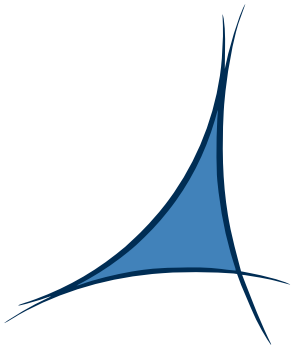

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Site integral management with Puppet

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PIC (Port d'Informació Científica)

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2. Puppet Architecture
3. Puppet Internals
4. Puppet in production: examples
5. Conclusions

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Introduction

- PIC (Port d'Informació Científica) is a data center of excellence for scientific-data processing.
- Current capacities: 4PB on disk, 3.5PB on tape and 3k cores
  - >600 servers and >70 diferent profiles
- Services group is composed by 8 people
- Persons/services balance indicates:
  - Clear need for centralized management tools
  - Target on automation
- Different tools evaluated since 2003, some basic (scripts) and some complex (quattor)
- In 2010 puppet was adopted as our central management tool.

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Introduction - Puppet Highlights

- Offers a gradual integration
- Declarative Language
- Ensure an homogeneous environment (transversal configs)
    - And service specific tuning on demand
- Runs over several O.S. platforms
    - High flexibility for adapting new projects (new requirements)
- Deploy personalized modules
- Quick benefits:
    - decrease of the administration load
    - reduction of human administration errors
    - Rapid & reusable configuration
- Great community support

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Puppet Architecture - Services handled with puppet (100%)

GridFTPs

Core Servers

dCache Pools
- Solaris
- Linux

C.E./CreamC.E.

L.F.C.

W.N.

P.B.S. ... F.T.S.

...and NON-CORE SERVICES!

Tape Servers

Core Servers

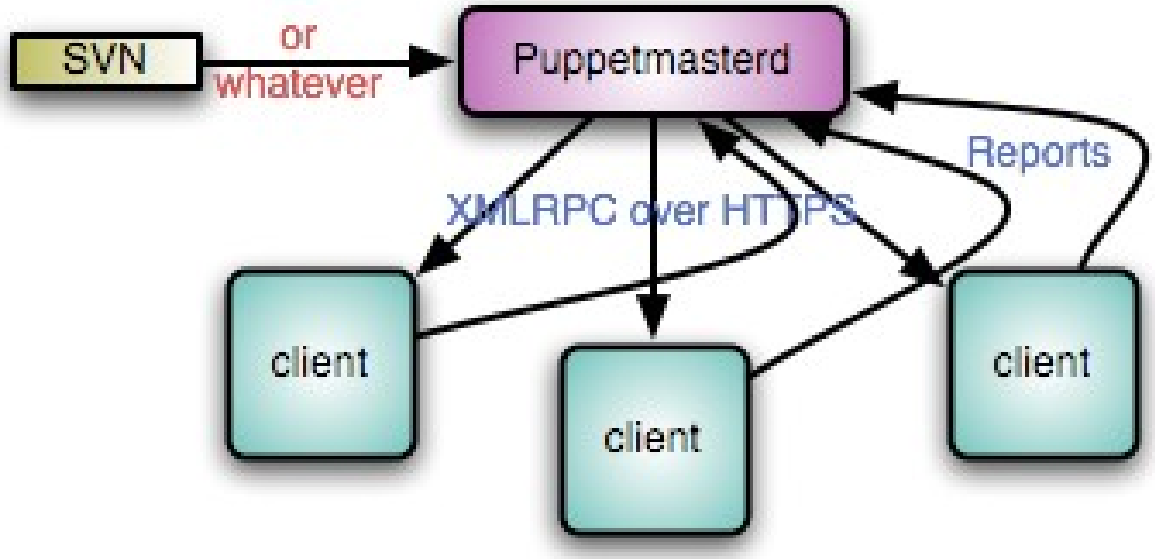
...

Pakiti

N.F.S.

Squid

Puppet Architecture



- Encrypted communication
- Agent receives a compiled catalog describing the desired configuration
- Puppet agent takes on the job to apply changes (configurations) if needed

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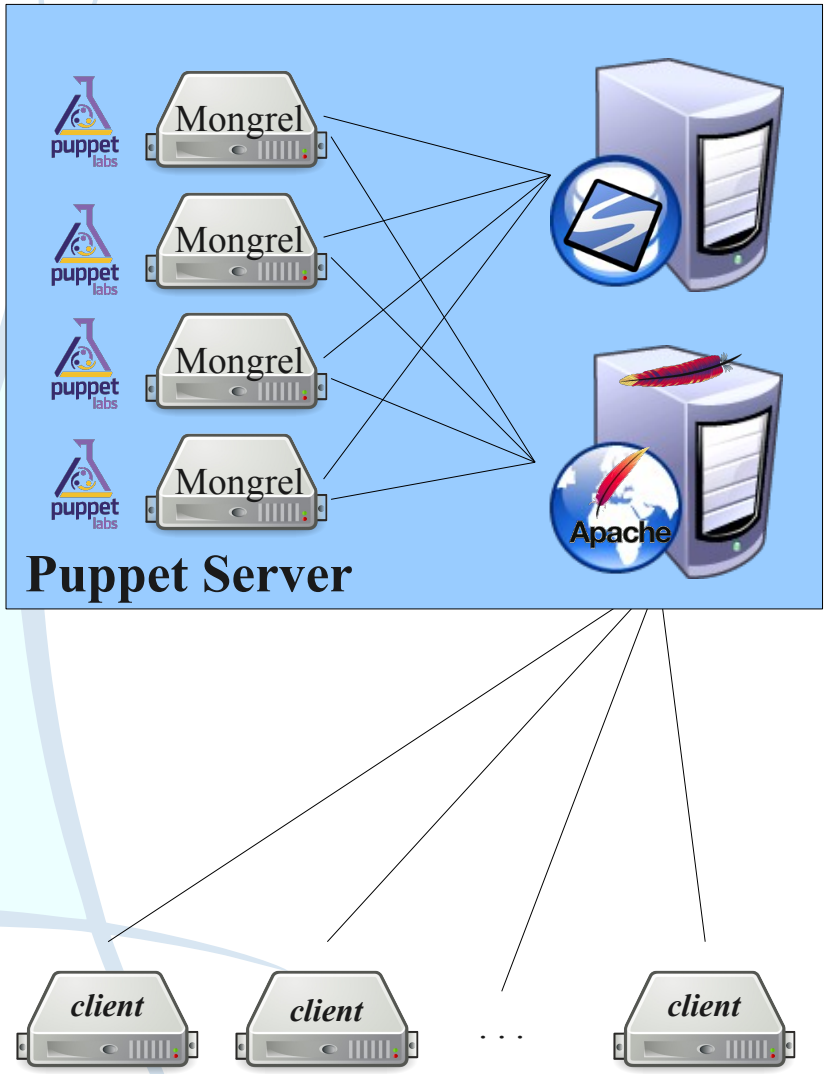
Puppet Architecture - Server Configuration

- Default HTTP Server: Webbrick
  - SSL
  - No Load Balancing
  - Does not scale
- Puppet + Mongrel + Apache
  - SSL Manager (Apache)
  - Load Balancing (Apache)
  - Mongrel allows to run several puppetmaster daemons
- SVN keeps code up2date
  - Change Control
  - Code update errors check



