The Open Source Cloud Stack: OpenStack and TOSCA

Tim Waizenegger
University of Stuttgart,
Institute of Parallel and Distributed Systems,
Universitätsstr. 38,
70569 Stuttgart, Germany
tim.waizenegger@ipvs.uni-stuttgart.de
http://www.ipvs.uni-stuttgart.de

Agenda

- **Project Introduction**
- Security Aspects
- OpenStack components and concepts
- Private cloud installation on IBM PureFlex
- Automating OpenStack from a TOSCA environment

Overview

SECADA

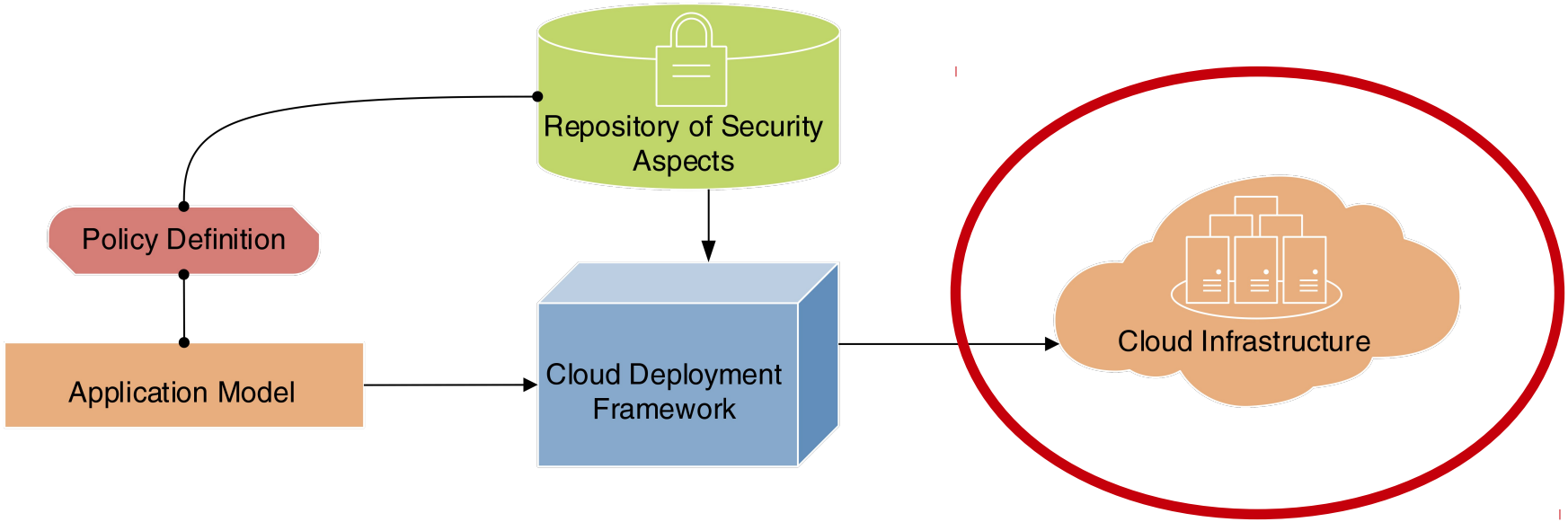
SECurity **A**spects for cloud **D**eployment **A**utomation

- Provide **security-aspects** for different components and functionalities of cloud services
- Define the security requirements of cloud services in a **high-level language** to make them human-readable and comparable while still being precise
- **Translate the high-level definition** of security requirements into specific instructions for the deployment of the cloud service at hand
- Integrate **security-aspects into cloud services models** for automated provisioning

Overview

SECADA

SECurity **A**spects for cloud **D**eployment **A**utomation



Overview

- Requirements for cloud service delivery depend on service model
  - **IaaS:** management of (physical) resources; allocation, provisioning, sharing, …
  - **PaaS:** operating platform services; managing instances/users, scaling, maintenance
  - **SaaS:** operating complex software topologies, automated provisioning of new instances/users

Overview

- Cloud applications are **composite applications**
- Higher-level services can be built on top of lower-level services
  - Enable the re-use of functionality
  - Separation of duties

