Monitoring and Fabric Management

The European DataGrid Project Team

http://www.eu-datagrid.org

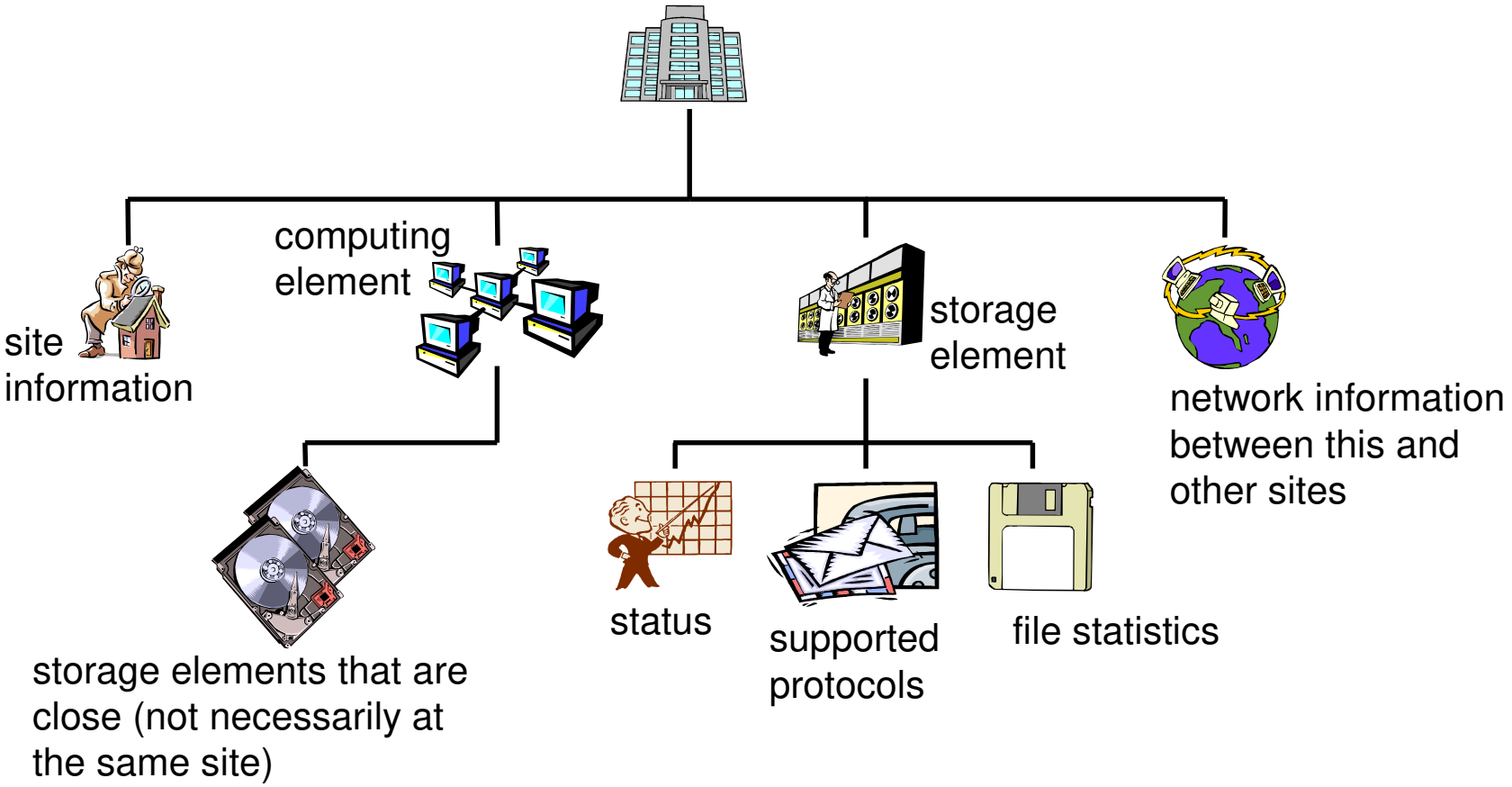
Contents

- Monitoring and Fabric management overview
- What is being monitored
- R-GMA
- Fabric management

Information and Monitoring Services

- EDG information providers
  - Software that provides information about resources and infrastructure
  - Provided by the work packages responsible for the resource
- Globus MDS (Metacomputing Directory Service or Monitoring and Discovery Service as it is now called)
  - Based on OpenLDAP, a hierarchical database
- R-GMA (Relational Grid Monitoring Architecture)
  - A relational implementation of the Global Grid Forum's GMA
    - Overview
    - Uses within the testbed

LDAP – Directory Information Tree



Siteinfo

```
in=siteinfo,Mds-Vo-name=ral-dev,Mds-Vo-name=uk,o=Grid

objectClass: SiteInfo

objectClass: DataGridTop

objectClass: DynamicObject

siteName: RALDEV

sysAdminContact: grid.sysadmin@rlac.uk

userSupportContact: grid.support@rlac.uk

siteSecurityContact: grid.security@rlac.uk

dataGridVersion: 1.2

installationDate: 20020704142800Z
```

Computing Element

```
ceId=dev01.hepgrid.clrc.ac.uk:2119/jobmanager-
    pbs-M,hn=dev01.hepgrid.clrc.ac.uk,Mds-Vo-
    name=ral-dev,Mds-Vo-name=uk,o=Grid
objectClass:DataGridTop
objectClass:ComputingElement
CEId:
    dev01.hepgrid.clrc.ac.uk:2119/jobmanager-
    pbs-M
GlobusResourceContactString:dev01.hepgrid.clr
    c.ac.uk:2119/jobmanager-
    pbs:/O=Grid/O=UKHEP/CN=dev01.hepgrid.c
    lrc.ac.uk
GRAMVersion:?
Architecture:intel
OpSys:RH 6.2
MinPhysicalMemory:258
MinLocalDiskSpace:2048
TotalCPUs:1
FreeCPUs:1
NumSMPs:0
MinSPUProcessors:0
MaxSPUProcessors:0
TotalJobs:0
RunningJobs:0
IdleJobs:0
IdleJobs:0
MaxTotalJobs:1
MaxRunningJobs:1
WorstTraversalTime:108000
EstimatedTraversalTime:0
Active:TRUE
Priority:20
MaxCPUTime:108000
MaxWallClockTime:432000
AverageSI00:300
MinSI00:300
MaxSI00:300
AuthorizedUser:/O=Grid/O=UKHEP/OU=hepgr
    id.clrc.ac.uk/CN=Tim Eves
AuthorizedUser:/O=Grid/O=UKHEP/OU=hepgr
    id.clrc.ac.uk/CN=Tim Folkes
RunTimeEnvironment:RALDEV
AFSAvailable:FALSE
OutboundIP:TRUE
InboundIP:FALSE
QueueName:M
LRMSType:PBS
LRMSVersion:OpenPBS_2.3
```

Close Storage Element

```
closeSE=dev02.hepgrid.clrc.ac.uk,ceId=dev01.hepgrid.clrc.ac.uk:2119/jobmanager-pbs-M,
   hn=dev01.hepgrid.clrc.ac.uk,Mds-Vo-name=ral-dev,Mds-Vo-name=uk,o=Grid
objectClass:CloseStorageElement
objectClass:DataGridTop
objectClass:DynamicObject
CEId:dev01.hepgrid.clrc.ac.uk:2119/jobmanager-pbs-M ;
CloseSE:dev02.hepgrid.clrc.ac.uk
MountPoint:/flatfiles
```

Storage Element

seId=dev02.hepgrid.clrc.ac.uk,Mds-Vo-name=ral-dev,Mds-Vo-name=uk,o=Grid

objectClass: StorageElement

objectClass: DataGridTop

objectClass: DynamicObject

SEId: dev02.hepgrid.clrc.ac.uk

CloseCE: dev01.hepgrid.clrc.ac.uk:2119/jobmanager-pbs-M

SEtypearchitecture: disk

SEsize: 13177

SEResourceContactString: grid.support@rl.ac.uk

SEvo: wpsix

Storage Element Protocols

seProtocol=gridftp, seId=dev02.hepgrid.clrc.ac.uk, Mds-Vo-name=ral-dev, Mds-Vo-name=uk, o=Grid
objectClass: StorageElementProtocol
objectClass: DataGridTop
objectClass: DynamicObject
SEId: dev02.hepgrid.clrc.ac.uk
SEProtocol: gridftp
Port: 2811

seProtocol=rfio, seId=dev02.hepgrid.clrc.ac.uk, Mds-Vo-name=ral-dev, Mds-Vo-name=uk, o=Grid
objectClass: StorageElementProtocol
objectClass: DataGridTop
objectClass: DynamicObject
SEId: dev02.hepgrid.clrc.ac.uk
SEProtocol: rfio
Port: 3147

seProtocol=file, seId=dev02.hepgrid.clrc.ac.uk, Mds-Vo-name=ral-dev, Mds-Vo-name=uk, o=Grid
objectClass: StorageElementProtocol
objectClass: DataGridTop
objectClass: DynamicObject
SEId: dev02.hepgrid.clrc.ac.uk
SEProtocol: file

Storage Element Status

in=status,seId=dev02.hepgrid.clrc.ac.uk,Mds-Vo-name=ral-dev,Mds-Vo-name=uk,o=Grid

