NTT docomo DOCOMO USA Labs

Clanavi: How to Manage Your Cloud by Drupal

02/23/2010

Yas Naoi – [yas]
DOCOMO p.a.c.t.

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

The Purpose of This Presentation

- Learn about Cloud Computing
- Introduce Clanavi
- Share Business Value
- Feedback from YOU!

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Agenda

- Cloud Computing Overview
- Clanavi
- Demo
- Business Value
- Q&A

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

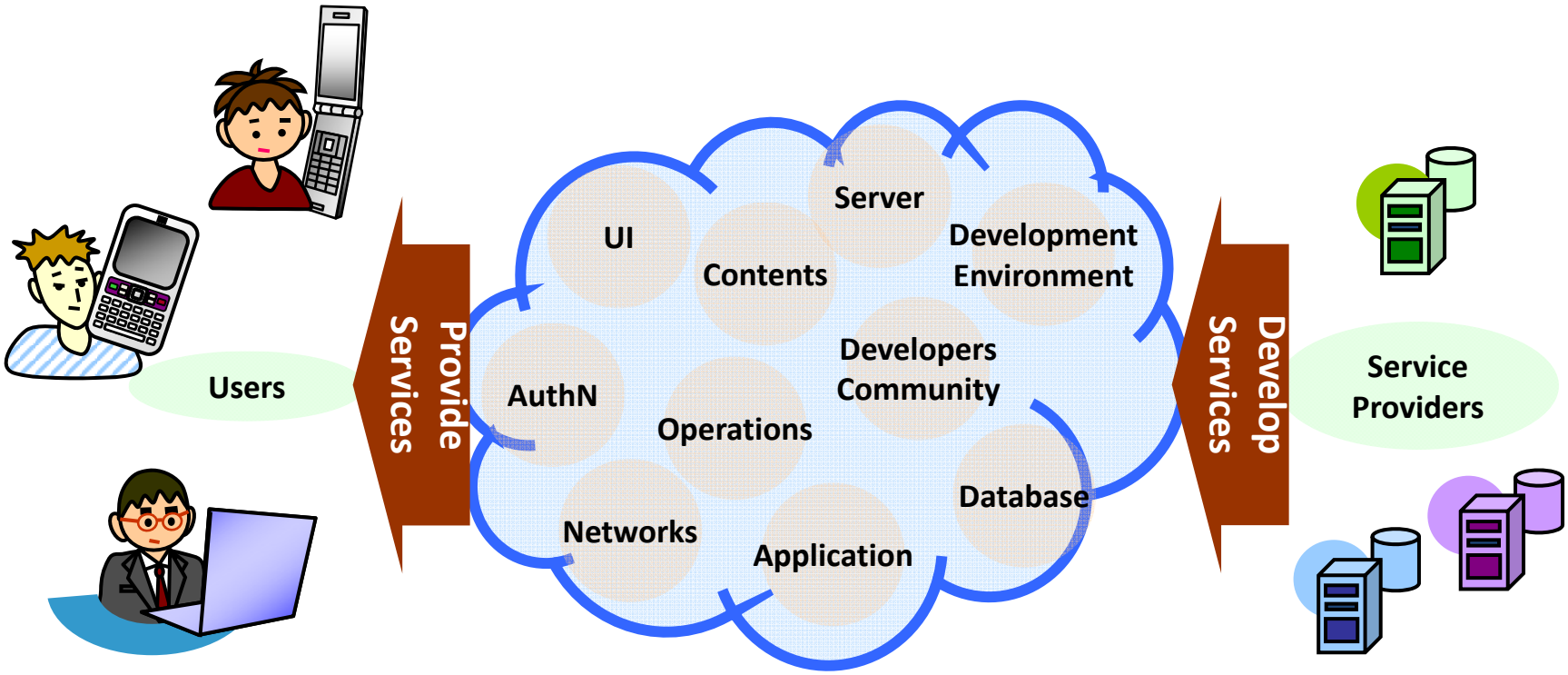
DOCOMO USA Labs

Cloud Computing Overview

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

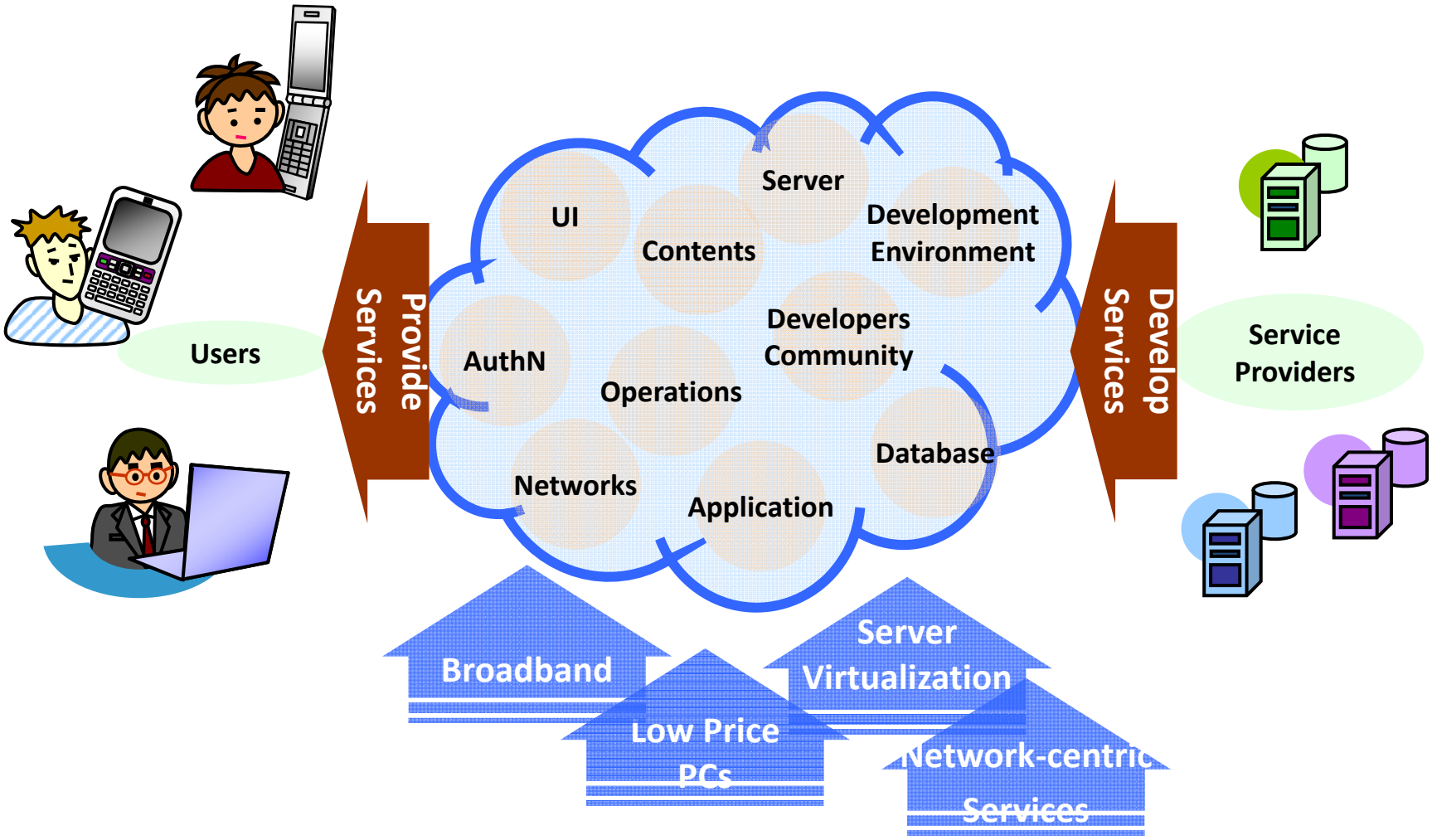
Centralized to the Internet



DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

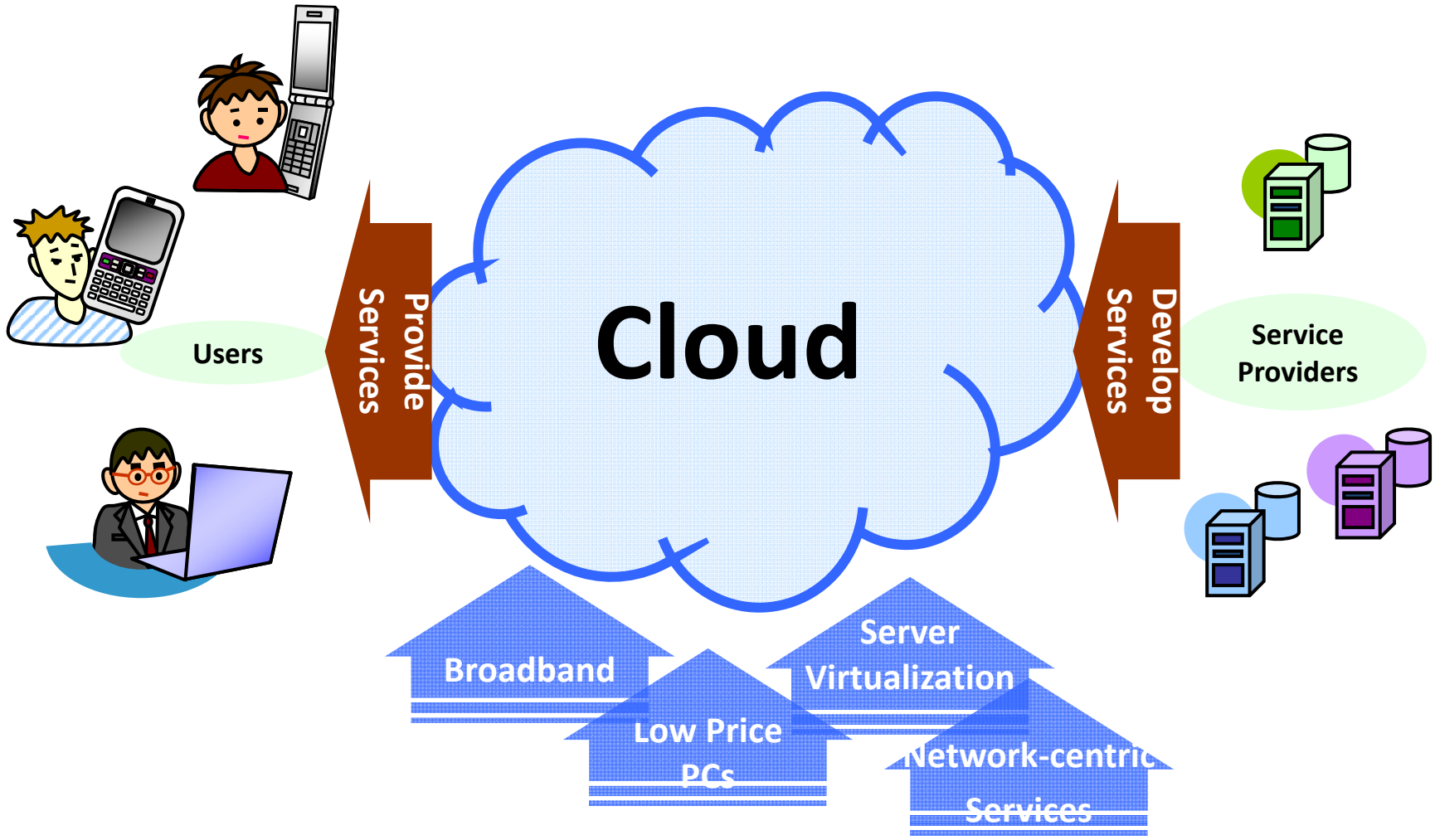
Centralized to the Internet



DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Centralized to the Internet



DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

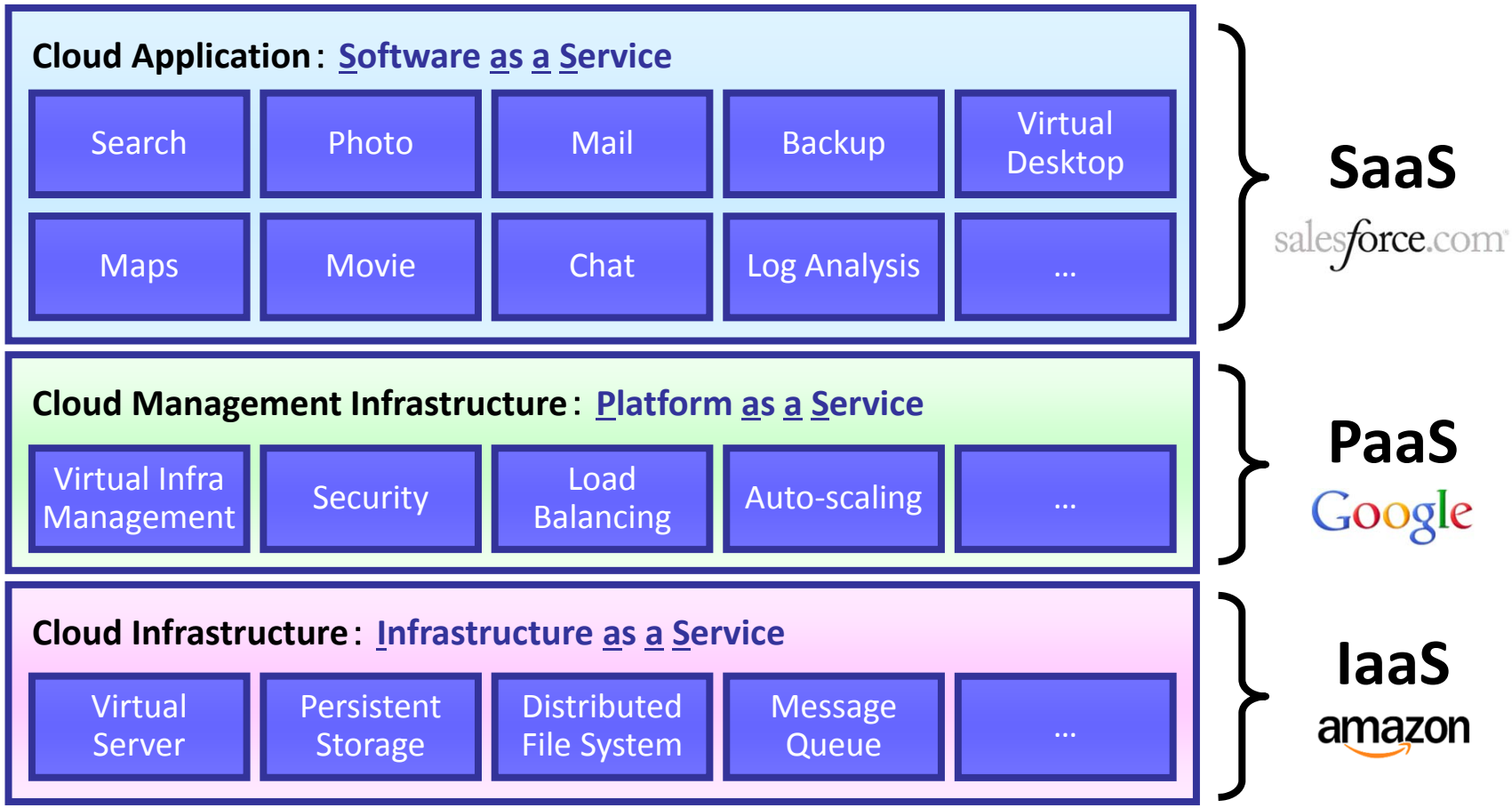
Cloud Computing Features

- On-Demand Resources
- Cost Reduction by Pay-as-you-go Billing / Server Consolidation
- Easy Provisioning
- Auto-scaling
- Higher Productivity

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

NTT docomo
DOCOMO USA Labs

Cloud Computing Architecture



DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Clanavi

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

NTT docomo DOCOMO USA Labs

Why Cloud for Service Providers?

