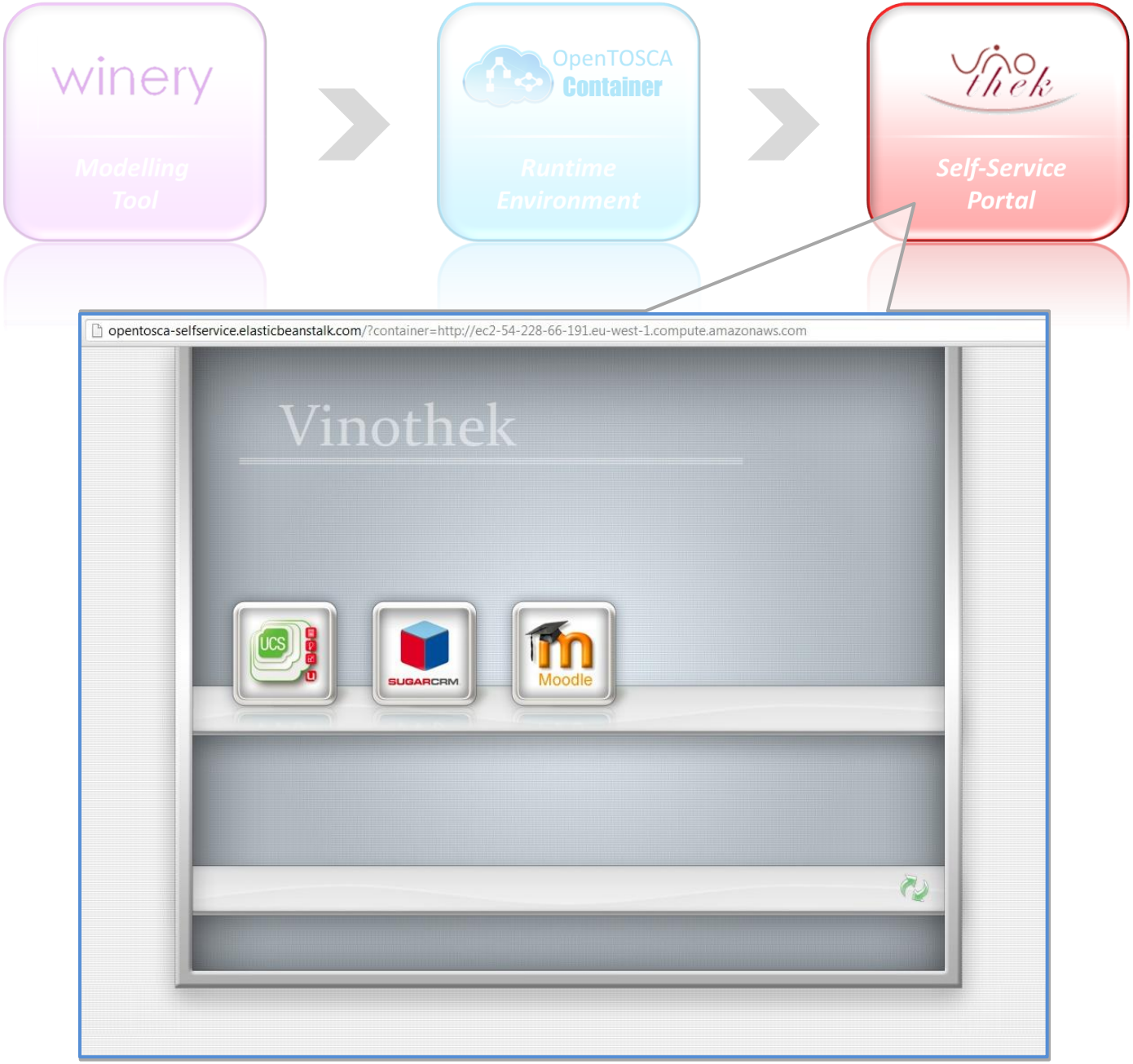
The OpenTOSCA Ecosystem



„Standards-based - Open Source - End-To-End Toolchain“

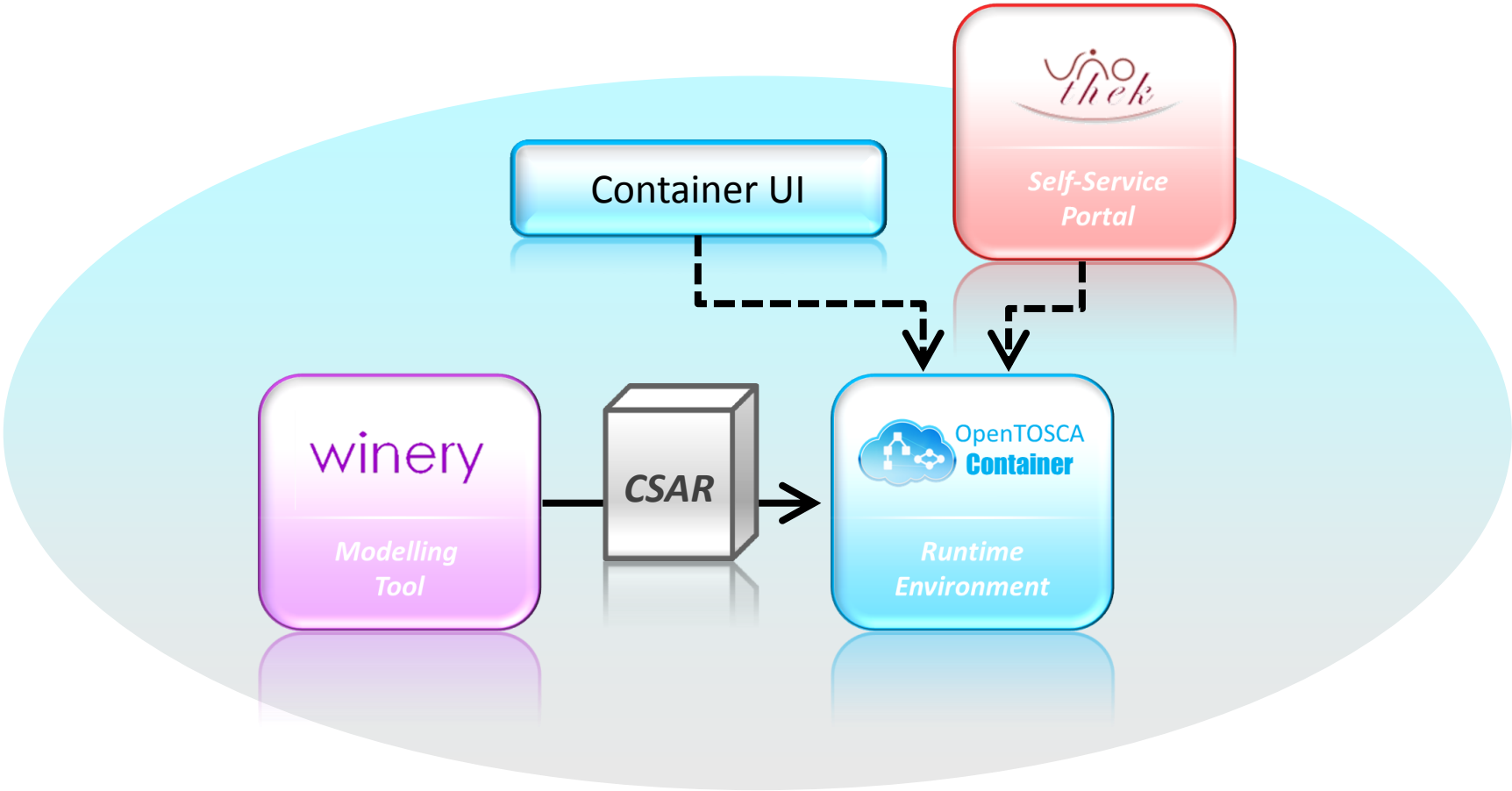

winery
Modelling Tool
OpenTOSCA Container
Runtime Environment
Self-Service Portal
Firefox
Winery Topologymodeller – Moodle
Save
Layout
Align-h (|)
Align-v (-)
Ids
Types
Properties
Deployment Artifacts
Requirements & Capabilities
Delete
Amazon_EC2
ApacheWebServer
BPEL
Debian
Glassfish
IBM_Web_Sphere
MySQL
ODE
PHP
PostgreSQL
Tomcat
Ubuntu
Virtual Machine
Windows
Moodle
(PHP)
calls
connectsTo
hostedOn
ApacheWebServer
(ApacheWebServer)
MySQL
(MySQL)
Ubuntu_1
(Ubuntu)
Ubuntu_2
(Ubuntu)
Amazon_EC2_1
(Amazon_EC2)
Amazon_EC2_2
(Amazon_EC2)
Name
Moodle
min
max


winery
Modelling Tool
OpenTOSCA Container
Runtime Environment
Self-Service Portal
ec2-54-228-66-191.eu-west-1.compute.amazonaws.com:8080/index.jsp?view=overview
Version 1.0
open Tosca
Overview
Deploy CSAR
About
Univention
SugarCRM
Moodle
Upload new CSAR
MoodleServiceTemplate.xml
IMPL-ARTIFACTS
SELF-SERVICE
PLANS
META-INF
IMPORTS
topology.png
DEPL-ARTIFACTS
PhpModule
(depends on)
MoodleWebApp
(connects to)
MoodleDB
(hosted on)
ApacheWebServer
MySql
OsApache
OsMySQL
VmApache
VmMySql
(Server)


winery
Modelling Tool
OpenTOSCA Container
Runtime Environment
Vinothek
Self-Service Portal
opentosca-selfservice.elasticbeanstalk.com/?container=http://ec2-54-228-66-191.eu-west-1.compute.amazonaws.com
Vinothek
UCS
SUGARCRM
Moodle


winery
Modelling Tool
OpenTOSCA Container
Runtime Environment
Vinothek
Self-Service Portal
Vinothek - Moodle
vinothek.opentosca.org/Moodle
Vinothek
Moodle
Moodle is a free software e-learning platform. It can be used in different environments such as education, training and development, and business settings.
Moodle supports typical features of an e-learning platform. It additionally provides some original innovations such as its filtering system.
More information about Moodle can be found on the official Website: http://moodle.com/
Default
Start Instance

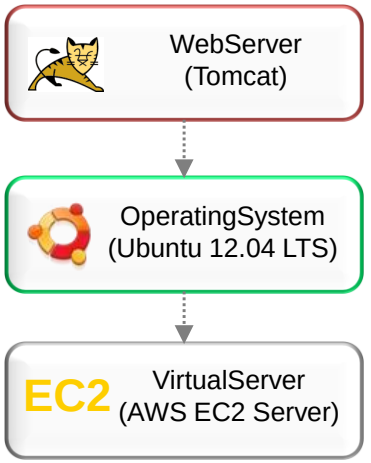
Ecosystem Structure & Relations



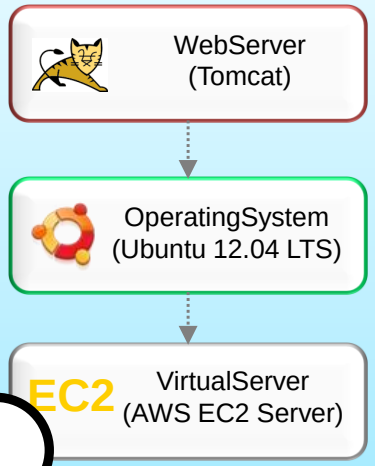
OpenTOSCA Container:
Plan-based Management

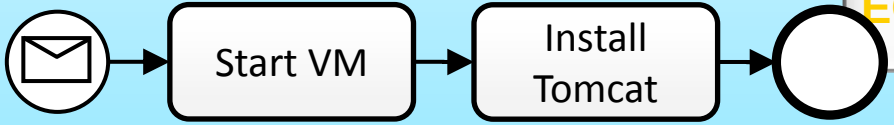
Two Flavors of Processing

- **Declarative → What?**
  - Example: “I want this, realize it!”
  - Runtime interprets topology and does deployment

