



INDIGO-DataCloud Wupi 4 (Resource Virtualization)

All stolen from Markus, Enol, Maciej, Giacinto and many others



High level objective

This work package is focusing on virtualizing local computing, storage and networking resources (IaaS) and on providing those resources in a standardized, reliable and performant way to remote customers or to higher level federated services, building virtualized site independent platforms.



More on the tasks

- WP 4.1: Virtualized Computing Cloud

- Task Lead: Enol Fernández, CSIC

- Partners: 7

- Objective:

Extend the features and functionality of IaaS cloud management platforms to support the development of higher level PaaS (at WP5), and to provide a reliable and performant access to on-demand compute capacities.



More on the tasks

- WP 4.2: Virtualized Storage Cloud

- Task Lead: Marcus Hardt, KIT

- Partners: 4

- Objective:

Provide storage access on different levels (Block, Object, Posix), targeting INDIGO-DataCloud offerings, as there are VMs, Containers or entire Platforms.



More on the tasks

- WP 4.3: Virtualized Network

- Task Lead: n.n. CESNET

- Partners: 5

- Objective:

Providing standardized access to local storage resource management tools, allowing to manage cross site network operations, like bandwidth monitoring and allocation, VPNs and service access authorization.



Partners

Task	Computing	Storage	Network
CSIC	X	0	0
LIP	X	0	X
IN2P3	X	0	0
INFN	X	X	X
ATOS	X	0	0
KIT	X	X	X
PSNC	0	X	0
DESY	0	X	X
CESNET	X	0	X
S. REPLY	0	0	X
CERN	0	0	0



Even more details

Task	4.1	4.2	4.3
CSIC	45	0	0
LIP	25	0	15
IN2P3	20	0	0
INFN	30	40	15
ATOS	15	0	0
KIT	15	40	15
PSNC	0	20	0
DESY	0	80	15
CESNET	15	0	15
S. REPLY	0	0	15
STFC	6	6	3
CERN	4	4	2
	Computing	Storage	Network
Total/Task	175	190	95



Subtasks

This is how we started

Computing (4.1)

Providing support for PaaS at the IaaS level

Improving the on-demand compute capabilities of data-centers

AAI Management for the virtualized computing cloud infrastructure

Storage (4.2)

Integration of AAI in storage

QoS Support

Cross Protocol Access: Providing access to the same data via several different interfaces

Workflow resp. Data Lifecycle Support

Network (4.3)

AAI Management for the network infrastructures

Evaluate available SDN features and interoperability

Use SDN to configure local networks to match PaaS

Providing support for PaaS at the IaaS level (Enol)

This sub-task will develop the missing features of current IaaS cloud management platforms to support the development of PaaS at WP5. It will focus on providing support for containers (as an alternative to heavier-weight VMs) and on providing local site orchestration features that simplify the management the lifecycle of the infrastructure (both for containers and VMs).

1. Extend cloud management platforms to provide container-based IaaS
 1. Develop container support in OpenStack and OpenNebula
 2. Provide trusted repositories for containers
 3. Extend (if needed) relevant standards (e.g. OCCl) to support containers and implement those extensions in OpenStack and OpenNebula
 4. Explore the possibilities of accessing specialized hardware (e.g. GPUs) at container level
2. Provide IaaS orchestration at the site level
 1. Extend relevant existing orchestrators to support the deployment of containers and VMs
 2. Include contextualization features
 3. Extend (if needed) and implement relevant standards (e.g. TOSCA) in the local site orchestrators



WP 4.1

Improving the on-demand compute capabilities of data-centers

This sub-task will focus on providing a better on-demand compute experience by improving the local IaaS schedulers and by integrating non-cloud resources through the execution of containers

1. Extend the scheduling capabilities of IaaS management framework to implementing mechanisms to kill/preempt/stop VMs/containers based on system defined parameters in order to launch new requests
 1. Extend existing APIs in OpenStack and OpenNebula to cover the possibility of killing/preempting/stopping resources
 2. Implement the mechanisms to kill/preempt/stop VMs/containers in OpenStack and OpenNebula
 3. Extend OpenStack and OpenNebula schedulers to support the implementation of policies that exploit these features
2. Develop and implement Fair Share scheduling policies in IaaS management frameworks (namely OpenStack and OpenNebula)
3. Provide homogeneous execution of application containers in different local computing resources (i.e. integrating container execution through batch systems as a job) focusing on the portability and flexibility for the user application.