- **Problems**
  - Manage Tons of Servers
  - Manage Peta-byte Class Data

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

NTT docomo DOCOMO USA Labs

Why Cloud for Service Providers?

- **Problems**
  - Manage Tons of Servers
  - Manage Peta-byte Class Data
- **Requirements**
  - Cost Reduction
  - Flexible Resource Management

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Why Cloud for Service Providers?

- **Cost Reduction**
  - Open Source
  - Browser-based Easy Operations
- **Flexible Resource Management**
  - Multiple Cloud Access
    - Private
    - Public

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Private Cloud Requirements

- **Browser-based UI**
  - Unified Access for Multiple Cloud

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Private Cloud Requirements

- **Browser-based UI**
  - Unified Access for Multiple Cloud
- **Management**
  - Linux & Windows
  - Virtual Machine Image
  - Server Template
  - Network
  - Audit Log and Reports
  - Backup

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Private Cloud Requirements

- **Browser-based UI**
  - Unified Access for Multiple Cloud
- **Management**
  - Linux & Windows
  - Virtual Machine Image
  - Server Template
  - Network
  - Audit Log and Reports
  - Backup
- **Security**
  - User Authentication
  - Permissions

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Private Cloud Requirements

- **Browser-based UI**
  - Unified Access for Multiple Cloud
- **Management**
  - Linux & Windows
  - Virtual Machine Image
  - Server Template
  - Network
  - Audit Log and Reports
  - Backup
- **Security**
  - User Authentication
  - Permissions
- **Monitoring**
  - Physical Servers / Cloud Nodes
  - Virtual Machines
  - Applications

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Private Cloud Requirements

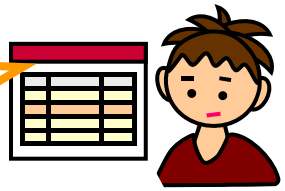
- **Browser-based UI**
  - Unified Access for Multiple Cloud
- **Management**
  - Linux & Windows
  - Virtual Machine Image
  - Server Template
  - Network
  - Audit Log and Reports
  - Backup
- **Security**
  - User Authentication
  - Permissions
- **Monitoring**
  - Physical Servers / Cloud Nodes
  - Virtual Machines
  - Applications
- **Open Source**

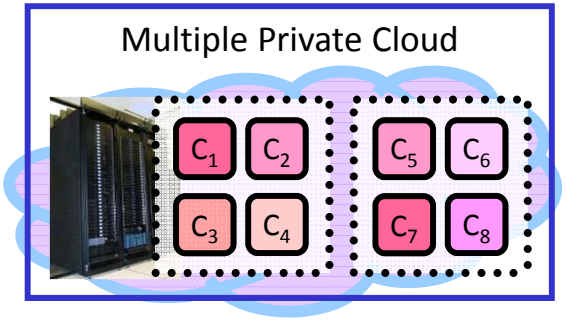
DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

NTT docomo
DOCOMO USA Labs

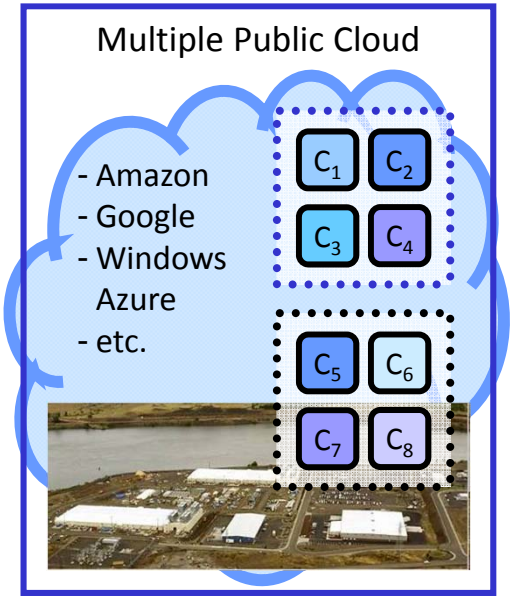
The Goal of Clanavi

- Unified Management Console
- Flexible Resource Management





FW

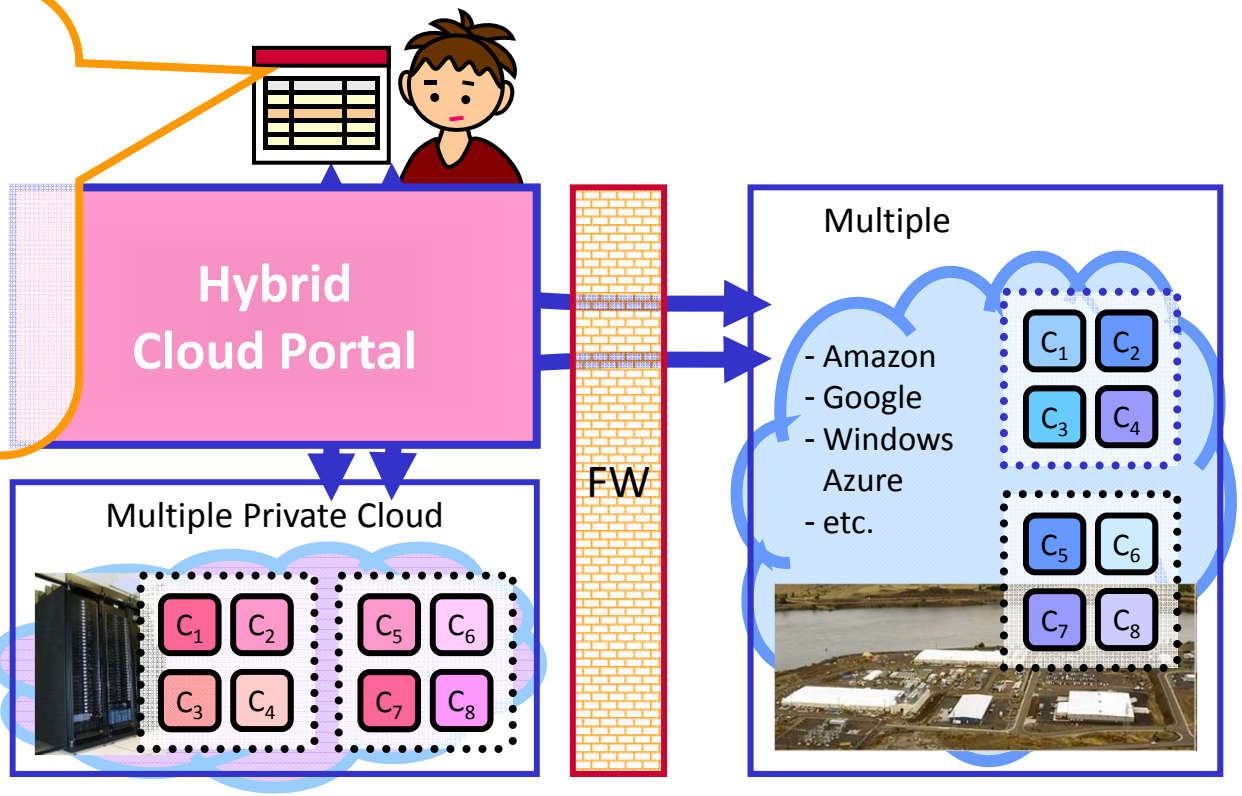


DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

The Goal of Clanavi

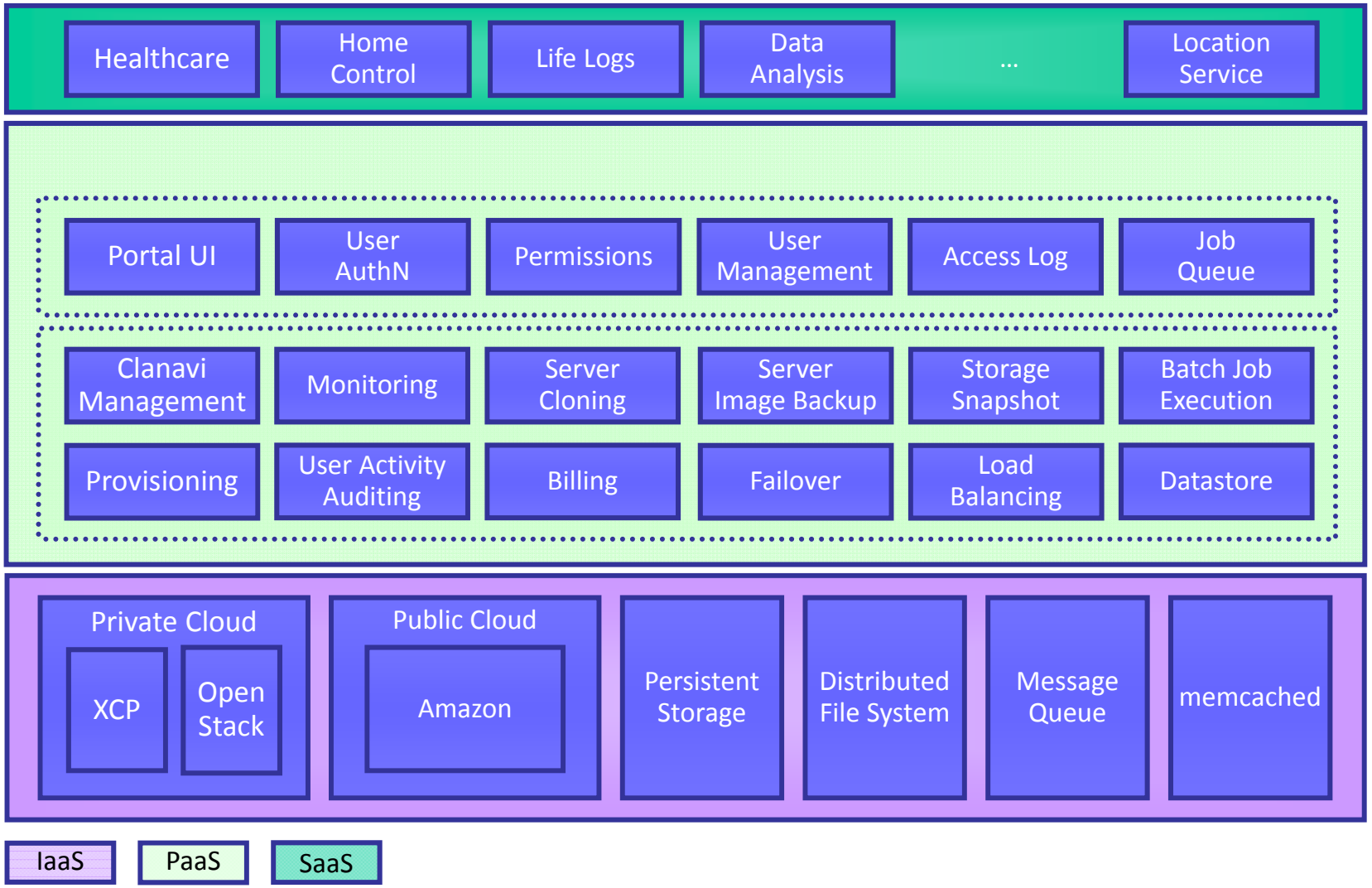
- Unified Management Console
- Flexible Resource Management
- Monitoring
- Security
- Backup
- Failover, etc.



DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

NTT docomo
DOCOMO USA Labs

Architecture Overview



DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Why Drupal?

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Why Drupal?

	Drupal + Custom Modules	Enomaly (Until Feb. 2010)
Developer	-	Enomaly
License	GPL2	AGPL3
Browser-based	Yes	Yes
Programming Language	PHP	Python
Database	MySQL	MySQL
Hypervisor Support	(Any)	KVM / Xen / etc (thru libvirt)
Install & Setup	Easy	Difficult
Functionality	(Yes)	Yes w/ Limitations
API	Drupal / REST	REST
Perspective	Users (and Admin)	Admin (and Users)
Stability	D6 Core Stable	Sometimes Database Corrupt

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Why Drupal?

	Drupal + Custom Modules	Enomaly (Until Feb. 2010)	oVirt (As of Mar. 2010)
Developer	-	Enomaly	Red Hat
License	GPL2	AGPL3	GPL2
Browser-based	Yes	Yes	Yes
Programming Language	PHP	Python	Ruby on Rails Python
Database	MySQL	MySQL	PostgreSQL
Hypervisor Support	(Any)	KVM / Xen / etc (thru libvirt)	KVM / Xen /etc (thru libvirt)
Install & Setup	Easy	Difficult	Difficult
Functionality	(Yes)	Yes w/ Limitations	(Yes)
API	Drupal / REST	REST	REST (Not Exposed)
Perspective	Users (and Admin)	Admin (and Users)	Admin and Users
Stability	D6 Core Stable	Sometimes Database Corrupt	Implementation Immature

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

NTT docomo
DOCOMO USA Labs

Why Drupal?

	Drupal + Custom Modules	Enomaly (Until Feb. 2010)	oVirt (As of Mar. 2010)	OpenXen Manager
Developer	-	Enomaly	Red Hat	Citrix
License	GPL2	AGPL3	GPL2	GPL2
Browser-based	Yes	Yes	Yes	Yes (Recently)
Programming Language	PHP	Python	Ruby on Rails Python	Python
Database	MySQL	MySQL	PostgreSQL	N/A
Hypervisor Support	(Any)	KVM / Xen / etc (thru libvirt)	KVM / Xen /etc (thru libvirt)	Xen Only
Install & Setup	Easy	Difficult	Difficult	Easy
Functionality	(Yes)	Yes w/ Limitations	(Yes)	Yes
API	Drupal / REST	REST	REST (Not Exposed)	XAPI / XML-RPC
Perspective	Users (and Admin)	Admin (and Users)	Admin and Users	Admin
Stability	D6 Core Stable	Sometimes Database Corrupt	Implementation Immature	Sometimes Hang-up

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Why Drupal?

- **Web Application Framework**

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Why Drupal?