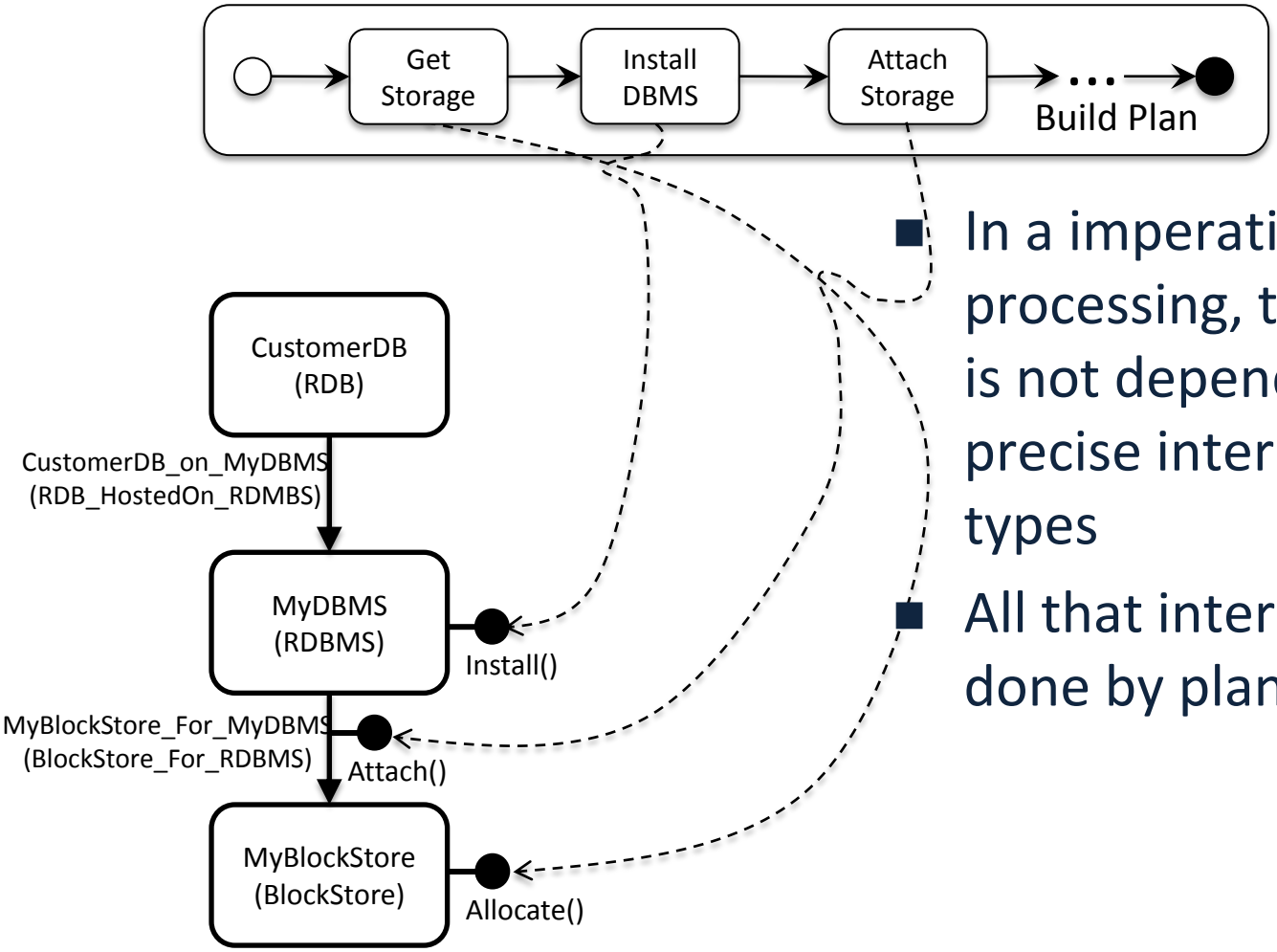


- **Imperative → How?**
  - Example: “First do this, than that.”
  - Management plan explicitly describes each step





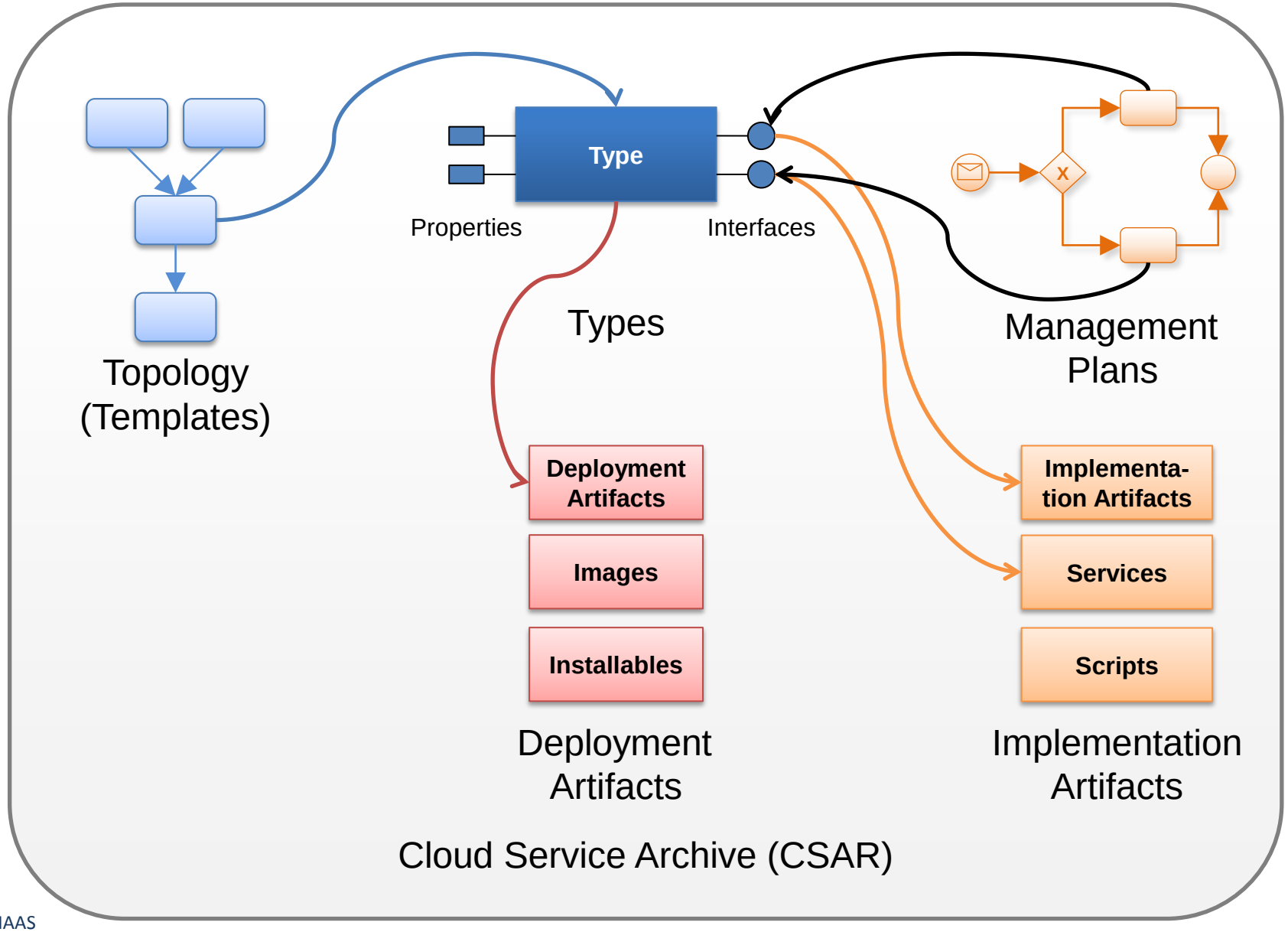
...And Its *Imperative* Processing



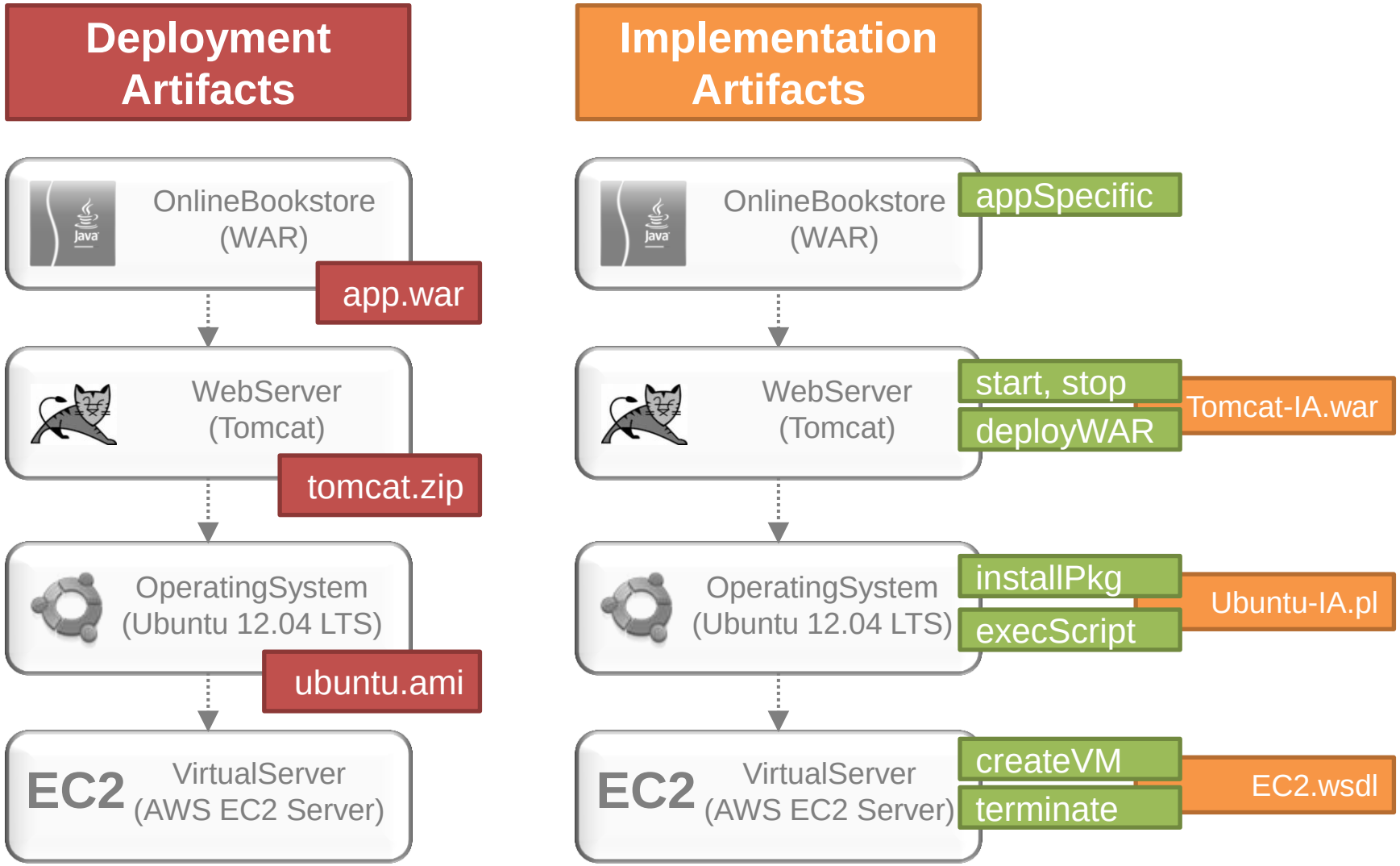
- In a imperative mode of processing, the environment is not dependent on a precise interpretation of the types
- All that interpretation is done by plans

PRO: No precise definition of all types, their processing, their behavior,… needed
CON: Plans must be specified even for “simple” provisioning and decommissioning needed

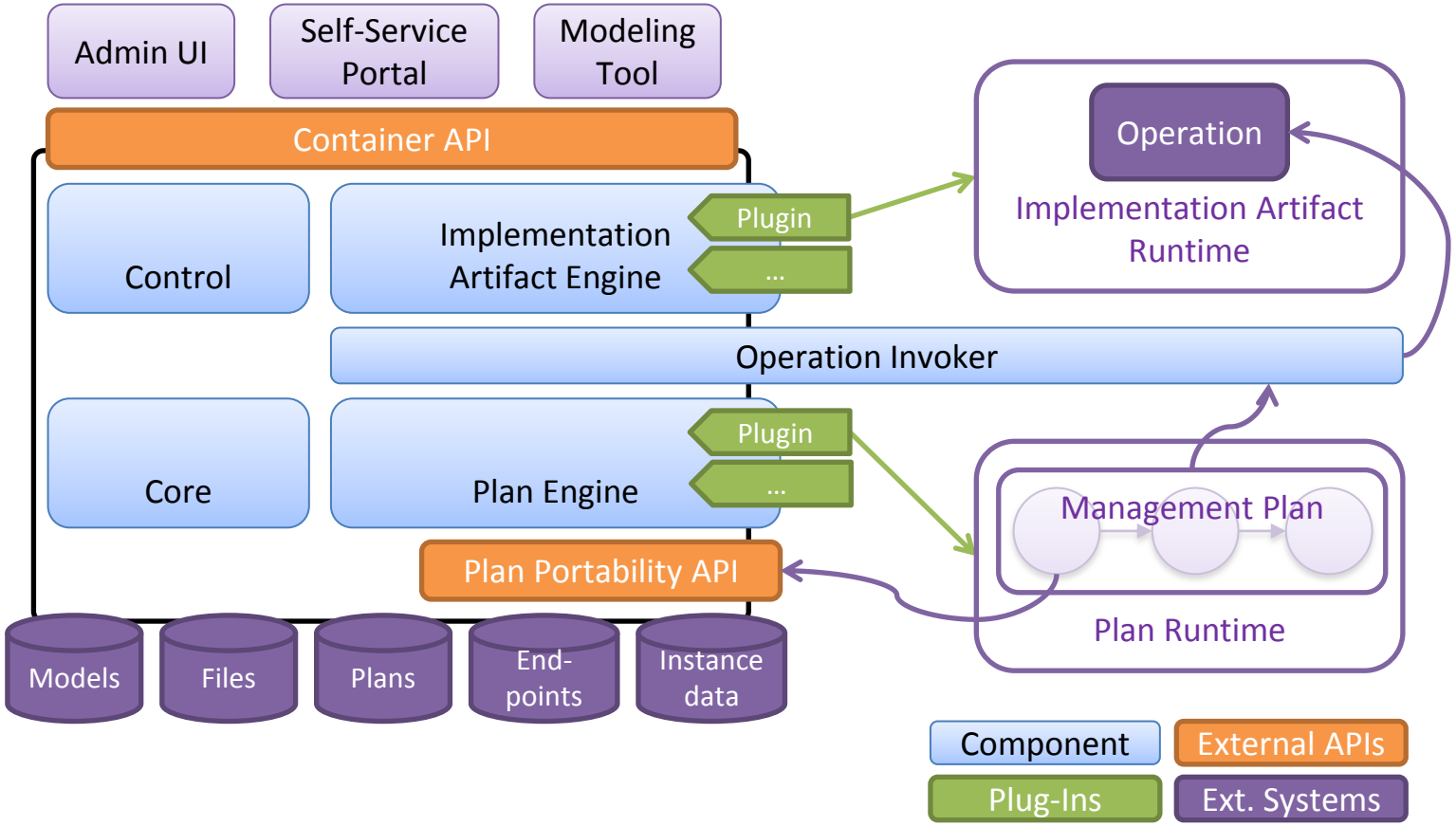
What is contained in a Cloud Service Archive (CSAR)?



