Status Report of Taiwan PanDA

21 Oct. 2013, PanDA workshop

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Academia Sinca Grid Computing

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Status Report of Taiwan PanDA

- ASGC Distributed Cloud OS
- PanDA deployment in ASGC, Taiwan
- Status of AMS computing support
- Status of support of other user/application groups
  - Users of Institute of Physics; IoP
  - Users of Institute of Earth Science; IES
- Distributed Service deployment
- AMS production support
  - PanDA-DEFT & JEDI deployment in Taiwan
 - Rucio integration for DDM

ASGC Distributed Cloud OS

Strategies

- **Leverage our successful experience as a Tier-1 center of the international collaboration project World-wide LHC Computing Grid (WLCG) in developing distributed cloud computing operating system (DiCOS) to support high energy physics research which is based on analysis of centrally generated big data.**

- **We will help design smart data center and apply DiCOS to support researches in other fields of science in Academia Sinica and in collaborating universities or institutions in order to make DiCOS a user driven platform for big data analytics.**

ASGC Distributed Cloud OS
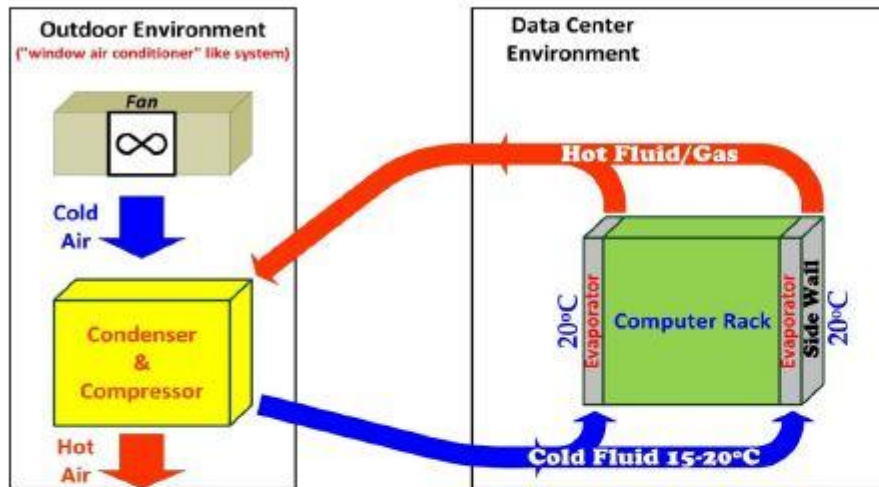
A Scalable Architecture

- IaaS and PaaS over a grid of data centers
- System components occupy only 2 nodes for a single data center
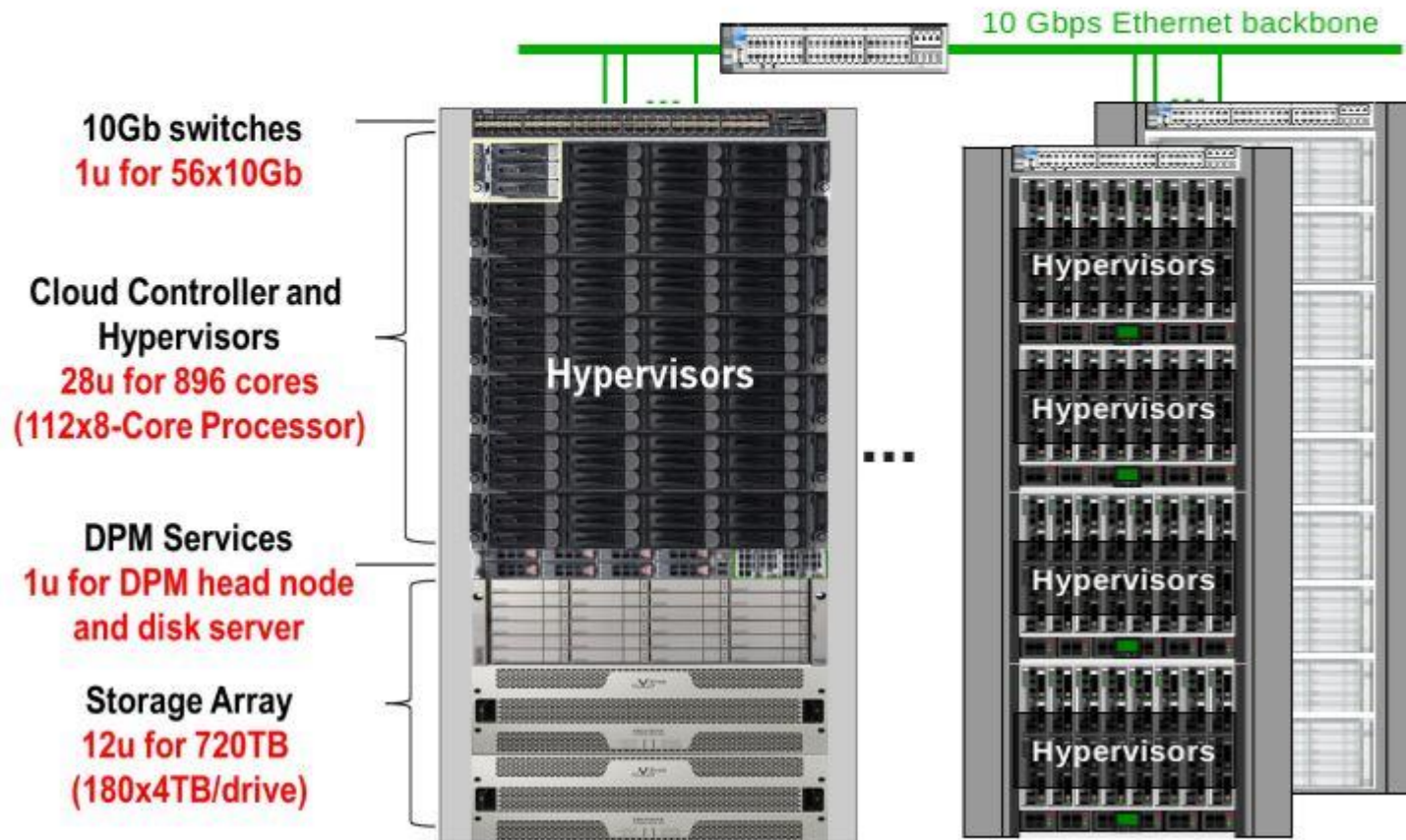
ASGC Distributed Cloud OS