- **Web Application Framework**
  - Highly-Modularized Architecture
  - User Authentication & Management
  - Permissions
  - Key-value Pair Programming Style (Array)

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

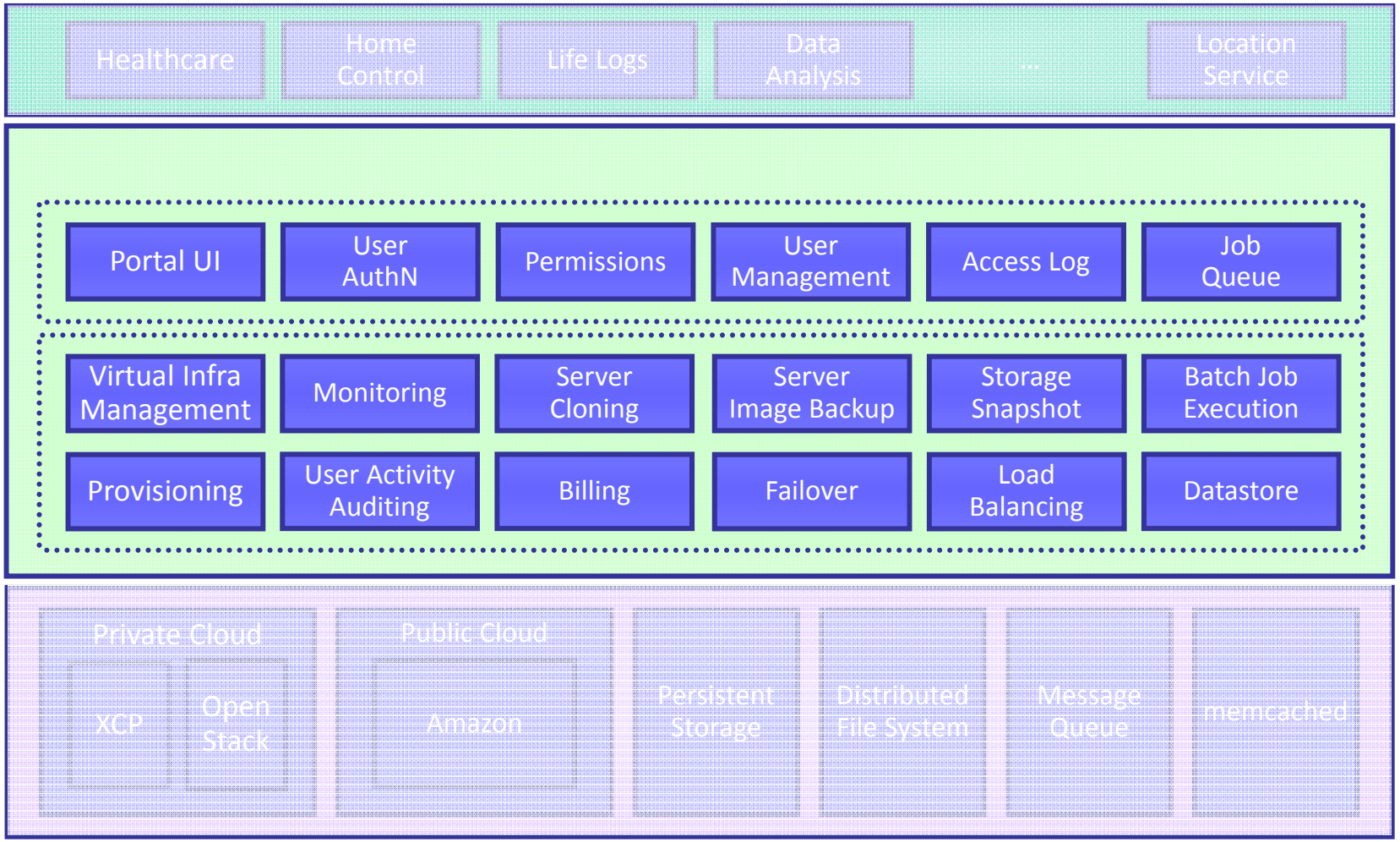
Why Drupal?

- **Web Application Framework**
  - Highly-Modularized Architecture
  - User Authentication & Management
  - Permissions
  - Key-value Pair Programming Style (Array)
  - Queuing System Support (D7)
  - NoSQL Support (D7)

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

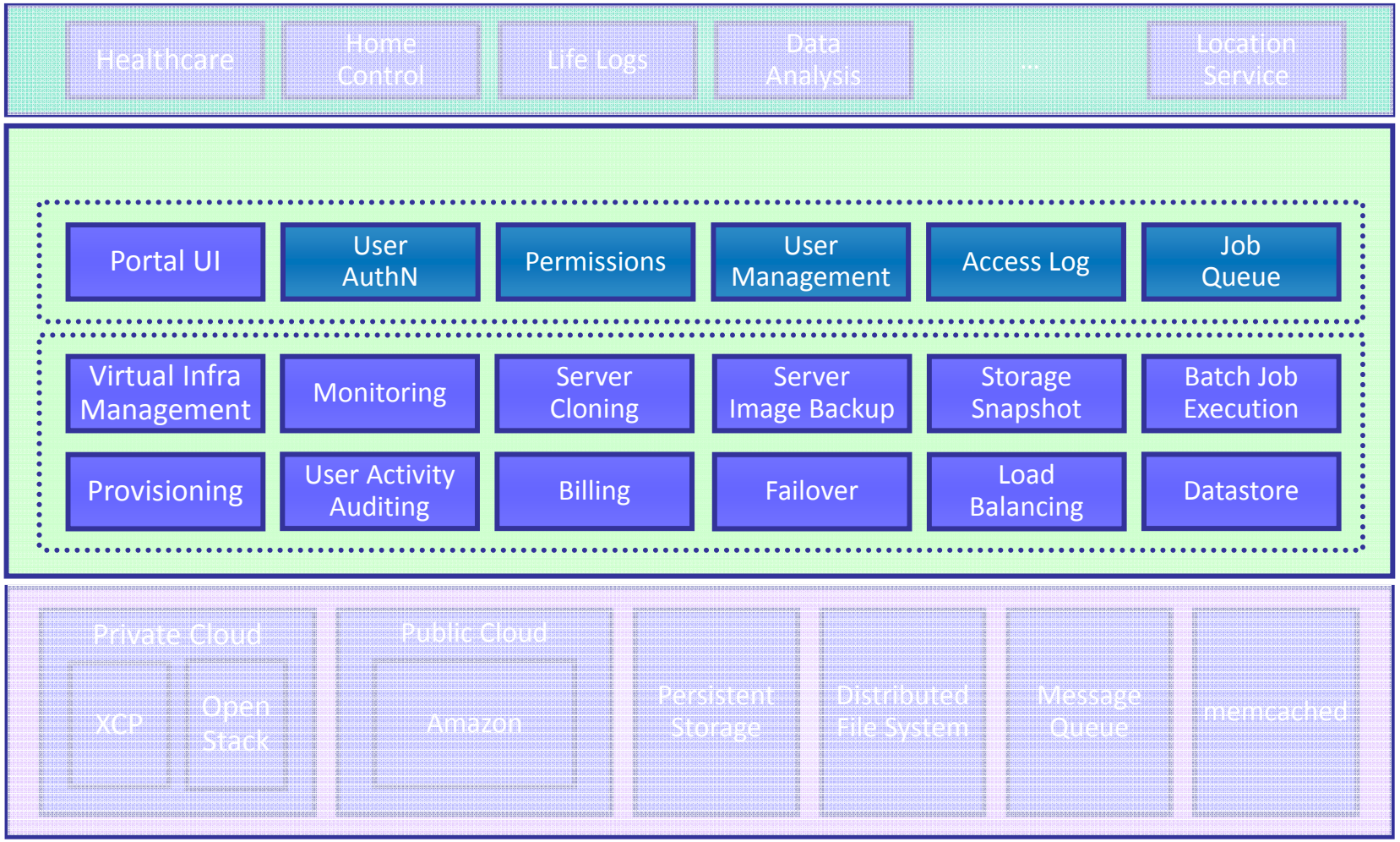
Architecture Overview



DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Architecture Overview



DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Clanavi

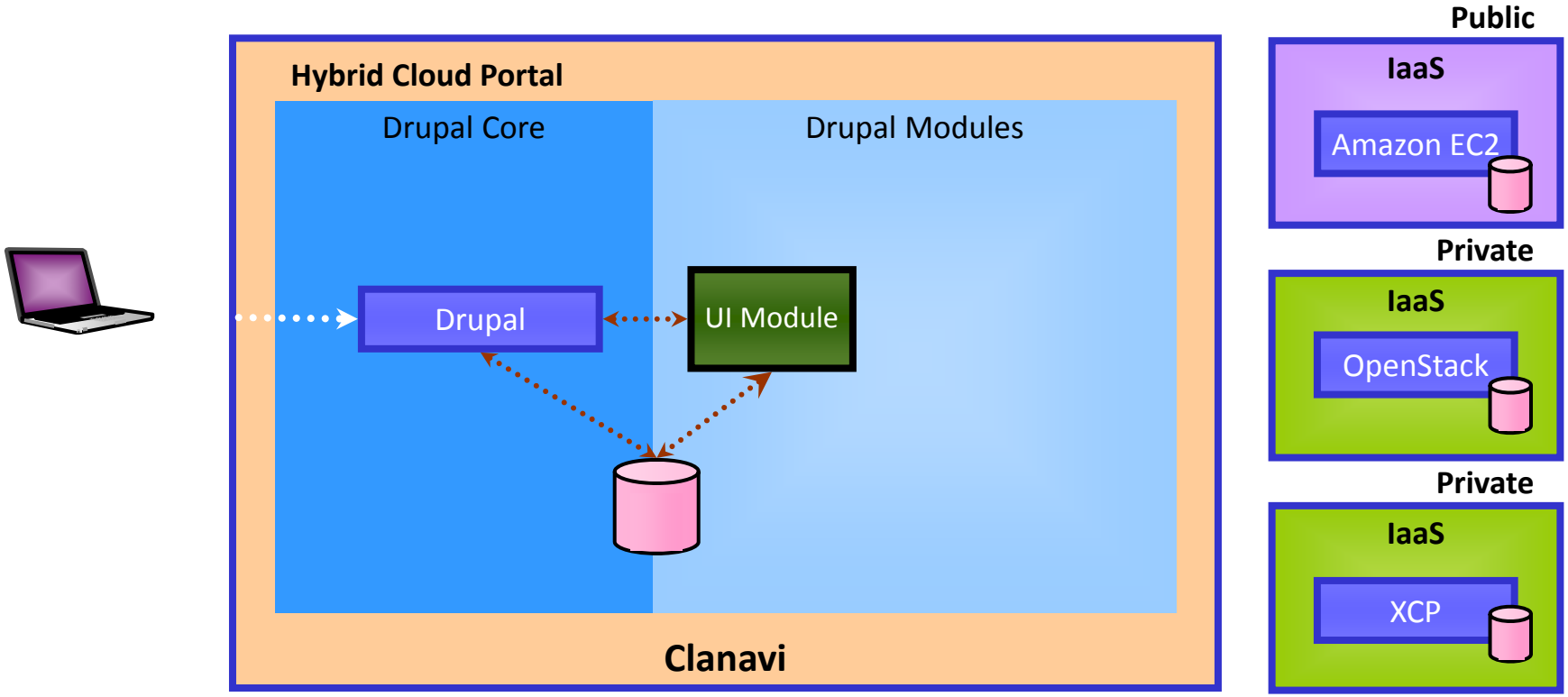
- Works with Multiple Cloud
  - Amazon EC2
  - XCP (Xen Cloud Platform)
  - OpenStack (Needs to Test)

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

NTT docomo
DOCOMO USA Labs

Architecture

- Drupal Core as Web Application Framework

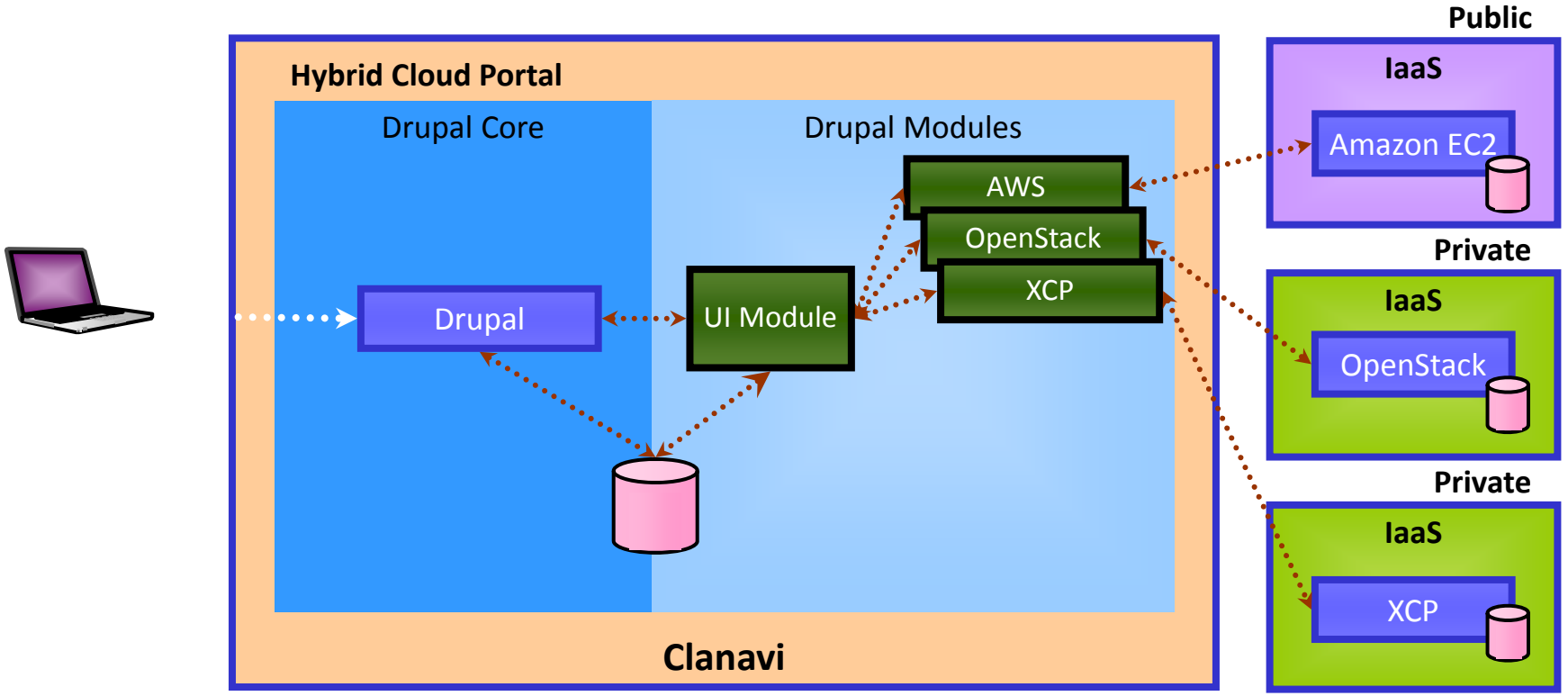


DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

NTT docomo
DOCOMO USA Labs

Architecture

- Drupal Core as Web Application Framework
- Drupal Custom Modules for Each Cloud, Templates, etc.