objectClass:StorageElementStatus

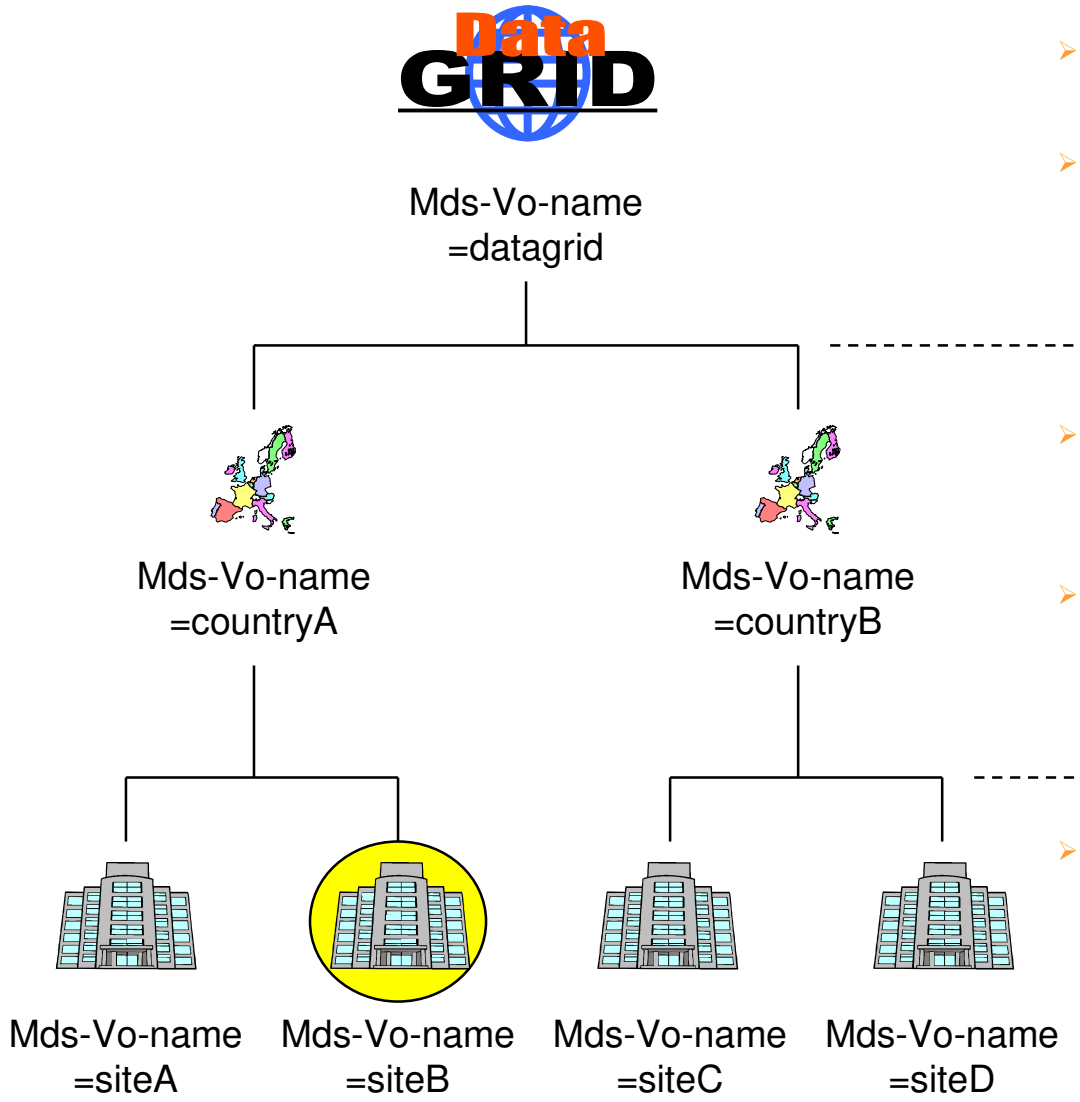
objectClass:DataGridTop

objectClass:DynamicObject

SEfreespace:12031

SEId:dev02.hepgrid.clrc.ac.uk

GRIS/GIIS Hierarchy



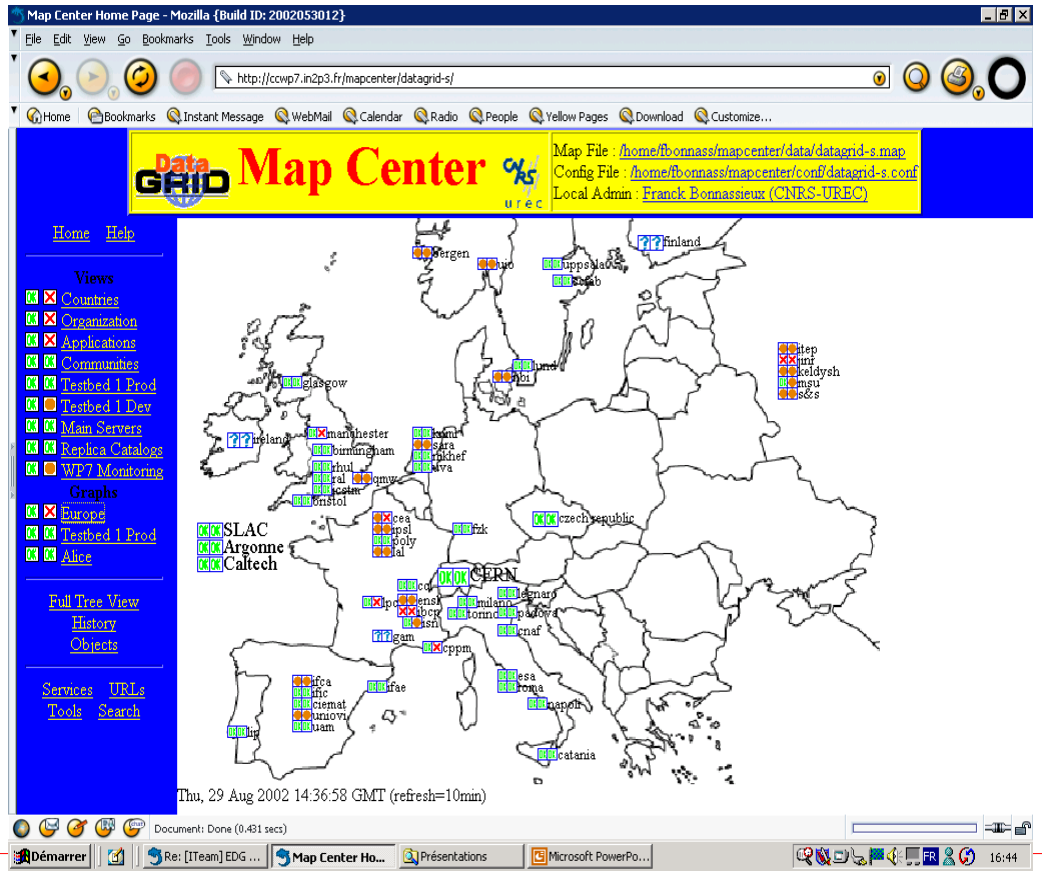
- Mds-Vo-name=datagrid,o=grid
  - This will look at all the data
- Mds-Vo-name=countryA,Mds-Vo-name=datagrid,o=grid
  - This will look at all the data from countryA

- Mds-Vo-name=countryA,o=grid
  - This will look at all the data from countryA
- Mds-Vo-name=siteB,Mds-Vo-name=countryA,o=grid
  - This will look at all the data from siteB

- Mds-Vo-name=siteB,o=grid
  - This will look at all the data from siteB

Map Centre – WP7

- Alternatively the information can be viewed using WP7's Map Center
- http://ccwp7.in2p3.fr/mapcenter/



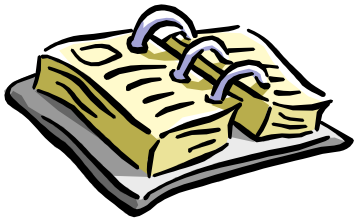
R-GMA

Relational - Grid Monitoring Architecture

An Overview

The Consumer Producer Model

Producer



Registry

Consumer

Command flow

Information flow

- Use the Grid Monitoring Architecture from Global Grid Forum
- A relational implementation
- Applied to both information and monitoring
- Creates impression that you have one RDBMS per VirtualOrganization

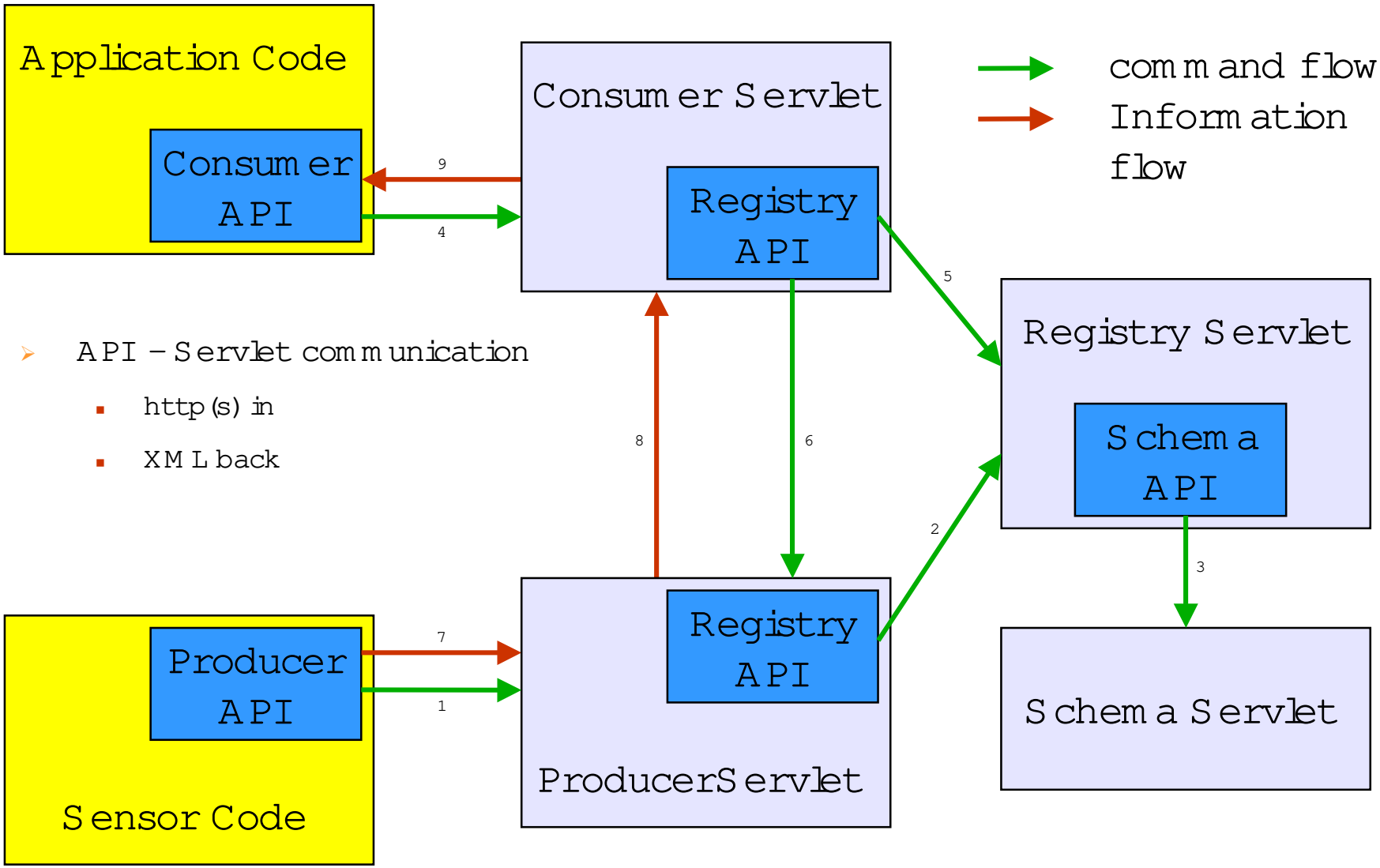
Relational Approach

- Not a general distributed RDBMS system, but a way to use the relational model in a distributed environment where ACID properties are not generally important.

- Producers announce: SQL "CREATE TABLE"
  publish: SQL "INSERT"

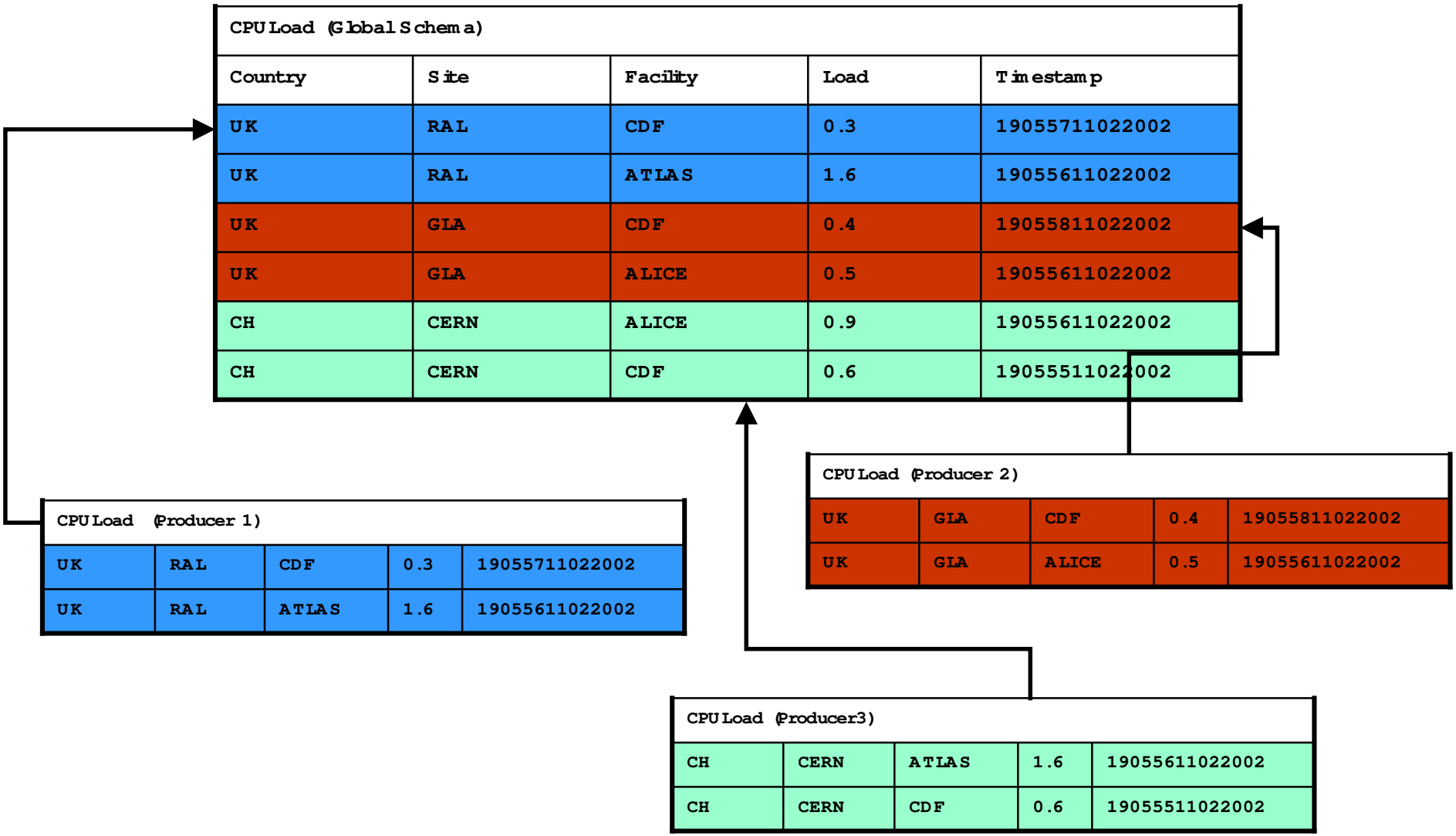
- Consumers collect: SQL "SELECT"

R-GMA



- API – Servlet communication
  - http(s) in
  - XML back

Schema & Contributions



Contributions are Views

CPULoad (Producer 1)				
UK	RAL	CDF	0.3	19055711022002
UK	RAL	ATLAS	1.6	19055611022002

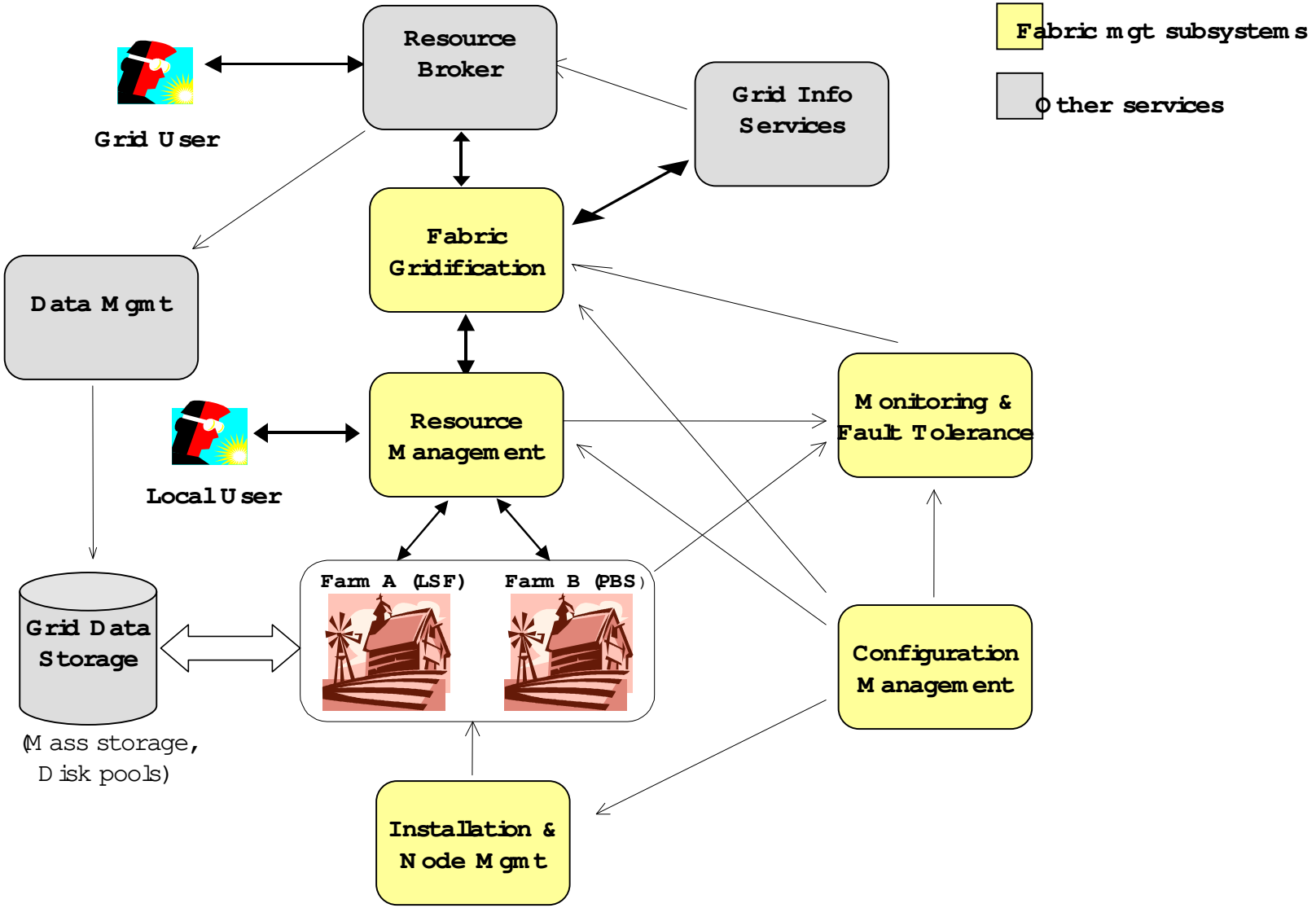
```
SELECT * FROM  cpuLoad

WHERE country = 'UK' AND site = 'RAL'
```