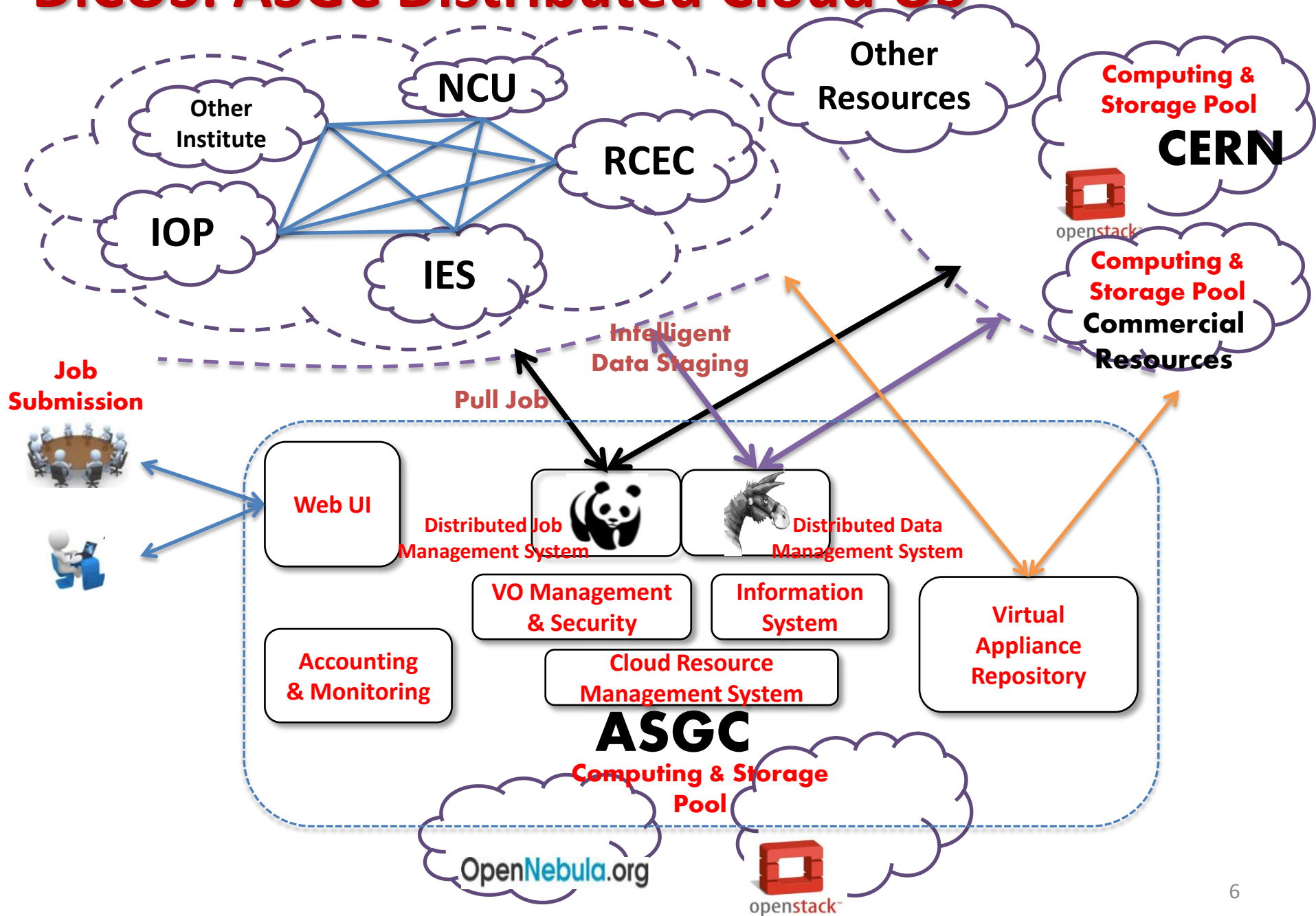**Fanless Single Rack Cloud Center**

Distributed Cloud Operating System (DiCOS) Developed in Collaboration with CERN
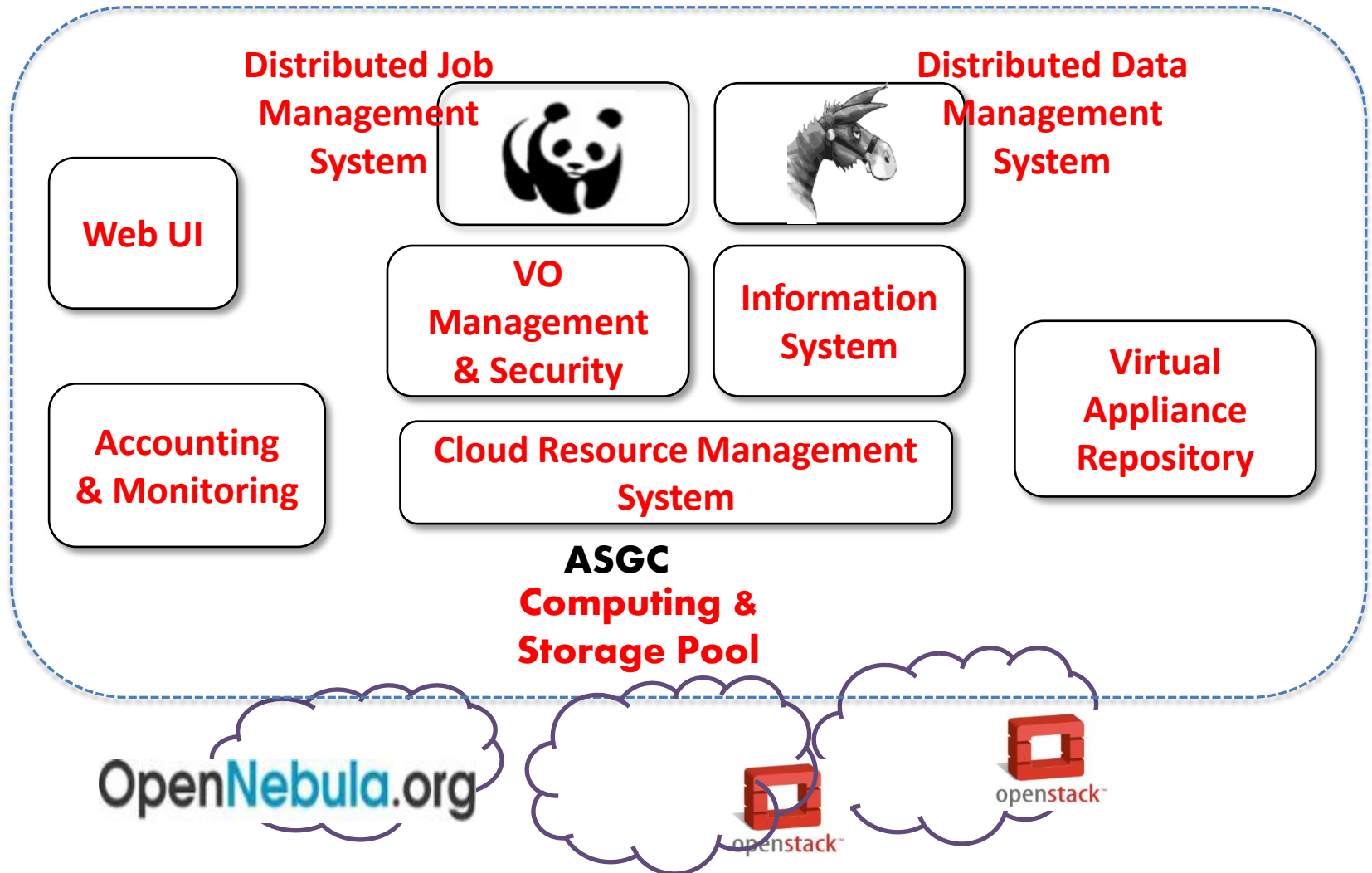
- No fan = No noise.
- High power usage efficiency:
  - PUE 1.2 (4.5 : 1) tested with ambient T ~ 25°C