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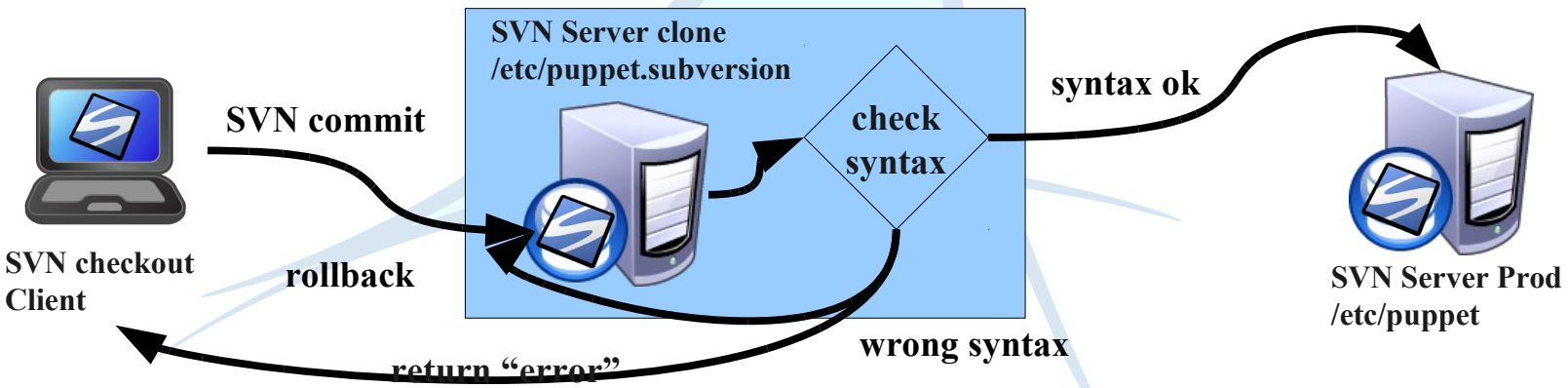
Puppet Architecture - Change Control & Workflow

- Production SVN location: /etc/puppet
- Services are served under the directory:

  /etc/puppet/manifests/services/$module

  – We configure which modules (services) we enable importing them at /etc/puppet/manifests/site.pp
- Syntax check on /etc/puppet.subversion before any SVN commit operation
  – Correct Syntax.: upload changes to /etc/puppet
  – Wrong Syntax: rollback on /etc/puppet.subversion



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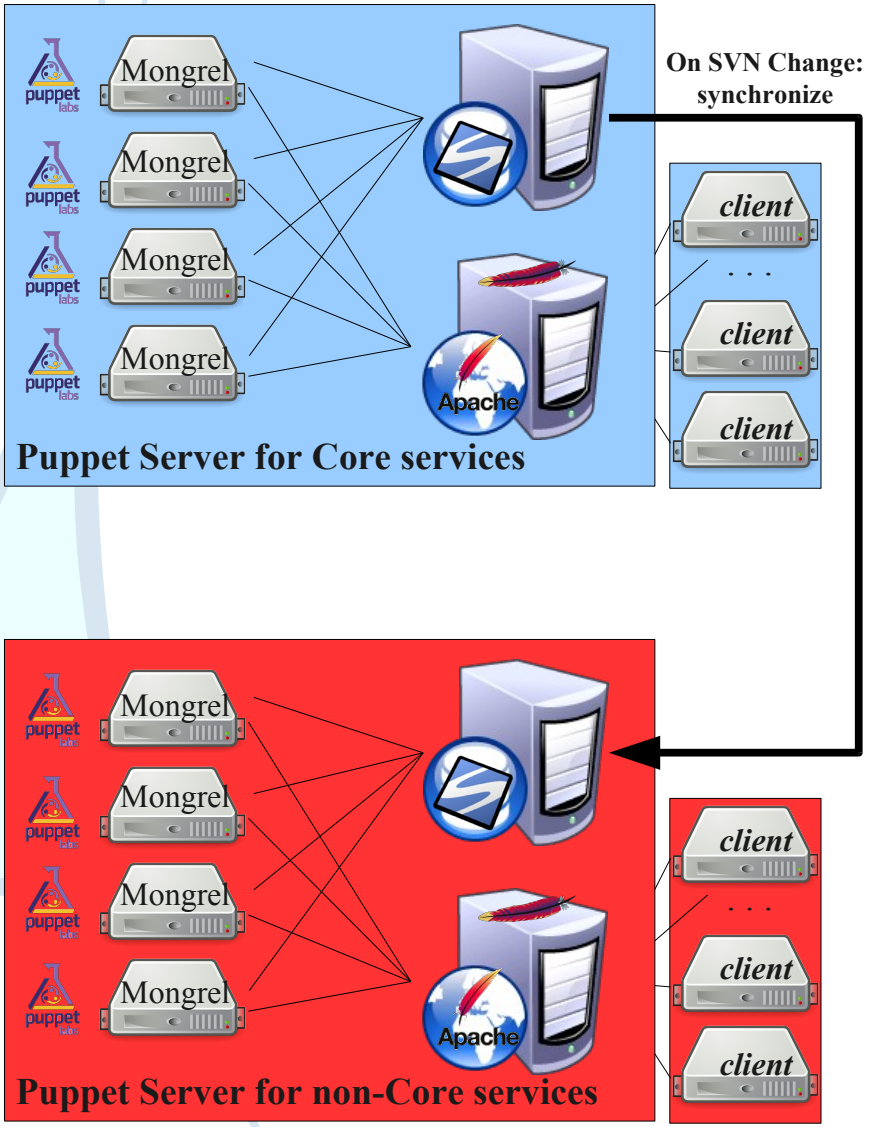
Puppet Architecture - Core vs. non-Core Services

- Puppet Server dedicated for non-Core services
- SVN sync
- Common puppet basic profile for all nodes hosted at pic
- Service modules from Core Puppet Server can be reused
- Non-core services users can build their own modules



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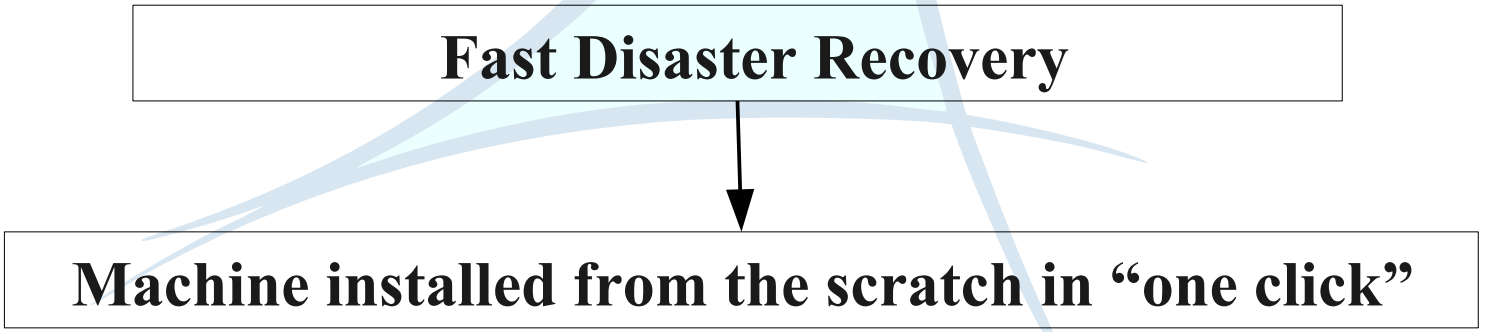
Puppet Architecture - PIC streamlined machine installation system

