Service Provisioning and Automation in the Cloud

A practical usage of cloud technology to rationalise and automate software testing, certification and deployment

Marc-Elian Bégin
SixSq

SixSq Sàrl

- Founded in 2007 by three partners
- Based in Geneva, Switzerland
- Privately held, limited liability company

- sixsq.com

SixSq Services

- Consultancy
  - Agile software development processes and practices
  - Automation of those processes and practices
  - Cloud and virtualization technologies
- Software development
  - Distributed systems
  - Cloud-based domain specific vertical solutions
- Training and coaching
  - Agile and Scrum training
  - Coaching service to put theory into practice

SixSq Products

- SlipStream
  - Automatic creation of new virtual machines
  - Automatic multi-machine deployment and orchestration of services
  - Runs on public or private cloud infrastructure
- StratusLab - European collaboration
  - Complete IaaS Cloud distribution
  - Open source

Collaborations and Partnerships

- Building ‘Cloud Read Pack’ hardware/software private cloud solution with IBM and Darest

- Amazon Independent Software Vendor

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A European cloud computing partnership: big science teams up with big business

HELIX NEBULA THESCIENCECLOUD

Strategic Plan

- Establish multi-tenant, multi-provider cloud infrastructure
- Identify and adopt policies for trust, security and privacy
- Create governance structure
- Define funding schemes

CERN

To support the computing capacity needs for the ATLAS experiment

EMBL

Setting up a new service to simplify analysis of large genomes, for a deeper insight into evolution and biodiversity

esa

To create an Earth Observation platform, focusing on earthquake and volcano research

Atos · Capgemini CONSULTING.TECHNOLOGY.OUTSOURCING · CloudSigma · egi · interoute from the ground to the cloud · logica be brilliant together · OpenNebula.org The Open Source Toolkit for Cloud Computing · orange Business Services · SAP · the SERVER LABS the IT architects · sixsq · Telefónica · terradue 2.0 · THALES · T-Systems

Main Customers

- Atos
- European Broadcast Union (Eurovision)
- ESA/ESTEC
- ESA/ESOC
- And more... I can’t talk about it yet, but it’s exciting!

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My Cloud Definition

My Cloud Definition...

Virtualisation + Simple API (REST is best :-)

- Yes!... this implies a IaaS foundation

- What's not in my definition:
  - Public/Private? Depends who takes care of elasticity
  - How you pay for the resources

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Why we need automation?

Silo Development

Silo Development

Dev

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Silo Development

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Silo Development

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Silo Development

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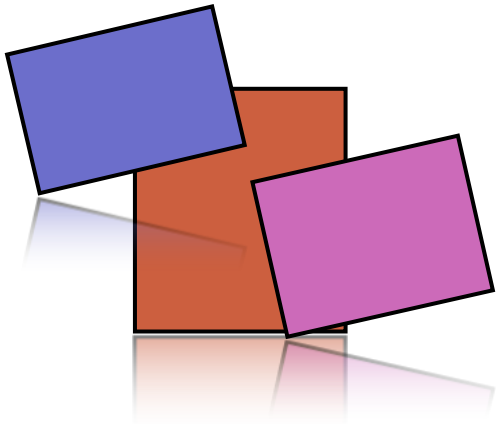
Silo Development



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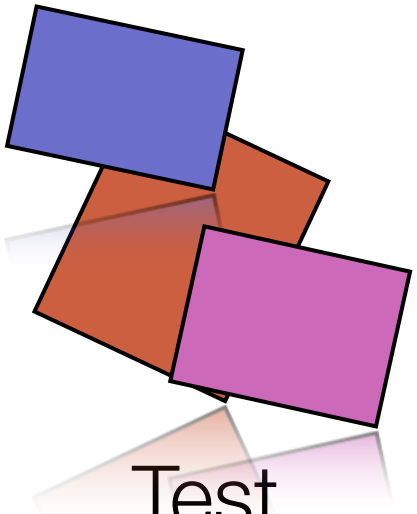

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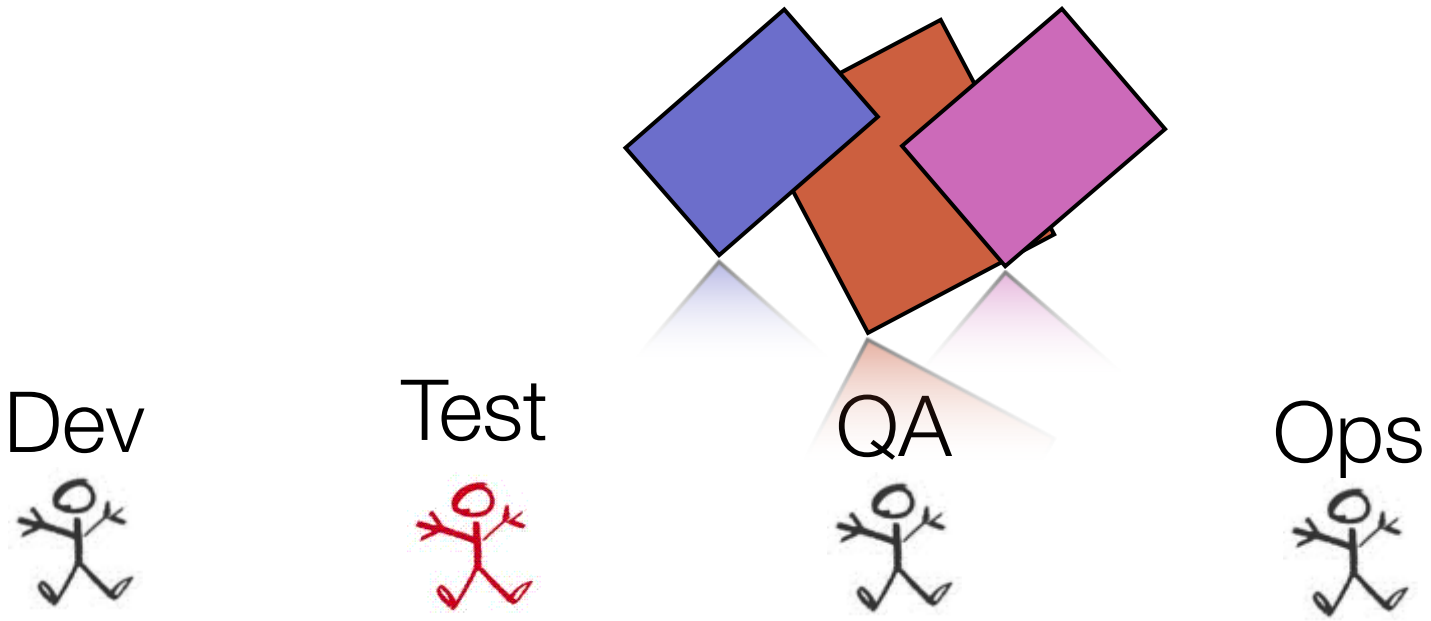

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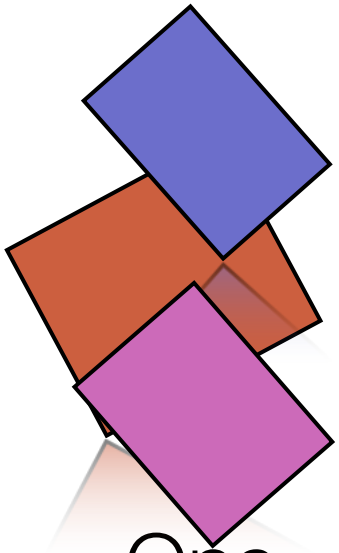

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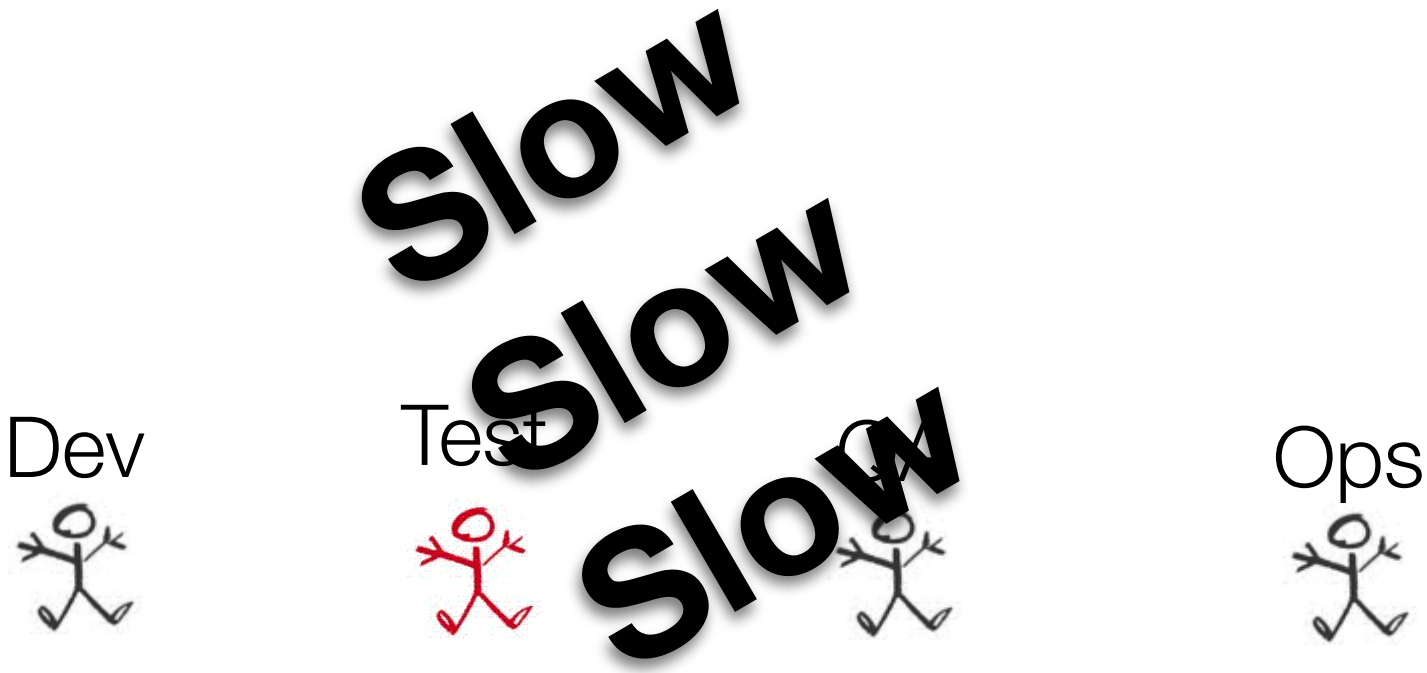

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On-Demand Provisioning

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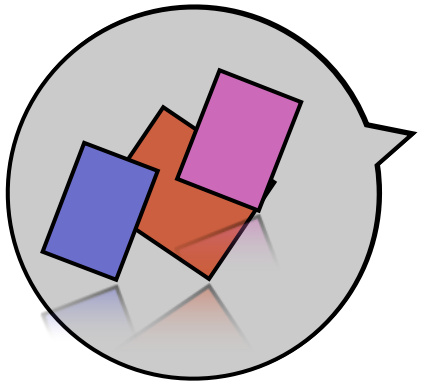
On-Demand Provisioning



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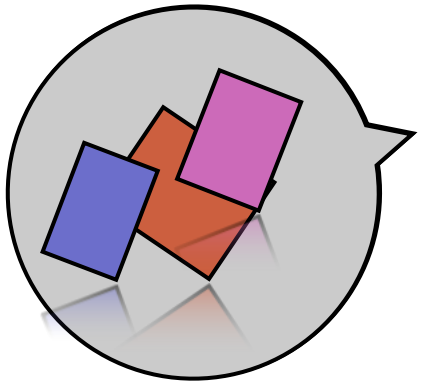

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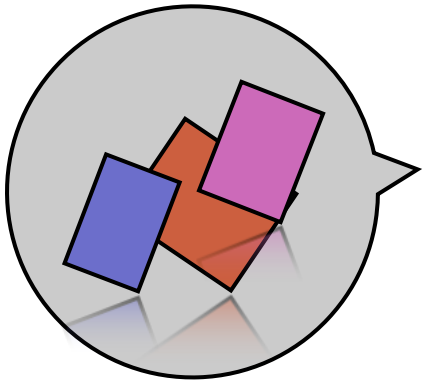

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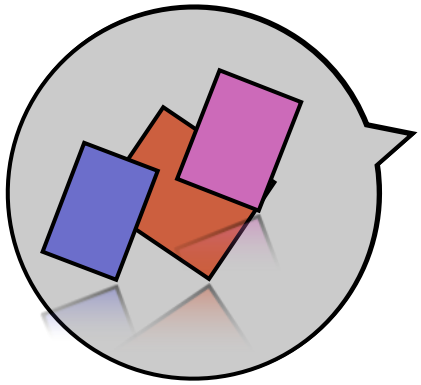

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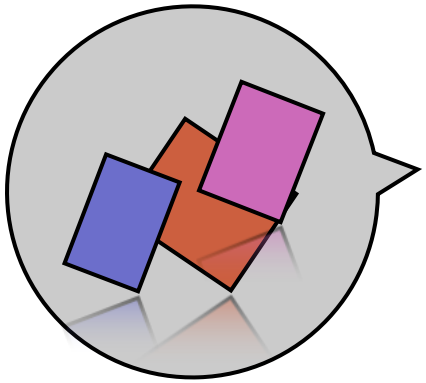

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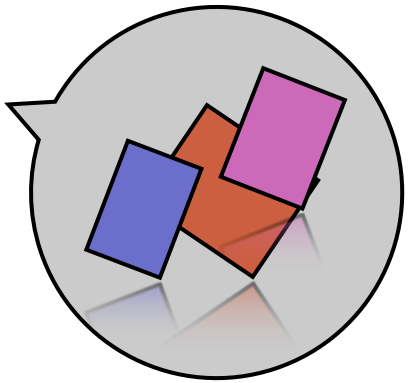

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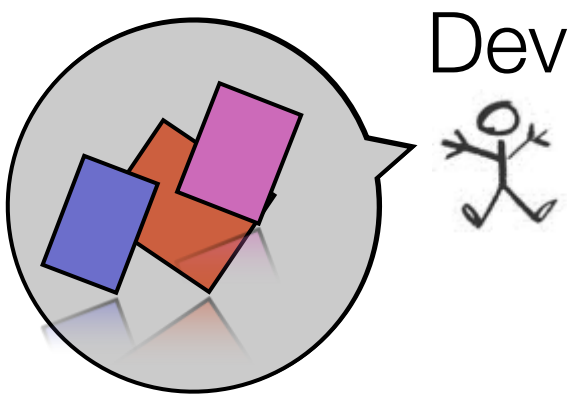

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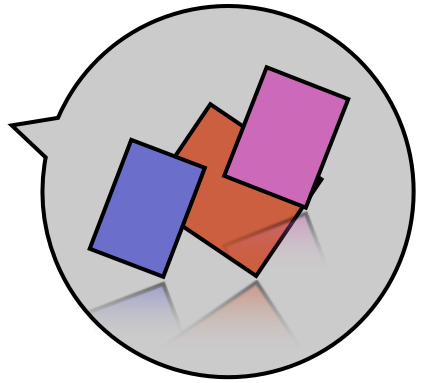

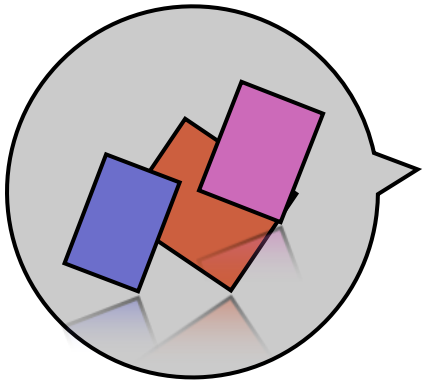

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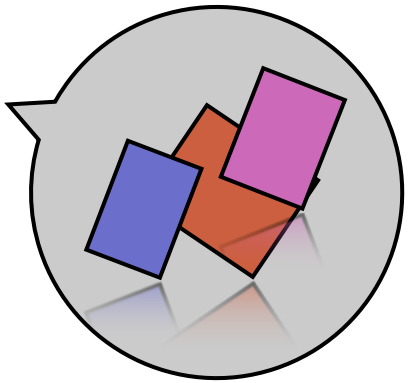

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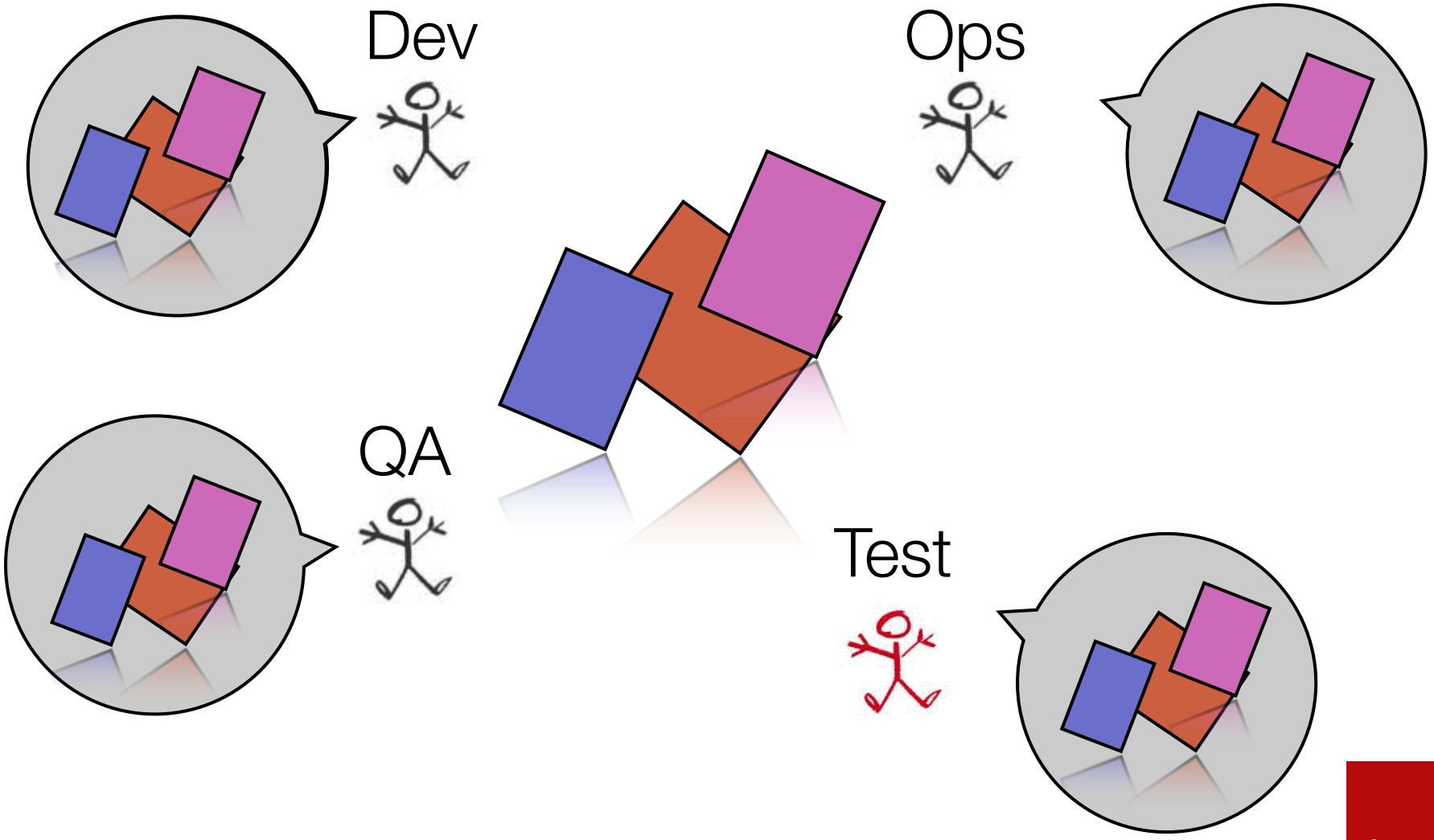

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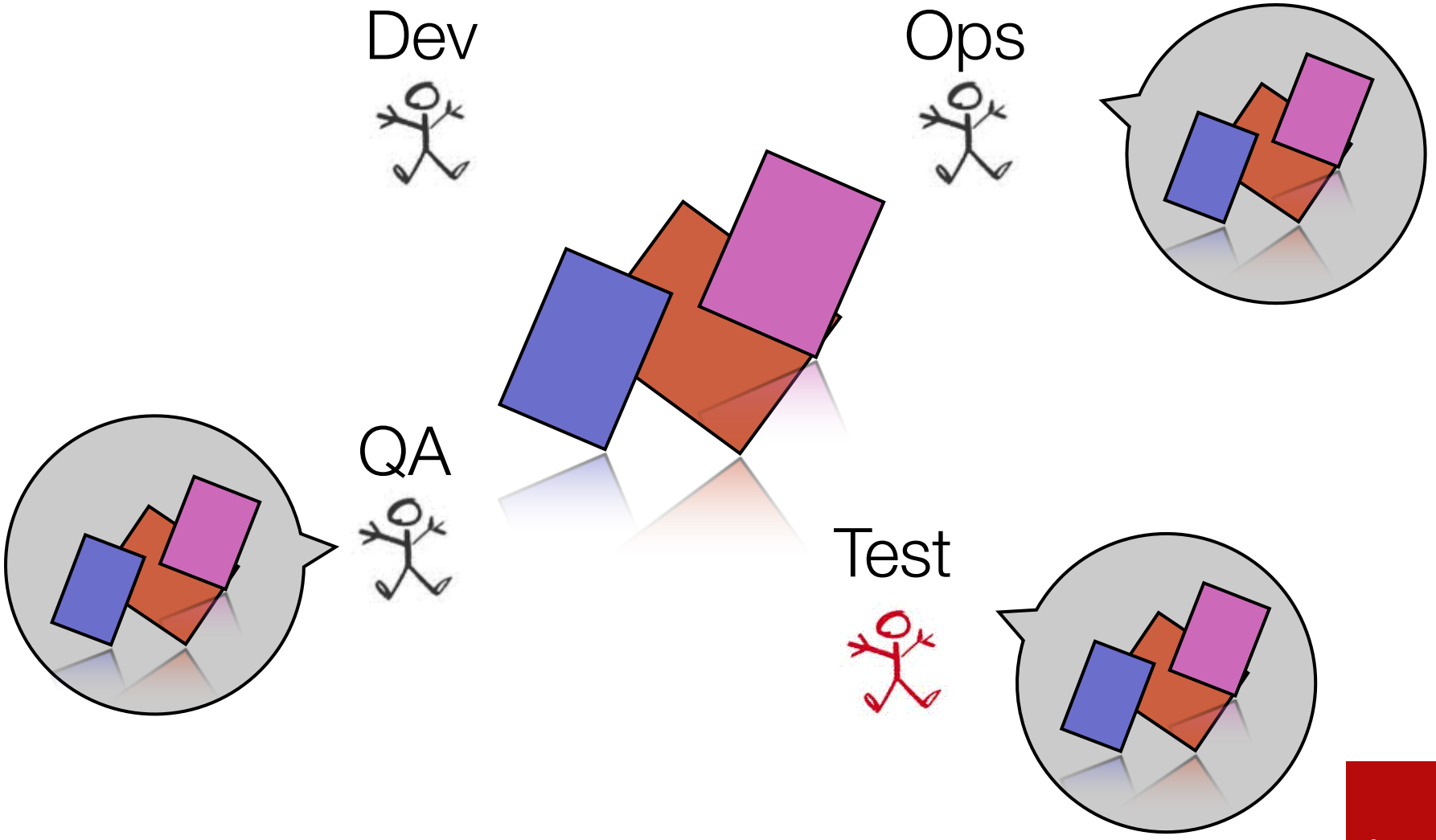

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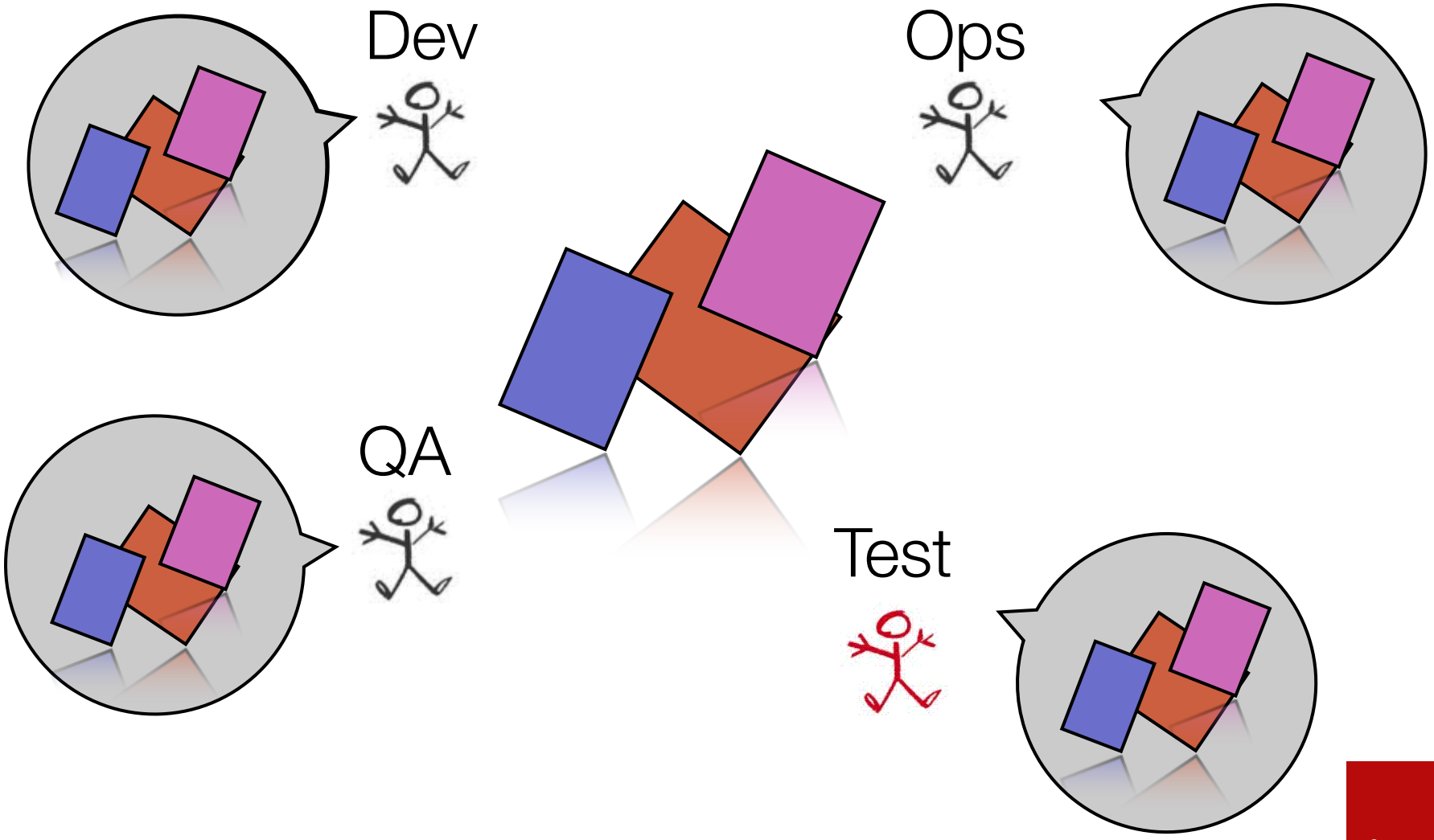

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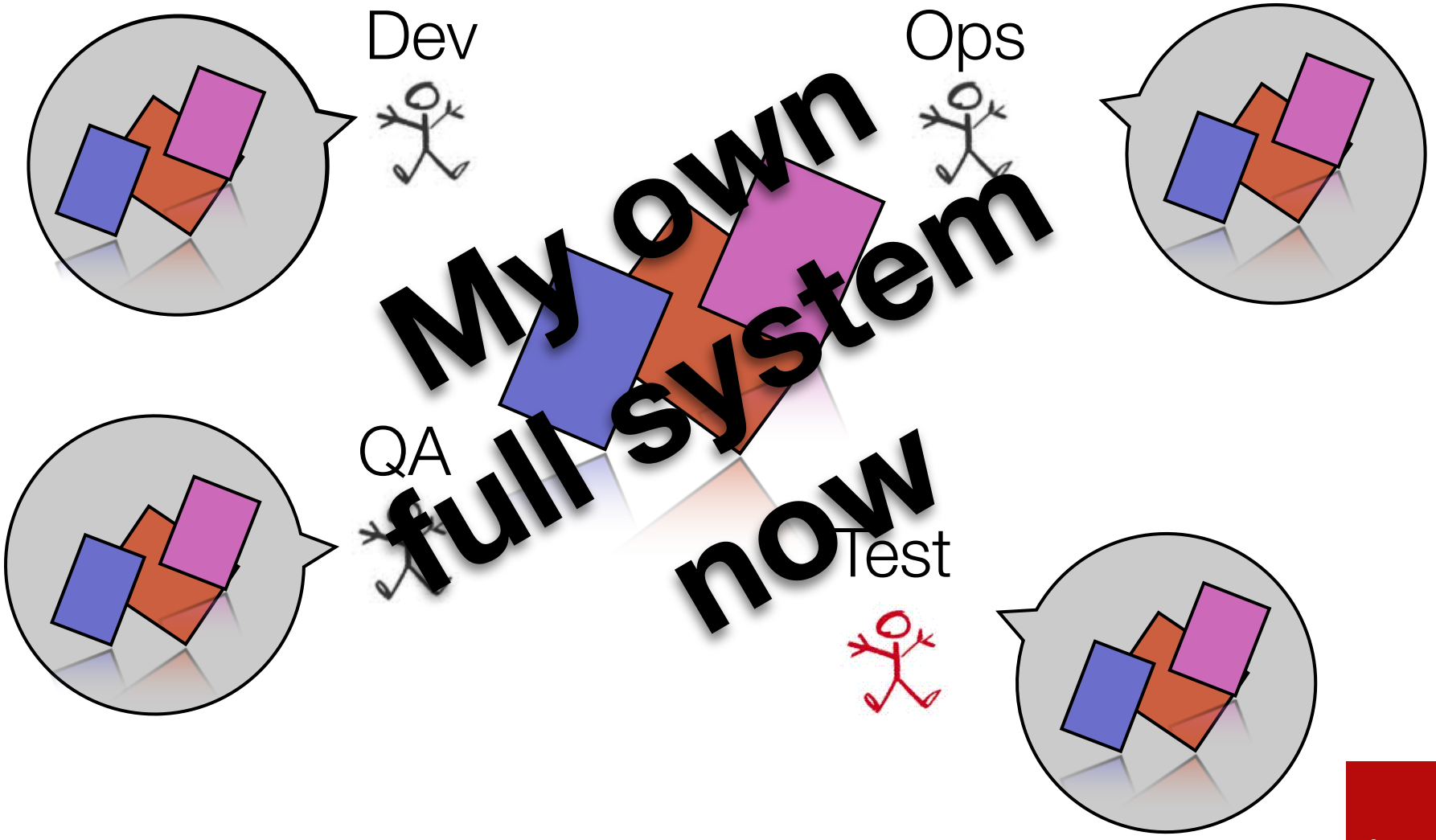

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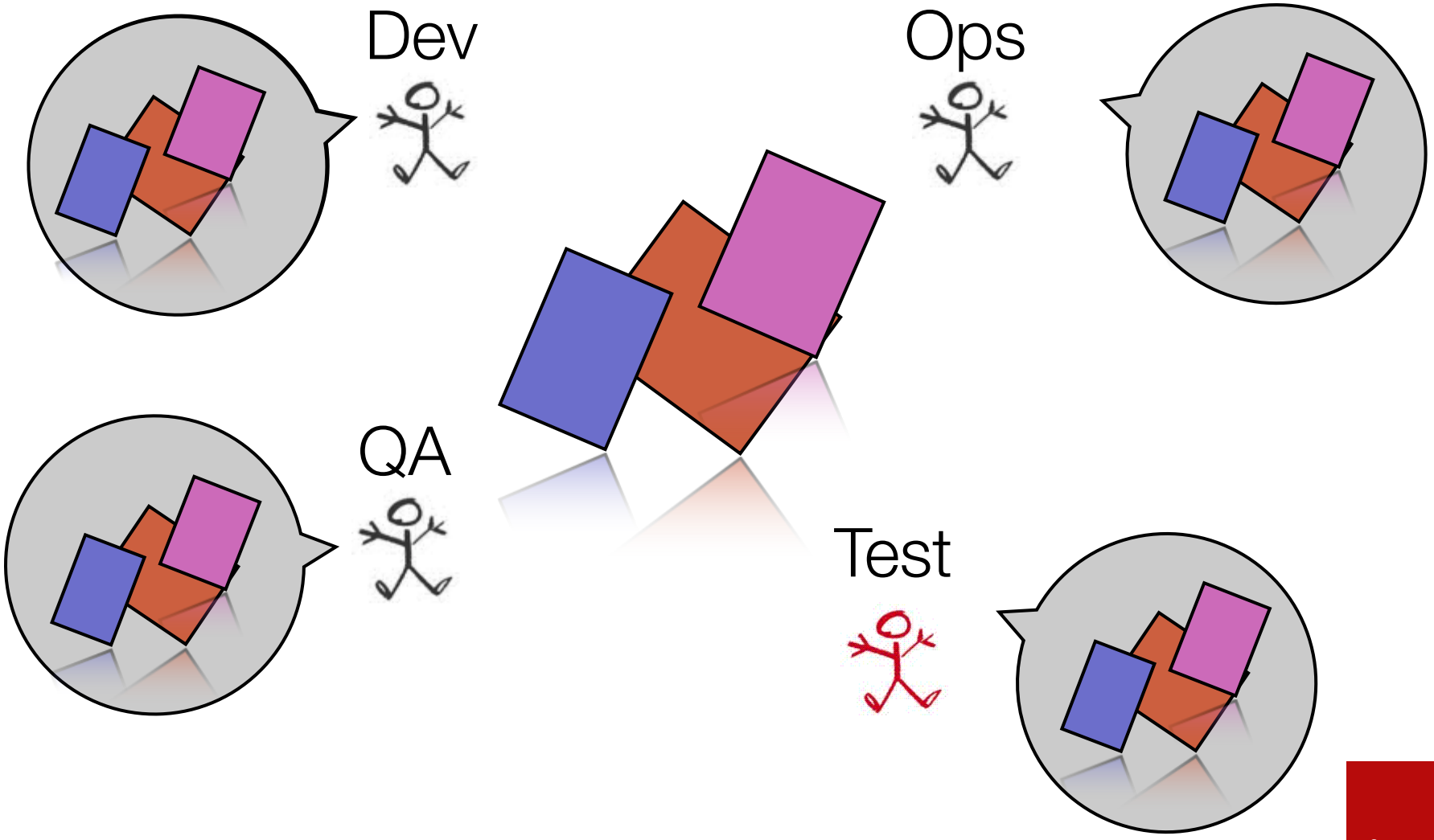

