Fabric Management

The European DataGrid Project Team

http://www.eu-datagrid.org

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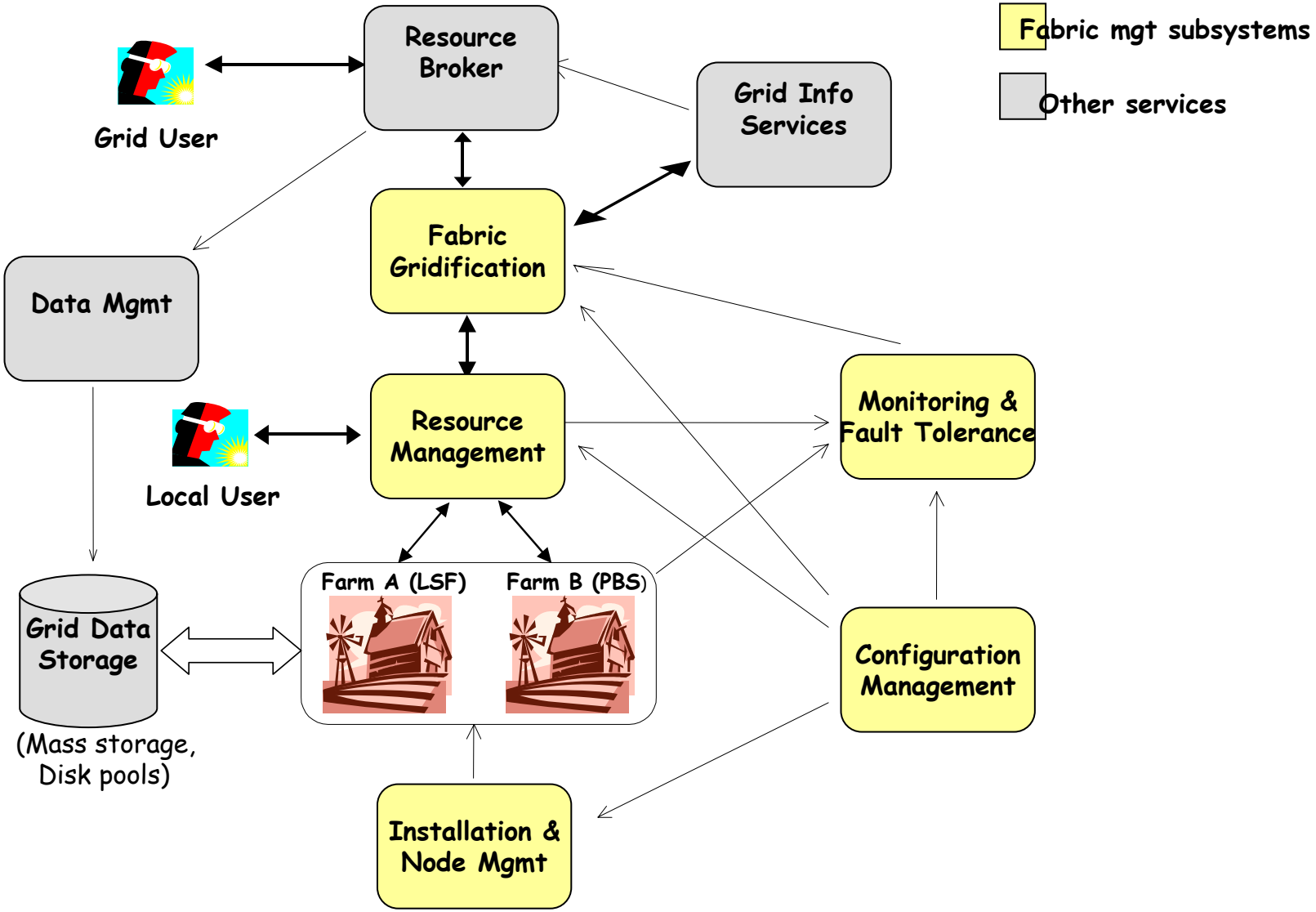
What is Fabric Management

- Definitions:
  - Cluster: "A collection of computers on a network that can function as a single computing resource through the use of tools which hide the underlying physical structure".
  - Fabric: "A complete set of computing resources (processors, memory, storage) operated in a coordinated fashion with a uniform set of management tools".
- Functionality:
  - Enterprise system administration – scalable to ~10K nodes
  - Provision for running grid jobs
  - Provision for running local jobs

Architecture logical overview



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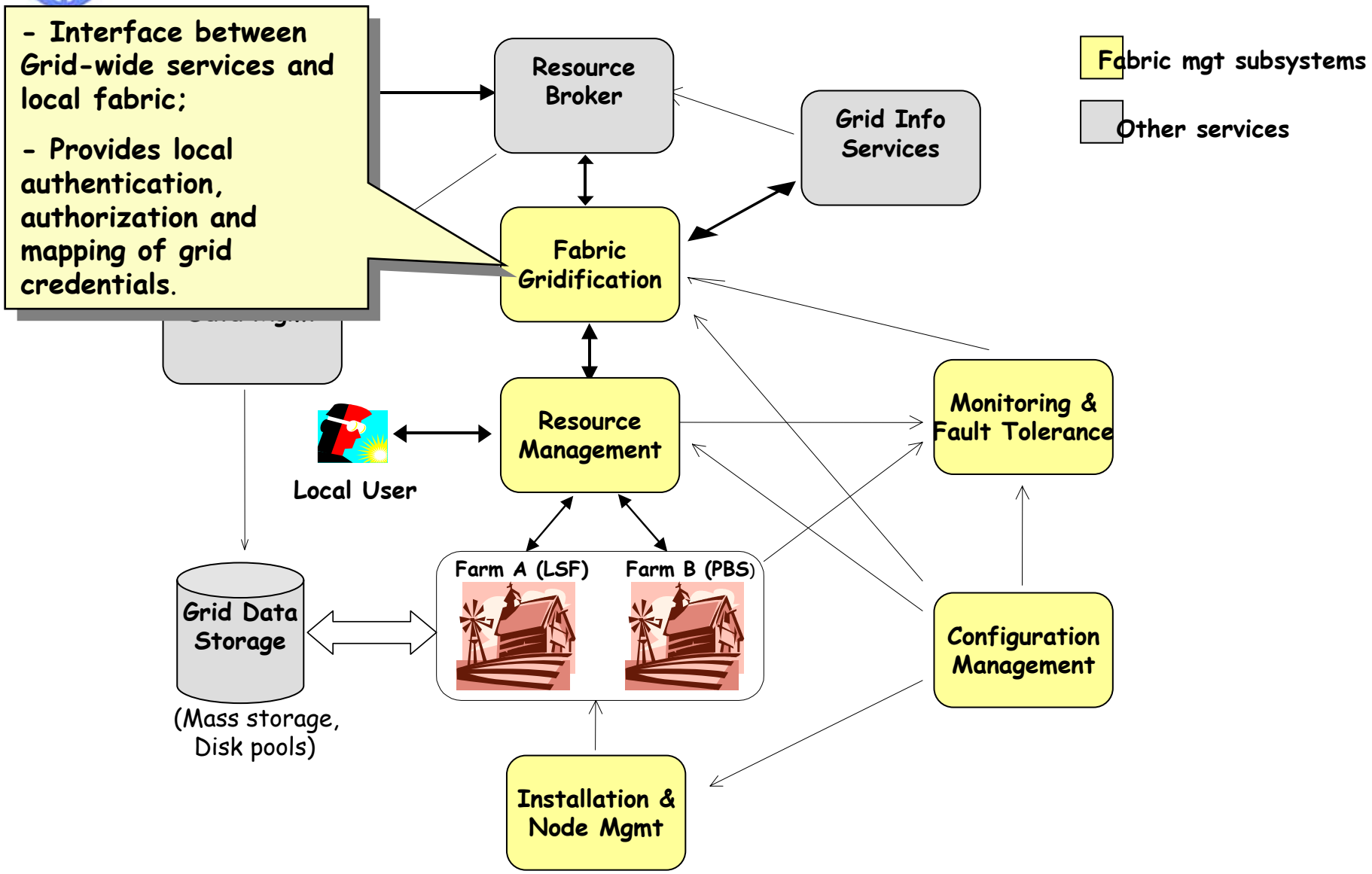