DiCOS: ASGC Distributed Cloud OS

ASGC Distributed Cloud OS

Distributed Job Management System

Distributed Data Management System

Web UI

VO Management & Security

Information System

Virtual Appliance Repository

Accounting & Monitoring

Cloud Resource Management System

ASGC Computing & Storage Pool

OpenNebula.org
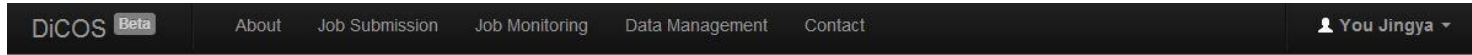
openstack

openstack

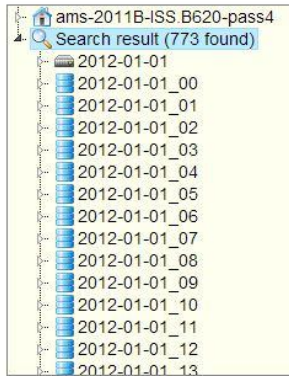# PanDA Deployment in ASGC

- Job Management Framework
  - PanDA-Server and Oracle DB
  - Support VO of AMS and TWGrid
  - PanDA Pilots support Rucio data registration and other functionalities
- Data Management Framework
  - Rucio-Server and SQLite(moving to MySQL now)
- Monitoring
  - PanDA Monitoring
- Web User Interface
  - DiCOS Web Server(Django), SQLite
  - Job Submission, Monitoring and DDM by Rucio
- Cloud with PanDA Pilots

Web UI for Job & Data Management

- http://dicos.grid.sinica.edu.tw

Data Management

Job Submission

Web UI for Job & Data Management
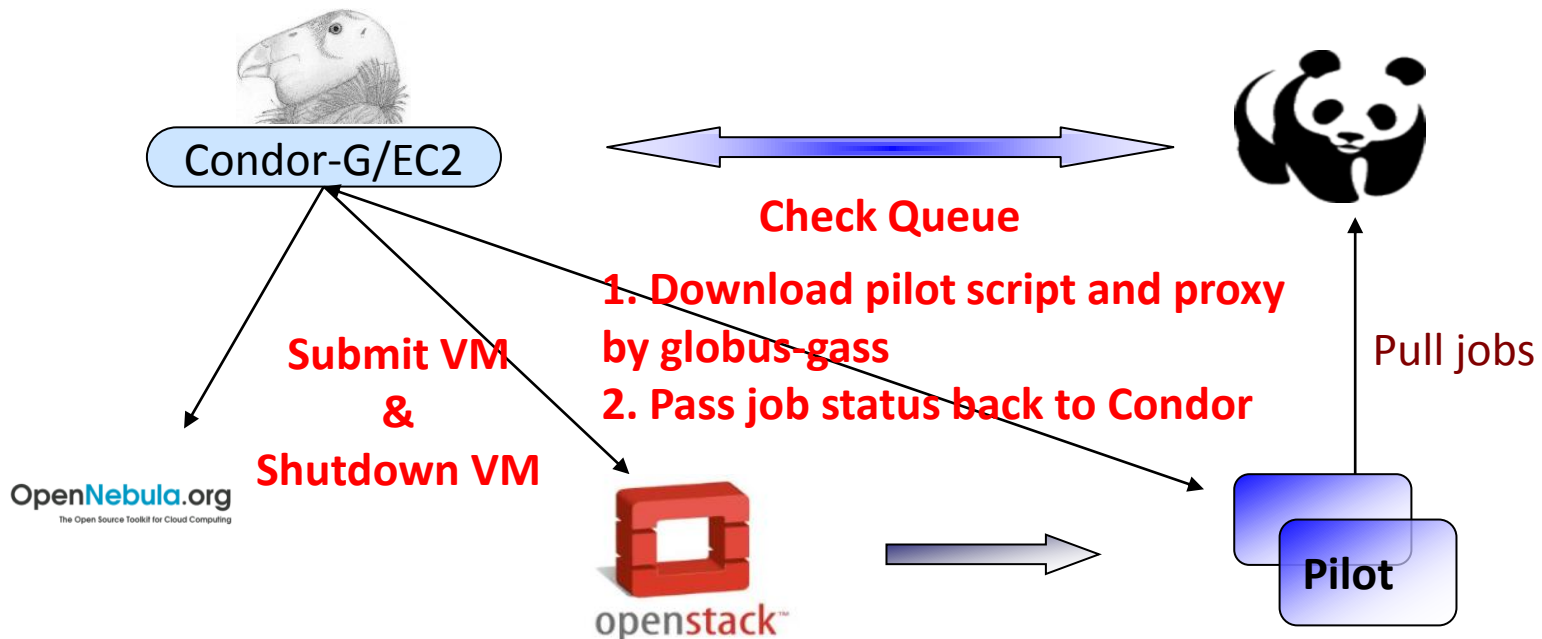
- http://dicos.grid.sinica.edu.tw
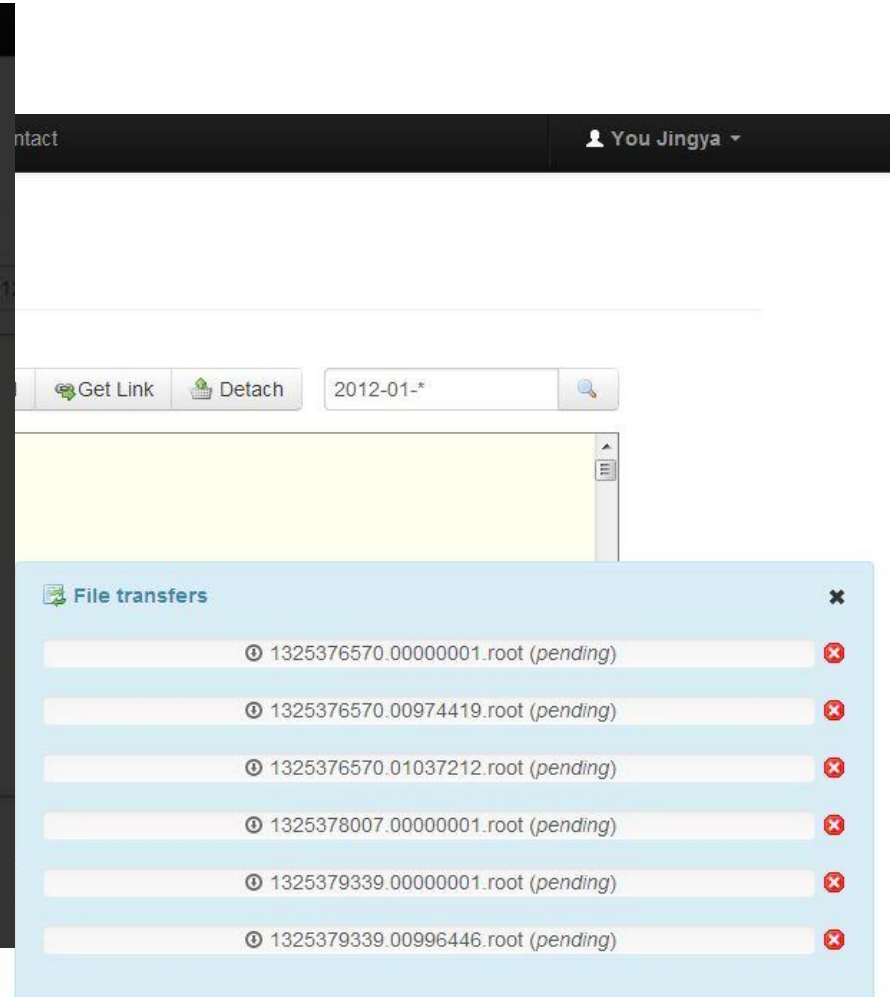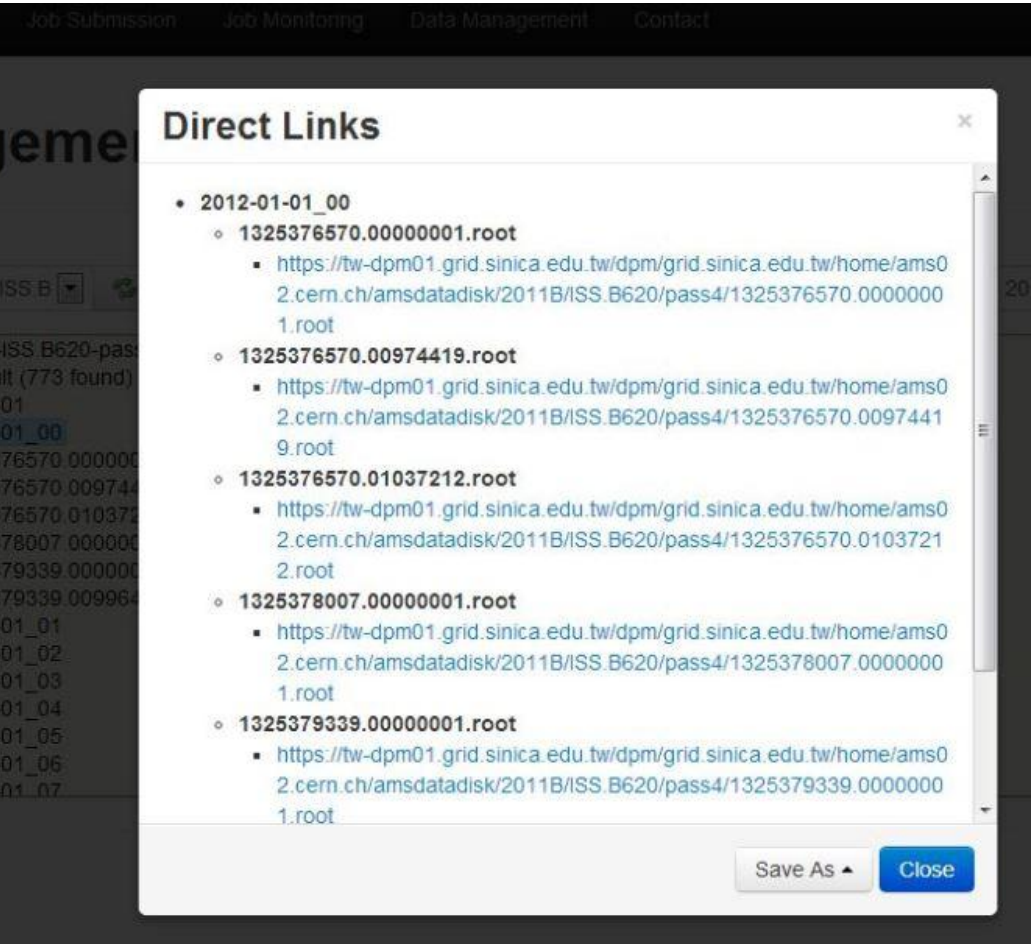
Data Management