CPULoad (Producer 2)				
UK	GLA	CDF	0.4	19055811022002
UK	GLA	ALICE	0.5	19055611022002

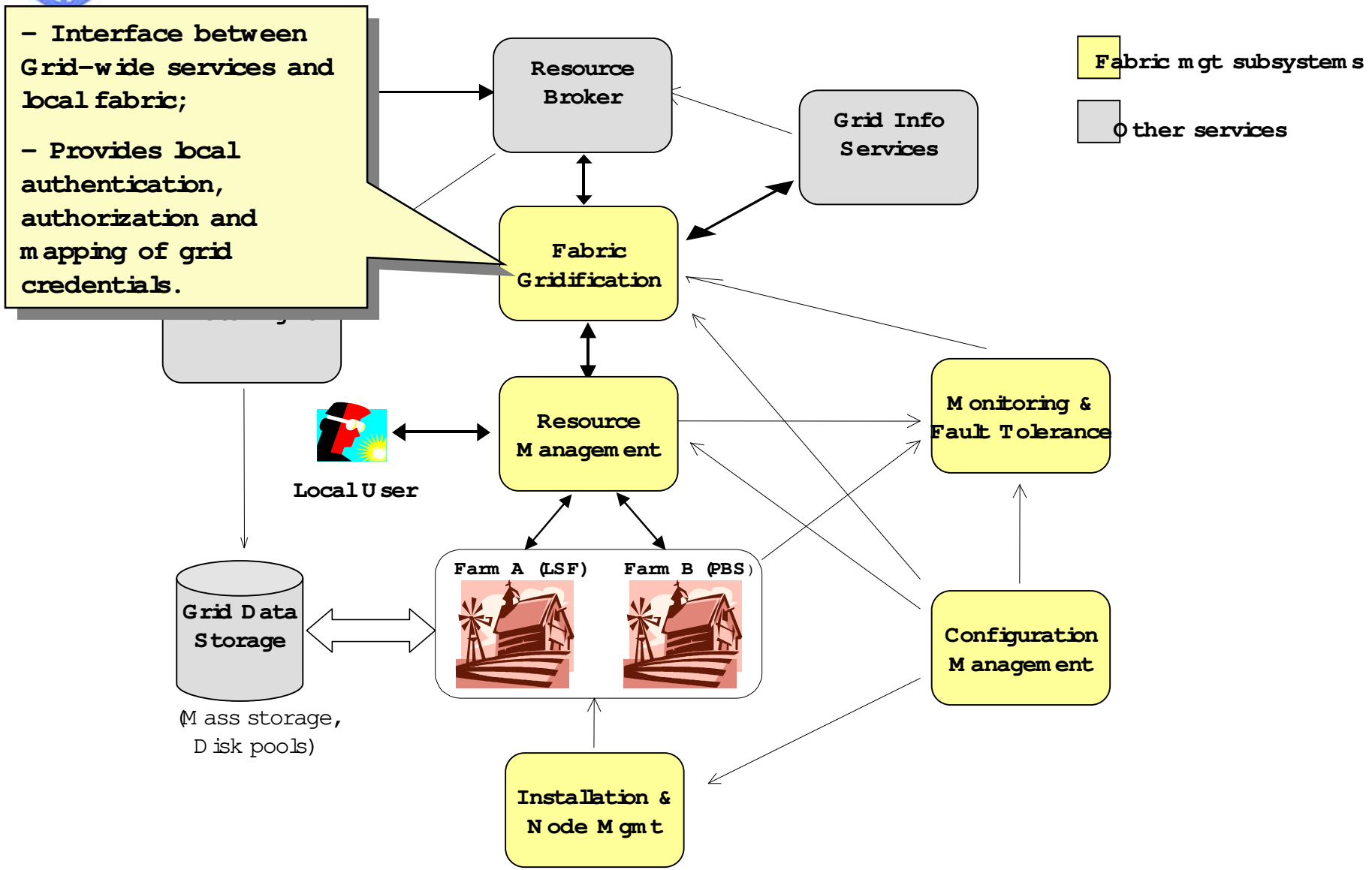
```
SELECT * FROM  cpuLoad

WHERE country = 'UK' AND site = 'GLA'
```