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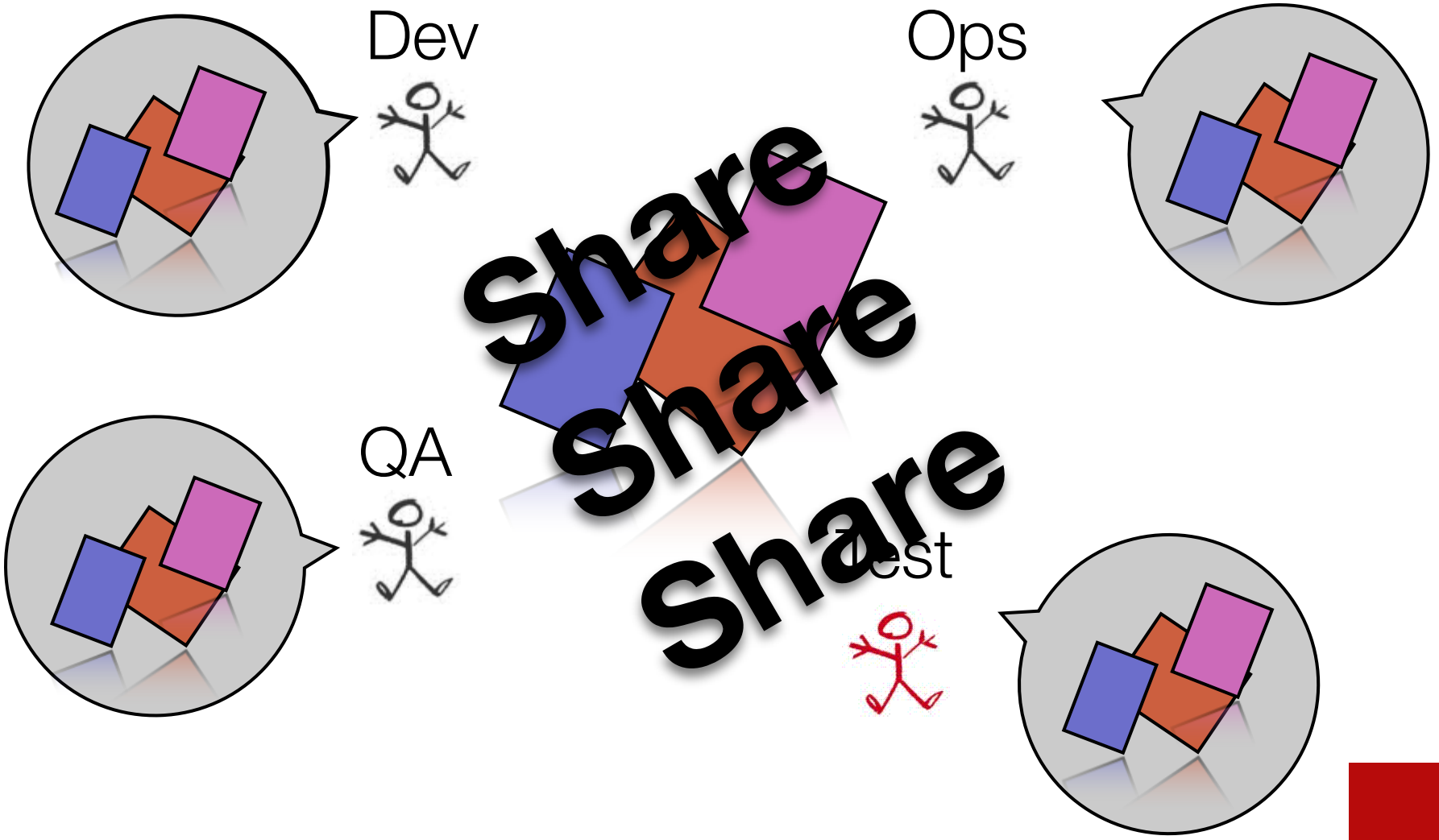

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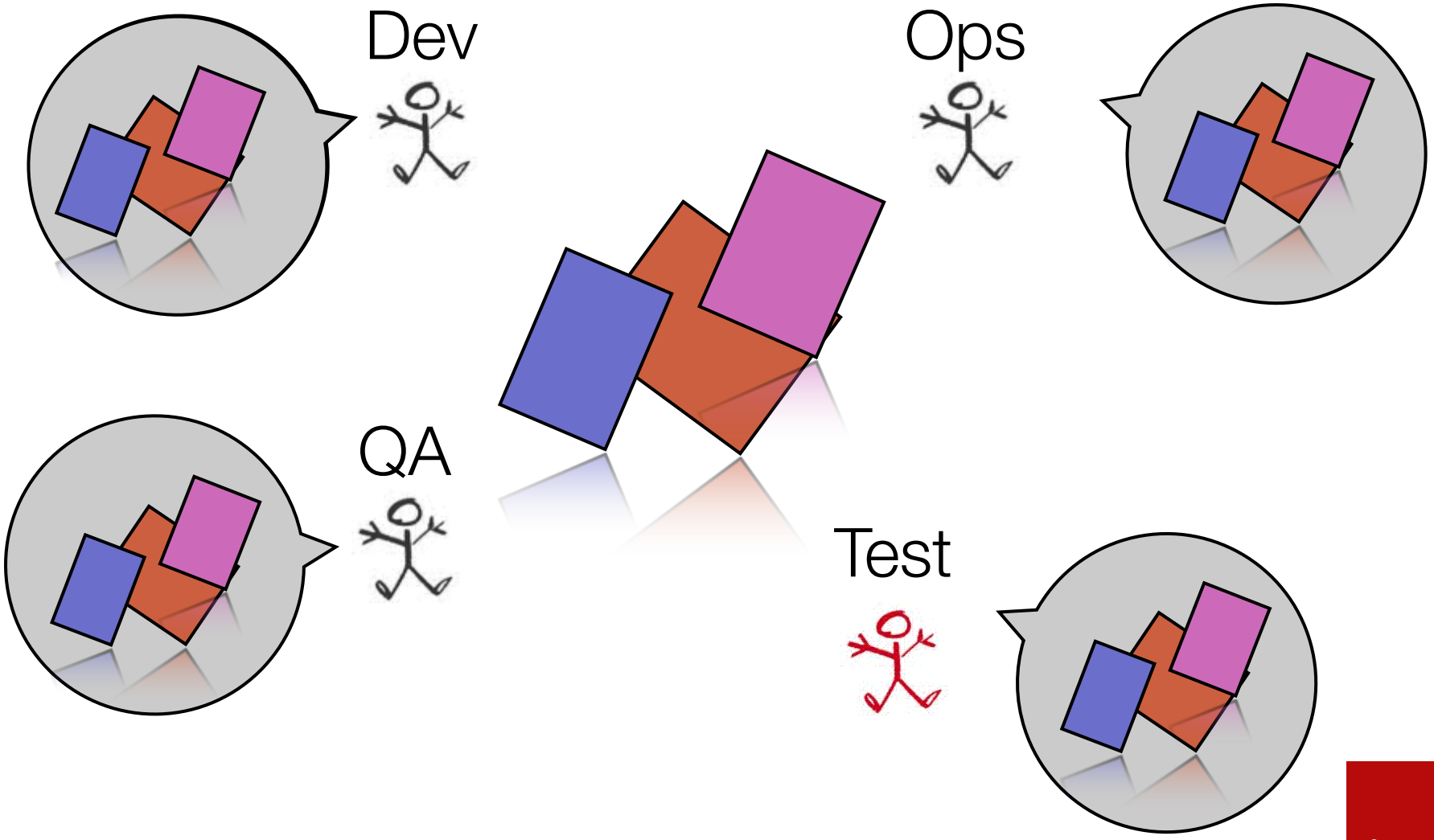
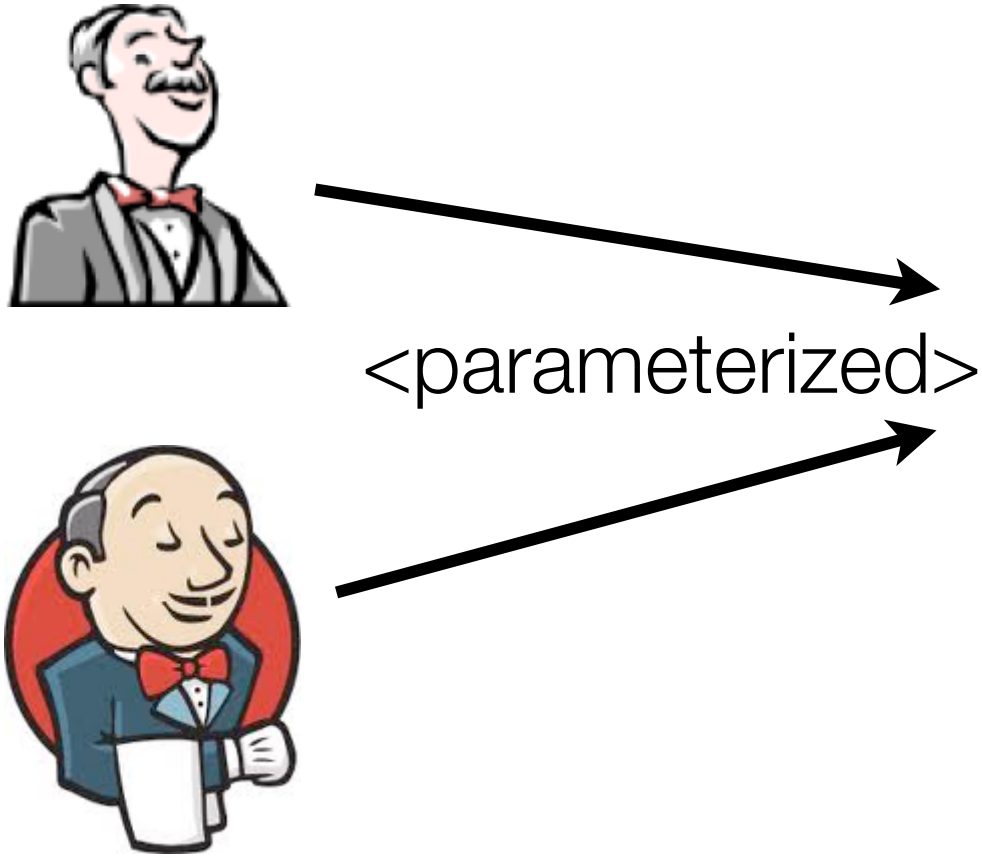


Continuous Integration



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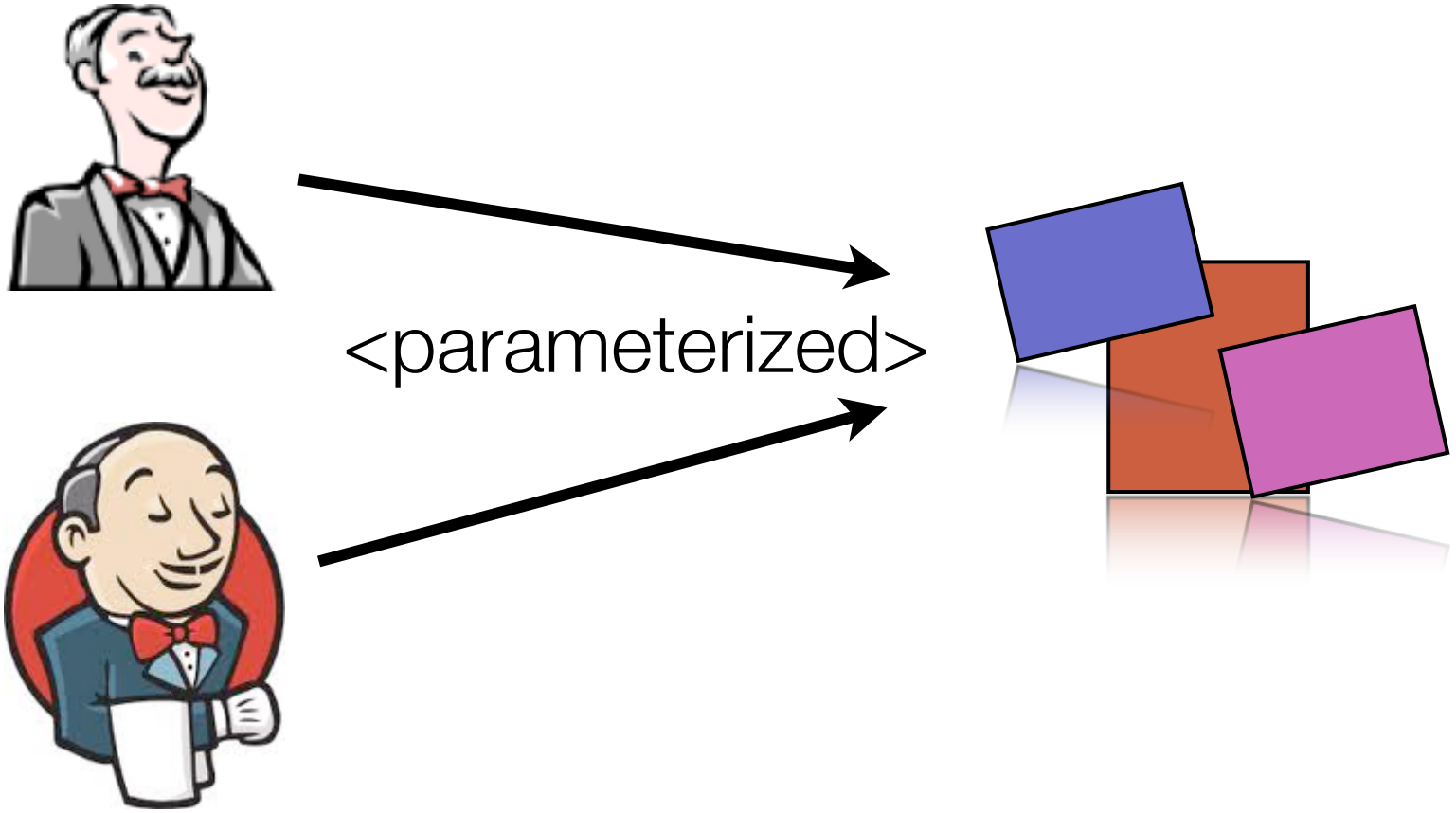

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Agile Methods Footprint

Agile Methods Footprint

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Agile Methods Footprint

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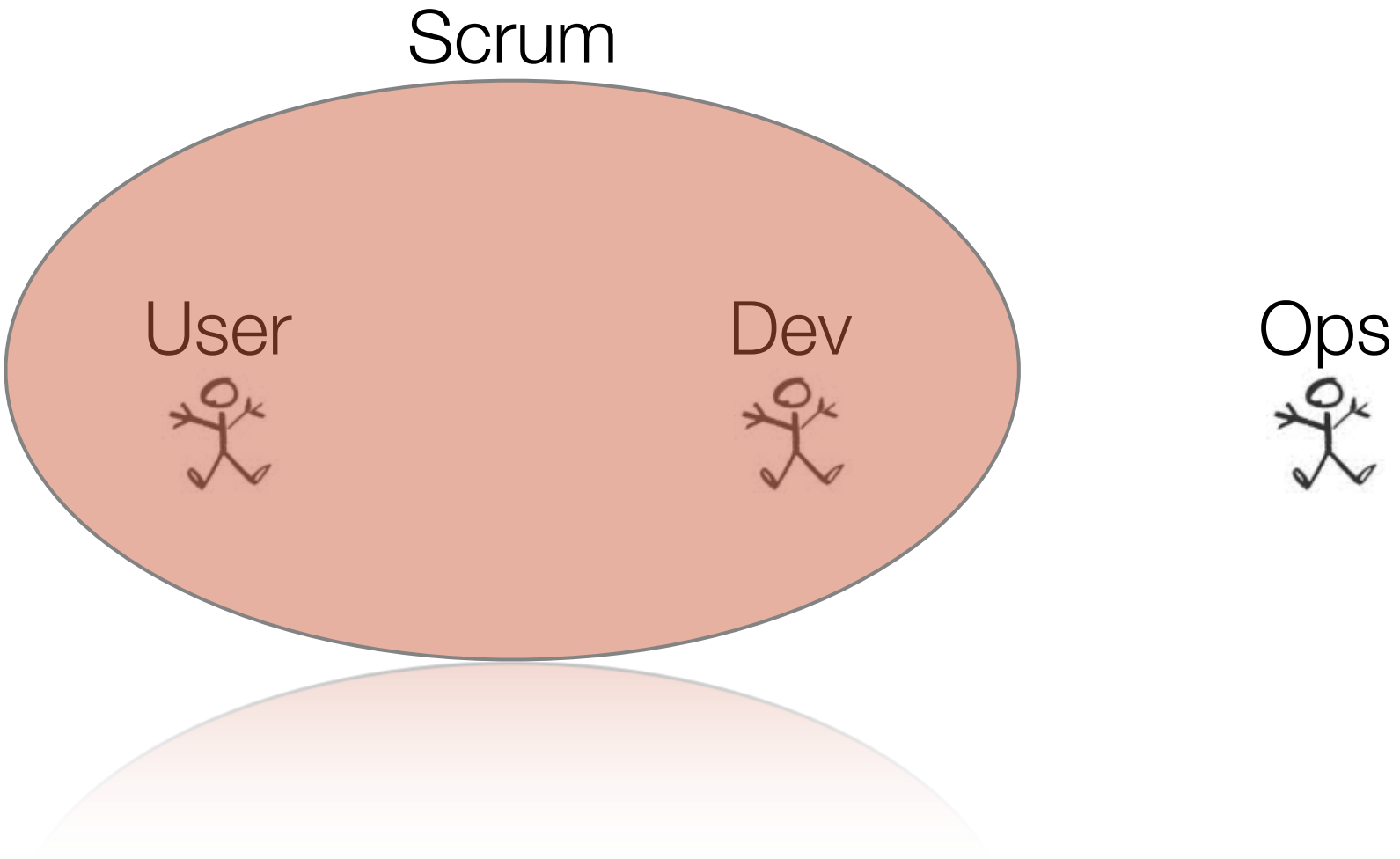
Agile Methods Footprint



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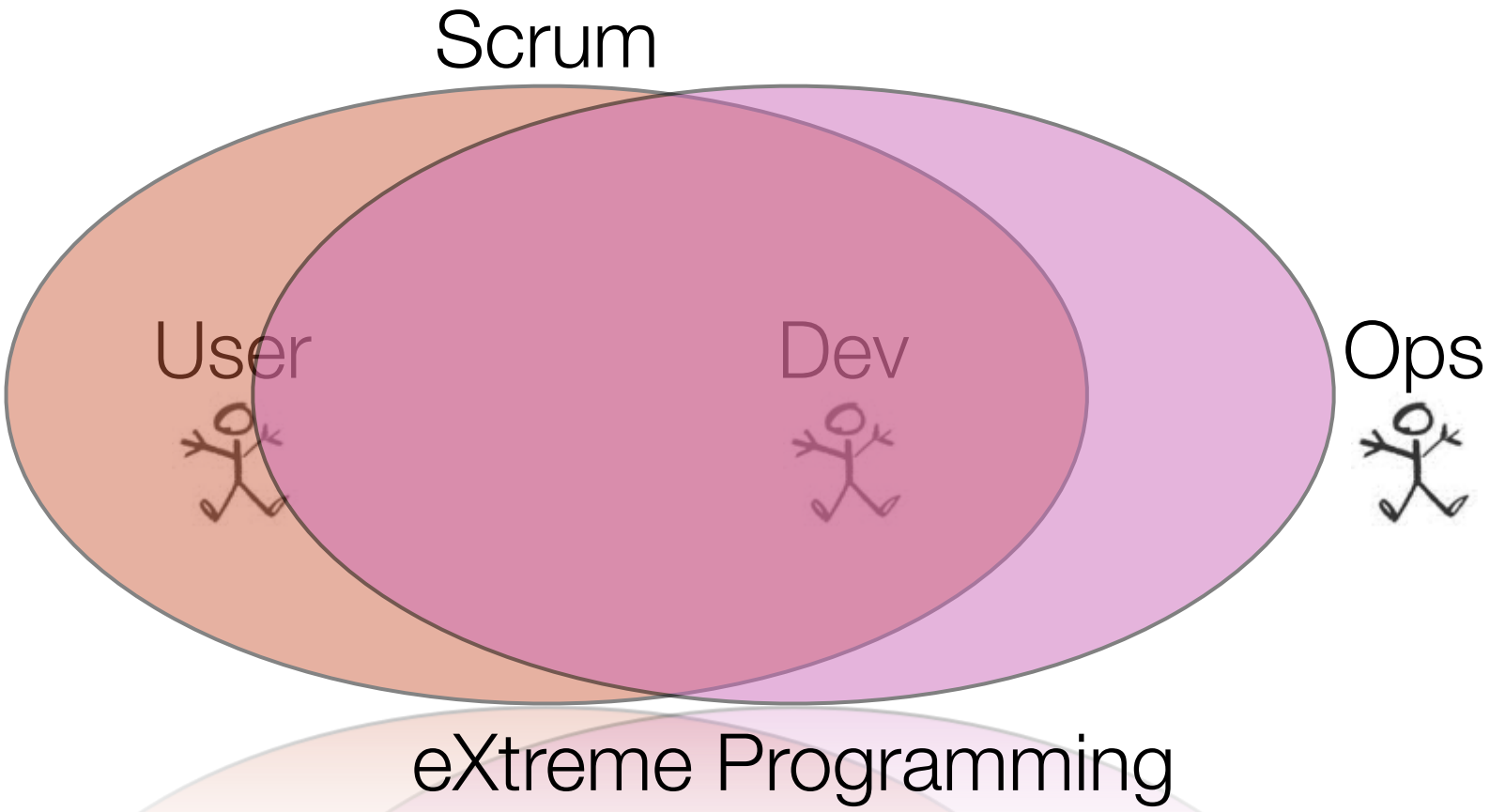

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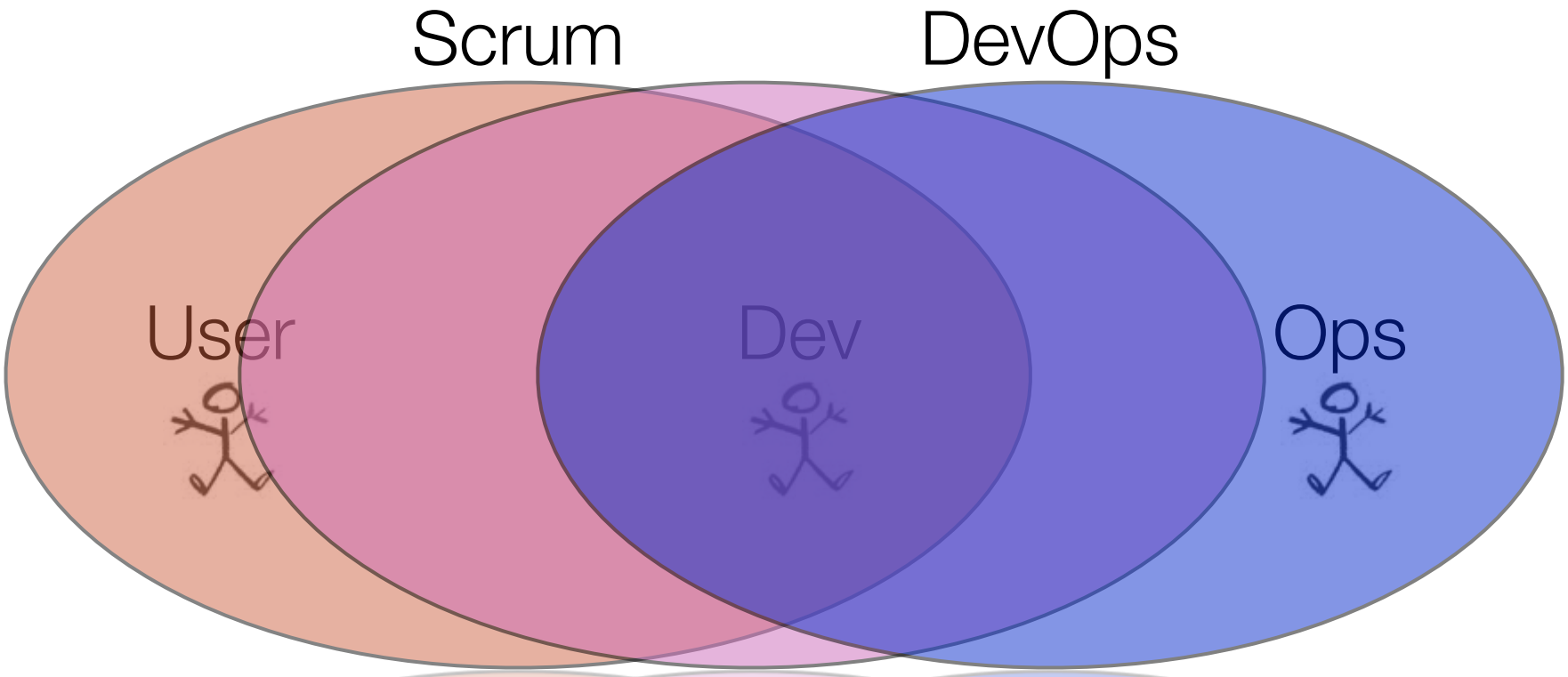

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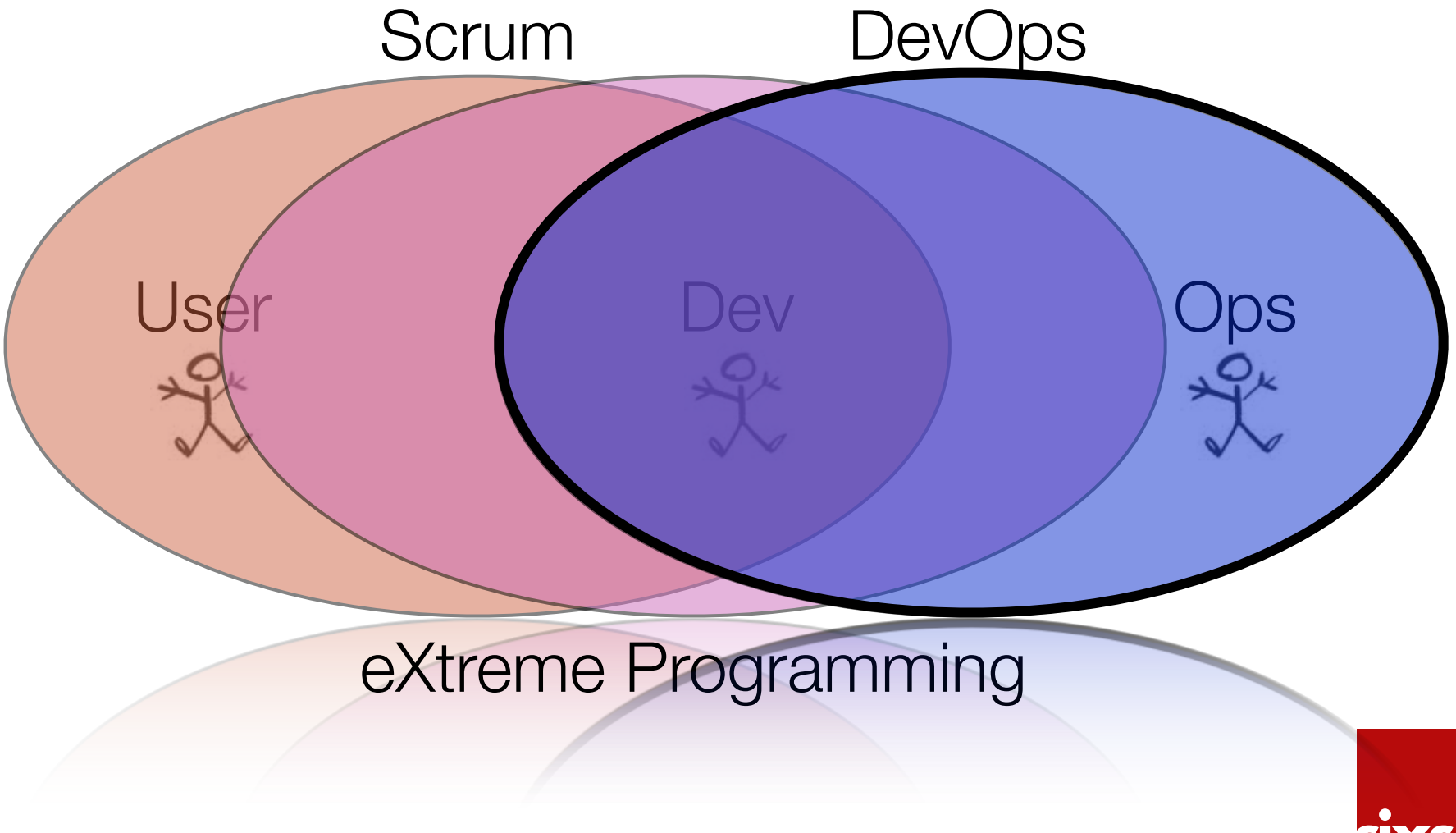

Case Study 1: **Mission Control System**

ESA ESOC

European Space Operations Centre, Darmstadt, Germany

Context and Problems

- Mission Control System deployment

- Deployment is manual
- Time consuming (multiple days...)
- Error prone resulting in configuration inconsistencies
- Poor reproducibility

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Relevance of this Case Study

- Complex legacy system
  - C++, Java, Perl, Python, Tcsh, CORBA (yes!)
  - Millions of lines of code, grown over several years
- Not designed for automation
- Great benefit from automation, if possible!

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Vision

- Automated on-demand deployments
- Consistent and reliable deployments
- Dramatic effort/cost reduction in deployment/testing

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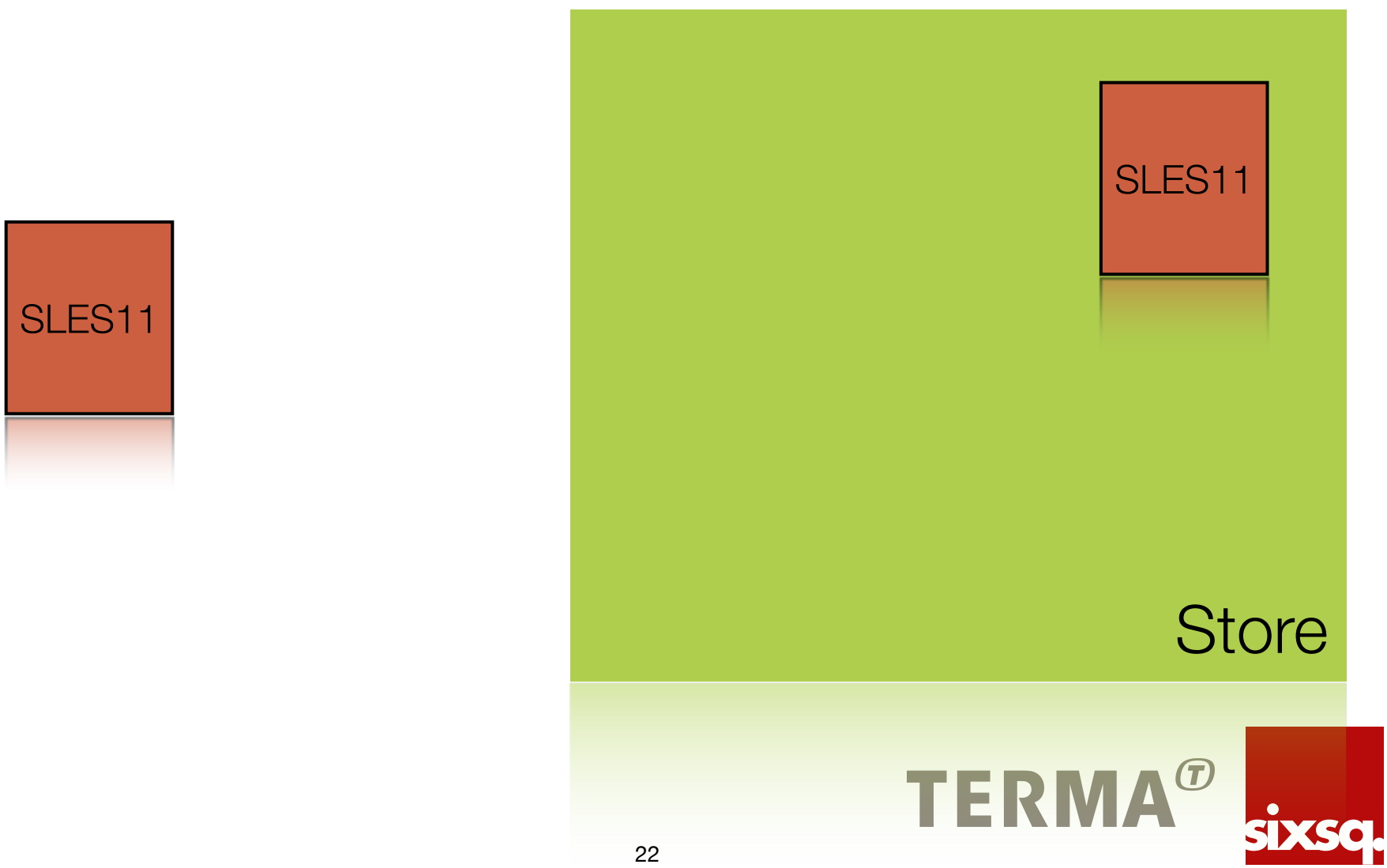
Image References

Image References



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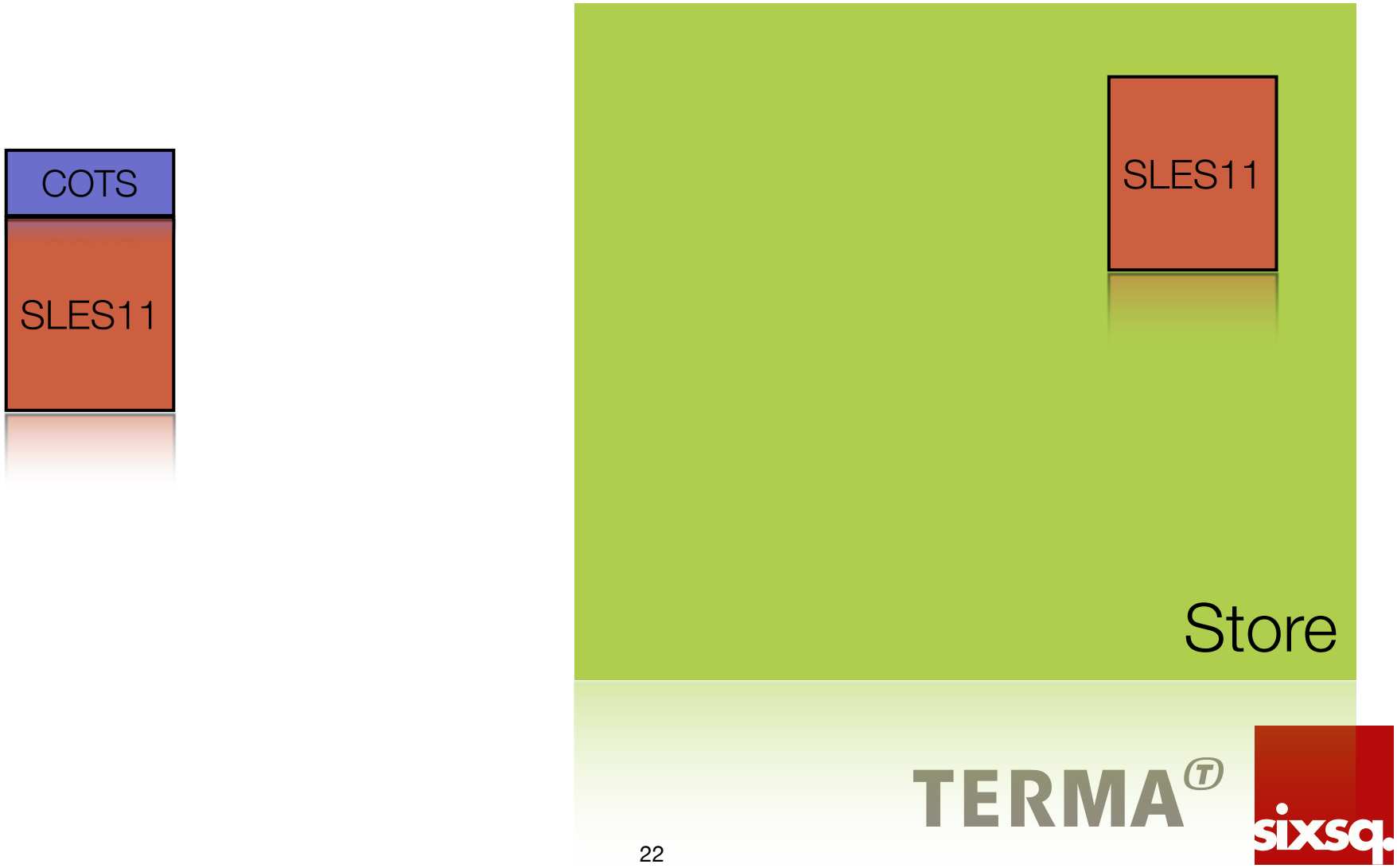