Cloud with PanDA Pilot

- Pilot submitted by Condor through EC2 interface to each cloud controller
- Mission-oriented virtual machine
  - Only running while jobs are active in PanDA queue
  - Auto-terminate while job is over

Condor-G/EC2

Check Queue

1. Download pilot script and proxy by globus-gass

2. Pass job status back to Condor

Submit VM & Shutdown VM

Pull jobs

OpenNebula.org
The Open Source Toolkit for Cloud Computing

openstack™

Pilot

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AMS Transfer Statistics

CERN to TW
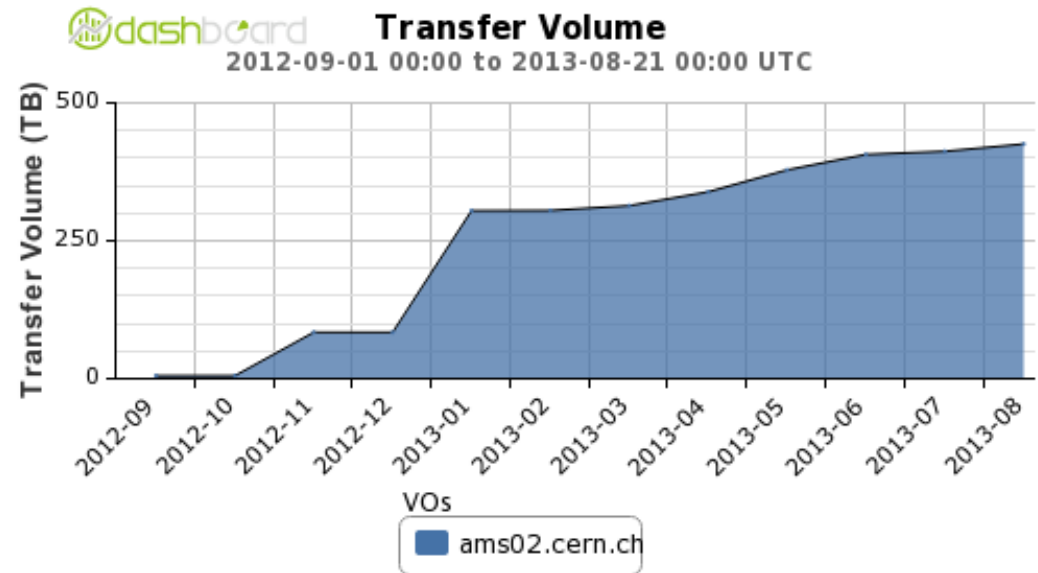
- **File Transfer Service via GRID**

- **SRM endpoints at CERN and TW**
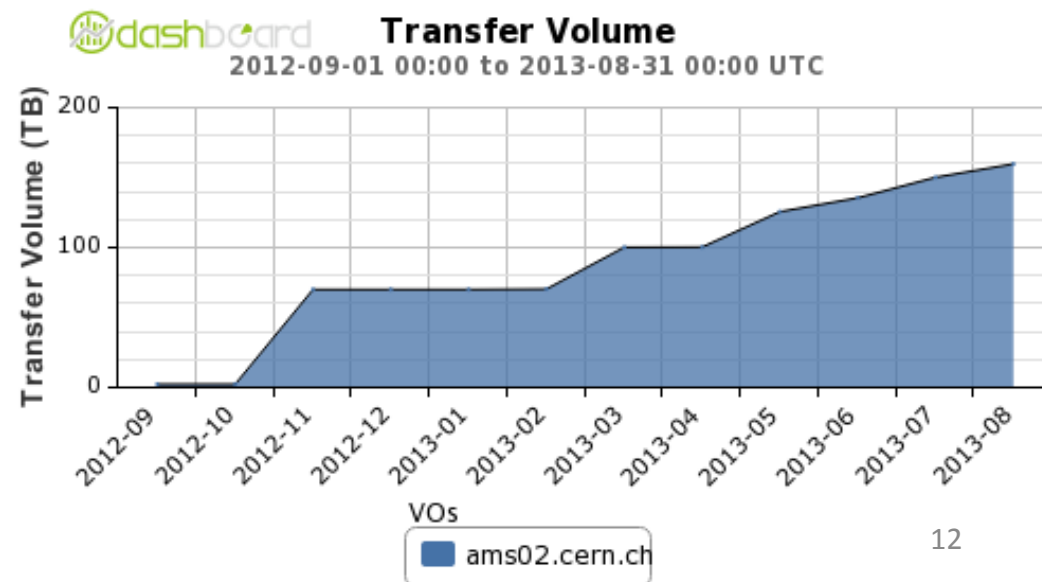
- **Duration: Sep. 2012 – Aug. 2013**