Deployment and Implementation Artifacts



OpenTOSCA Architecture Simplified



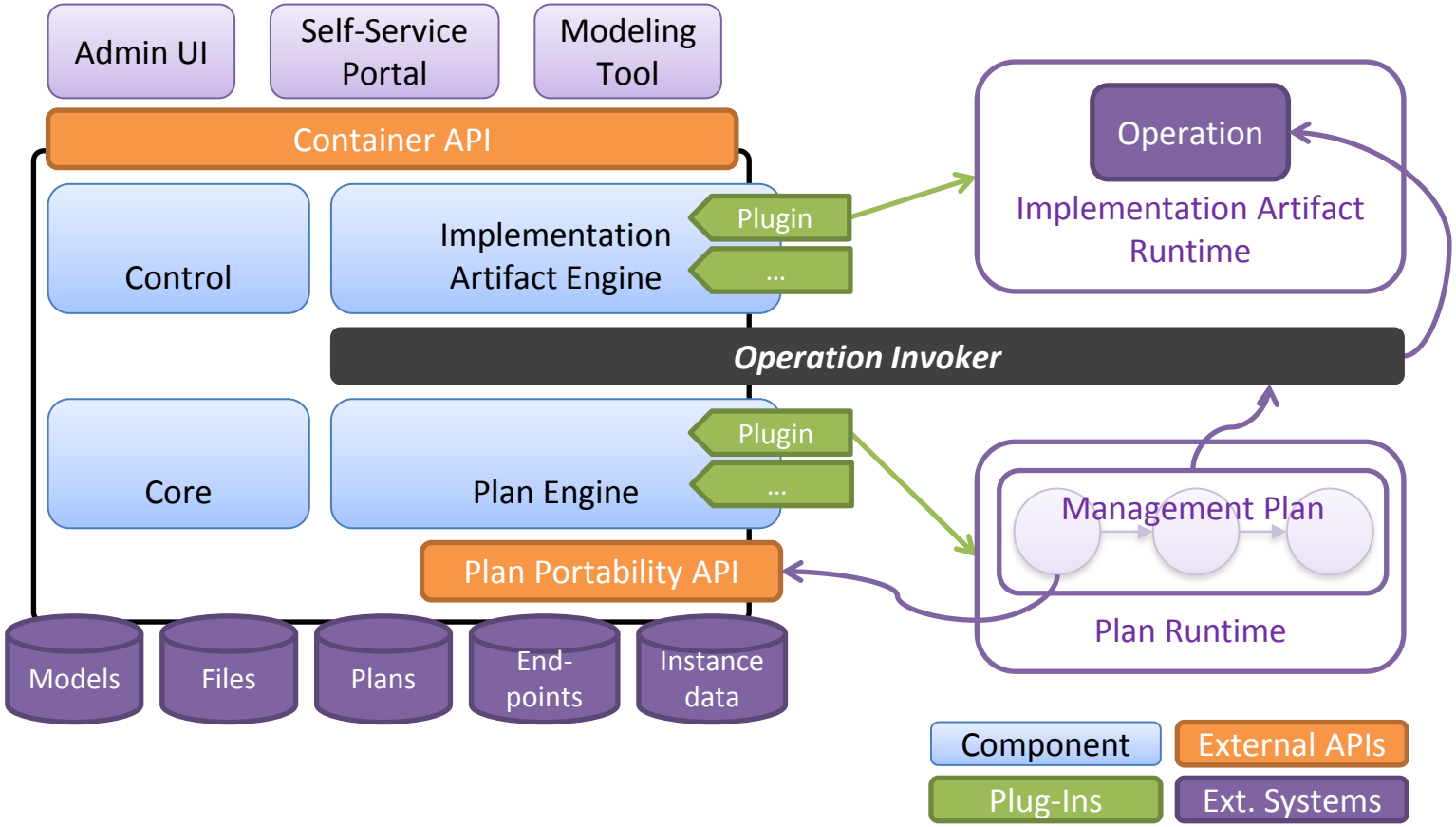
Currently supported:

- ***Implementation Artifacts***
  - Java-based, asynchronous SOAP / HTTP – Webservices (WAR)
  - SH Scripts (ongoing research)
- ***Deployment Artifacts***
  - All possible types ☺

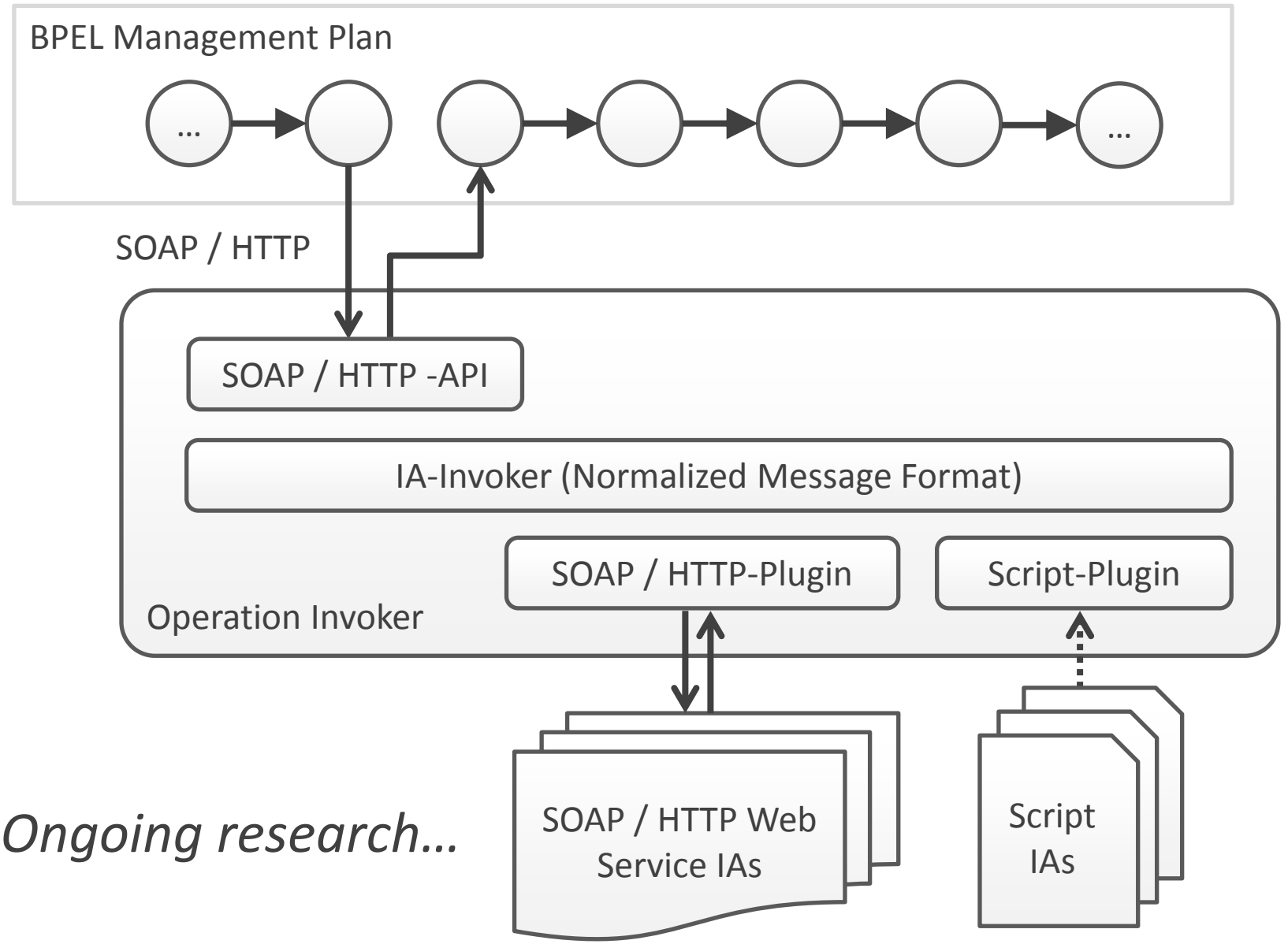
  → Management Plans can process Deployment Artifacts arbitrarily
- ***Node Types / Relationship Types***
  - In general all Node / Relationship Types can be processed
  - If special operations / actions are required, they must be implemented either (i) in the plan or the type must provide (ii) a corresponding Implementation Artifact

  → Custom Node and Relationship Types can be defined and used!
- ***Management Plans***
  - BPEL workflows

Simplified OpenTOSCA Architecture

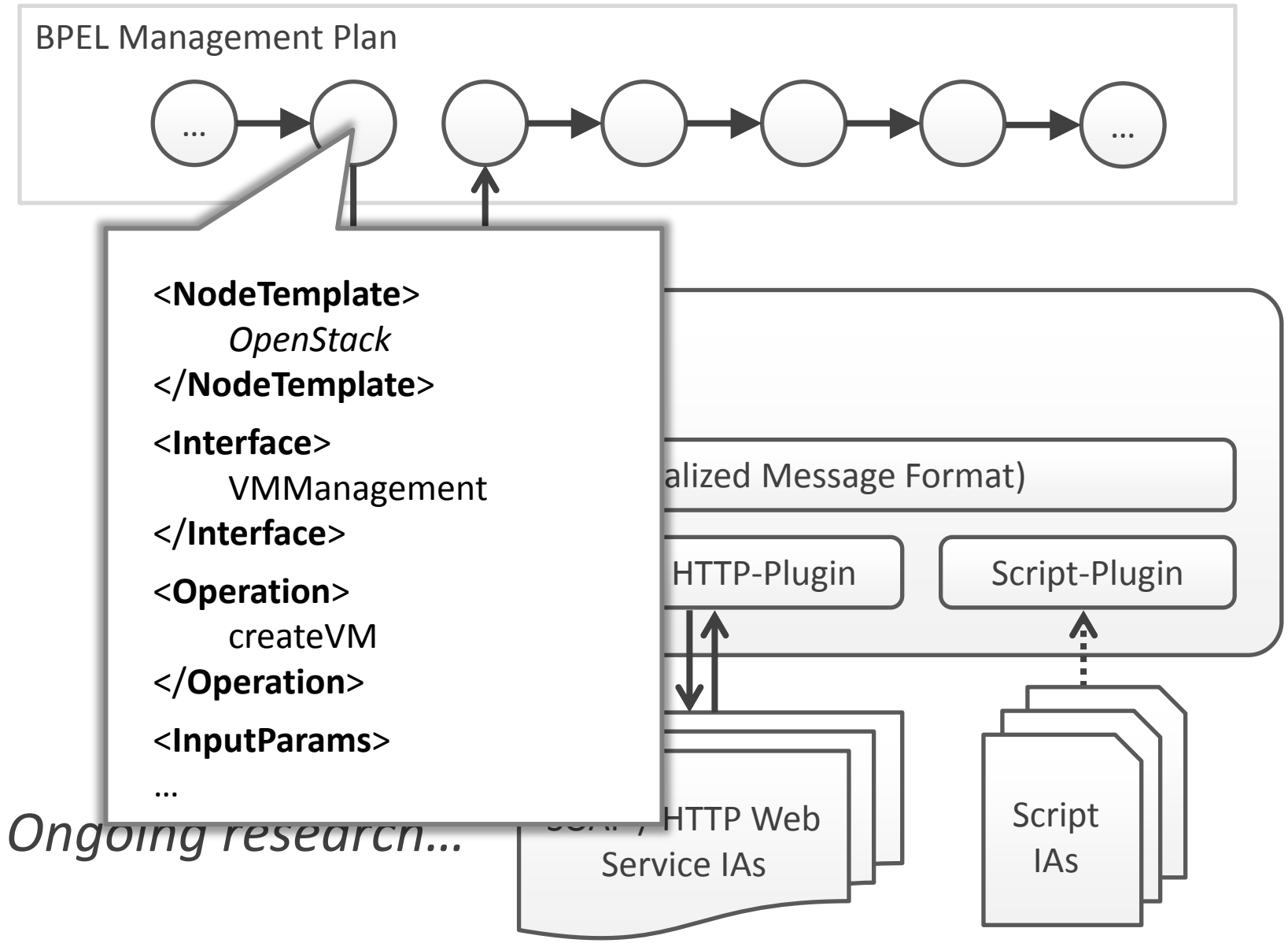


Operation Invoker



Ongoing research…

Operation Invoker



Ongoing research...