WP 4.1

AAI Management for the virtualized computing cloud infrastructure

- Designing and implementing relevant AAI interfaces/ mechanisms(if not yet done) to accept authentication mechanism used by local users and by the higher level PaaS in OpenStack and OpenNebula.
- Implementing delegation-based access to supported services, in order to allow IaaS (orchestrator) and PaaS to perform operations on those services on behalf of the actual user.



Subtasks

Now

Computing (4.1)

Providing support for PaaS at the IaaS level

Improving the on-demand compute capabilities of data-centers

Storage (4.2)

QoS Support

Cross Protocol Access:
Providing access to the same data via several different interfaces

Workflow resp. Data Lifecycle Support

Network (4.3)

Evaluate available SDN features and interoperability

Use SDN to configure local networks to match PaaS

Commons

AAI Management

Monitoring

Accounting



Technical Considerations



Notes on Authentication

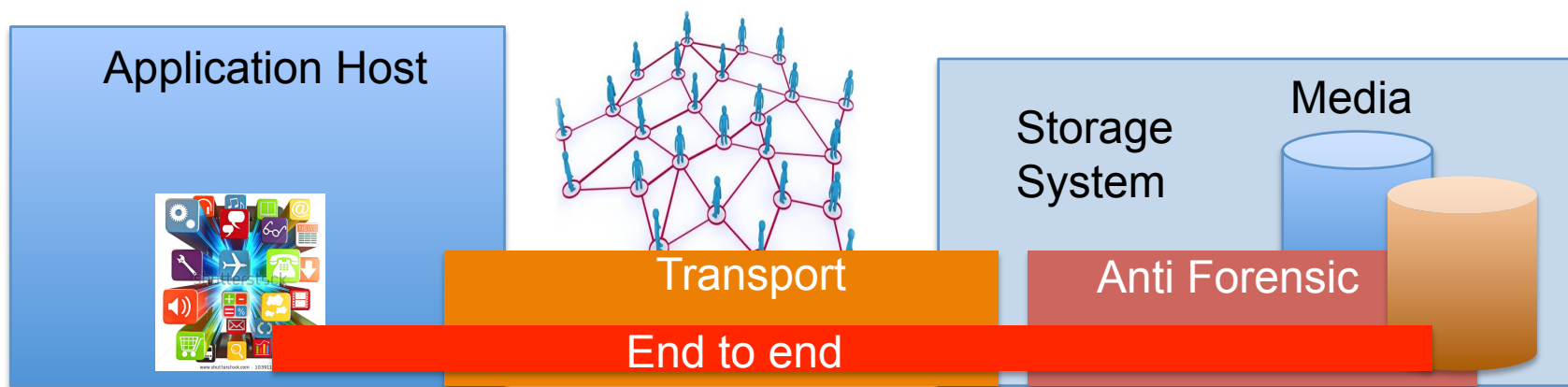
- Authentication
 - In collaboration with WP5, we'll accept a minimum of authentication mechanisms to identify/authenticate users locally, preferably federated credentials.
 - Robot credentials / group based authentication might be accepted based on the site (resp. national) policies.
 - Discussion ongoing on how that interoperates with WP5.

Notes on Authorization

- Authorization
 - WP4 resources will provide proper authorization.
 - That might be based on group level. E.g. VOMS proxies. Responsibility delegated to the community.
 - In case of IdPs, different trust levels might be used. (e.g. “Umbrella IdP” -> minimum trust)
 - Group management services currently considered to be in the responsibility of WP5.
 - Discussion ongoing on how that interoperates with WP5.