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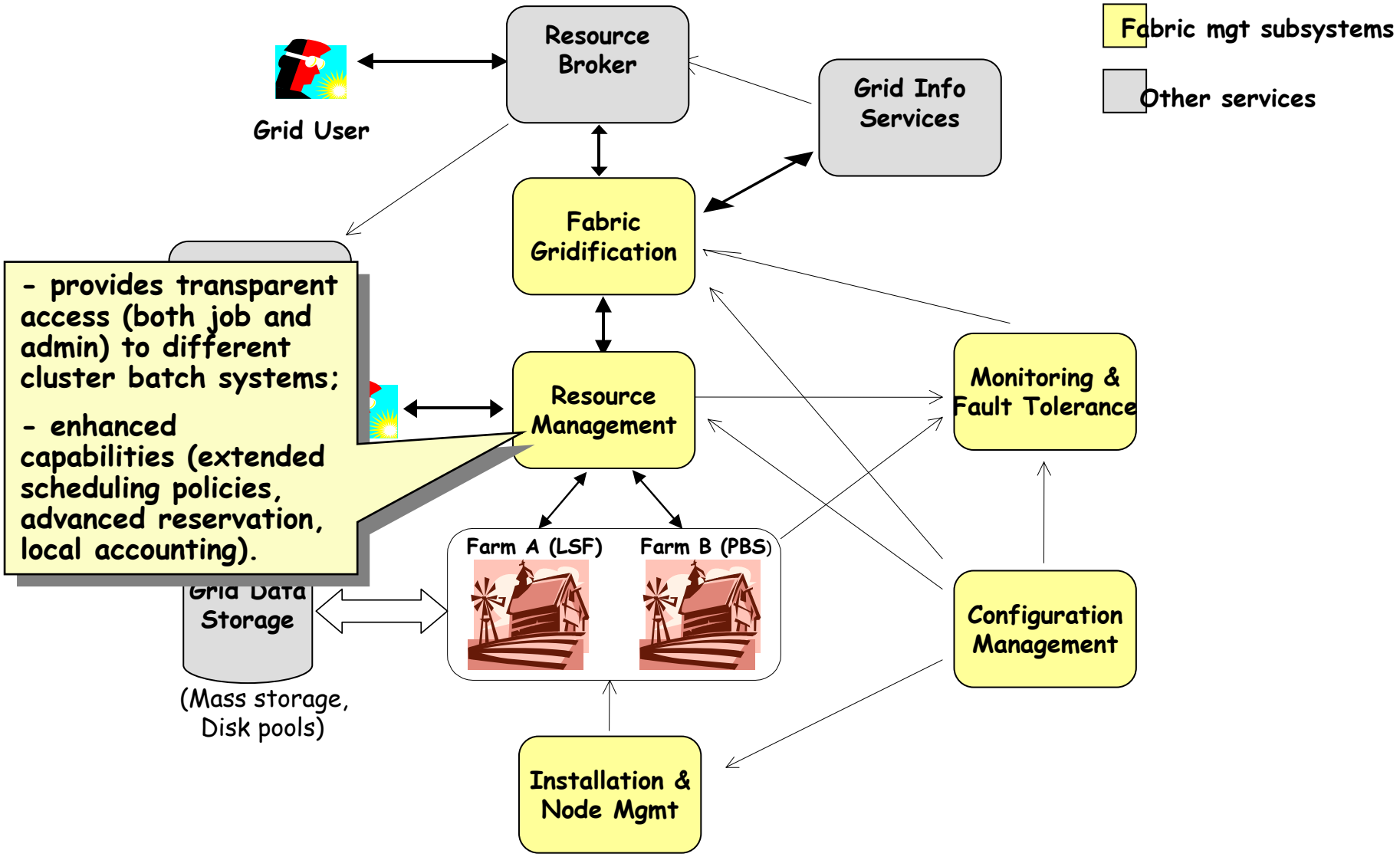

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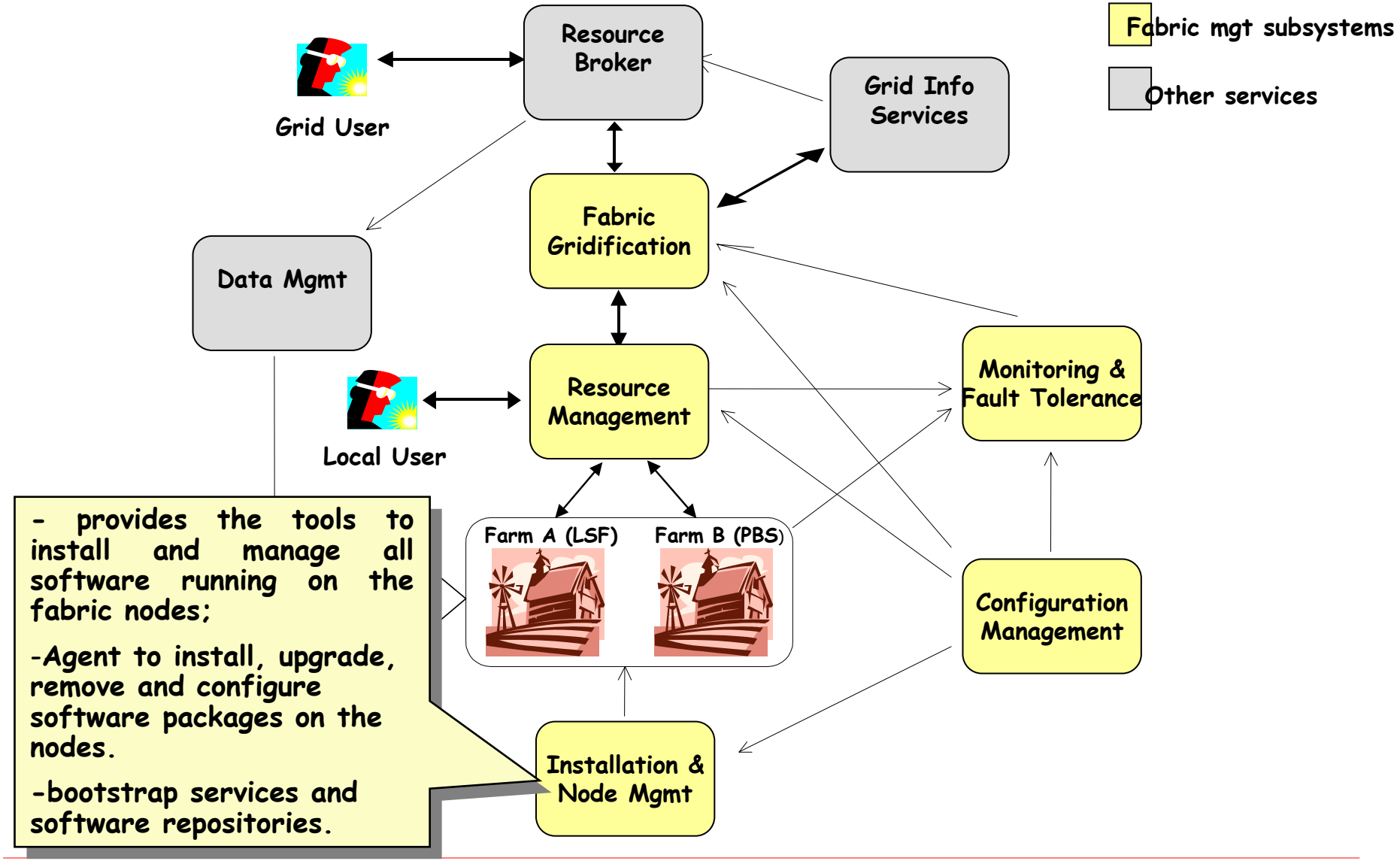

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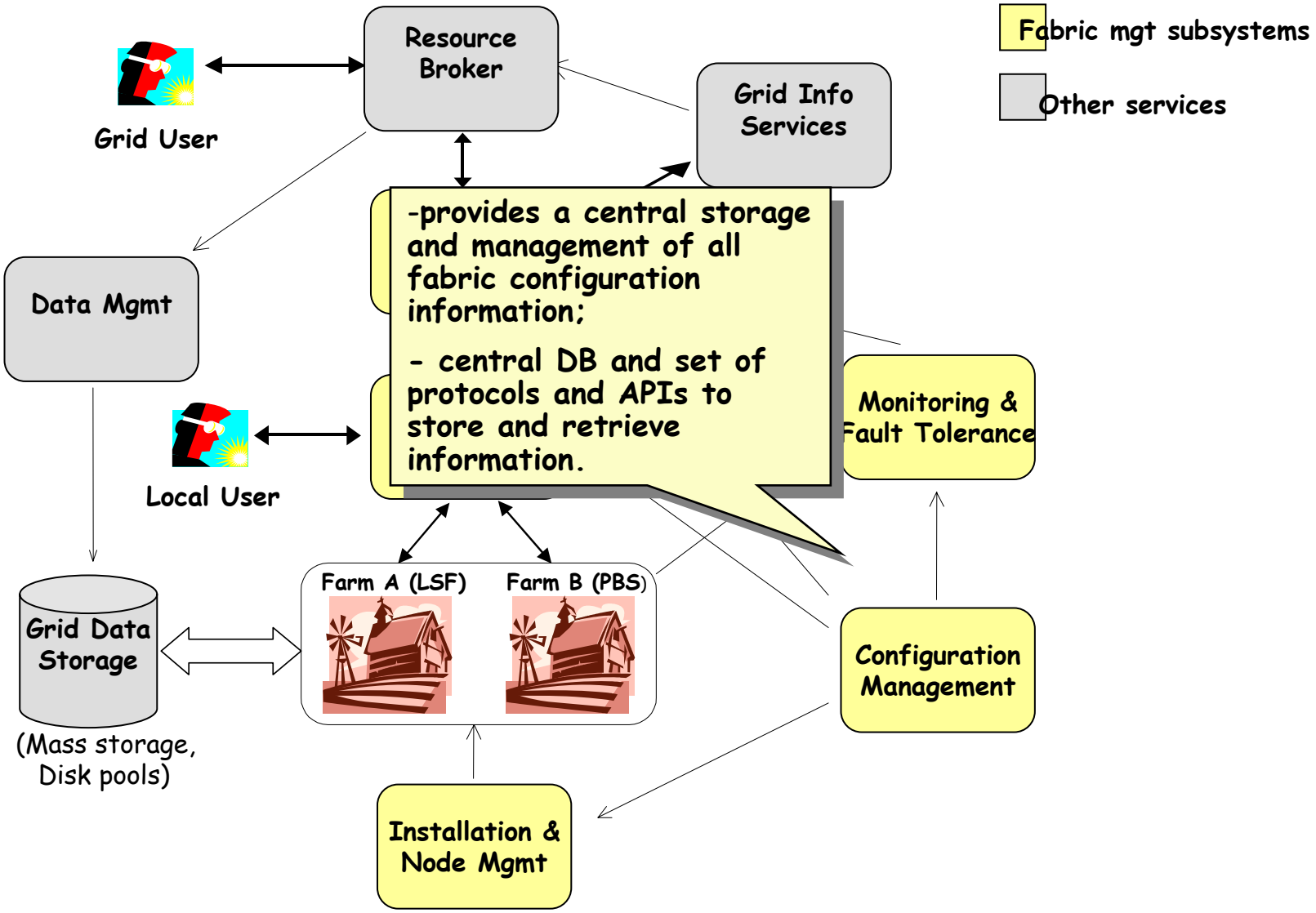