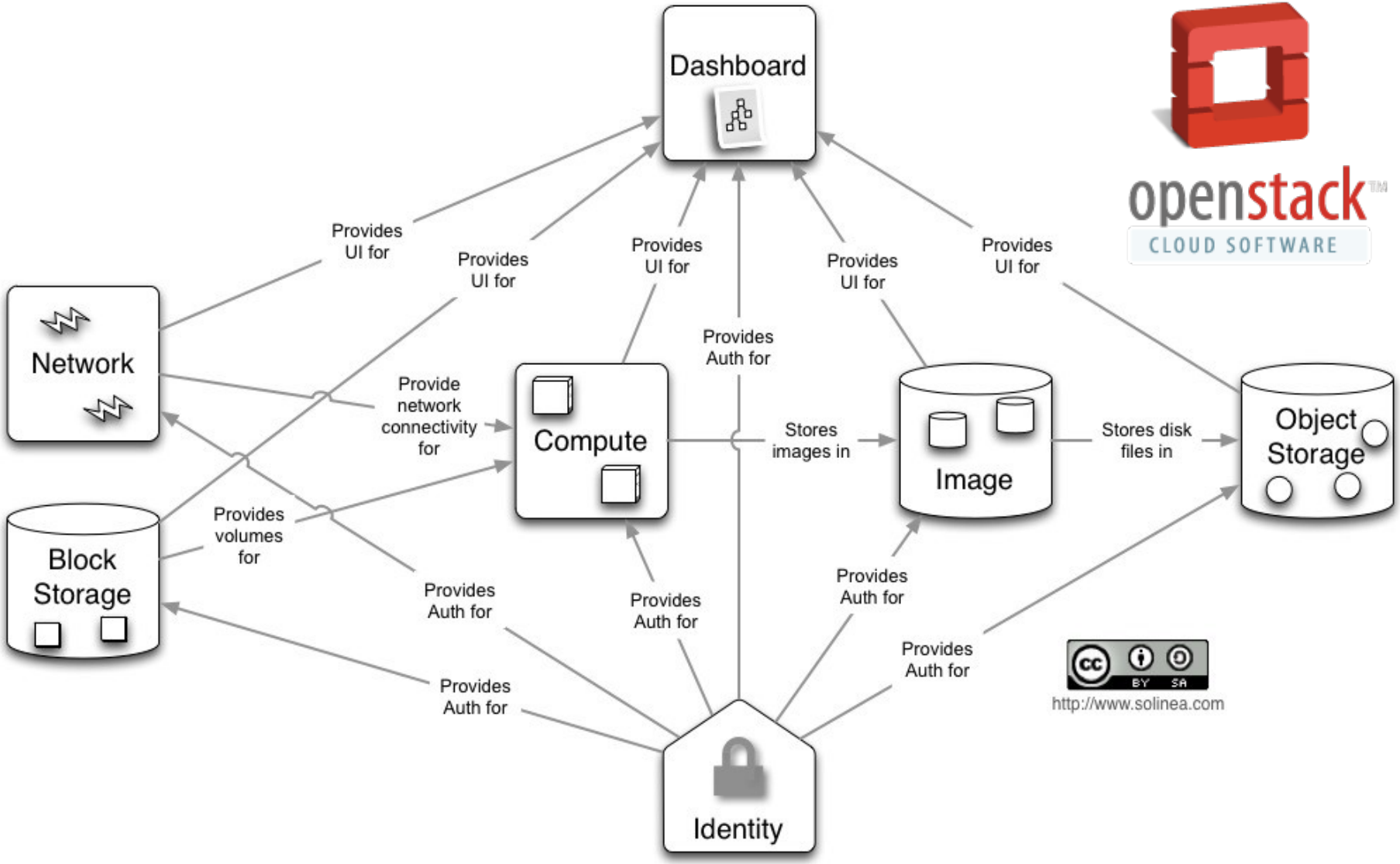
Goal: deploy security-enhanced applications using TOSCA templates

Requirement: availability of components as services

Agenda

- Project Introduction
- Security Aspects
- **OpenStack components and concepts**
- Private cloud installation on IBM PureFlex
- Automating OpenStack from a TOSCA environment

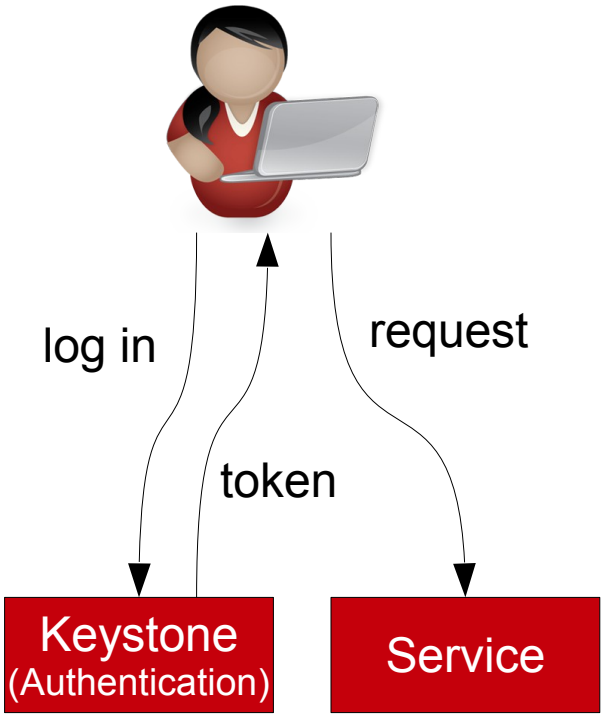
OpenStack Components



OpenStack Concepts

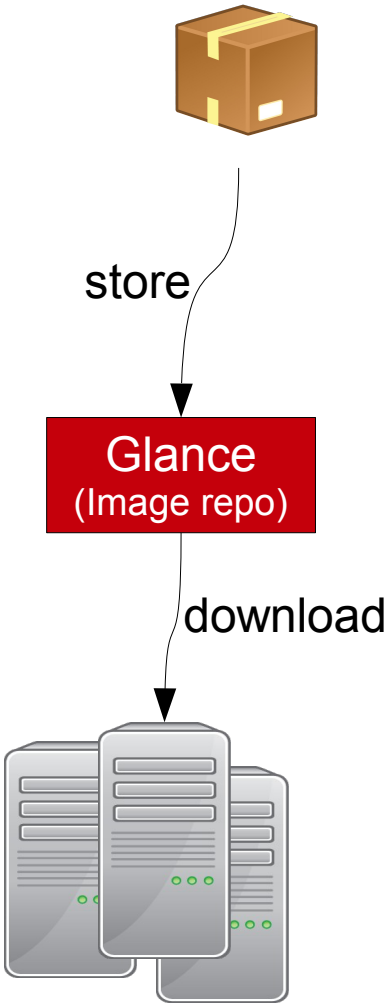
- Functionality separated into loosely coupled components
- No shared datastore
- Supports arbitrary distribution of components on nodes
- Components interact using a versioned HTTP-API
- All API calls require authentication
- No built-in high-availability/redundancy on a system level