Fabric Management

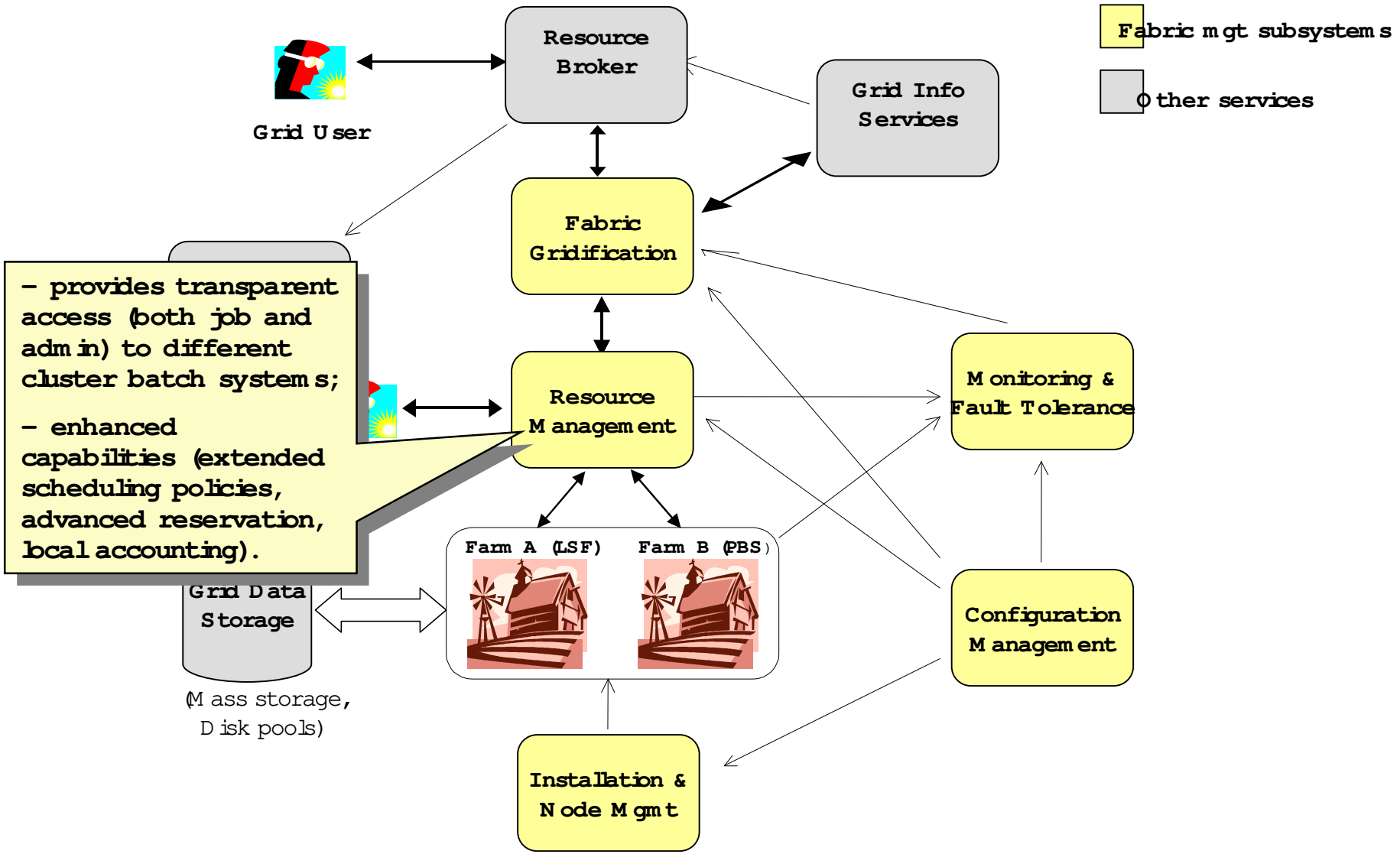
Architecture logical overview



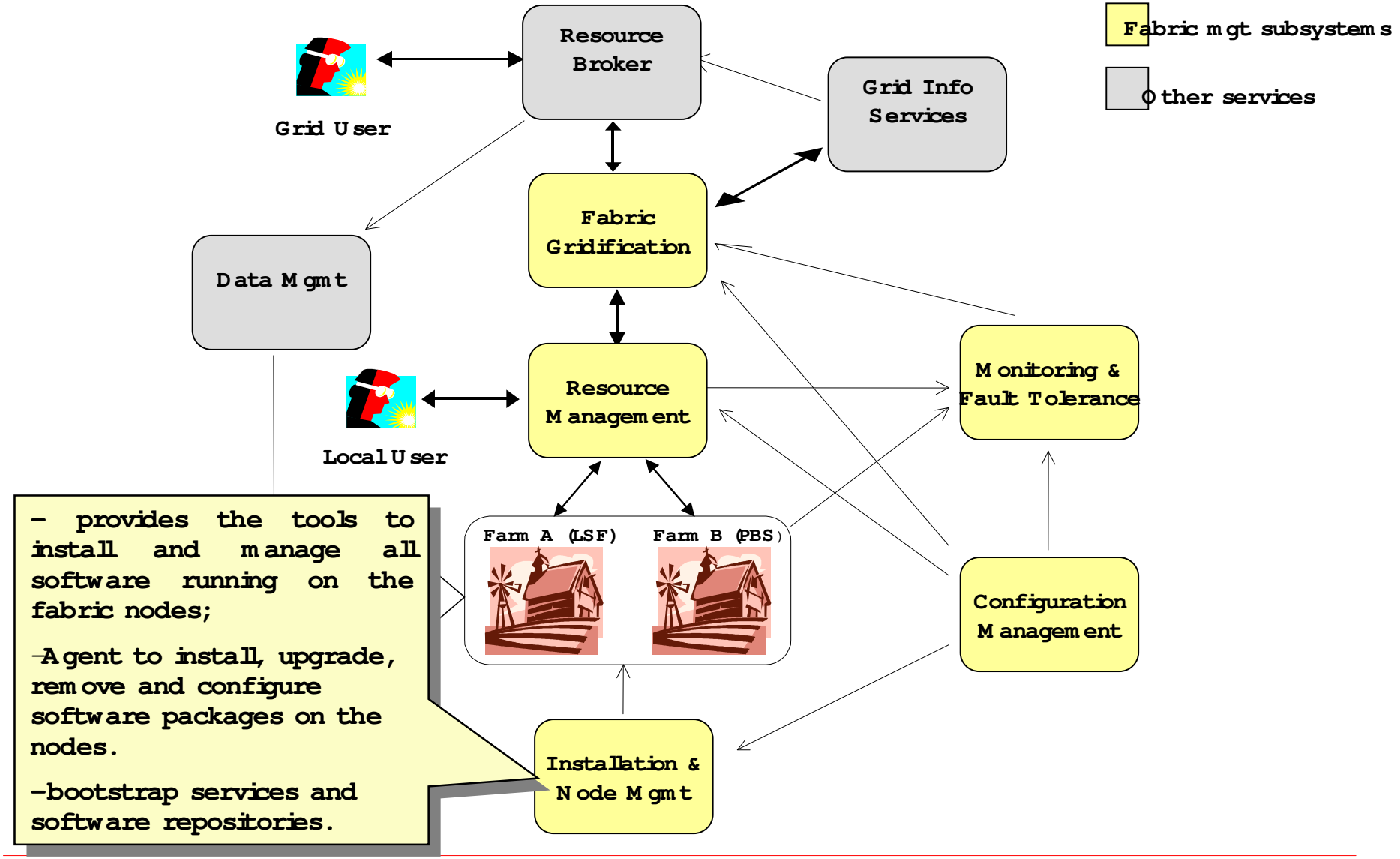
Architecture logical overview



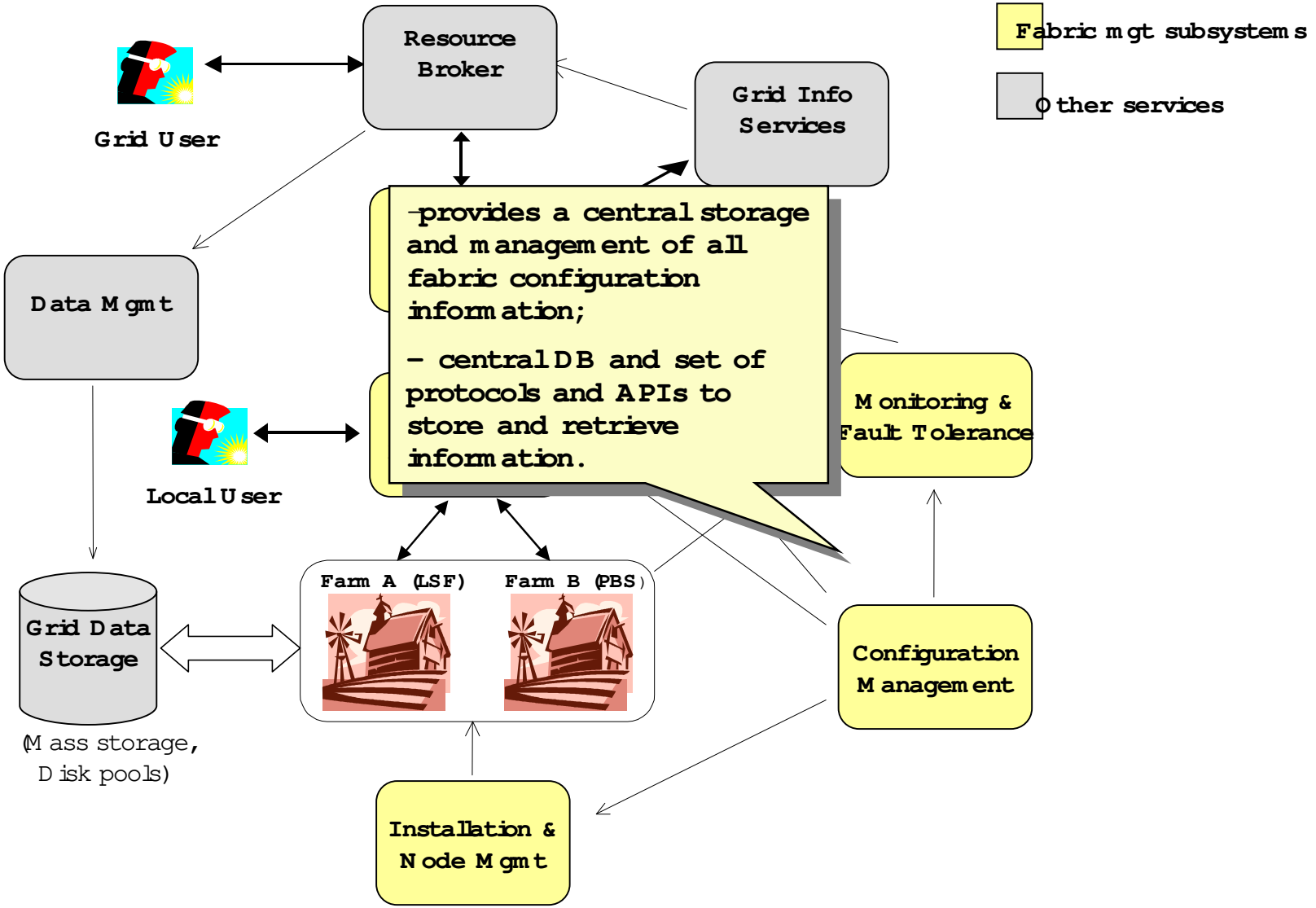
Architecture logical overview



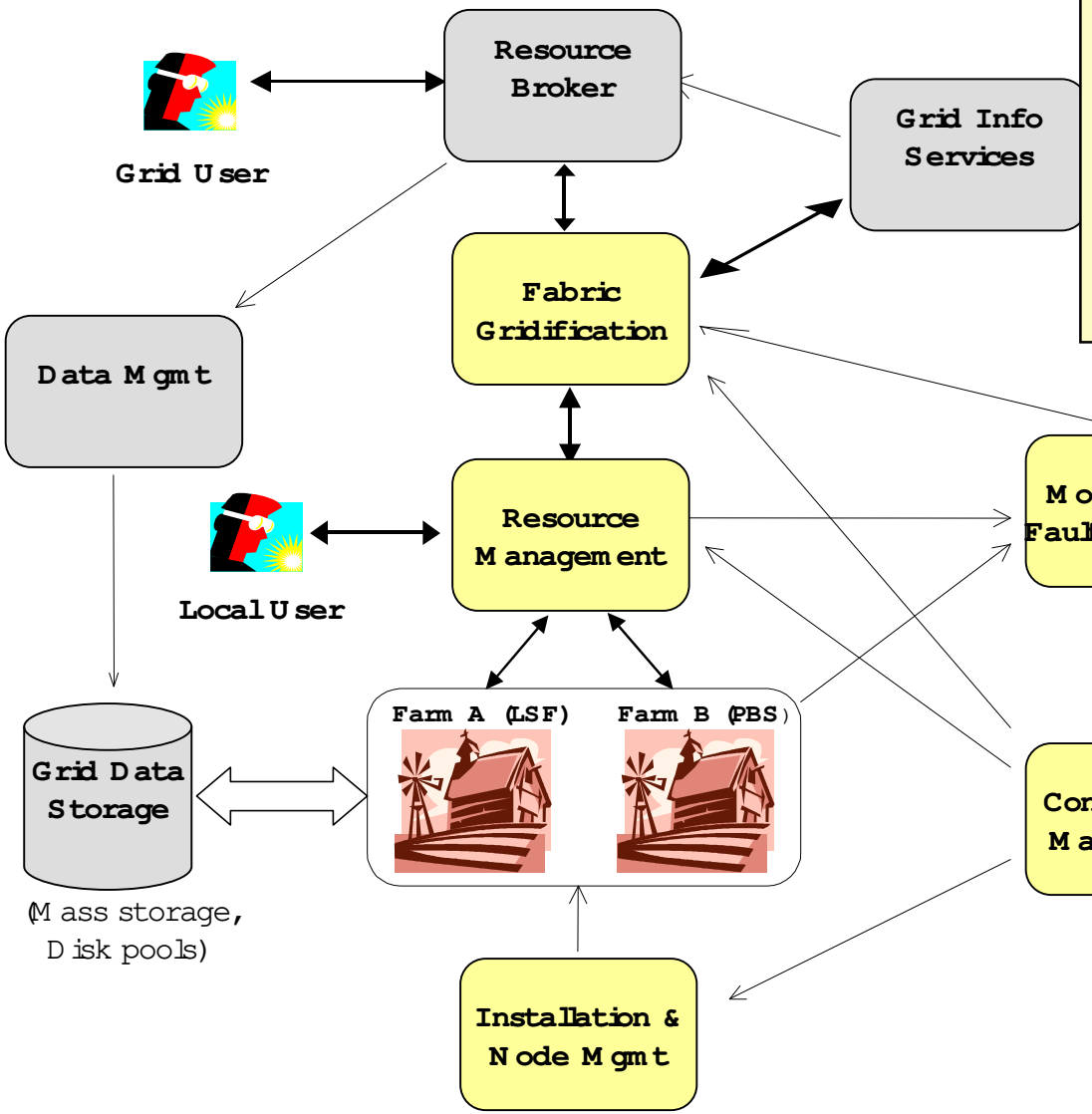
Architecture logical overview



Architecture logical overview



Architecture logical overv

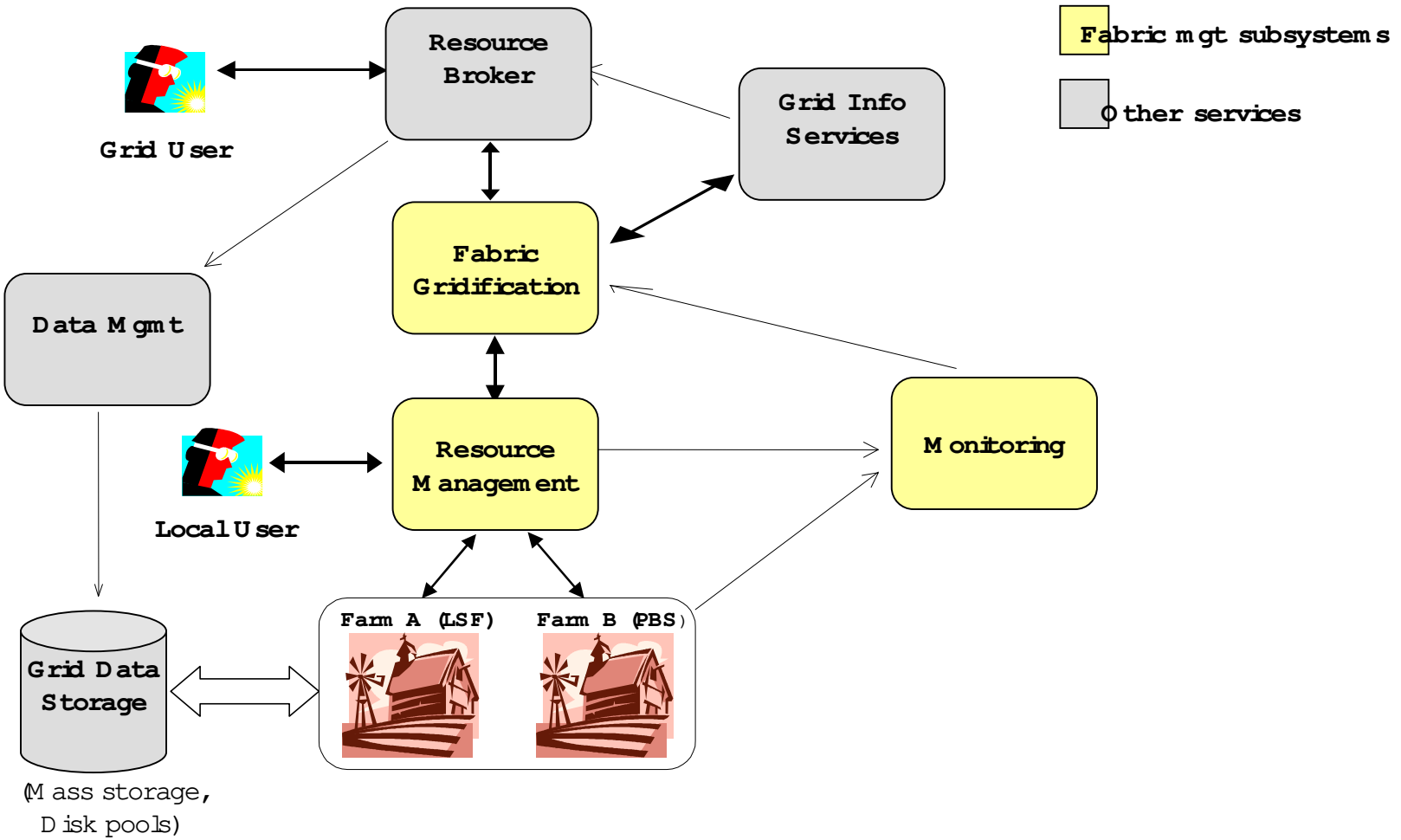


- provides the tools for gathering monitoring information on fabric nodes;

-central measurement repository stores all monitoring information;

- fault tolerance correlation engines detect failures and trigger recovery actions.

User job management (Grid and local)



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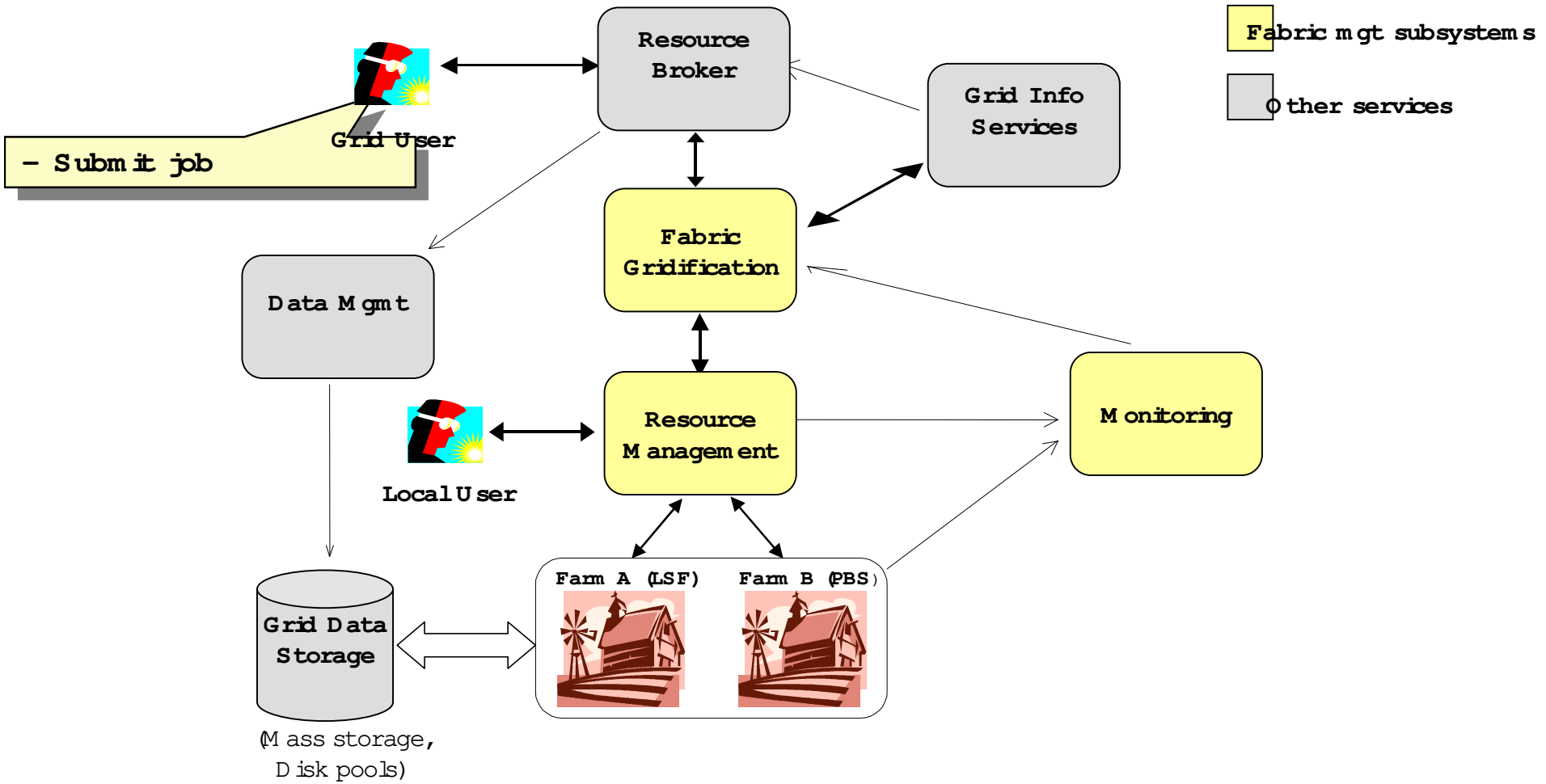