Image References

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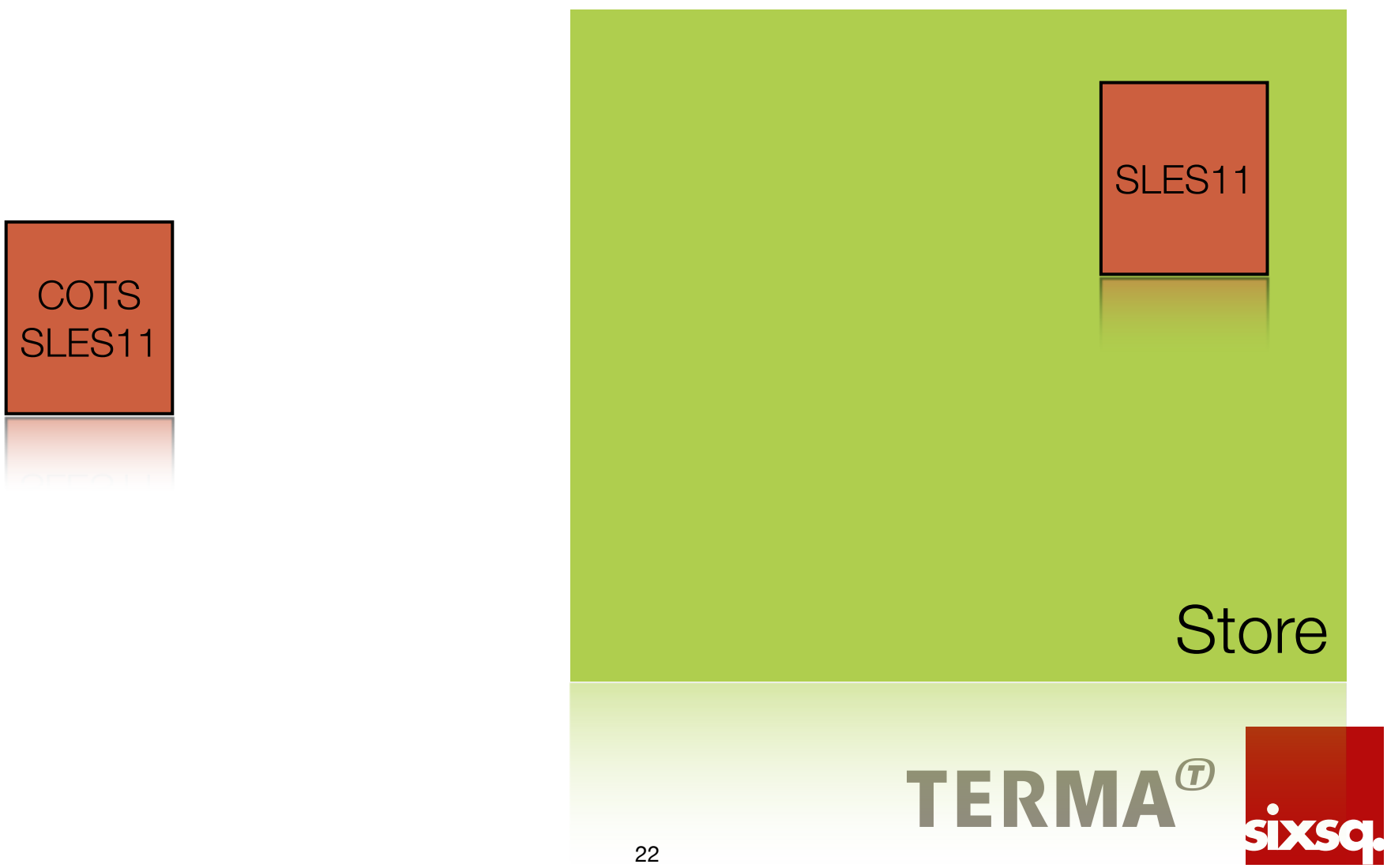

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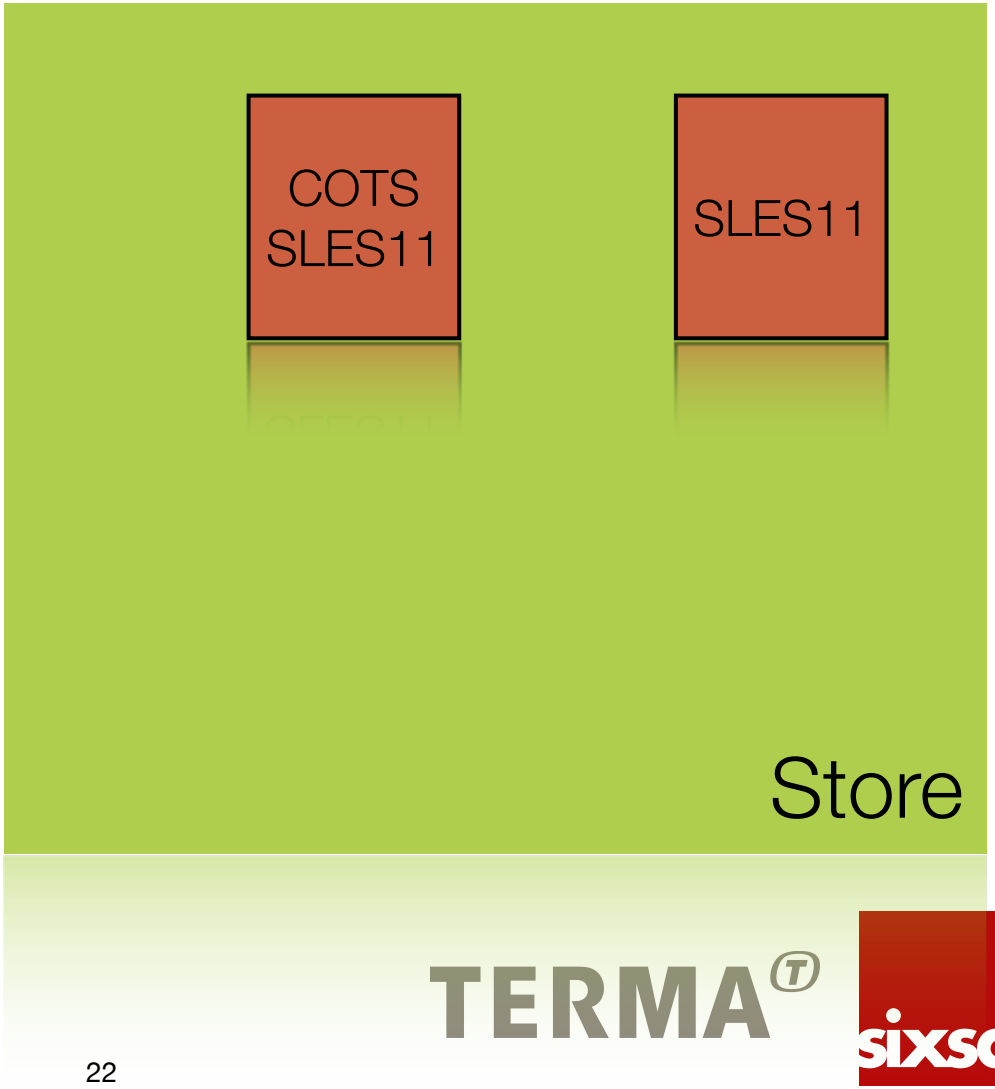

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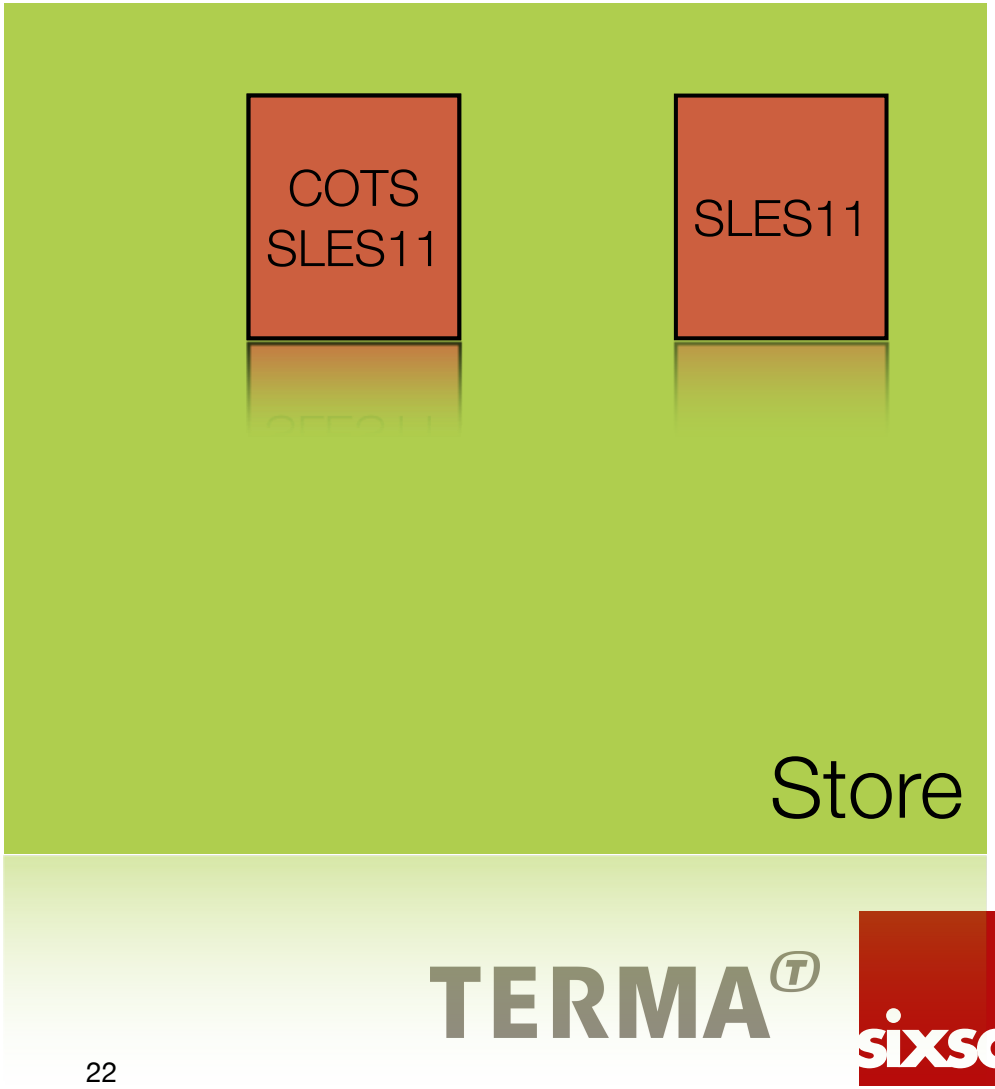

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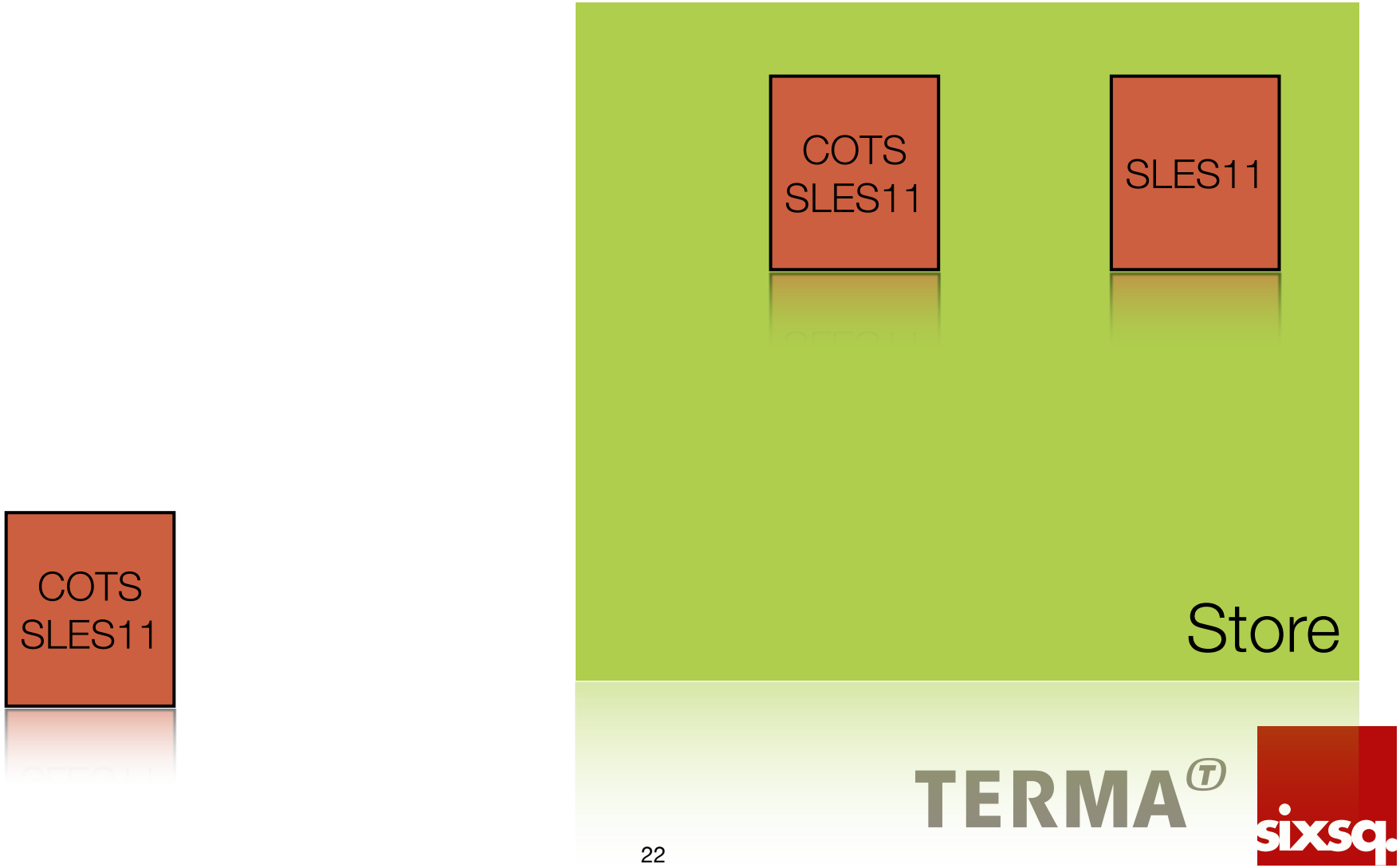

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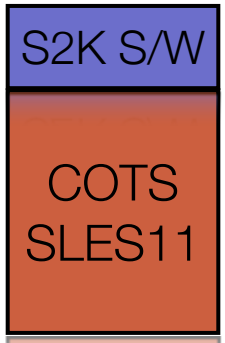

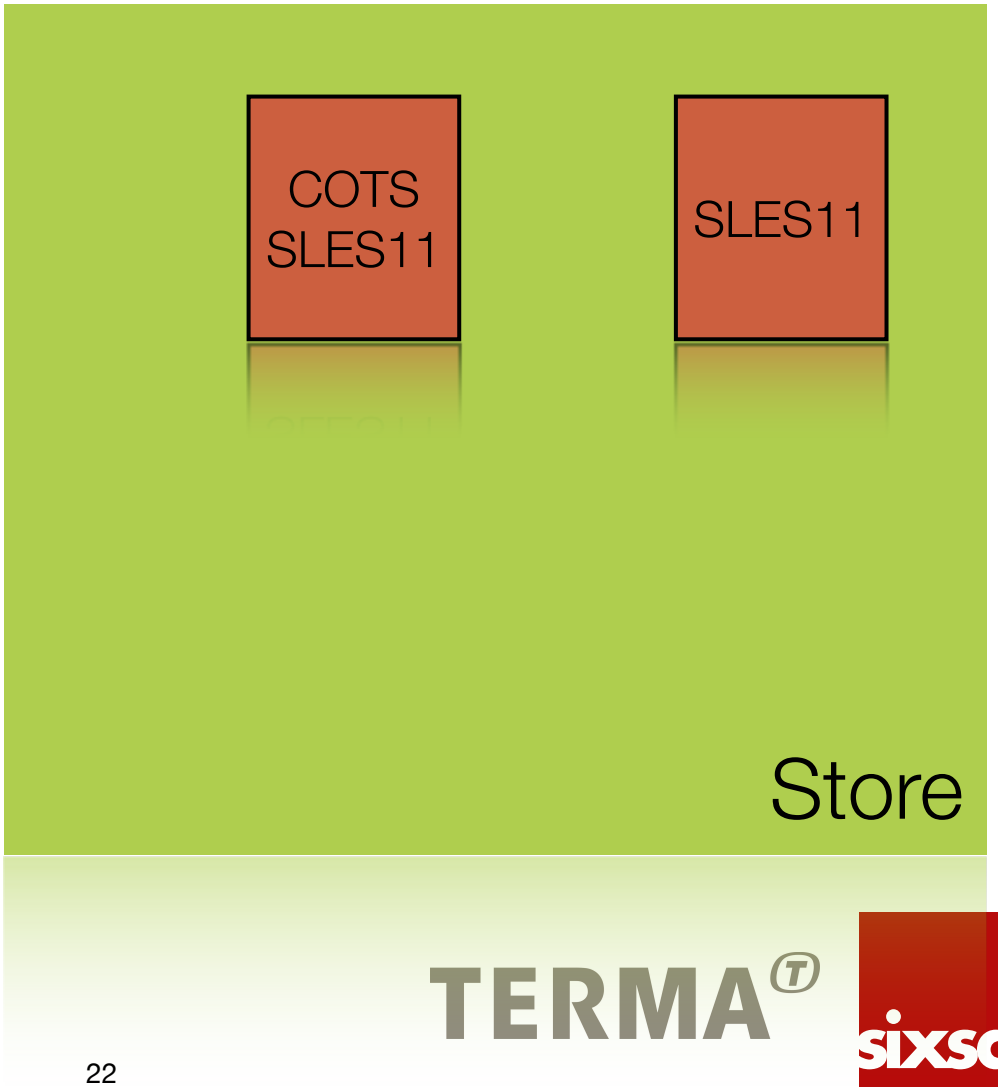

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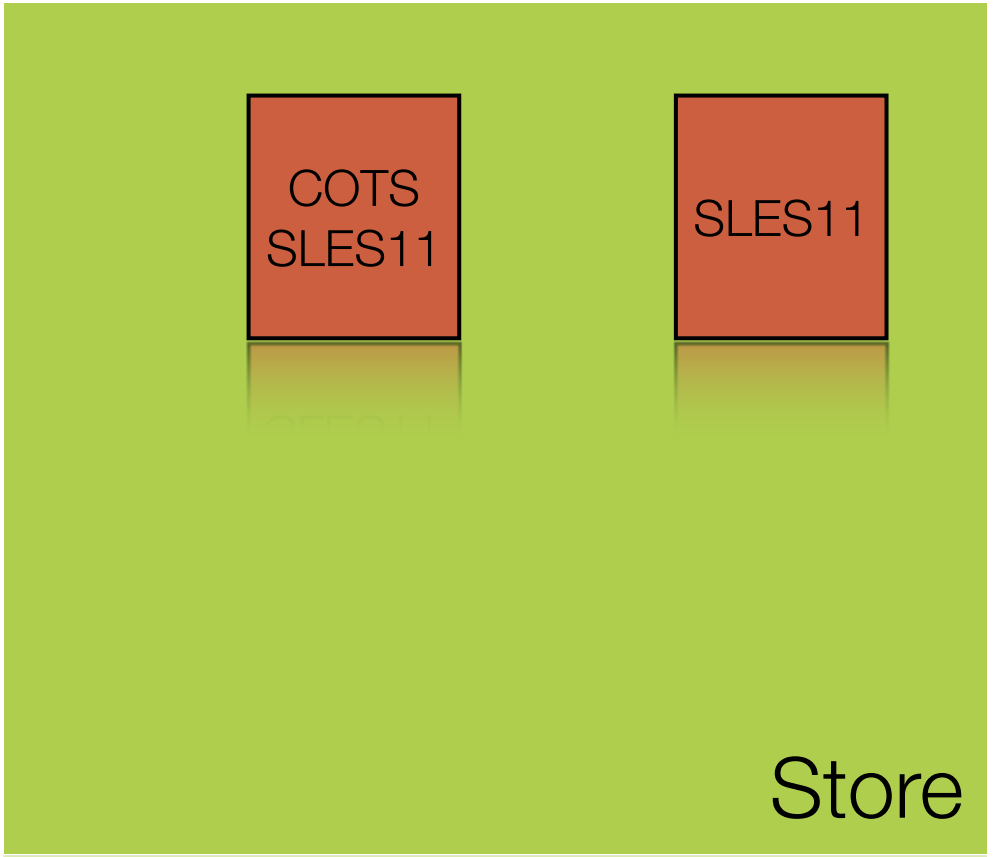

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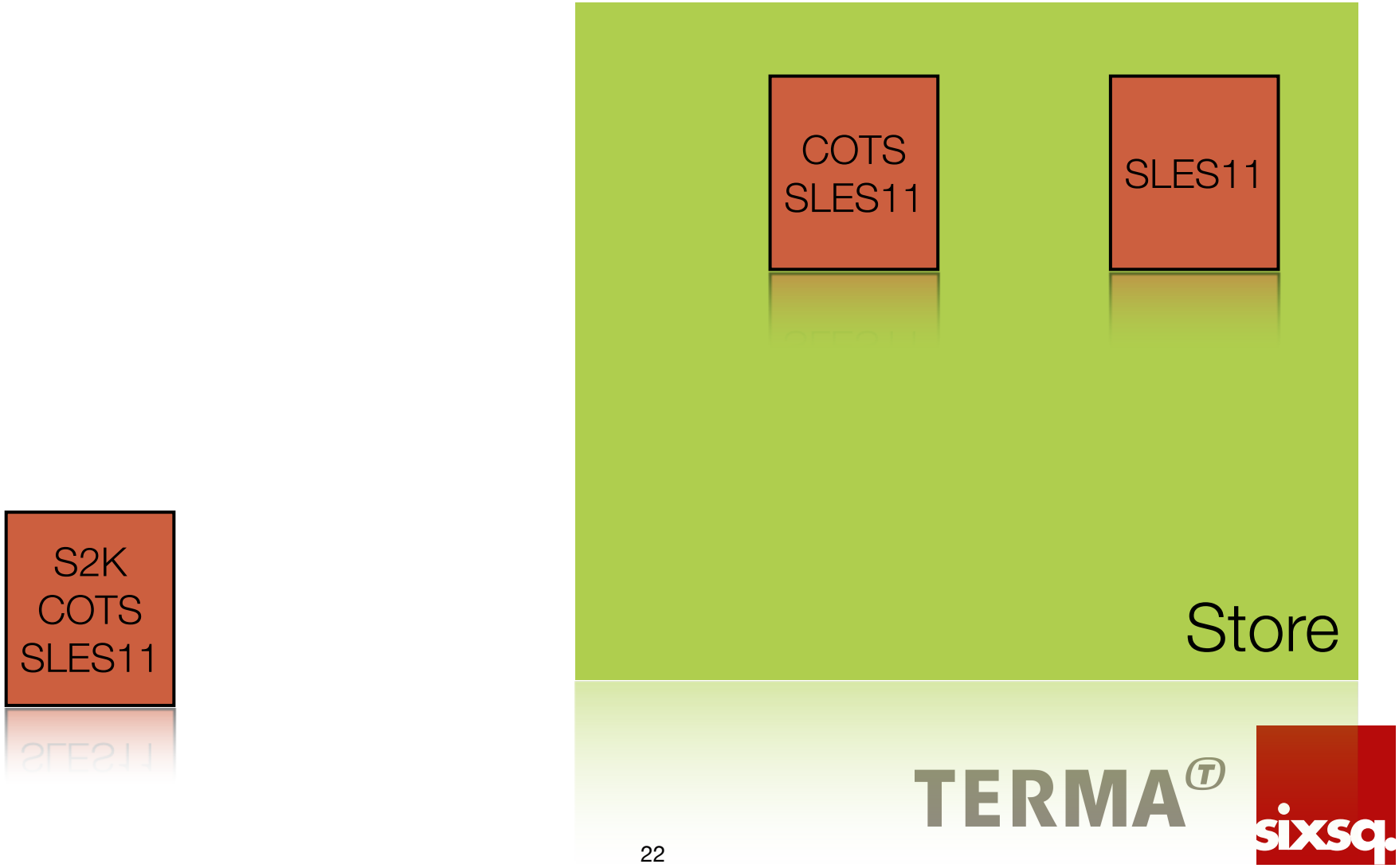

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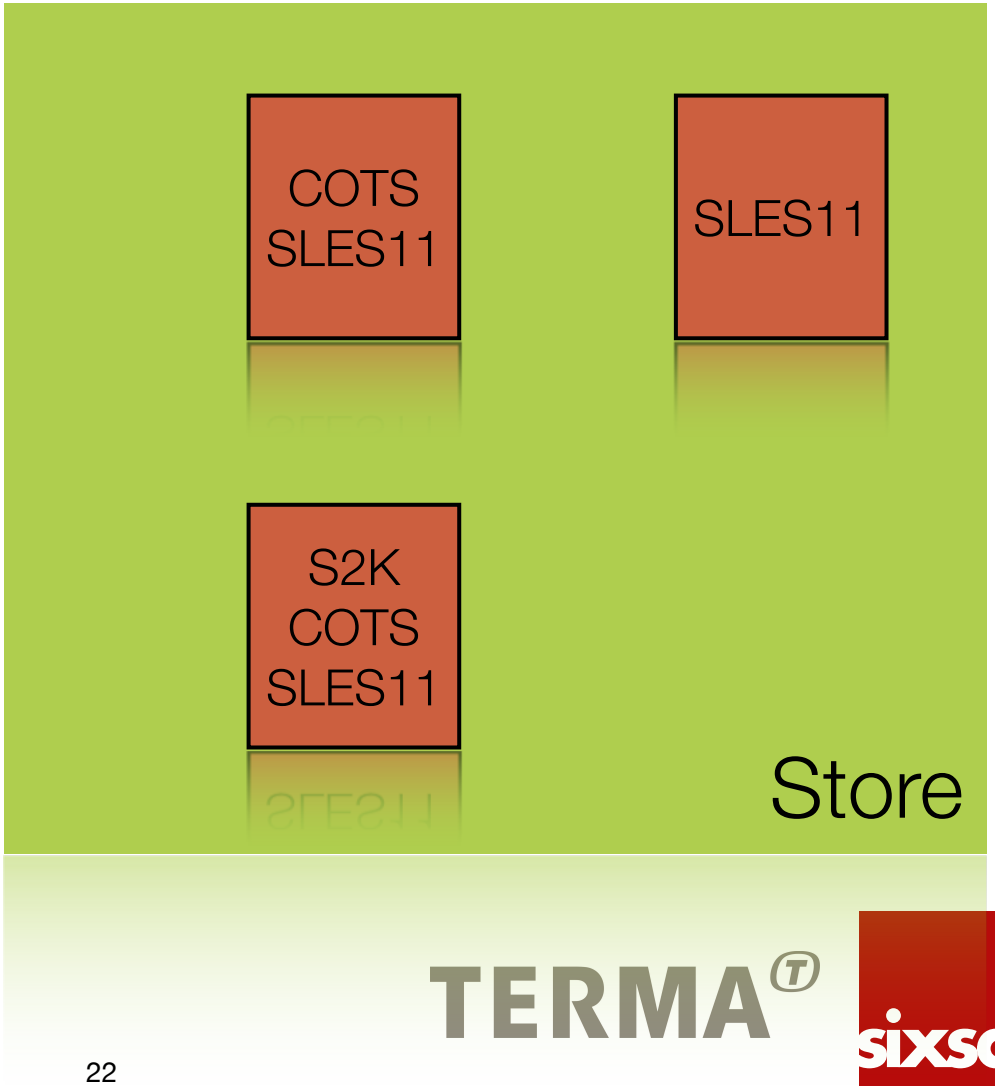

Deployment Scenario

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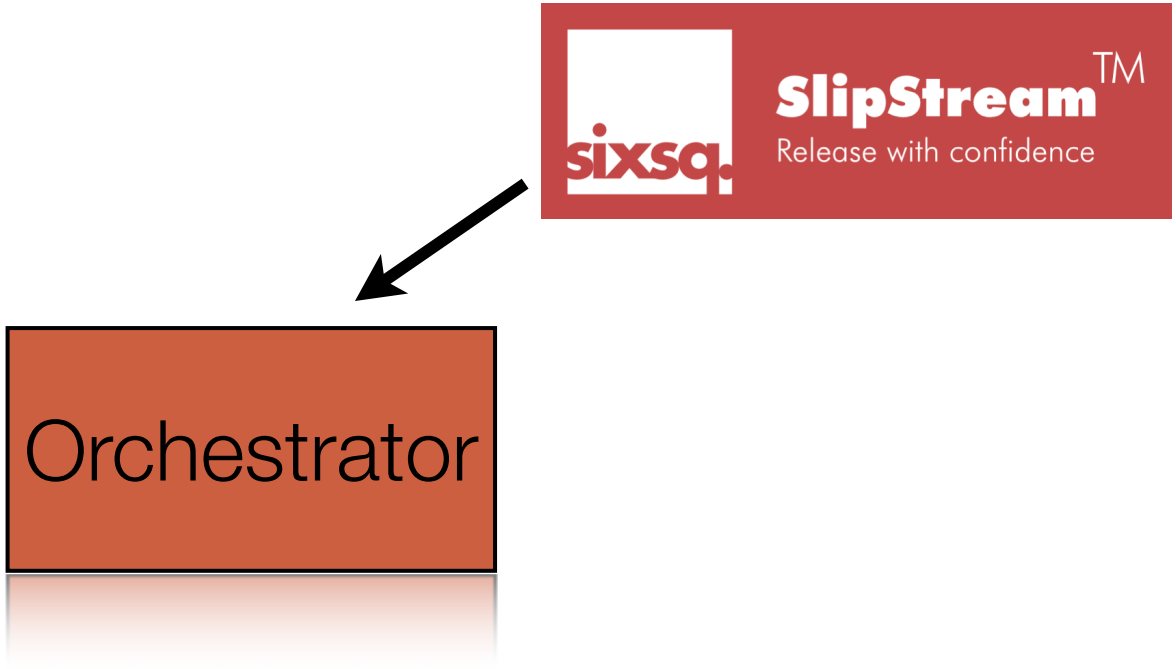

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Deployment Scenario

Orchestrator

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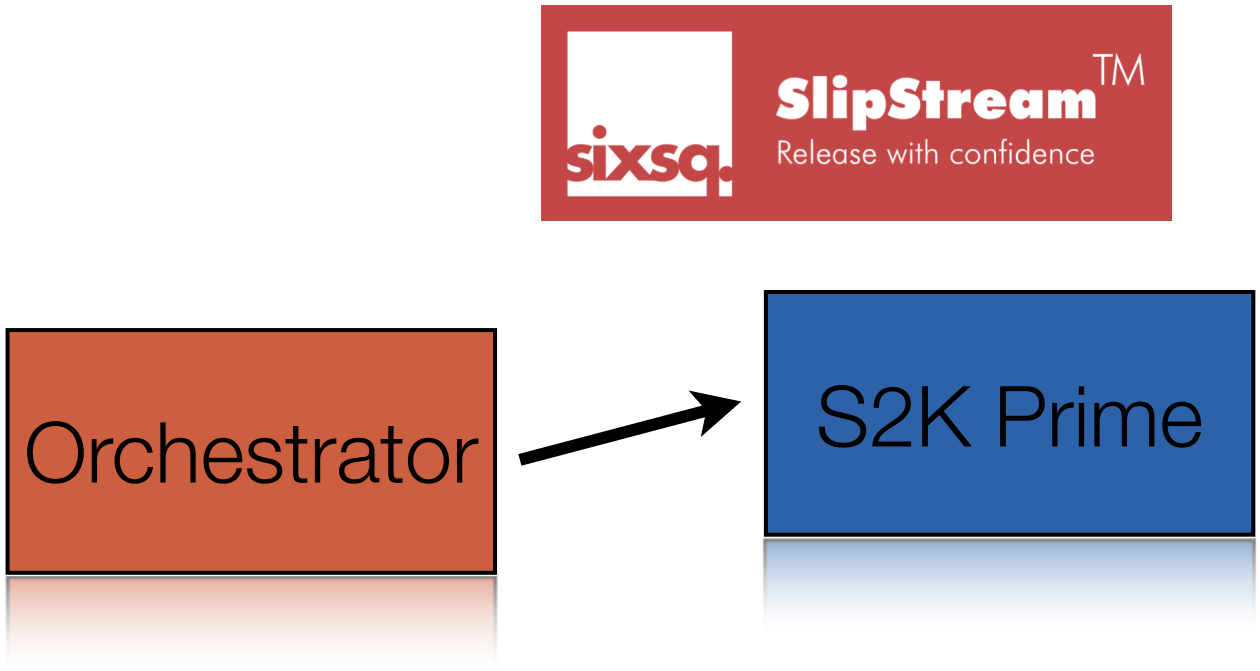
Deployment Scenario



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Deployment Scenario

Orchestrator

S2K Prime

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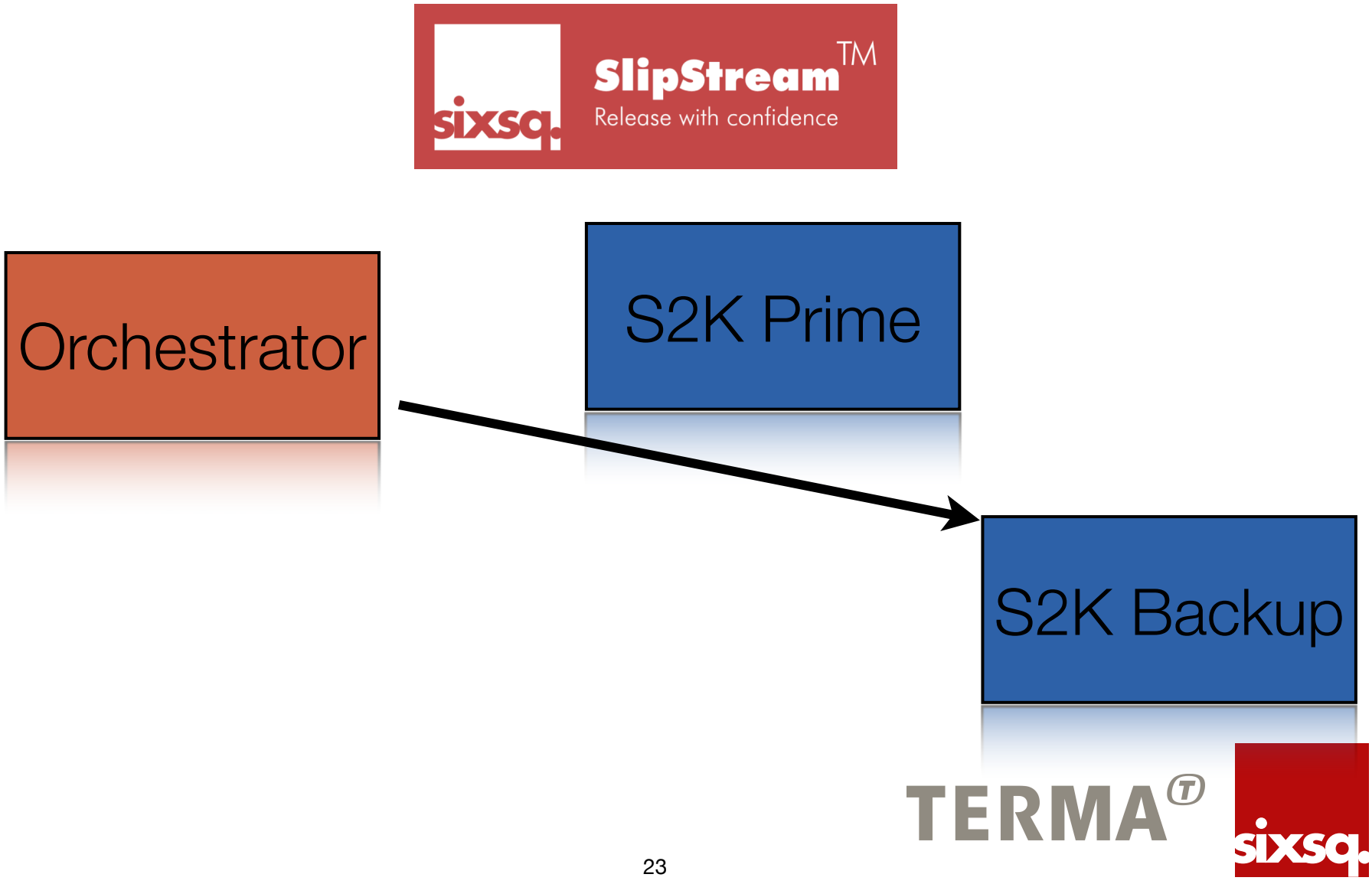
Deployment Scenario