- **CERN to TW**
  - **Volume: 423.654TB**
  - **Number of File: 598,815**

- **TW to CERN**
  - **Volume: 158.979TB**
  - **Number of File: 91,097**

TW to CERN

Other Applications Support using PanDA

- Application Support in various research groups as below
  - Other HEP research groups (App: GMC(geant4))
  - Polymer Physics & Biomacromolecule physics
    - Computer simulations, Serial computing & batch submission
  - Earth science, Climate changes
    - MPI & OpenMP (App: gemb(x))
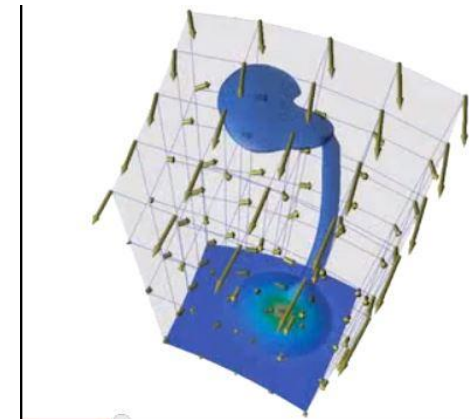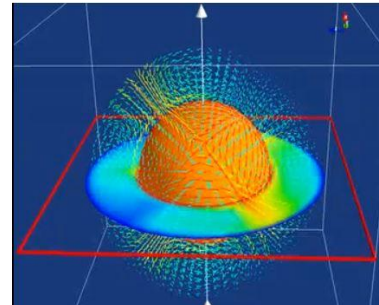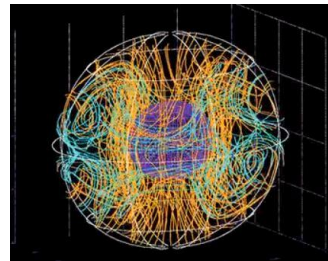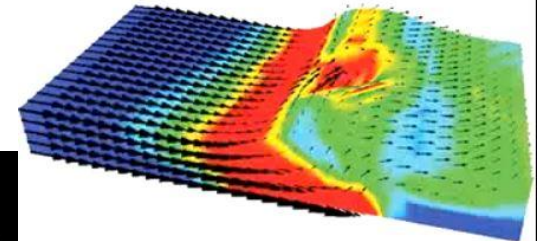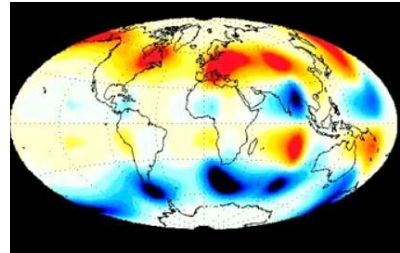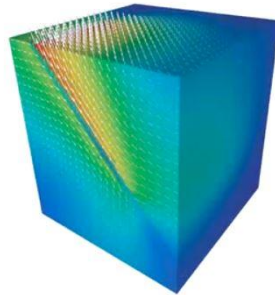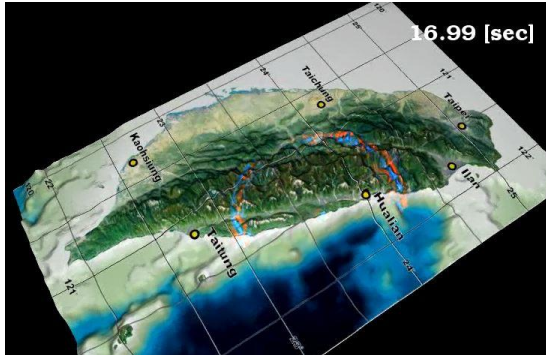
Other Applications Support using PanDA

- Compiling -> Porting -> Testing -> Running
  - Co-work with users in various applications
  - Transformation script in each application/research group is required
  - Moving them from local cluster to grid
- Emerging Requirements
  - Customization of runGenerator (transformation script) for each application/groups
  - Intermediate result check during jobs are running
  - Data sharing policy is different in each research groups
  - Monitoring requirements
    - Tasks/jobs management
    - Computing efficiency and performance …etc

Plan of Distributed Service Deployment

- Resources Integration for Academia Sinica campus and remote sites
  - Support <u>High Energy Physics</u> research
  - Support researches in <u>other fields of science in Academia Sinica</u>
  - Collaborate with <u>other universities or institutions</u>
- User-driven
  - User priority of local and remote sites
  - Data locality
  - Reduce loading of data transfer

Installation of a Site

Computing Site

openstack™

Web UI

Accounting & Monitoring

Service Components

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Distributed Service Deployment

NCU

Remote Site (National Central University)