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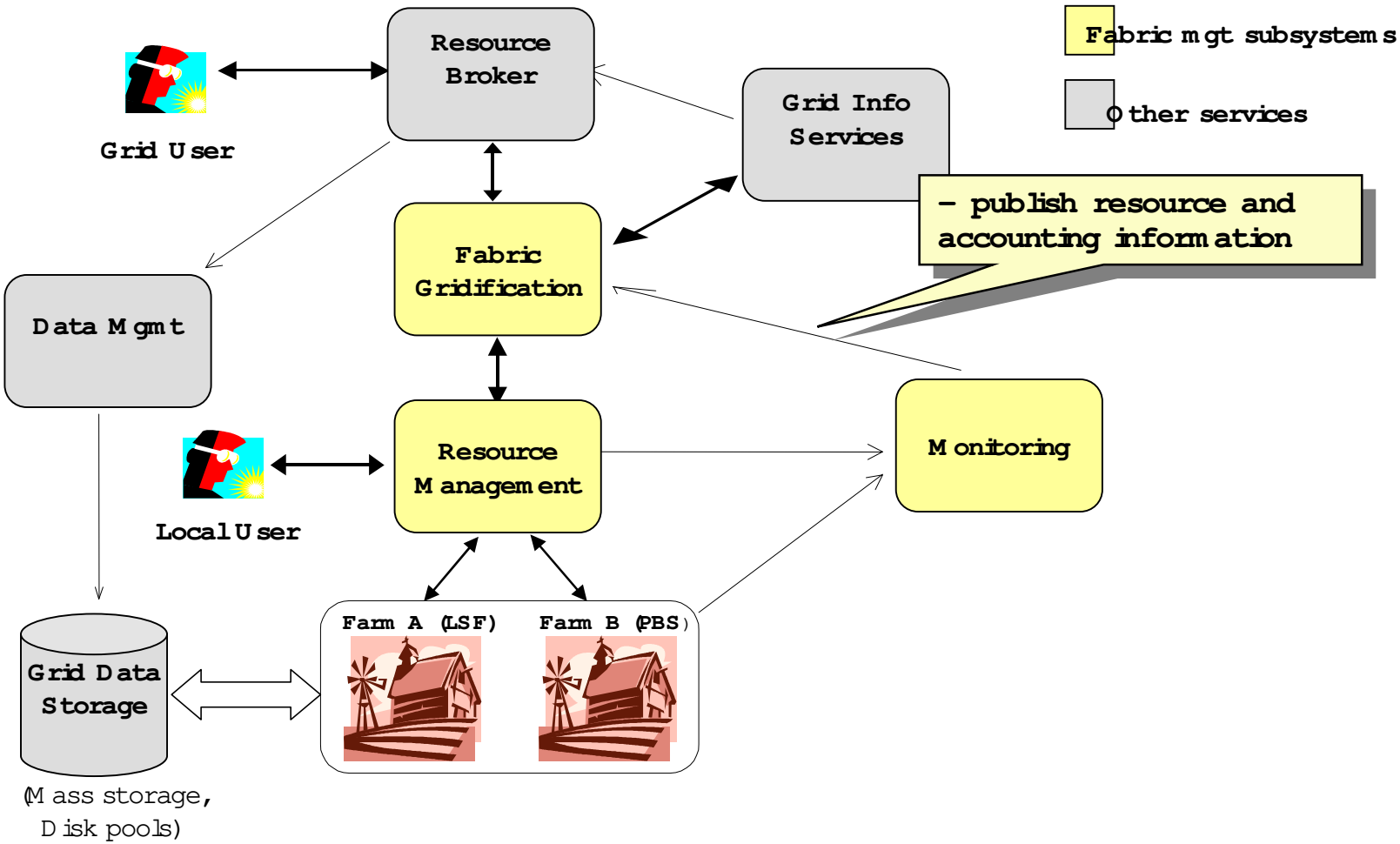

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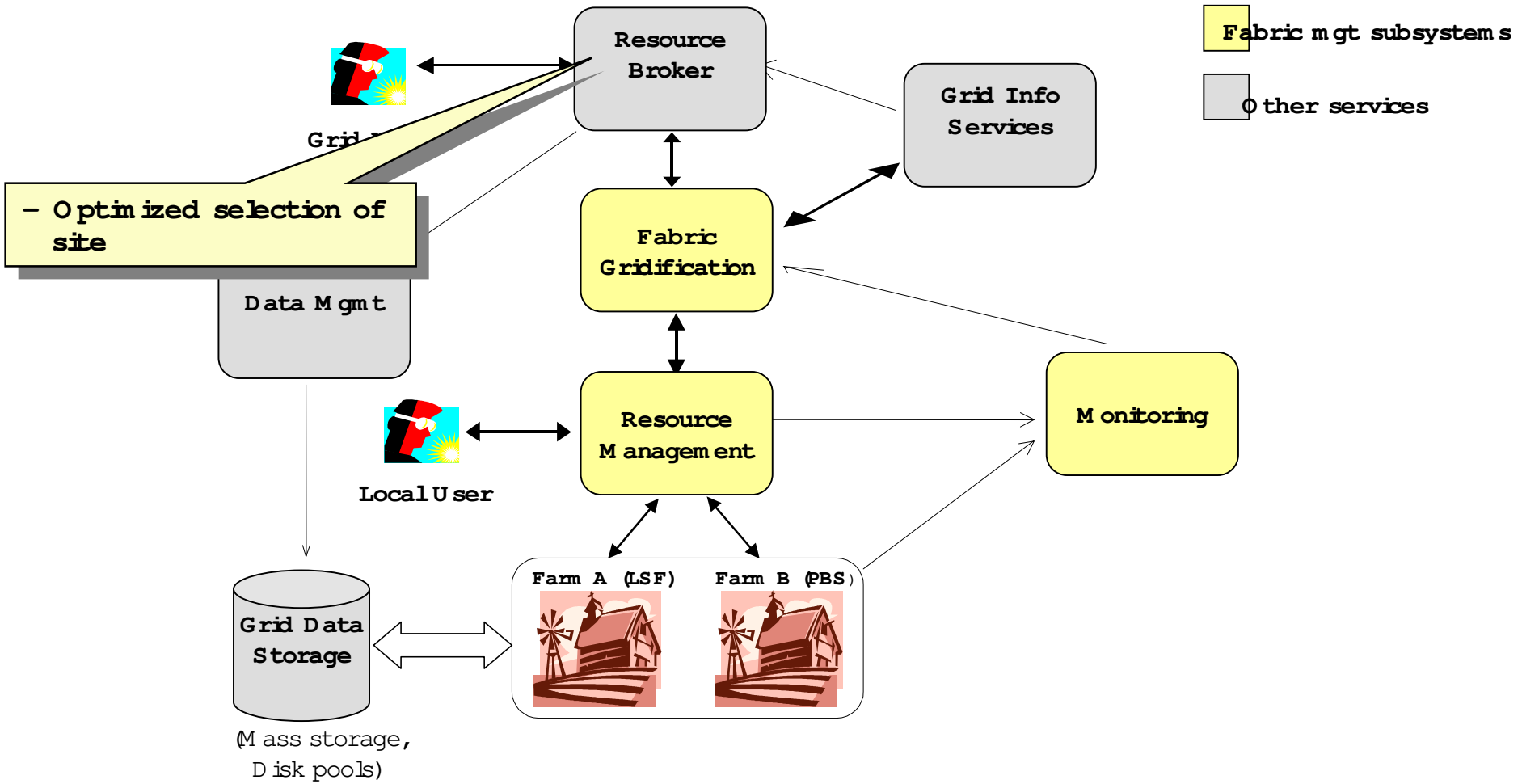

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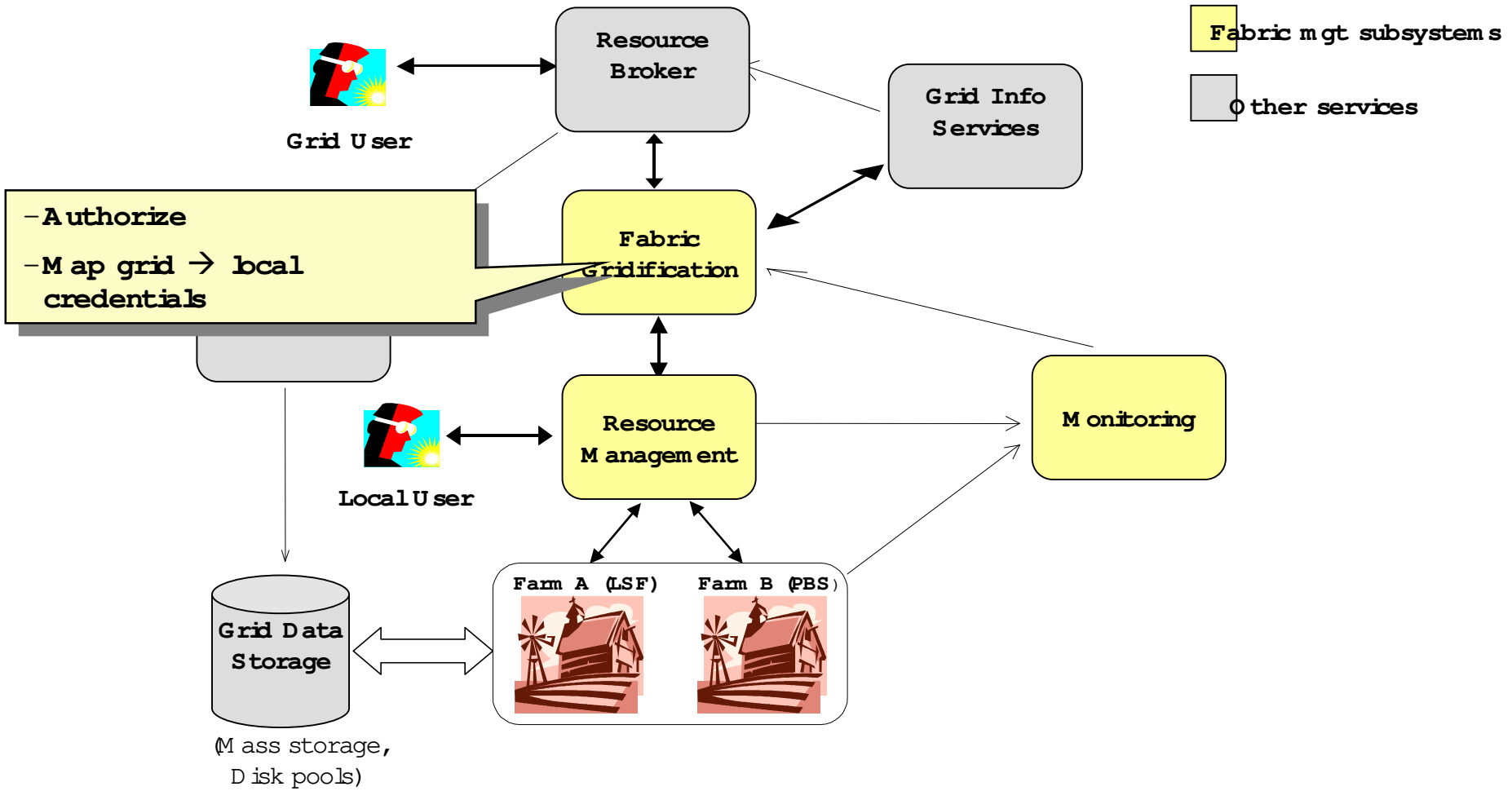