OpenStack – Keystone



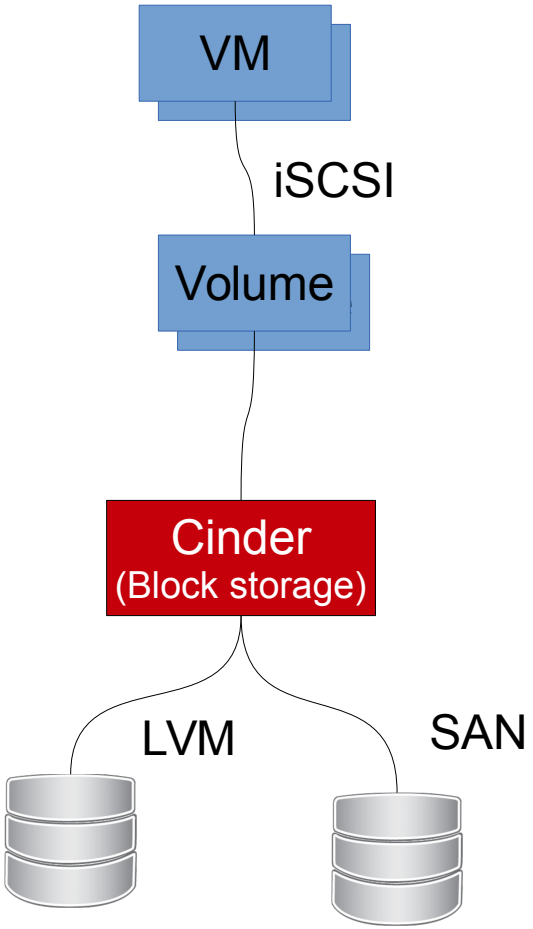
- Federated authentication
- Mandatory component
- API-consumers use tokens to authenticate against services
- Keystone validates tokens

OpenStack – Glance



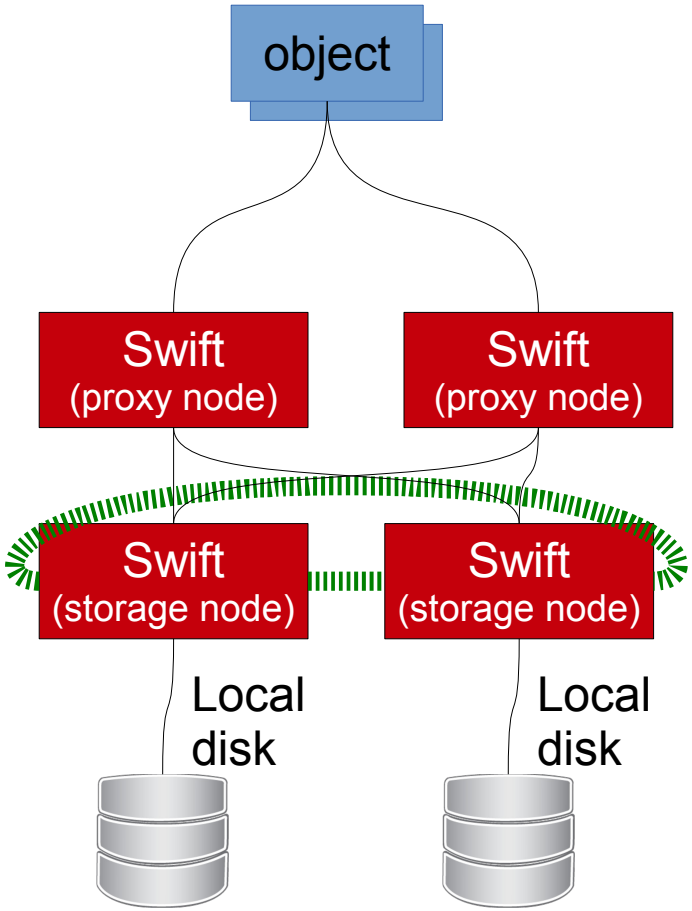
- Stores VM-Images
  - Internal (local) storage or reference to external location
- Provide download-endpoint for hypervisors
- **No support for creating images**