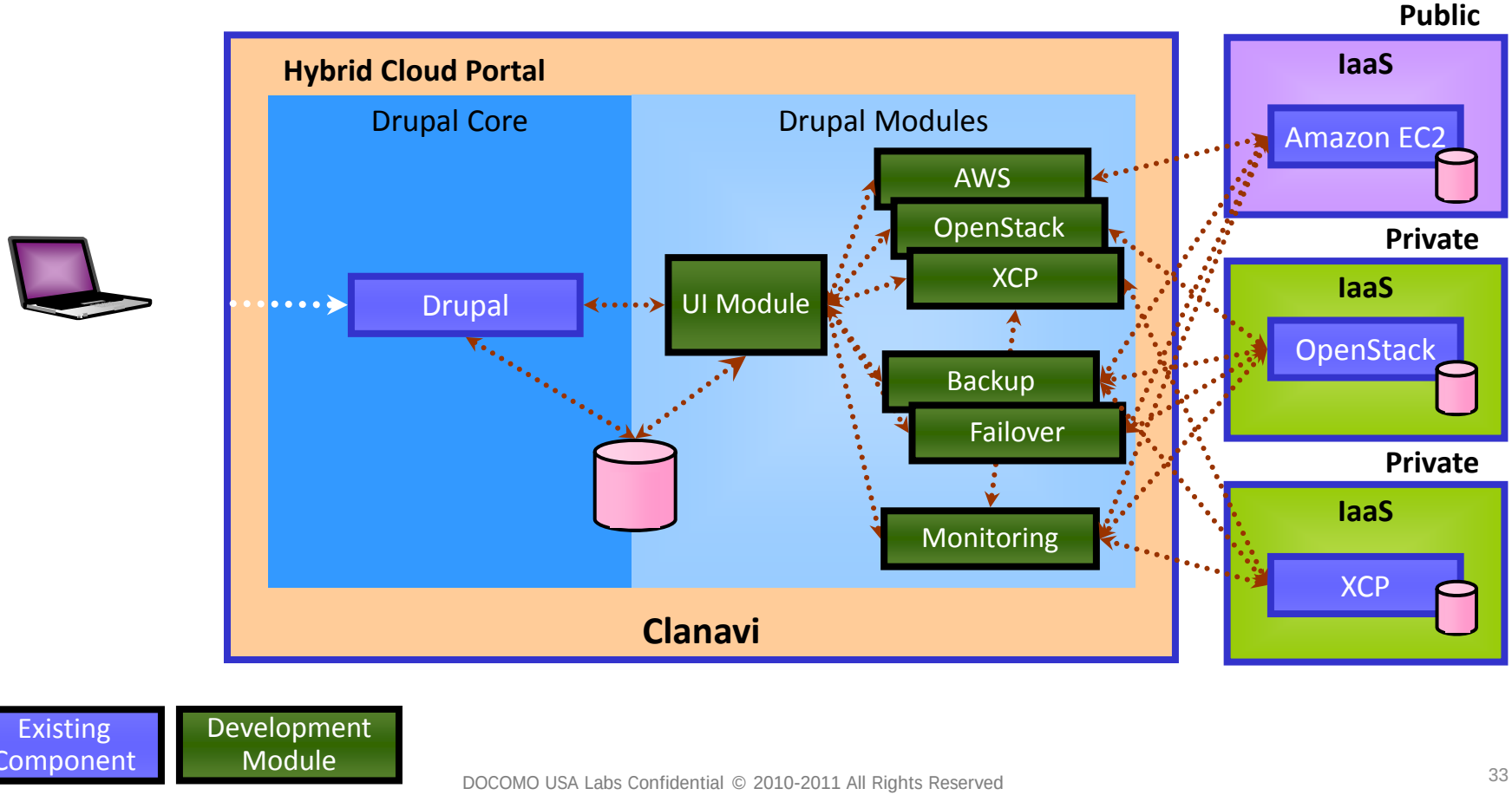


DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

NTT docomo
DOCOMO USA Labs

Architecture

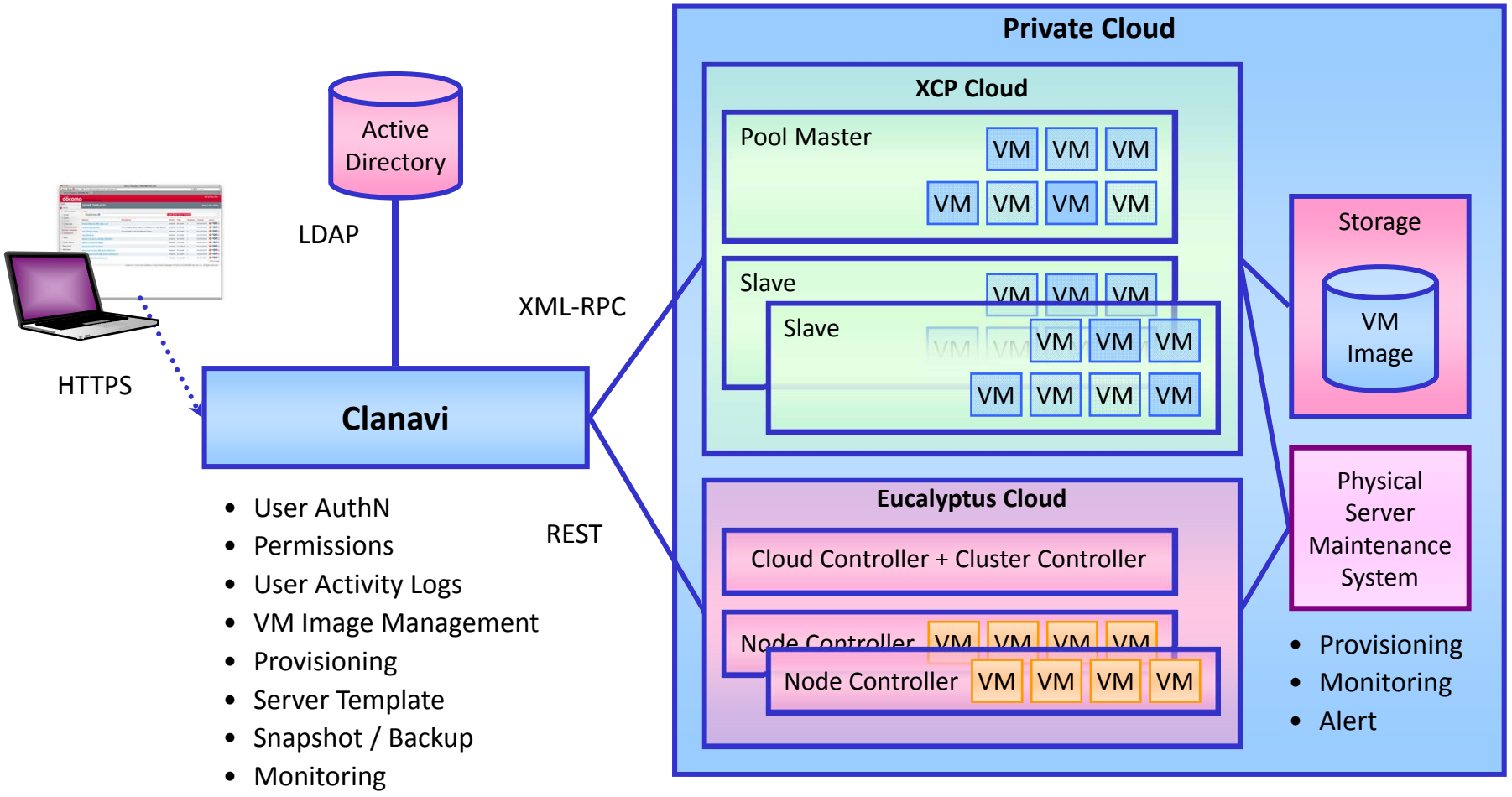
- Drupal Core as Web Application Framework
- Drupal Custom Modules for Each Cloud, Templates, etc.
- Failover by Monitoring Virtual Machines



DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Deployment



DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Systems Requirements

- Drupal 6.20
- Ubuntu 10.10
- Apache 2.2
- MySQL 5.1
- PHP 5.3
- Collectd 4.8
- RRDTool 1.3
- Nagios 3.2

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Modules

Category	Module Name	Description
Cloud Management	Common	• System Common Library
	Amazon	• Manage Amazon EC2
	OpenStack	• Manage OpenStack Cloud
	XCP	• Manage XCP Cloud

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Modules

Category	Module Name	Description
Cloud Management	Common	• System Common Library
	Amazon	• Manage Amazon EC2
	OpenStack	• Manage OpenStack Cloud
	XCP	• Manage XCP Cloud
Provisioning	Registration	• Manage Virtual Server Images
	Server Templates	• Manage Server Templates
	Cluster	• Manage Server Template Collection
	Scripting	• Manage Scripts for Automation
	Input Parameters	• Input Parameters for Running Virtual Server

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Modules

Category	Module Name	Description
Cloud Management	Common	• System Common Library
	Amazon	• Manage Amazon EC2
	OpenStack	• Manage OpenStack Cloud
	XCP	• Manage XCP Cloud
Provisioning	Registration	• Manage Virtual Server Images
	Server Templates	• Manage Server Templates
	Cluster	• Manage Server Template Collection
	Scripting	• Manage Scripts for Automation
	Input Parameters	• Input Parameters for Running Virtual Server
Reporting	Audit	• User Activity Log
	Usage Report	• Cost Estimation Depending on Hours of Usage
	Alerts	• Provides Alert Functionality

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Modules

Category	Module Name	Description
Cloud Management	Common	• System Common Library
	Amazon	• Manage Amazon EC2
	OpenStack	• Manage OpenStack Cloud
	XCP	• Manage XCP Cloud
Provisioning	Registration	• Manage Virtual Server Images
	Server Templates	• Manage Server Templates
	Cluster	• Manage Server Template Collection
	Scripting	• Manage Scripts for Automation
	Input Parameters	• Input Parameters for Running Virtual Server
Reporting	Audit	• User Activity Log
	Usage Report	• Cost Estimation Depending on Hours of Usage
	Alerts	• Provides Alert Functionality
Reliability	Failover	• Provide Failover Functionality
	Backup	• Provide Backup Functionality

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Clanavi Status

- Total 25K Steps
- Continuing Refactoring
- 11/09/2010: Uploaded to drupal.org
- http://drupal.org/node/**919966**

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Problem in-the-Cloud

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Problem in-the-Cloud

- Async Operations for VMs on Clanavi

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

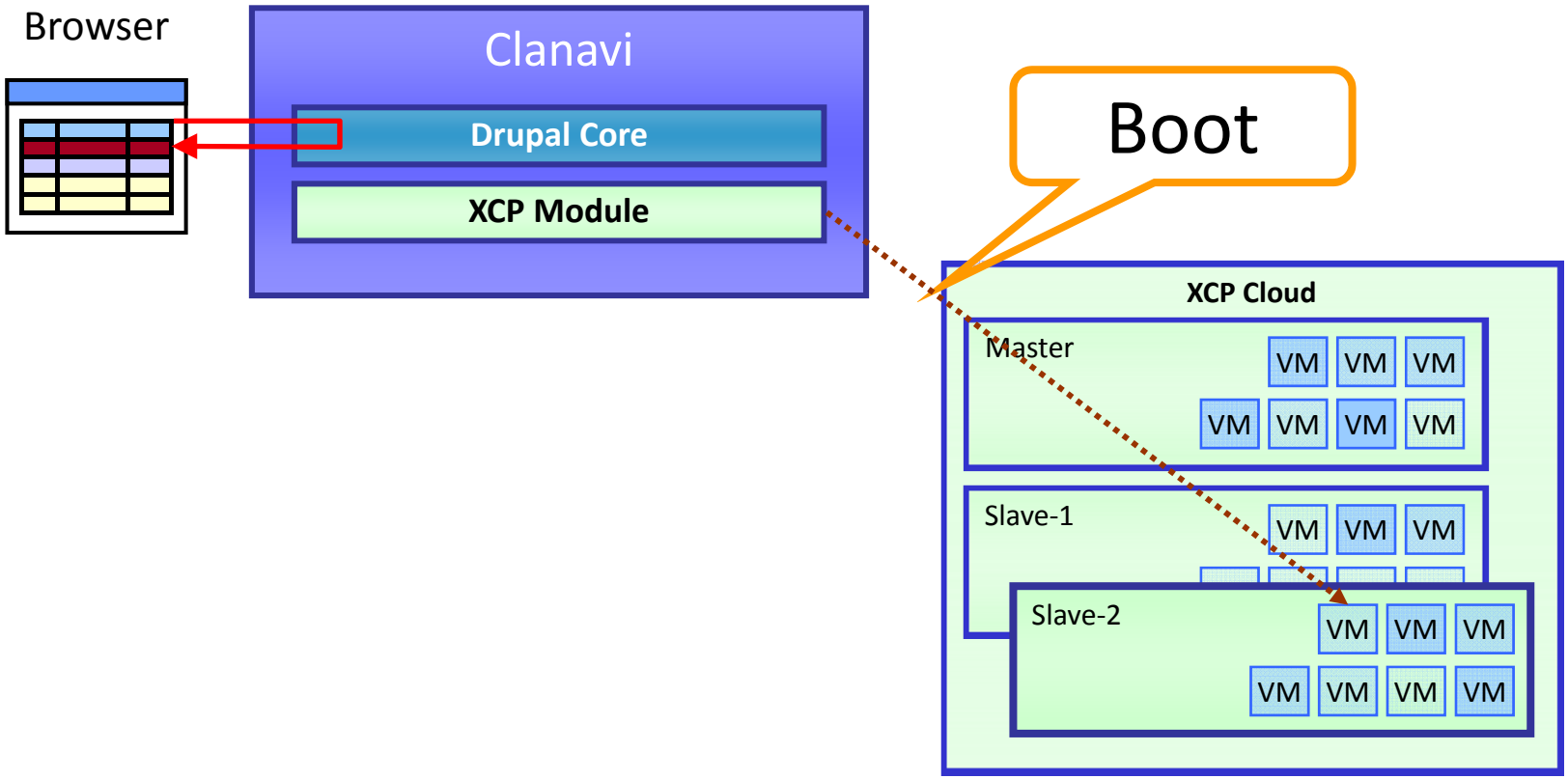
Problem in-the-Cloud

- Async Operations for VMs on Clanavi
  - Boot
  - Shutdown
  - Suspend / Resume
  - VM Backup