ASGC

Web UI

Accounting & Monitoring

IoP

IES

IES

Academia Sinica

Remote Site

NDHU

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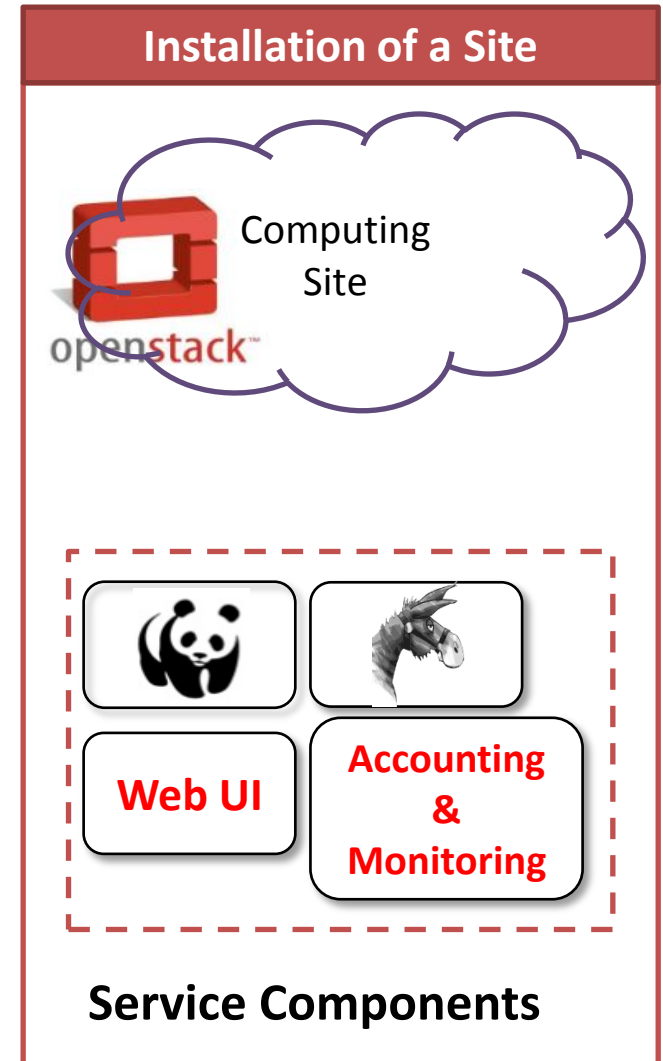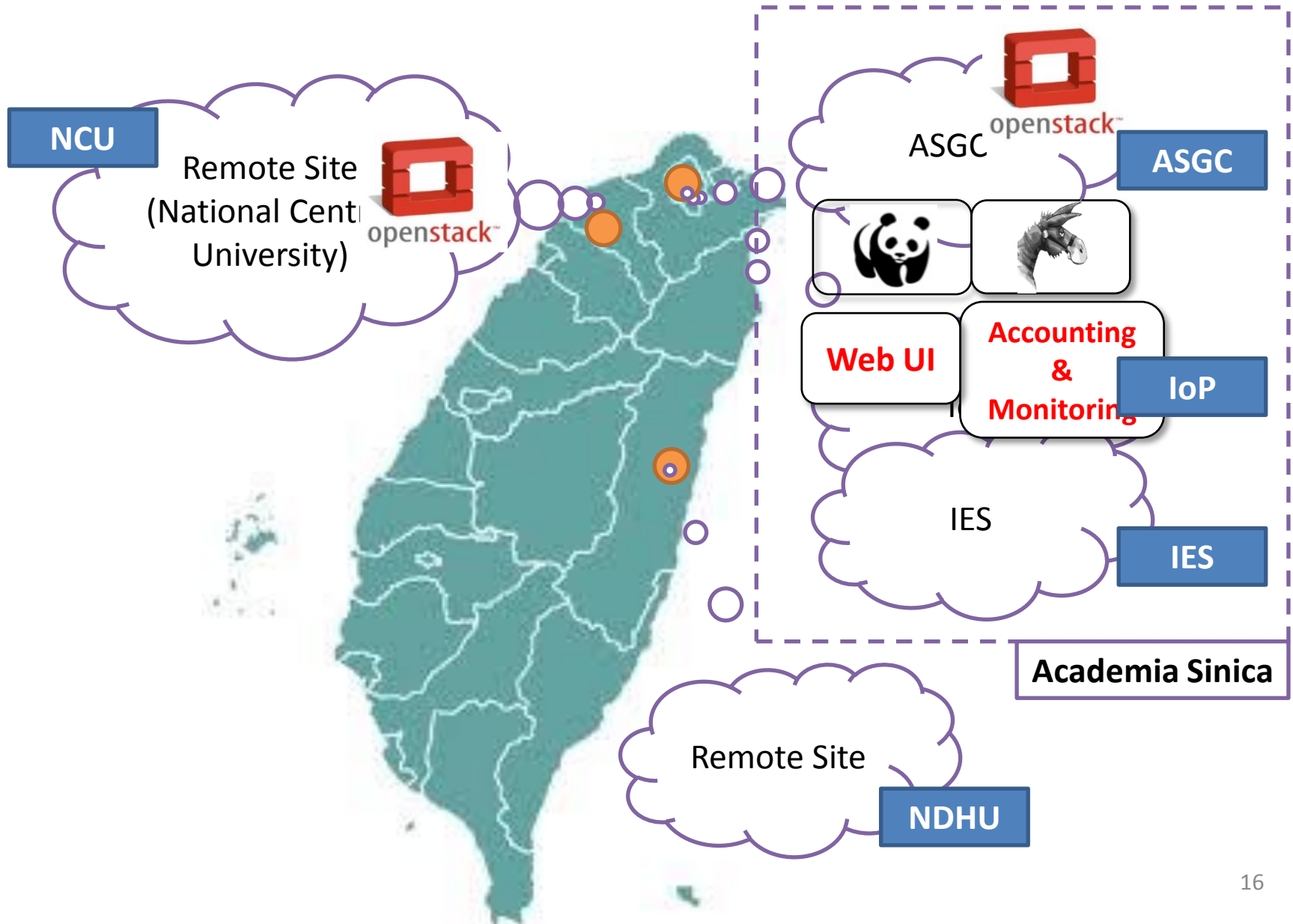
Current Workflow of AMS Production

OracleDB
Jobs/events/Status

- Query DB for available and remaining jobs
- Update DB for jobs applied and which site owns those jobs

- Update job and data file status

AMS Validation System

AMS Remote Client (Perl CGI)

- Apply jobs
- Job scripts are sent to site's email account

- Validation

AMS Storage for Production

Remote Sites

- Upload data file to CERN Castor
- Upload journal to specific place in CERN machine

- Run jobs & completing jobs

AMS Production Service

Plan of AMS Production Support

OracleDB Jobs/events/Status

AMS Production Service

AMS Storage for Production

AMS Production manager

AMS Prod Agent II

AMS Prod Agent I

AMS Prod Manger

JEDI alpha

PanDA

DEFT

ASGC Distributed Sites

ASGC Distributed Sites

[JEDI-DB]

[Panda DB]

[DEFT DB]

Pland of AMS Production Support

- **PanDA JEDI for AMS Production**
- ✓ Workflow & Data Management for AMS Production
- ✓ PanDA-JEDI Setup
  - JEDI Implementation (*AMS) [DB installation done]
    - ① *DDMClient [On-going]
    - ② TaskRefiner
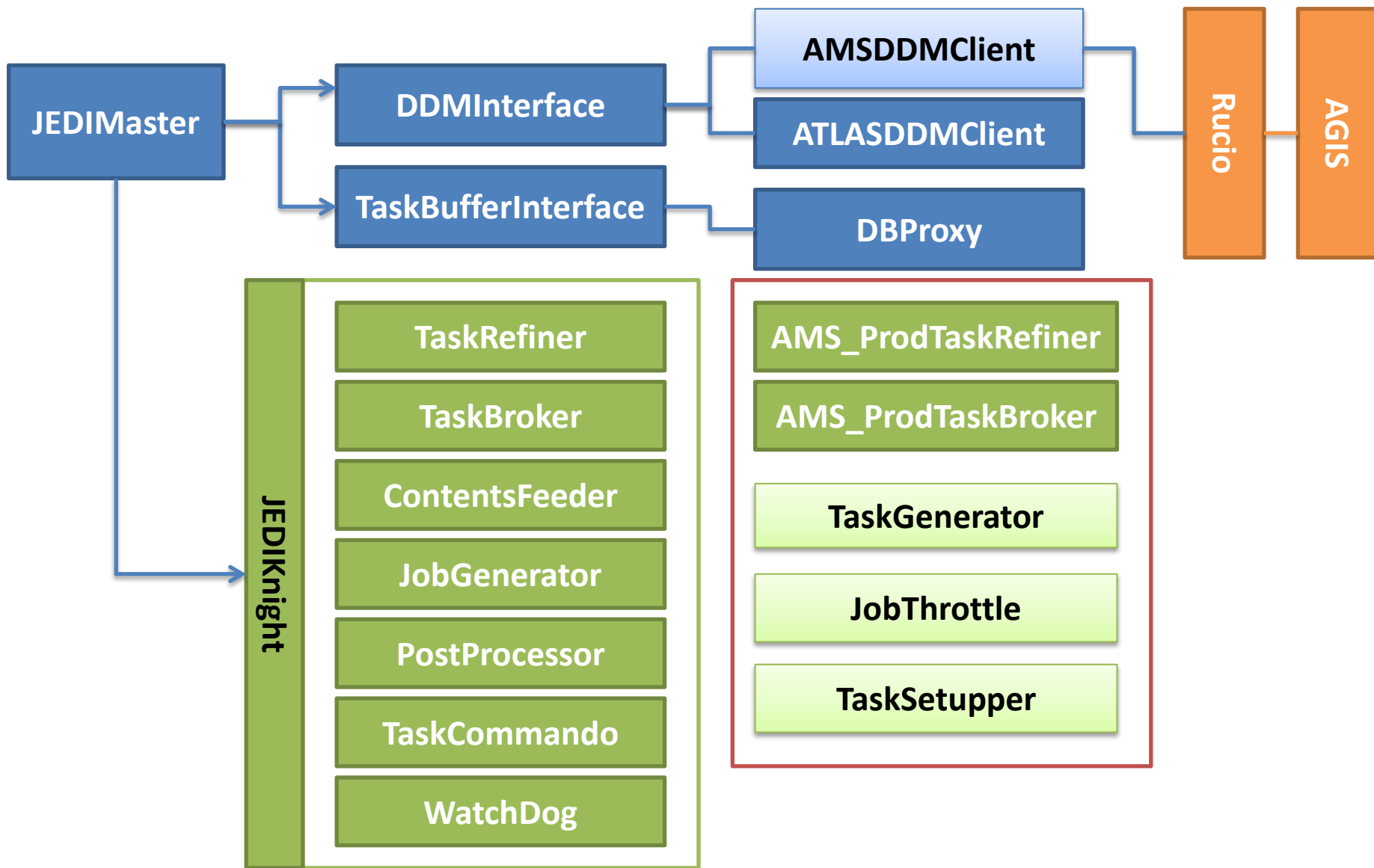   - ③ *TaskBroker
    - ④ TaskGenerator
    - ⑤ *TaskSetupper
    - ⑥ *JobBroker
  - Testing [On-going]
    - ➢ Make JEDI works for Taiwan PanDA