OpenStack – Cinder



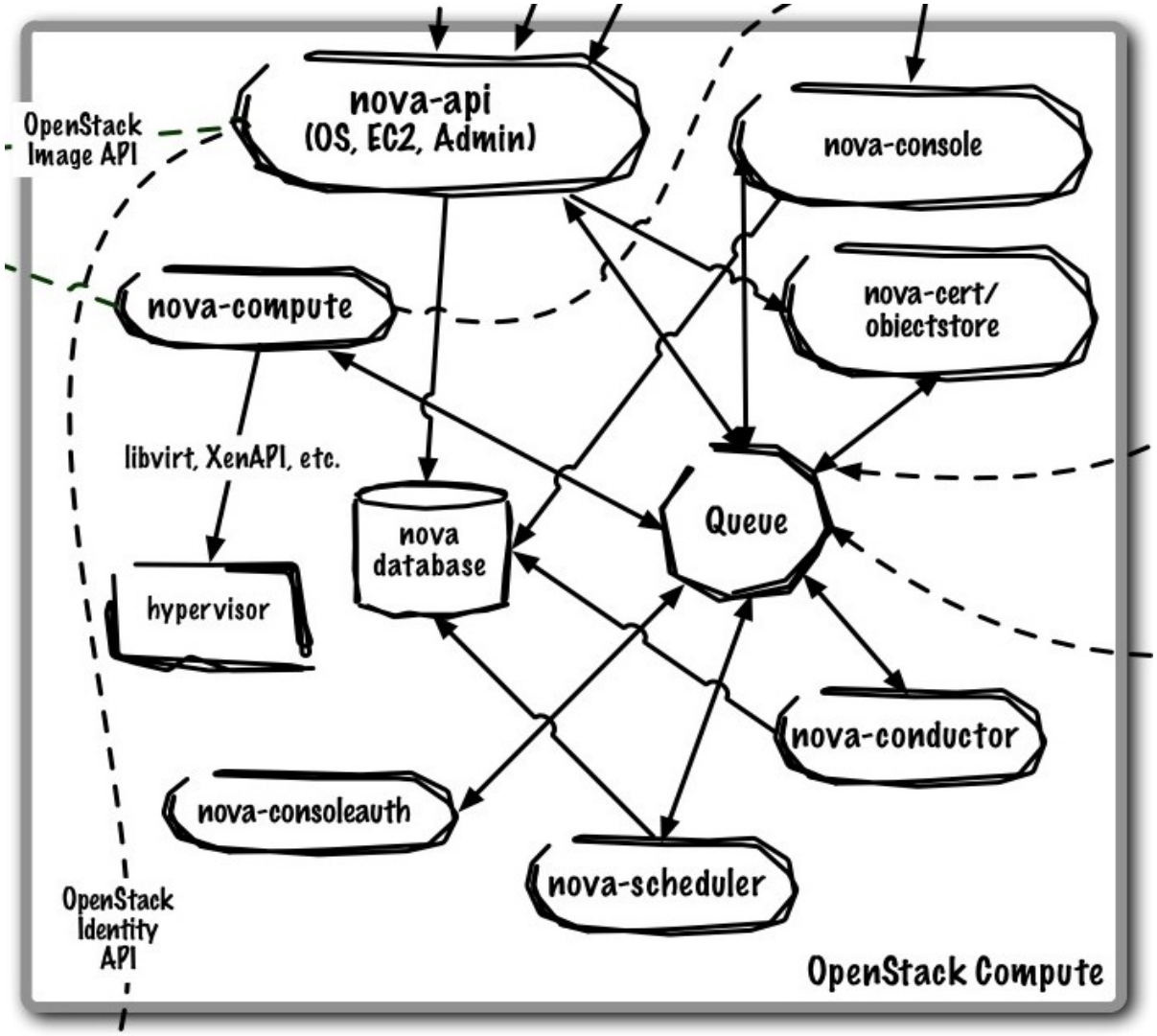
- Provide block storage volumes for VMs
- One-to-one association between volume and VM (no shared storage)
- Multiple back ends
  - Linux logical volume manager
  - Direct interaction with compatible SAN

OpenStack – Swift



- Open-sourced project by Rackspace
- Integrated high-availability
- Replication of objects in replication-ring
- Redundant proxy-nodes
- Proxy-nodes forward requests to storage nodes that have the requested object

OpenStack – Nova

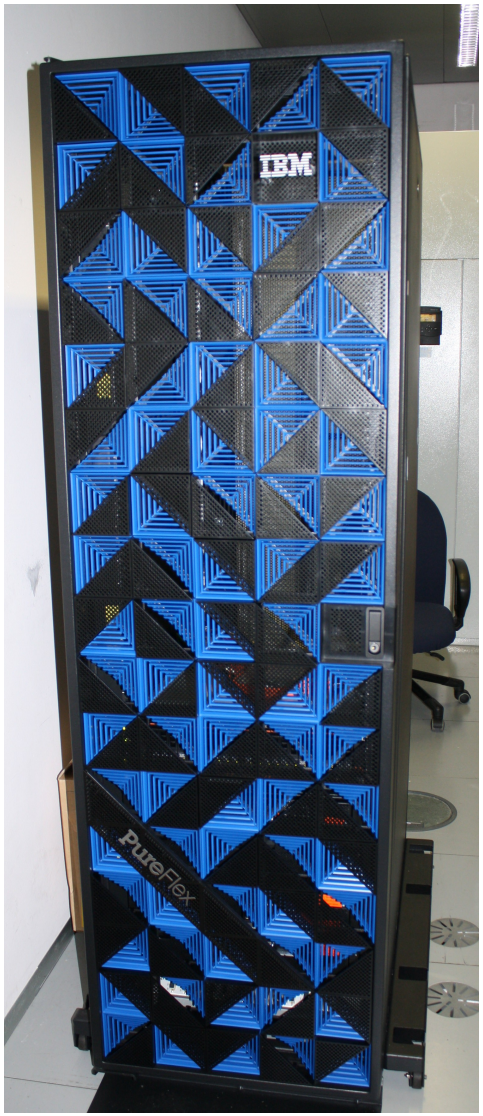


- Provide IaaS API
- Control hypervisors
- Manage VMs
- Connect VMs to
  - Storage
  - Network
- Sub-components can be distributed