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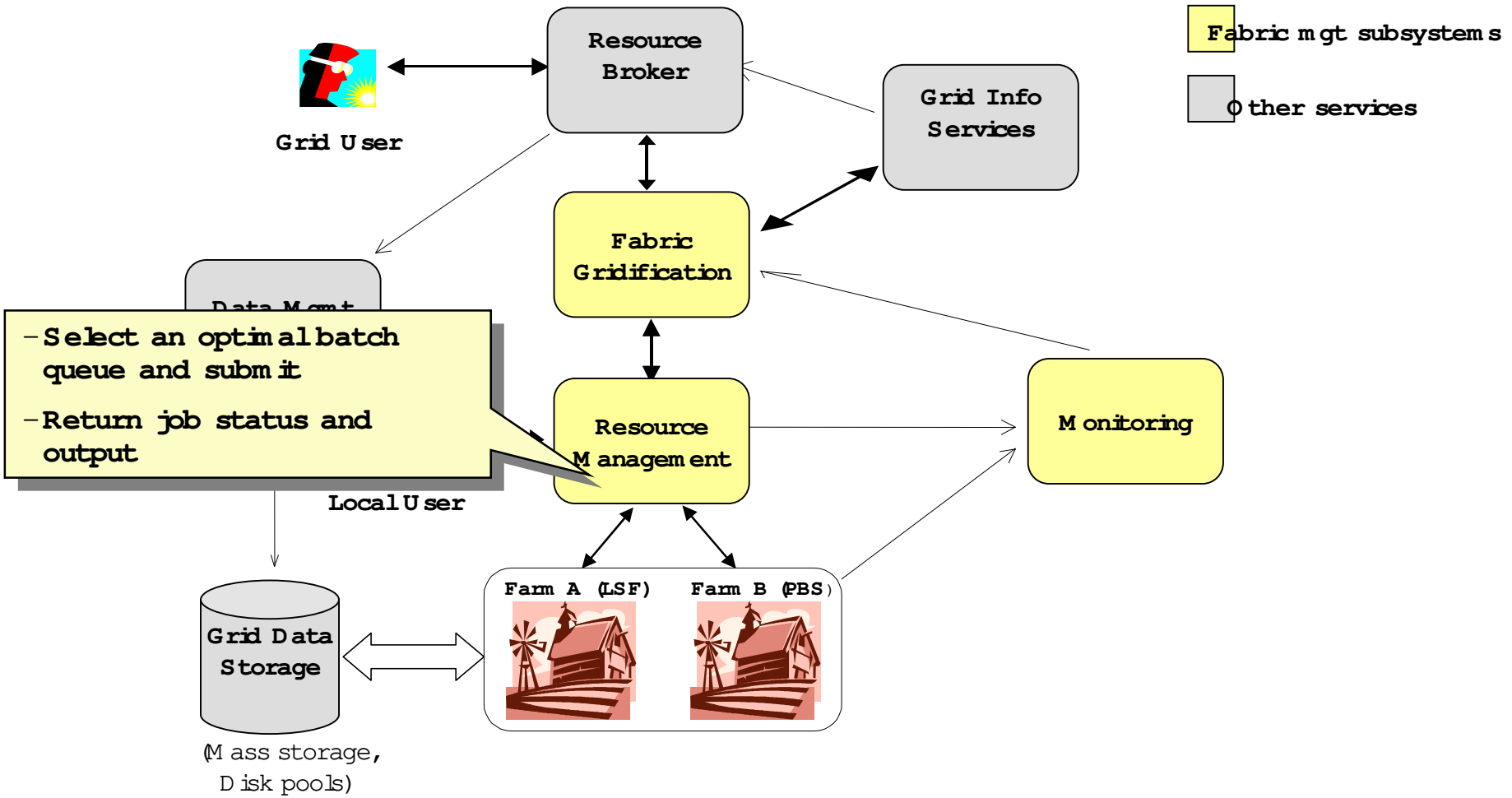
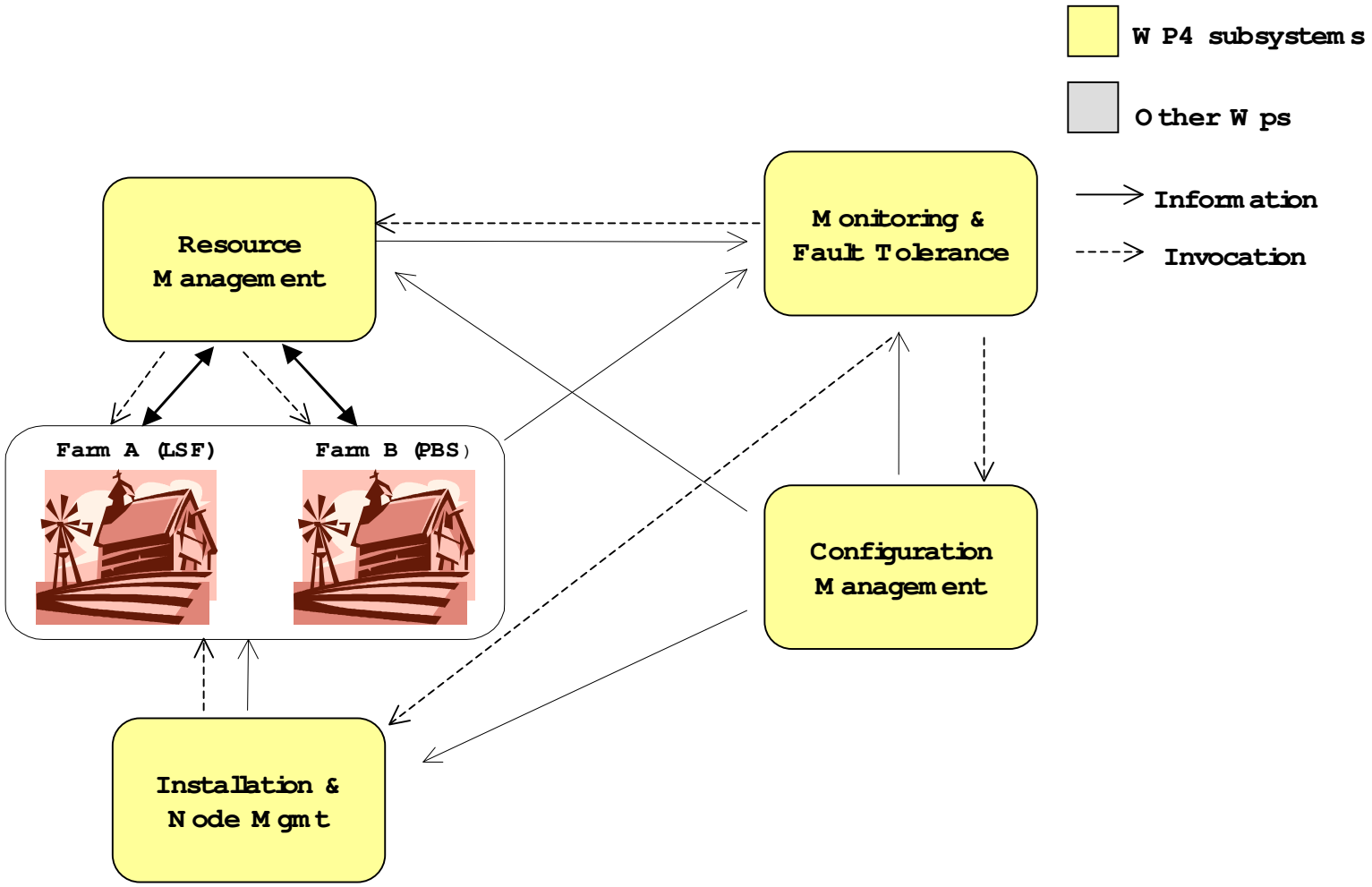
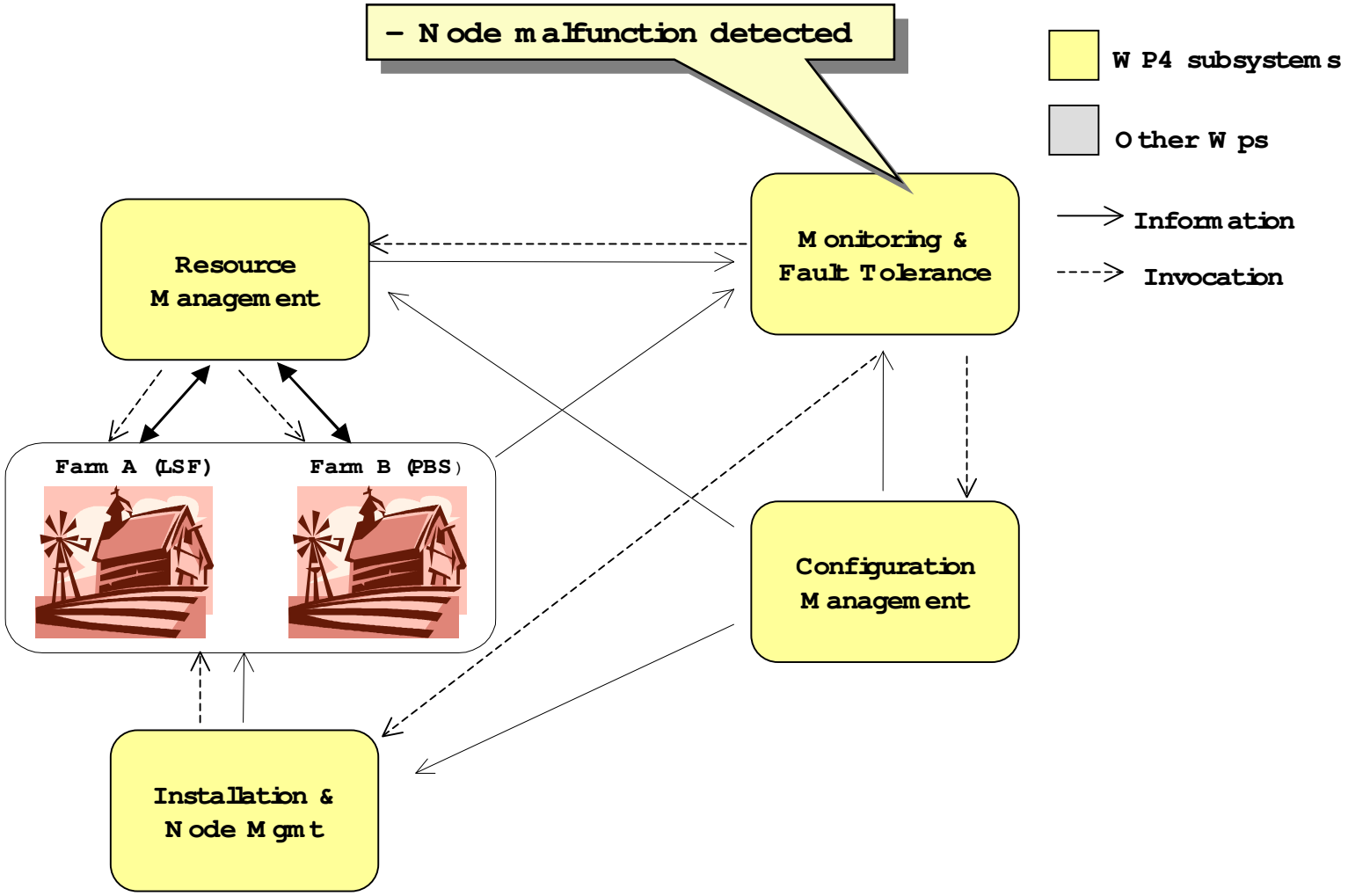