Notes on Encryption

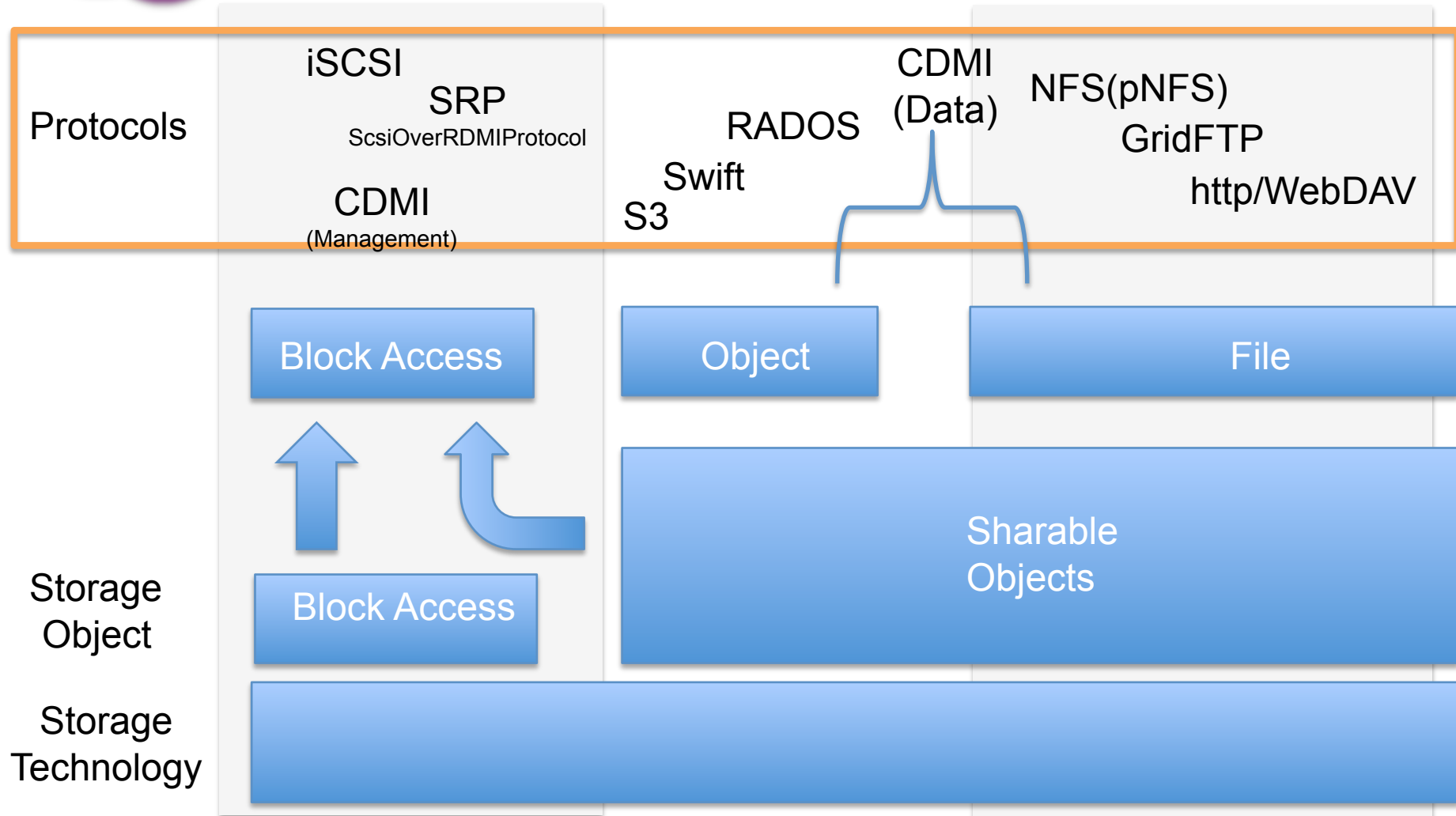
- Encryption (Most relevant for storage)
 - Depending on the use cases (resp. user requirements) there are different levels of encryption.
 - Transport versus “Long Term Encryption” (Anti-Forensic) versus “End to End”
 - We decided to leave that to the site, but would like to specify that as QoS attribute (like AL and RP)