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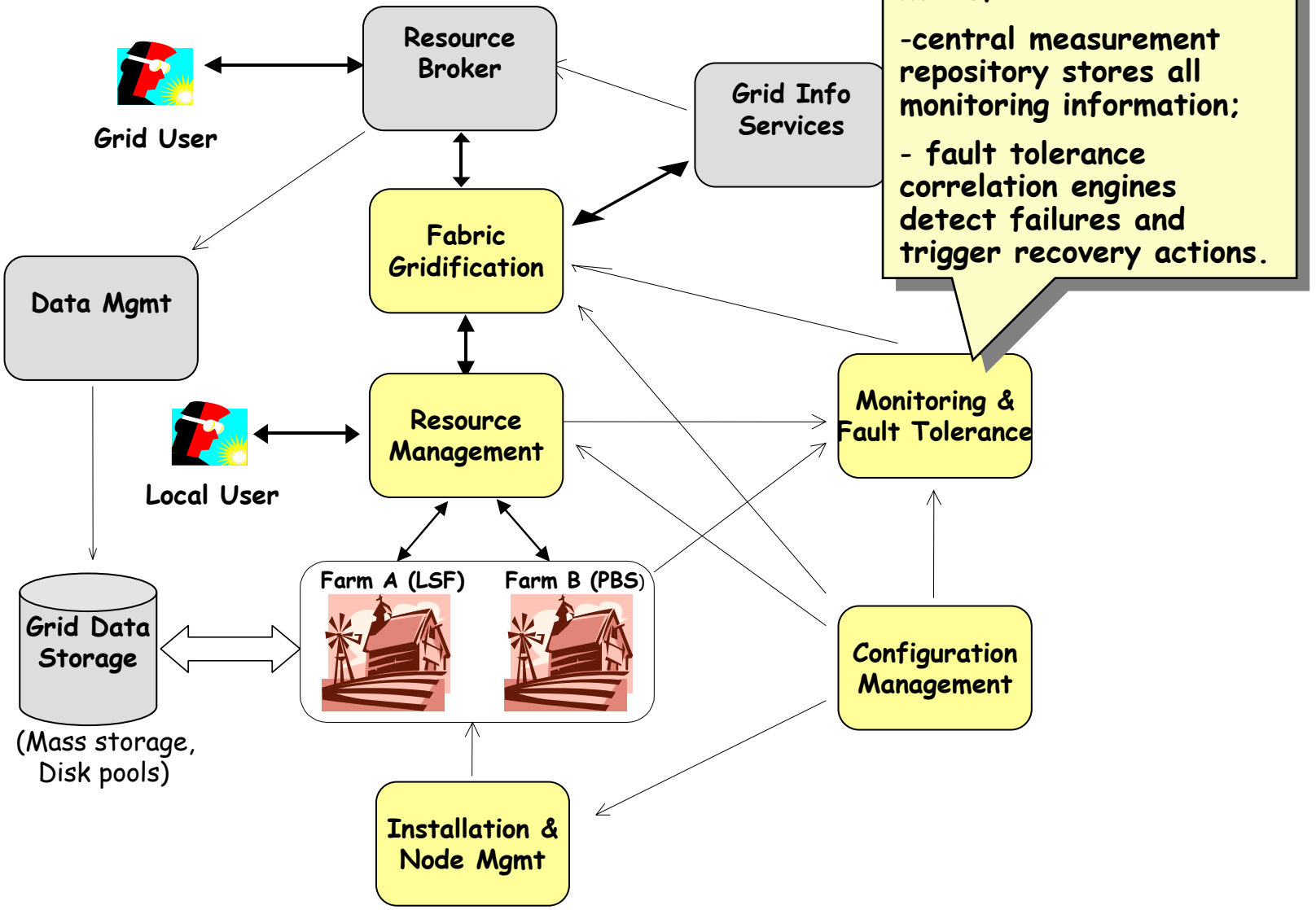
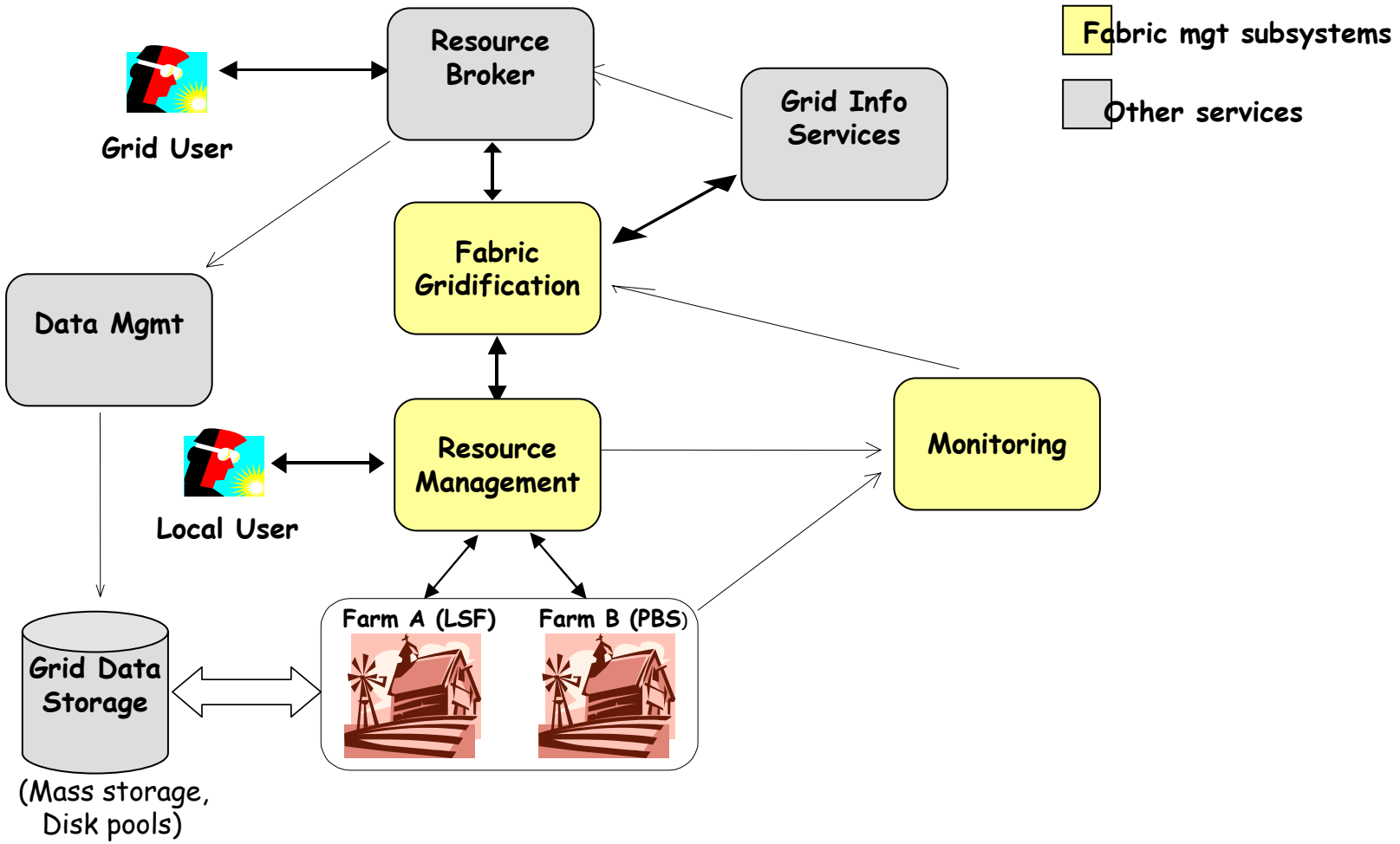