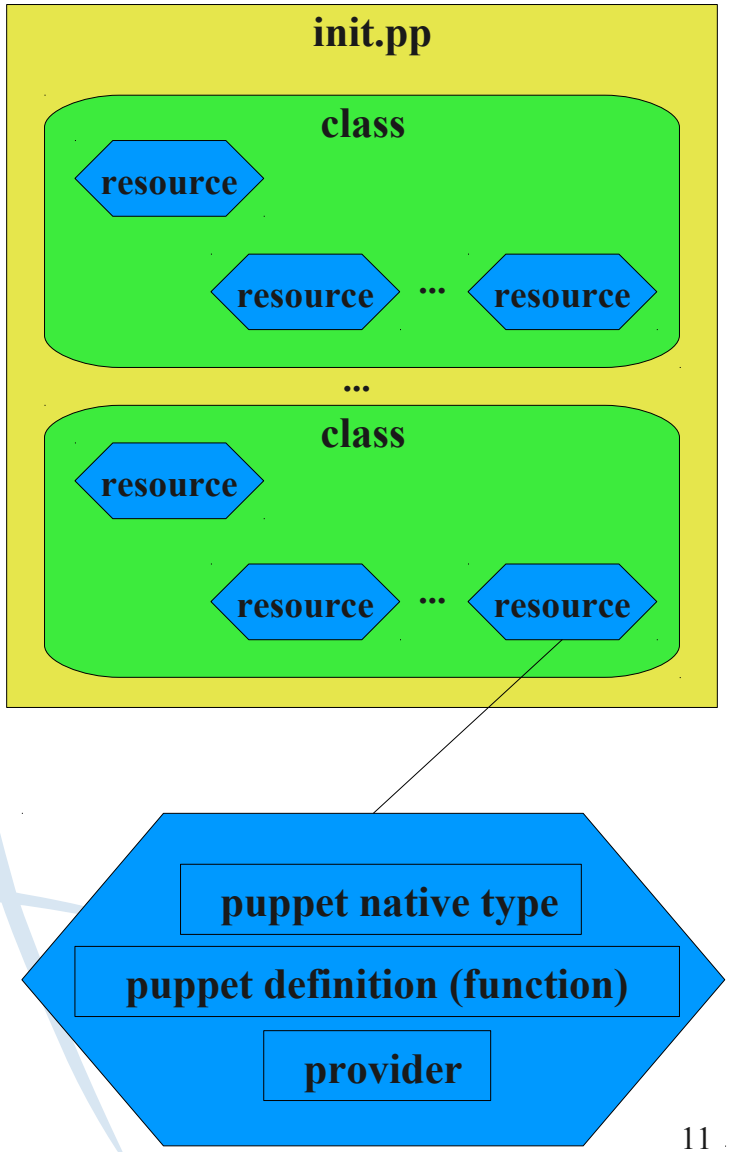
- Installation is done via PXE.
- Custom kickstart files are created by local script
- Custom postinstall is added
  - Adds local puppet repo
  - Installs desired puppet client version
  - Runs puppet against server
- The host wakes up configured and “linked” to puppet server
  - which is the case for every host at pic



Puppet Internals - Puppet Module (I)

- A Puppet module is a collection of:
  - resources
  - classes
  - files
  - definitions
  - templates

```
MODULE_PATH/
    downcased_module_name/
        files/
        manifests/
            init.pp
        lib/
            puppet/
                parser/
                    functions
                provider/
                type/
            facter/
        templates/
        README
```



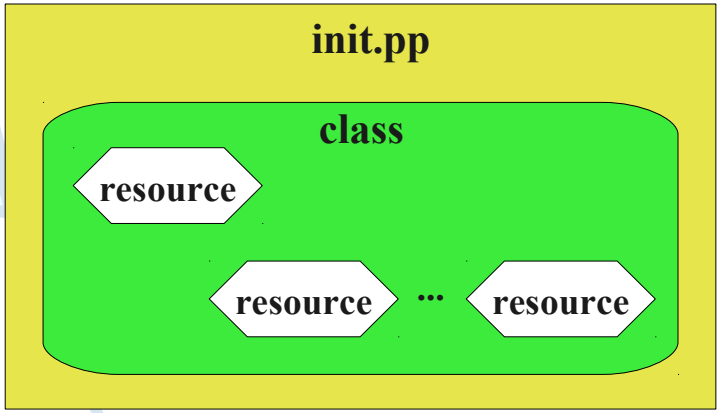
Puppet Internals - Puppet Module (II)

```
class bacula_client {

        package { 'bacula-client.$architecture':
            ensure   => latest,
            alias    => "bacula",
            provider => yum,
            require  => Repo["sl55${architecture}.repo"];
        }

        file { "bacula-fd.conf": # ... ; }

        service { "bacula-fd": # ... ; }
}
```



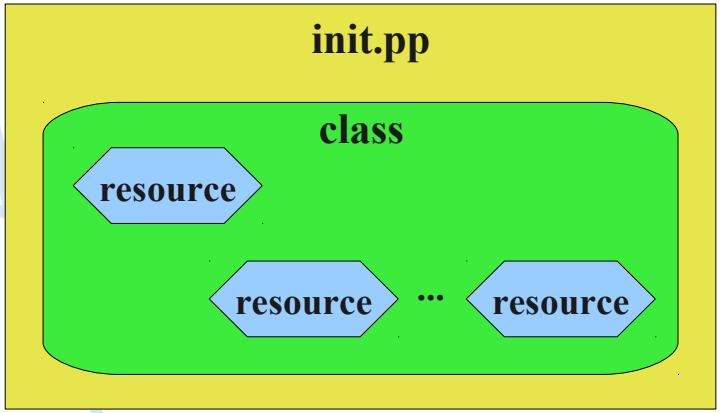
Puppet Internals - Puppet Module (III)

```
class bacula_client {

        package { 'bacula-client.$architecture':
            ensure   => latest,
            alias    => "bacula",
            provider => yum,
            require  => Repo["sl55${architecture}.repo"];
        }

        file { "bacula-fd.conf": # ... ; }

        service { "bacula-fd": # ... ; }
}
```

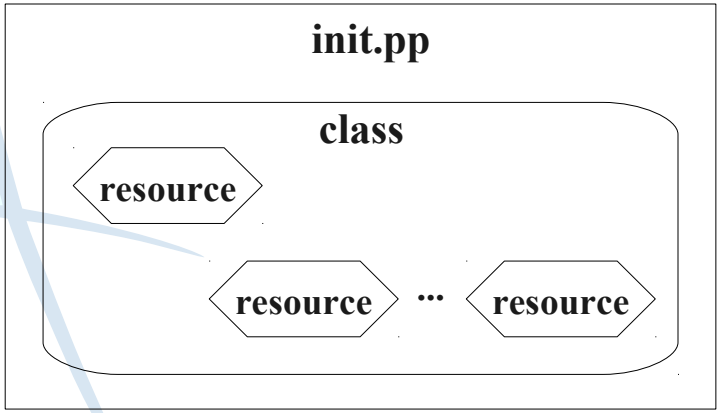


Puppet Internals - Puppet Module (IV)