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

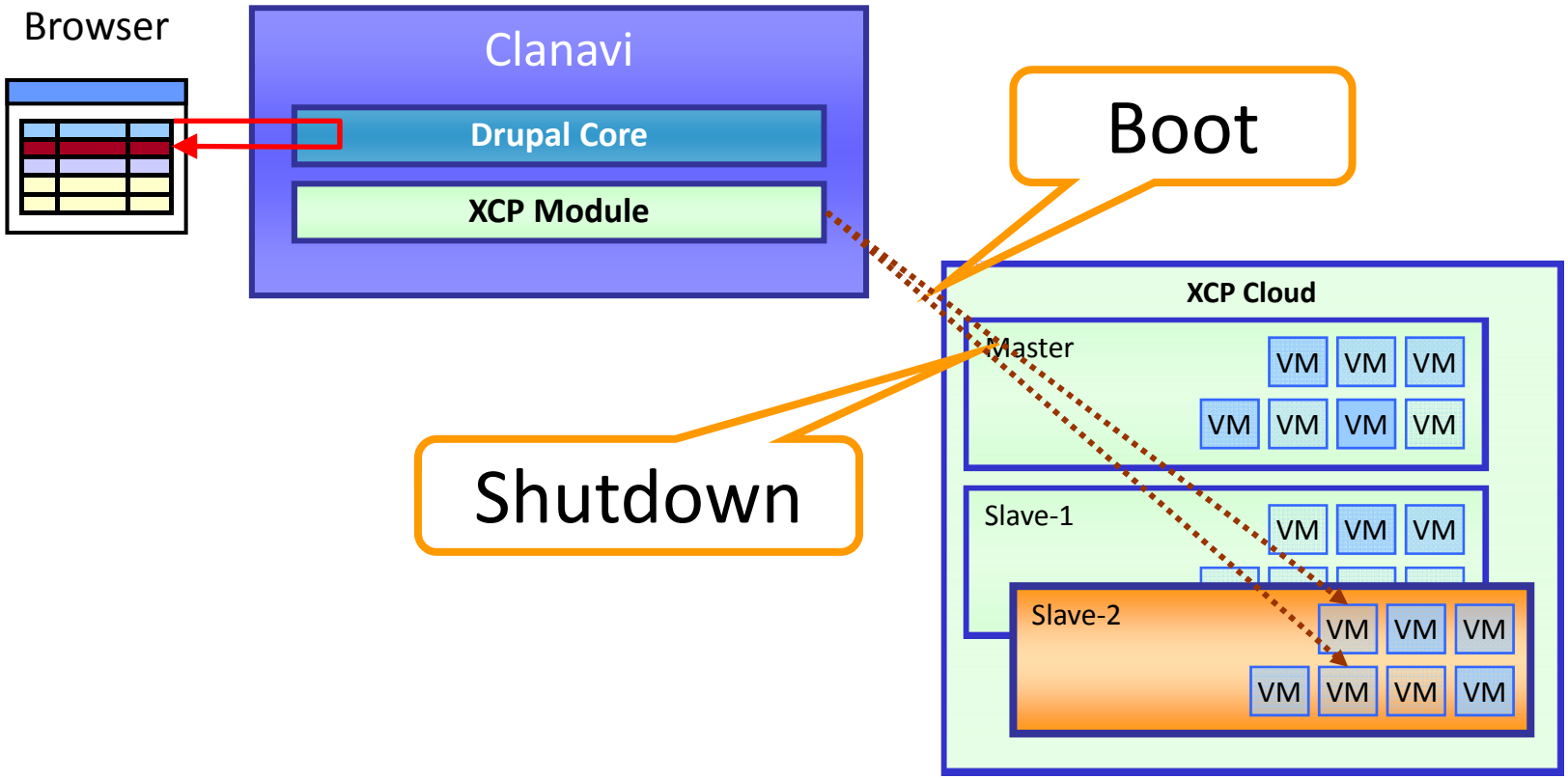
Clanavi Operation



DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

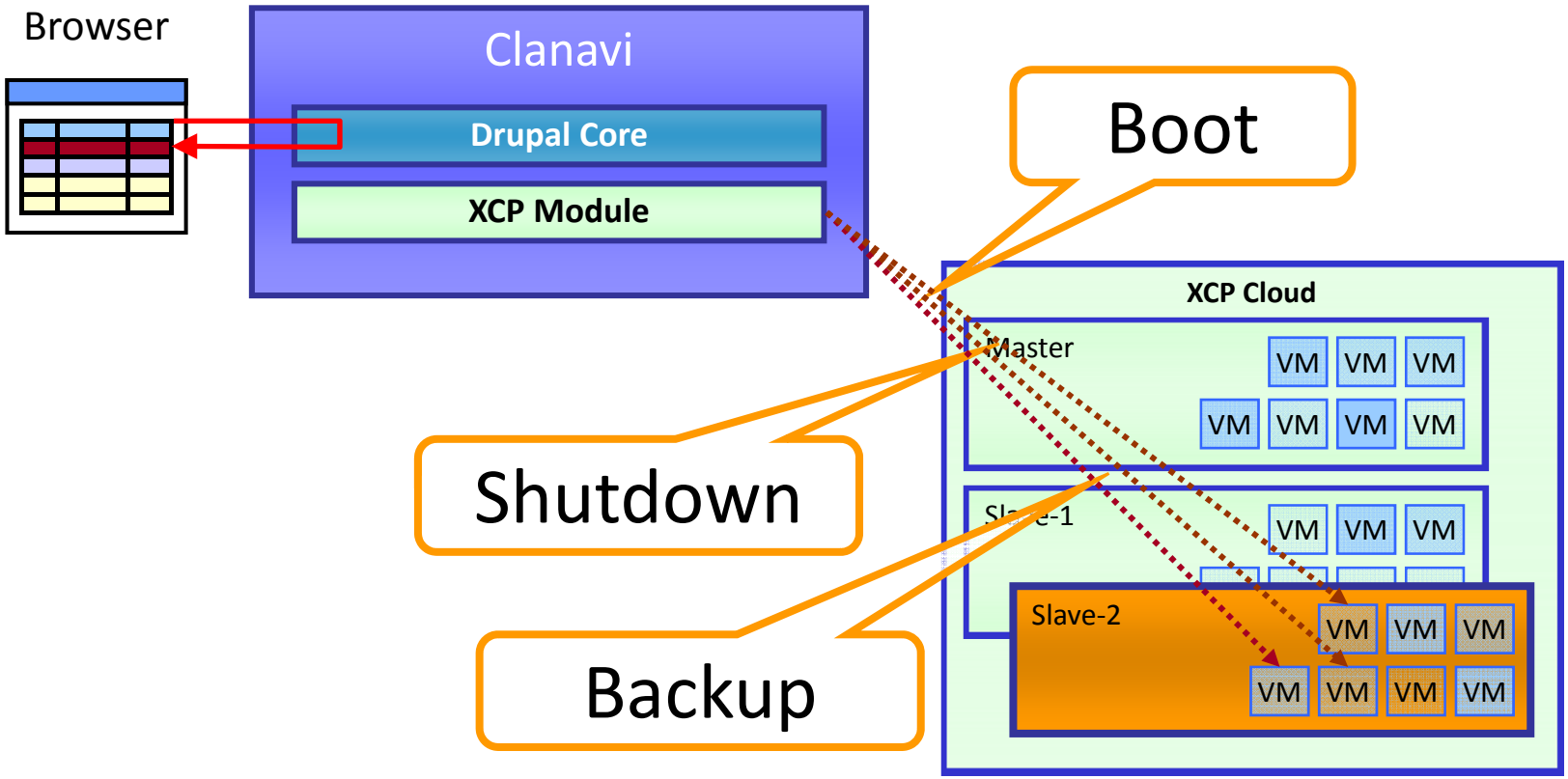
Clanavi Operation



DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

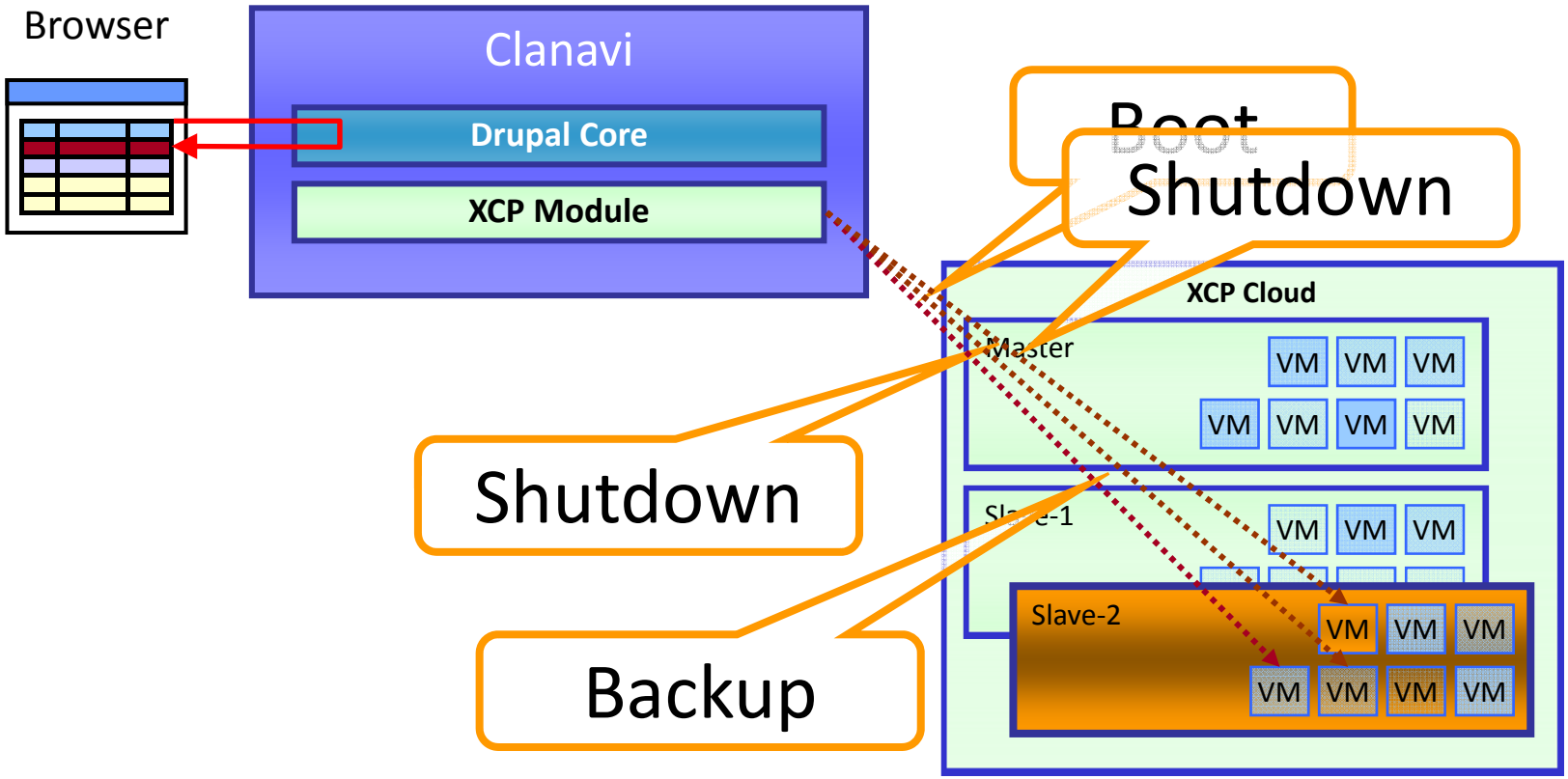
Clanavi Operation



DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

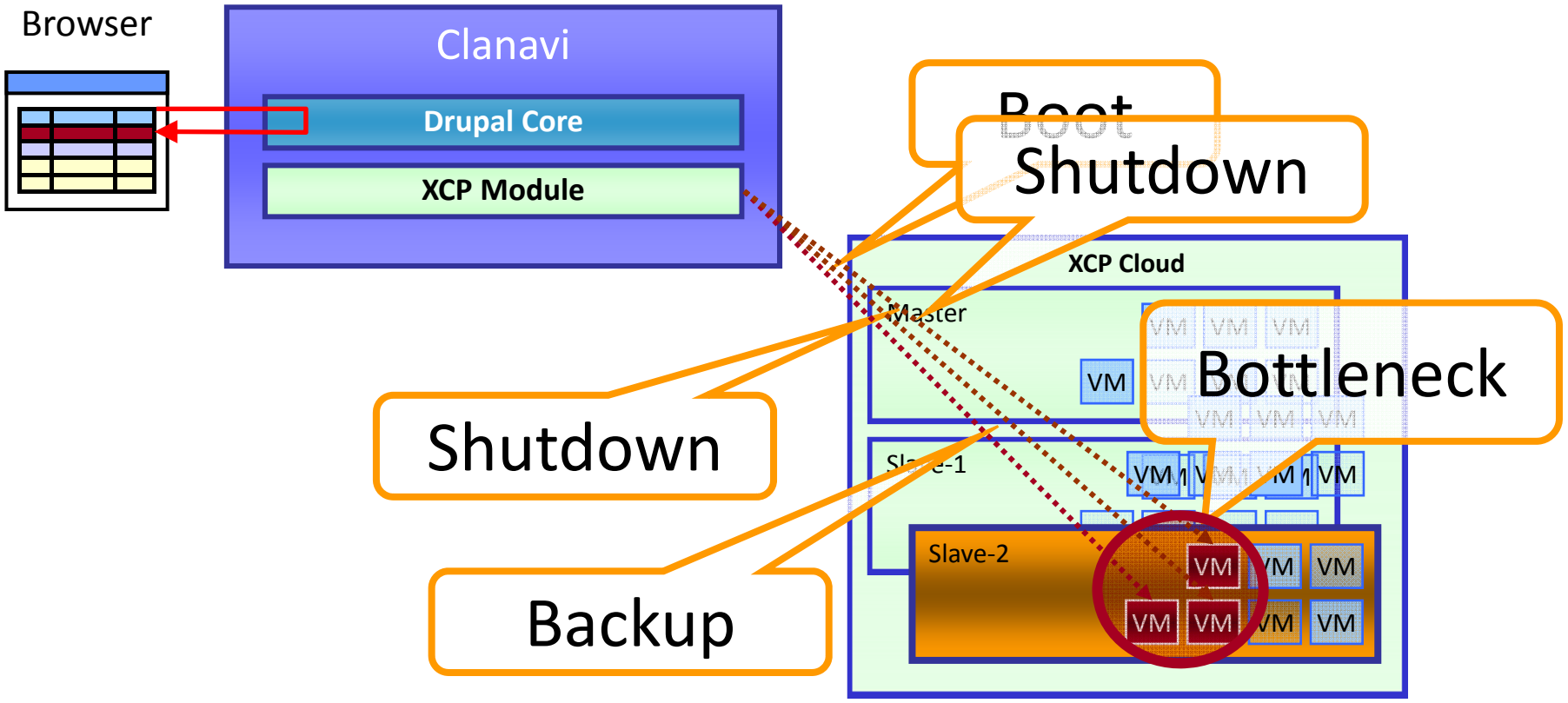
Clanavi Operation



DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

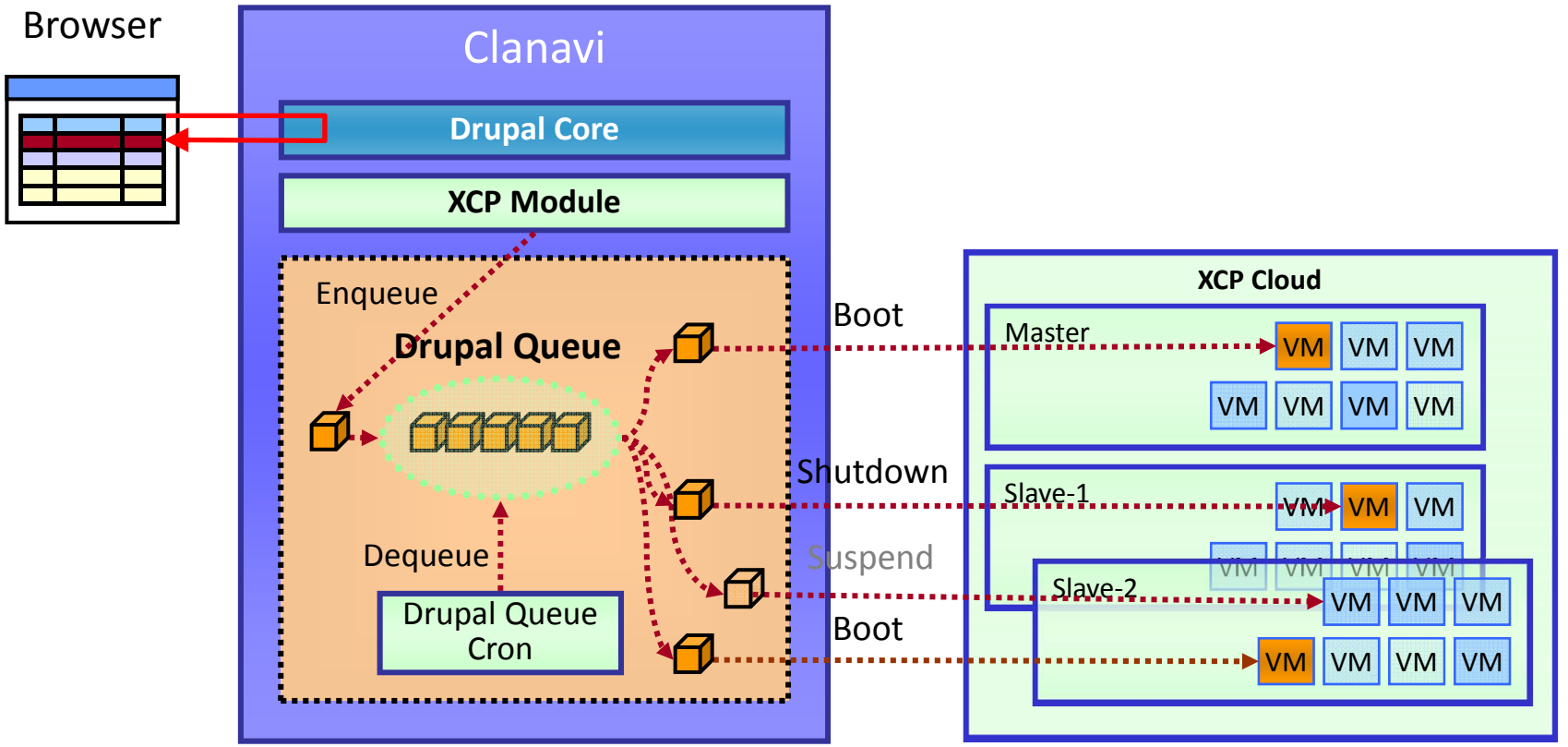
Clanavi Operation



DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

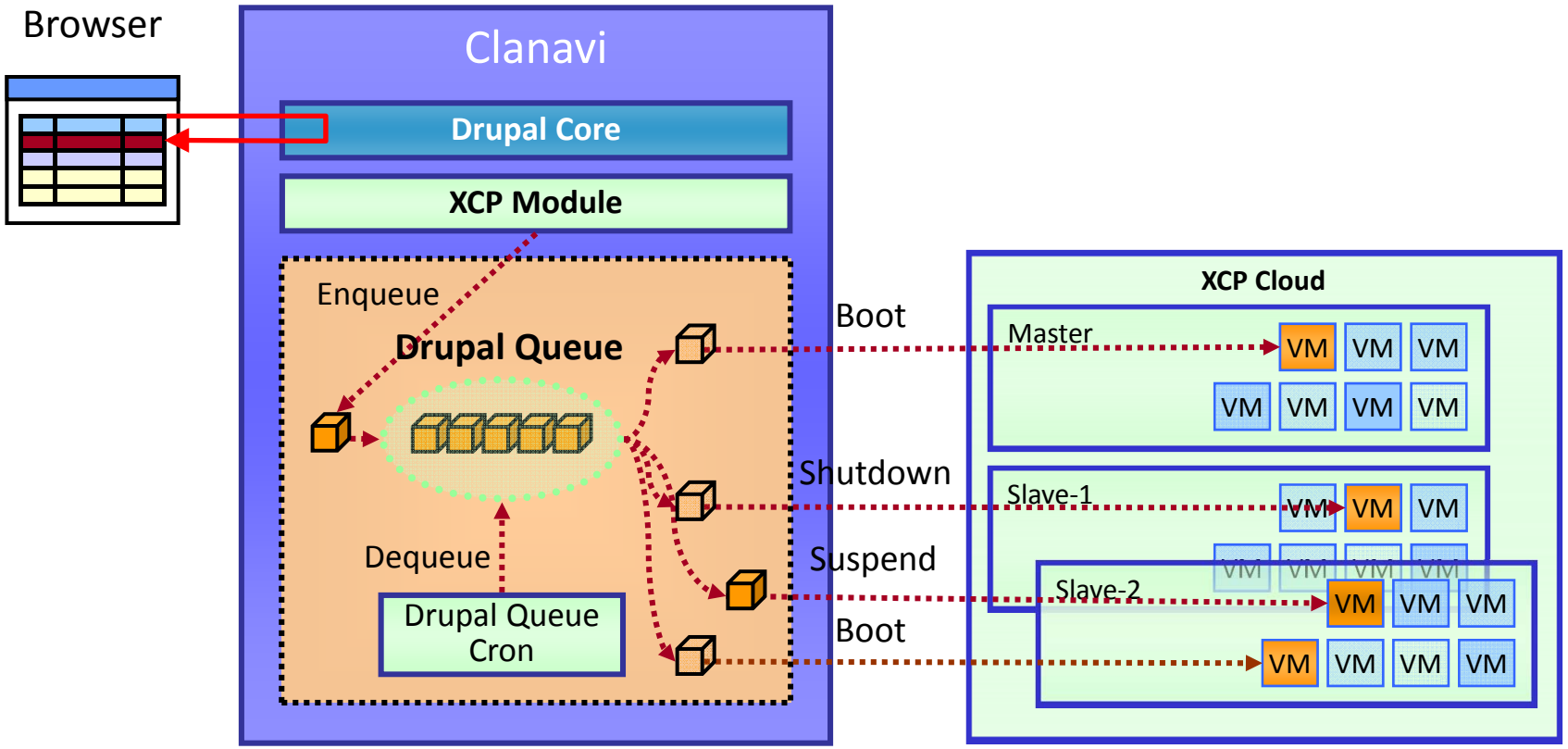
Clanavi Operation Using Drupal Queue



DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

NTT docomo
DOCOMO USA Labs

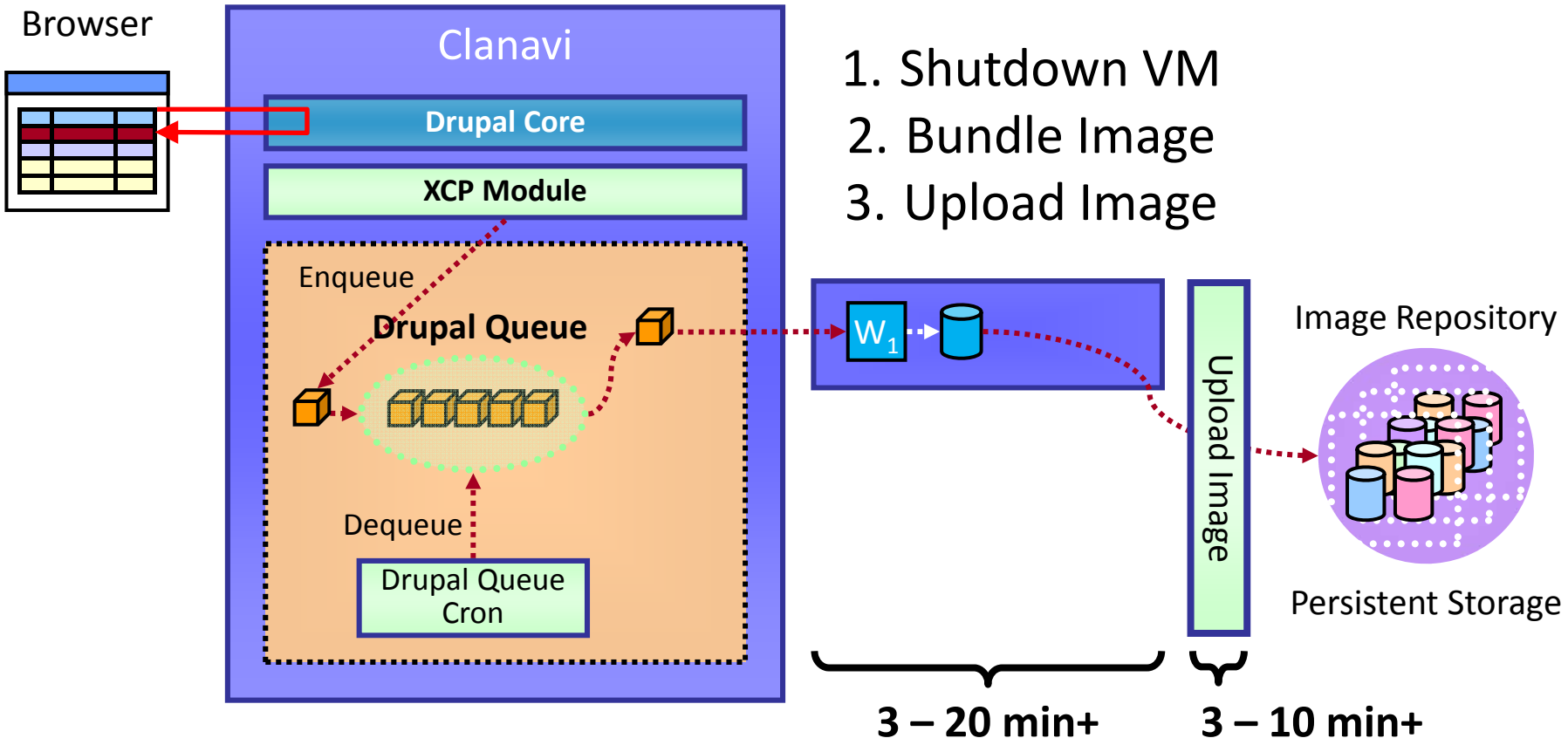
Clanavi Operation Using Drupal Queue



DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

VM Image Backup Using Drupal Queue

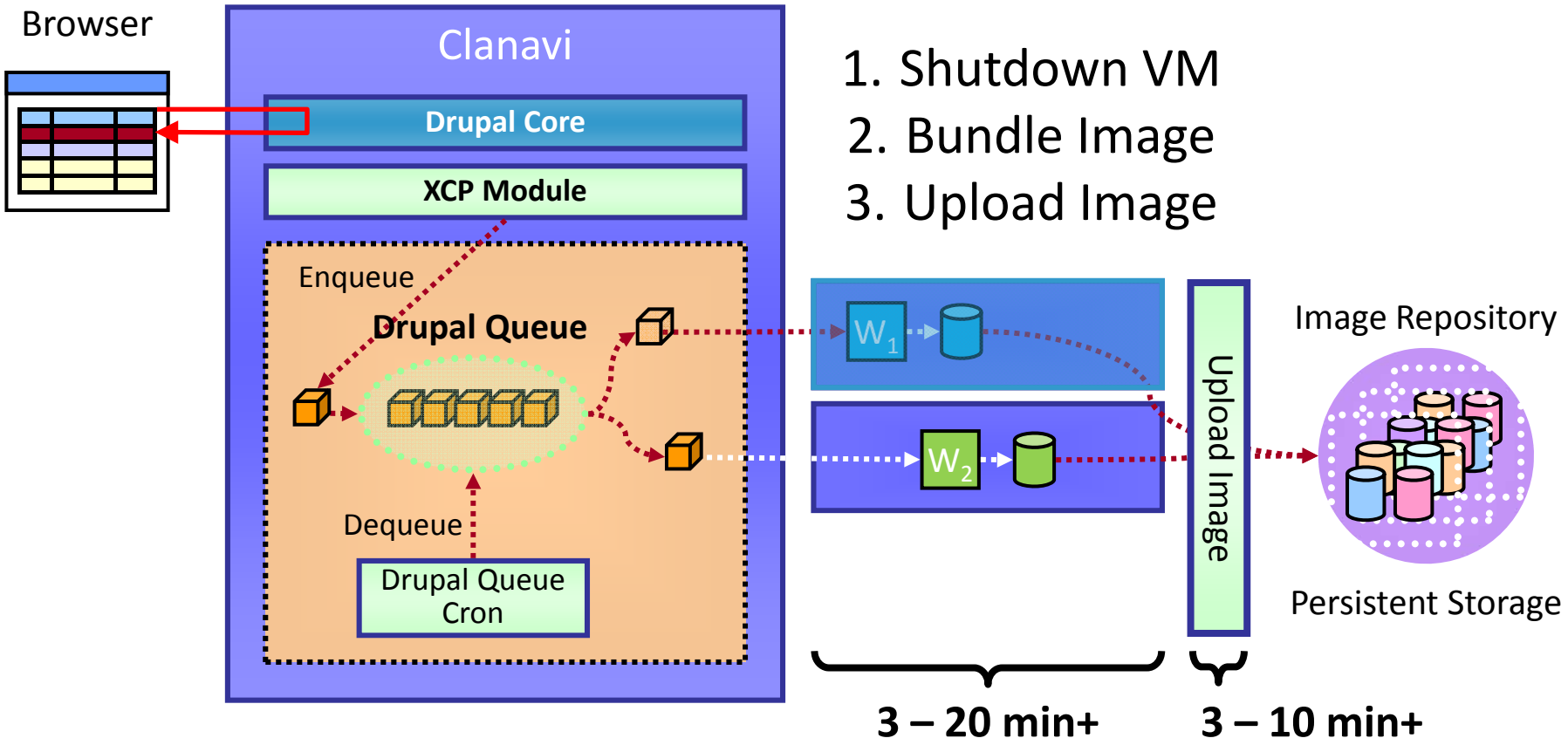


Wn …Worker Process

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

VM Image Backup Using Drupal Queue

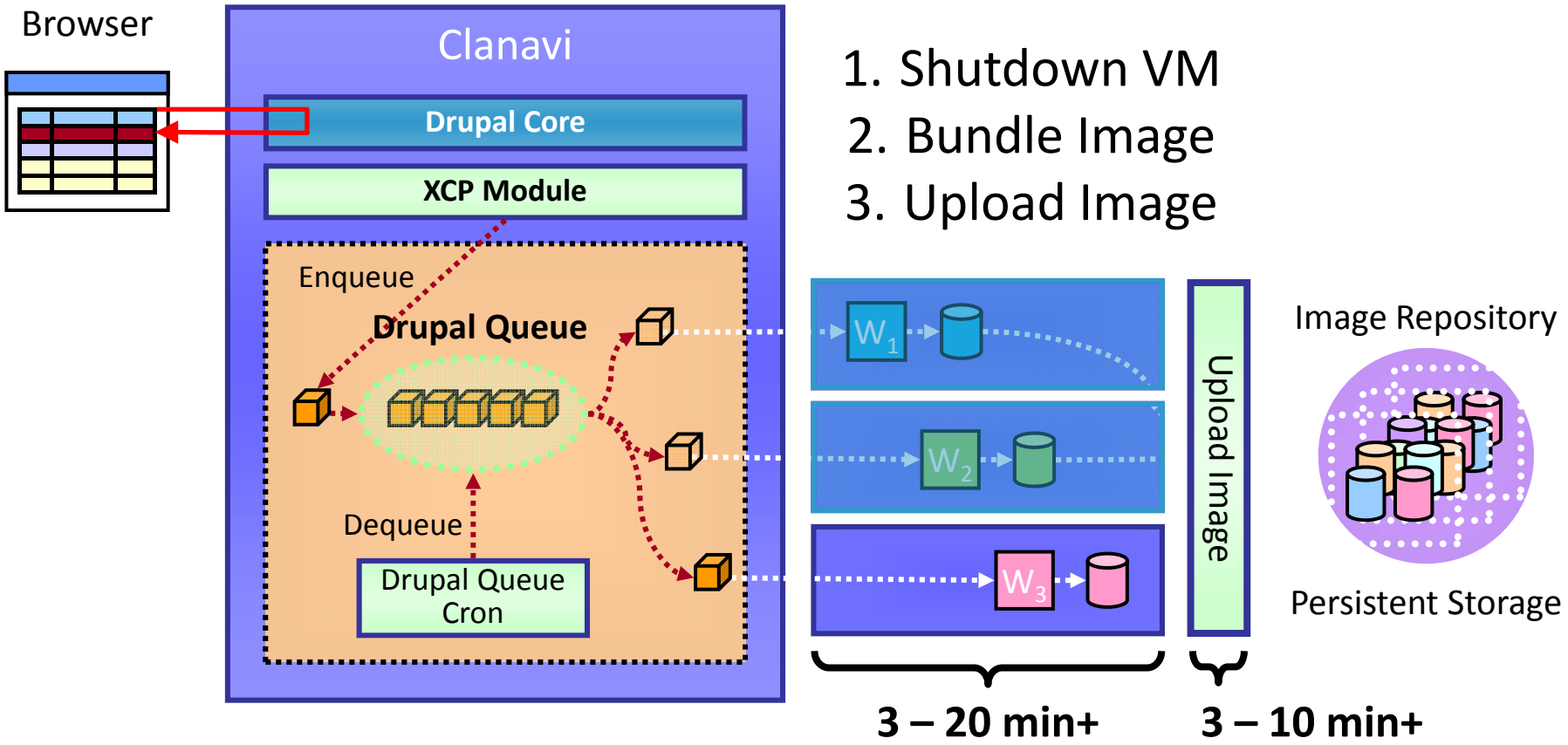


Wn …Worker Process

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

NTT docomo
DOCOMO USA Labs

VM Image Backup Using Drupal Queue



W_n …Worker Process

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Demo