Agenda

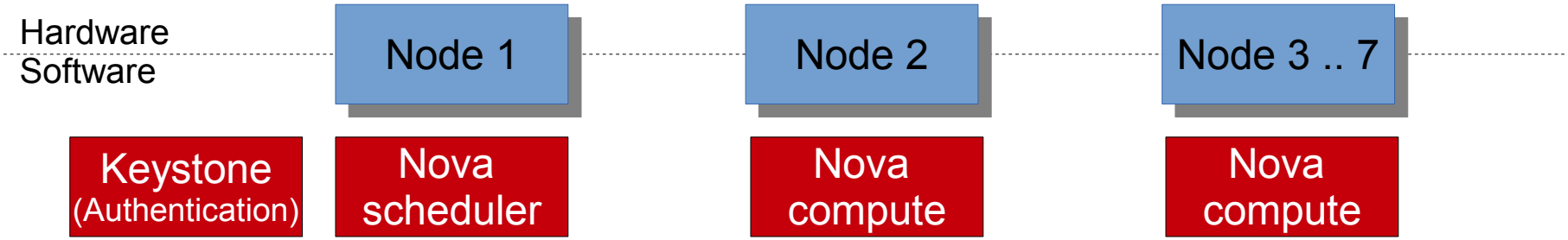
- Project Introduction
- Security Aspects
- OpenStack components and concepts
- **Private cloud installation on IBM PureFlex**
- Automating OpenStack from a TOSCA environment

IBM PureFlex based Installation

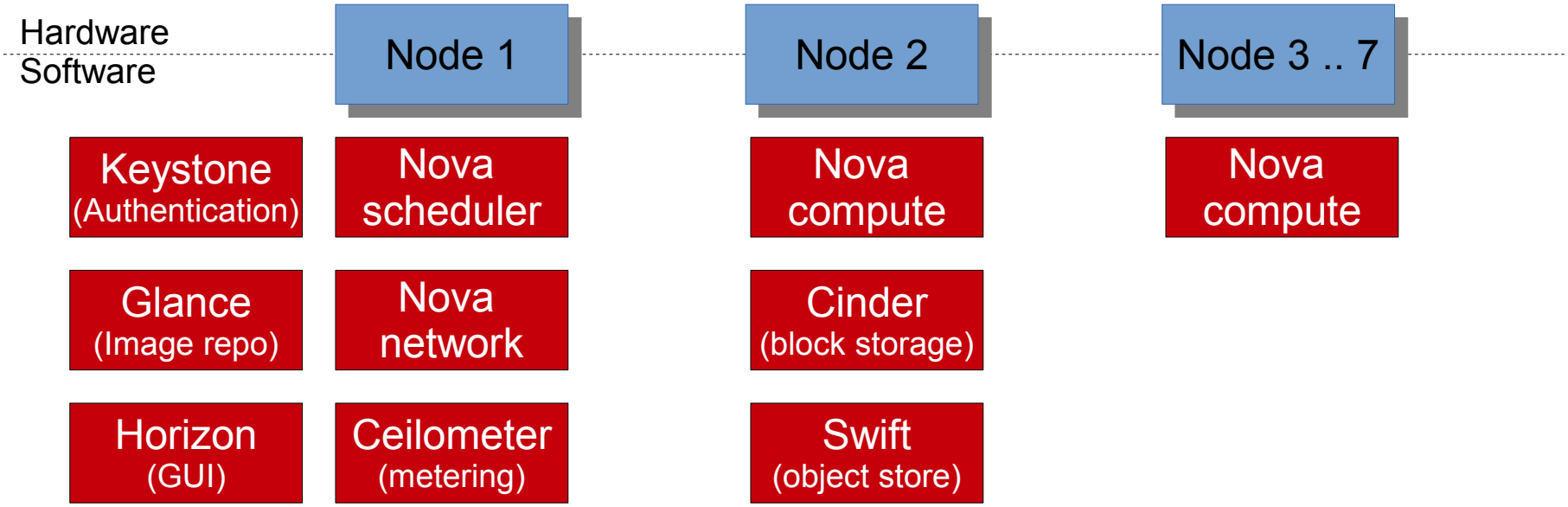


- High-density server rack, successor to IBM Blade-Center
- Currently 7 nodes, each
  - 2x 6-core Intel Xeon E5 2,3 GHz
  - 256GB main memory
  - 300GB SAS storage
- Storevize V7000 SAN
  - 24 SAS Disks
  - ~10TB usable capacity