User job management (Grid and local)



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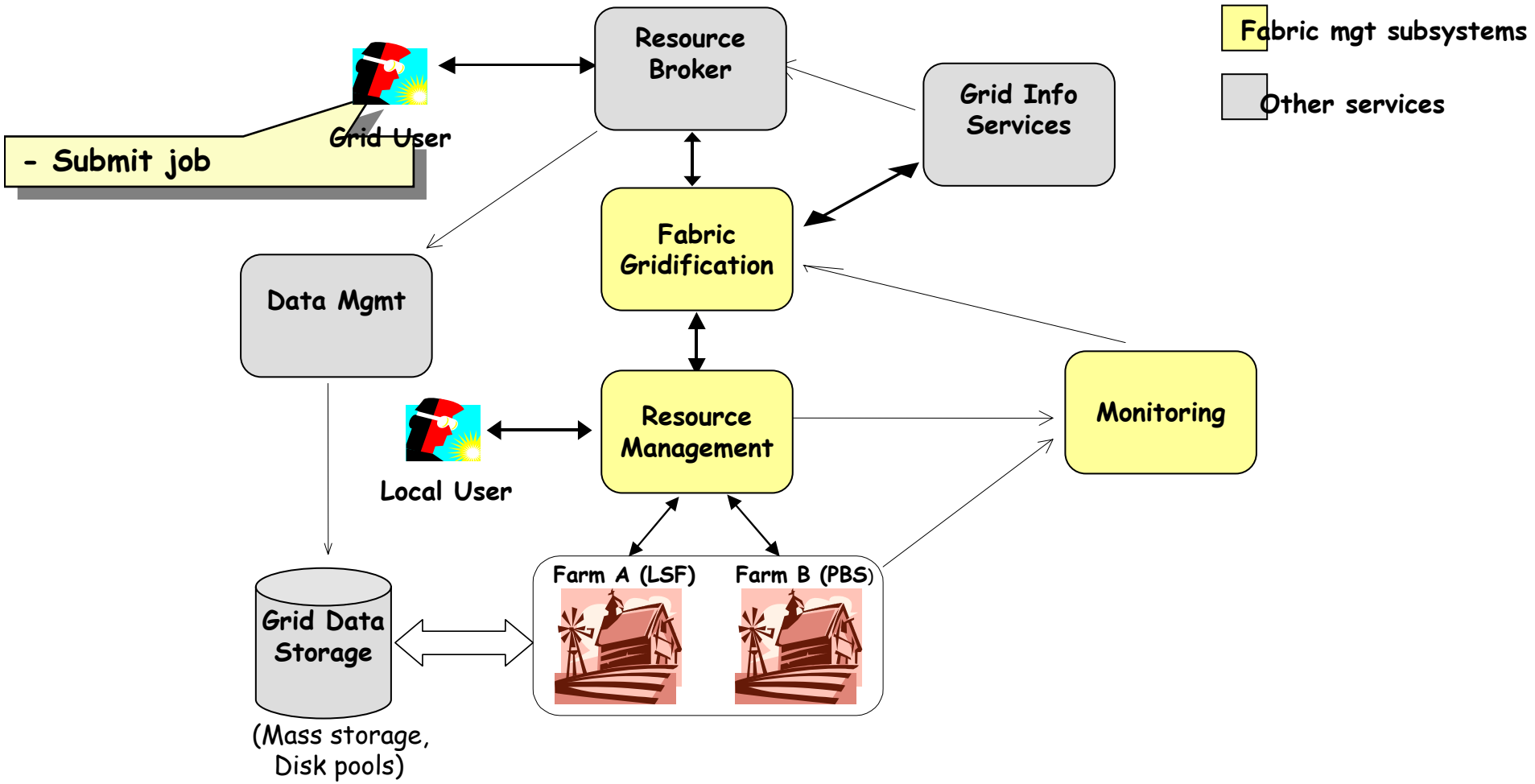

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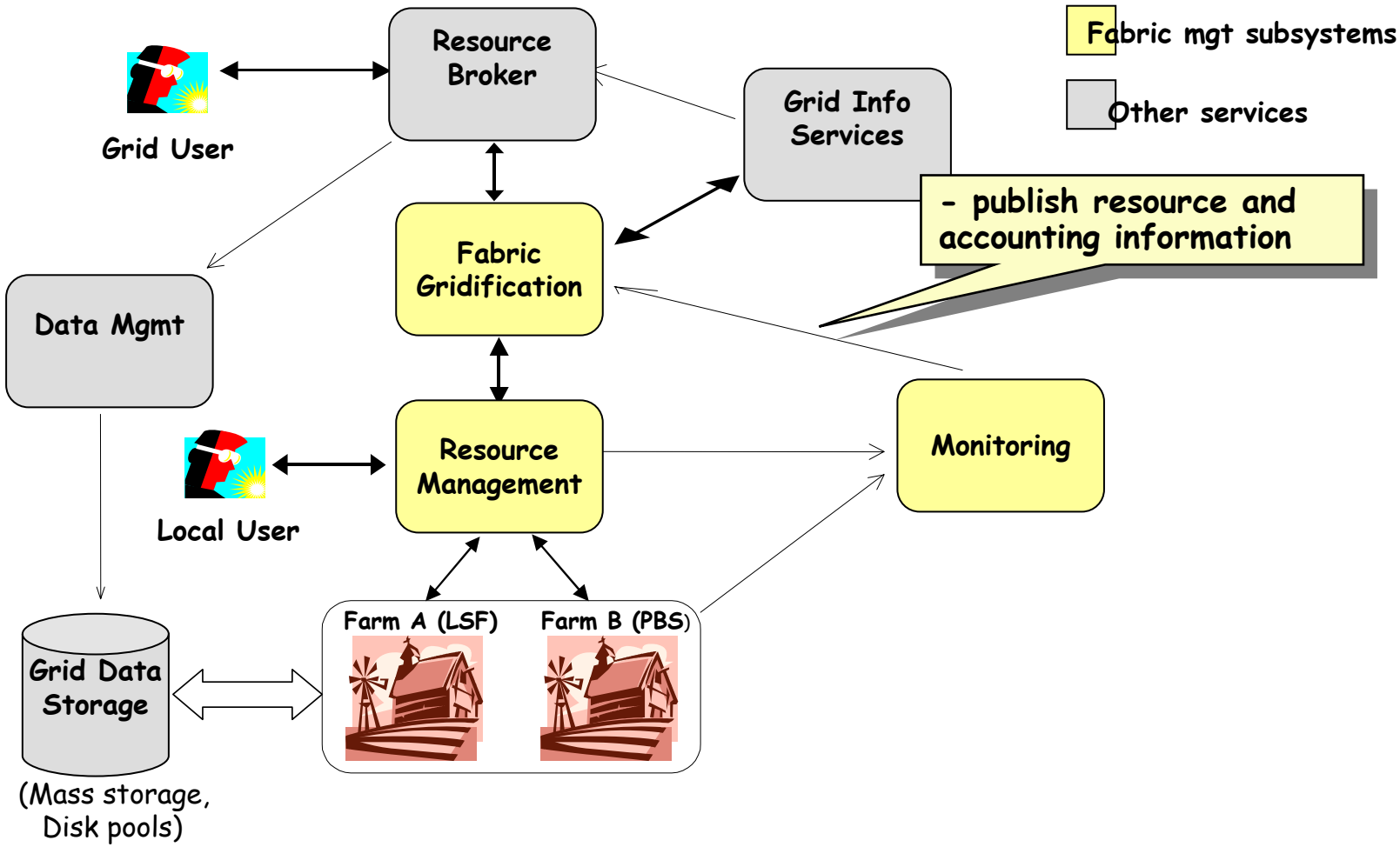