Resource type

```
package { 'bacula-client.$architecture':
        ensure   => latest,
        alias    => "bacula",
        provider => yum,
        require  => Repo["sl55${architecture}.repo"];
}
```

Puppet Native Resource



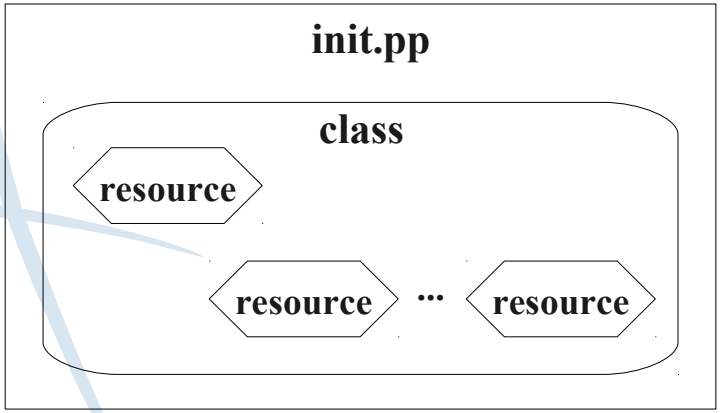
Puppet Internals - Puppet Module (V)

Resource type

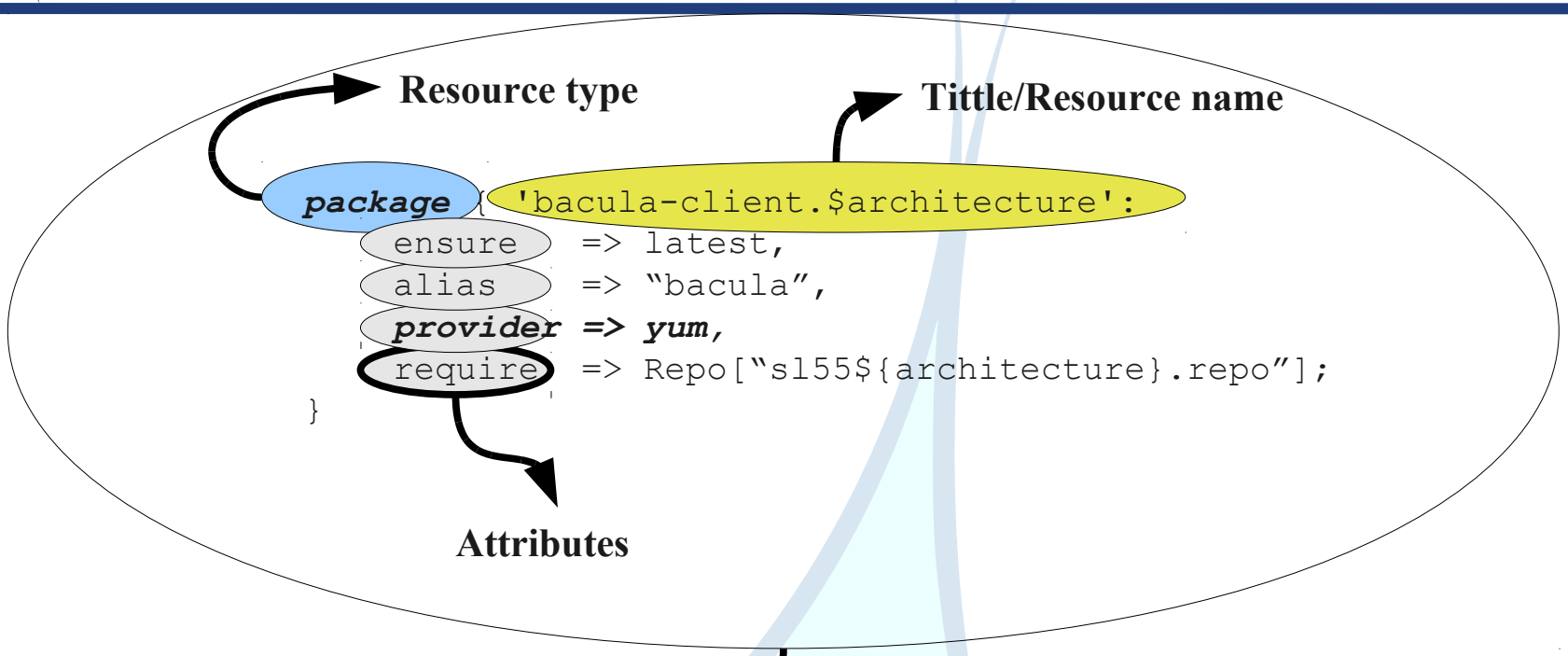
Title/Resource name

```
package { 'bacula-client.$architecture':
    ensure   => latest,
    alias    => "bacula",
    provider => yum,
    require  => Repo["sl55${architecture}.repo"];
}
```