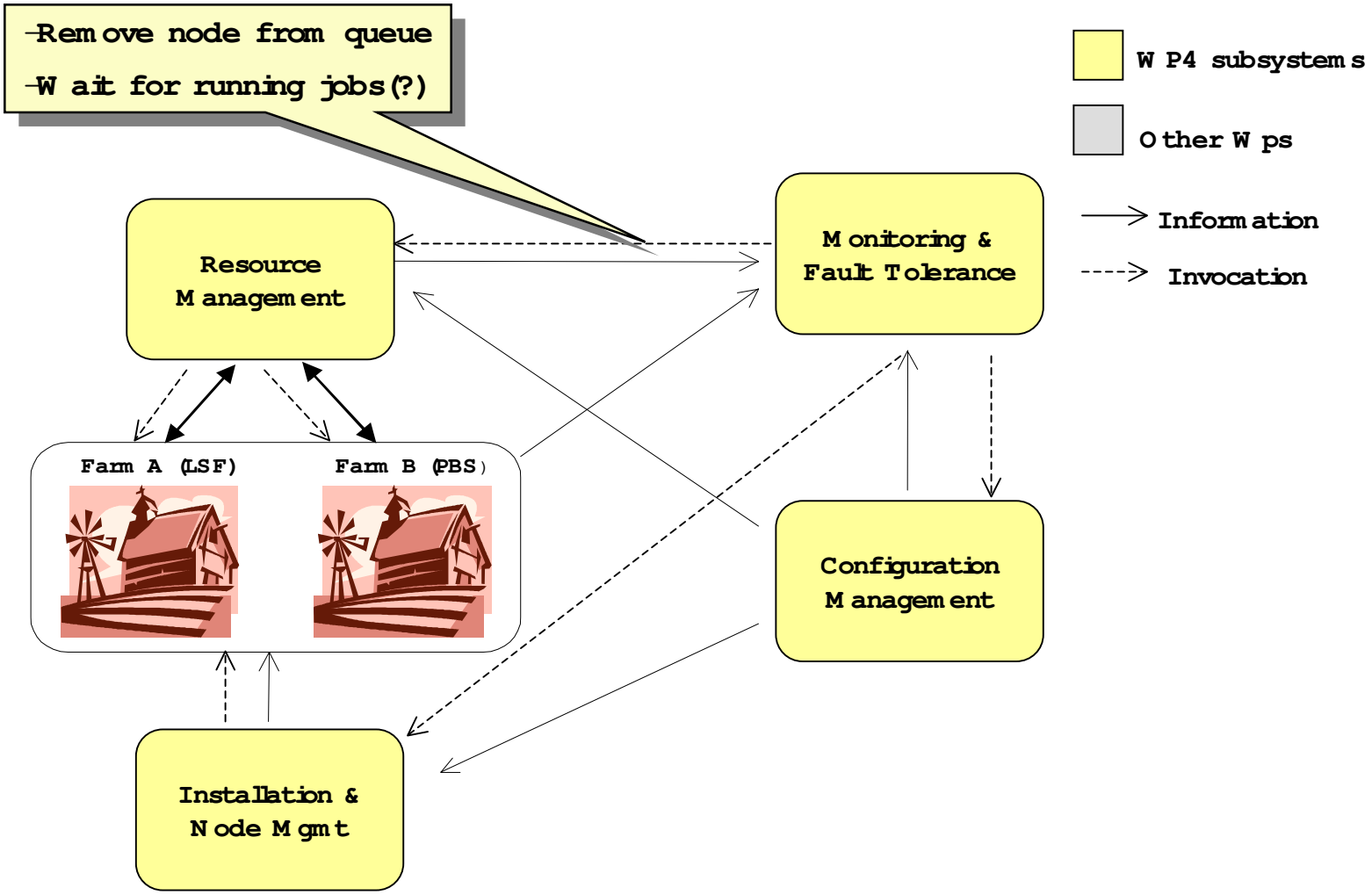
Automated management of large clusters



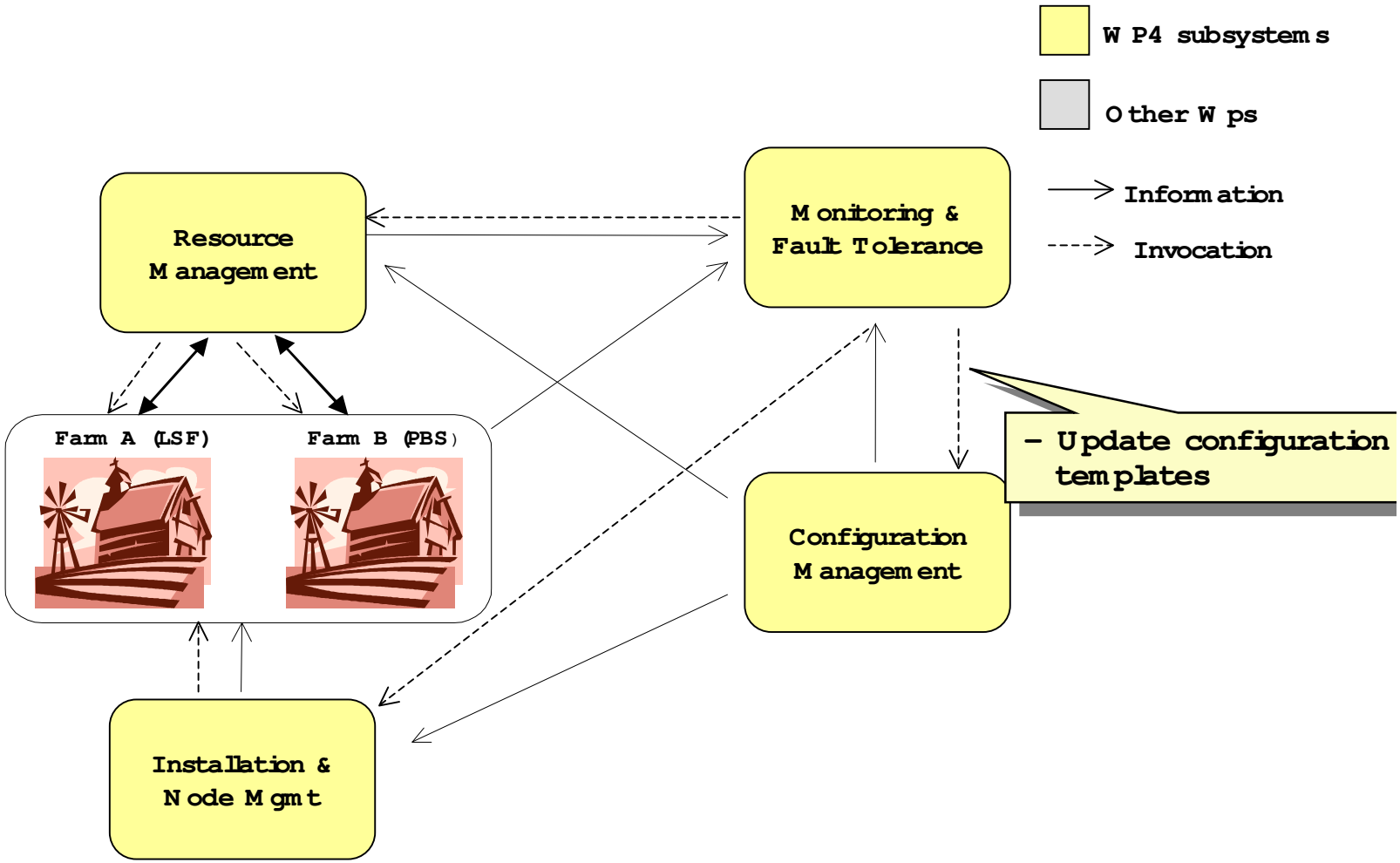
Automated management of large clusters



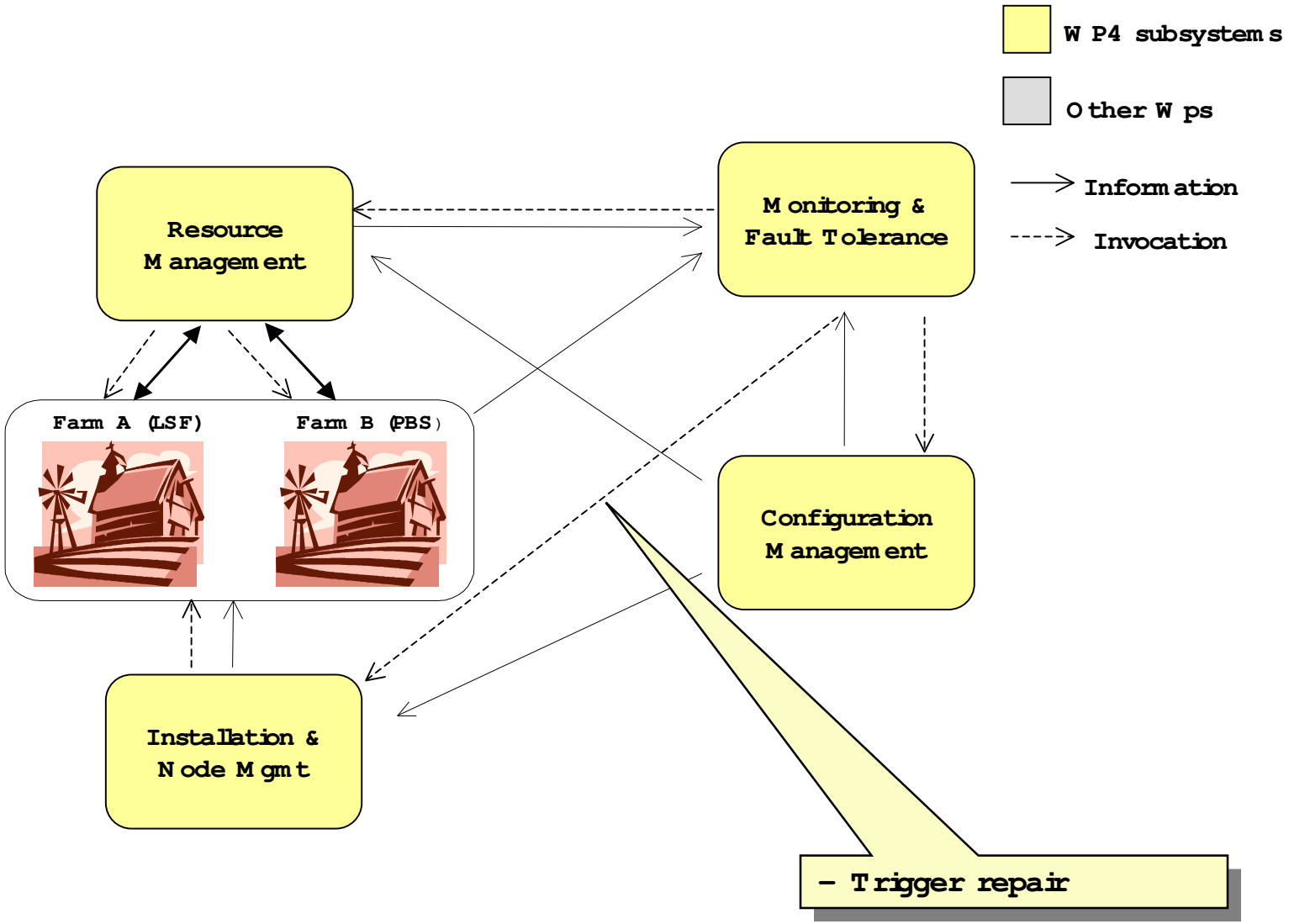
Automated management of large clusters



Automated management of large clusters



Automated management of large clusters



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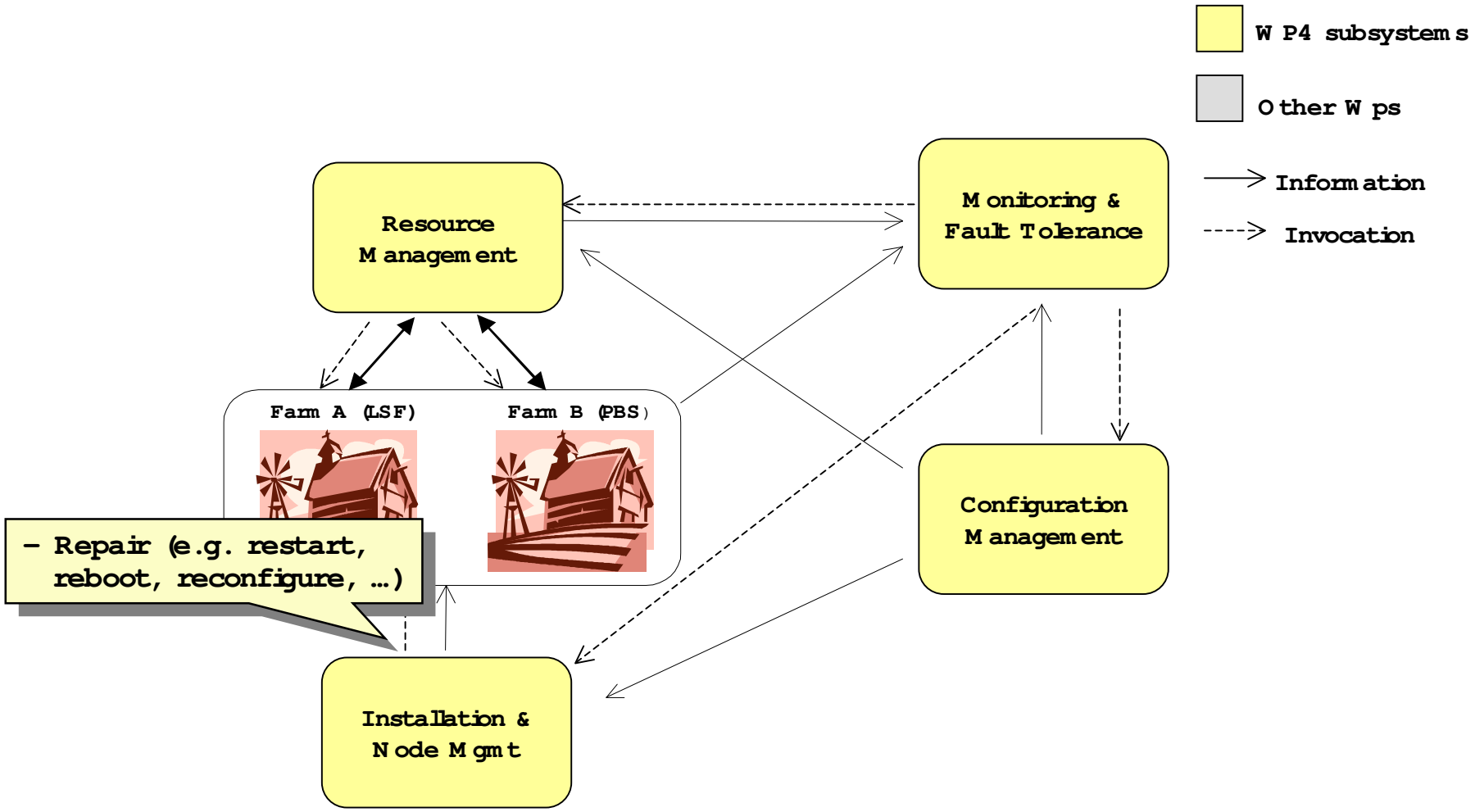

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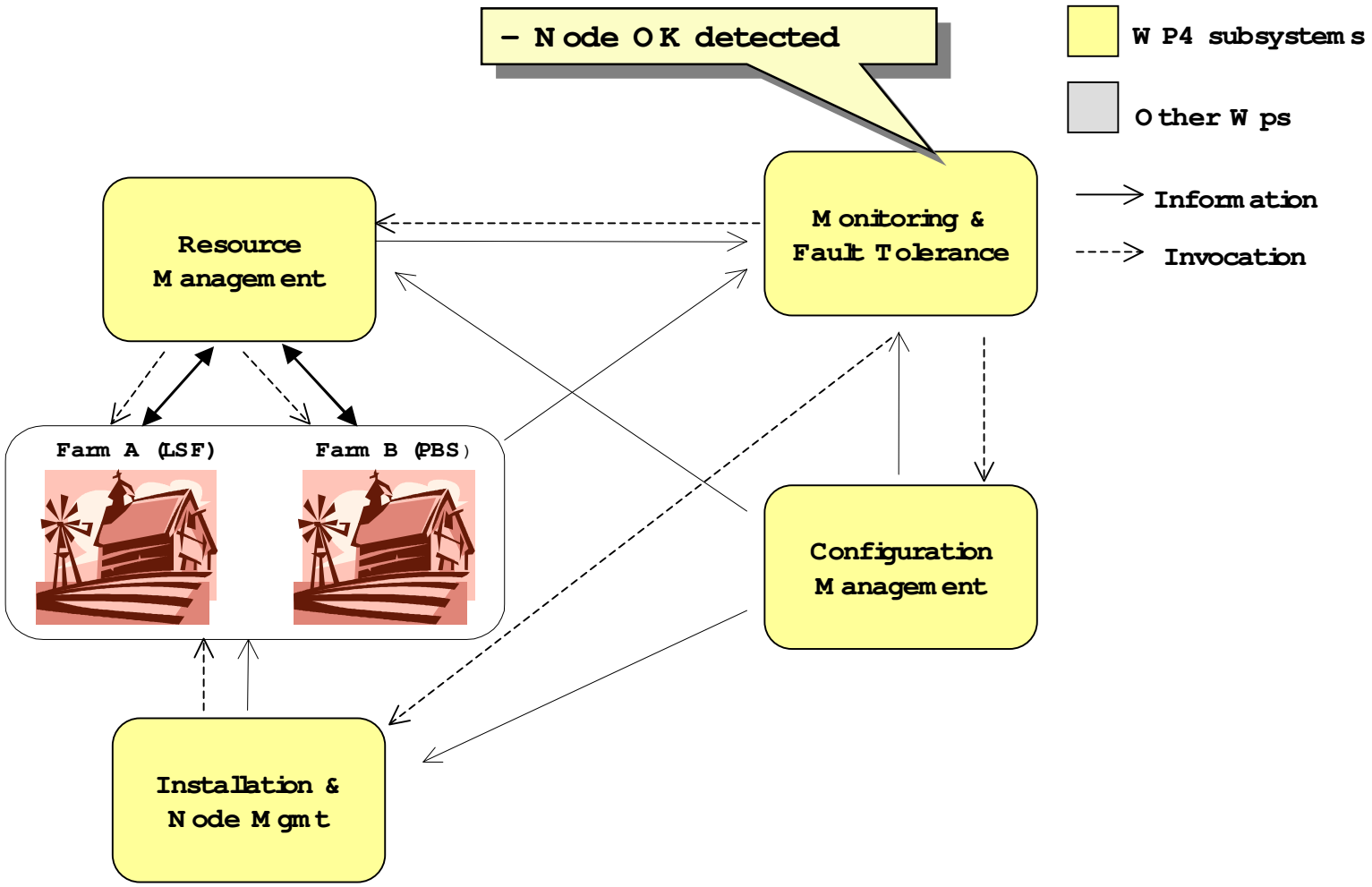