Deployment Scenario

Orchestrator

S2K Prime

S2K Backup

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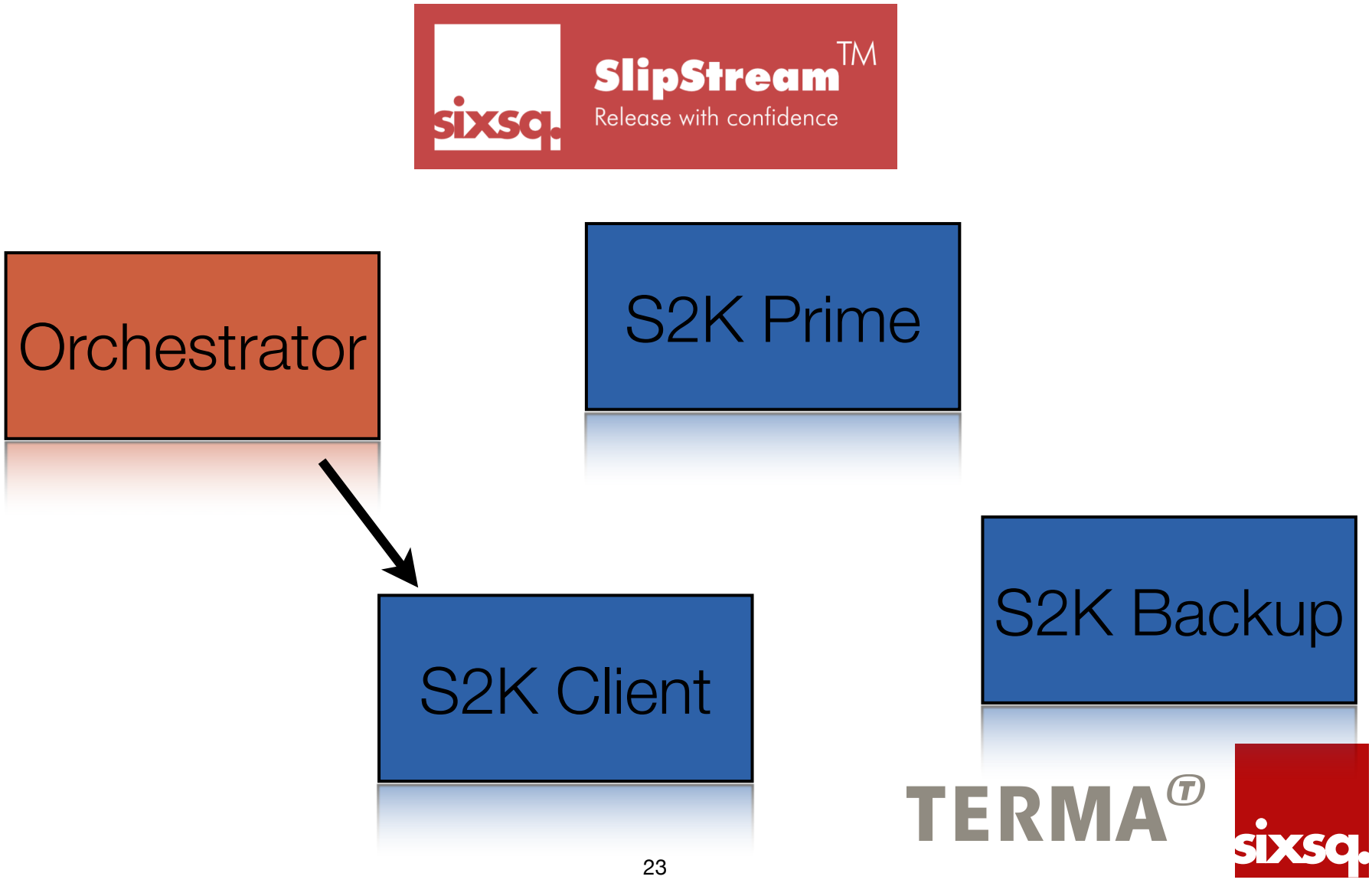

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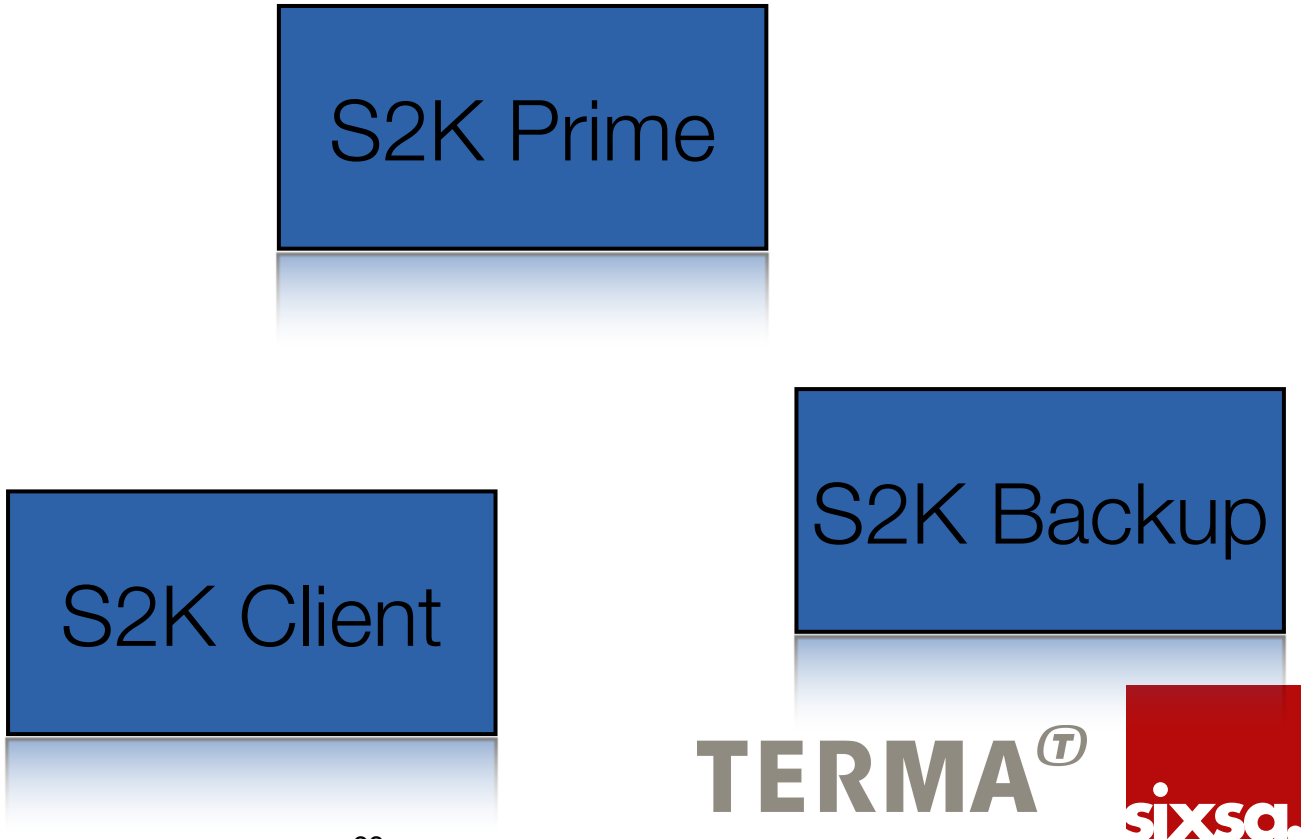

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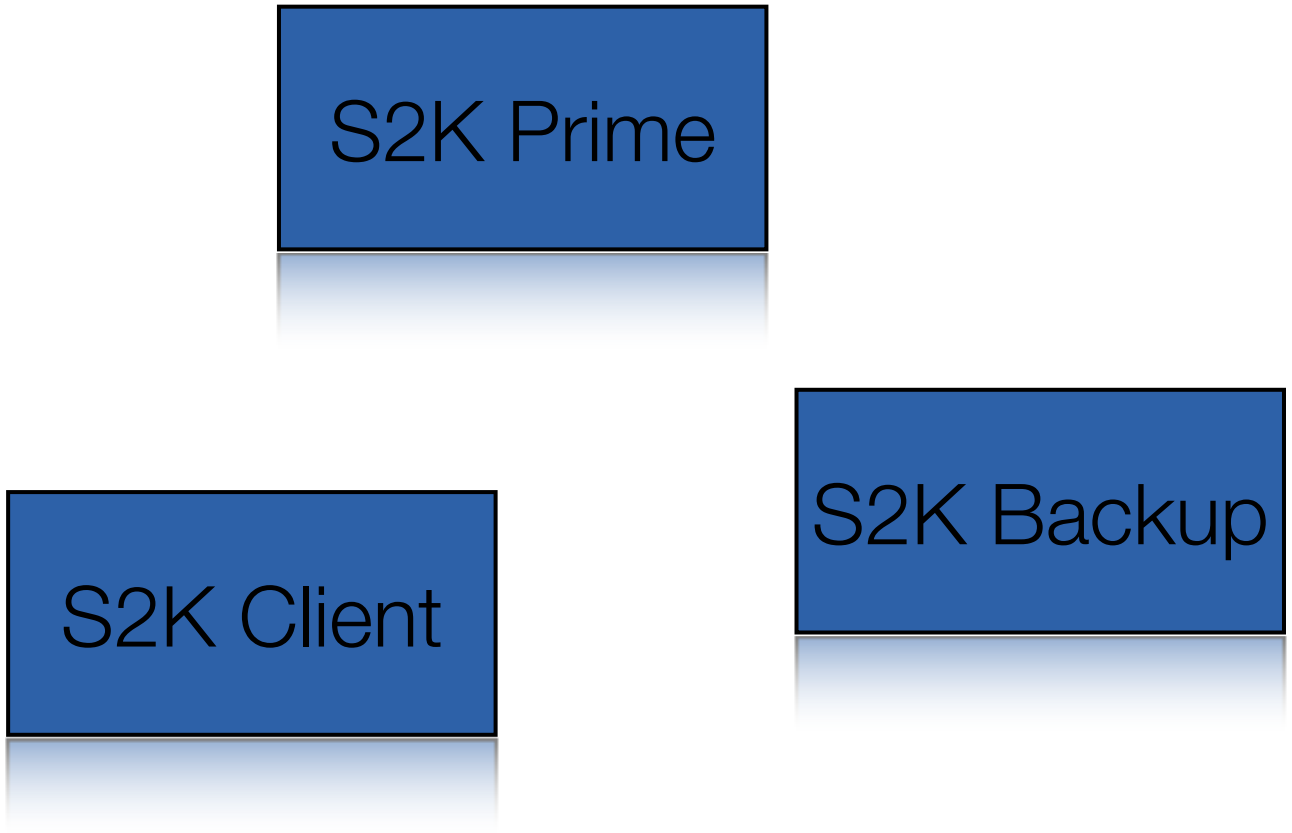

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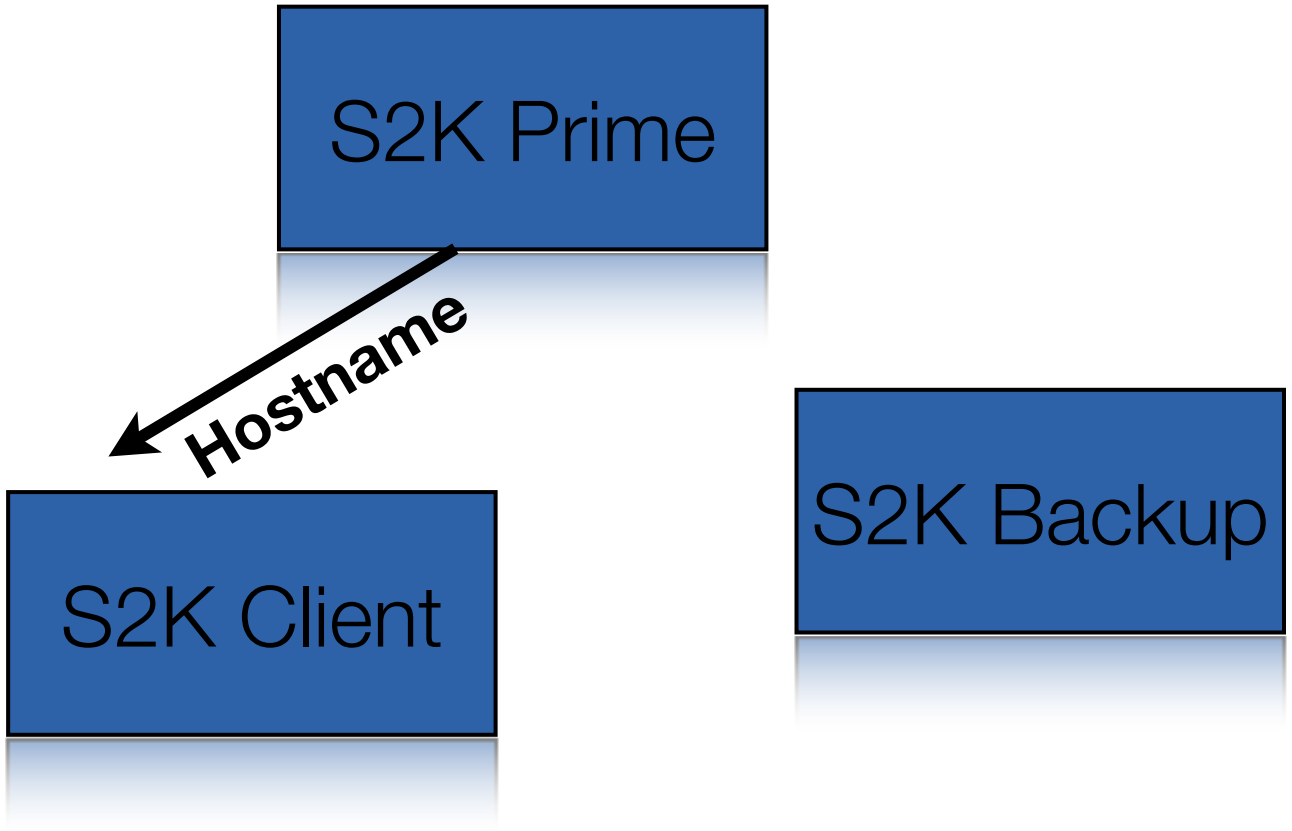

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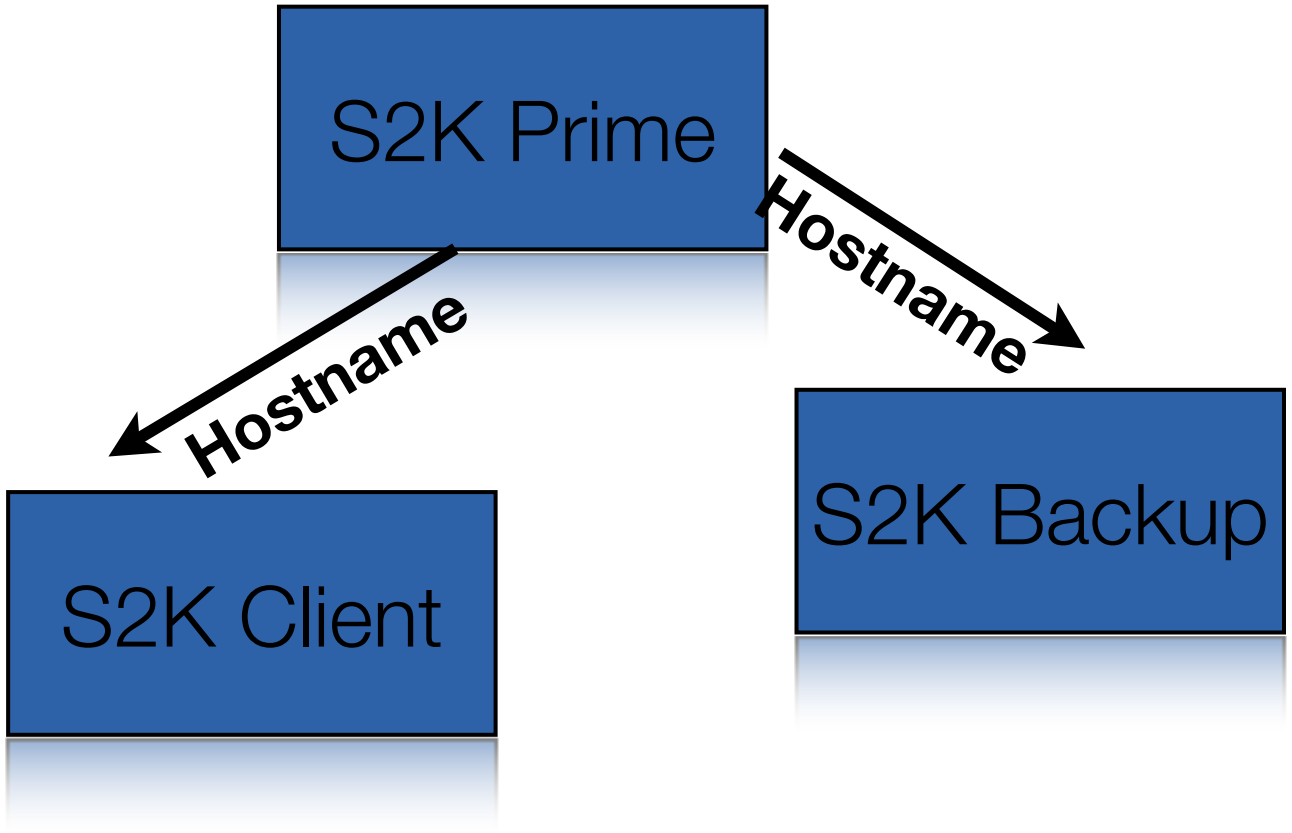

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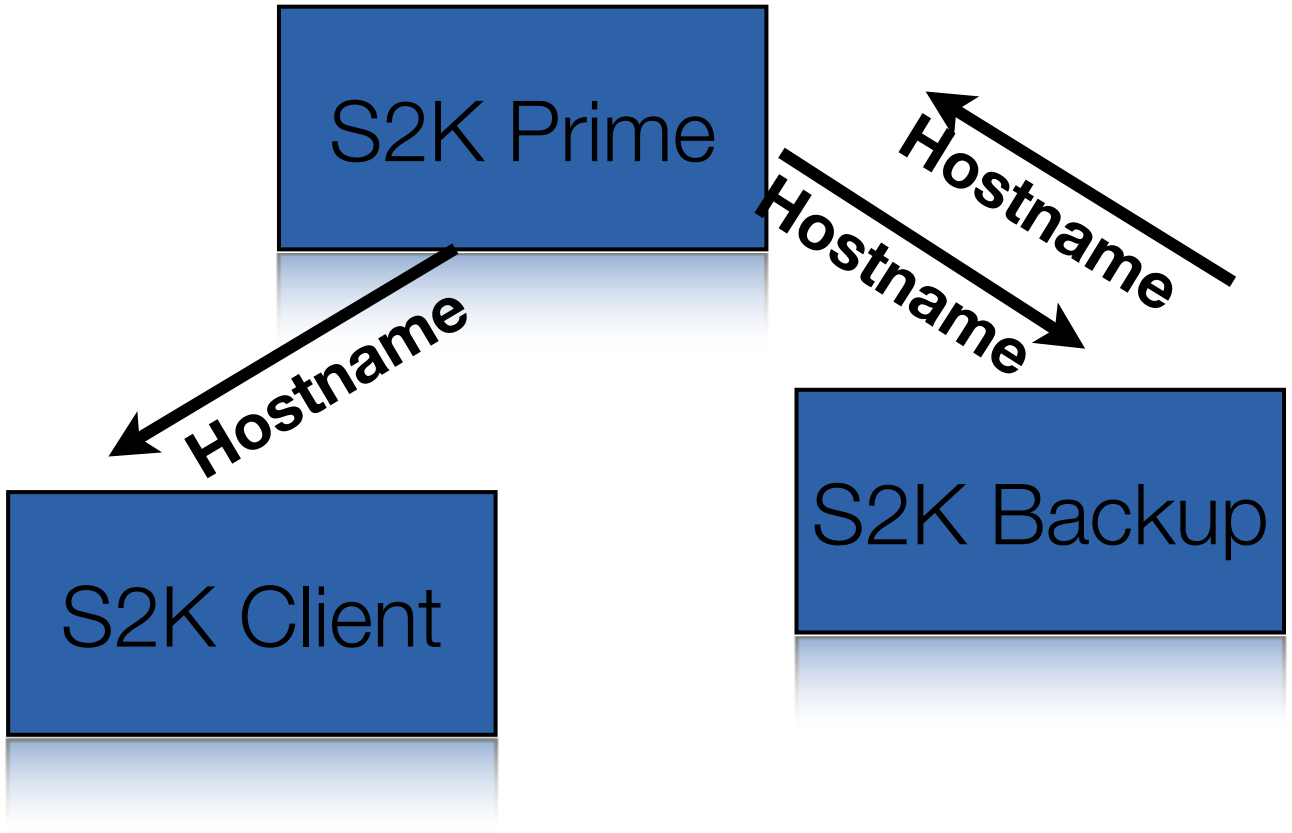

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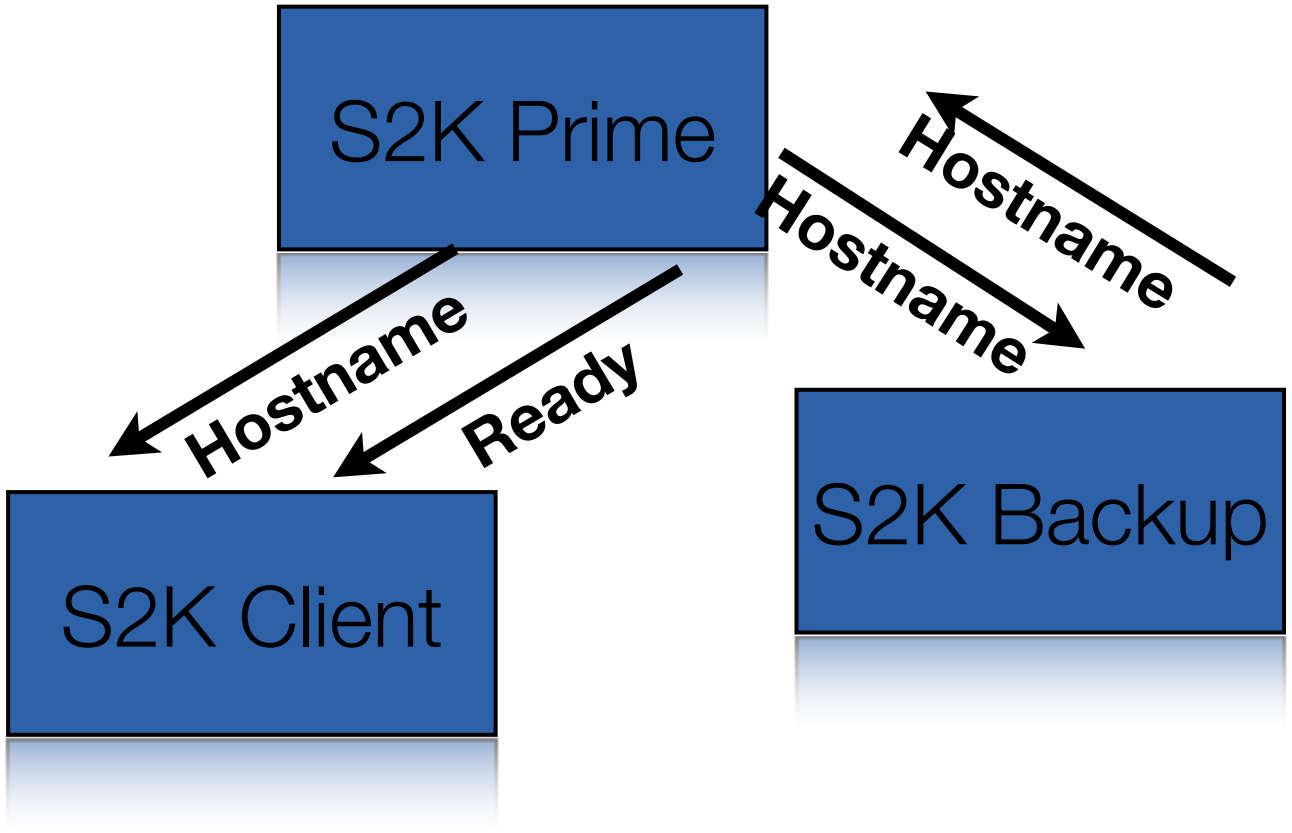
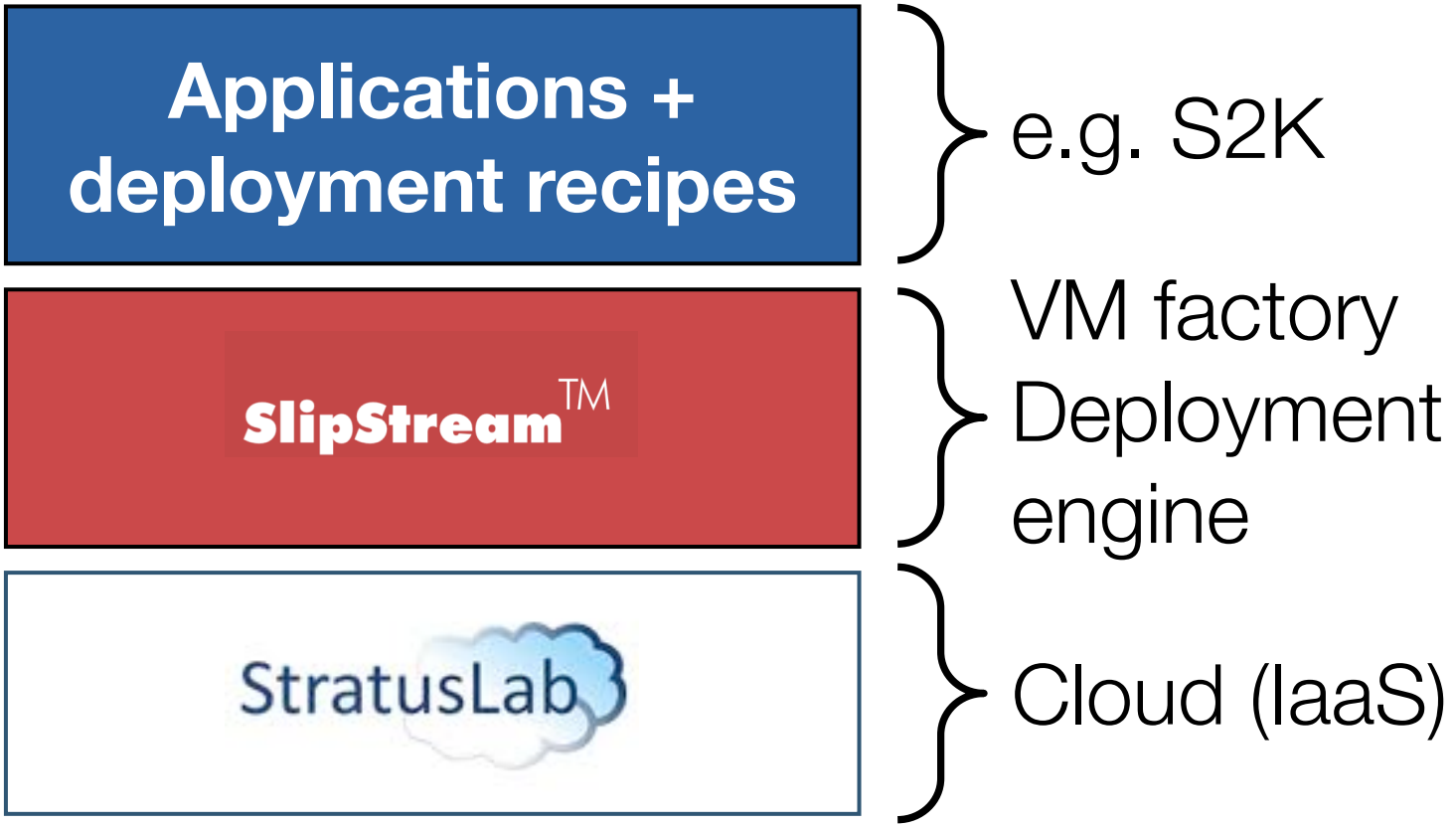


Solution Overview



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Cloud Infrastructure

- Infrastructure as a Service (IaaS) provides:
  - Virtual machine life-cycle
  - VM image store
  - Storage
- StratusLab used for IaaS cloud:
  - License: Apache 2.0
  - European

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S2K configuration in SlipStream

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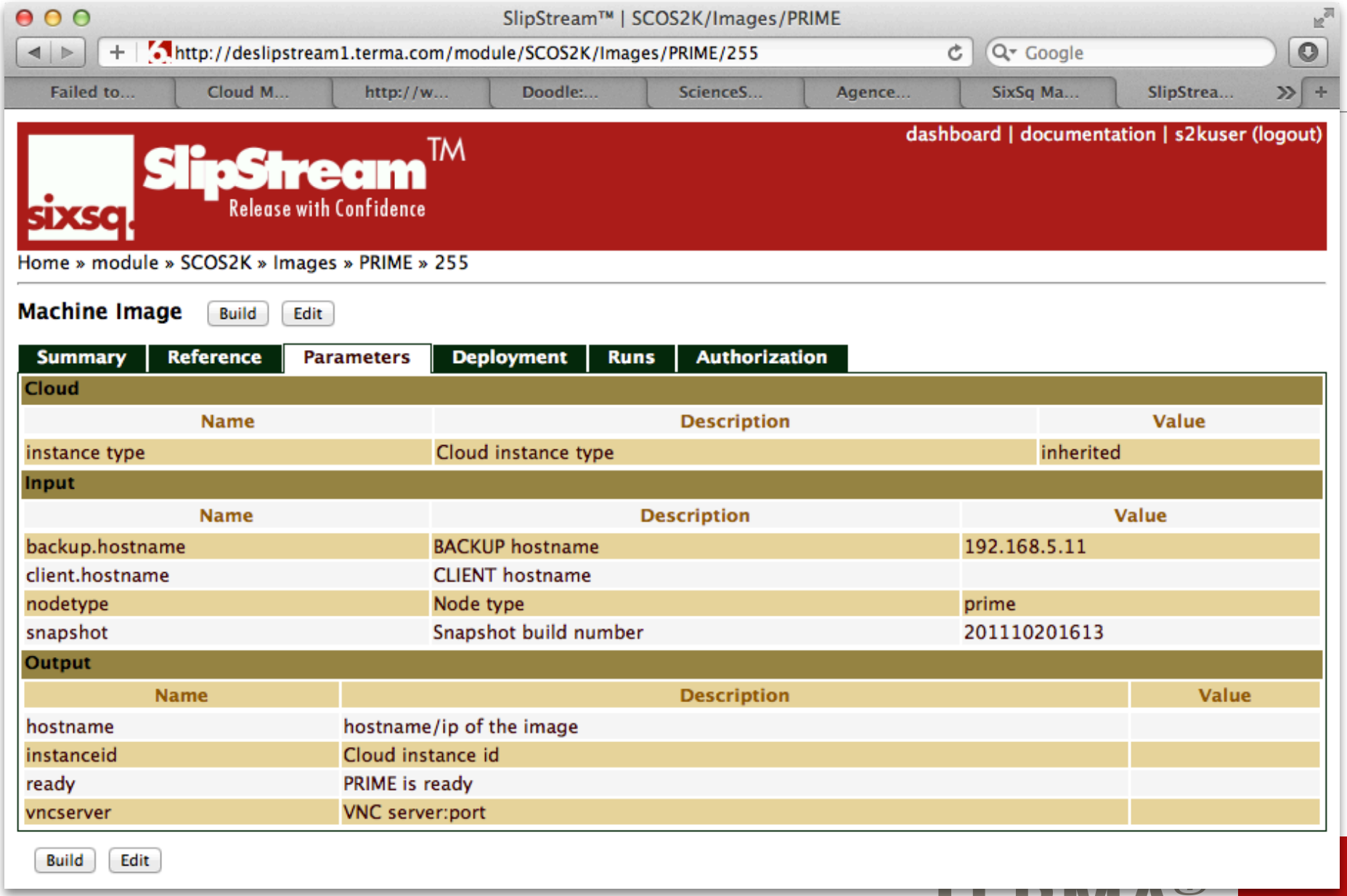
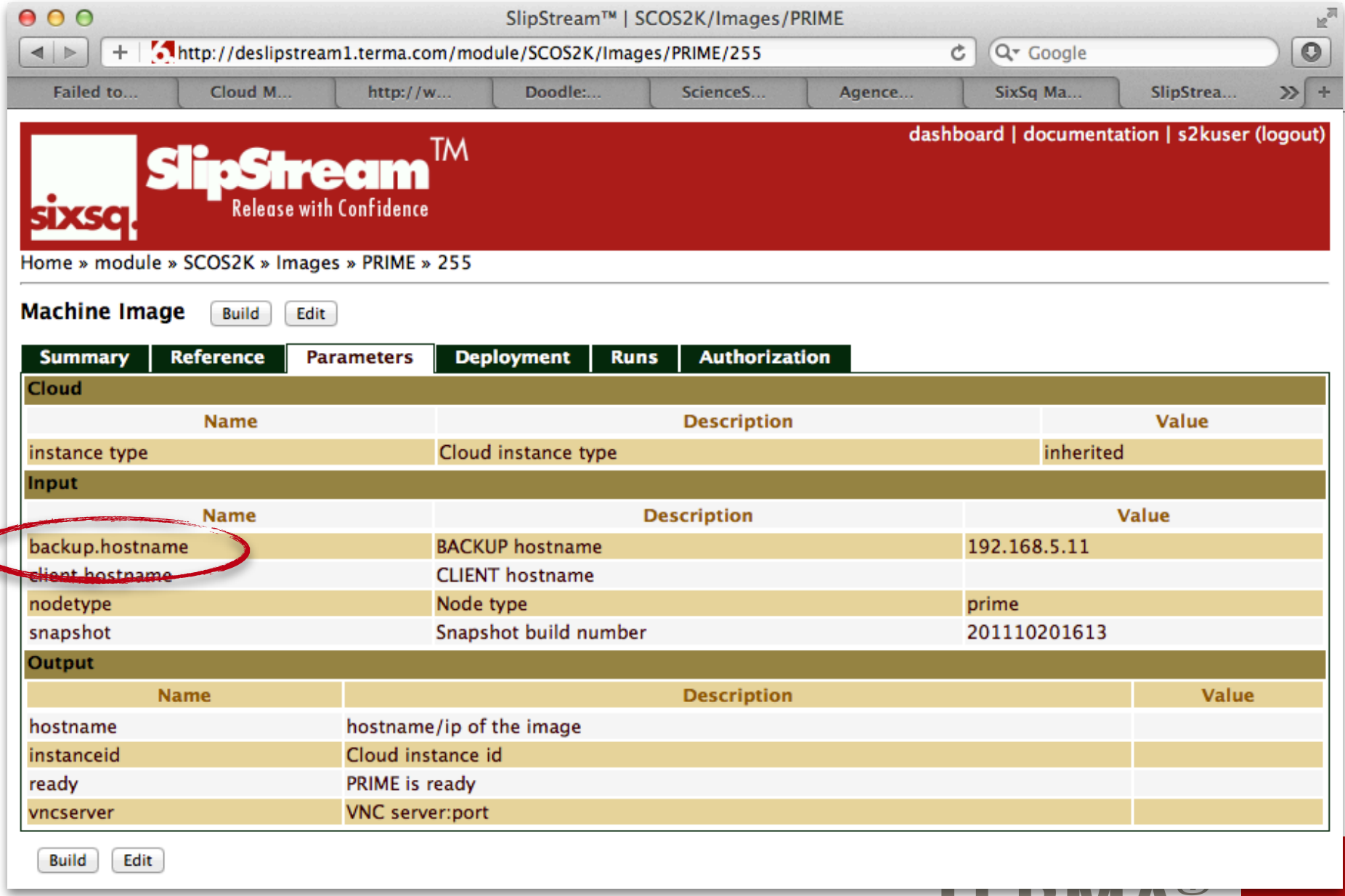