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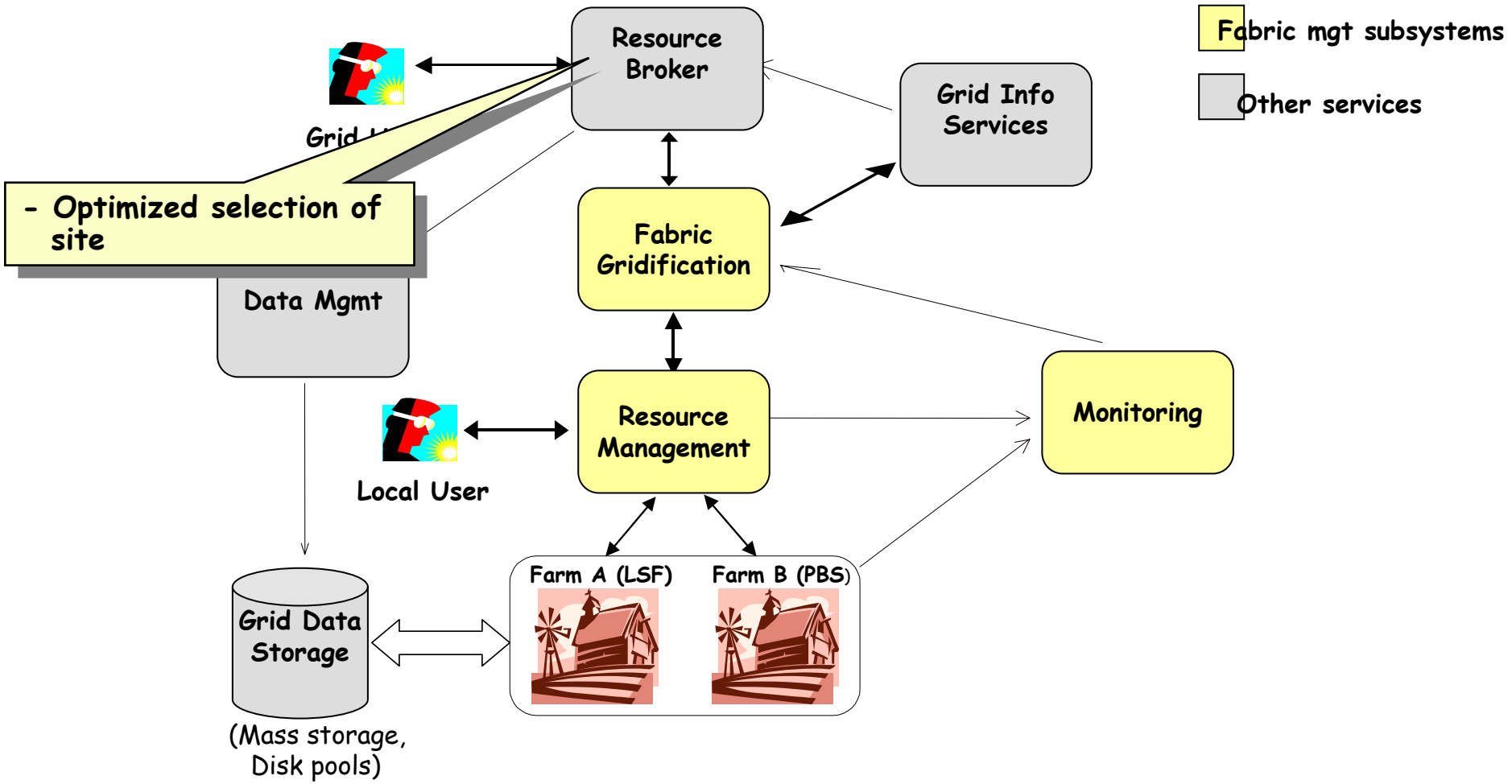

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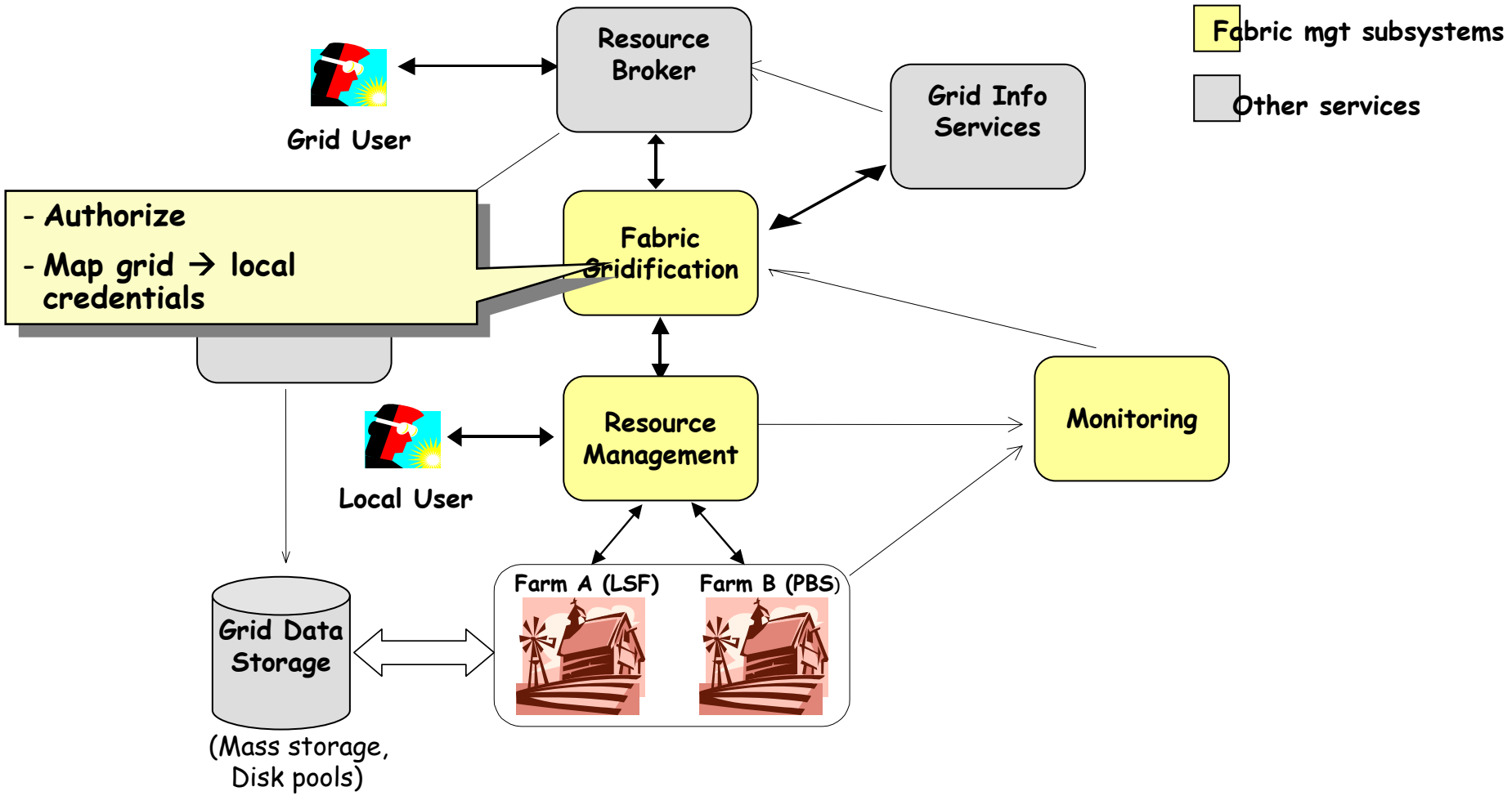

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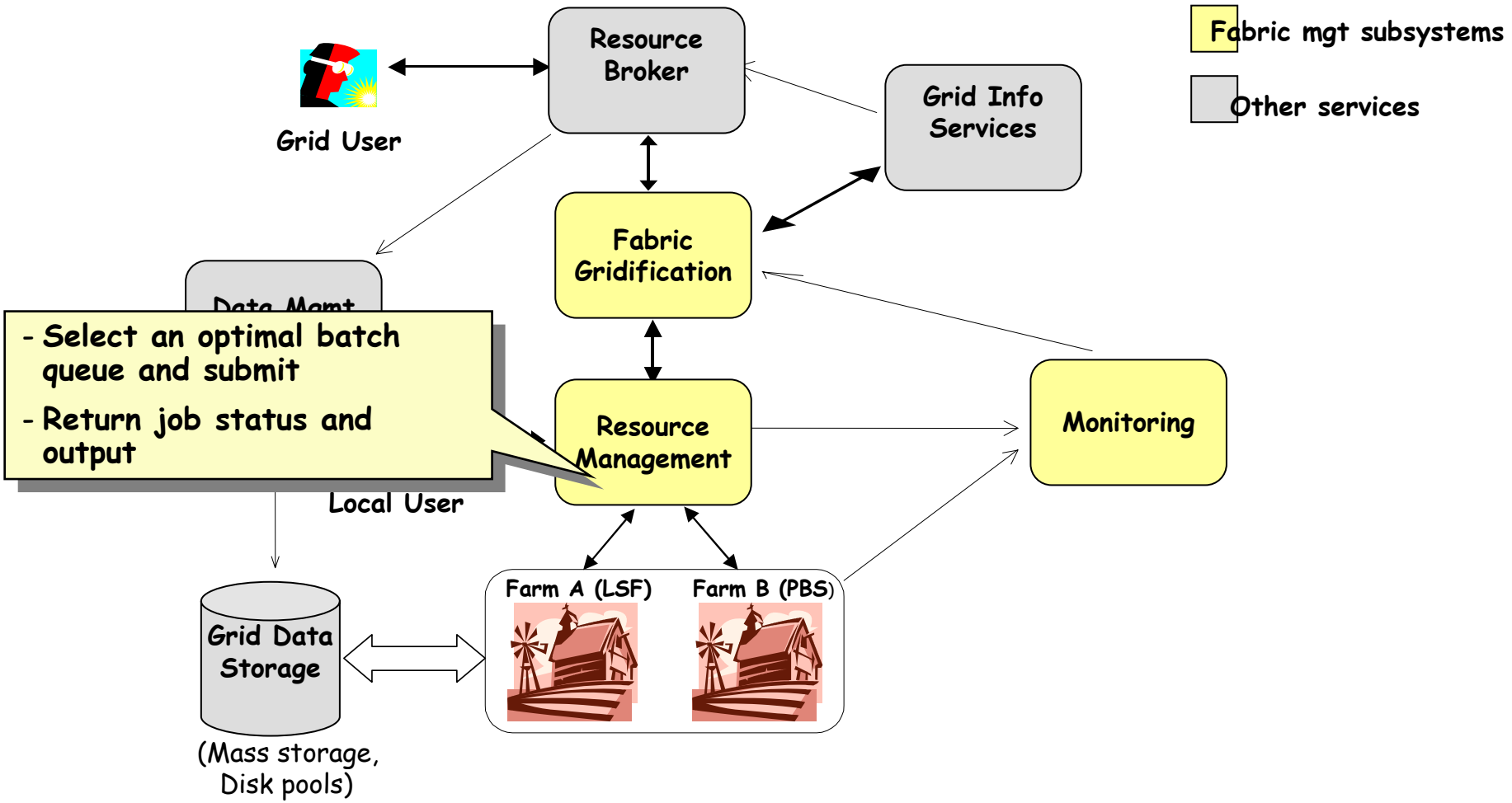