The Power of (Open)TOSCA

Major strenghts of the (Open)TOSCA concept

- Node Types can provide management logic by very **different kinds of Implementation Artifacts**

- OpenTOSCA ***directly*** supports (Operation Invoker):
  - Script IAs 
  - Java-based Webservice IAs (WARs) 

- OpenTOSCA ***indirectly*** supports any kind of IA
  - Plans can do whatever they want with arbitrary types of IAs


Major strenghts of the (Open)TOSCA concept

- Enables wrapping many (!) different kinds of managenent interfaces and technologies ☺

  - ***You want to install a special Webserver?***

  → Attach the corresponding Script to the Node Type and let the plan execute it on the operating system

  - ***You want to provision a virtual machine on Provider X?***

  → Attach a Java Webservice IA to the Node Type that implements the „createVM“ operation and call it

Core Concept

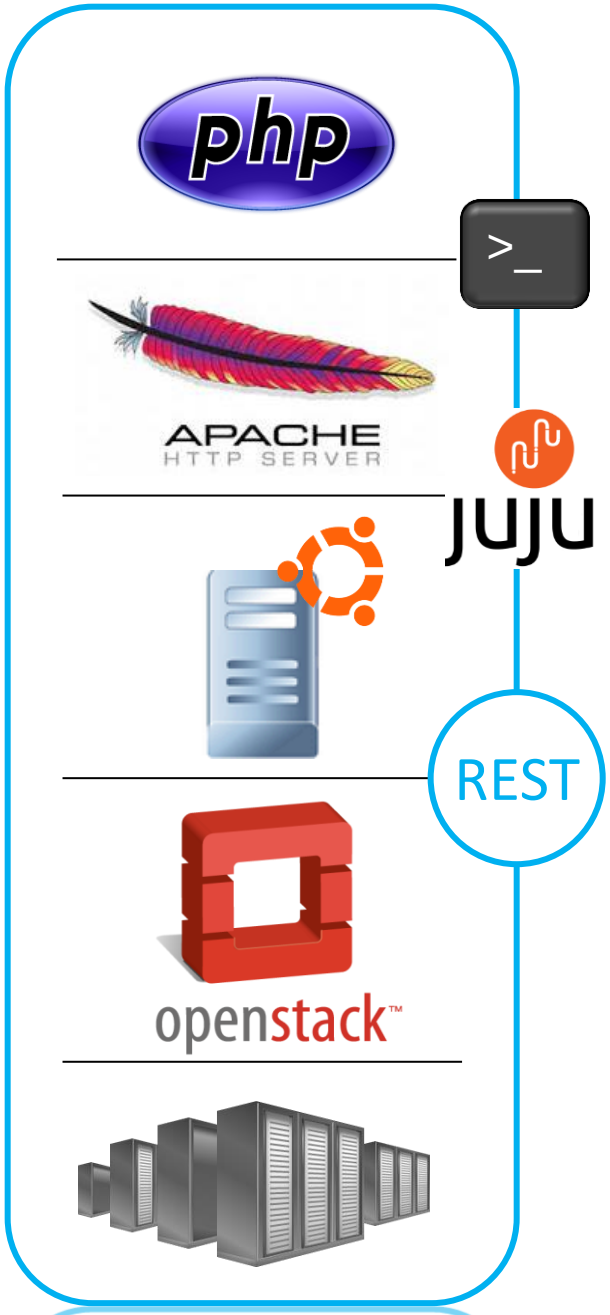
- The core concept of OpenTOSCA:

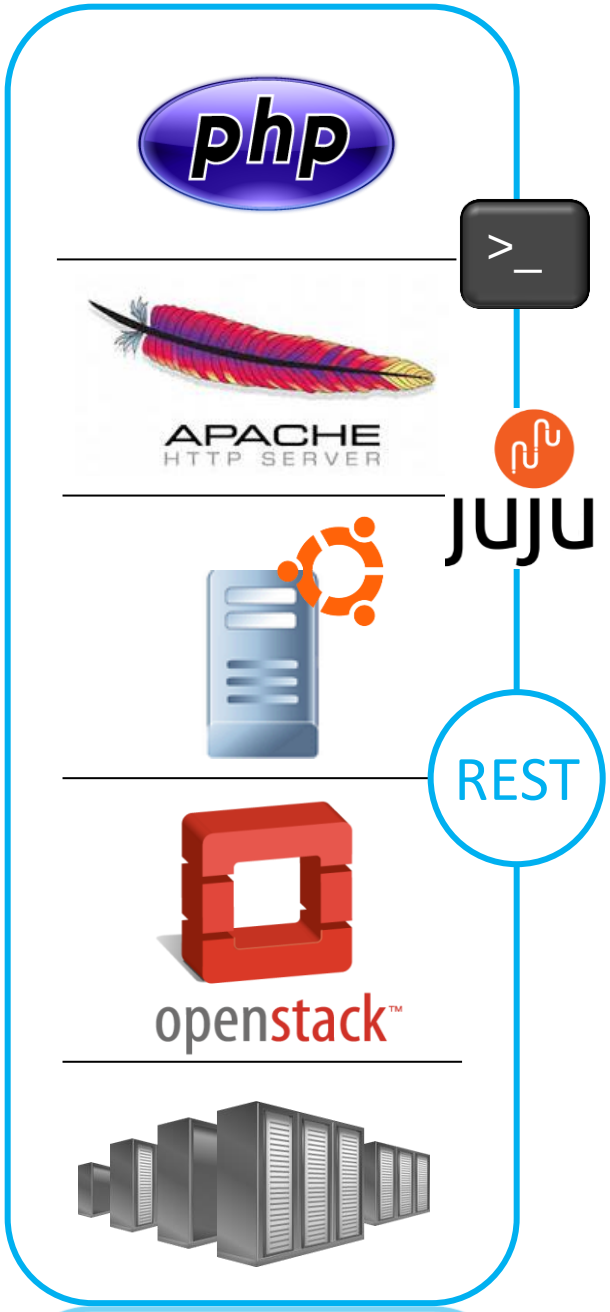
<u>All</u> required management logic is contained in the CSAR

- This leads to completely self-contained CSARs:
  - CSAR provides ***all*** executables:

→ Low-level management logic is implementd as IAs

→ Plans orchestrate all these Implementation Artifacts


php
>_
APACHE
HTTP SERVER
juju
REST
openstack™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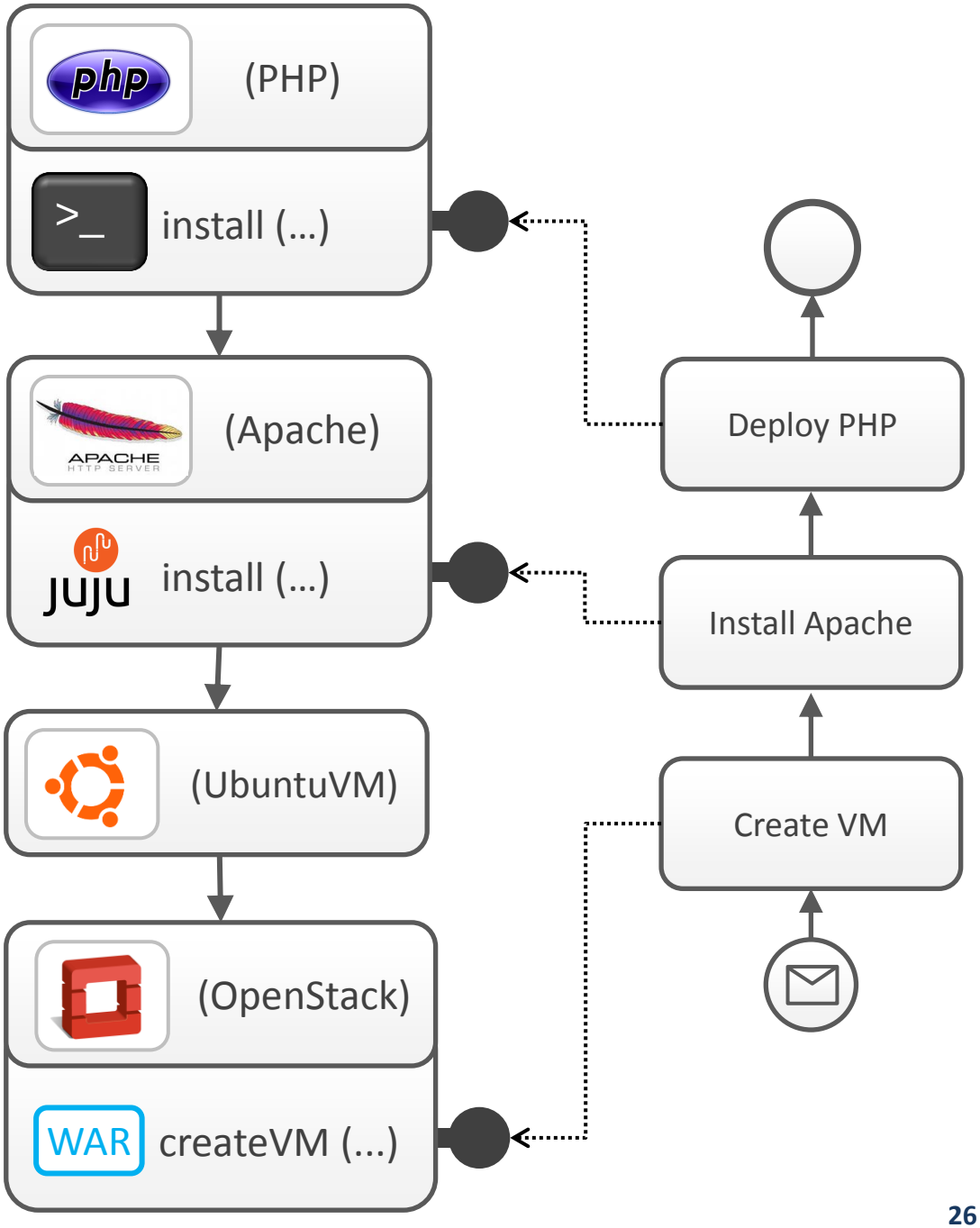
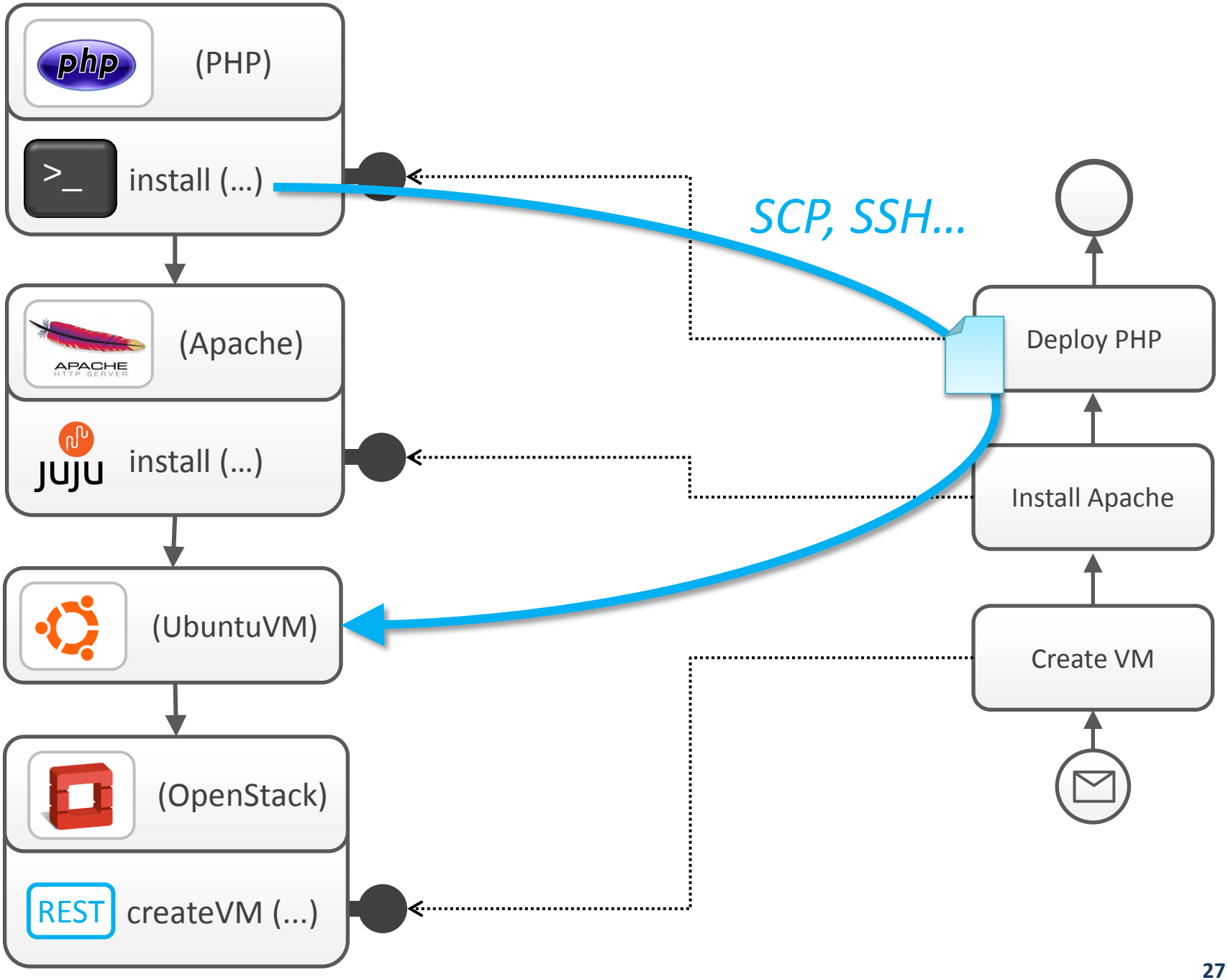