SlipStream™ | SCOS2K/Images/PRIME
http://deslipstream1.terma.com/module/SCOS2K/Images/PRIME/255
Google
Failed to...
Cloud M...
http://w...
Doodle:...
ScienceS...
Agence...
SixSq Ma...
SlipStrea...
SlipStream™
Release with Confidence
dashboard | documentation | s2kuser (logout)
Home » module » SCOS2K » Images » PRIME » 255
Machine Image
Build
Edit
Summary
Reference
Parameters
Deployment
Runs
Authorization
Cloud
Name
Description
Value
instance type
Cloud instance type
inherited
Input
Name
Description
Value
backup.hostname
BACKUP hostname
192.168.5.11
client.hostname
CLIENT hostname
nodetype
Node type
prime
snapshot
Snapshot build number
201110201613
Output
Name
Description
Value
hostname
hostname/ip of the image
instanceid
Cloud instance id
ready
PRIME is ready
vncserver
VNC server:port
Build
Edit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Node type
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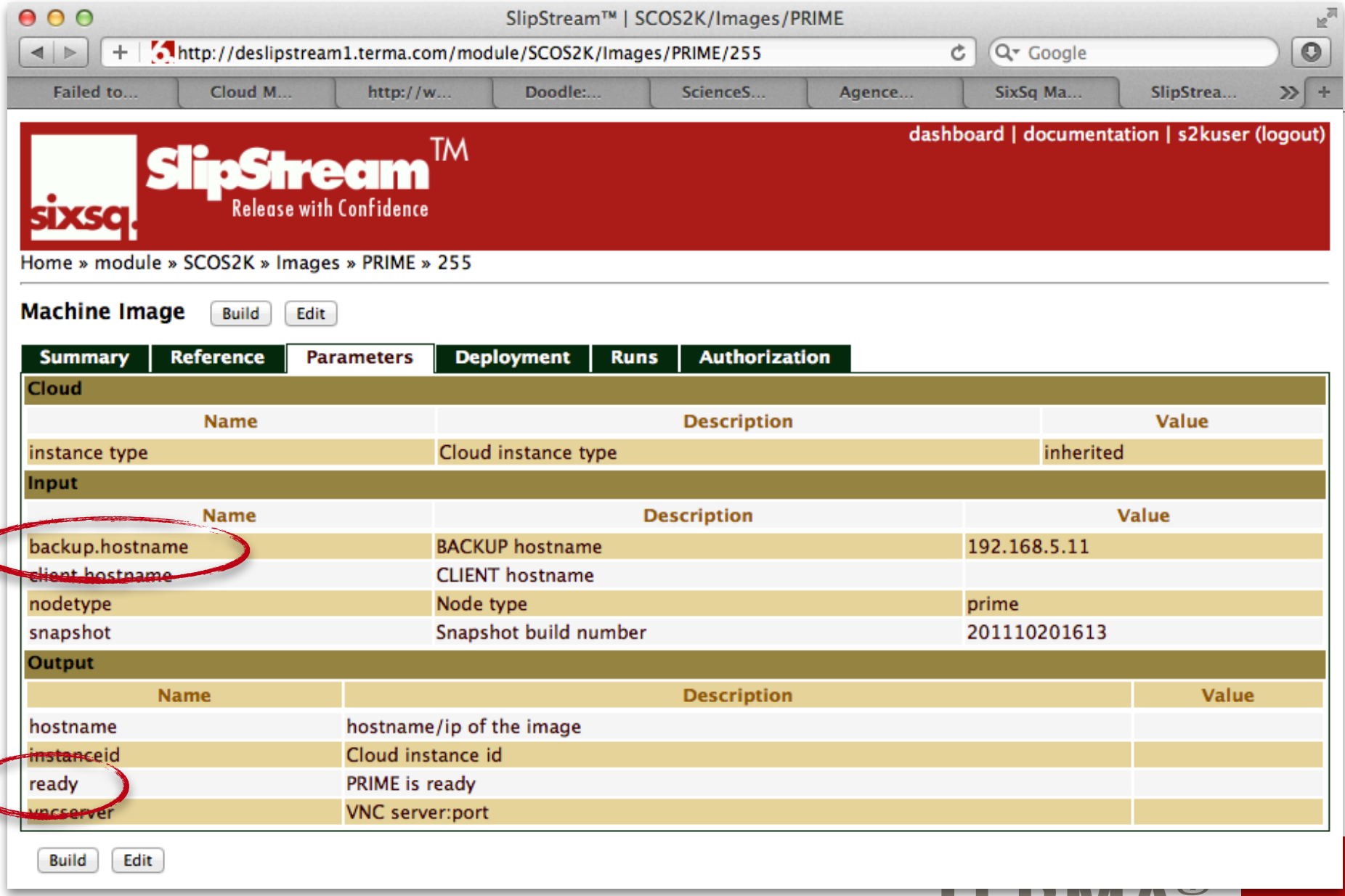
Cloud instance id
ready
PRIME is ready
vncserver
VNC server:port
Build
Edit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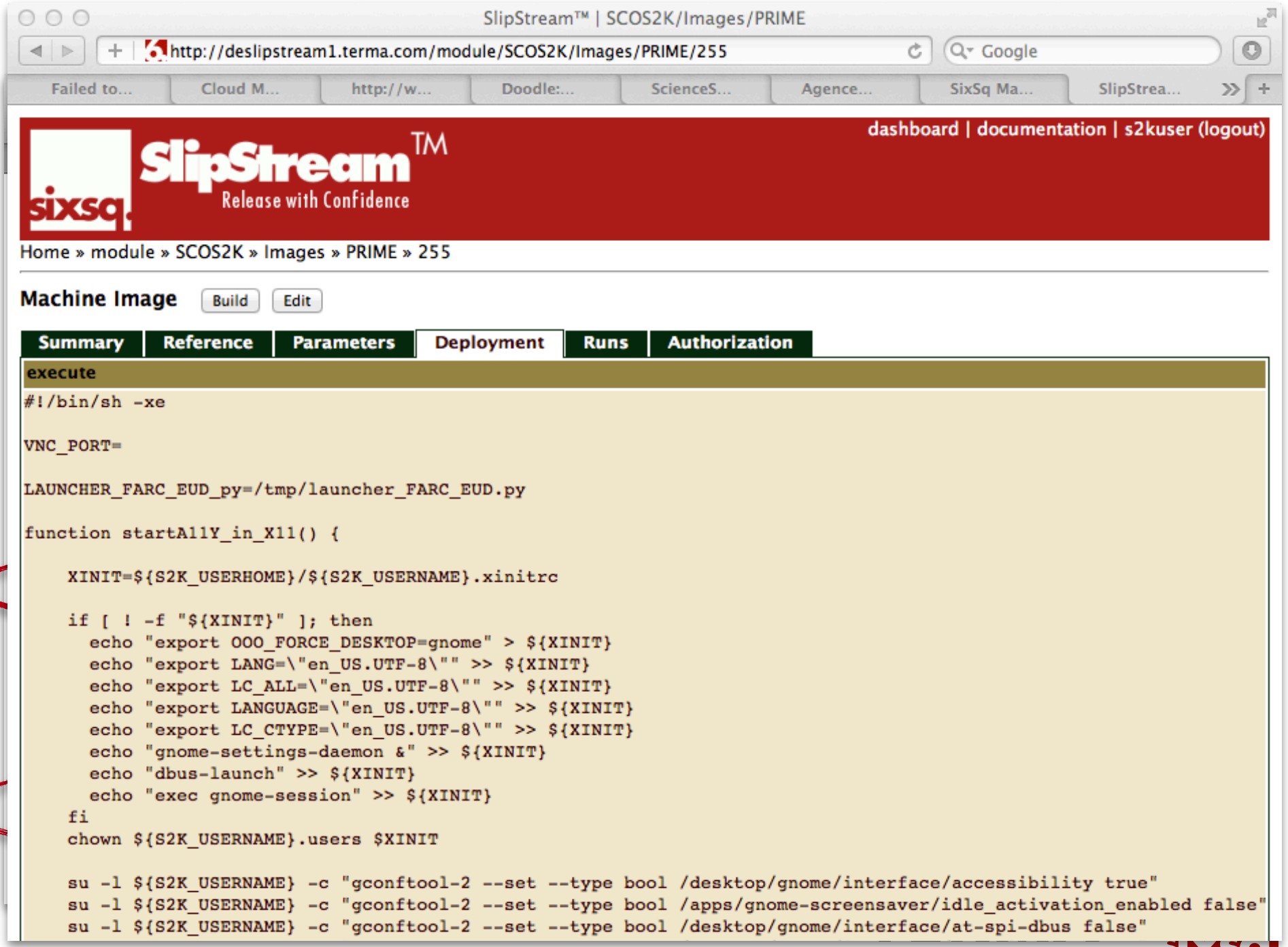
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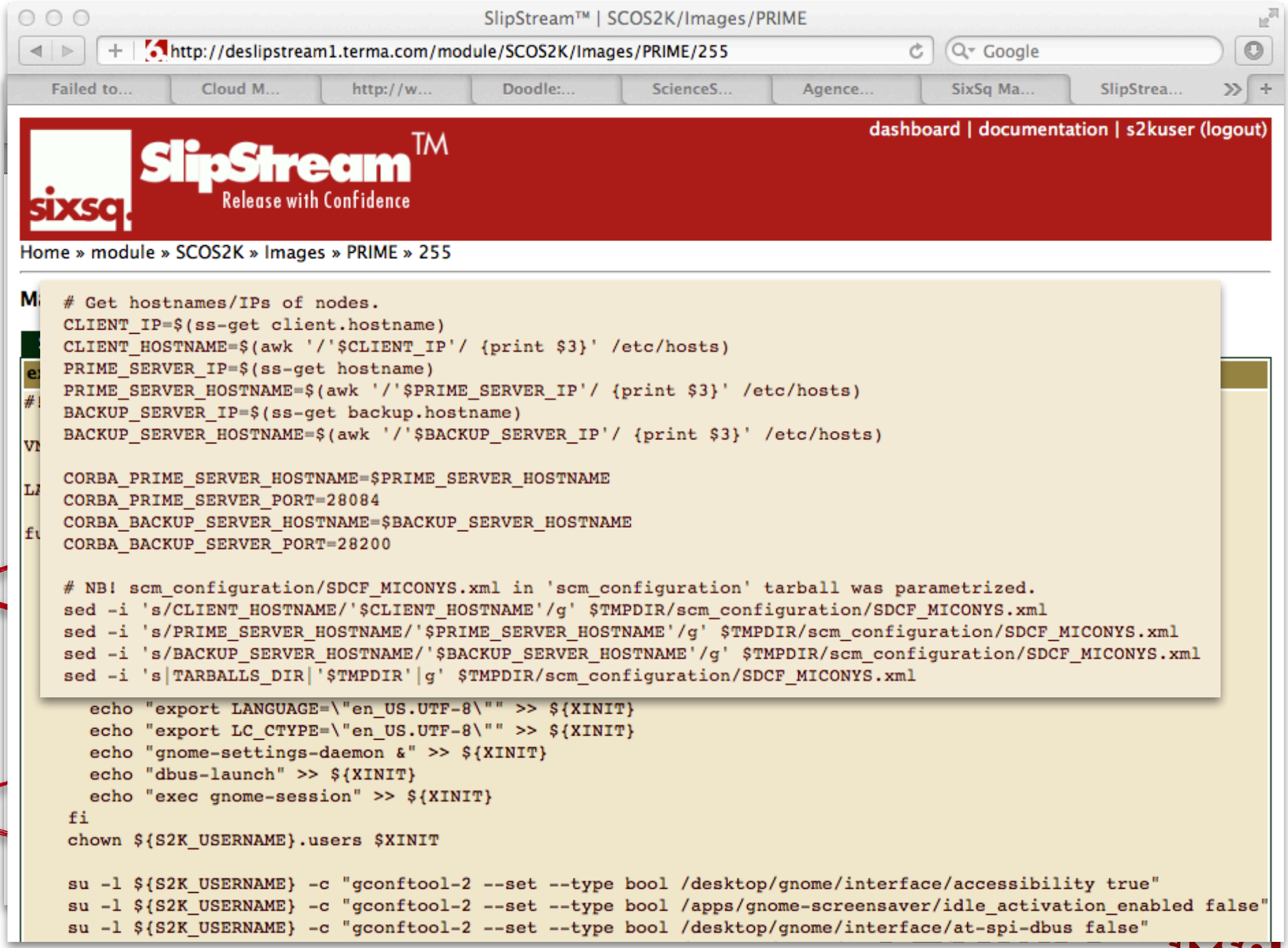
Machine Image
Build
Edit
Summary
Reference
Parameters
Deployment
Runs
Authorization
execute
#!/bin/sh -xe
VNC_PORT=
LAUNCHER_FARC_EUD_py=/tmp/launcher_FARC_EUD.py
function startA11Y_in_X11() {
XINIT=${S2K_USERHOME}/${S2K_USERNAME}.xinitrc
if [! -f "${XINIT}"]; then
echo "export OOO_FORCE_DESKTOP=gnome" > ${XINIT}
echo "export LANG=\"en_US.UTF-8\"" >> ${XINIT}
echo "export LC_ALL=\"en_US.UTF-8\"" >> ${XINIT}
echo "export LANGUAGE=\"en_US.UTF-8\"" >> ${XINIT}
echo "export LC_CTYPE=\"en_US.UTF-8\"" >> ${XINIT}
echo "gnome-settings-daemon &" >> ${XINIT}
echo "dbus-launch" >> ${XINIT}
echo "exec gnome-session" >> ${XINIT}
fi
chown ${S2K_USERNAME}.users $XINIT
su -l ${S2K_USERNAME} -c "gconftool-2 --set --type bool /desktop/gnome/interface/accessibility true"
su -l ${S2K_USERNAME} -c "gconftool-2 --set --type bool /apps/gnome-screensaver/idle_activation_enabled false"
su -l ${S2K_USERNAME} -c "gconftool-2 --set --type bool /desktop/gnome/interface/at-spi-dbus false"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# Get hostnames/IPs of nodes.
CLIENT_IP=$(ss-get client.hostname)
CLIENT_HOSTNAME=$(awk '/'$CLIENT_IP'/ {print $3}' /etc/hosts)
PRIME_SERVER_IP=$(ss-get hostname)
PRIME_SERVER_HOSTNAME=$(awk '/'$PRIME_SERVER_IP'/ {print $3}' /etc/hosts)
BACKUP_SERVER_IP=$(ss-get backup.hostname)
BACKUP_SERVER_HOSTNAME=$(awk '/'$BACKUP_SERVER_IP'/ {print $3}' /etc/hosts)
CORBA_PRIME_SERVER_HOSTNAME=$PRIME_SERVER_HOSTNAME
CORBA_PRIME_SERVER_PORT=28084
CORBA_BACKUP_SERVER_HOSTNAME=$BACKUP_SERVER_HOSTNAME
CORBA_BACKUP_SERVER_PORT=28200
# NB! scm_configuration/SDCF_MICONYS.xml in 'scm_configuration' tarball was parametrized.
sed -i 's/CLIENT_HOSTNAME/'$CLIENT_HOSTNAME'/g' $TMPDIR/scm_configuration/SDCF_MICONYS.xml
sed -i 's/PRIME_SERVER_HOSTNAME/'$PRIME_SERVER_HOSTNAME'/g' $TMPDIR/scm_configuration/SDCF_MICONYS.xml
sed -i 's/BACKUP_SERVER_HOSTNAME/'$BACKUP_SERVER_HOSTNAME'/g' $TMPDIR/scm_configuration/SDCF_MICONYS.xml
sed -i 's|TARBALLS_DIR|'$TMPDIR'|g' $TMPDIR/scm_configuration/SDCF_MICONYS.xml
echo "export LANGUAGE=\"en_US.UTF-8\"" >> ${XINIT}
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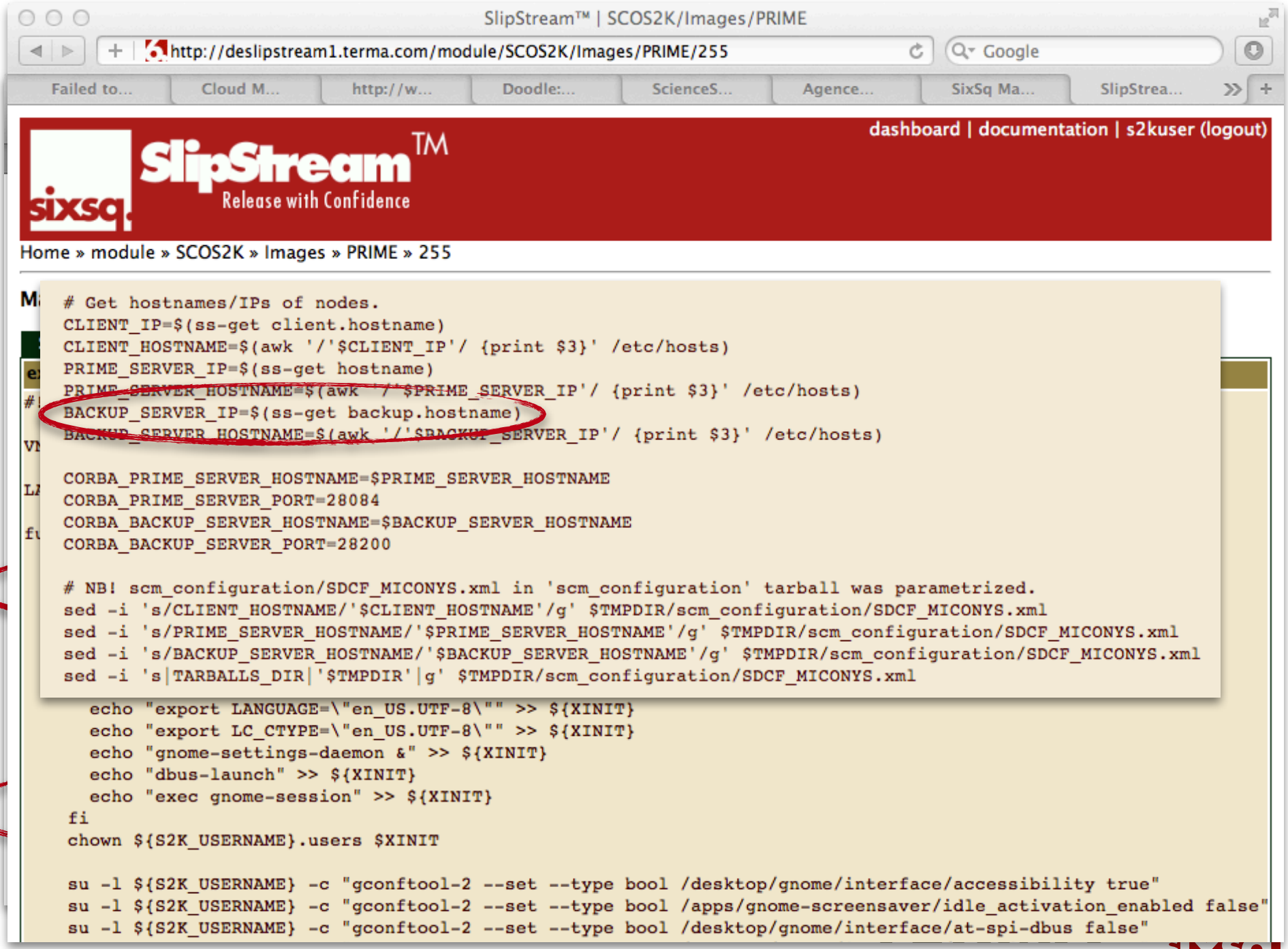
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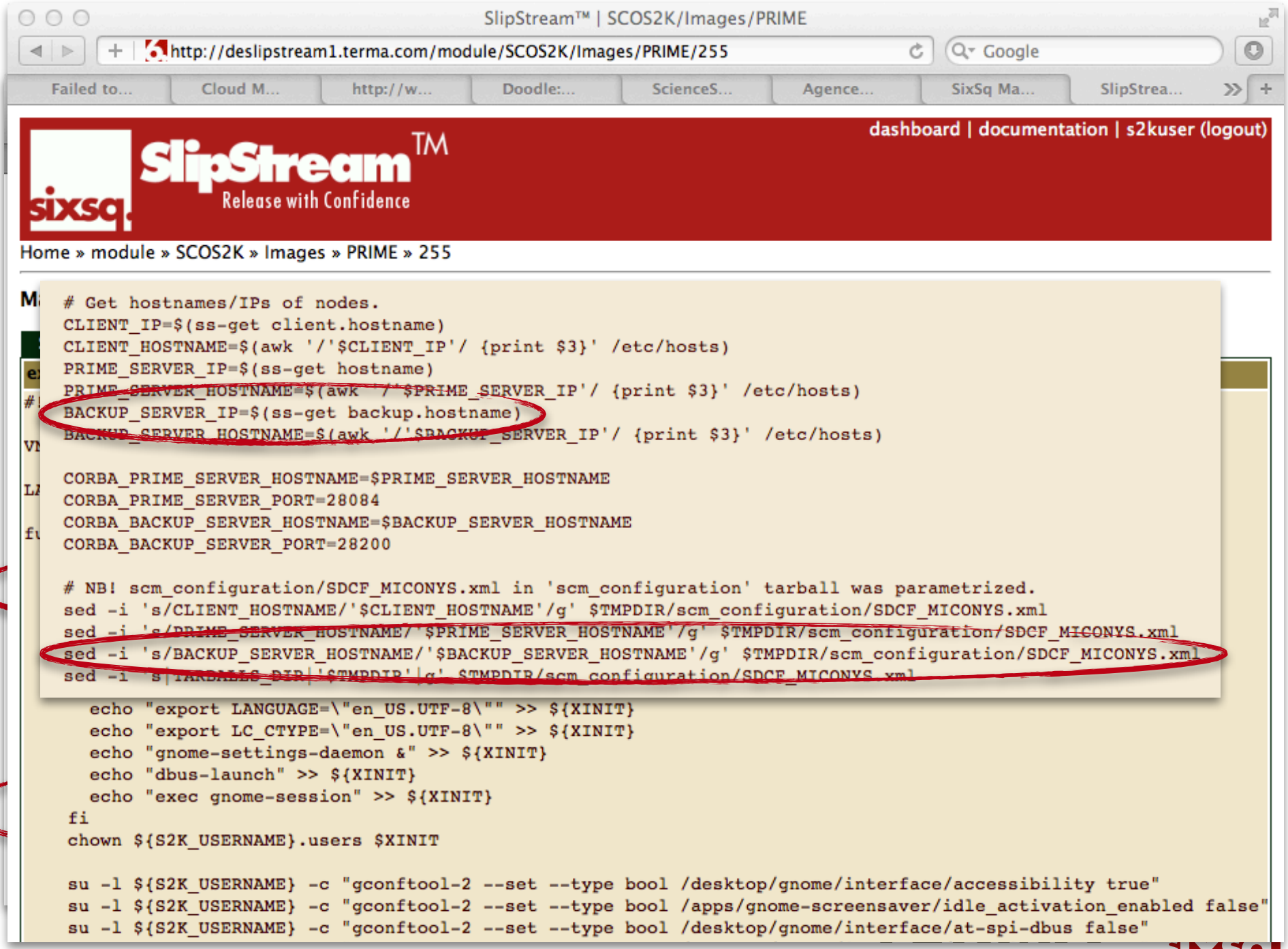
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SlipStream dashboard and reports

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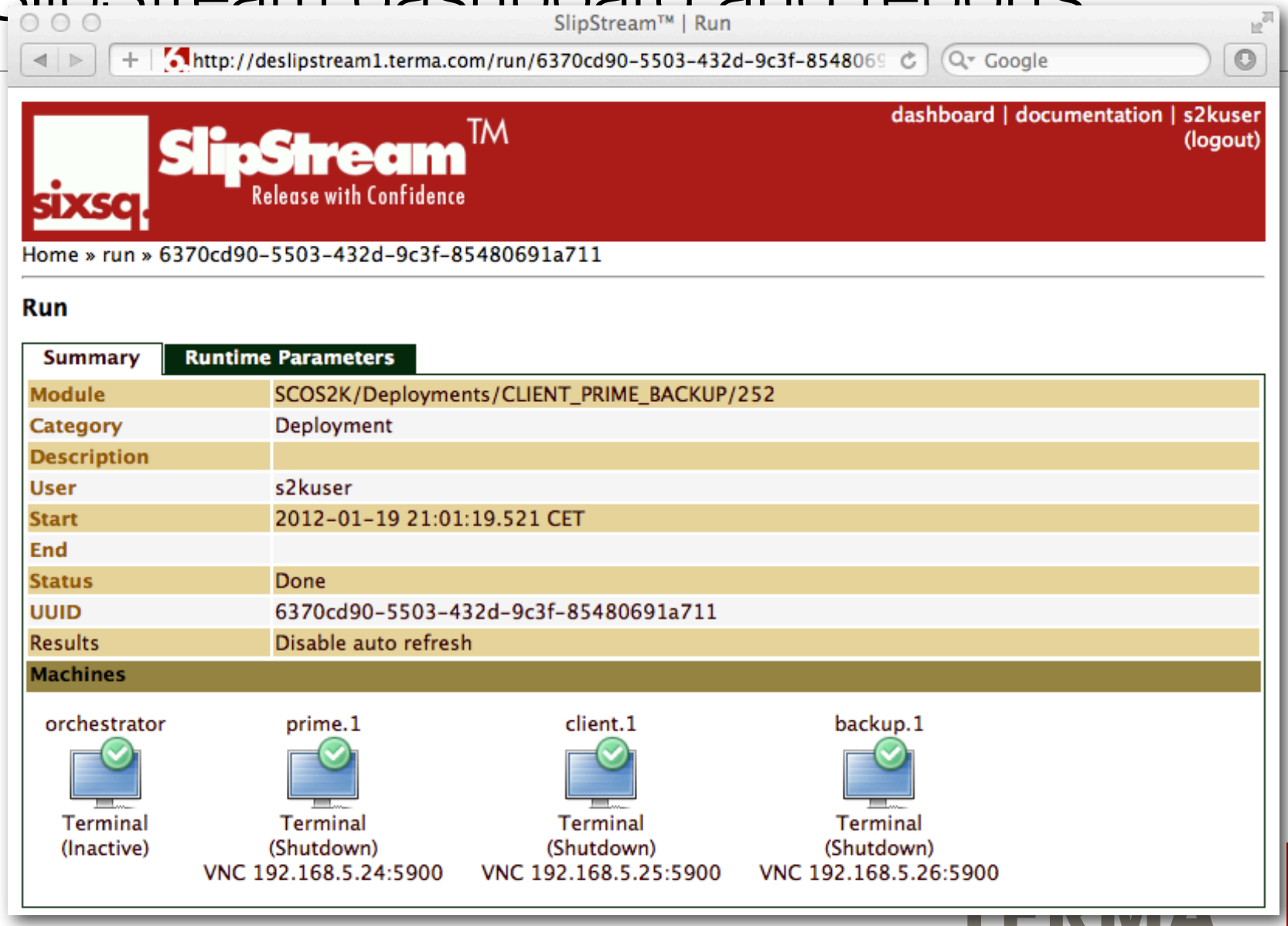
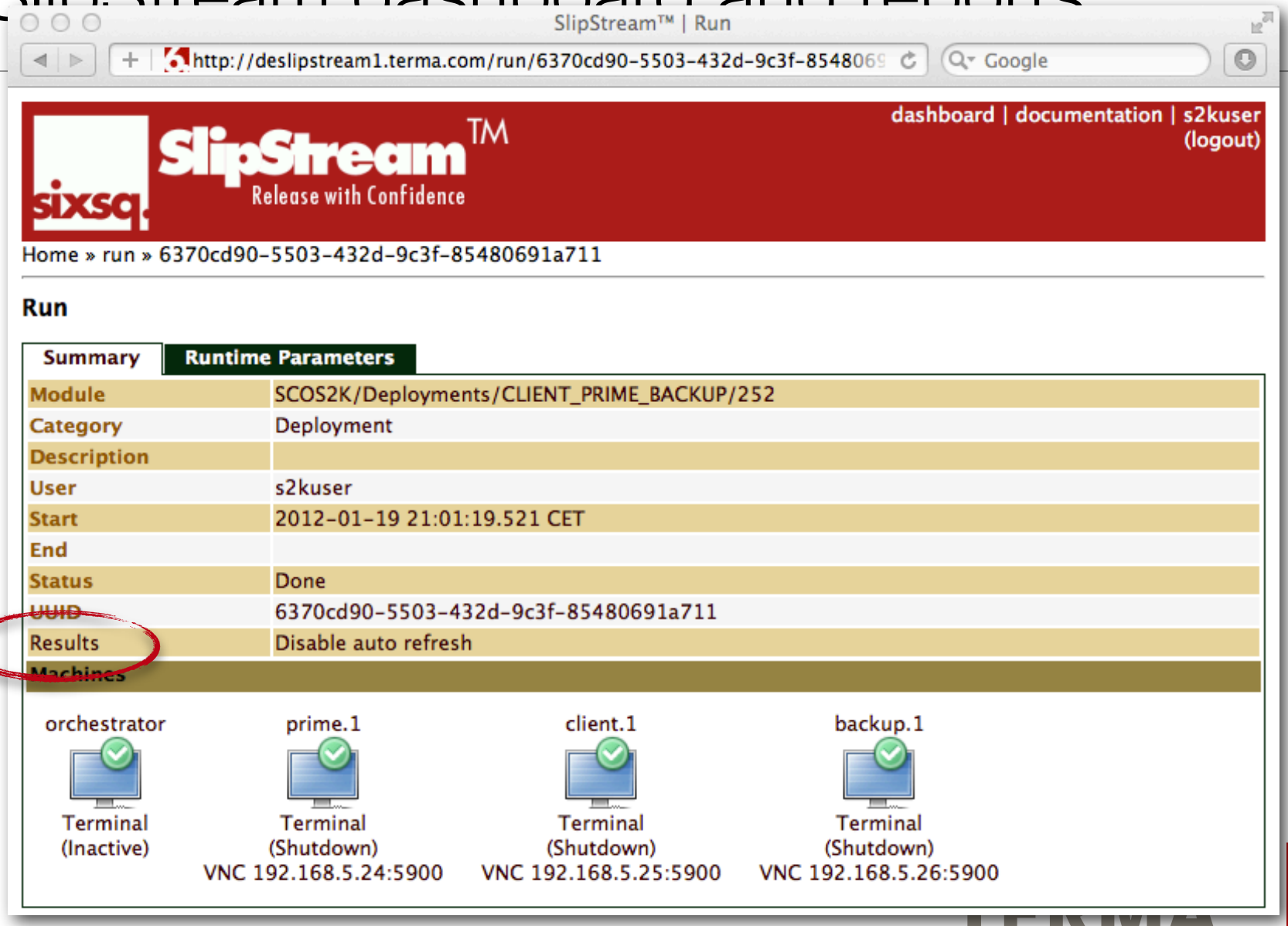
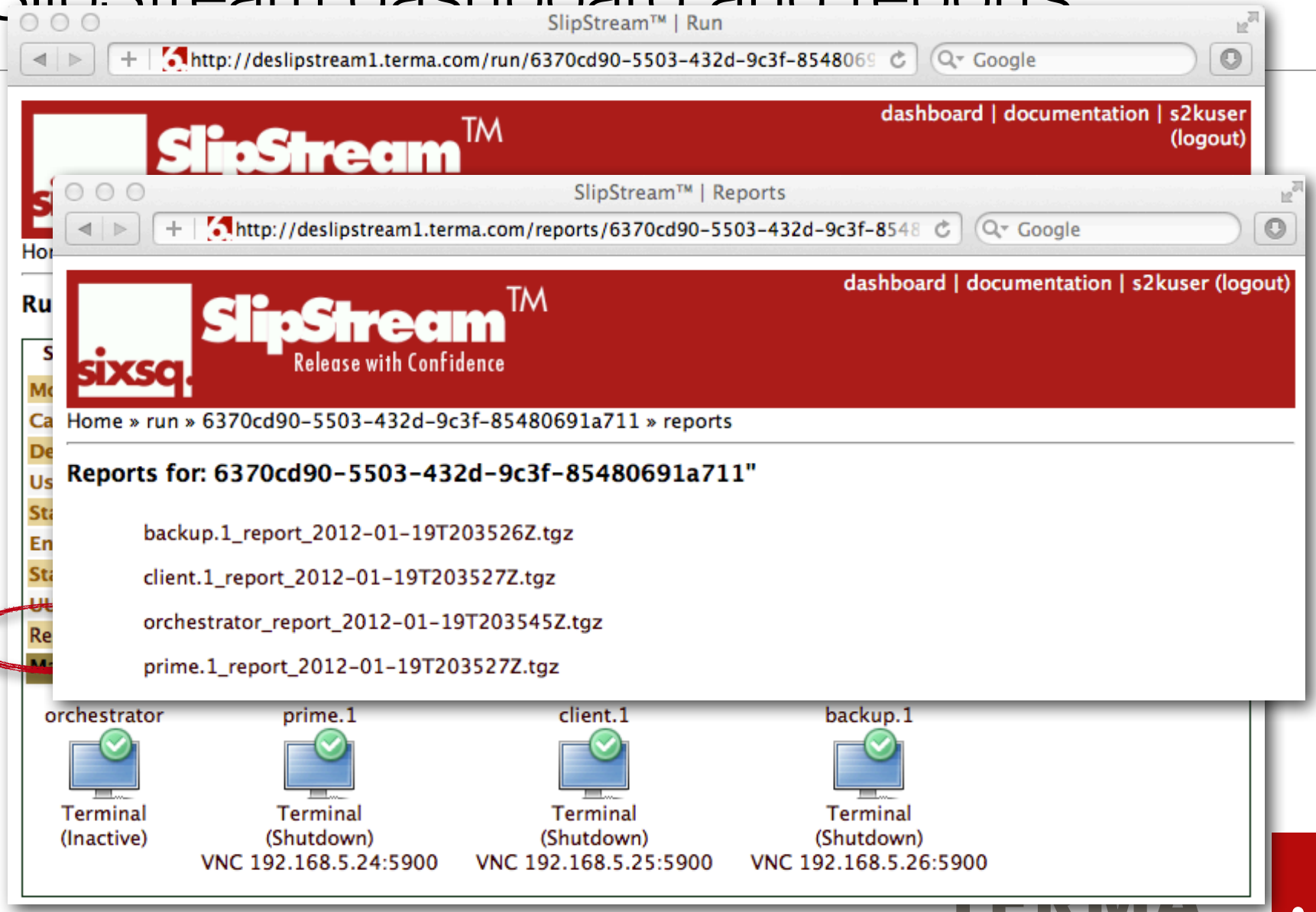
SlipStream dashboard and reports