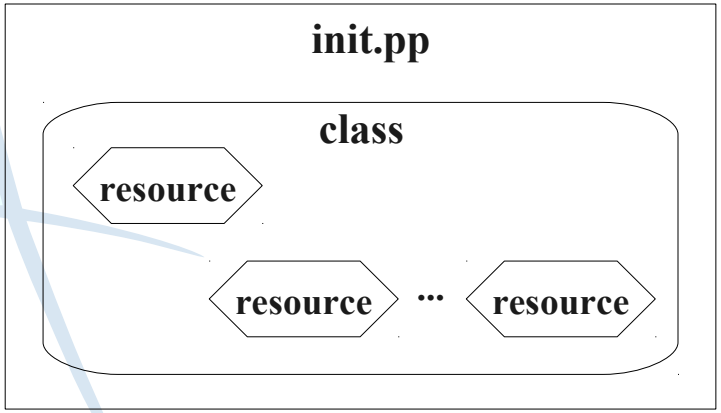
Puppet Native Resource



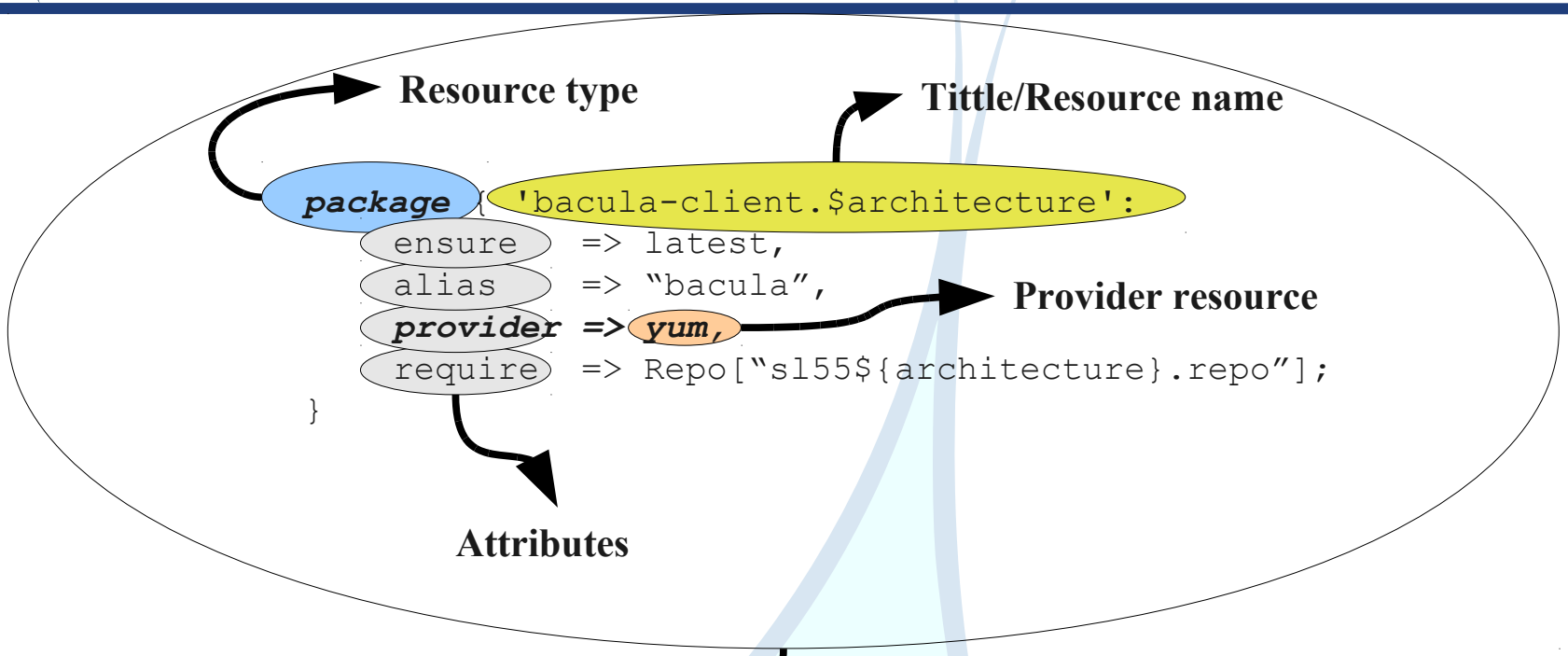
Puppet Internals - Puppet Module (VI)



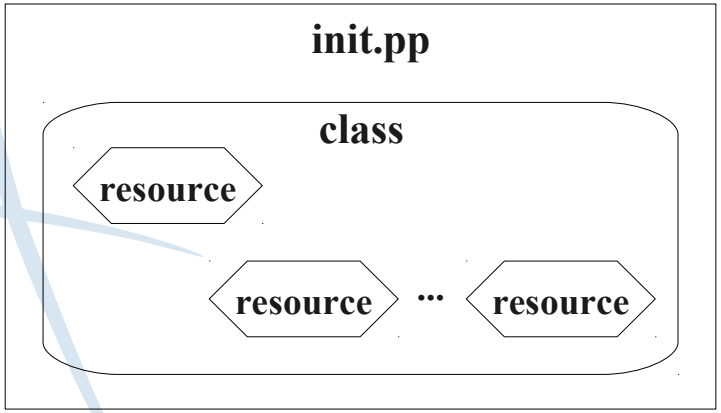
Puppet Native Resource



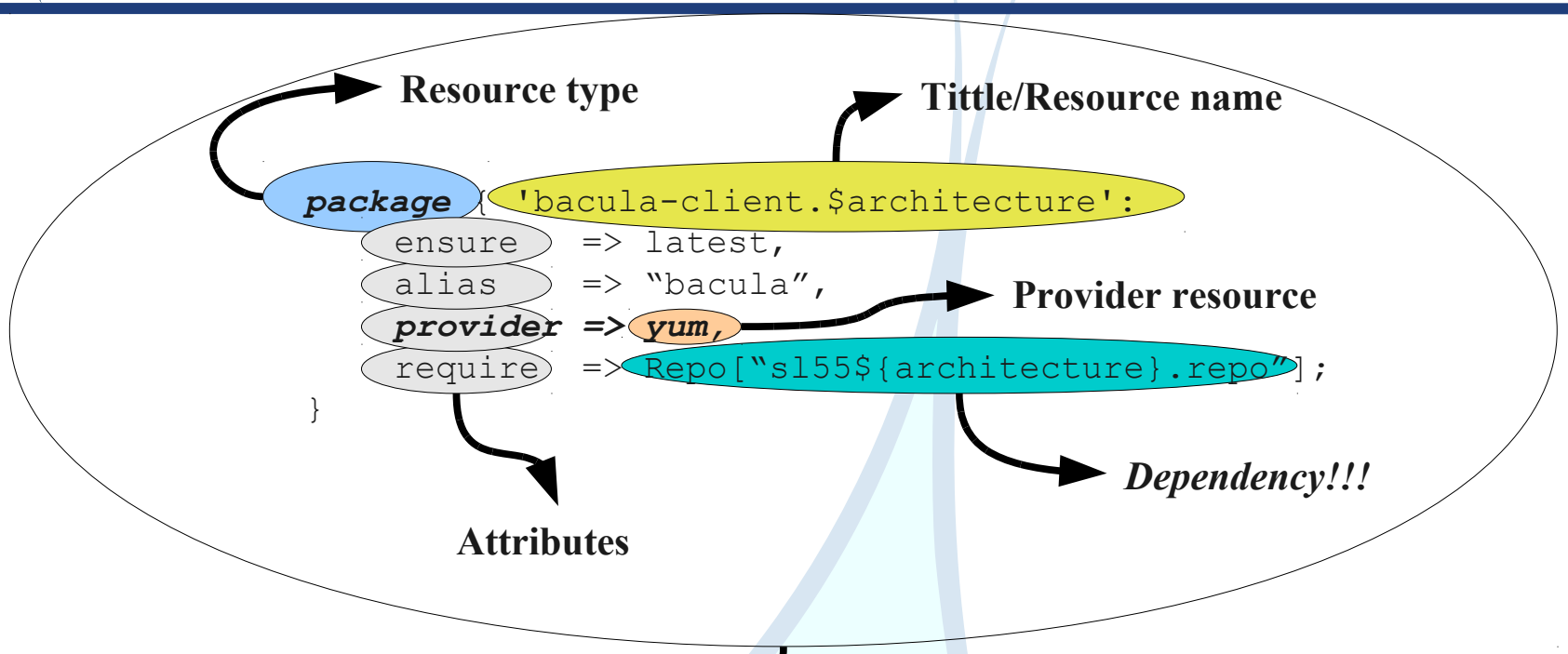
Puppet Internals - Puppet Module (VII)



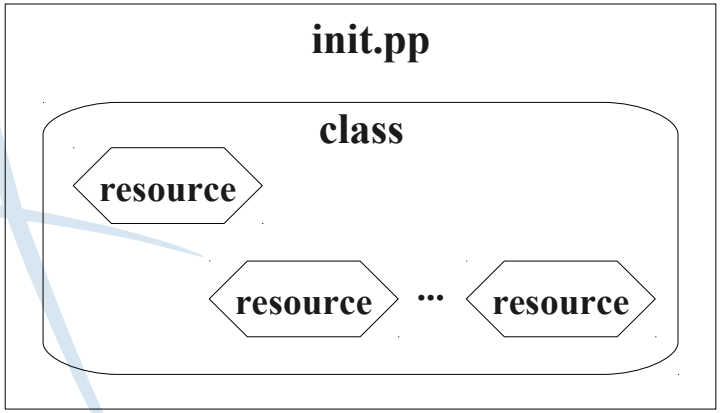
Puppet Native Resource



Puppet Internals - Puppet Module (VIII)