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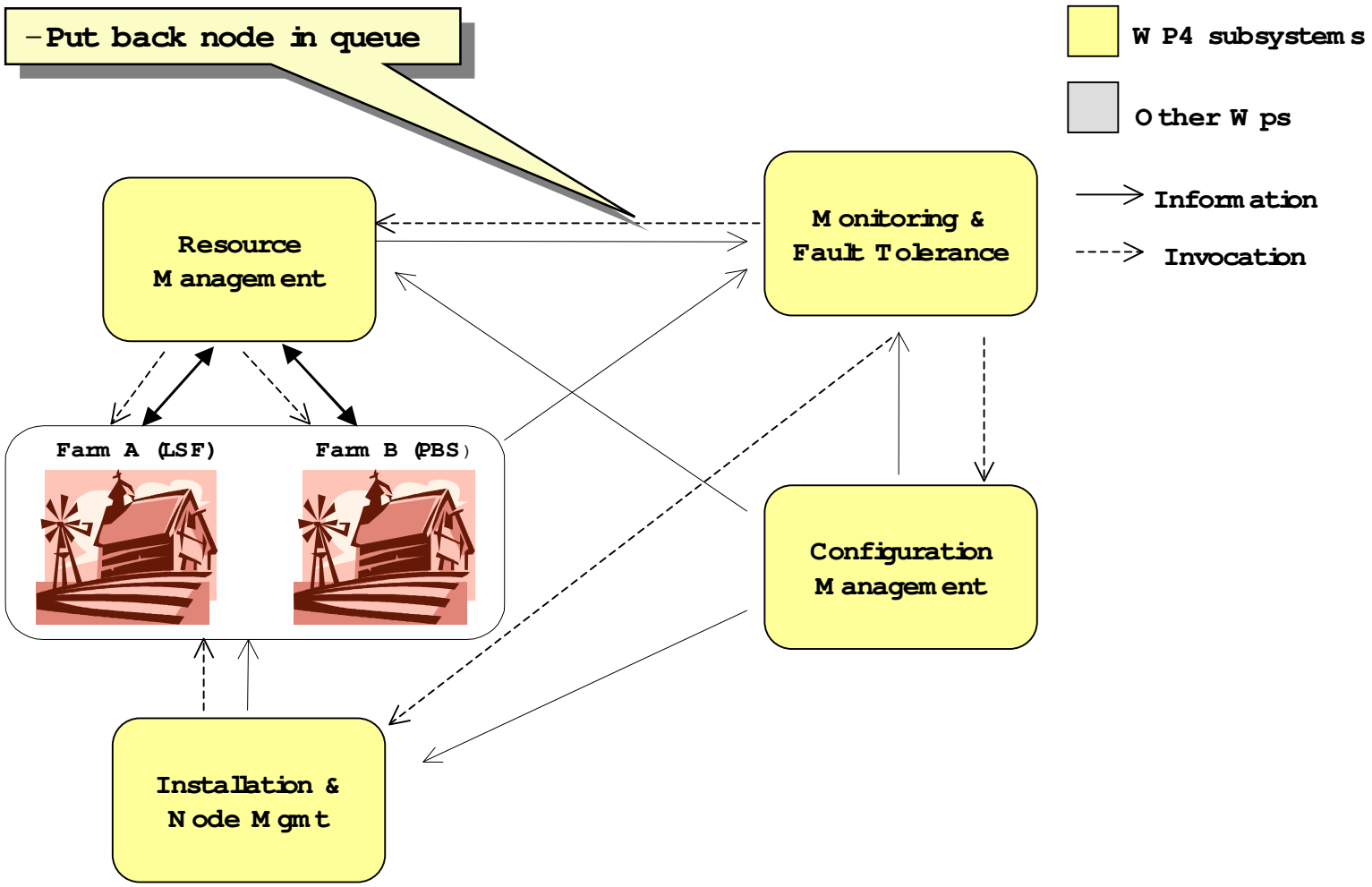

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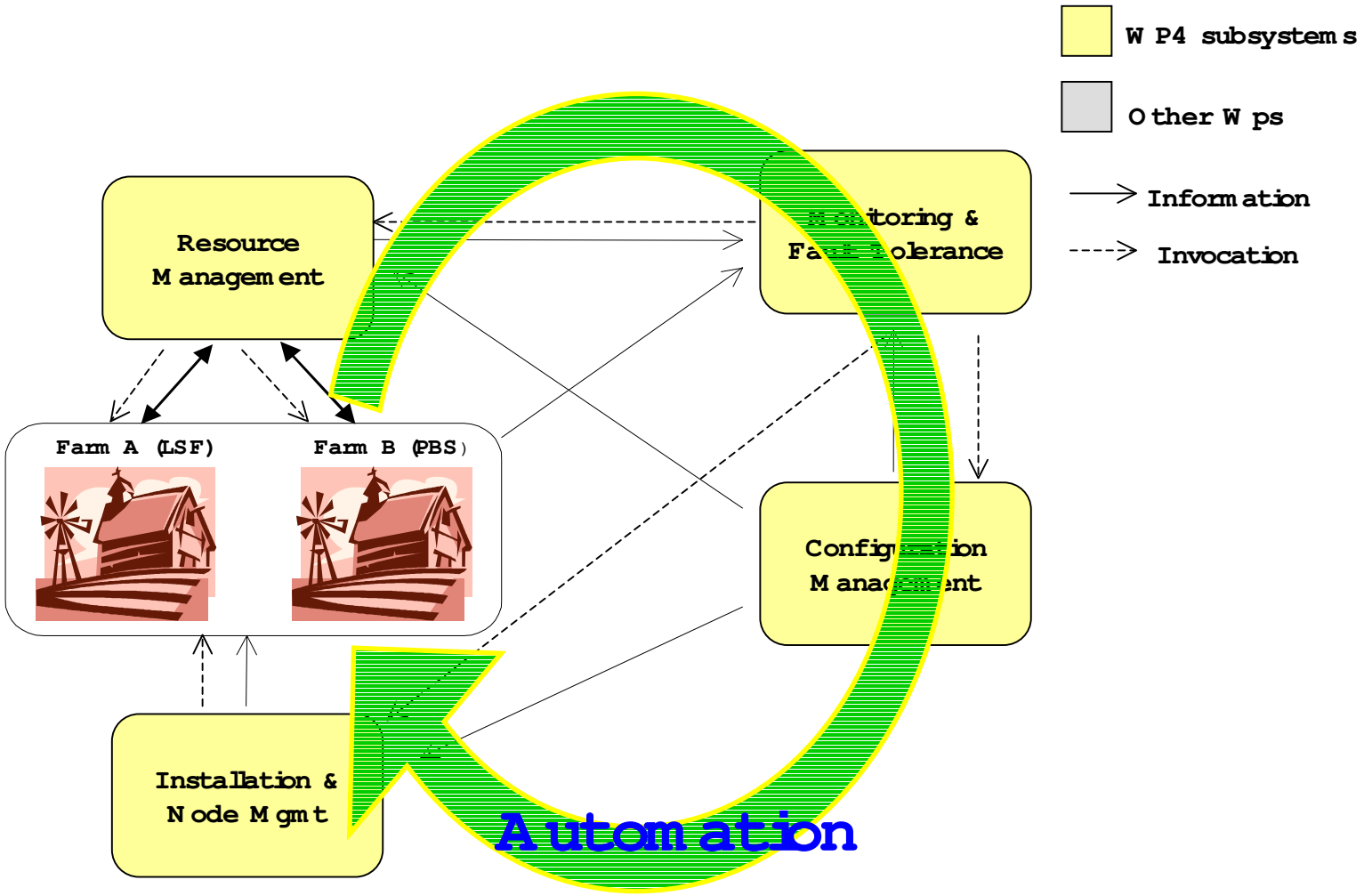


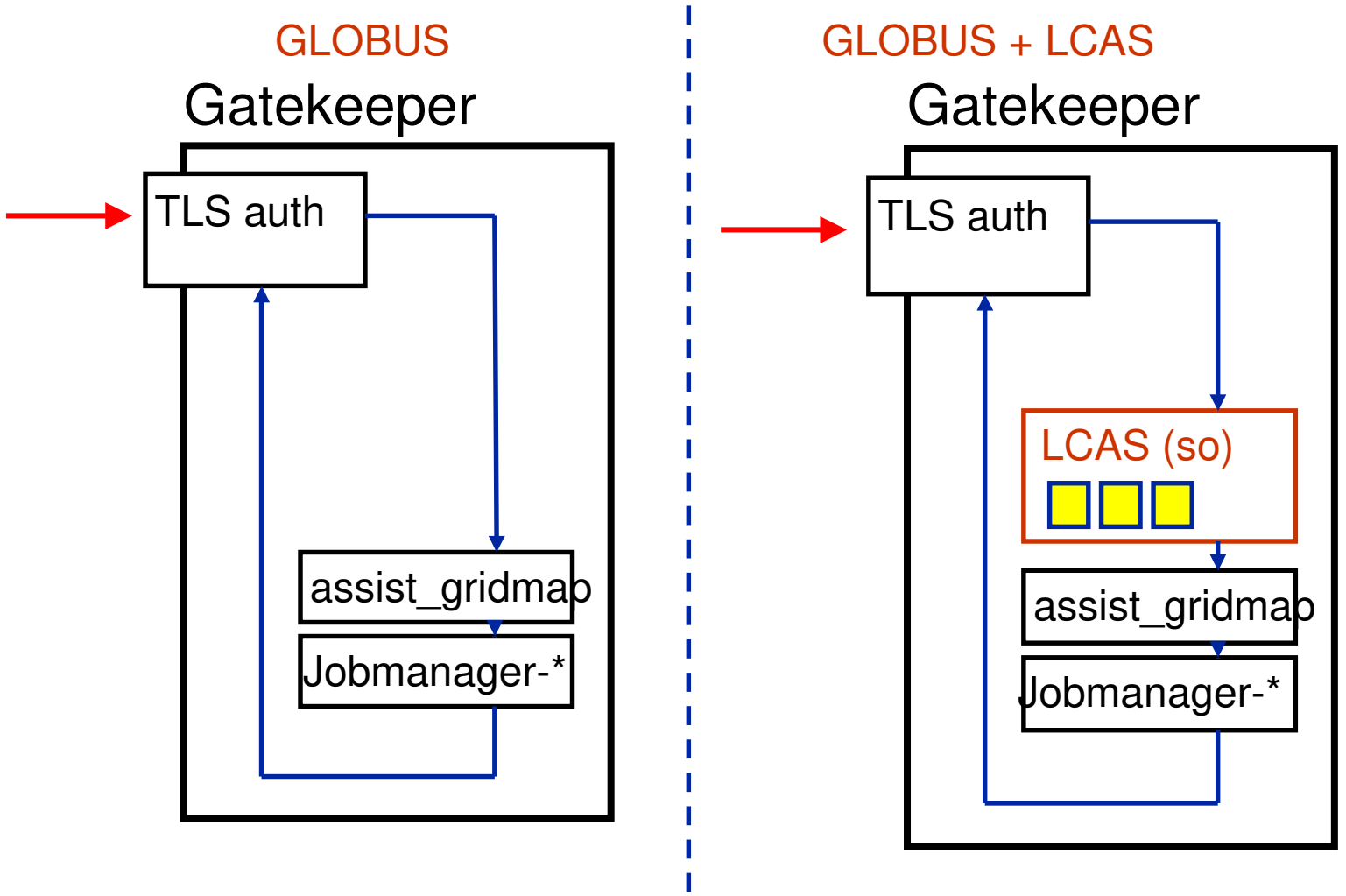
LCFG (Local ConFiGuration system)

- Widely used fabric tool, whose purpose is to handle automated installation and configuration in a very diverse and evolving environment
- Mechanism:
  - Abstract configuration parameters are stored in a central repository located in the LCFG server.
  - Scripts on the host machine (LCFG client) read these configuration parameters and either generate traditional configuration files, or directly manipulate various services.

Local Authorization: LCAS

- The Local Centre Authorization Service (LCAS) handles authorization requests to the local computing fabric.
- In this release the LCAS is a shared library, which is loaded dynamically by the globus gatekeeper. The gatekeeper has been slightly modified for this purpose and will from now on be referred to as edg-gatekeeper.
- The authorization decision of the LCAS is based upon the users' certificate and the job specification in RSL (JDL) format. The certificate and RSL are passed to (plug-in) authorization modules, which grant or deny the access to the fabric. Three standard authorization modules are provided by default:
  - lcas_userallow.mod, checks if user is allowed on the fabric (currently the gridmap file is checked).
  - lcas_userban.mod, checks if user should be banned from the fabric.
  - lcas_timeslots.mod, checks if fabric is open at this time of the day for datagrid jobs.

Authentication control flow EDG gatekeeper



* And store in job repository

Further Information

- Information and Monitoring Services
  - http://hepunx.rl.ac.uk/edg/wp3/

- Fabric Management
  - http://cern.ch/hep-proj-grid-fabric/