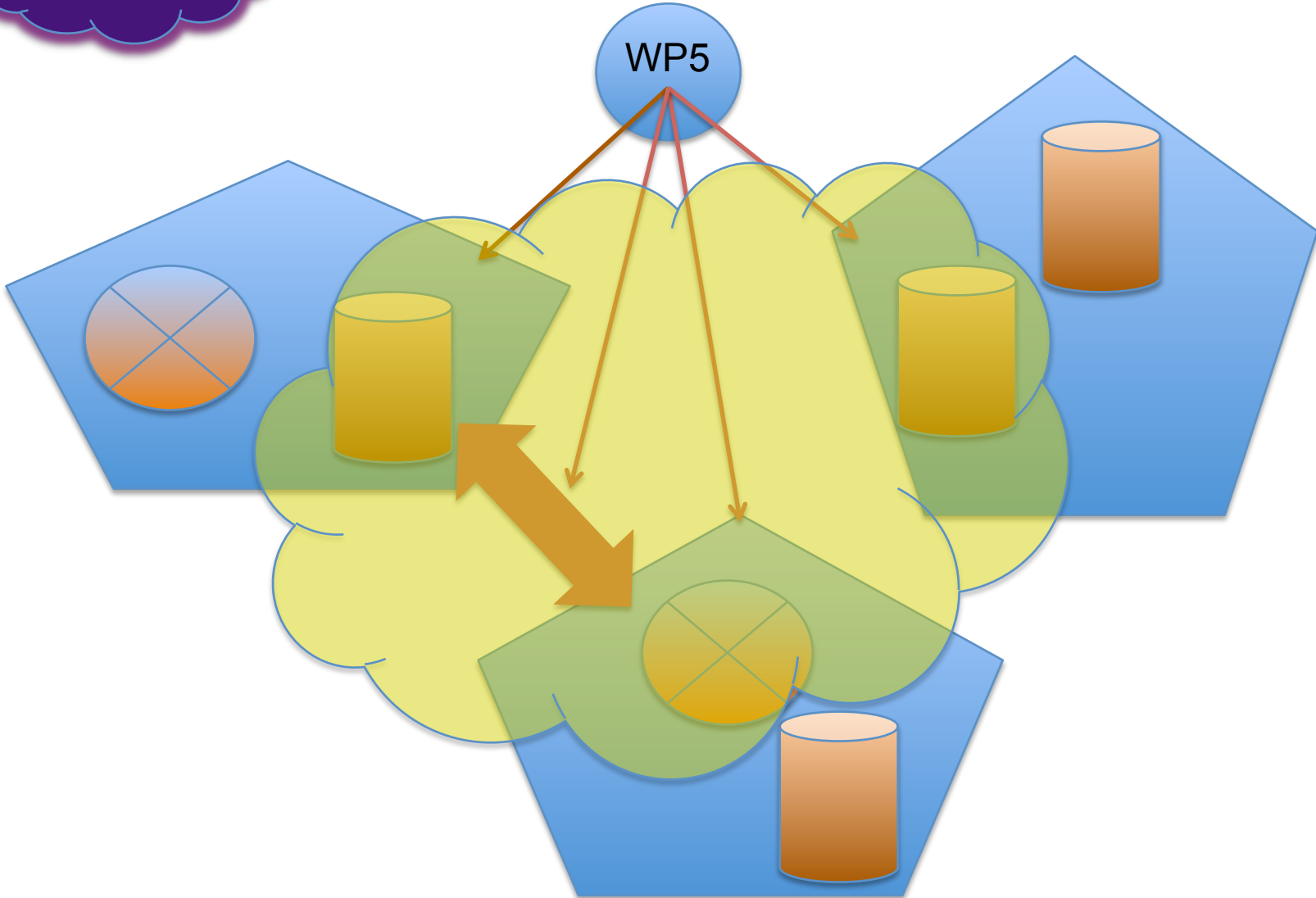
Storage Interface Concept

Based on Maciej picture in the WP4 area (oversimplified)