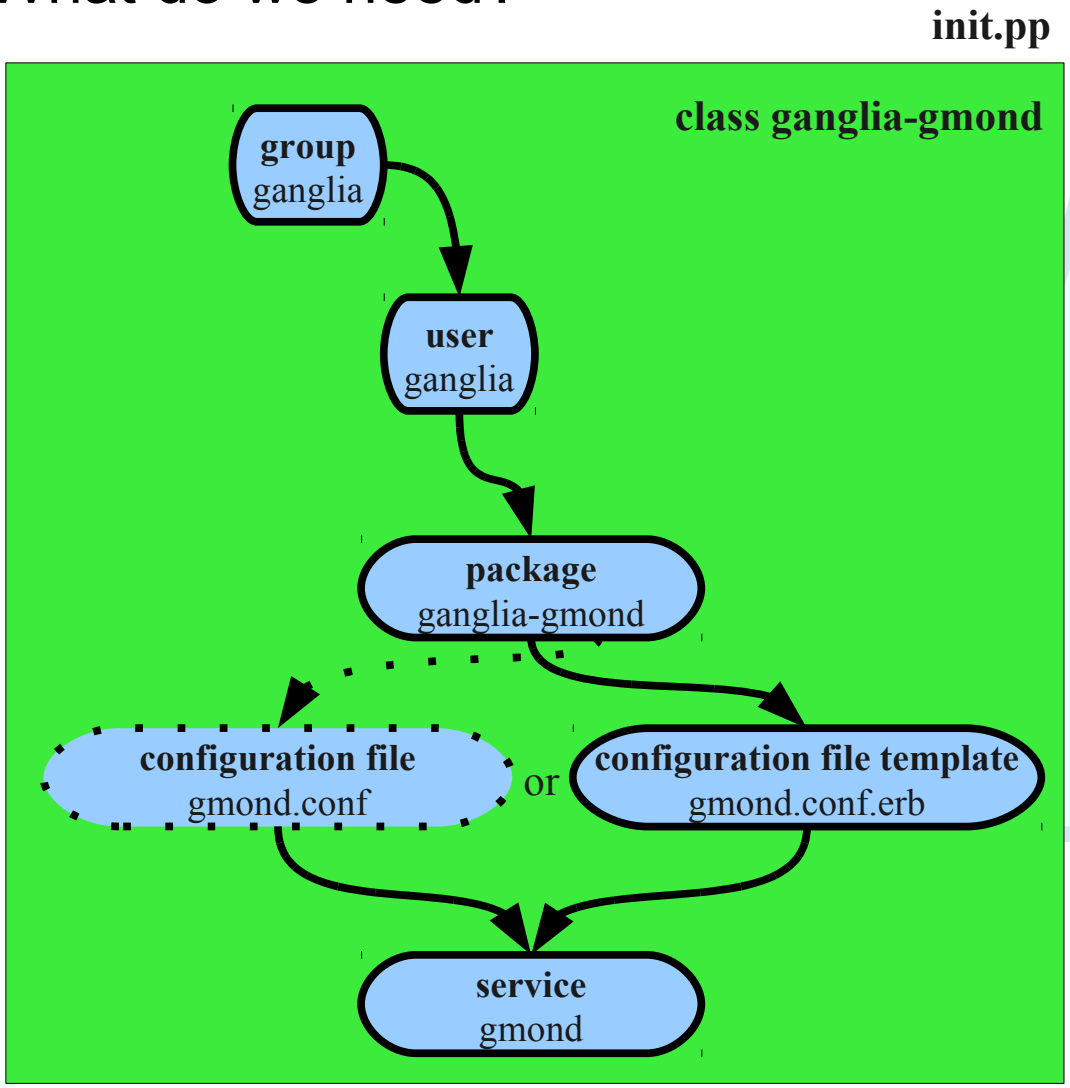


Puppet Native Resource



Puppet in production: Ganglia Client example

What do we need?




```
MODULE_PATH/
    gangliaclient/
        files/
          etc/
              gmond.conf
        manifests/
            init.pp
        lib/
            puppet/
                parser/
                    functions
                provider/
                type/
            facter/
        templates/
              gmond.conf.erb
        README
```

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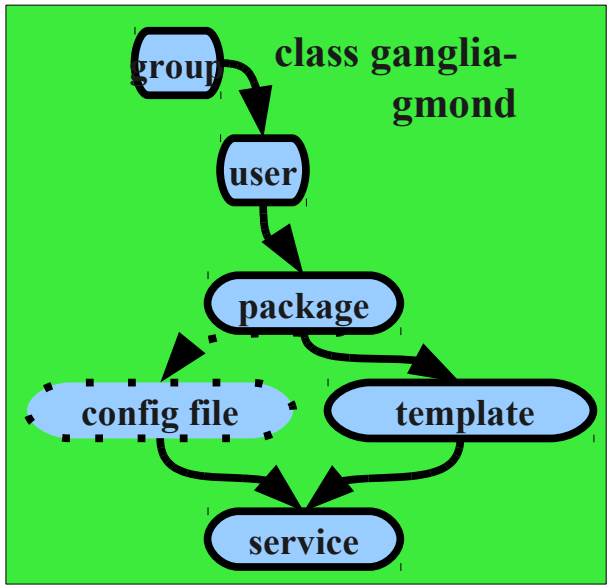
Puppet in production: Ganglia Client example

```
class ganglia {
        group { 'ganglia':
                name    => 'ganglia',
                ensure  => 'present',
                gid     => 200;
        }
        user { 'ganglia':
                name    => 'ganglia',
                ensure  => 'present',
                uid     => 200,
                gid     => 200,
                home    => '/var/lib/ganglia',
                shell   => '/sbin/nologin',
                require => Group['ganglia'];
        }
        package { "ganglia-gmond.$architecture" : require => User["Ganglia"]; }
        file { '/etc/gmond.conf' :
                content => template("common_ganglia/gmond.conf.erb"),
                notify  => Service["gmond"],
        }
        service { 'gmond':
                name    => 'gmond',
                ensure  => running,
                require => Package["ganglia-gmond.$architecture"],
        }
}
```



Puppet in production: Ganglia Client example

templates/gmond.conf.erb

```
/* Beggining of the file */

...

globals {
  setuid = yes
  user = nobody
  cleanup_threshold = 300
}

cluster {
  name = "<%= cluster %>"
}

udp_send_channel {
  mcast_join = <%= mcast_ip %>
  port = 8649
  ttl = 5
}

...
```

```
...

udp_recv_channel {
  mcast_join = <%= mcast_ip %>
  port = 8649
  bind = <%= mcast_ip %>
}

tcp_accept_channel {
  port = 8649
}

...

/* End of the file */
```

Puppet in production: YAIM module at pic

- Active
  - administrator triggers the node configuration with YAIM
- What do we need?