(PHP)
install (...)
(Apache)
install (...)
(UbuntuVM)
(OpenStack)
WAR
createVM (...)
Deploy PHP
Install Apache
Create VM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(Apache)
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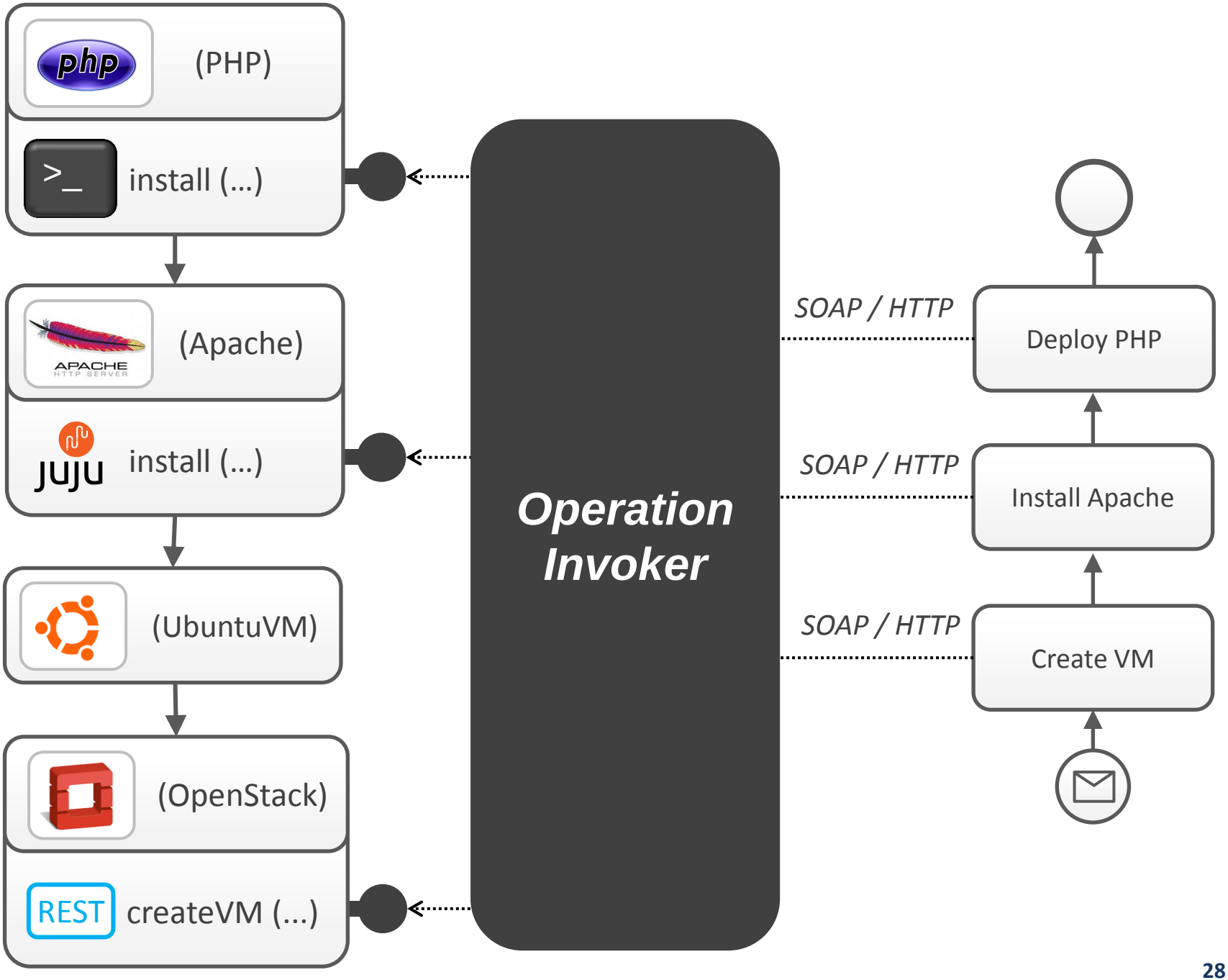
(UbuntuVM)
(OpenStack)
REST
createVM (...)
SCP, SSH...
Deploy PHP
Install Apache
Create VM


(PHP)
install (...)
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REST
createVM (...)
Operation Invoker
SOAP / HTTP
SOAP / HTTP
SOAP / HTTP
Deploy PHP
Install Apache
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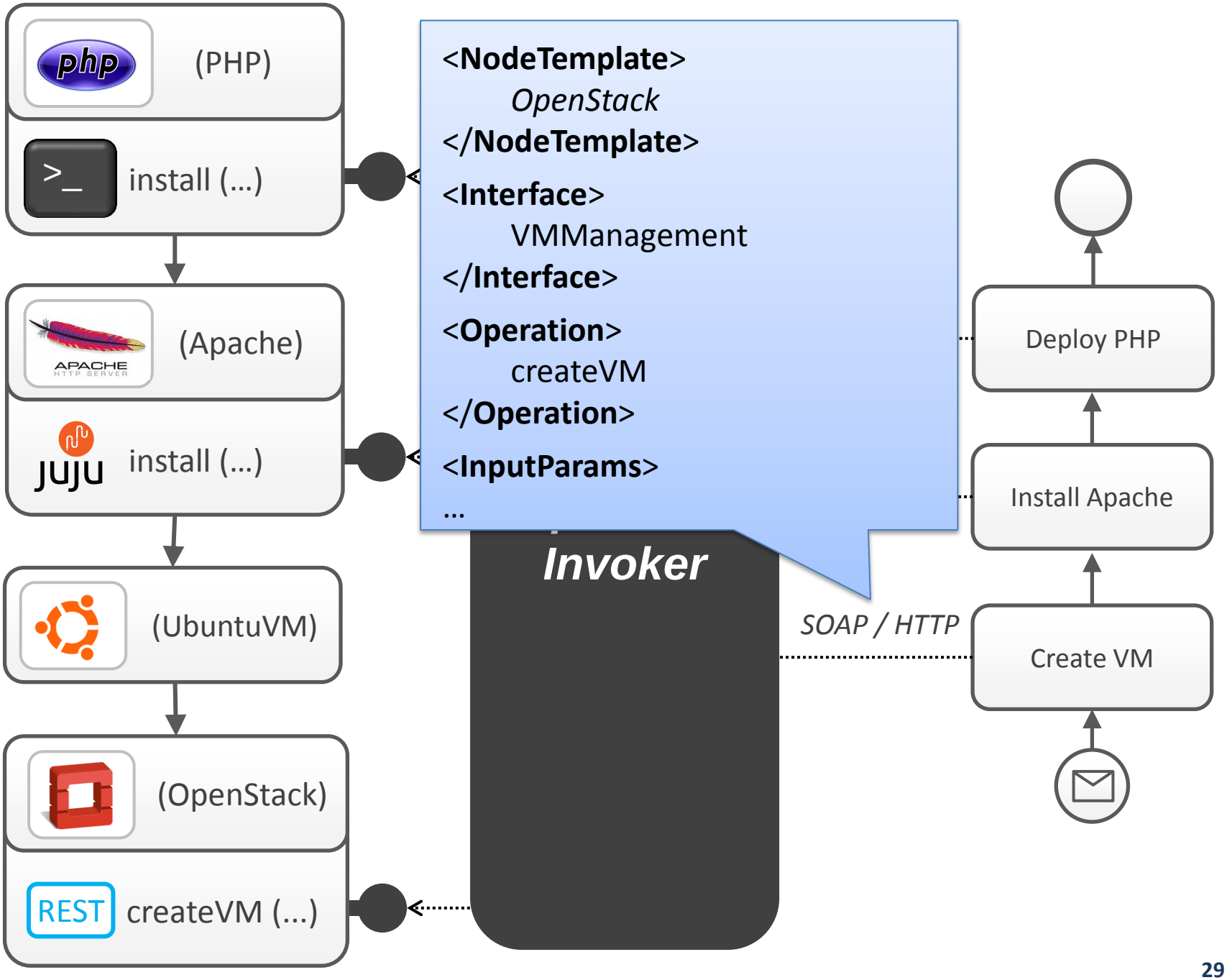
(PHP)
install (...)
(Apache)
install (...)
(UbuntuVM)
(OpenStack)
REST
createVM (...)
<NodeTemplate>
OpenStack
</NodeTemplate>
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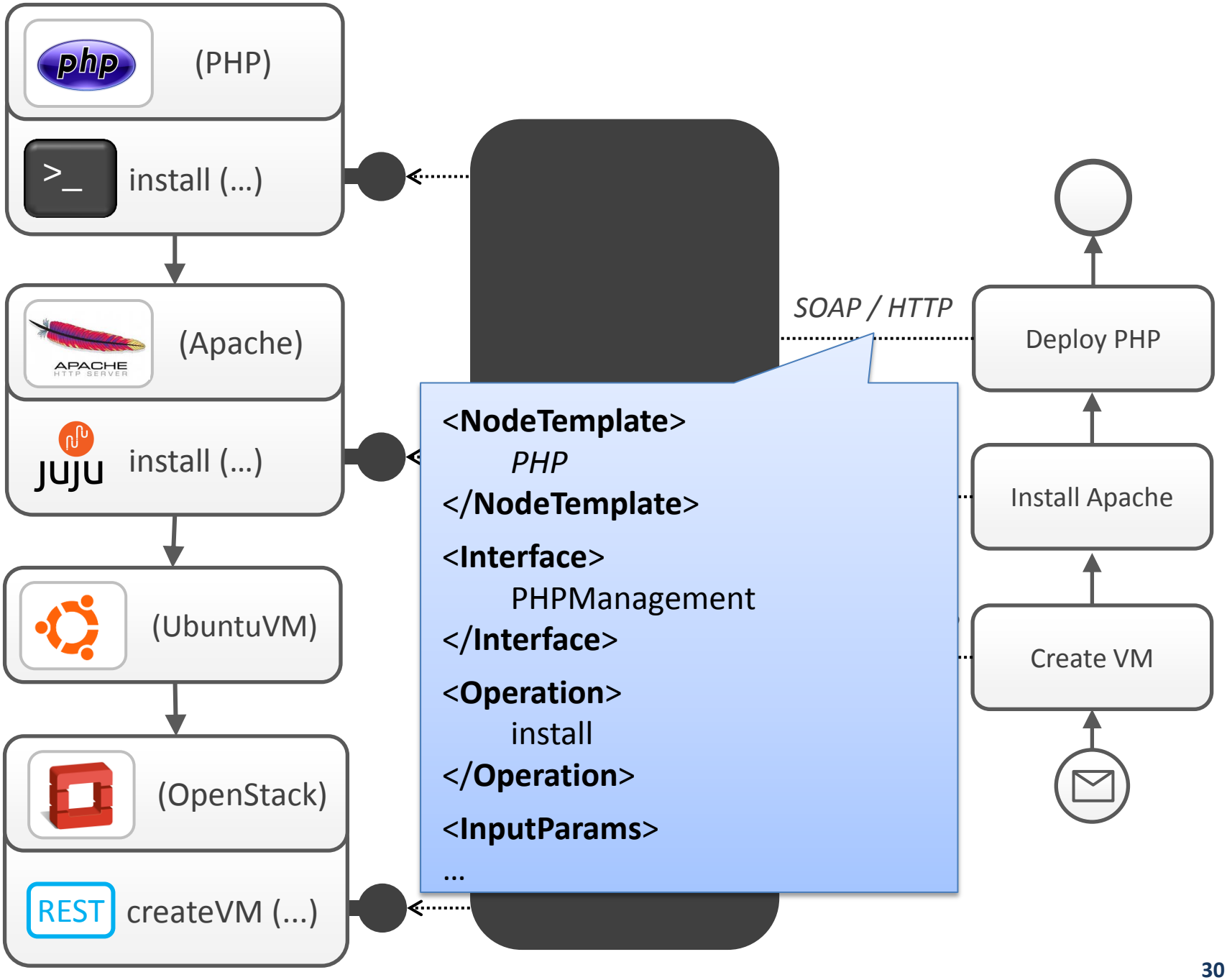
VMManagement
</Interface>
<Operation>
createVM
</Operation>
<InputParams>
...
Invoker
SOAP / HTTP
Deploy PHP
Install Apache
Create VM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SOAP / HTTP
<NodeTemplate>
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<Interface>
PHPManagement
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install
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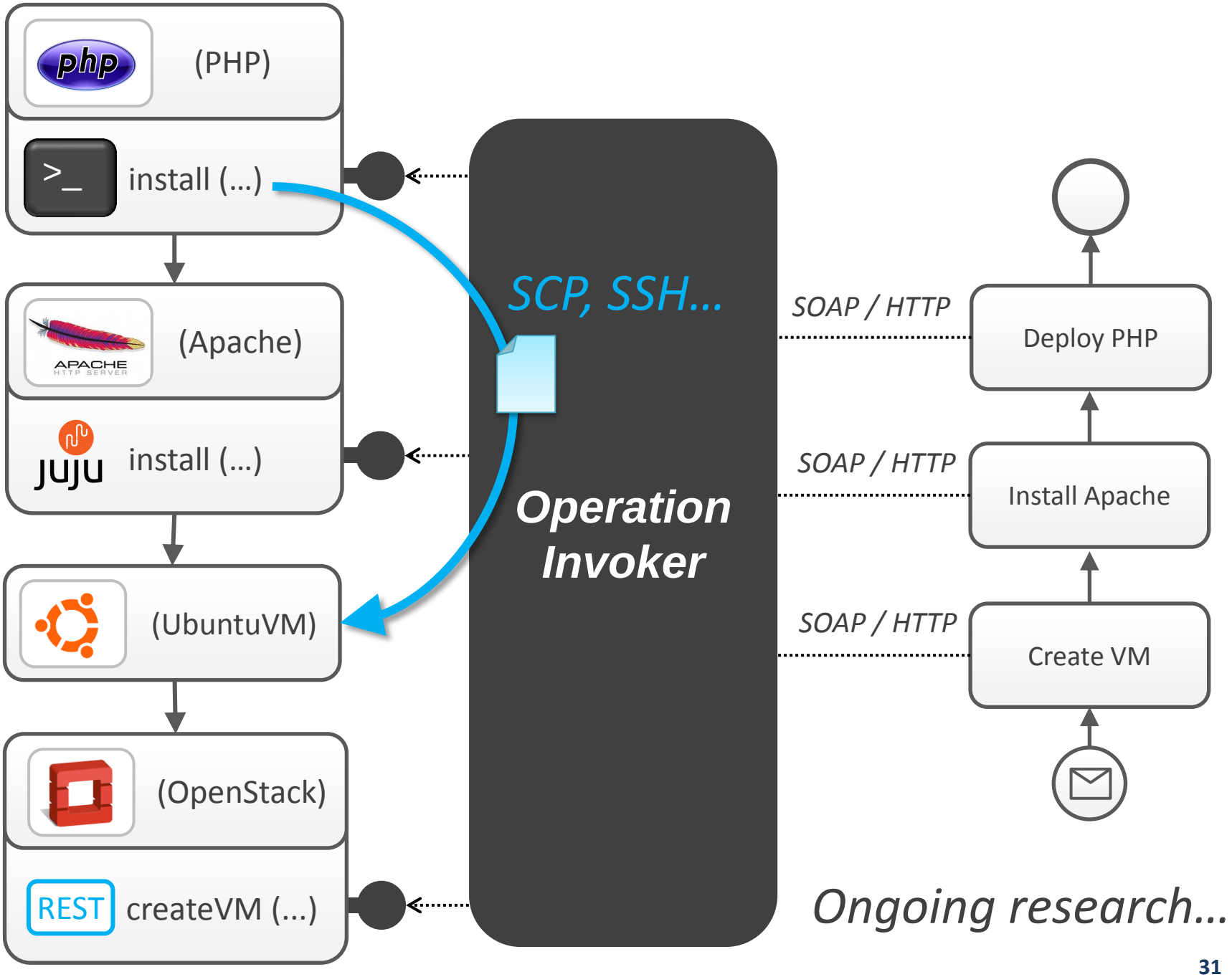
...
Deploy PHP
Install Apache
Create VM