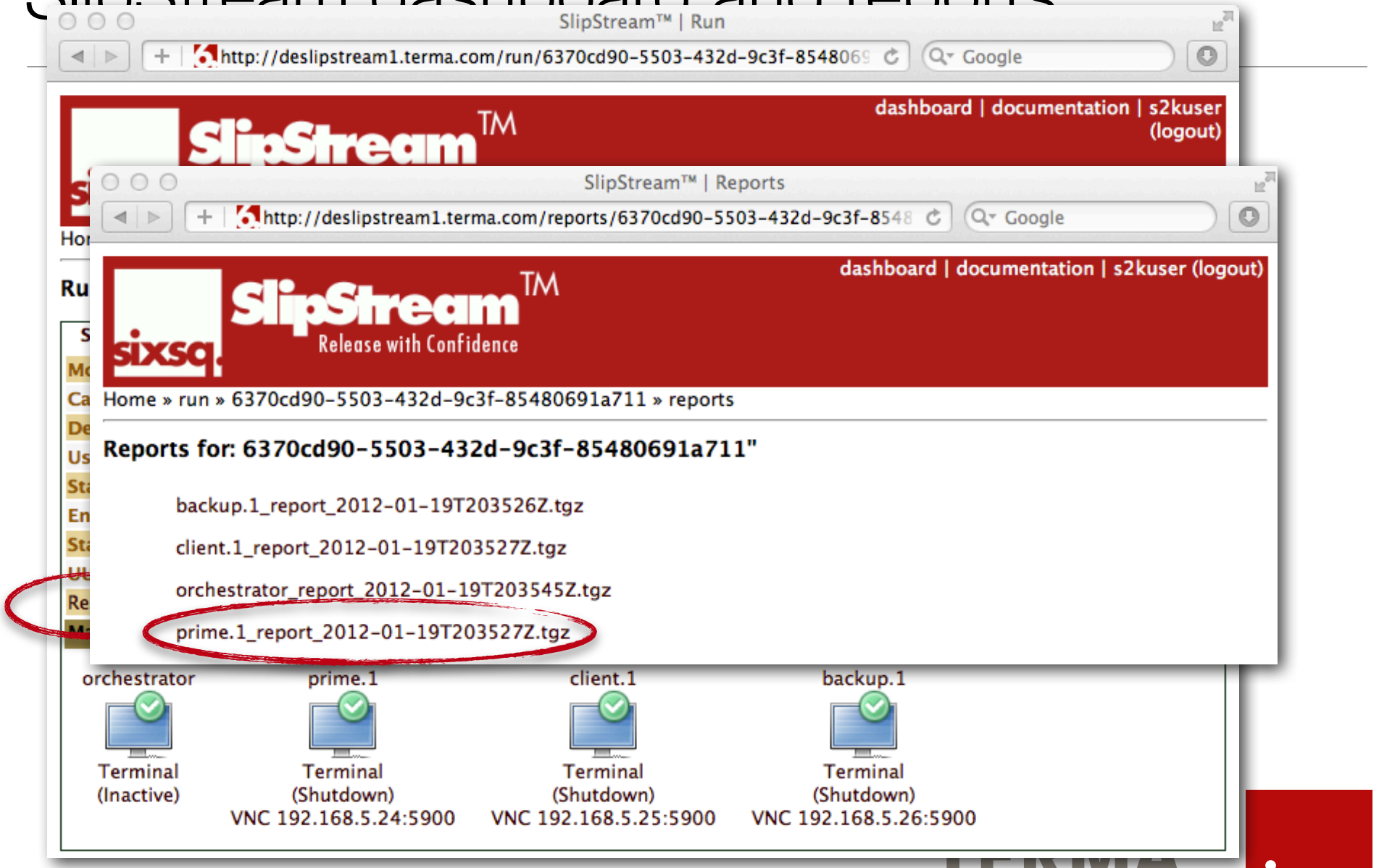
SlipStream dashboard and reports



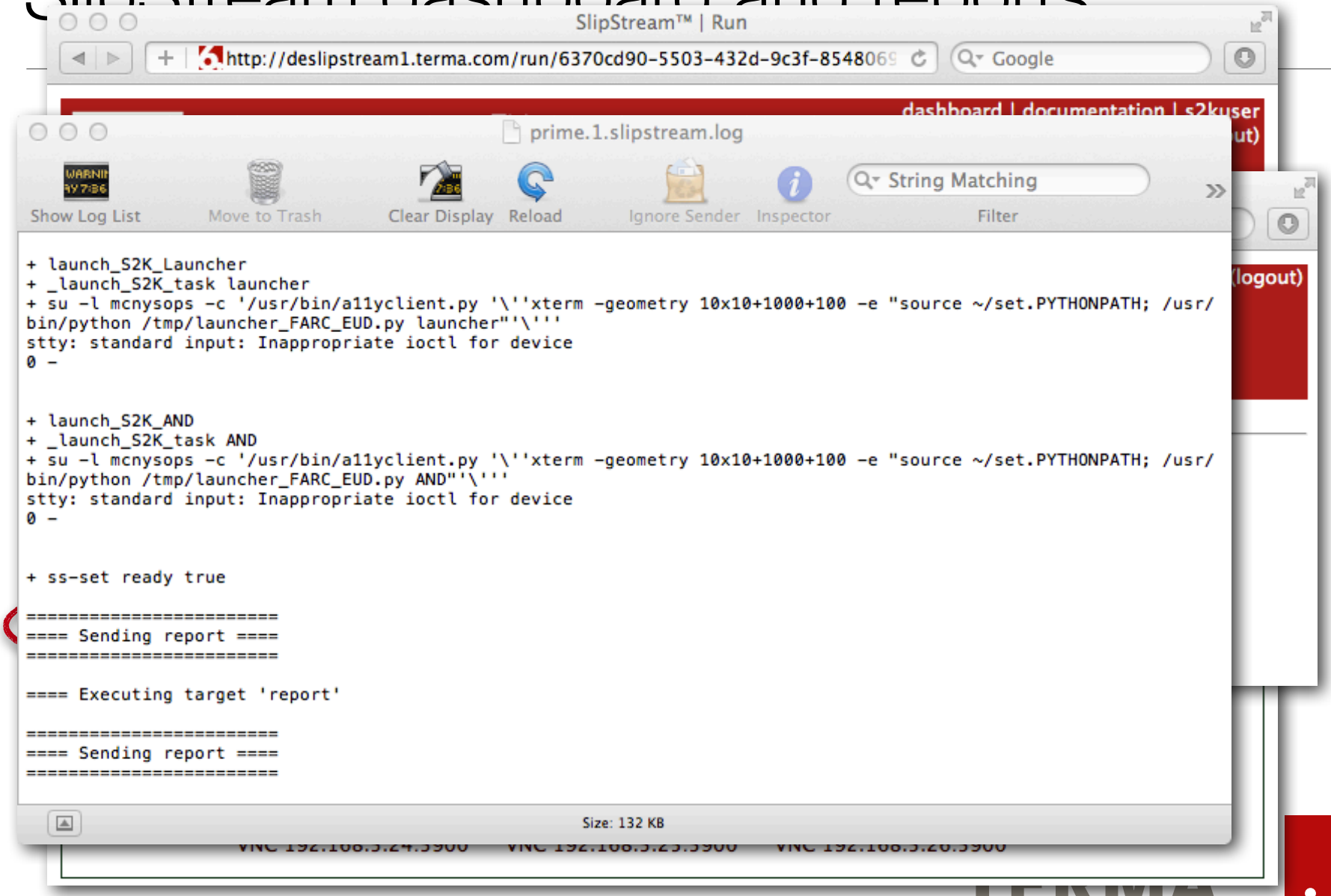
SlipStream dashboard and reports



SlipStream dashboard and reports



SlipStream dashboard and reports



7 minutes later...

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Next steps?

- Execute Entire Verification Suite (e.g. ART)
- Tighter integration with build process
  - Integrate with CI solution (e.g. Hudson, Jenkins)
  - Generate binary packages to simplify installation

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Continuous Integration

<s2k-build-version>
<s2k-config-profile>

SlipStream™
Release with confidence

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Continuous Integration

<s2k-build-version>
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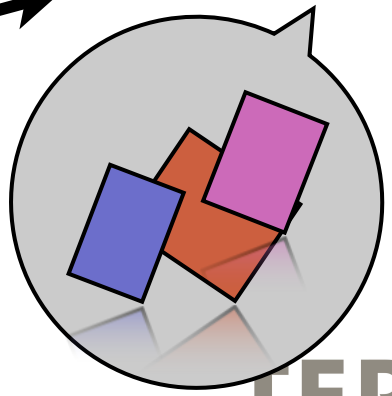
SlipStream™
Release with confidence



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Continuous Integration

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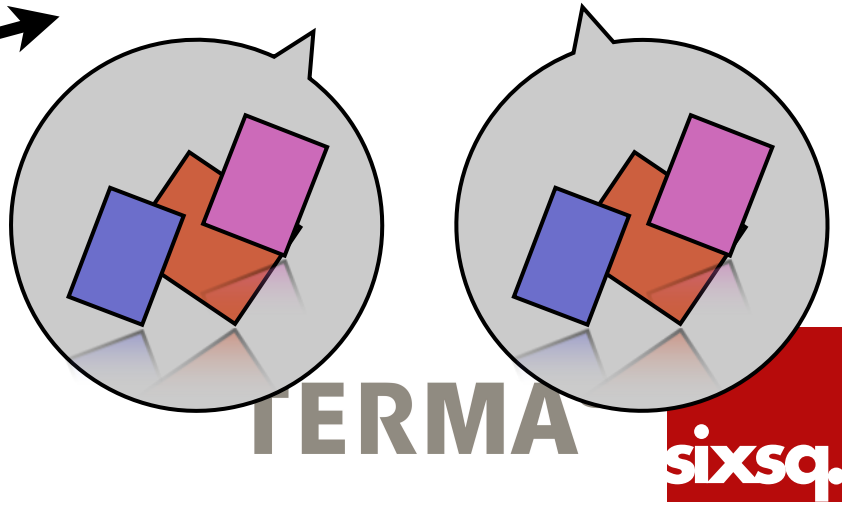
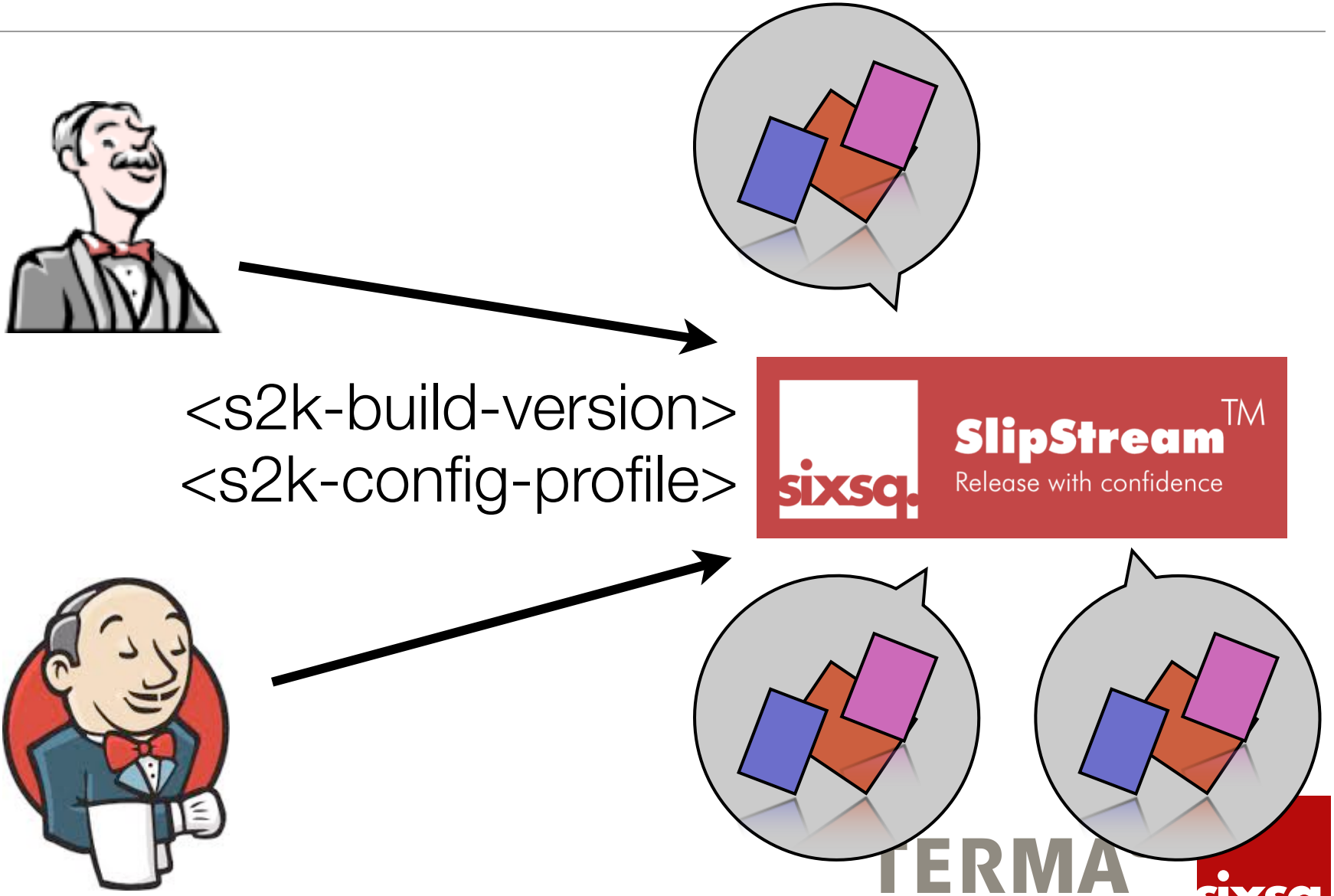
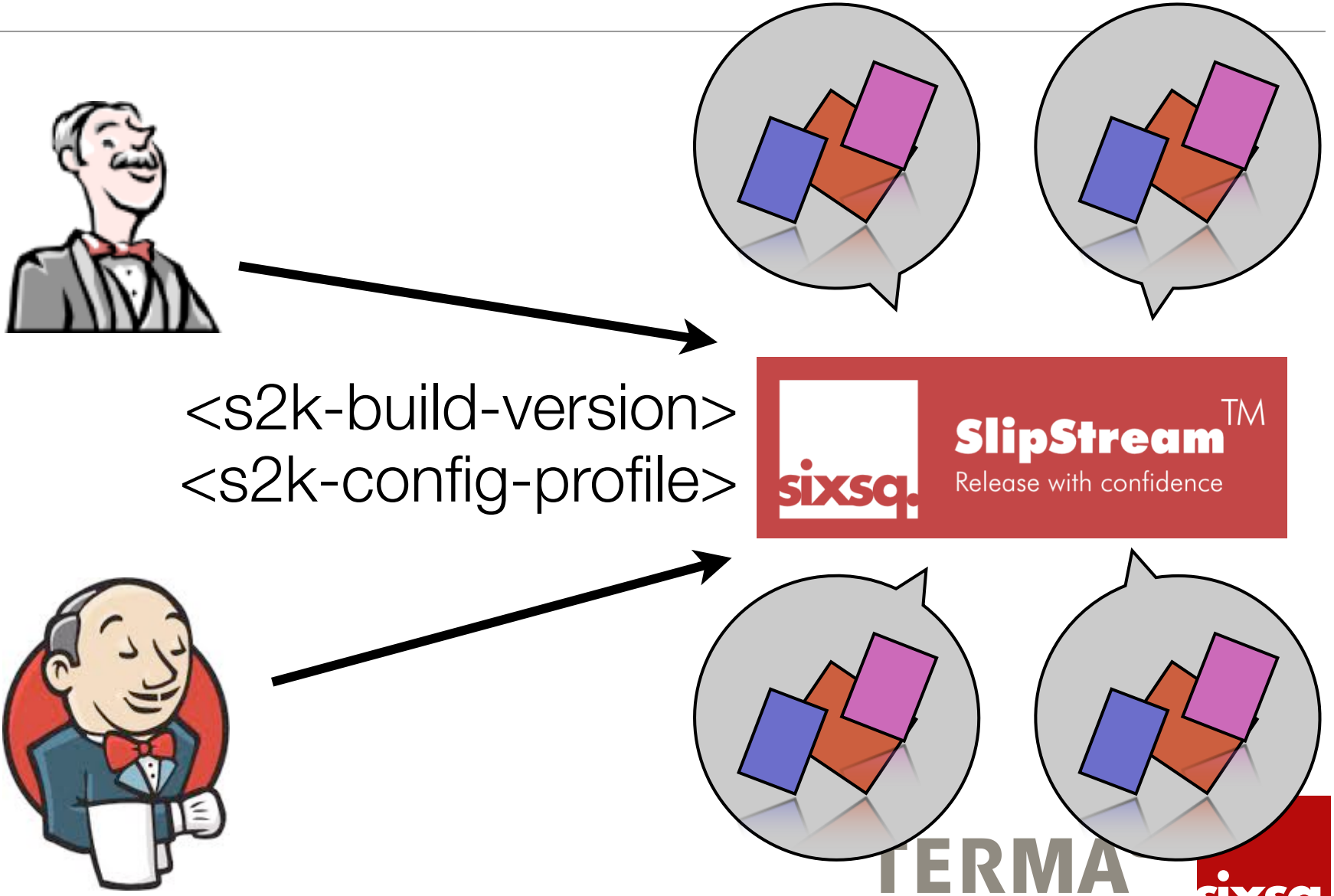


Continuous Integration



Continuous Integration



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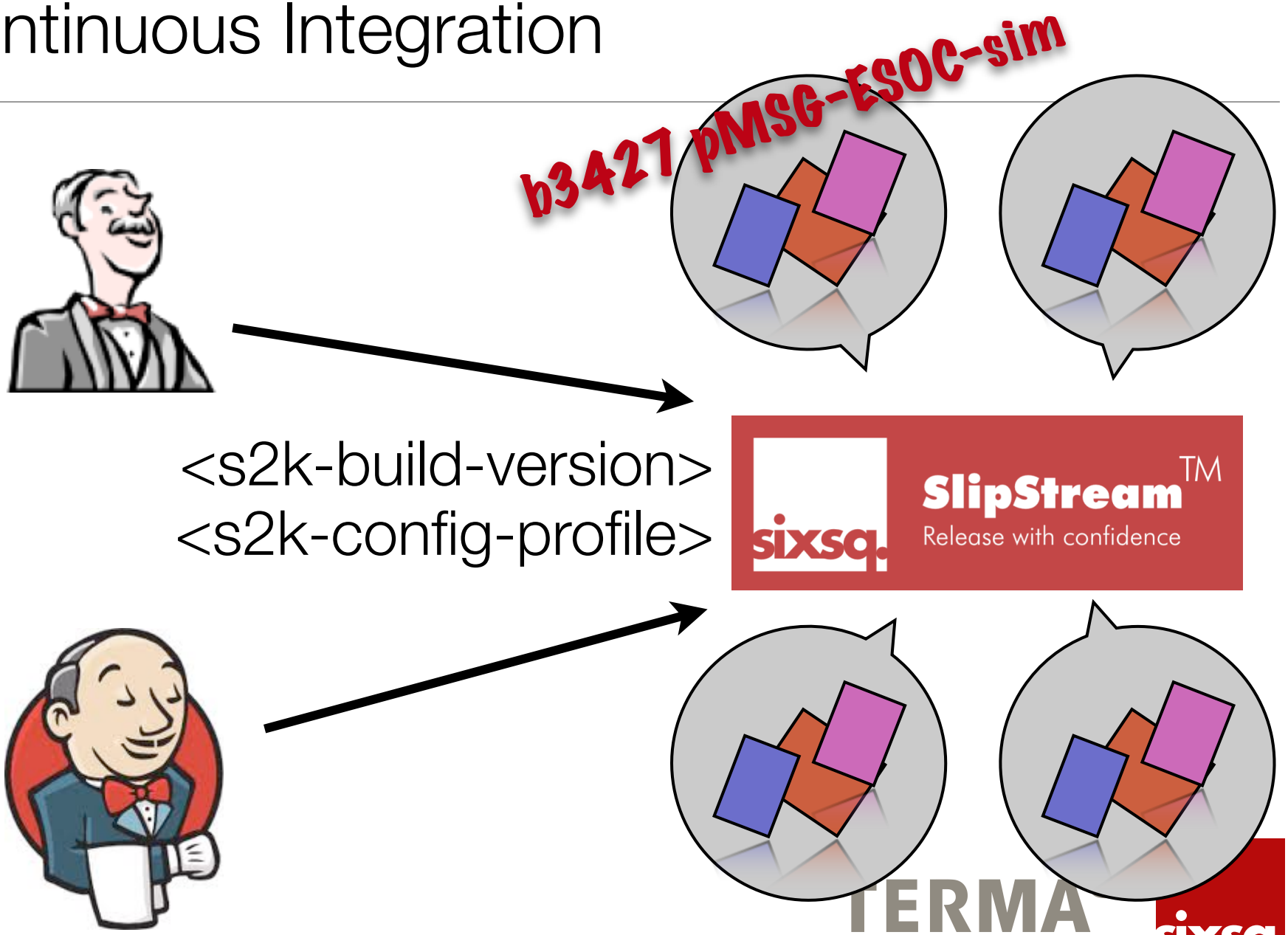
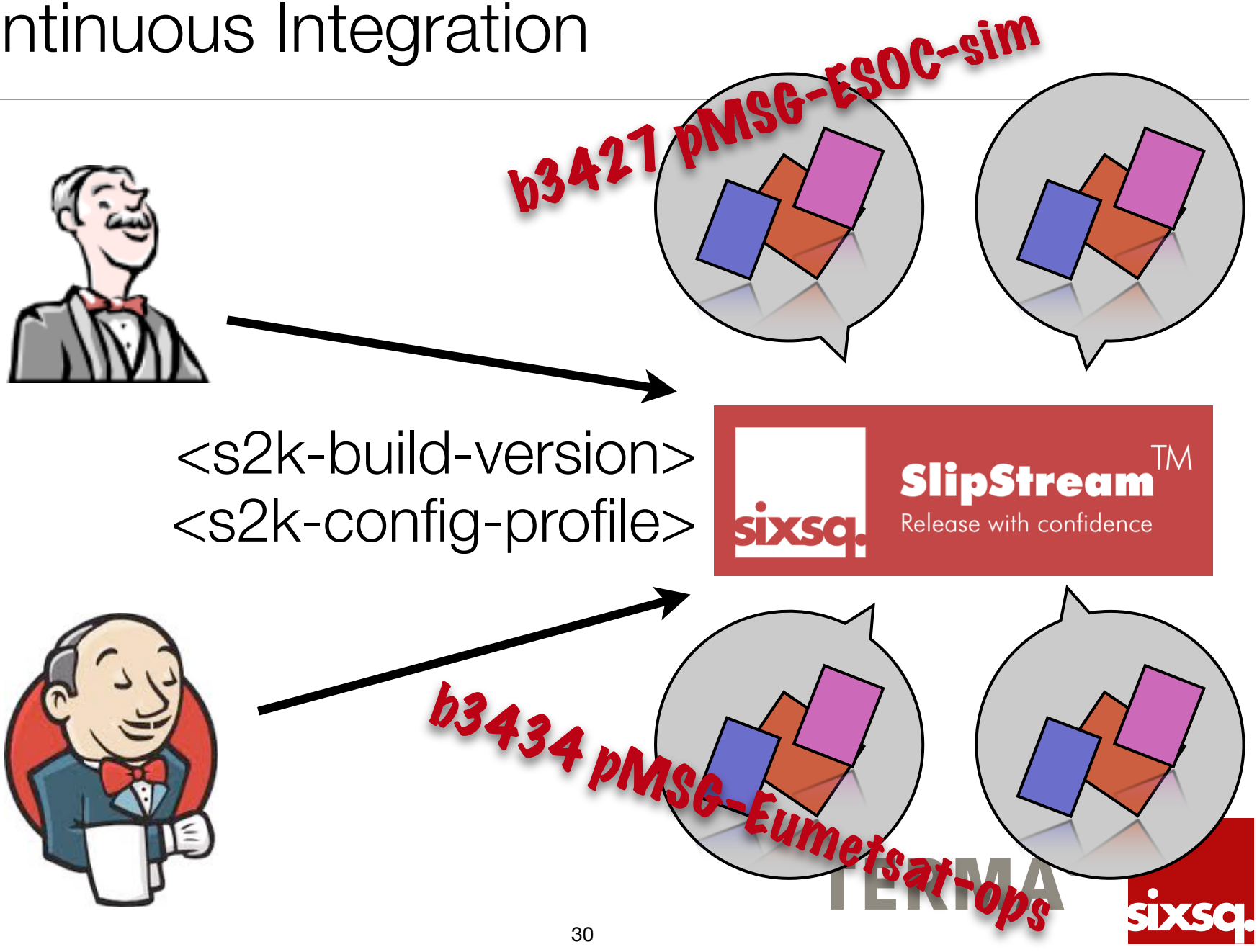


Continuous Integration



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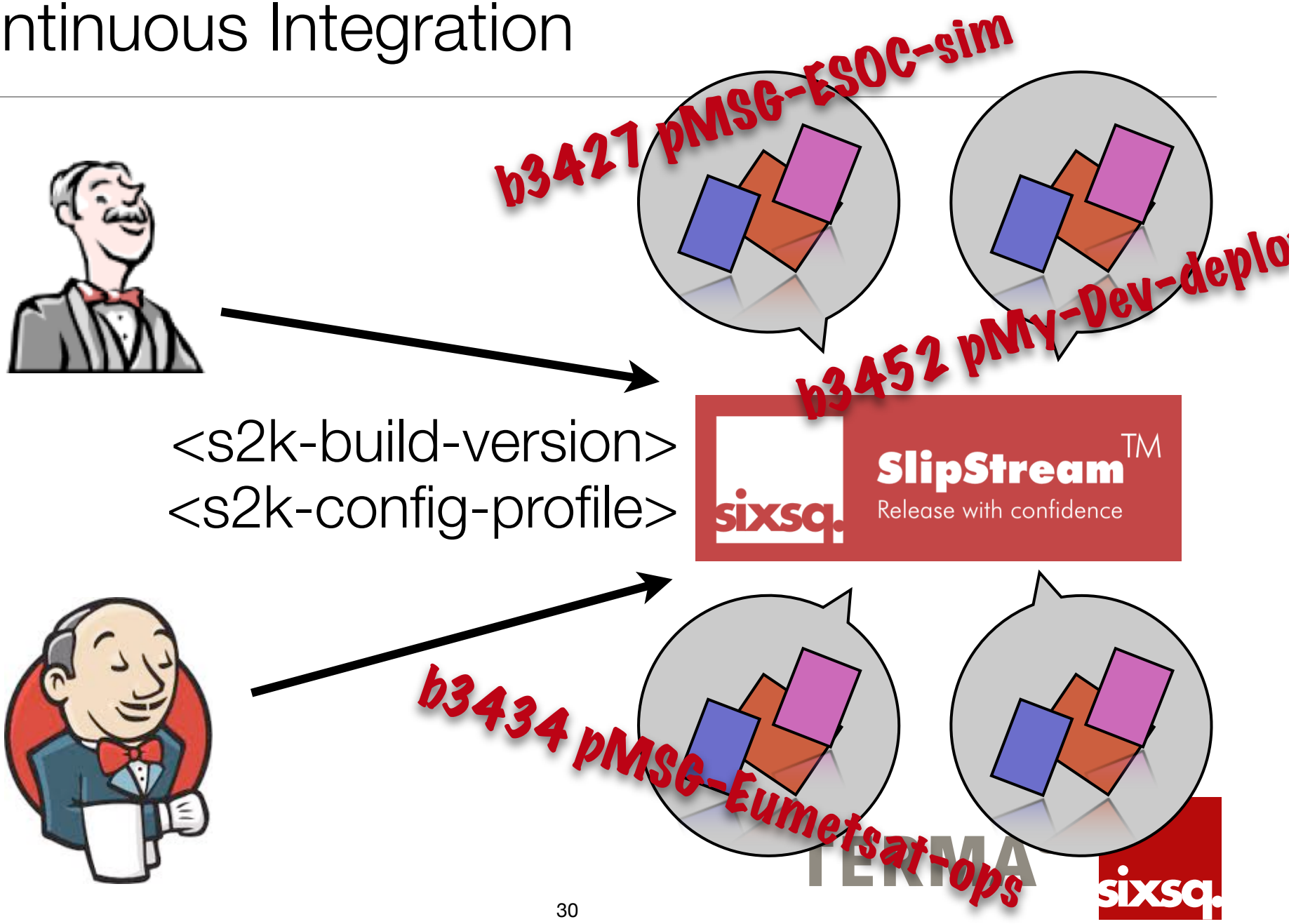
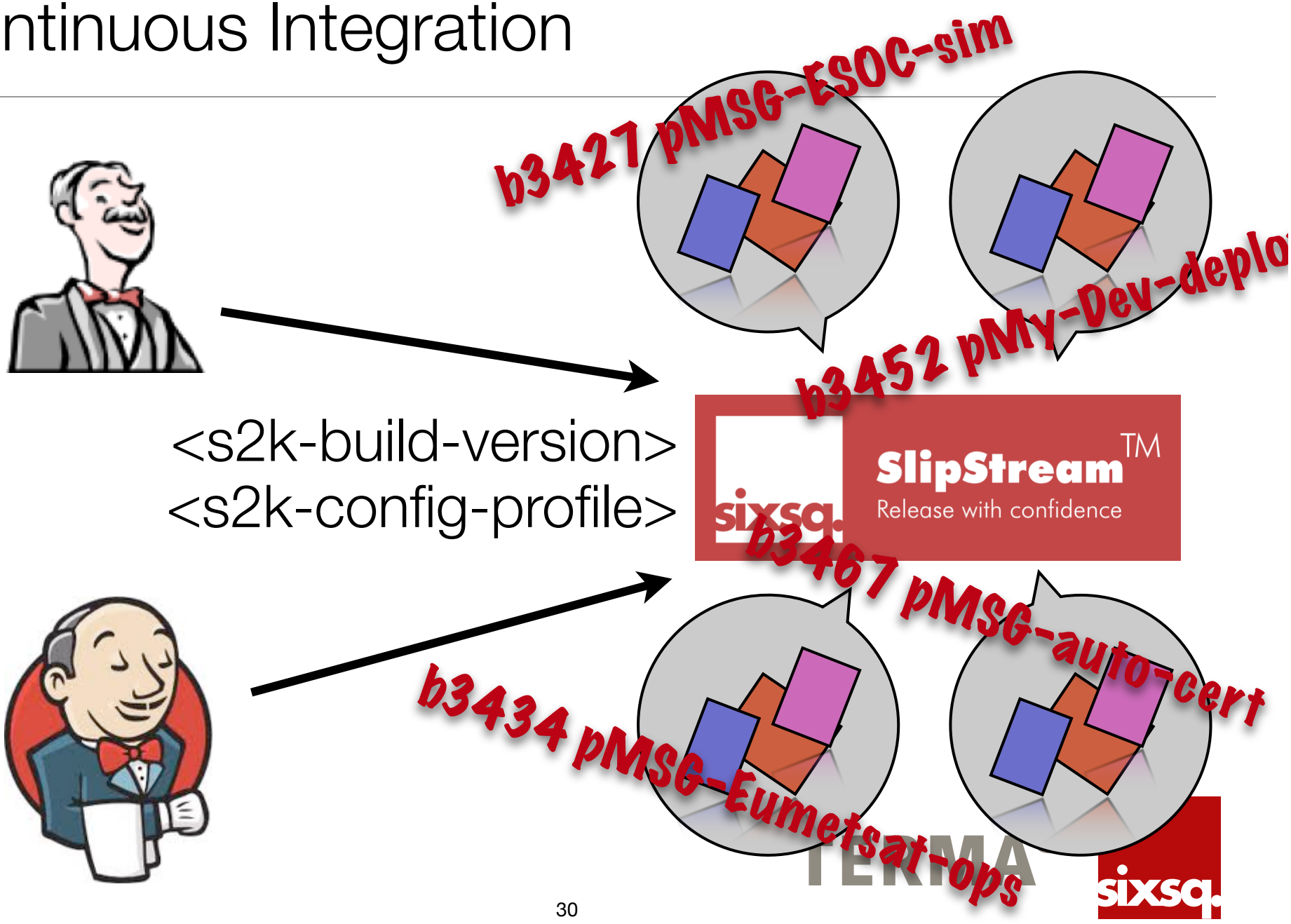
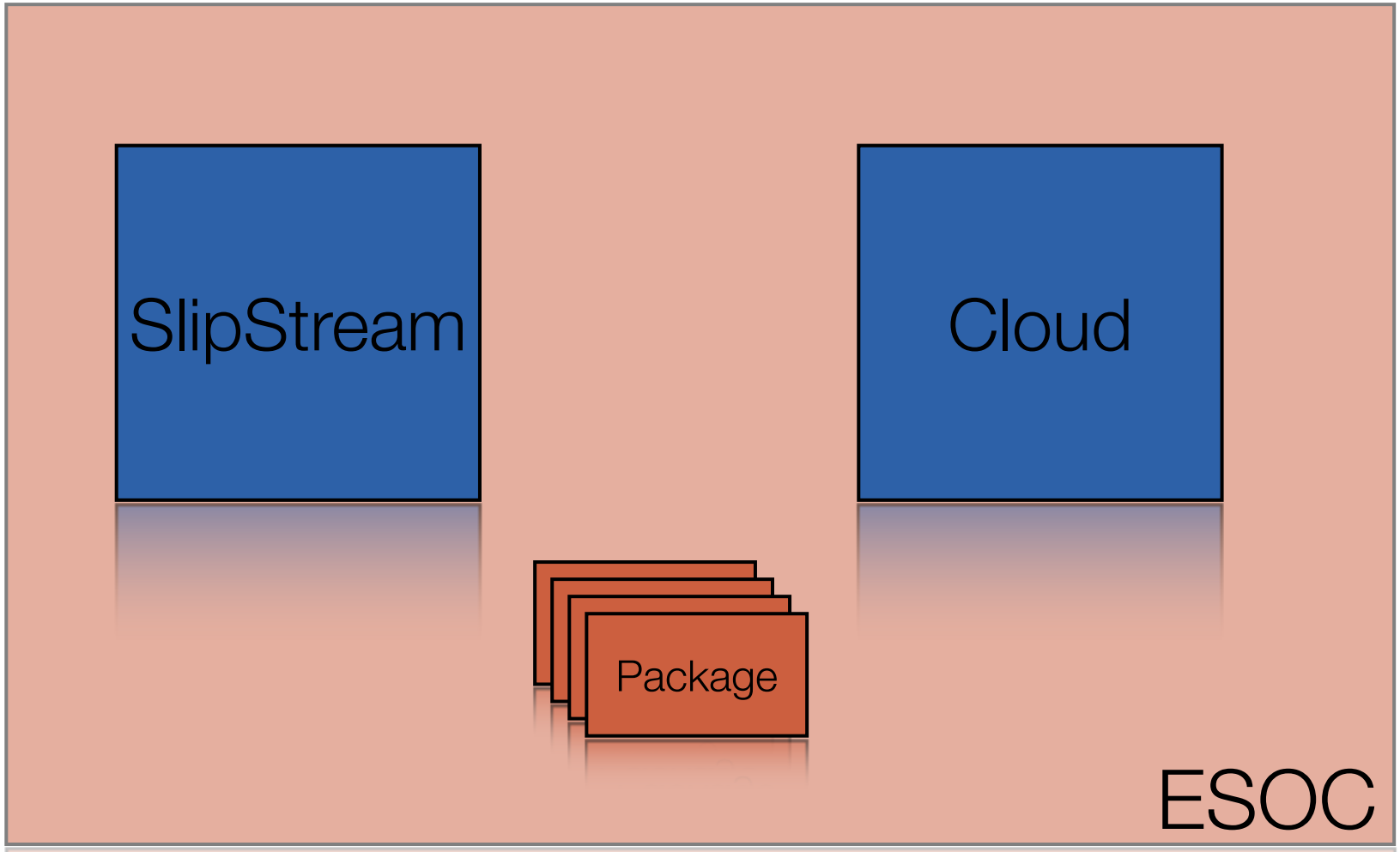