Fabric Management @ Release 1.2

- Installation and configuration:

  LCFG (Local ConFiGuration system)

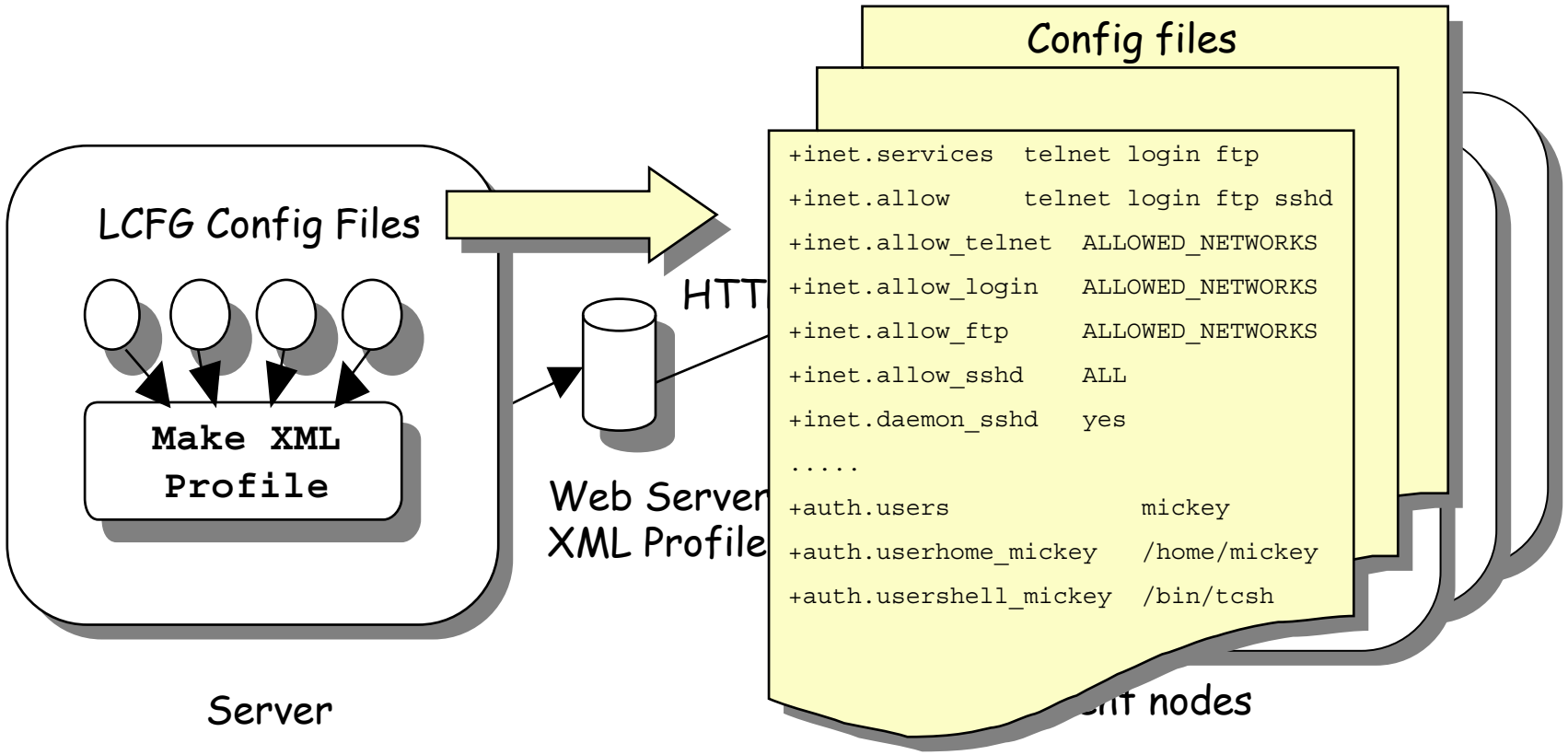
- Gridification:

  LCAS + edg_gatekeeper

LCFG (Local ConFiGuration system)

- LCFG is originally developed by the Computer Science Department of Edinburgh University
- Handles automated installation, configuration and management of machines
- Basic features:
  - automatic installation of O.S.
  - installation/upgrade/removal of all (rpm-based) software packages
  - centralized configuration and management of machines
  - extendible to configure and manage EDG middleware and custom application software

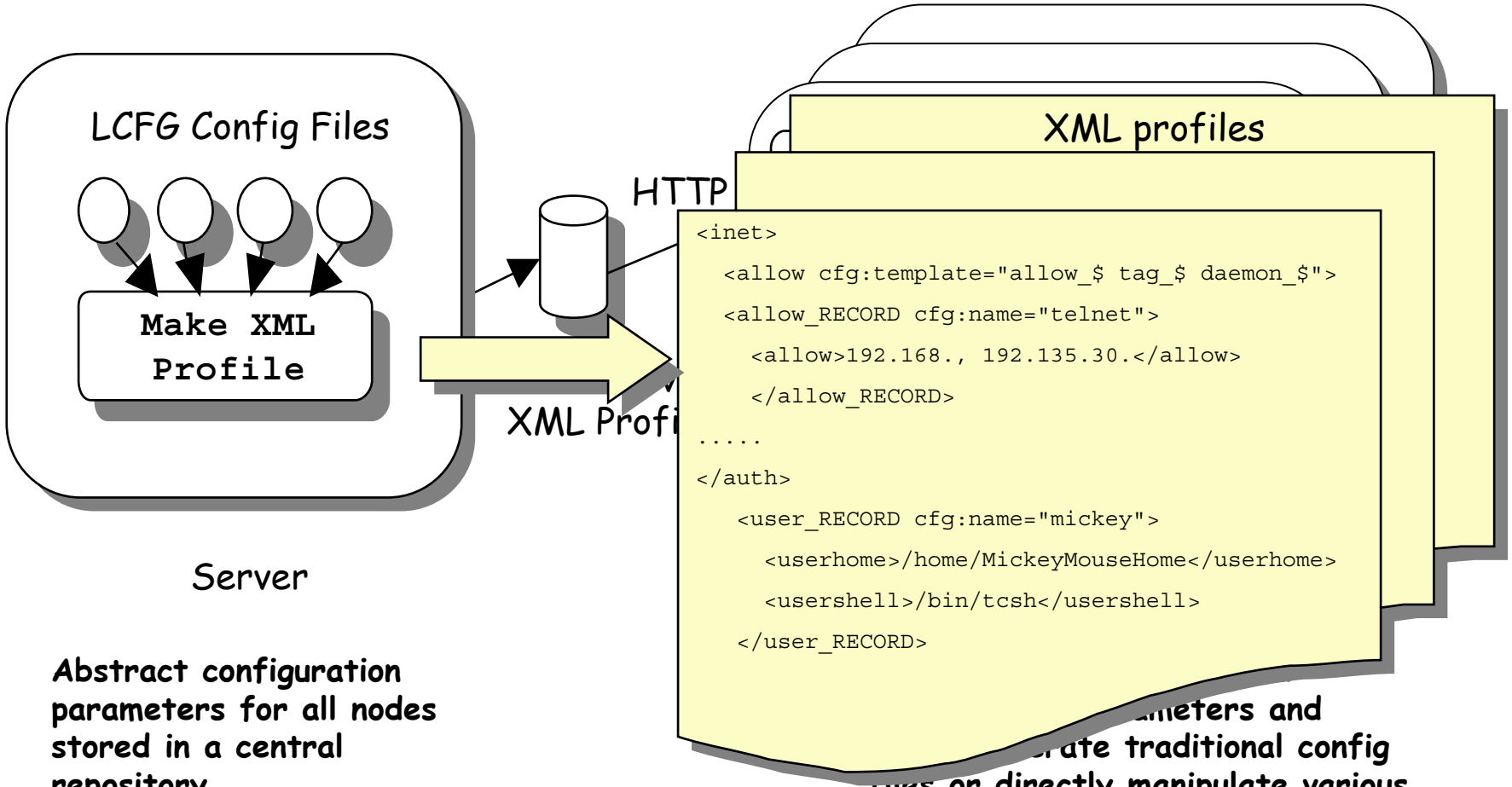
LCFG system architecture



Abstract configuration parameters for all nodes stored in a central repository

A collection of agents read configuration parameters and either generate traditional config files or directly manipulate various services