(PHP)
install (...)
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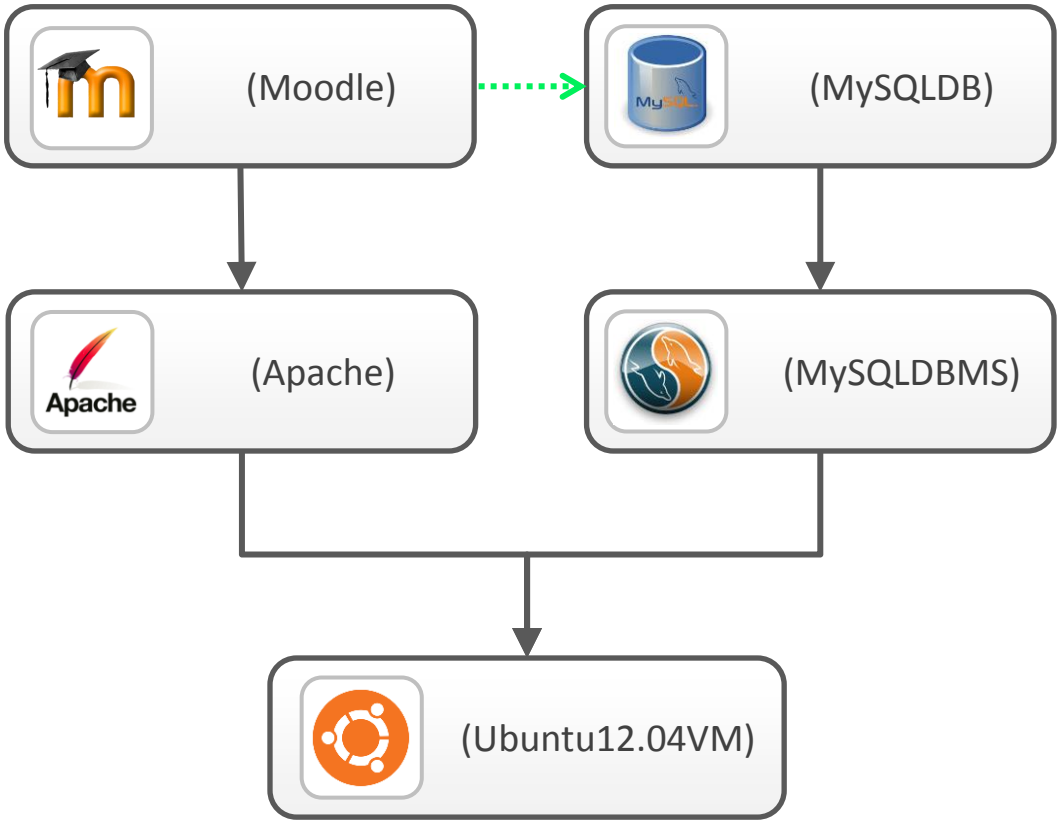
REST
createVM (...)
SCP, SSH...
Operation Invoker
SOAP / HTTP
SOAP / HTTP
SOAP / HTTP
Deploy PHP
Install Apache
Create VM
Ongoing research...

Portability & Interoperability

Moodle – A school software based on LAMP

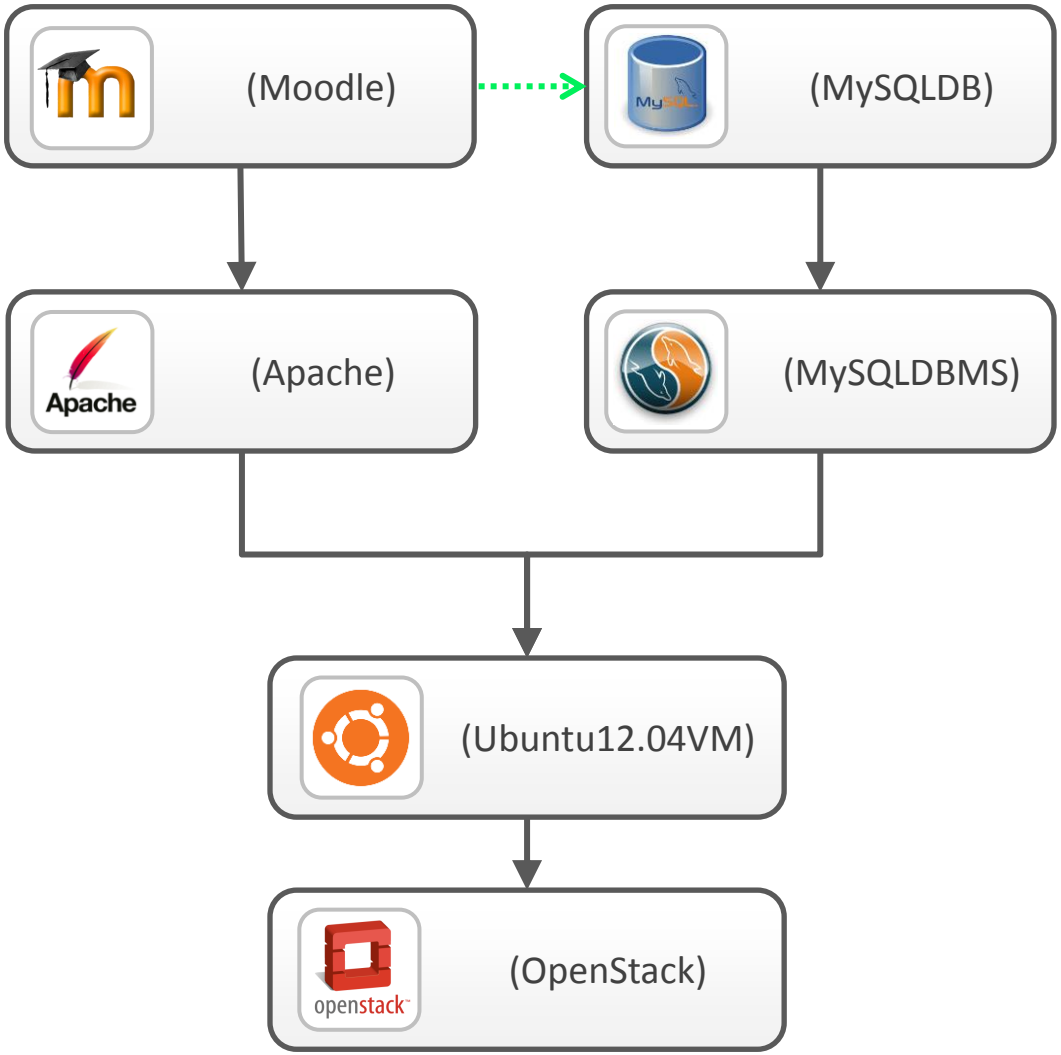


Where to host the application?