- **PanDA-JEDI Architecture**

- **PanDA JEDI for AMS Production**
- ✓ Atlas Grid Information System
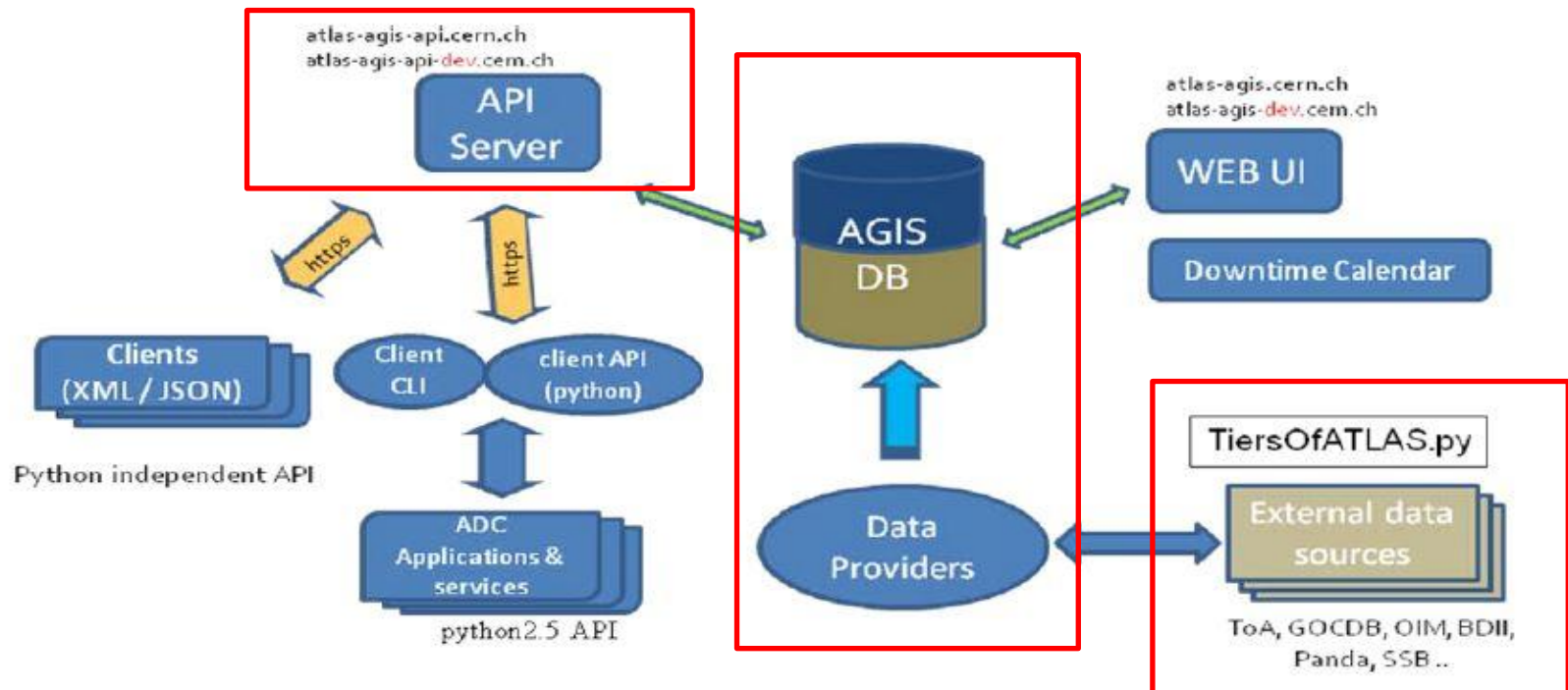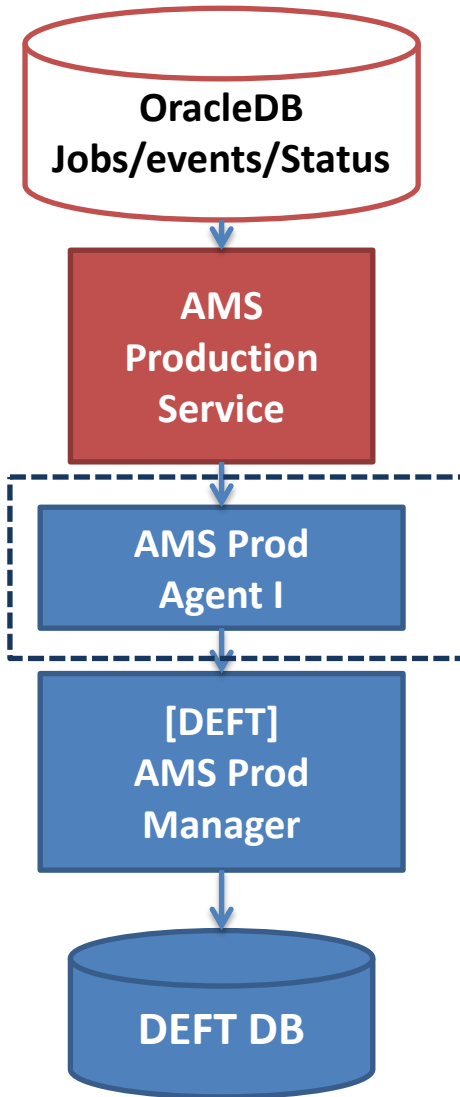 - [AGIS API Server] + [AGIS DB] + [Rucio AGIS-Info Package]