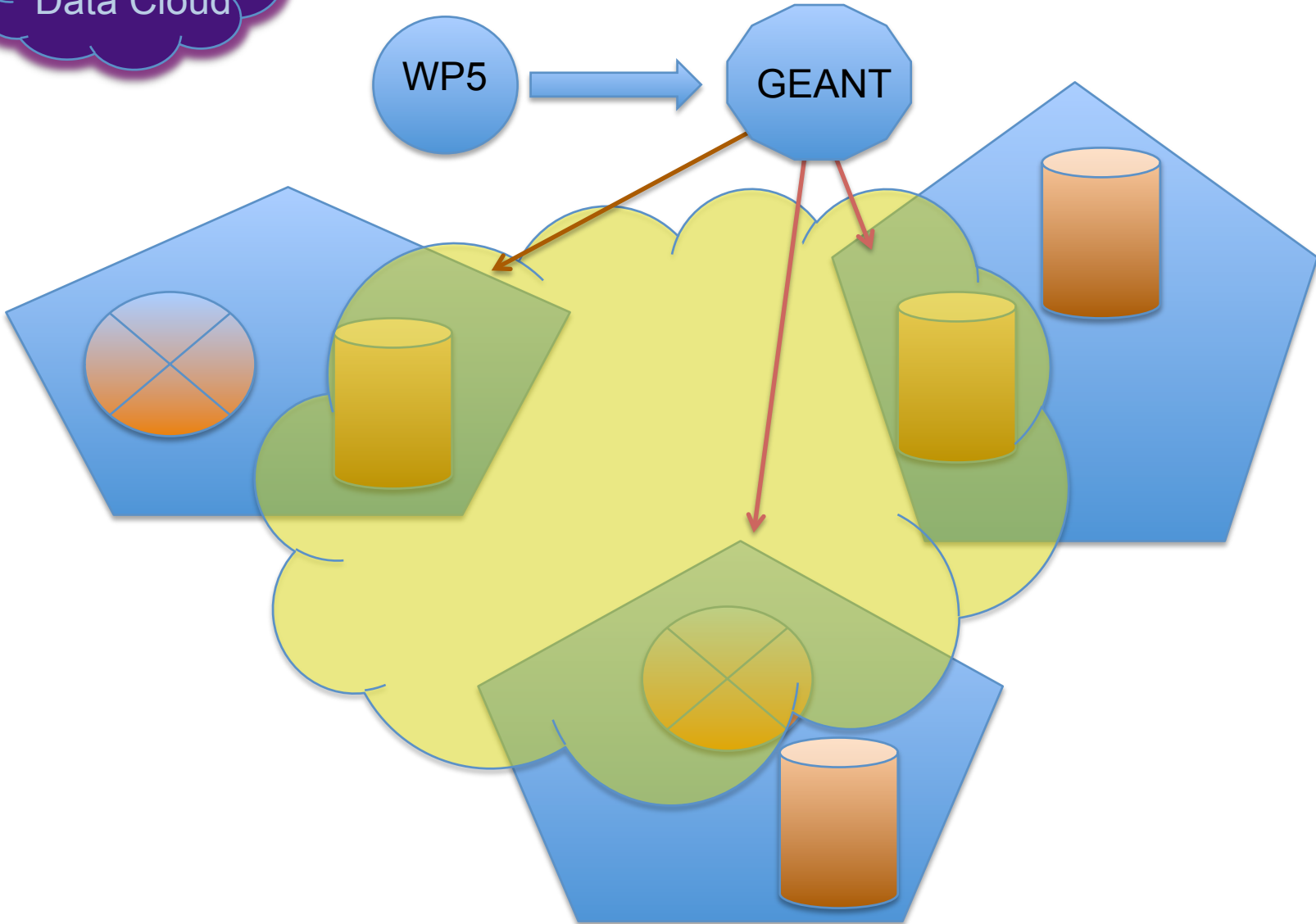
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Deliverables

(Thanks to Enol)

- Design documents (some are common with WP5)
 - Evaluating existing background technologies
 - Overall Design in relation to WP5
 - Defining a minimum set of access mechanisms for IaaS
 - Defining a metrics to evaluate KPI ? (Real performance of
 - Scalability
 - Performance of job submission and tran
- Proof of concept in connecting to the WP5 framework (at that time only dummy WP5 functionality)