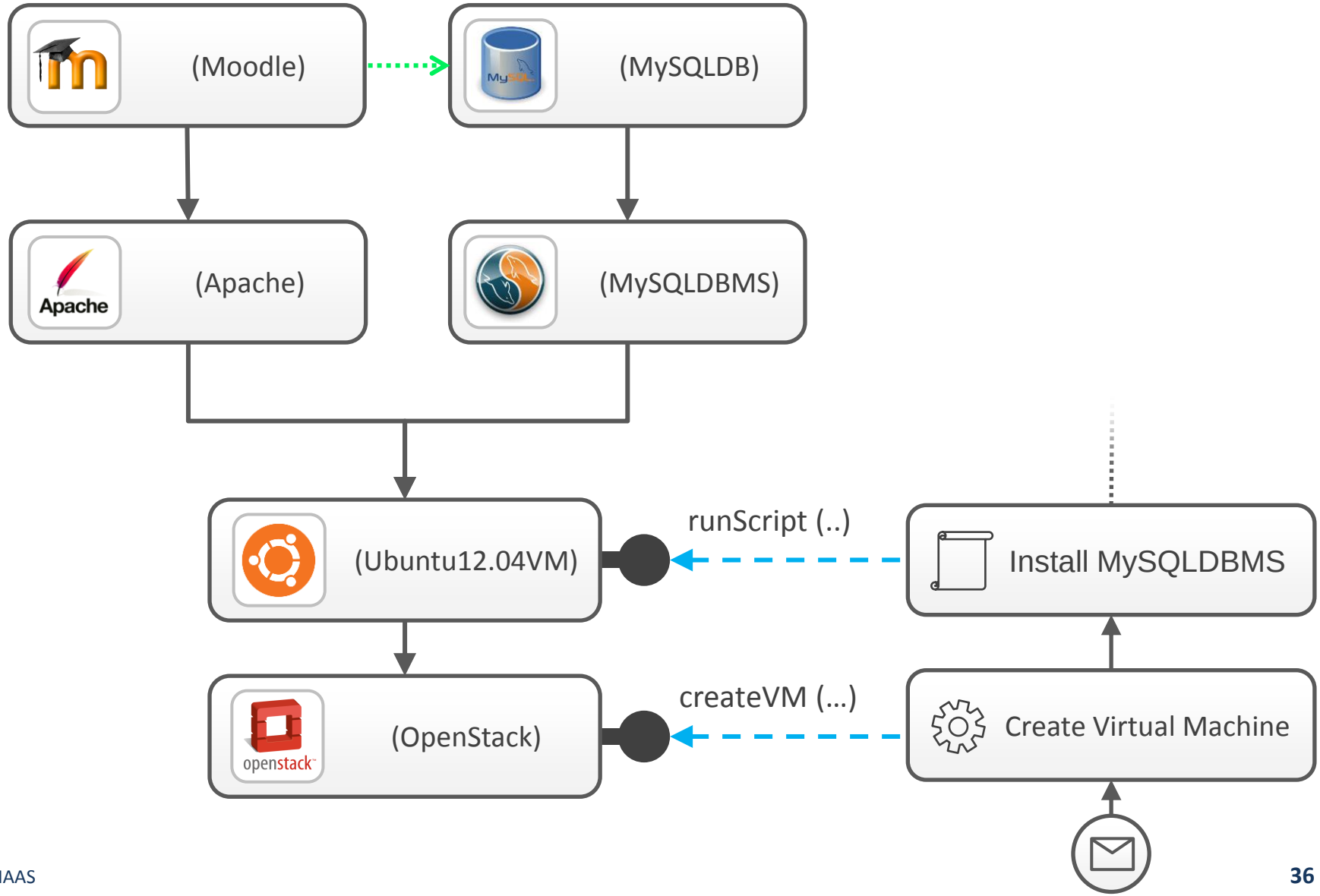
Moodle – A school software based on LAMP

Would be a cool thing, right?

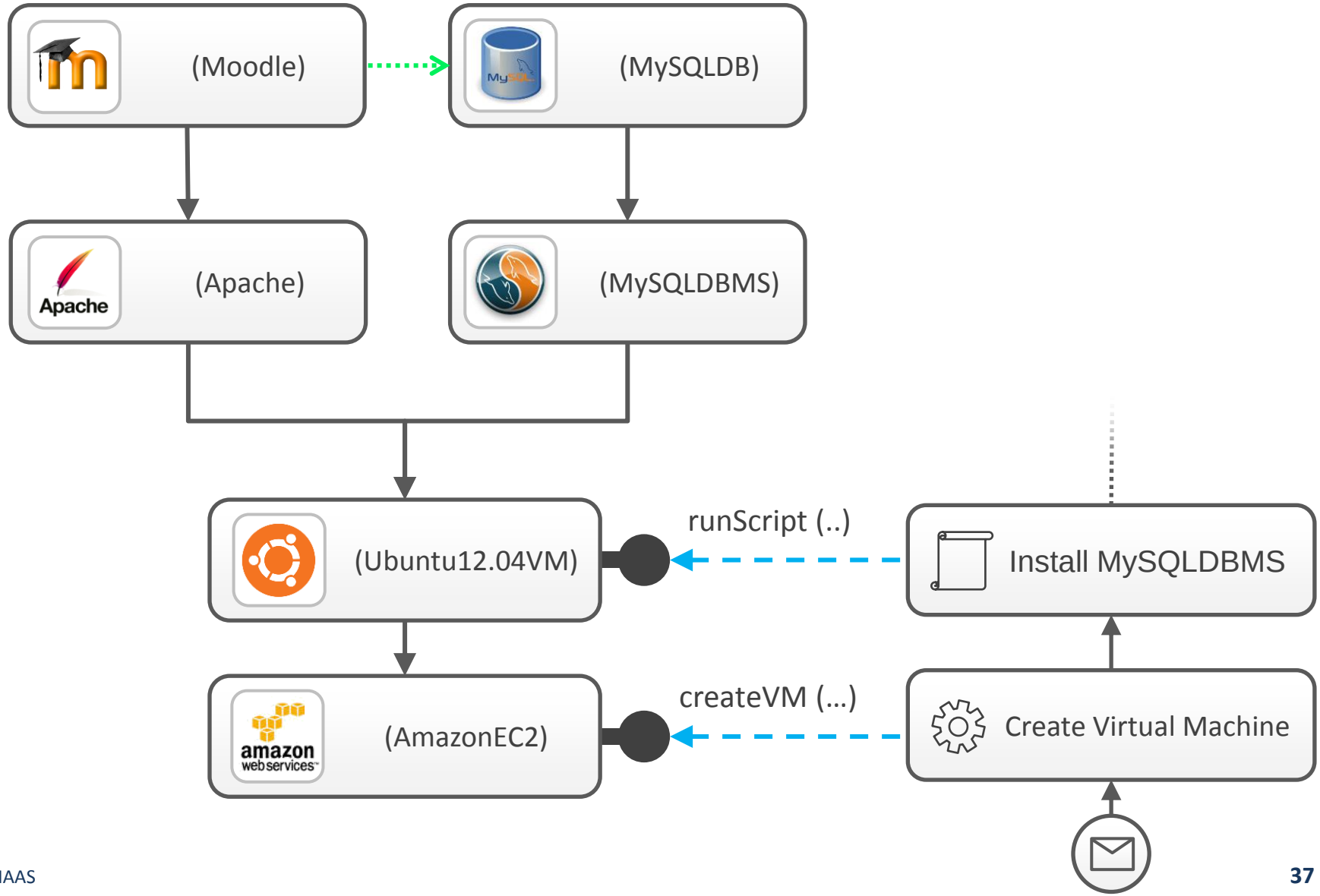
Moodle – A school software based on LAMP



Exchangeable Node Types: OpenStack and AmazonEC2



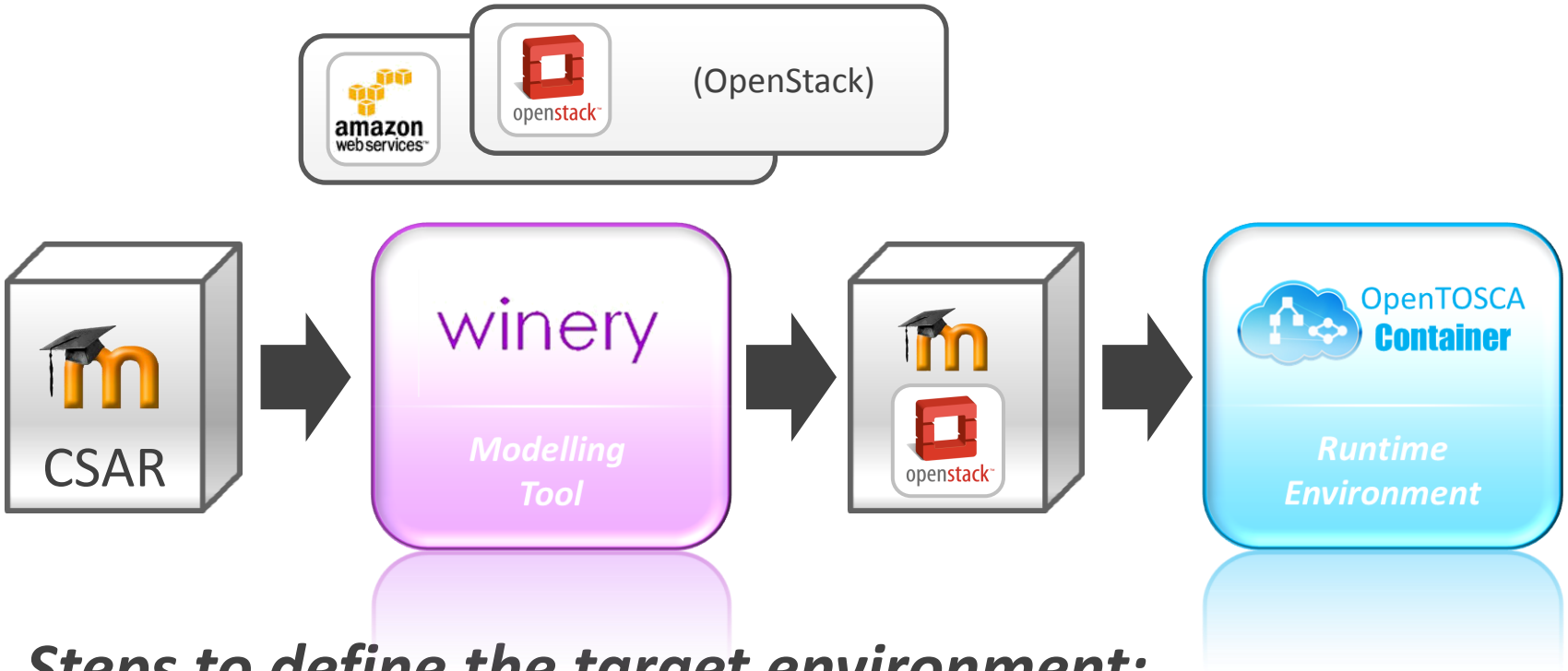
Exchangeable Node Types: OpenStack and AmazonEC2



Input Message of Provisioning Plan

- We were able to design a uniform interface for both „createVM“ operations
  - Parameters of both proprietary APIs are similar and can be mapped
  - For example, Amazon Region = OpenStack Endpoint
  - etc.
- ***Identical Interfaces = Identical Plan*** ☺
- All these parameters are exposed to the input message of the plan
  - In general, very flexible (and reusable!) implementation of Management Plans possible

The „workflow“ of defining the target environment



Steps to define the target environment:

1. *Open CSAR in Winery*
2. *Put the desired Node Type into the Topology*
3. *Safe CSAR and deploy it in OpenTOSCA*

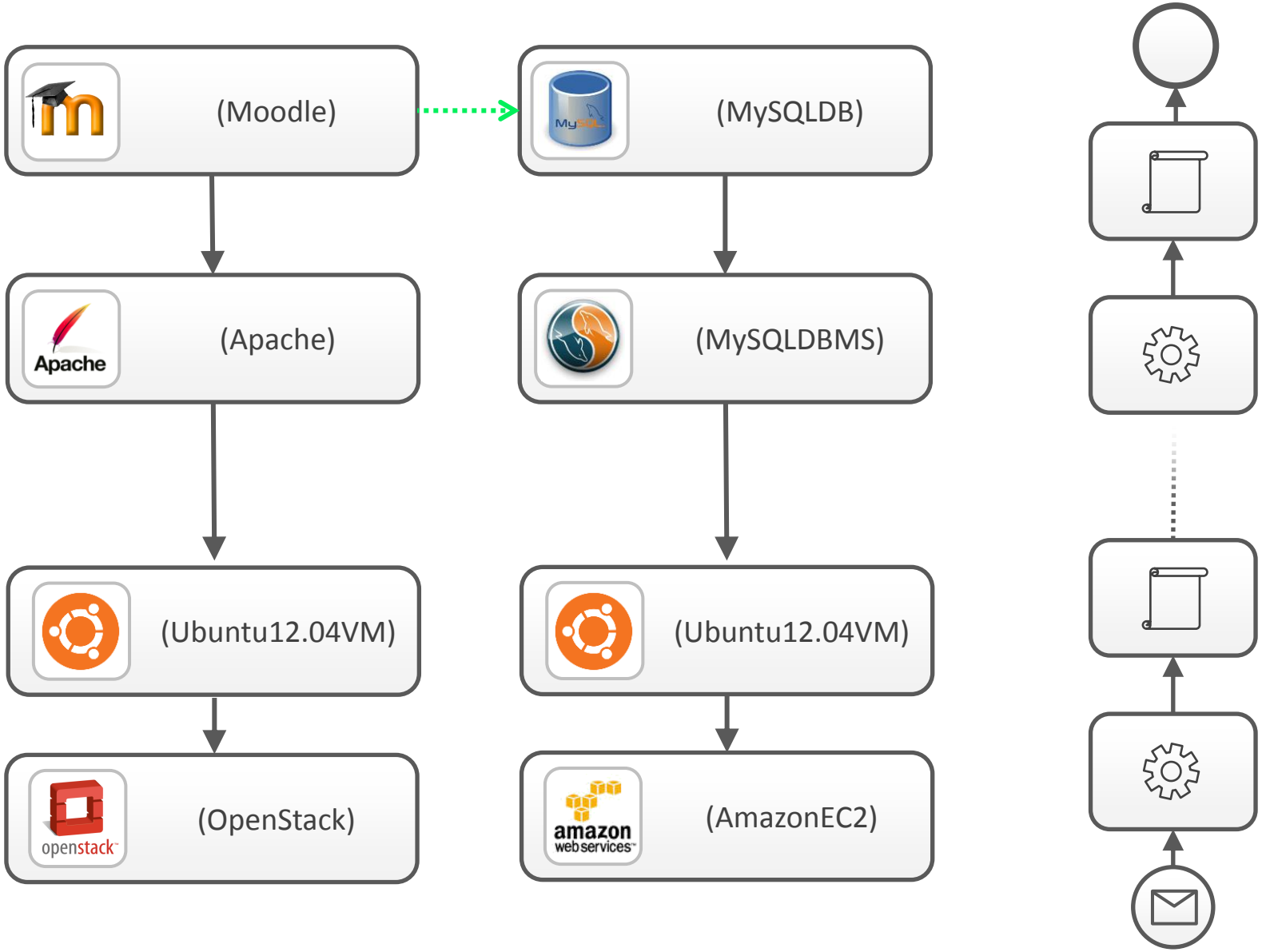
Self-contained CSARs

- This concept enables creating ***self-contained CSARs***
  - Contain management logic of different layers
    - IAs orchestrate infrastructure, platform, or software services
    - IAs to install components, e.g., scripts
  - All the logic is shipped with the CSAR