LCFG system architecture



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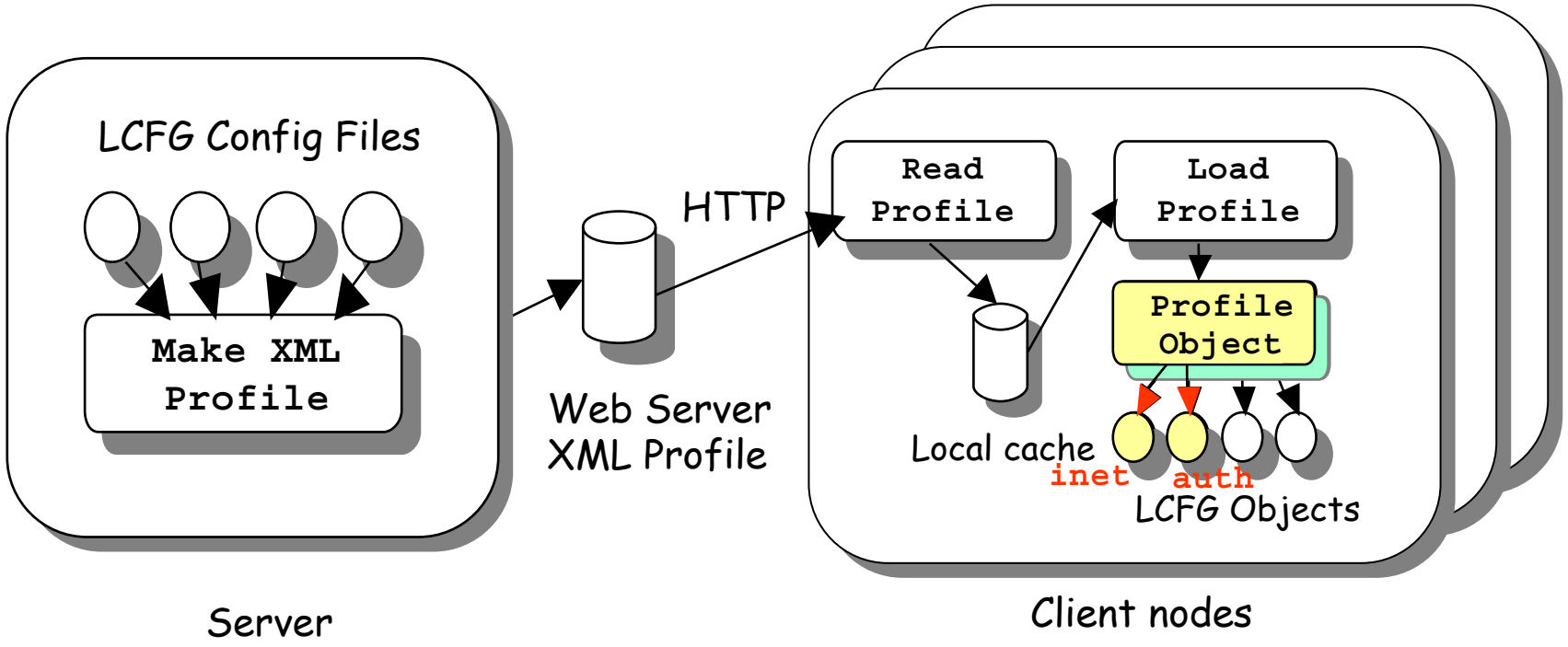

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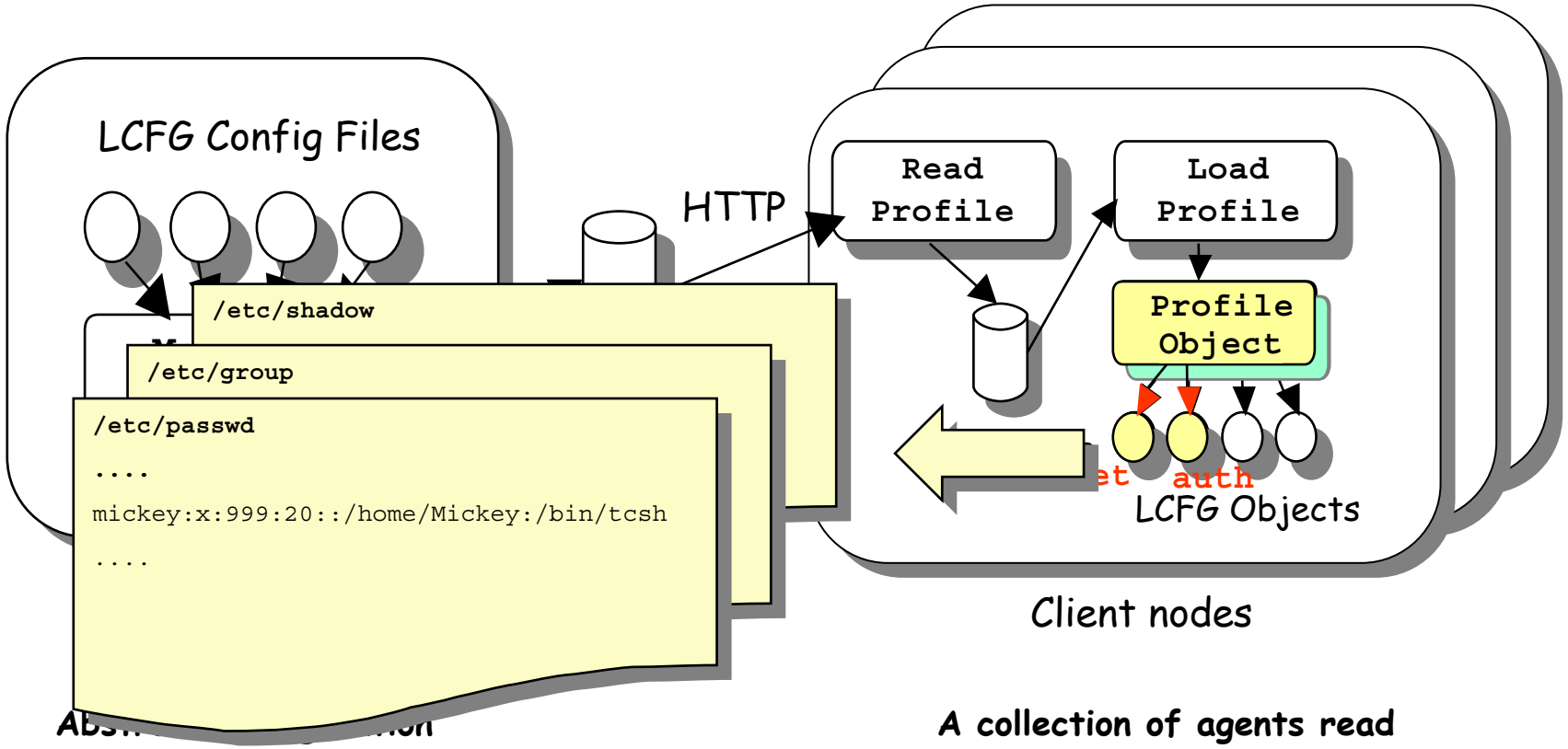


parameters for all nodes stored in a central repository

A collection of agents read configuration parameters and either generate traditional config files or directly manipulate various services

LCFG: what's a component?

- Component == object
- It's a simple shell script
- Each component provides a number of "methods" (start, stop, reconfig,...) which are invoked at appropriate times
- A simple and typical object behaviour:
  - Started when notified of a configuration change
  - Loads its configuration (locally cached)
  - Configures the appropriate services, by translating config parameters into a traditional config file and reloading a service if necessary (e.g. restarting a init.d service).
- LCFG provides components to manage the configuration of services of a machine: inet, auth, nfs, cron, ...
- Admins/mw developers can build new custom components to configure and manage their own applications

LCFG component skeleton

```
#!/bin/bash2
class=mycomp                    # set the name of the component (mycomp)
. /etc/obj/generic              # include std methods and definitions
Start() {                       # Start the component
}
Configure() {                   # Do the configuration
}
Case "$1" in                    # 'main' program
  configure)        Configure;
     *)             DoMethod "$@";
esac
```

LCFG component methods

- Start() method:

```
Start() {                          # 'Start' the component
    Generic_Start;                 # standard setup steps
    Configure;                     # reconfigure the component
    if [ $? = 0 ]; then
      OK "Component mycomp started"
    else
      Fail "Starting component mycomp"
    fi
}
```

- Configure() method:

```
Configure() {                       # Do the configuration
    LoadResources  myresource1 myresource2 …
    CheckResources myresource1 myresource2 …
    # your code
    do_whatever …
    return status;
}
```

LCFG component example (I)

ldconf component - Configures /etc/ld.so.conf *(Cal Loomis)*

.def file:

```
class           ldconf
methods         start configure
conffile
paths
```

Resources defined on server:

```
conffile        /etc/ld.so.conf
paths           /usr/local/lib /opt/globus/lib
```

LCFG component example (II)