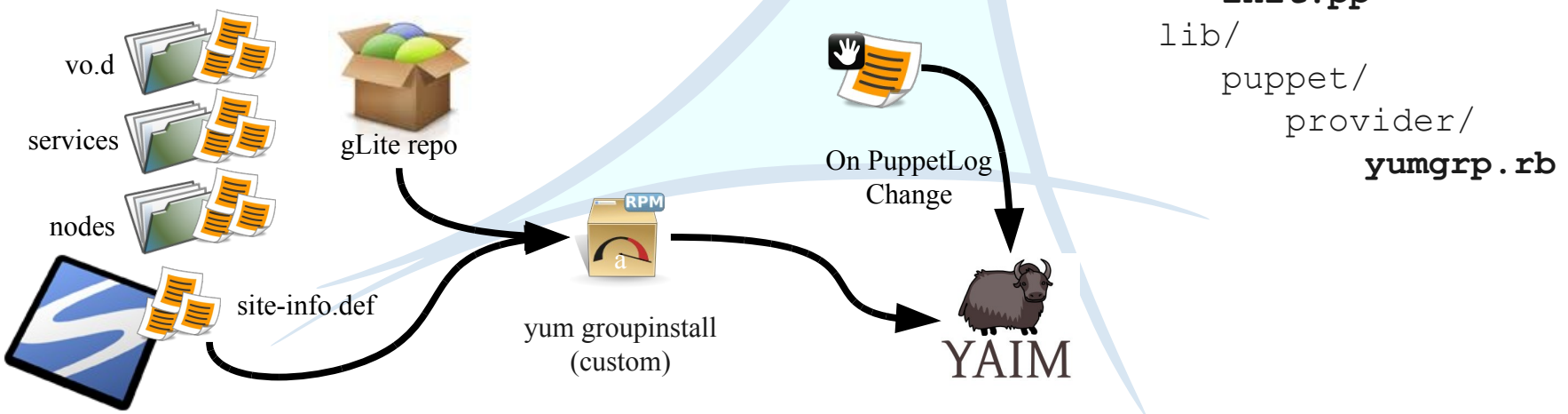
  gLite Repositories

  gLite Packages

  YAIM Configuration files

  YAIM Node Configuration

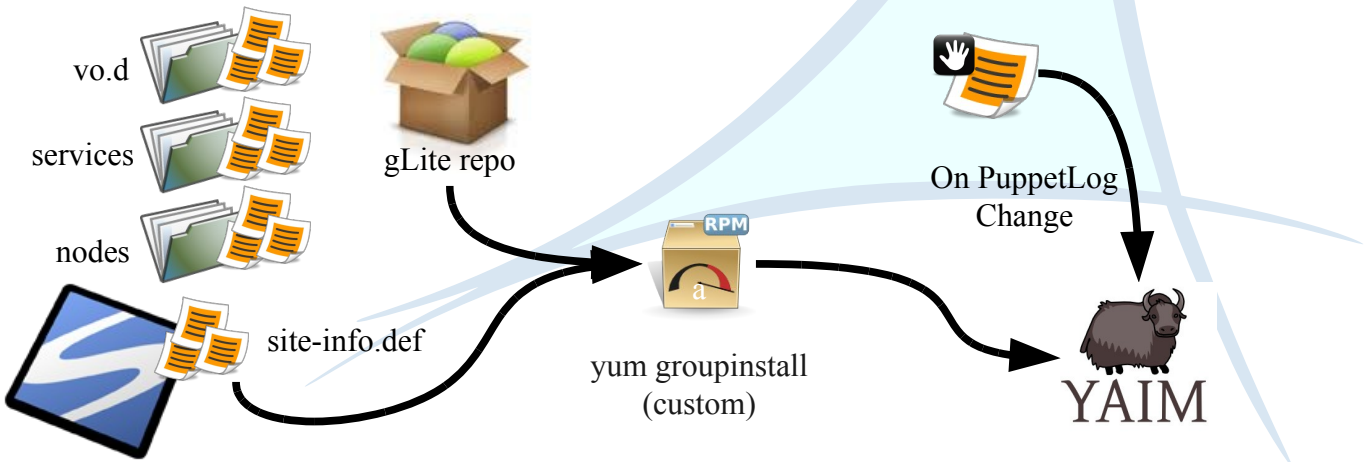
```
MODULE_PATH/
    yaim/
        manifests/
            init.pp
        lib/
            puppet/
                provider/
                    yumgrp.rb
```



Puppet in production: YAIM module at pic

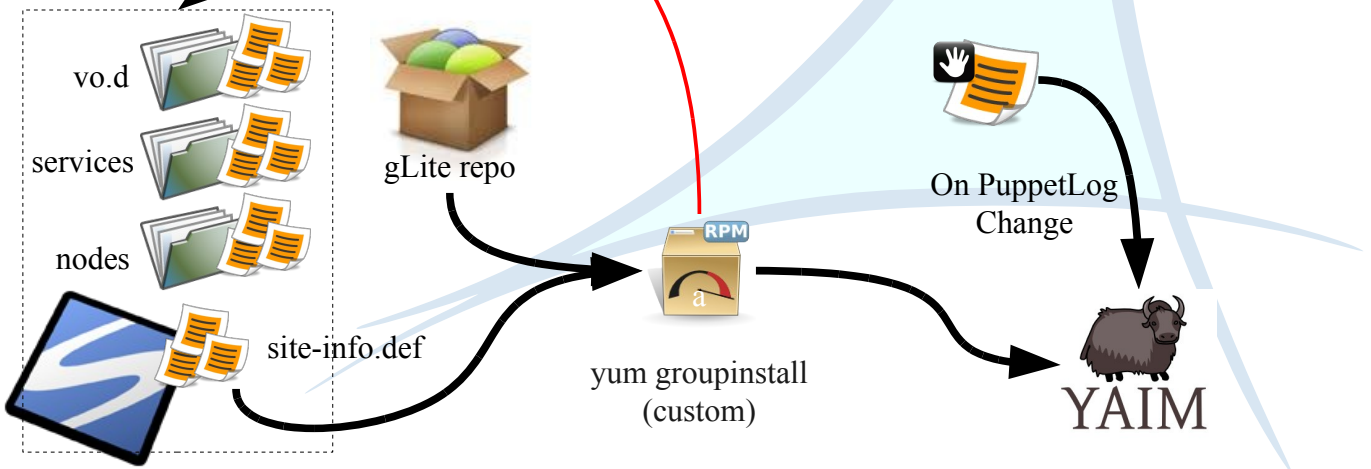
```
# Base repository (same for updates and extras repositories)

yumrepo { "glite$glite-UI.repo":
      baseurl  => "http://repo.pic.es/mrepo/glite-$glite-release-UI-$architecture/RPMS.base/",
      name     => "glite-UI",
      descr    => "gLite 3.2 UI service release repository",
      gpgkey   => "http://glite.web.cern.ch/glite/glite_key_gd.asc",
      exclude  => "maui maui-client",
      gpgcheck => 0,
      enabled  => 1,
}
```



Puppet in production: YAIM module at pic

```
package { "glite-UI":
    ensure  => installed,
    provider => yumgroupinstall,
    require     => [ Class["common_yaimfiles"], Yumrepo["glite-UI"], ... ];
}
```