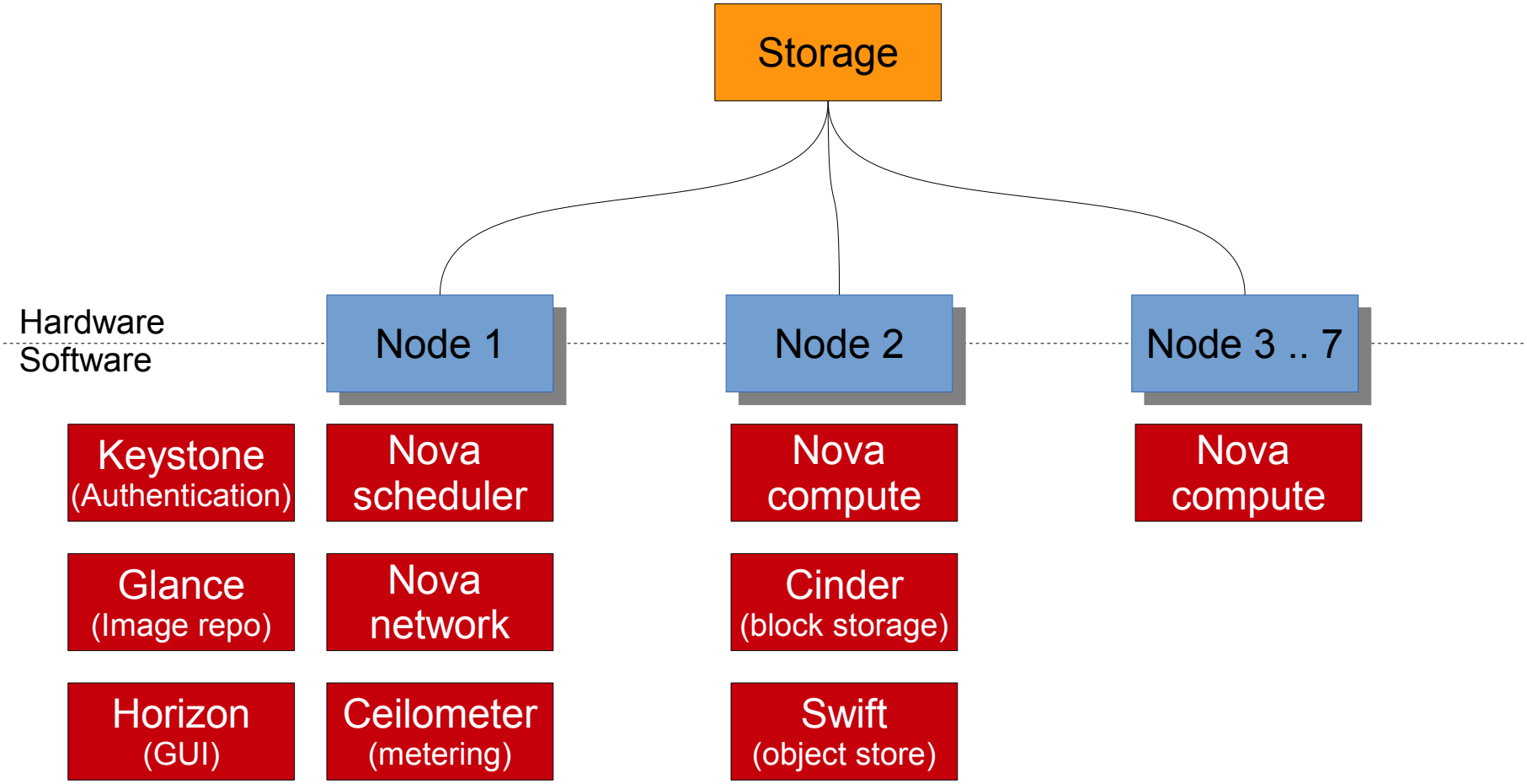
Cluster setup



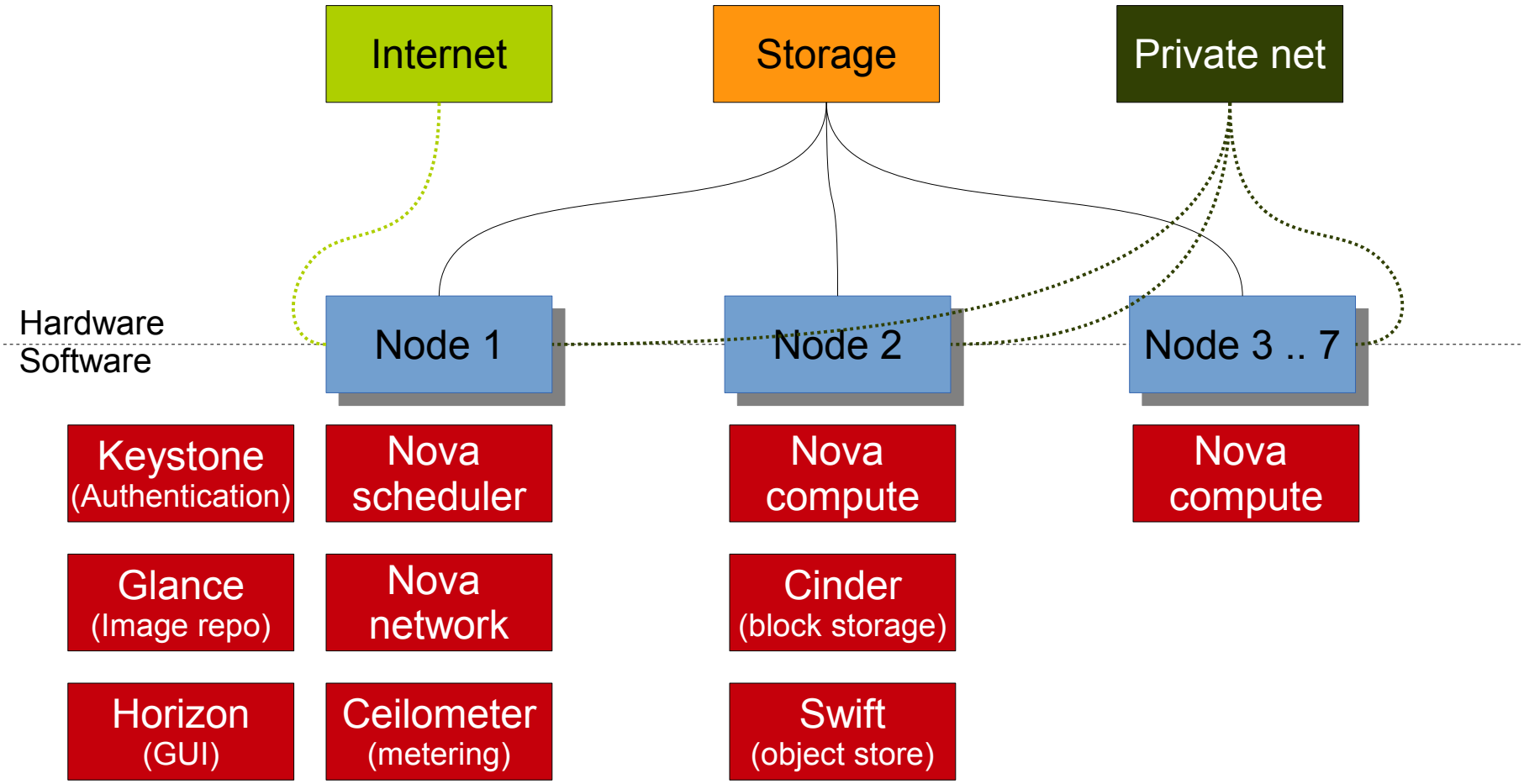
Cluster setup



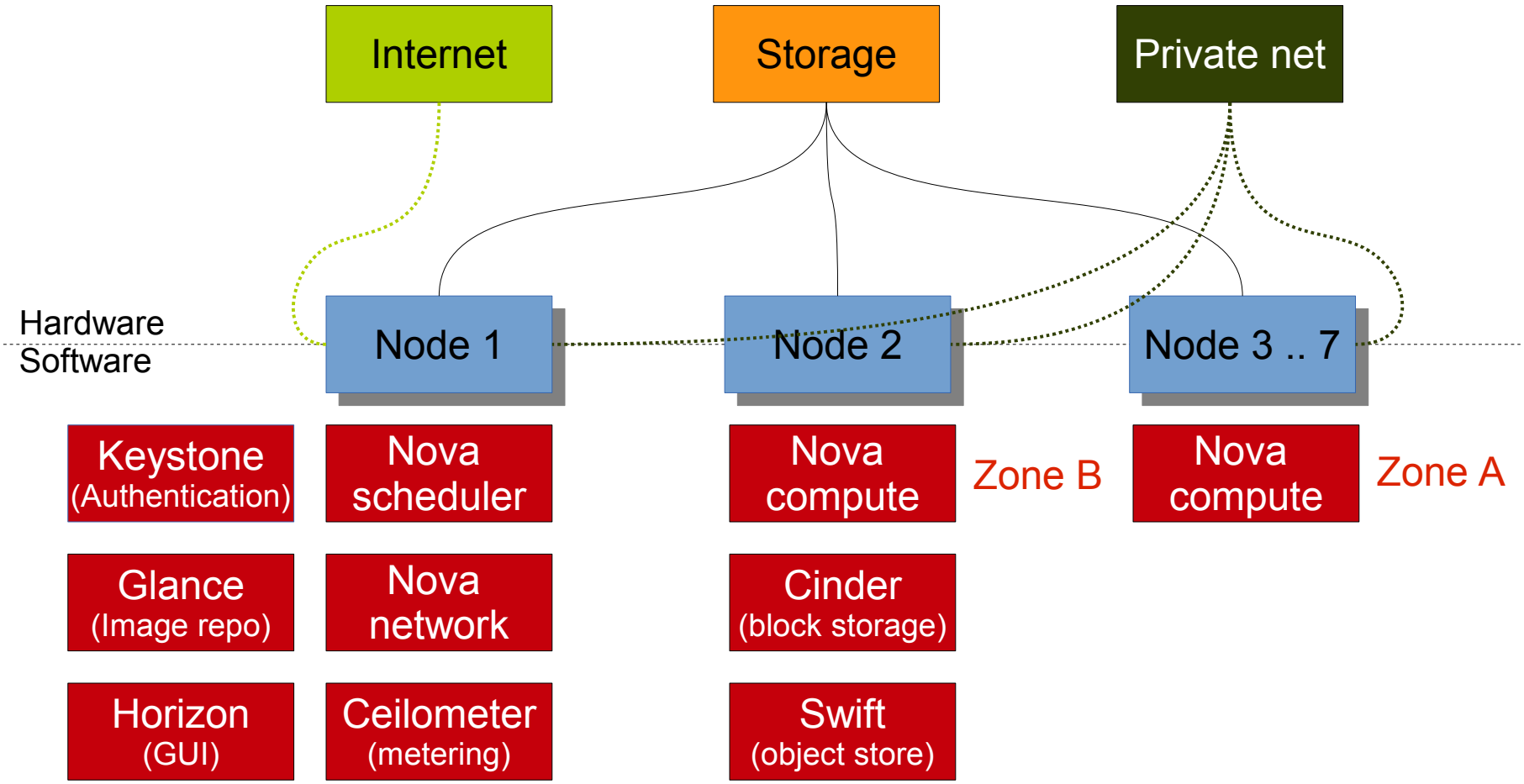
Cluster setup



Cluster setup



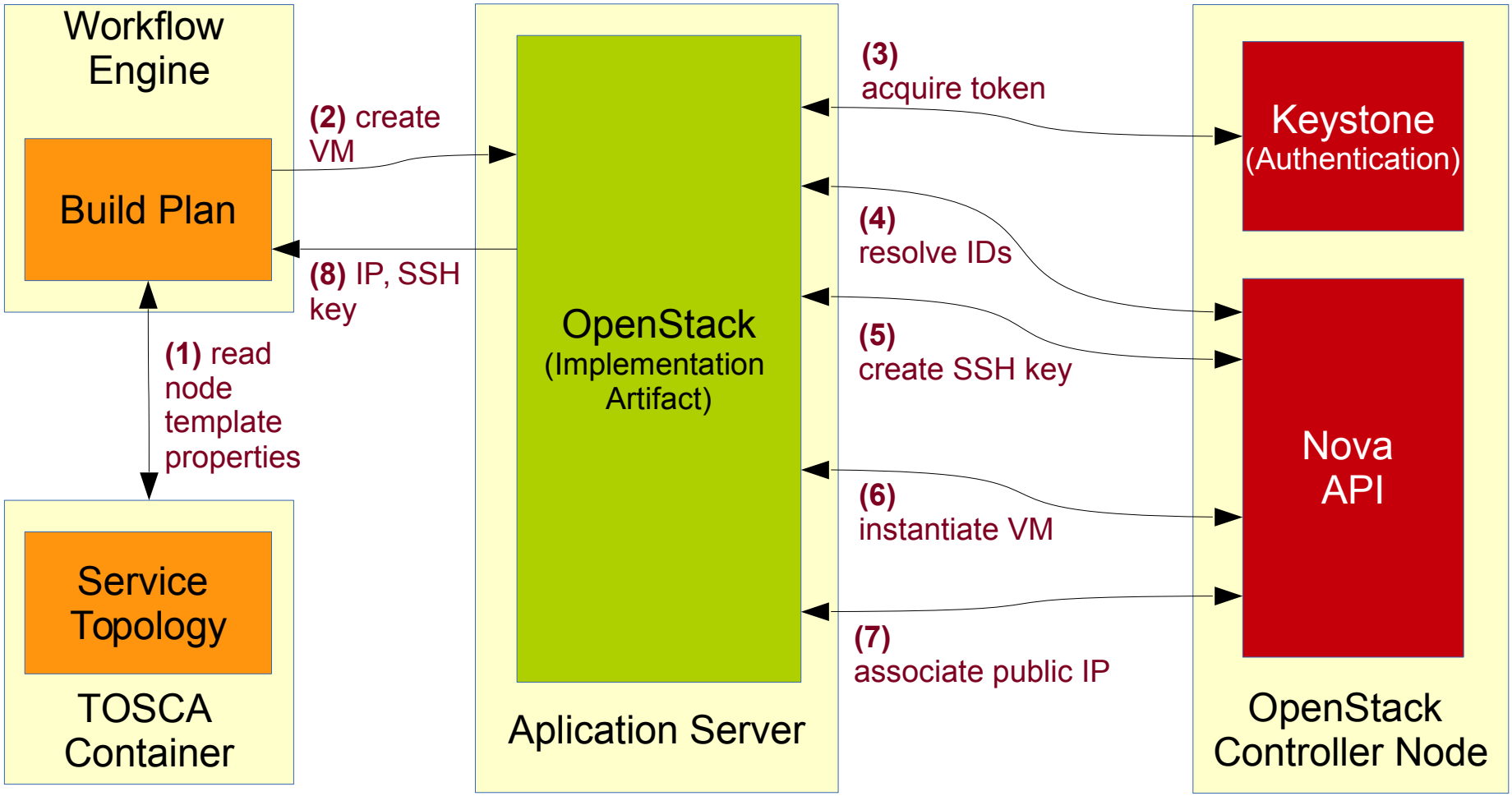
Cluster setup



Agenda

- Project Introduction
- Security Aspects
- OpenStack components and concepts
- Private cloud installation on IBM PureFlex
- **Automating OpenStack from a TOSCA environment**

TOSCA Integration



Thank You!

Tim Waizenegger
University of Stuttgart,
Institute of Parallel and Distributed Systems,
Universitätsstr. 38,
70569 Stuttgart, Germany
tim.waizenegger@ipvs.uni-stuttgart.de
http://www.ipvs.uni-stuttgart.de