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Business Value by Clanavi

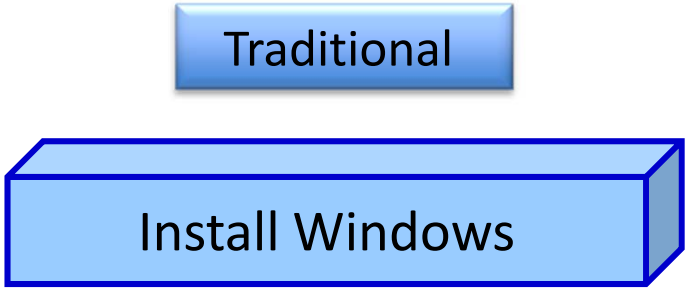
DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

Cost Reduction

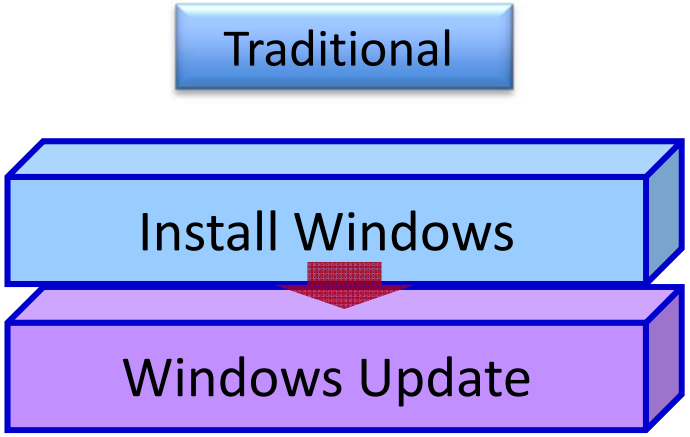
Cost Reduction

Traditional

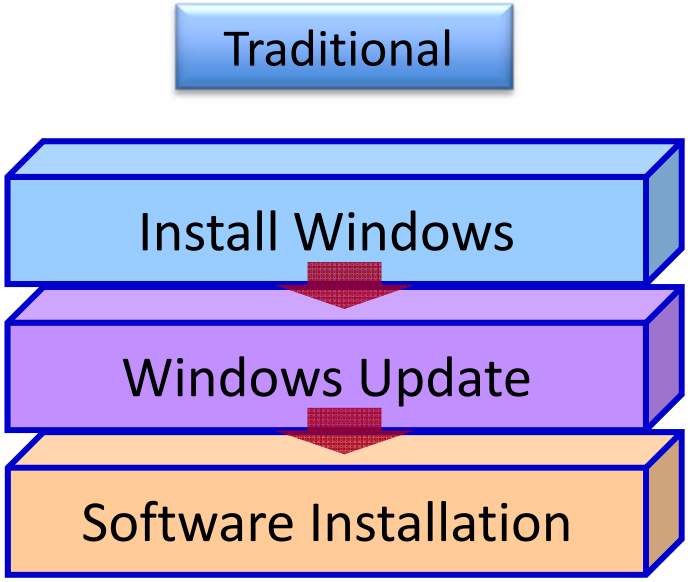
Cost Reduction



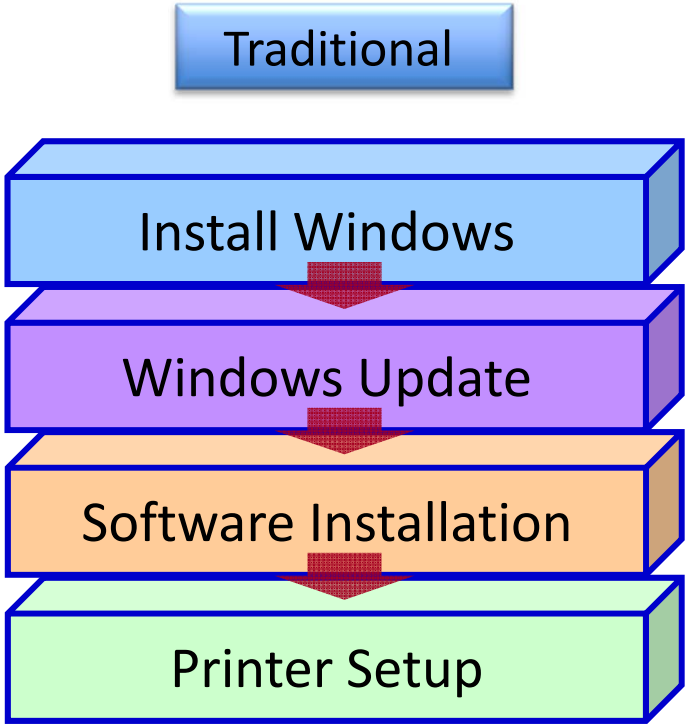
Cost Reduction



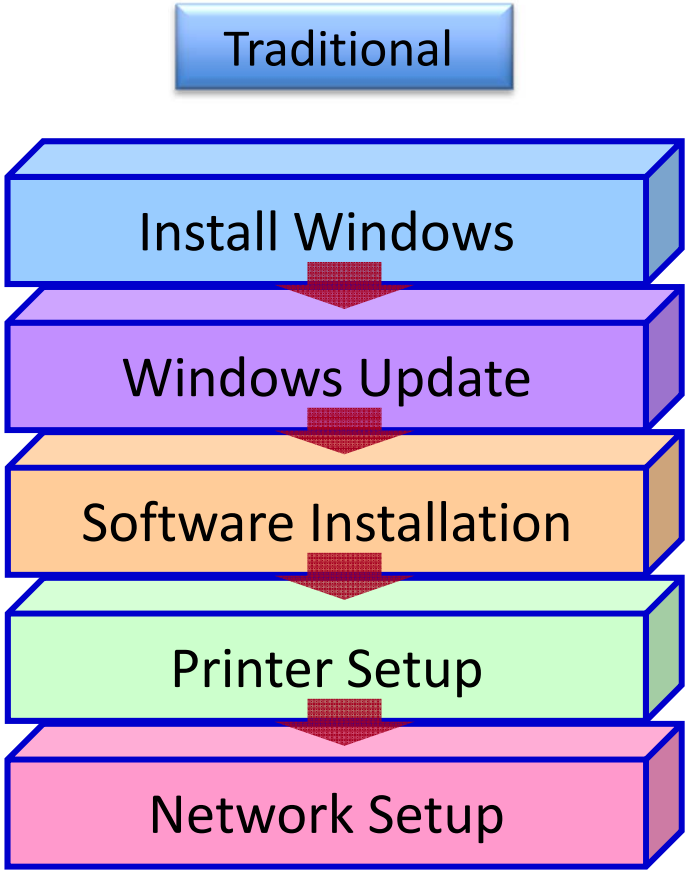
Cost Reduction



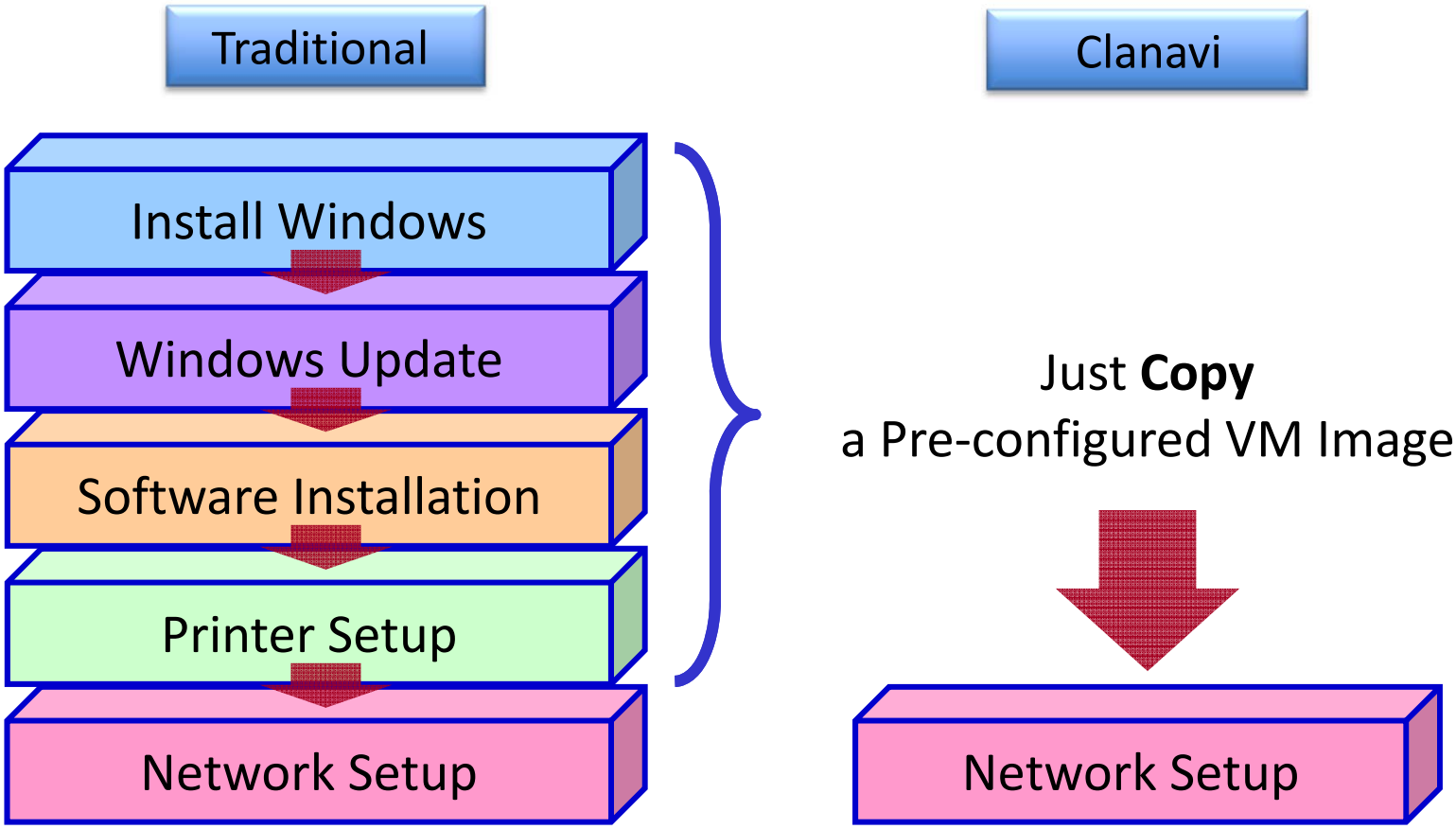
Cost Reduction



Cost Reduction



Cost Reduction



DOCOMO USA Labs

Business Value (1/2)

- **Clanavi**
  - No Promising OSS
  - Reference Model and Implementation for Cloud Management
    - Multiple Cloud Support
    - Security
    - Reliability
    - Scalability