Continuous Integration



Potential Deployments - ESOC Internal



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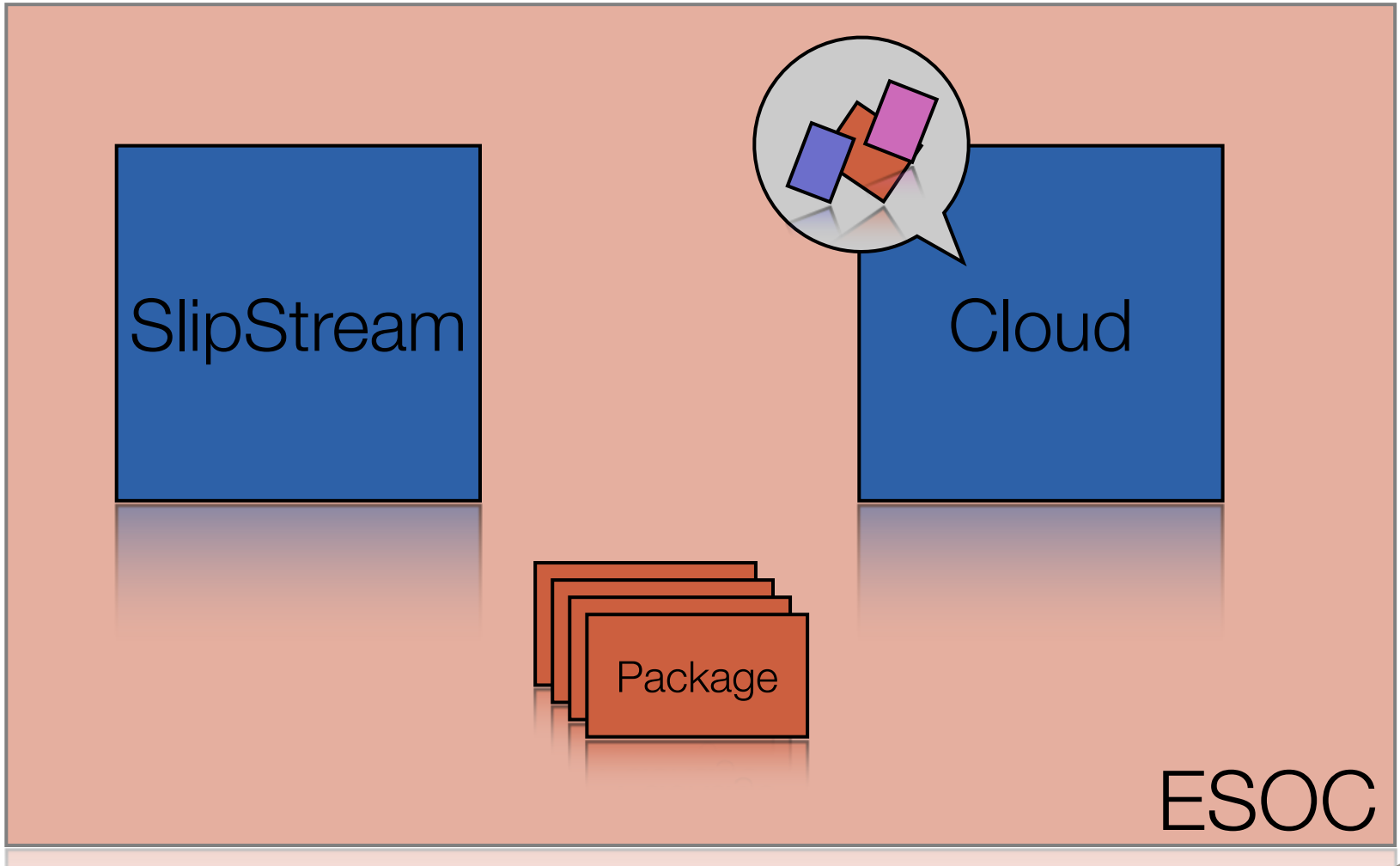

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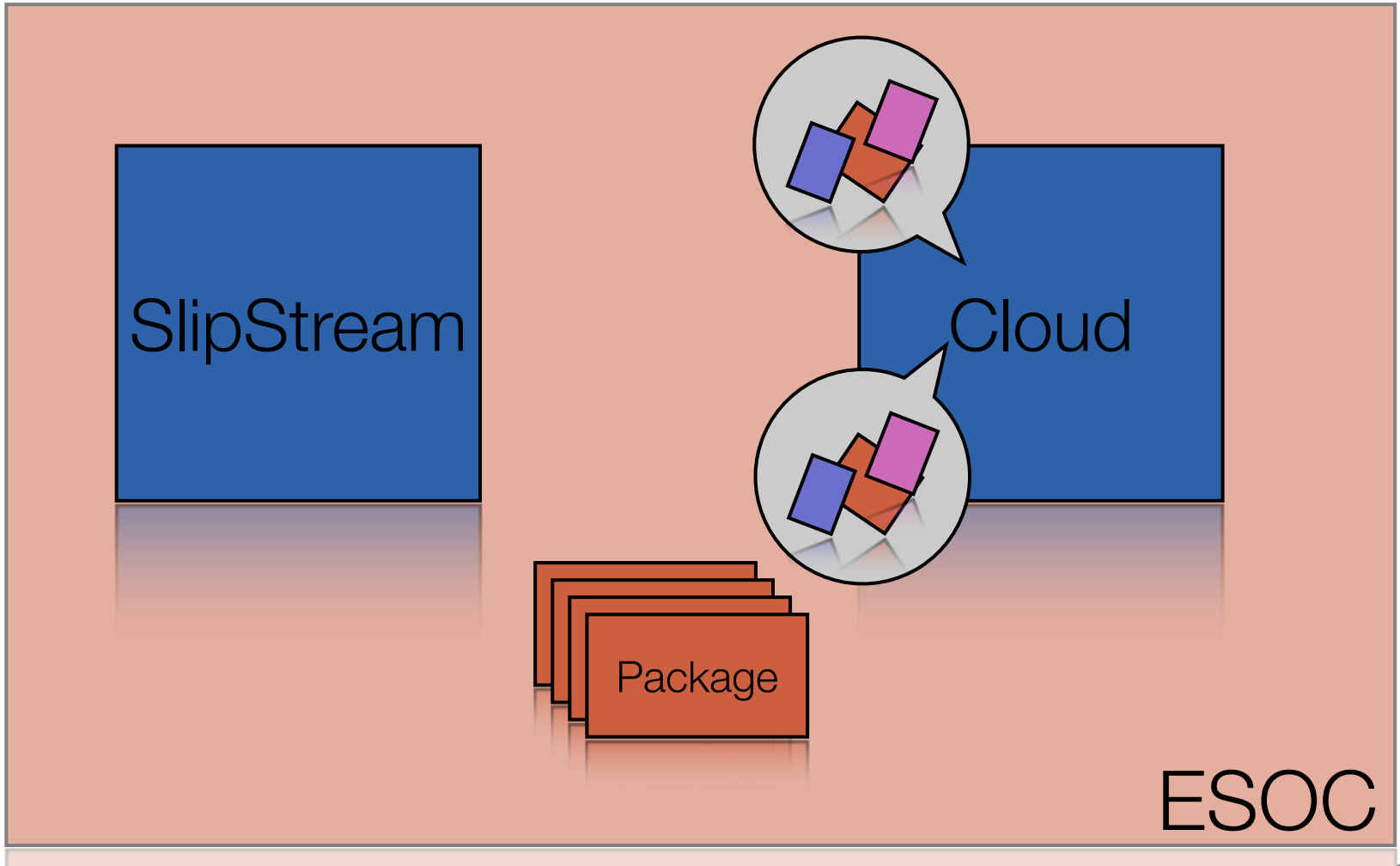

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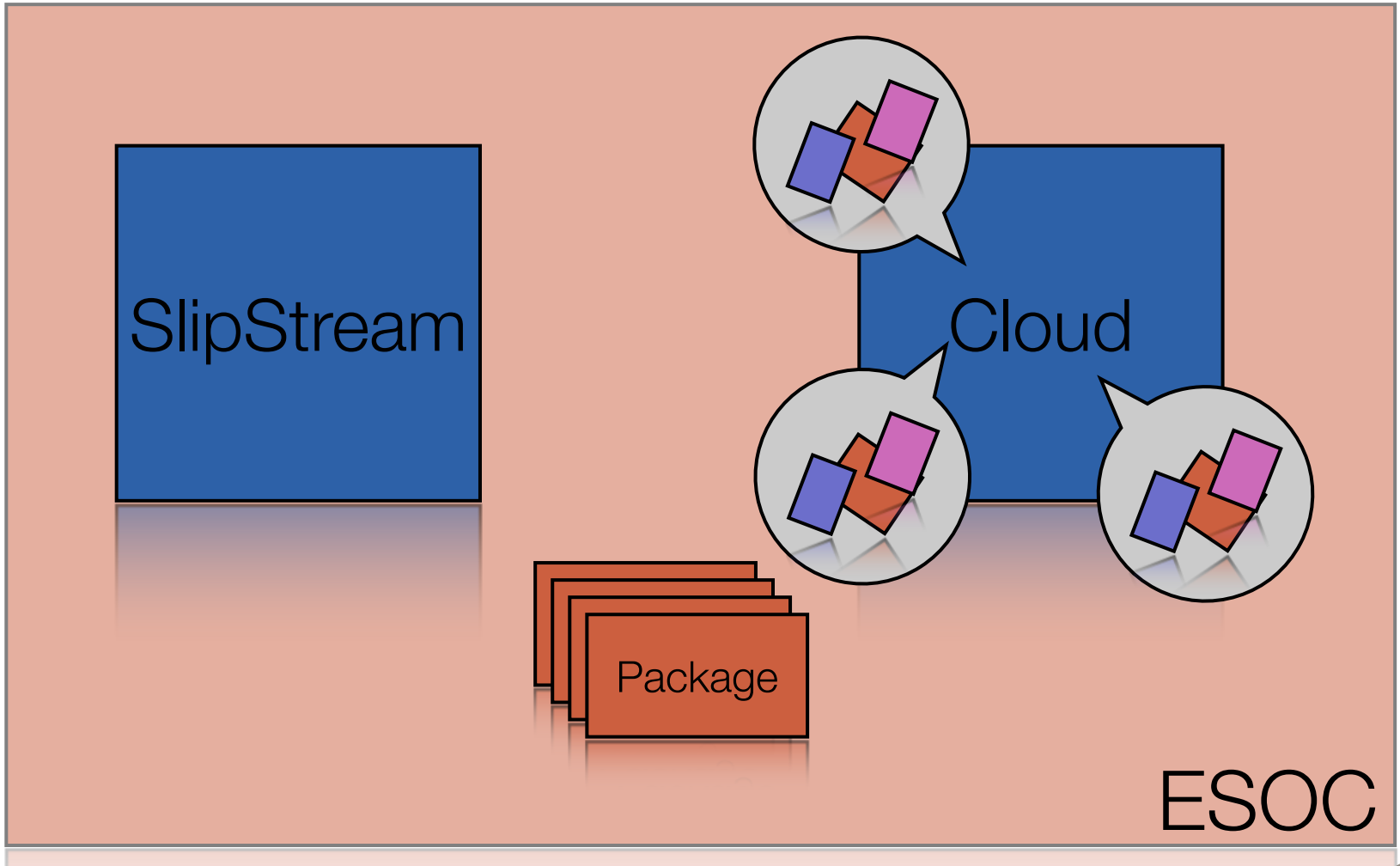

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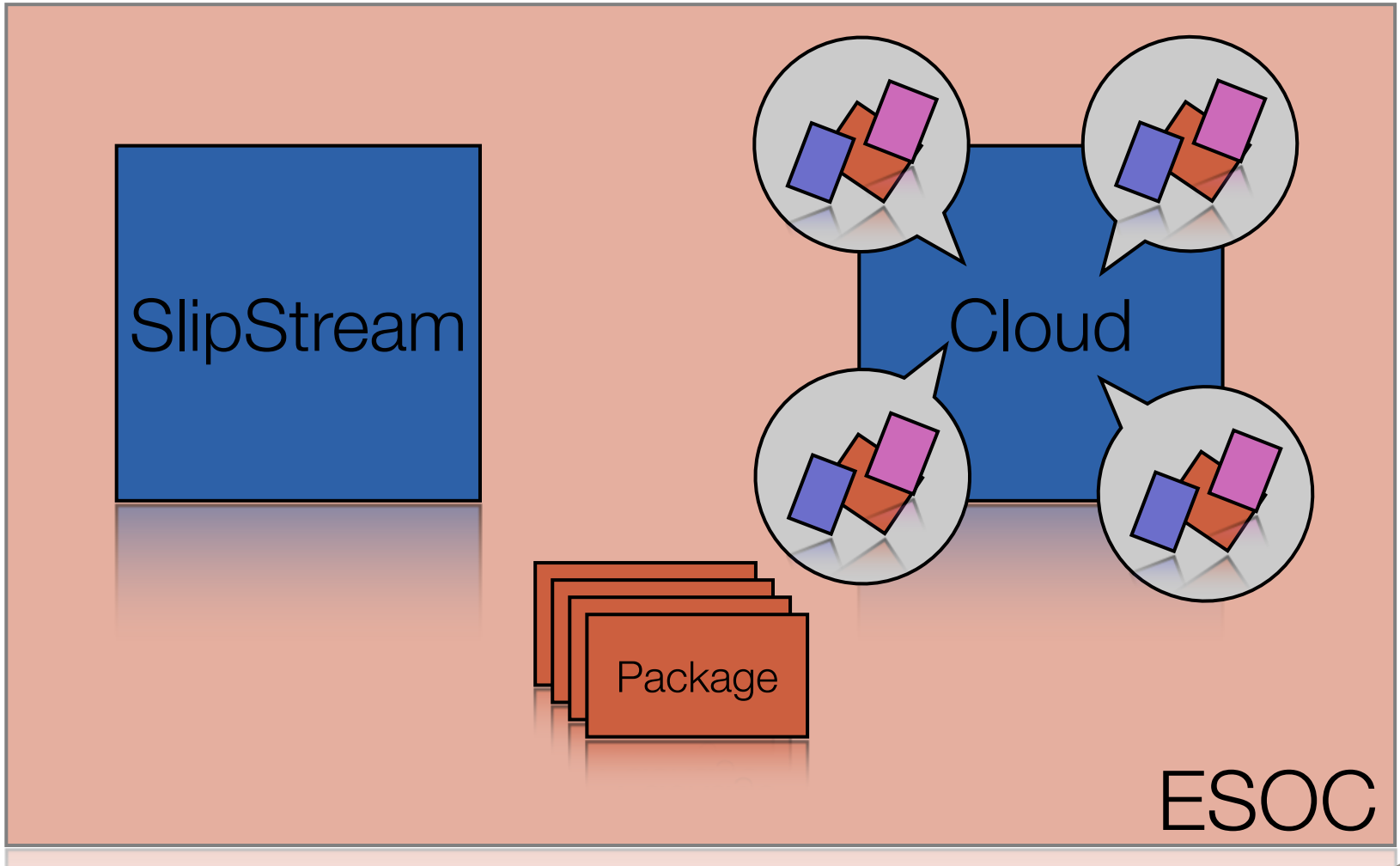

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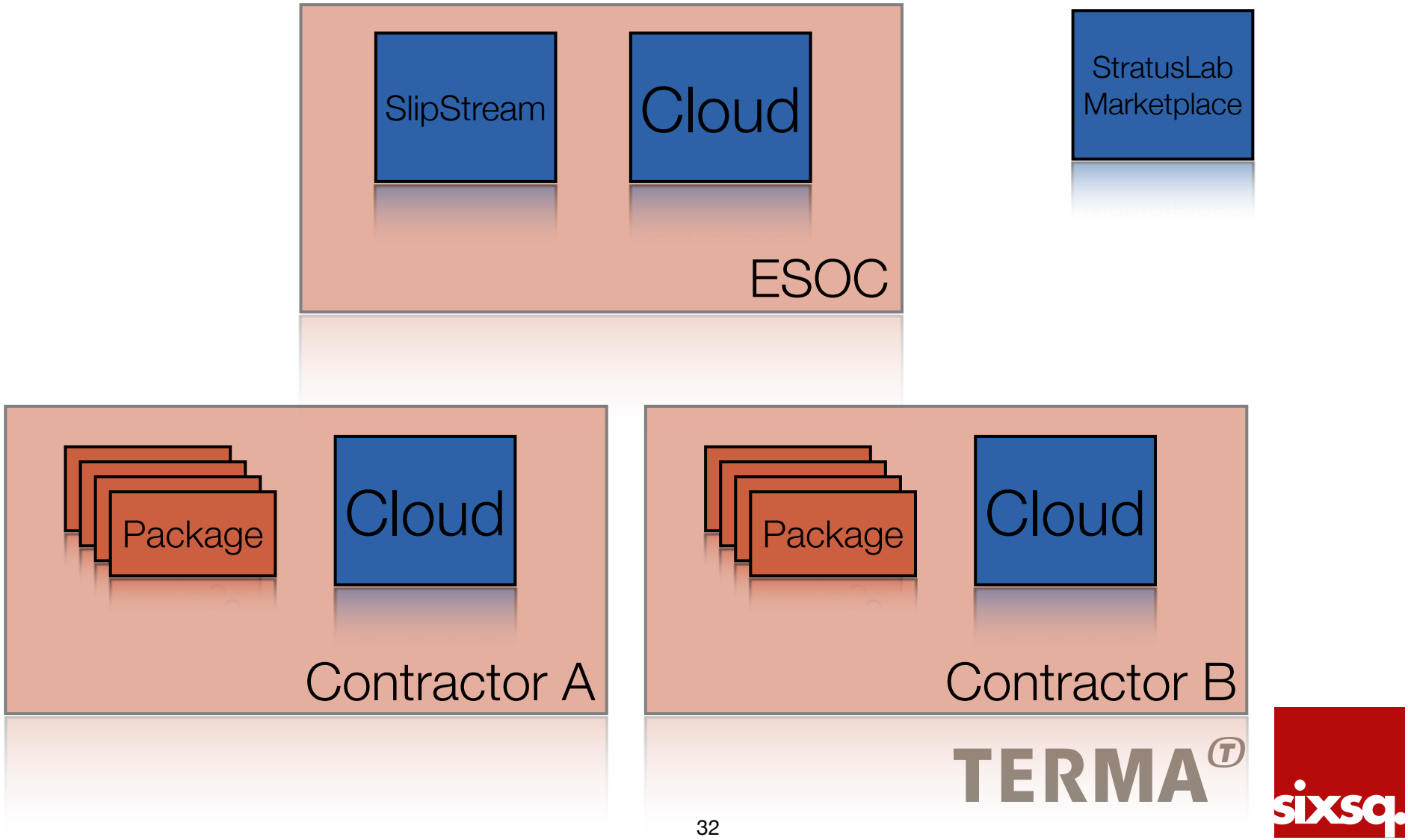
Potential Deployments - Shared Dev



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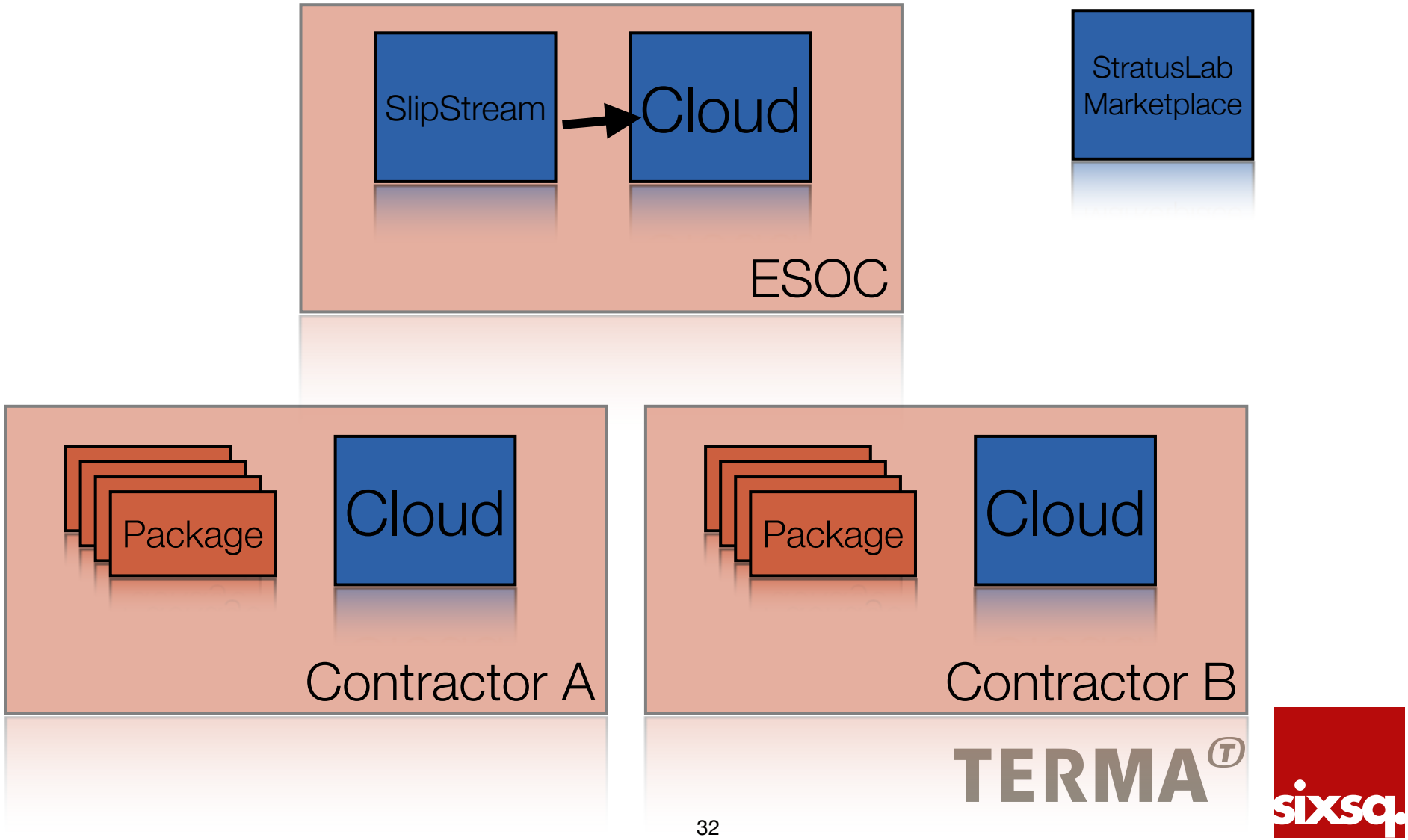

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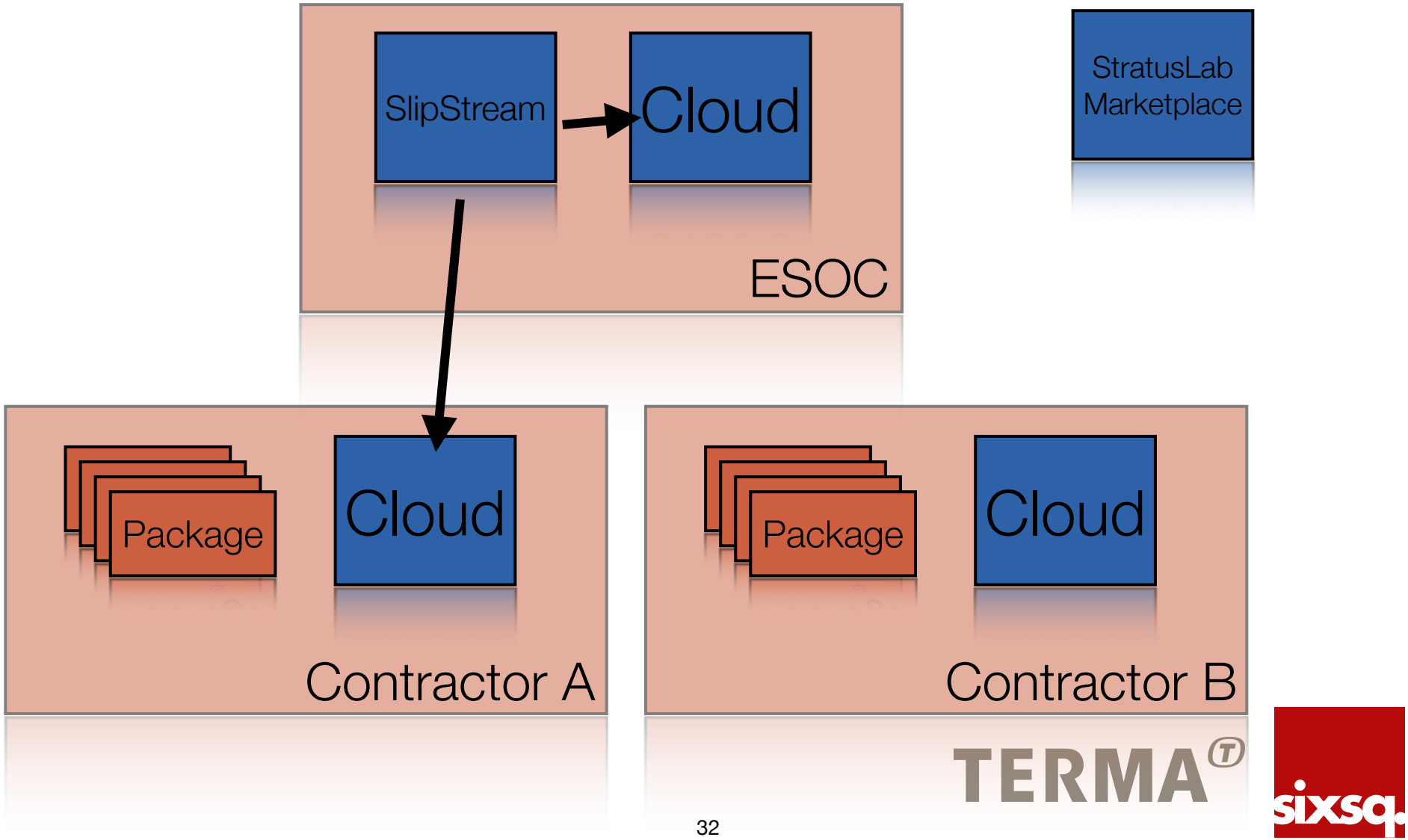

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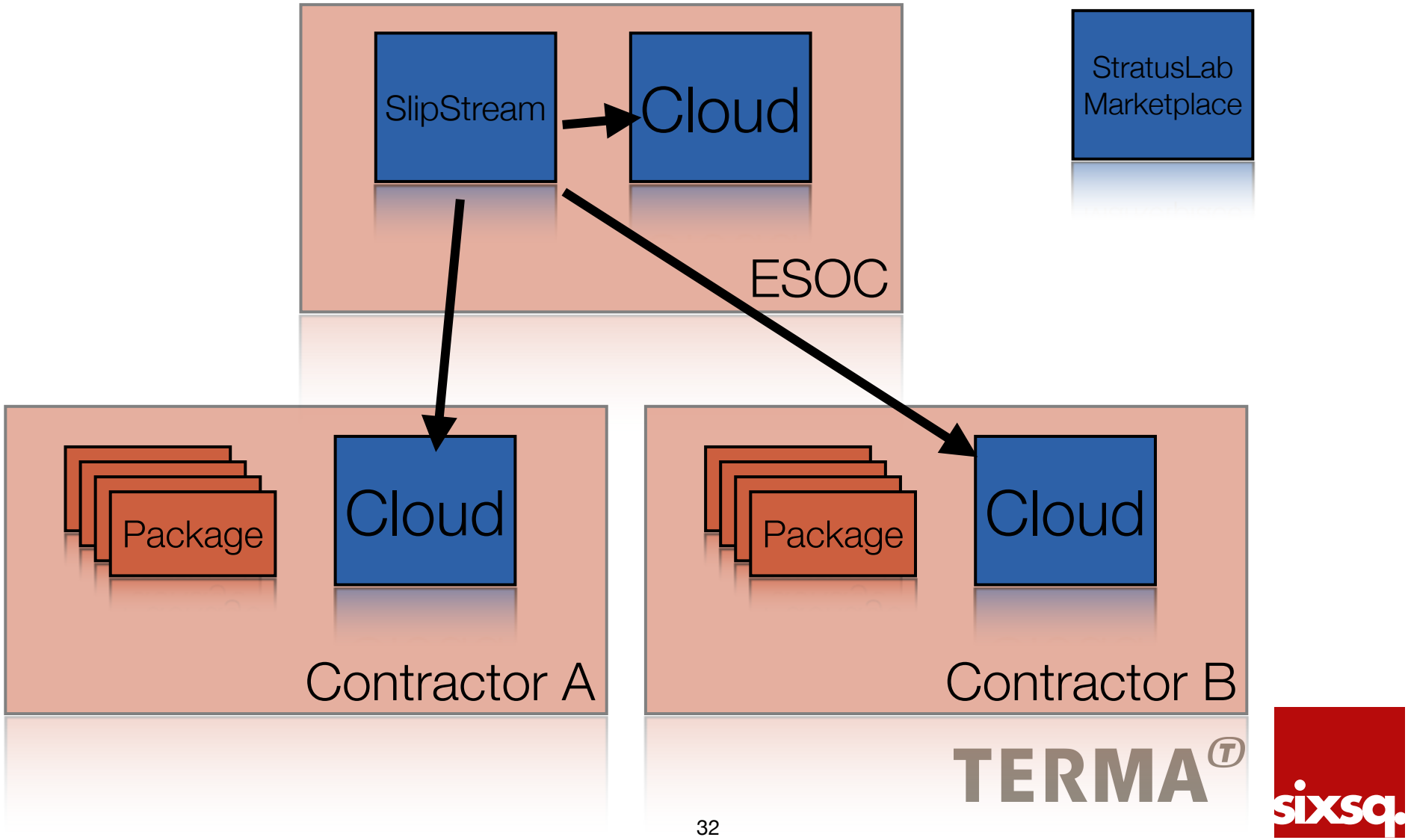

Case Study 2:
Multi-Media News Exchange Platform

Goal

- Create news exchange platform, between most European (and others) broadcasters (> 70 sites)
- In time, replace satellites
- No single point failure

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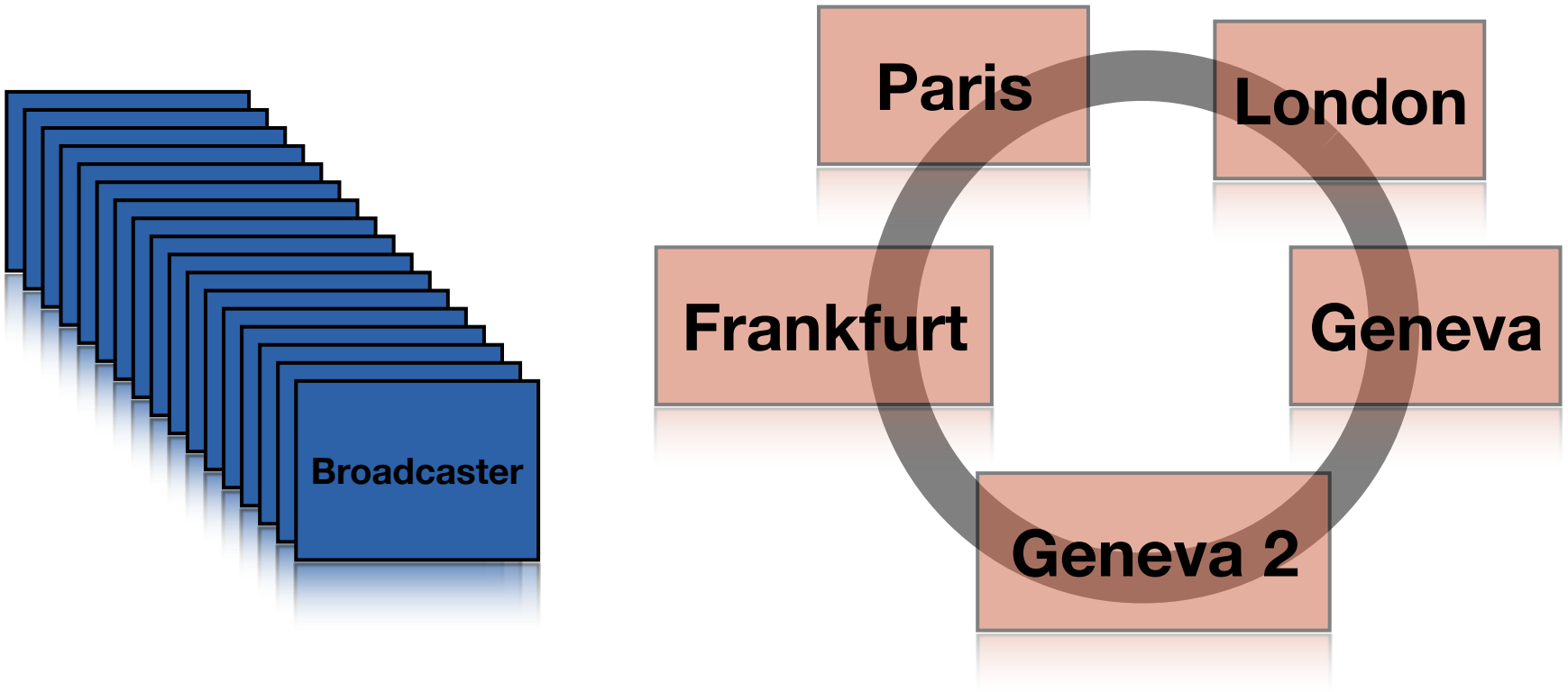
Production Deployment



Technologies

- RESTful web services
  - Clojure, Noir web framework
  - Stateless
- Persistence: Cassandra/Datastax

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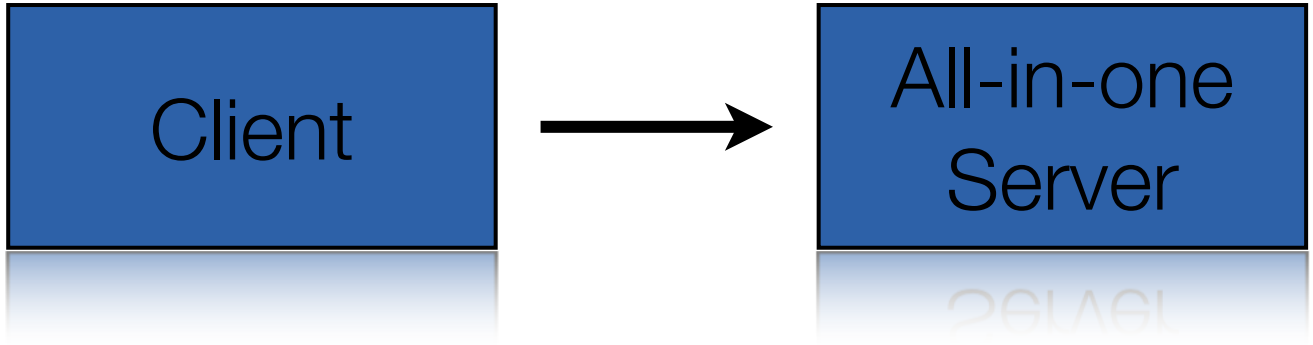
Challenges

- Need to certify full system before large deployment
- >80 sites involved all together!!
- Distributed development teams (4 sites)

Development Deployment



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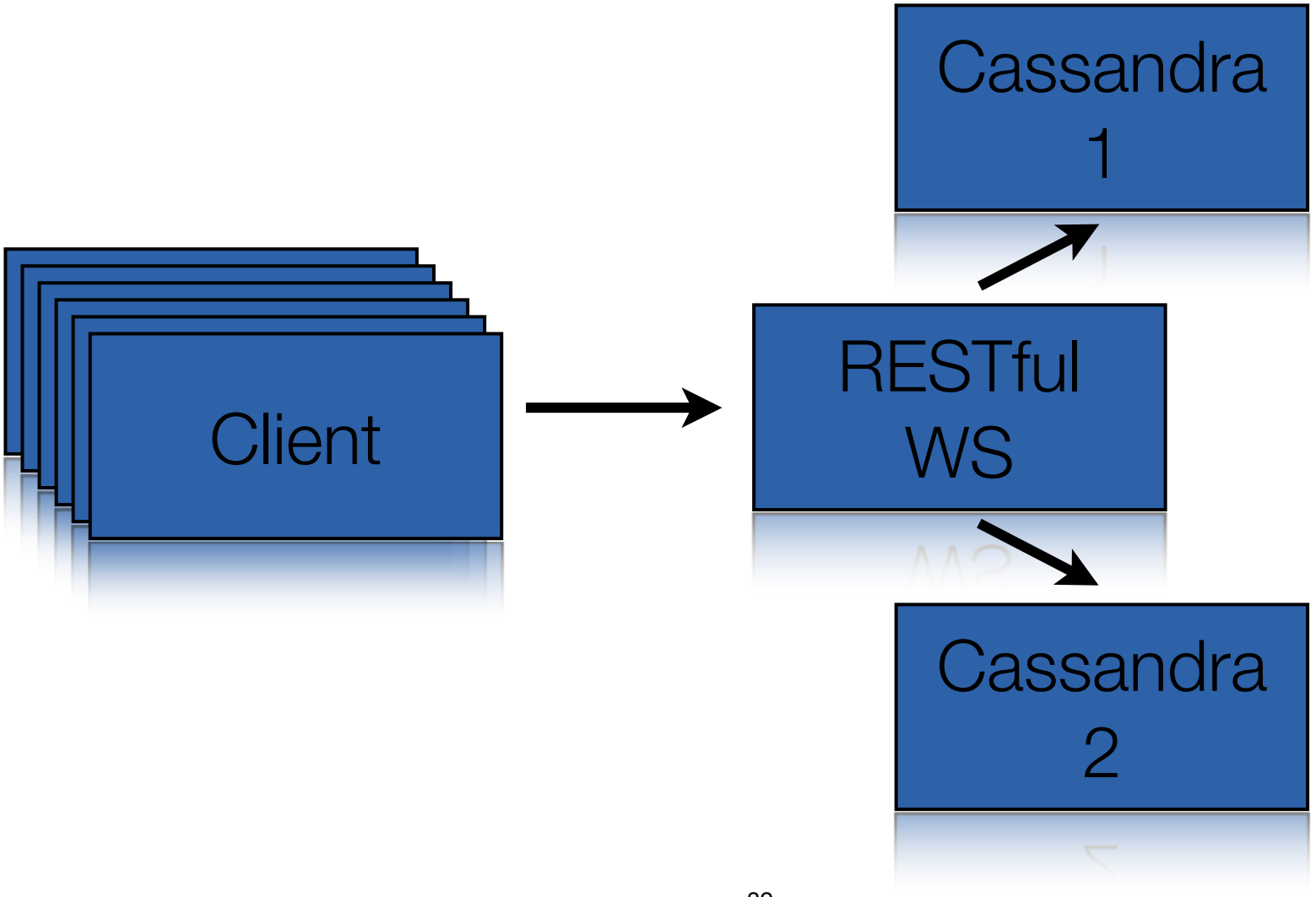
Site Deployment