Figure 2. Schematic view of AGIS client-server architecture

Plan of AMS Production Support

- AMS Prod Agent I

```
OracleDB
Jobs/events/Status
        │
        ▼
   AMS
Production
 Service
        │
        ▼
┌ ─ ─ ─ ─ ─ ─ ─ ┐
  AMS Prod
   Agent I
└ ─ ─ ─ ─ ─ ─ ─ ┘
        │
        ▼
  [DEFT]
 AMS Prod
 Manager
        │
        ▼
  DEFT DB
```
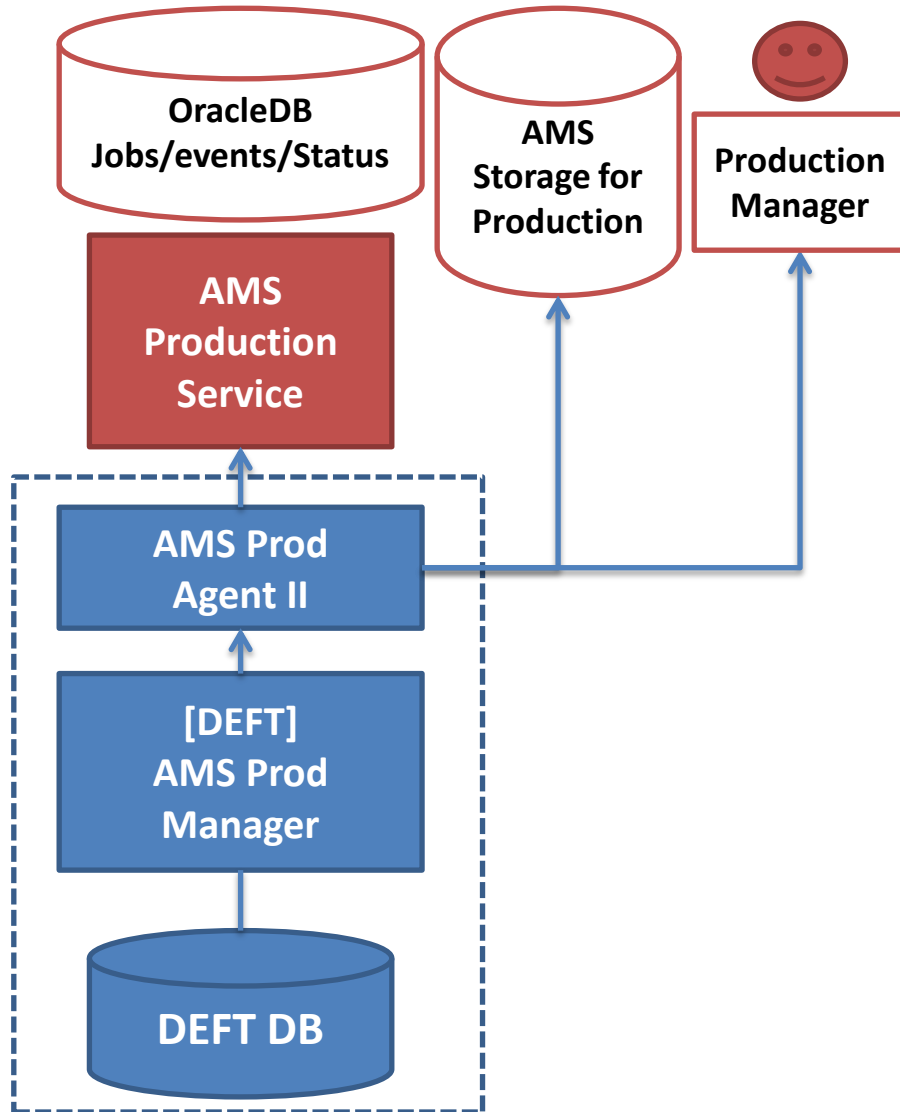
AMS-RC Agent
① Apply email for AMS prod task

DEFT-Task-Submit Agent
② Parse email
③ Create Task and TaskParams by DEFT
   interface or DEFT DB insertion
- [DEFT_TASK], [PRODSYS_COMM],
  [DEFT_META], [DEFT-DATASETS]

taskParamMap['*jobParameters*'] = [
  {'*type*':'*template*',
   '*param_type*':'*input*',
**'*value*':'*inputAODFile=${IN}*', '*dataset*':'*data12_8TeV.00214651.physic
s_Egamma.merge.AOD.f489_m1261*',**
   },

Plan of AMS Production Support

OracleDB
Jobs/events/Status

AMS Storage for Production

Production Manager

AMS Production Service

AMS Prod Agent II

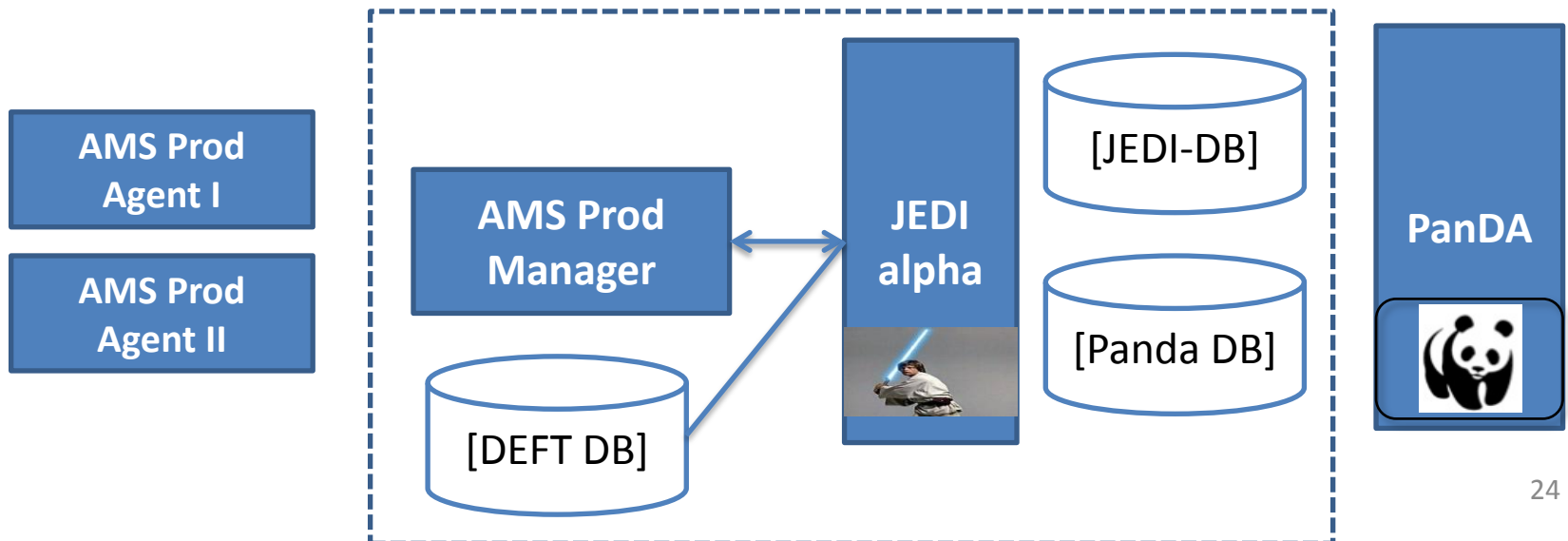**[DEFT] AMS Prod Manager**

DEFT DB

- AMS Prod Agent II

Monitor
① Task Status DEFT/JEDI, PanDA Jobs

Validation
① Availability Check of datasets and files when tasks are finished by Rucio
② AMS Production Validation Check of datasets and files to see if they are all pass

Plan of AMS Production Support

- AMS Prod Manager
    1. DEFT Integration
    2. Monitoring Interface for DEFT & JEDI
- Monitoring
    1. Solution for JEDI, DEFT & PanDA Monitoring
- Task Definition, DDM & Workflow
    1. Co-working with AMS Production computing team

Plan of AMS Production Support

- AMS Prod Manager
    1. DEFT Integration
    2. Which Monitoring Interface for DEFT & JEDI
- Monitoring
    1. Solution for JEDI, DEFT & PanDA Monitoring
- Task Definition & Workflow Management in AMS