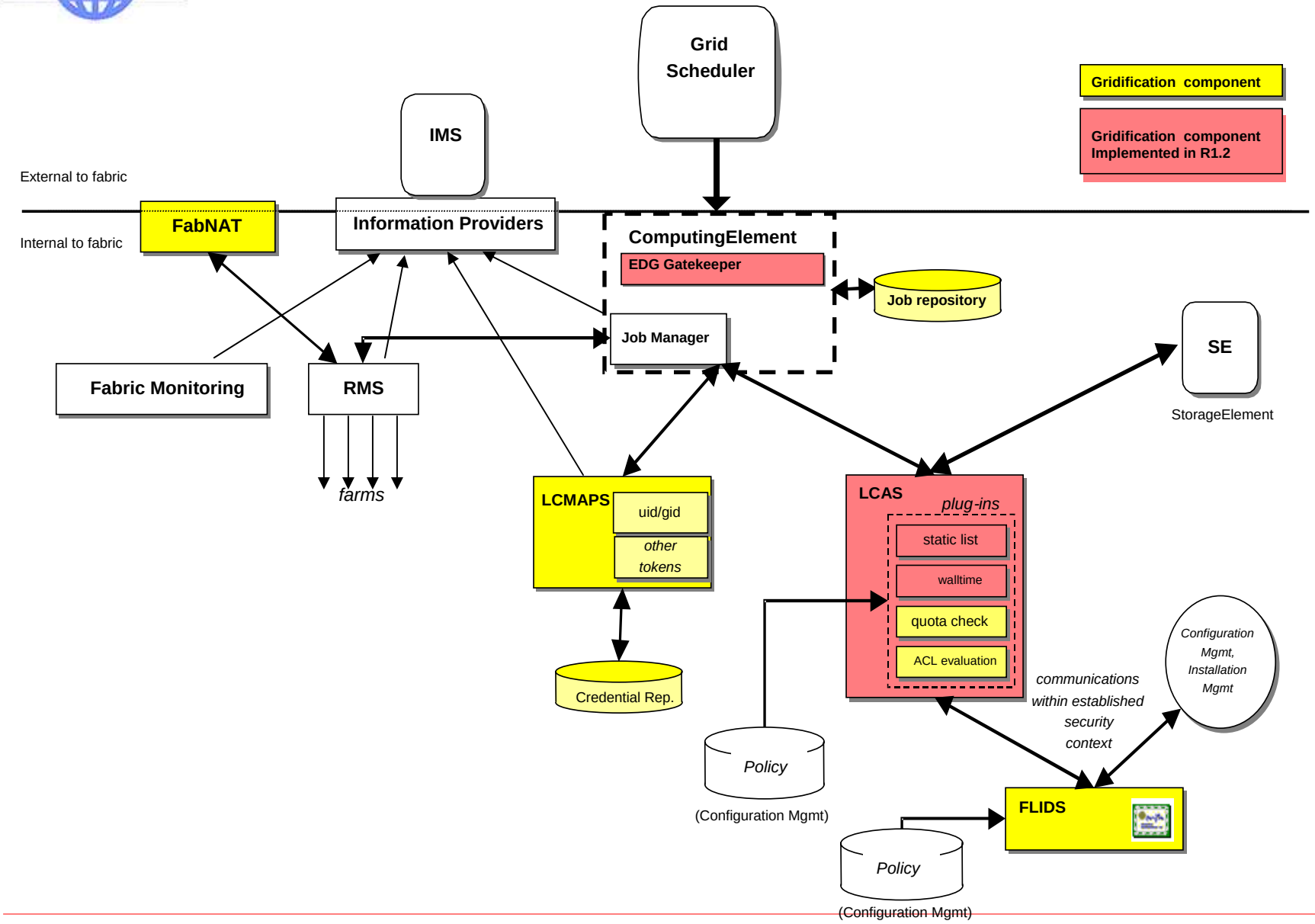
Component: Configure() method

```
Configure() {

      LoadResources  conffile paths
      CheckResources conffile paths

      # Update ld.so.conf file.
      for i in $paths; do
          line=`grep $i $conffile`
          if [ -z "$line" ]; then
              echo "$i" >> $conffile
          fi
      done
      /sbin/ldconfig;
      return $?;
 }
```

Software distribution with LCFG

- It is done with an LCFG component called updaterpms.
- The standard system packaging format is used: `rpm` for Linux
- It is managed as any other LCFG component.
- Functionality:
  1. Compares the packages currently installed on the local node with the packages listed in the configuration
  2. Computes the necessary install/deinstall/upgrade operations
  3. Orders the transaction operations taking into account rpm dependency information
  4. Invokes the packager with the right operation transaction set
- Packager functionality:
  1. Read operations (transactions)
  2. Downloads new packages from repository
  3. Executes the operations (installs/removes/upgrades)

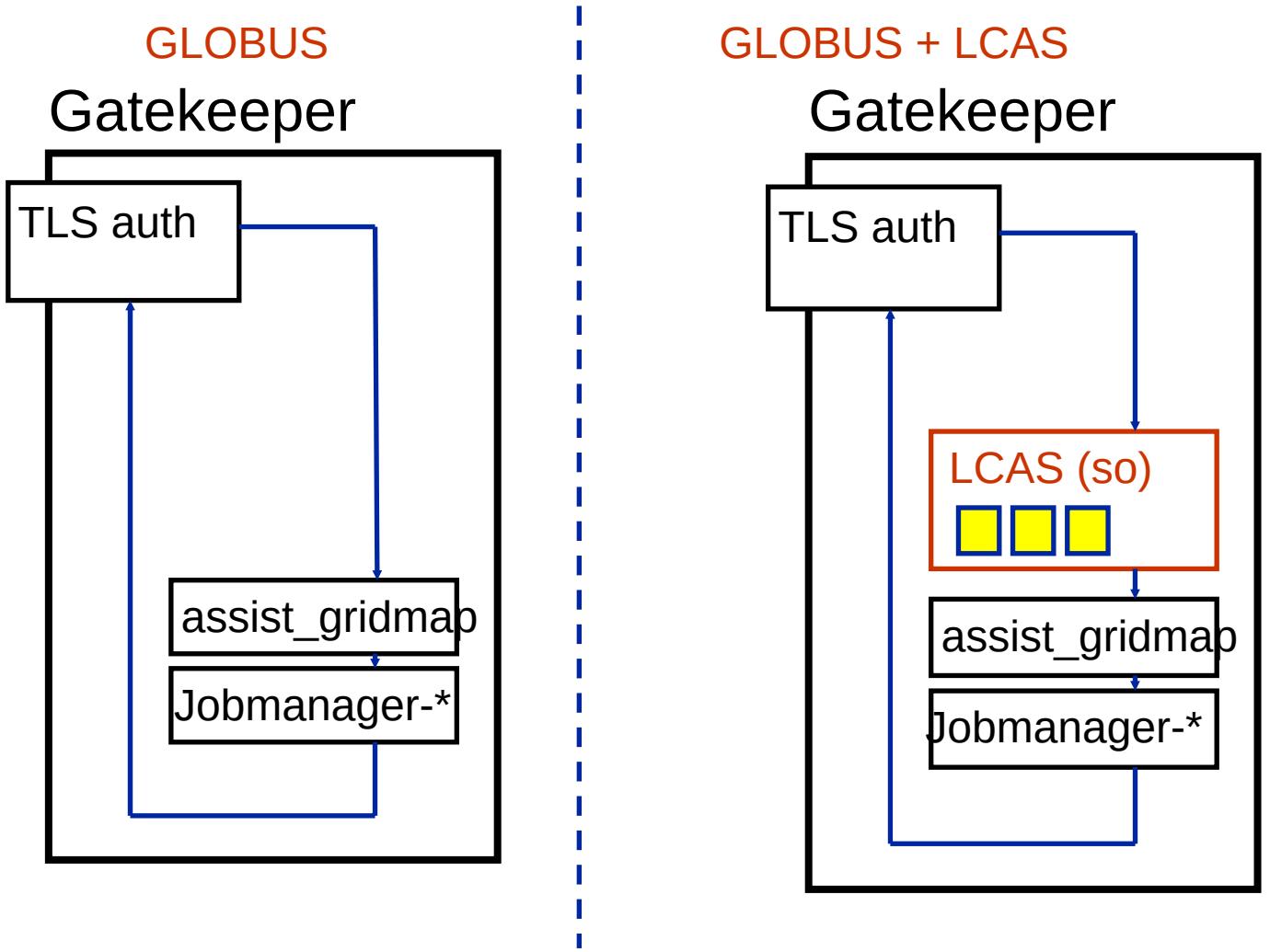
Gridification Architecture



LCAS 1.0 (EDG release 1.2)

- 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

Summary

- Two main fabric management components deployed on release 1.2:
- Installation and Configuration management functionality:
  - LCFG (Local ConFiGuration system): handles automated installation, configuration and management of machines.
- Gridification functionality:
  - LCAS (Local Centre Authorization Service) + edg_gatekeeper: handle authorization requests to the local computing fabric.
- And more components coming in next releases in the areas of fabric monitoring, resource management, and configuration management.
- Experience and conclussions from this release: automatic installation and configuration of the DataGrid middleware was very useful for the testbed due to the complexity of the software.