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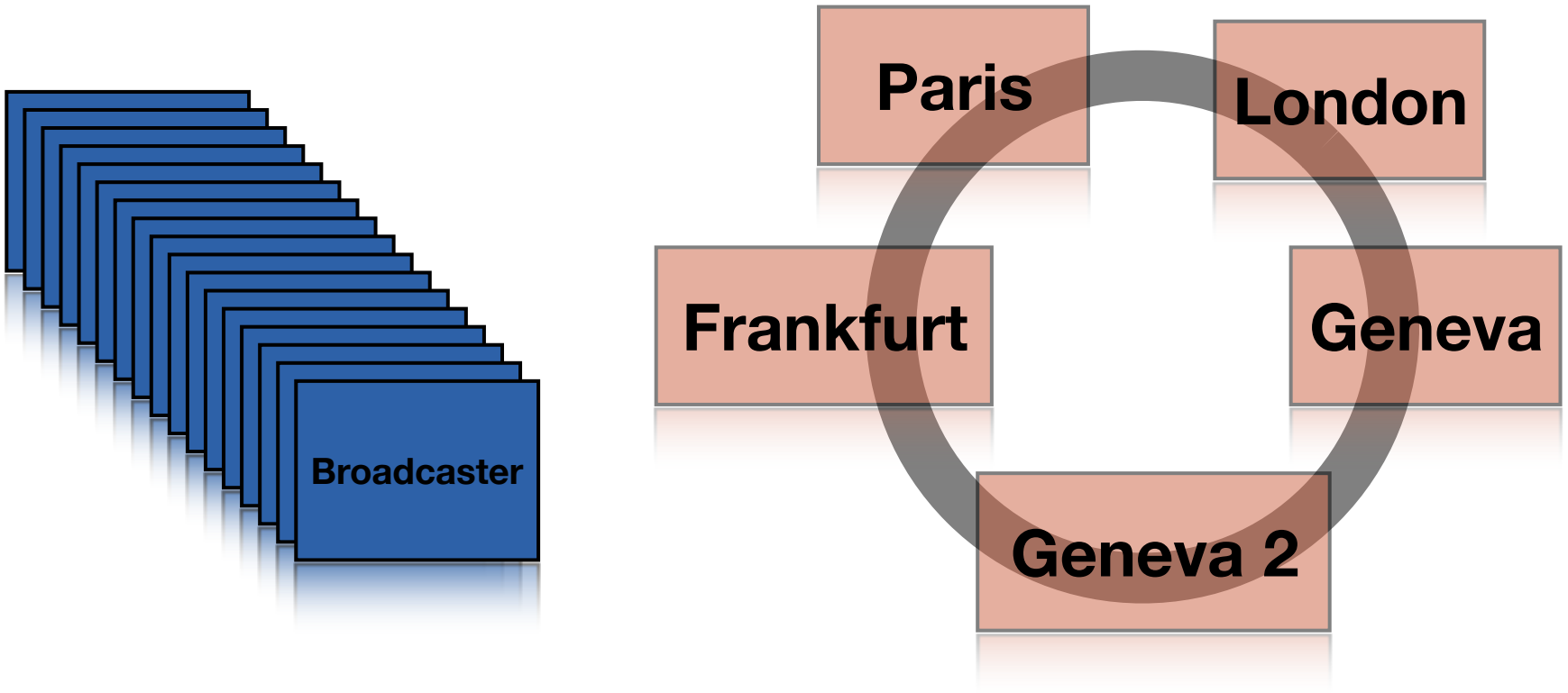
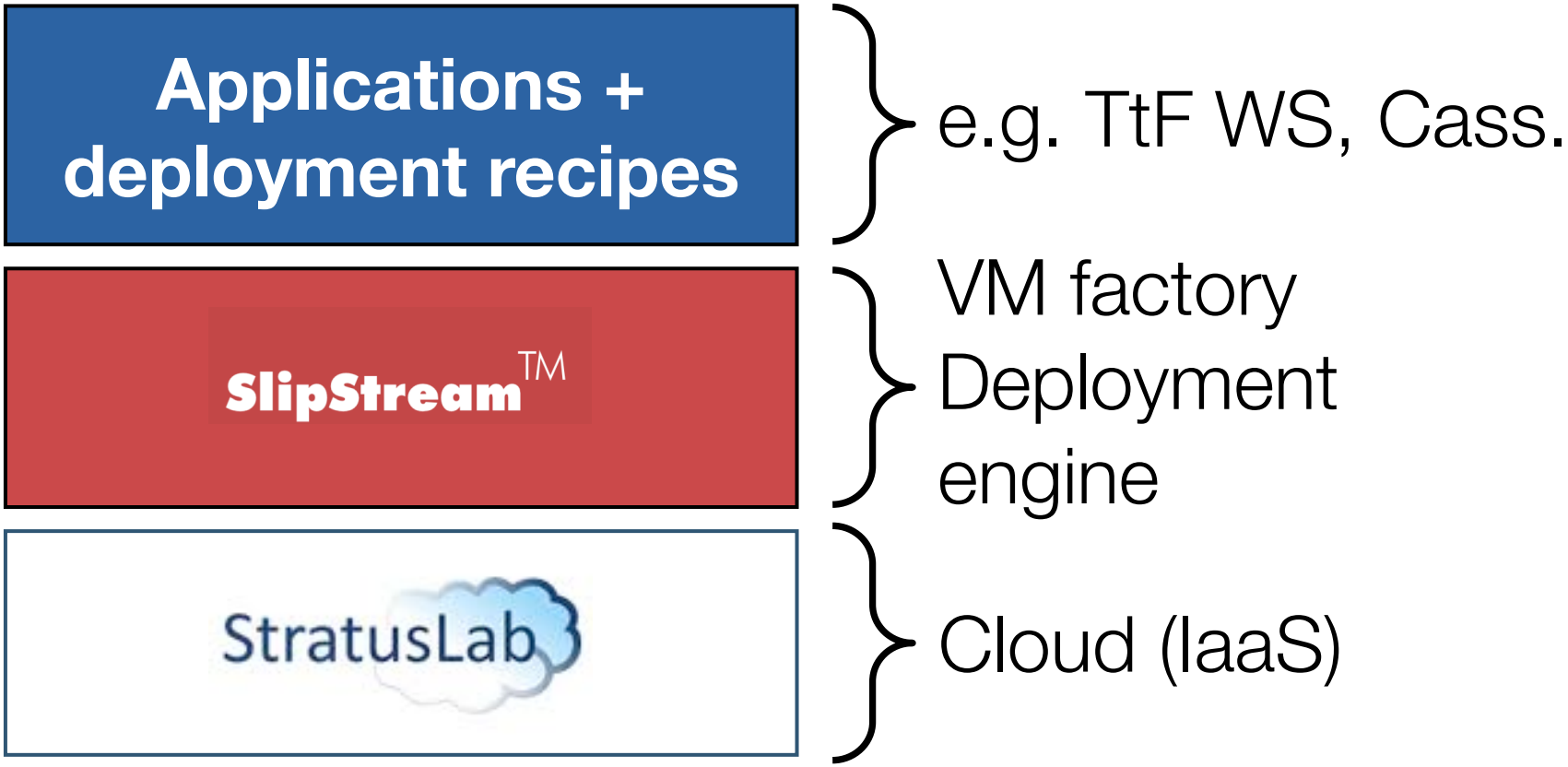
Production Deployment



Solution Overview



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Case Study 3:
Cluster Provisioning

Helix Nebula: ESA/SSEP

- SSEP
- Processing based on gLite based cluster (1 CE + n WN)
- Large satellite image data set made available
- Users can self-provision their own cluster

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Helix Nebula: ESA/SSEP

- SSEP...
- Processing based on gLite based cluster (1 CE + n WN)
- Large satellite image data set made available
- Users can self-provision their own cluster

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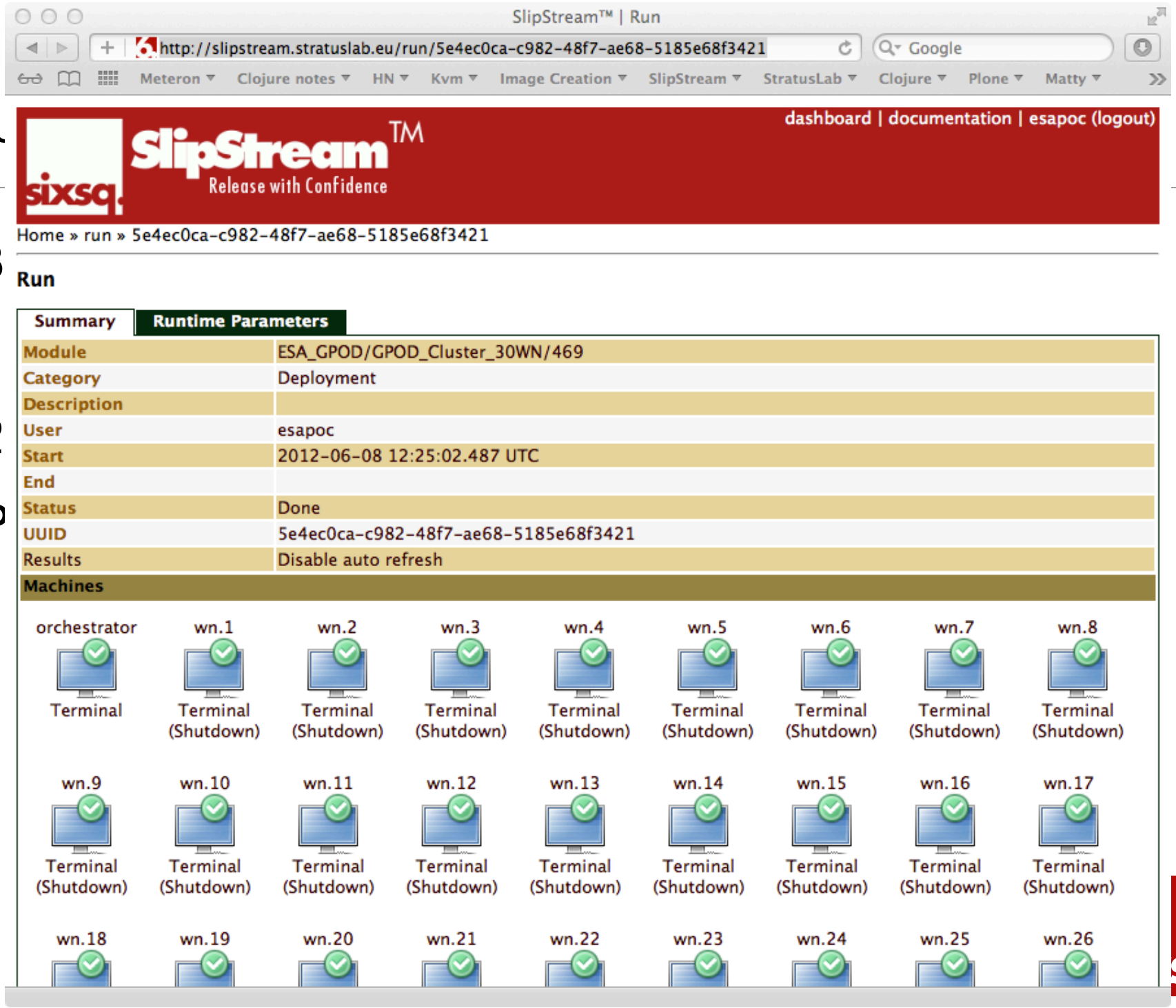
Automated Deployment

- 30 WNs deployment
- 124 deployed virtual cores
- 248 GB RAM
- Provisioned in 2 minutes, from a single action!!

Au

- 3
- 1
- 2
- P


SlipStream™ | Run
http://slipstream.stratuslab.eu/run/5e4ec0ca-c982-48f7-ae68-5185e68f3421
Google
Meteron
Clojure notes
HN
Kvm
Image Creation
SlipStream
StratusLab
Clojure
Plone
Matty
sixsq
SlipStream™
Release with Confidence
dashboard | documentation | esapoc (logout)
Home » run » 5e4ec0ca-c982-48f7-ae68-5185e68f3421
Run
Summary
Runtime Parameters
Module
ESA_GPOD/GPOD_Cluster_30WN/469
Category
Deployment
Description
User
esapoc
Start
2012-06-08 12:25:02.487 UTC
End
Status
Done
UUID
5e4ec0ca-c982-48f7-ae68-5185e68f3421
Results
Disable auto refresh
Machines
orchestrator
Terminal
wn.1
Terminal (Shutdown)
wn.2
Terminal (Shutdown)
wn.3
Terminal (Shutdown)
wn.4
Terminal (Shutdown)
wn.5
Terminal (Shutdown)
wn.6
Terminal (Shutdown)
wn.7
Terminal (Shutdown)
wn.8
Terminal (Shutdown)
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Terminal (Shutdown)
wn.10
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Terminal (Shutdown)
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Terminal (Shutdown)
wn.18
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wn.21
wn.22
wn.23
wn.24
wn.25
wn.26

SlipStream

Image Factory and System Provisioning

Who's deploying SlipStream?

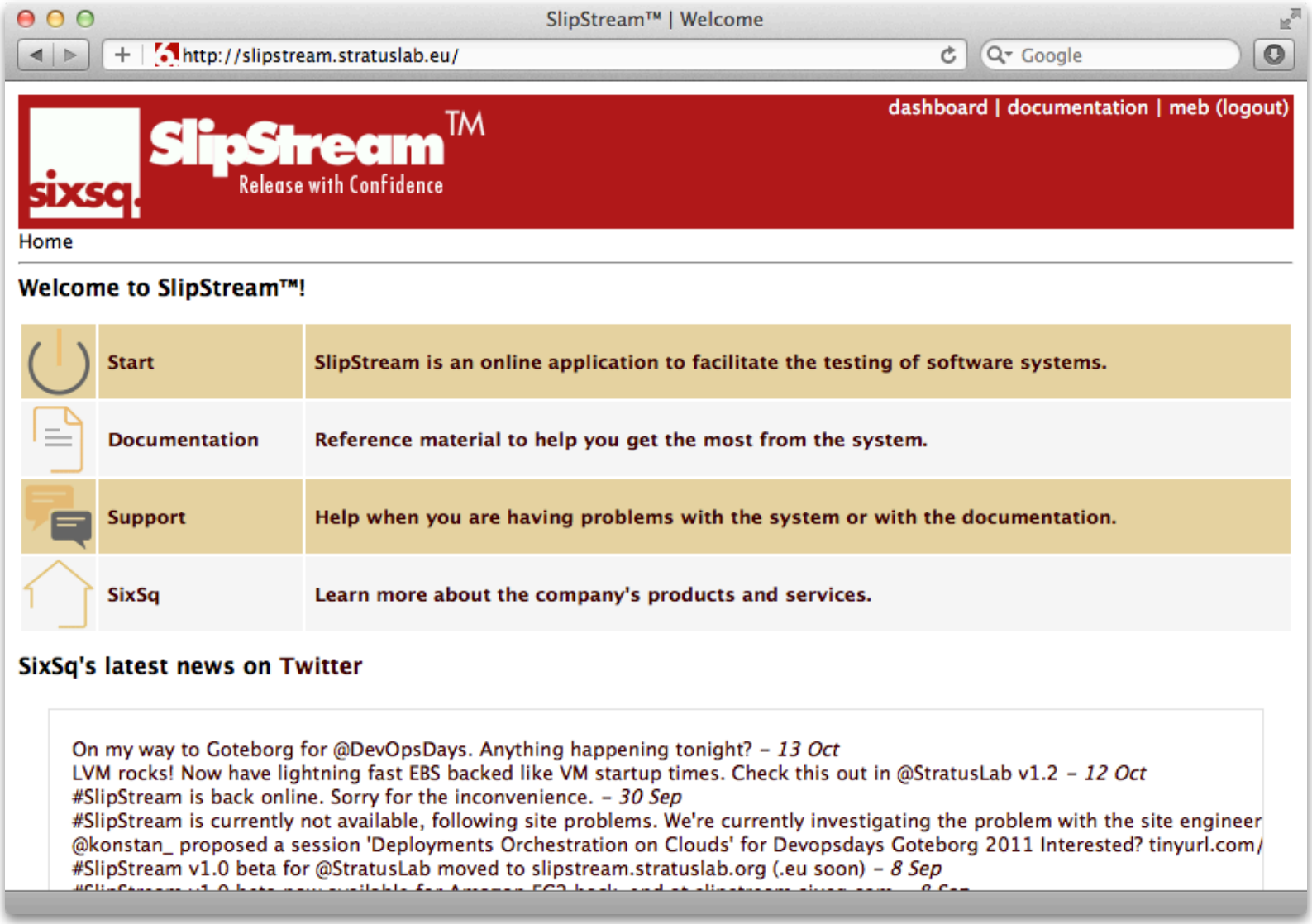
- Academic production systems
  - CNRS - LAL - France
  - GRNET - Greece
- Commercial production systems
  - SixSq - Amazon EC2
  - Atos - Eindhoven - Holland (Helix Nebula PoC environment Automated GPOD deployment
  - European Broadcast Union (Eurovision) - in progress
    - Entire Transition to File server solution
- Adding support for HP OpenStack Cloud Service
- Certifying for IBM PureSystems

Main Features

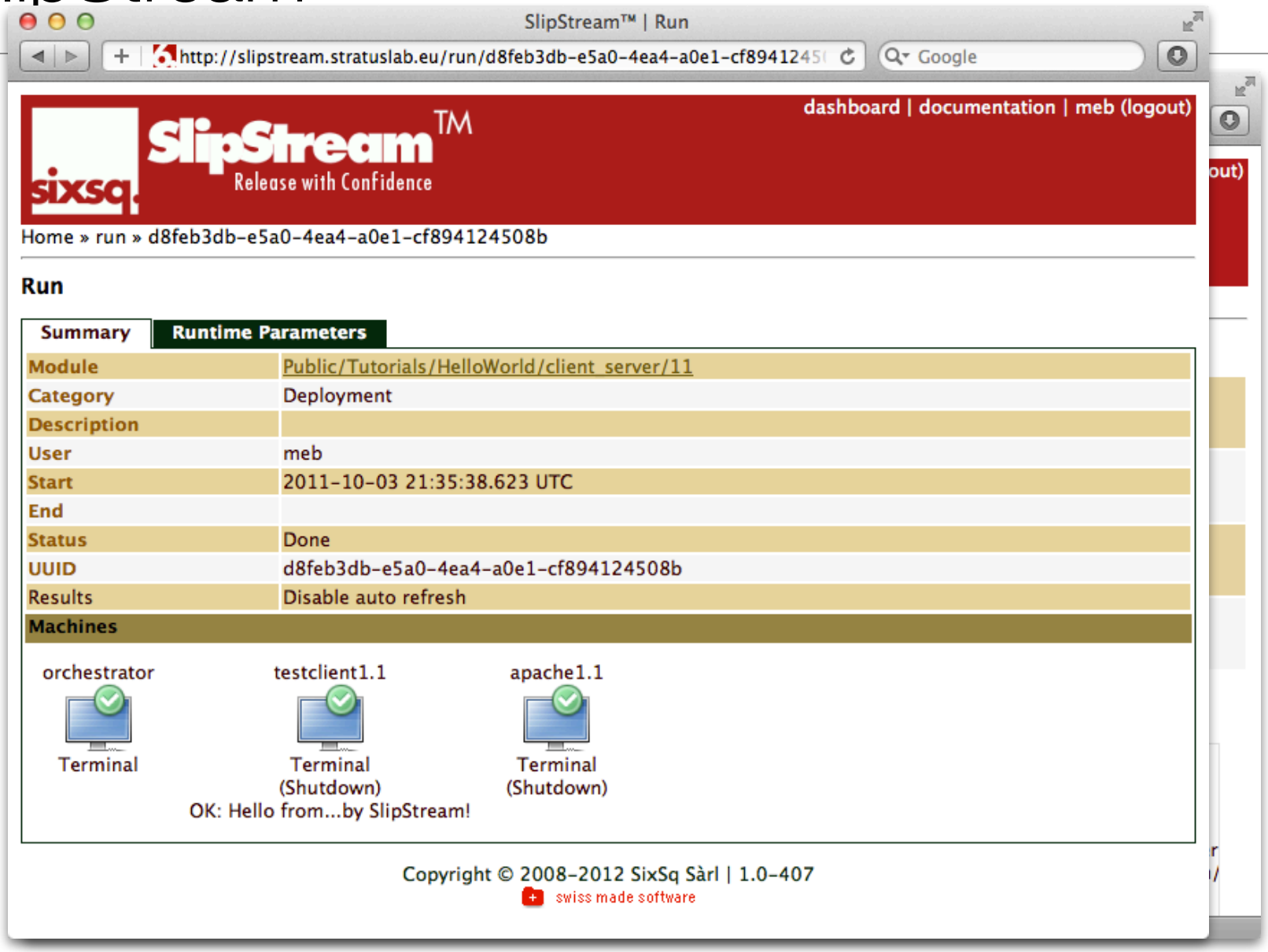
- Virtual Machine Factory
  - **Automatic creation** of new virtual machines
  - Based on existing public images or custom built images
- Deployment
  - **Multi-tier machine topology** modeling
  - Automatic deployment and **orchestration of services**
  - On-demand provisioning of systems

SlipStream

SlipStream


SlipStream™ | Welcome
http://slipstream.stratuslab.eu/
Google
dashboard | documentation | meb (logout)
SlipStream™
Release with Confidence
sixsq
Home
Welcome to SlipStream™!
Start
SlipStream is an online application to facilitate the testing of software systems.
Documentation
Reference material to help you get the most from the system.
Support
Help when you are having problems with the system or with the documentation.
SixSq
Learn more about the company's products and services.
SixSq's latest news on Twitter
On my way to Goteborg for @DevOpsDays. Anything happening tonight? – 13 Oct
LVM rocks! Now have lightning fast EBS backed like VM startup times. Check this out in @StratusLab v1.2 – 12 Oct
#SlipStream is back online. Sorry for the inconvenience. – 30 Sep
#SlipStream is currently not available, following site problems. We're currently investigating the problem with the site engineer
@konstan_ proposed a session 'Deployments Orchestration on Clouds' for Devopsdays Goteborg 2011 Interested? tinyurl.com/
#SlipStream v1.0 beta for @StratusLab moved to slipstream.stratuslab.org (.eu soon) – 8 Sep

SlipStream


SlipStream™ | Run
http://slipstream.stratuslab.eu/run/d8feb3db-e5a0-4ea4-a0e1-cf8941245
Google
dashboard | documentation | meb (logout)
SlipStream™
Release with Confidence
Home » run » d8feb3db-e5a0-4ea4-a0e1-cf894124508b
Run
Summary
Runtime Parameters
Module
Public/Tutorials/HelloWorld/client_server/11
Category
Deployment
Description
User
meb
Start
2011-10-03 21:35:38.623 UTC
End
Status
Done
UUID
d8feb3db-e5a0-4ea4-a0e1-cf894124508b
Results
Disable auto refresh
Machines
orchestrator
Terminal
testclient1.1
Terminal
(Shutdown)
OK: Hello from...by SlipStream!
apache1.1
Terminal
(Shutdown)
Copyright © 2008-2012 SixSq Sàrl | 1.0-407
swiss made software

Main Features

- Virtual Machine Factory
  - Automatic creation of new virtual machines
  - Based on existing public images or custom built images
- Deployment
  - Multi-machine deployment
  - Automatic deployment and orchestration of services
  - On-demand provisioning of systems

SlipStream Cloud support

StratusLab

Simple yet powerful IaaS cloud solution

Who's deploying StratusLab?

- Academic production systems
  - CNRS (2 installations) - LAL and IBCP - France
  - GRNET - Greece
- Commercial production systems
  - Atos - Eindhoven - Holland (Helix Nebula PoC environment with ~500 cores)
  - More (confidential)
- Many more private installations

Who's behind StratusLab?

CNRS (FR)

UCM (ES)

GRNET (GR)

SIXSQ (CH)

TID (ES)

TCD (IE)

Key features

- Rich contextualisation
- Integration with shared/federated Marketplace
- Supports copy on write and thin provisioning for fast instantiation
- Dynamic creation of disks (volumes)
- Storage backend: iSCSI, Fiber Channel, Shared File System (e.g. NFS)
- Rich command-line client for automation integration
- REST API (except for Open Nebula VM management with XML-RPC)

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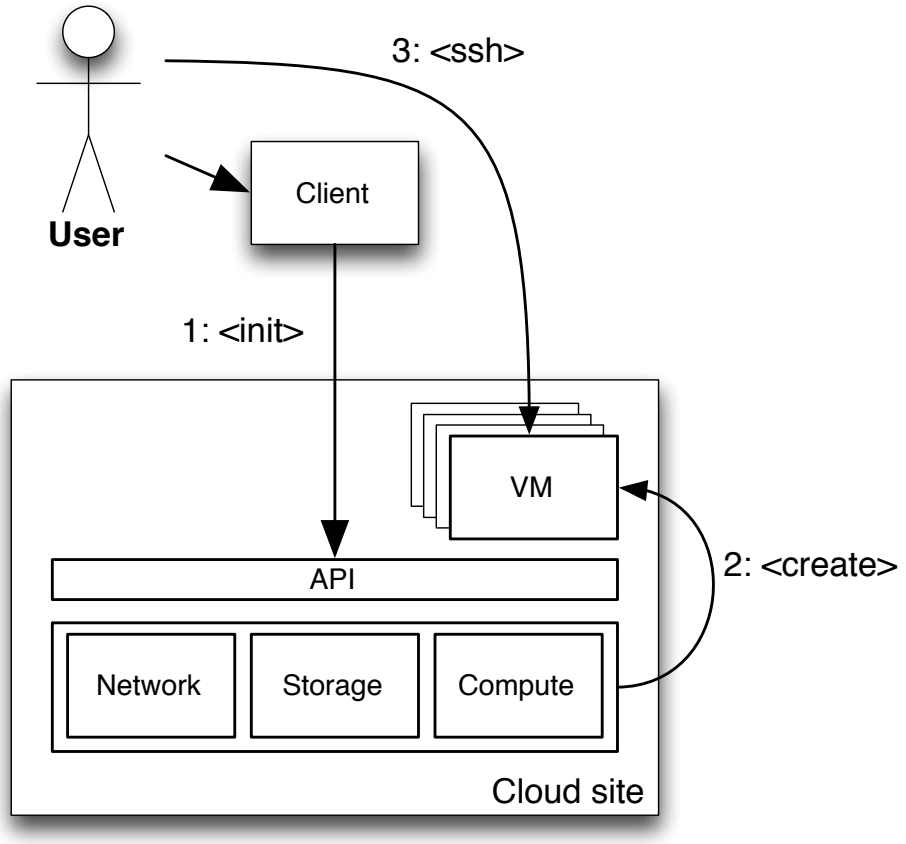
Infrastructure as a Service basics



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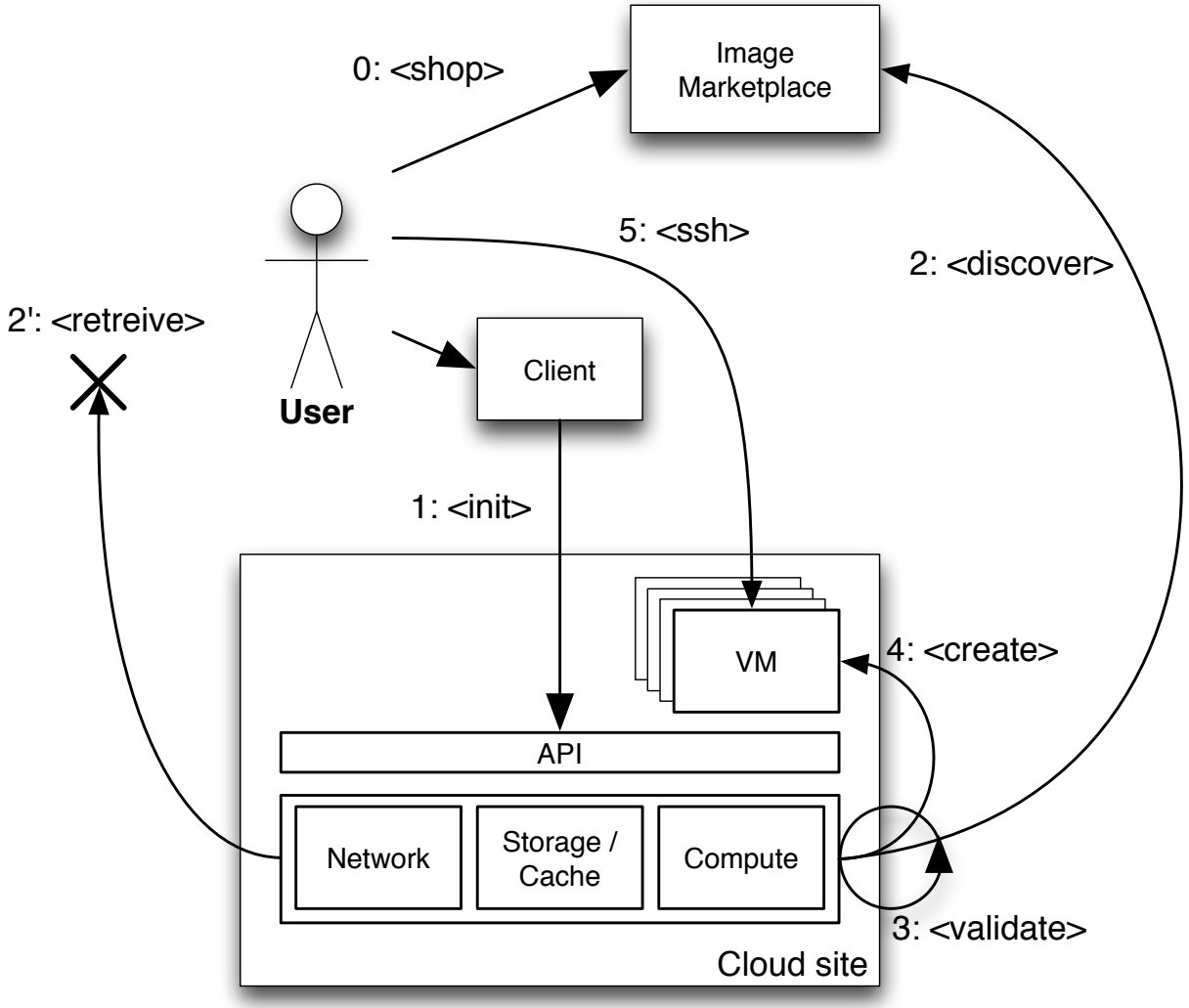
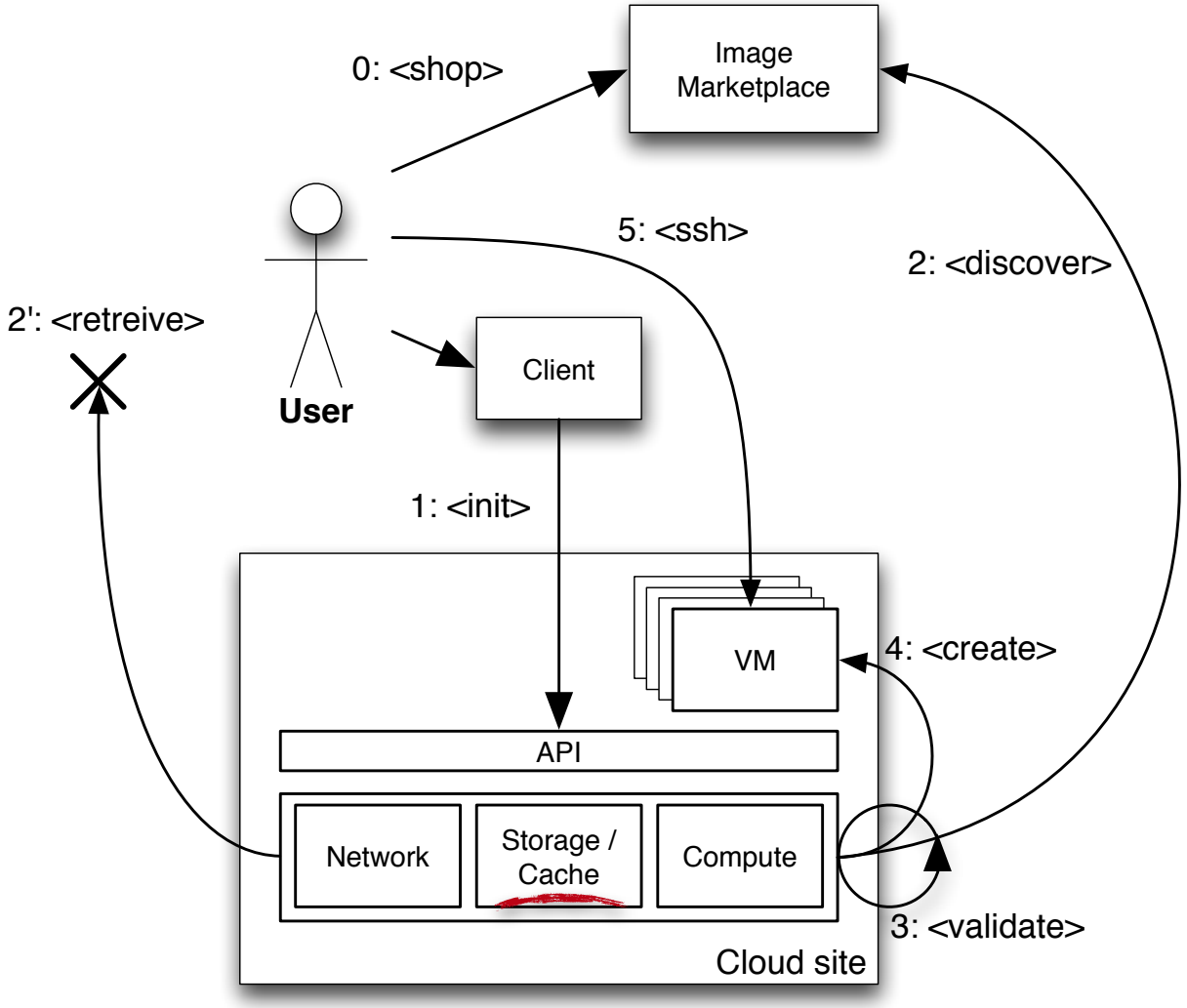
IaaS Federation with StratusLab



IaaS Federation with StratusLab



Deployment Models

- Federation of Marketplaces for flexible image management
- Public cloud deployment (e.g. Atos and CNRS)
- Private federated cloud deployment (e.g. EBU)
- Caching of images across cloud installations

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SixSq commitment

Maintain and further develop

- StratusLab Marketplace
- StratusLab Storage Service
- Integration with OpenNebula

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Conclusions

Conclusions

- **Automation is paramount** to succeed in building (distributed) systems
- **Cloud is** a **key** ingredient, not only virtualisation
- Need a **management layer** and a **share platform**
- Try... learn... **have fun**!!

Try it!!

slipstream.stratuslab.eu

slipstream.sixsq.com

Give us feedback...

sixsq


Thanks :-)
sixsq.com
support@sixsq.com
sixsq.