→ OpenTOSCA is ***not*** coupled to any specific Cloud or Management technology / provider

→ Can be ***extended by implementing new Node Types without modifying the container***

Hybrid Applications

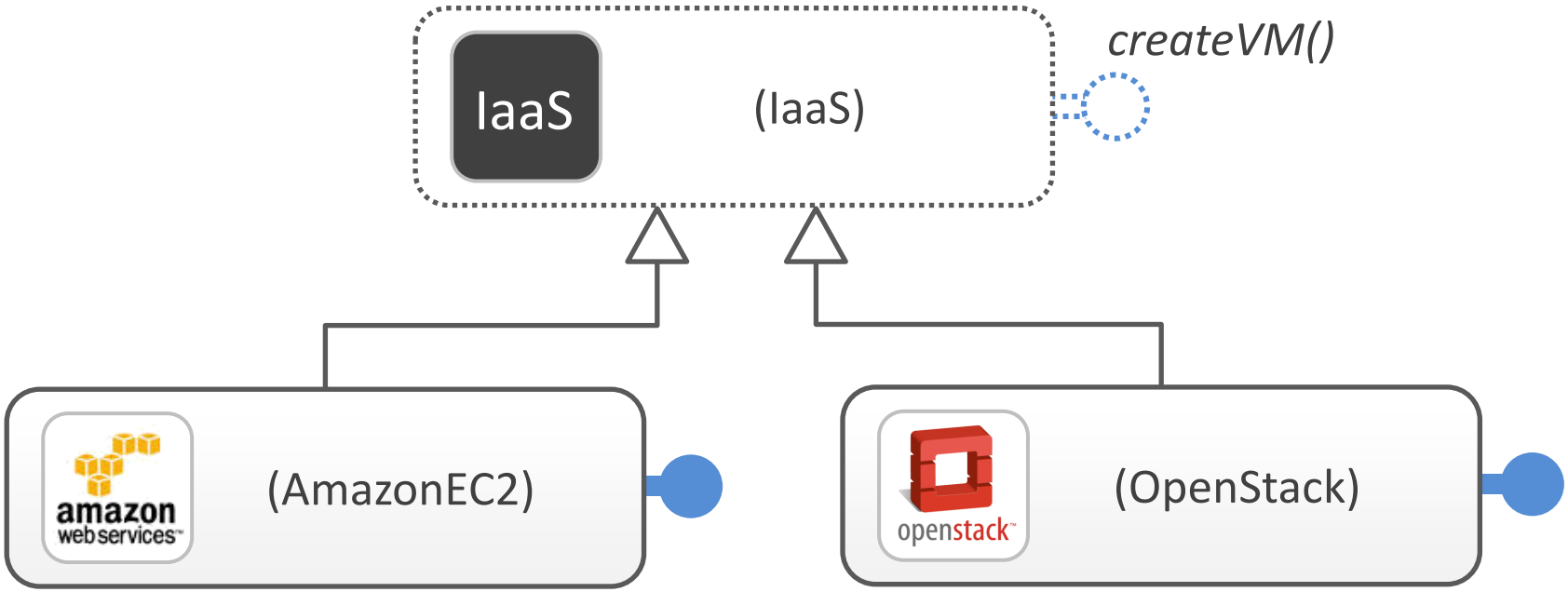


Advantages

- The OpenTOSCA container is ***completely independent from any concrete technology or provider***

- Management Plans can implement ***very complex management flows*** that act directly on the operations provided by Node Types…
  - … which can be customized arbitrarily

Advantages



- Standardizing (abstract) Node Types additionally supports this as it enables a seamless exchange
  - … no need to adapt plans for other providers ☺
  - … only the implementation ***IN*** the CSAR changes

  → Very extensible! Supports portability!

Advantages

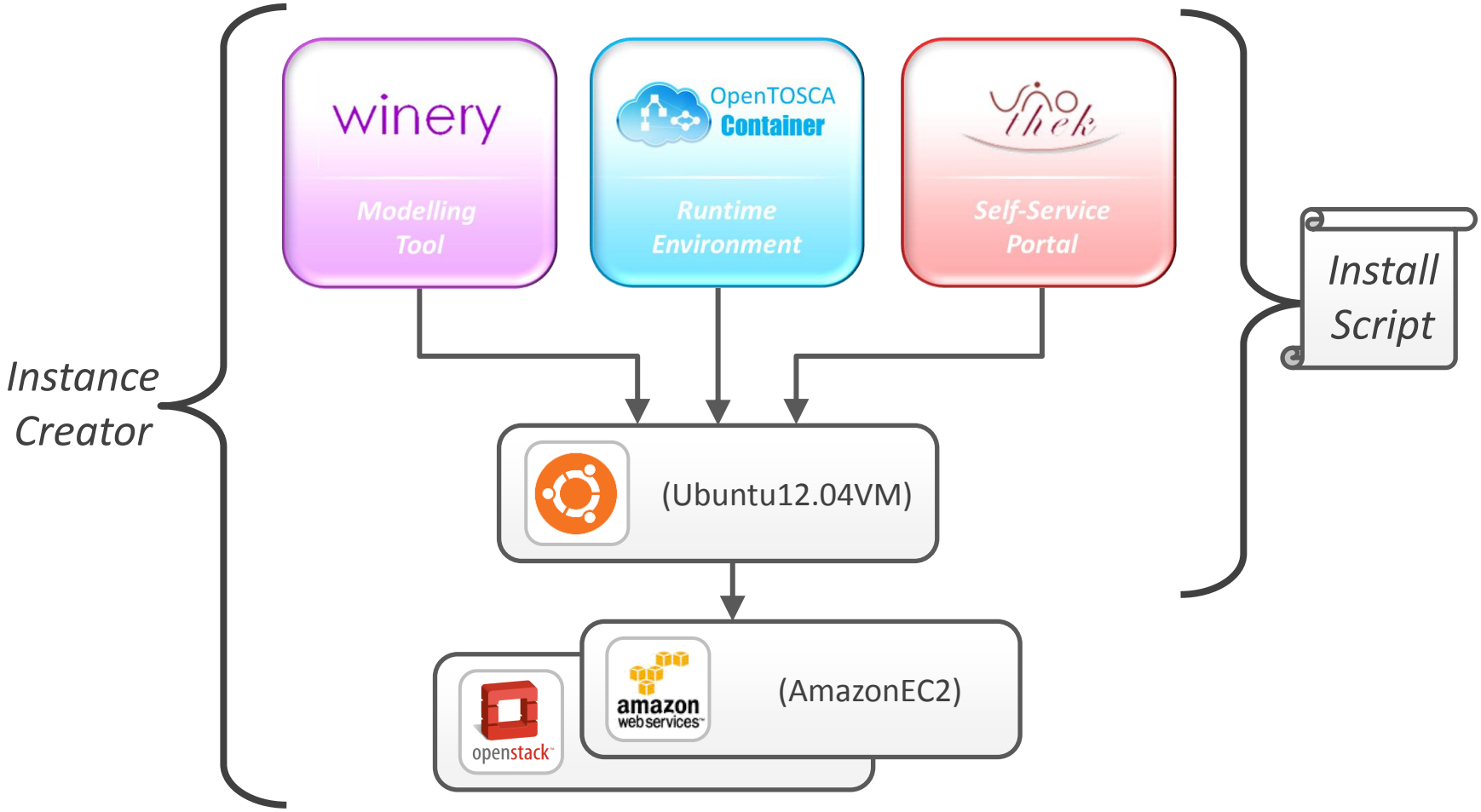
- Because the whole management logic is completely contained in the CSAR, the execution is the same every time…
  - …on each TOSCA Runtime Environment that is able to process the Plans and Implementation Artifacts

Challenges and Problems

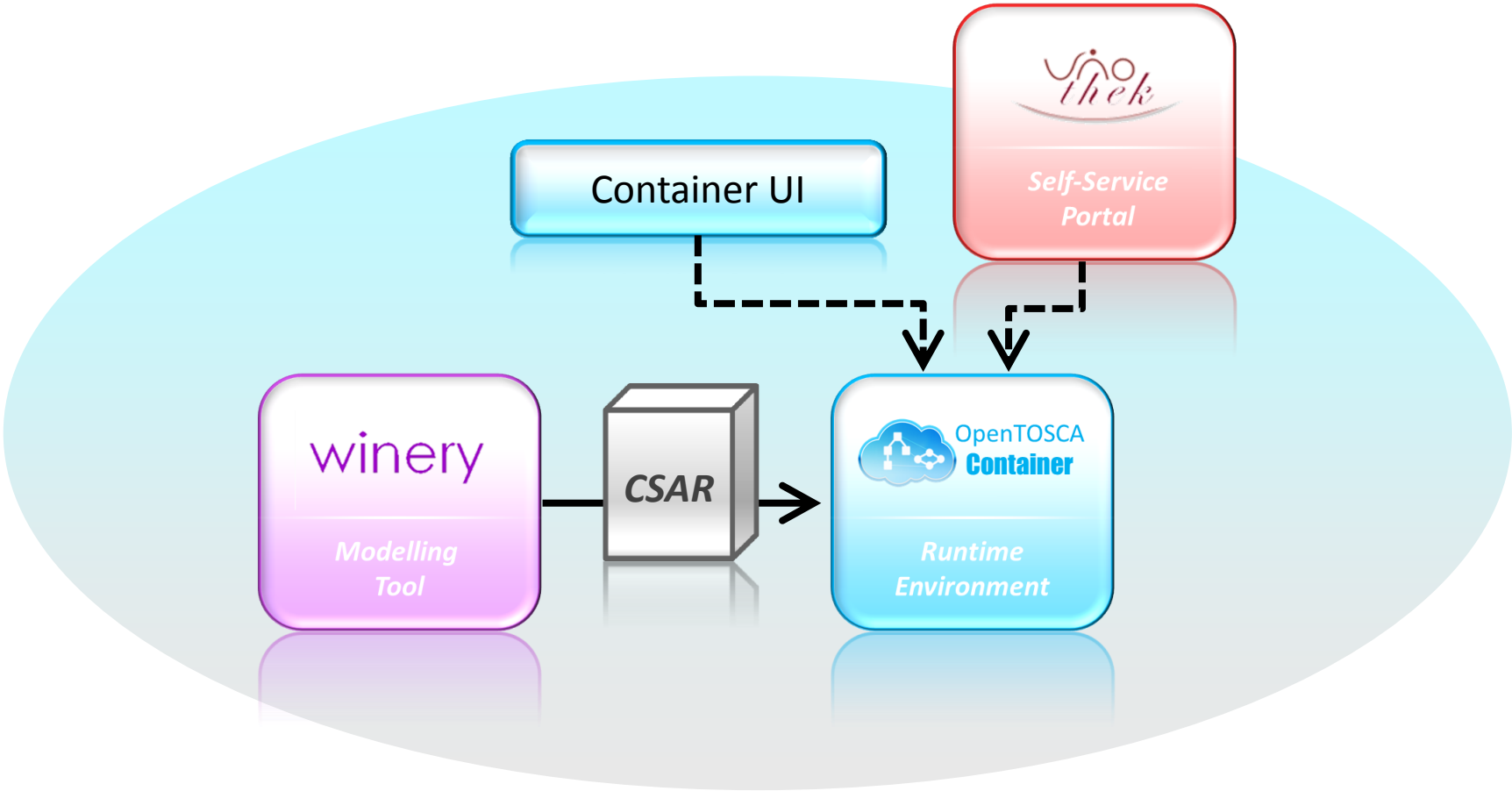
- Implementing „good“ Node Types not easy…
  - Interfaces and properties must be defined
  - Management logic must be implemented
  - However, as Java is supported for IAs, this is possible! ☺
- Management Plans must be created
  - However, the Operation Invoker eases that ☺
    - Abstraction from IA implementations
    - Uniform and simple SOAP / HTTP interface
    - Asynchronous processing supported
    - BPEL fragments available

How to work with the OpenTOSCA Ecosystem?

Install OpenTOSCA



www.demo.opentosca.org



Thank you for your attention!