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

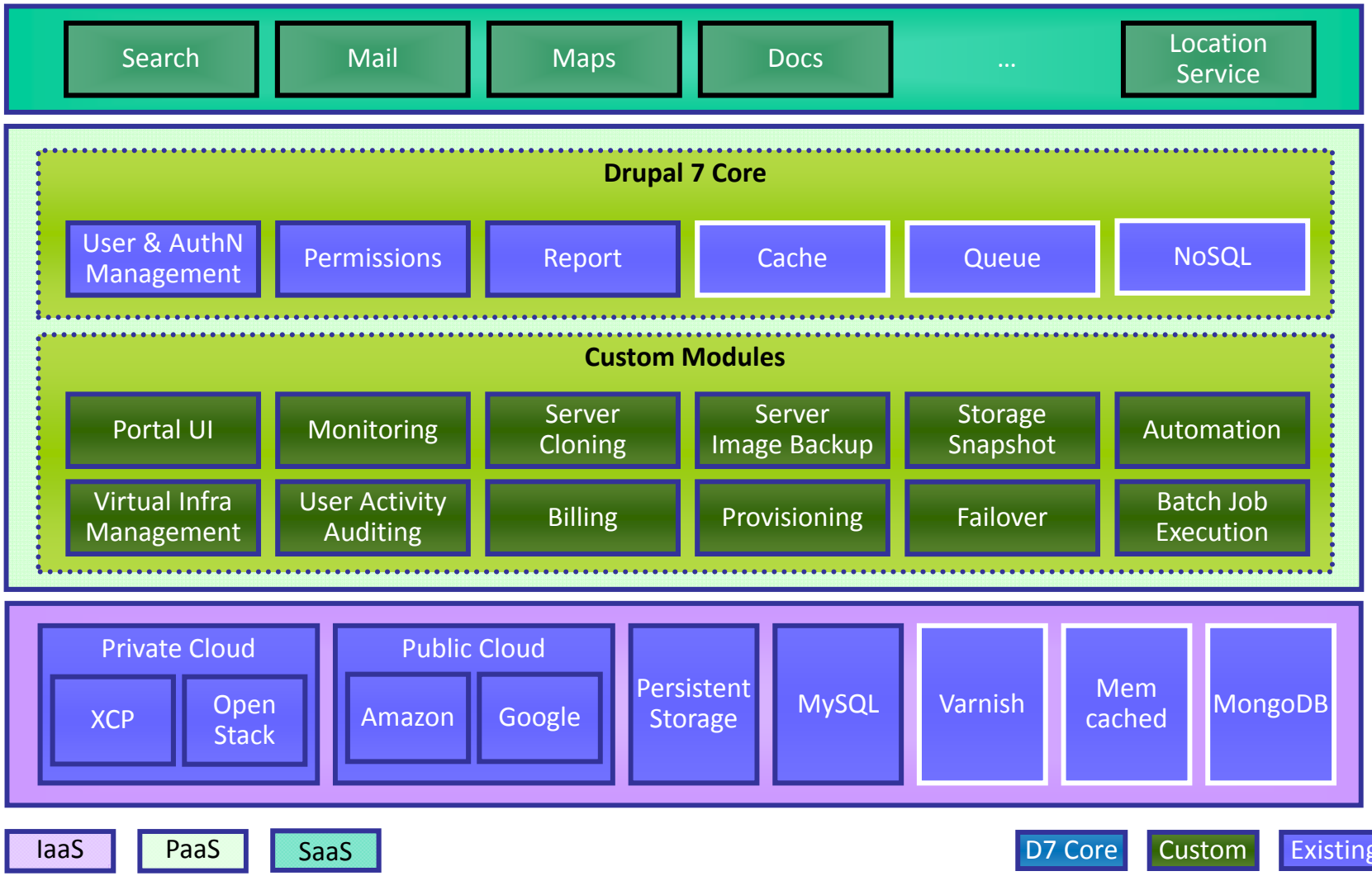
DOCOMO USA Labs

Business Value (2/2)

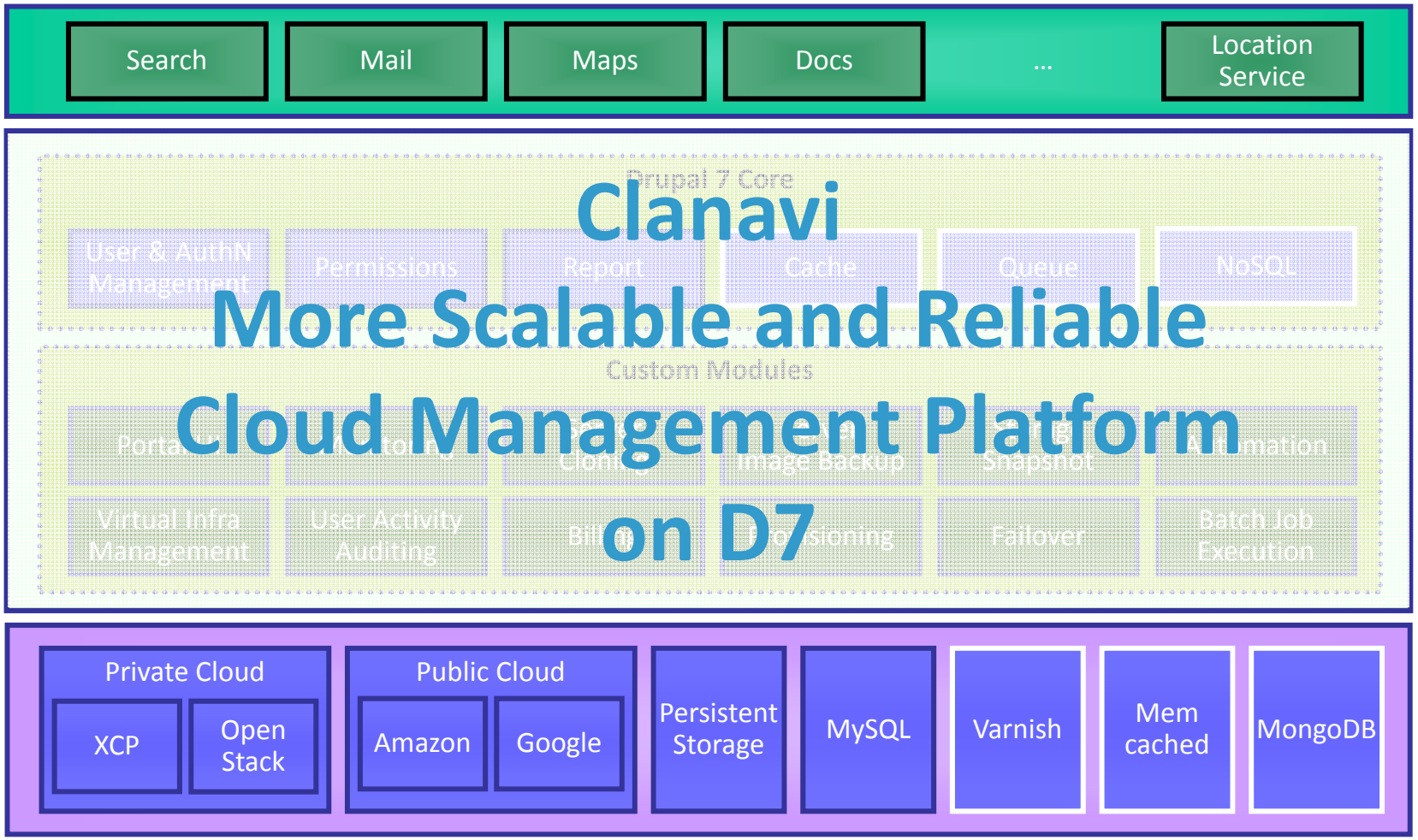
- **Clanavi**
  - Effective Cost Reduction of Cloud Management
    - Unified Access to Multiple Cloud
    - Easy Provisioning
    - Easy Operations

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

Future Direction



Future Direction



DOCOMO USA Labs

Q&A

- Download : drupal.org/node/919966
- Follow me : @yas
- Hiring : naoi@docomo-pact.com

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

Thank You!

"Coming together is a beginning, keeping together is a progress; working together is a success."

- Henry Ford

Yas Naoi

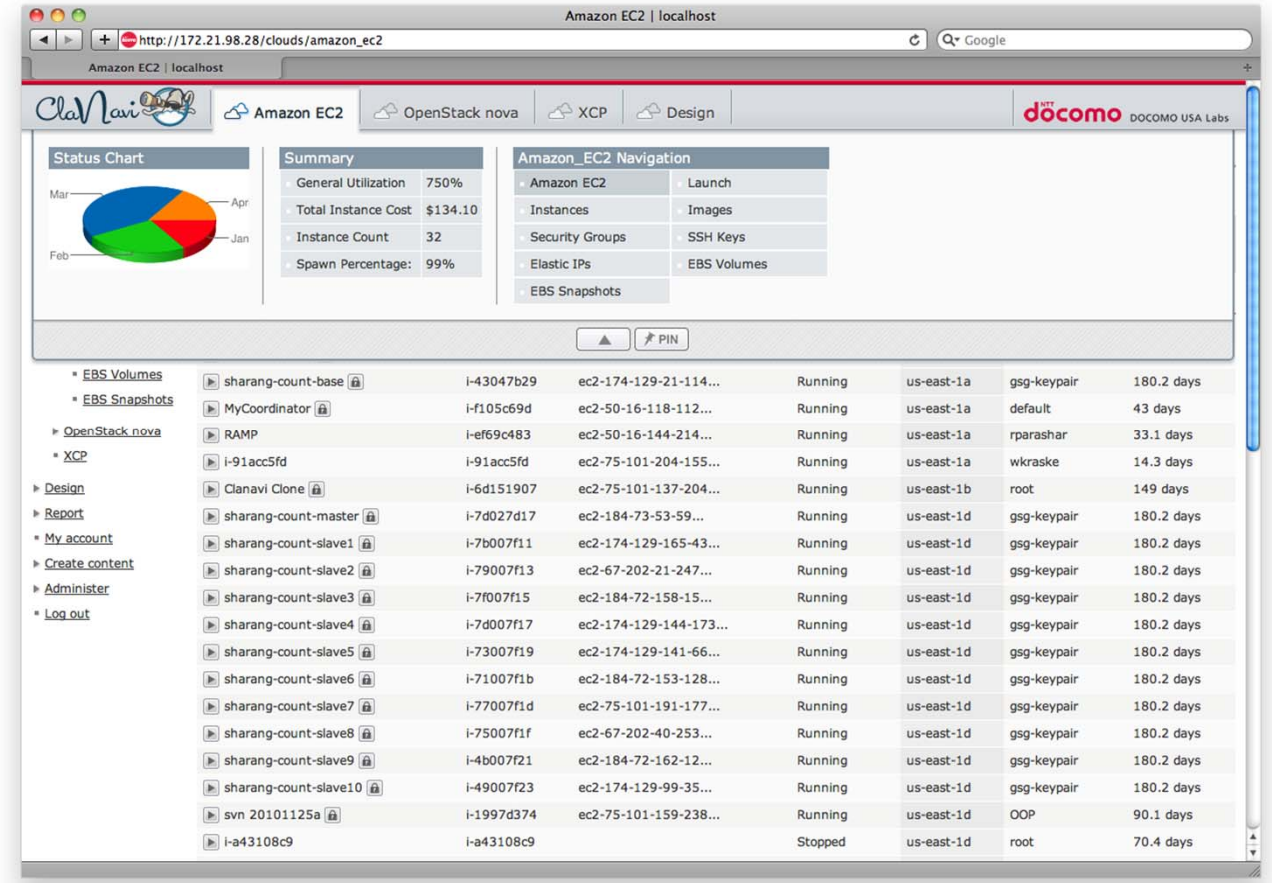
naoi@docomo-pact.com

Backup

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

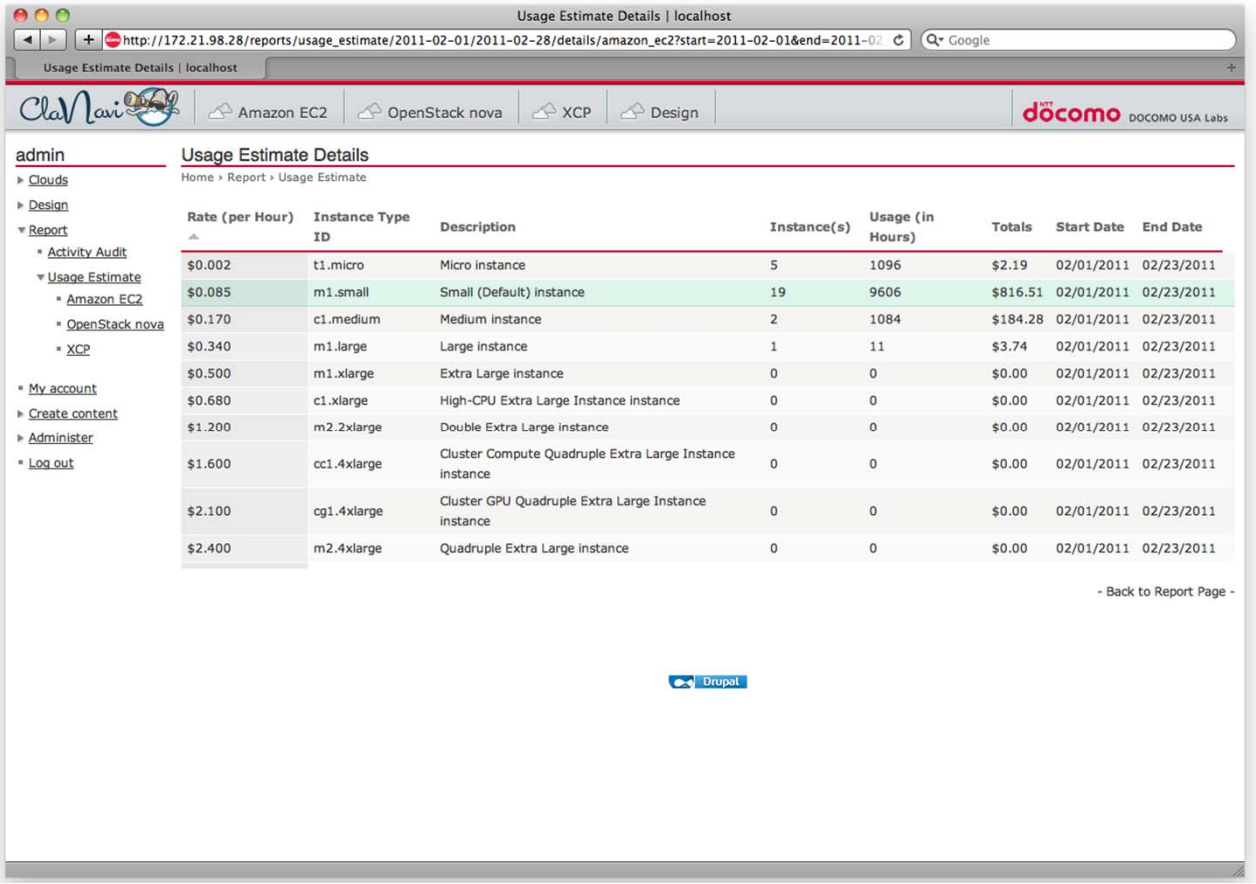
Clanavi



DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved

DOCOMO USA Labs

Report – Usage Estimate



Rate (per Hour)	Instance Type ID	Description	Instance(s)	Usage (in Hours)	Totals	Start Date	End Date
$0.002	t1.micro	Micro instance	5	1096	$2.19	02/01/2011	02/23/2011
$0.085	m1.small	Small (Default) instance	19	9606	$816.51	02/01/2011	02/23/2011
$0.170	c1.medium	Medium instance	2	1084	$184.28	02/01/2011	02/23/2011
$0.340	m1.large	Large instance	1	11	$3.74	02/01/2011	02/23/2011
$0.500	m1.xlarge	Extra Large instance	0	0	$0.00	02/01/2011	02/23/2011
$0.680	c1.xlarge	High-CPU Extra Large Instance instance	0	0	$0.00	02/01/2011	02/23/2011
$1.200	m2.2xlarge	Double Extra Large instance	0	0	$0.00	02/01/2011	02/23/2011
$1.600	cc1.4xlarge	Cluster Compute Quadruple Extra Large Instance instance	0	0	$0.00	02/01/2011	02/23/2011
$2.100	cg1.4xlarge	Cluster GPU Quadruple Extra Large Instance instance	0	0	$0.00	02/01/2011	02/23/2011
$2.400	m2.4xlarge	Quadruple Extra Large instance	0	0	$0.00	02/01/2011	02/23/2011

DOCOMO USA Labs Confidential © 2010-2011 All Rights Reserved