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Puppet in production: YAIM module at pic

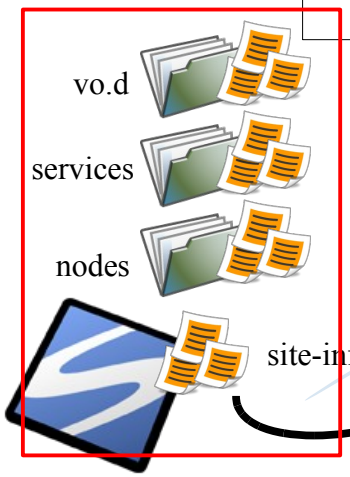
```
file { '/opt/localconf/' :
          ensure  => directory,
          mode    => 700 ,
          recurse => true;
       # ...
       '/root/.subversion/auth/svn.simple/038204f6e0a3451cbdf1440fa00a6e10' :
          require => File['/root/.subversion/auth/svn.simple/'],
          content => '$SVN_PASSWORD'; }

exec { 'svn_check_out' :
       cwd     => '/opt/localconf',
       command => 'svn co svn://ser01.pic.es/yaim_conf/gLite/',
       creates => '/opt/localconf/gLite/',
       require => File['localconf'];
     'svn_update' :
       cwd     => '/opt/localconf',
       command => 'svn up gLite',
       require => [ Exec['svn_check_out'],
                    File['/root/.subversion/auth/svn.simple/
                    038204f6e0a3451cbdf1440fa00a6e10']]; }
```

Secure gLite permisssions

Define SVN authentication

SVN checkout

SVN update




gLite repo


On PuppetLog Change

yum groupinstall (custom)


YAIM

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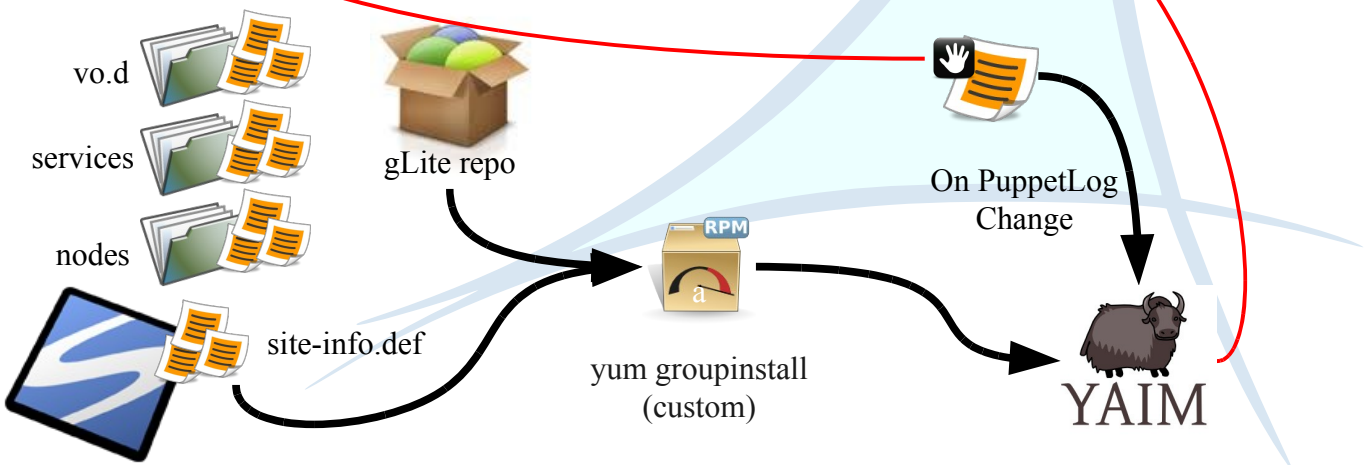
Puppet in production: YAIM module at pic

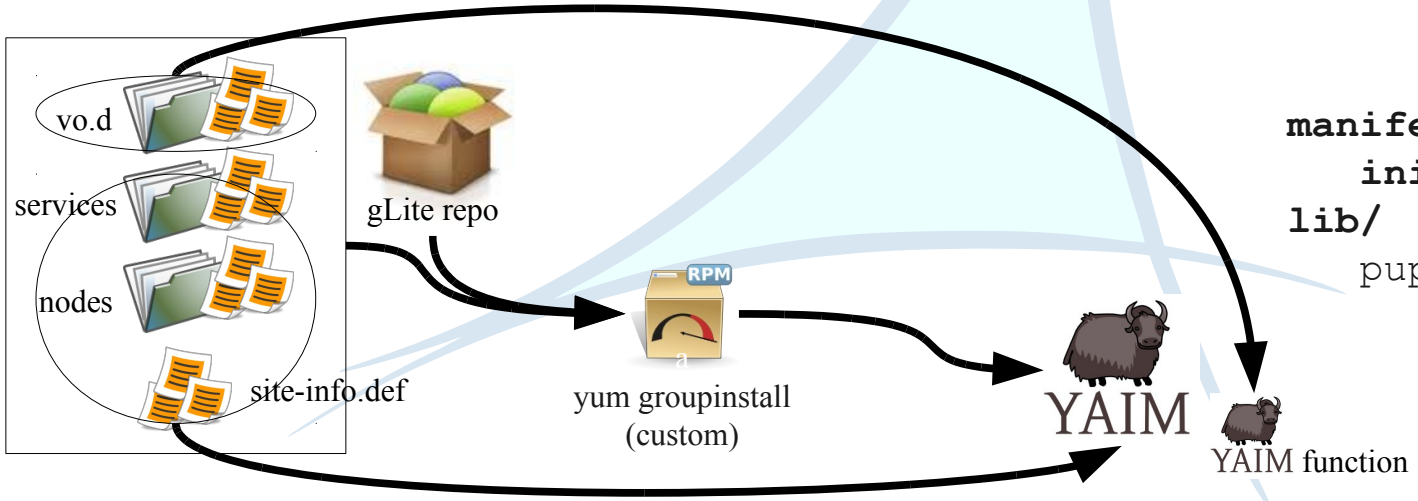
```
define common_exec_yaim($common_yaim_environemnt,$yaim_meta) {
        exec {
        'yaim_conf' :
                command => "/opt/glite/yaim/bin/yaim -c -s /opt/localconf/gLite/yaim/
$common_yaim_environemnt/site-info.def $yaim_meta",
                unless  => "tail -n1 /opt/glite/yaim/log/yaimlog|grep 'INFO: YAIM terminated
succesfully'",
                require => Package[“glite-UI”];
        }
}

common_exec_yaim {
        'yaim_UI_pic' :
                common_yaim_environemnt => prod,
                yaim_meta               => '-n glite-UI',
                notify                  => Class['pbsclient_conf'],
}
```



Puppet in production: YAIM module alternatives

- Passive
  - On configuration file update
  - Puppet inmediatly reconfigures the node with YAIM
- What do you need?
  - gLite Repositories
  - gLite Packages
  - YAIM Configuration files
  - YAIM Node Configuration

```
MODULE_PATH/
    yaim/
        files/
            opt/
                yaim_prod/
                    site-info.def
                    ...
                    vo.d/
                        atlas
                        ...
                    services/
                        ...
                    nodes/
                        ...
                yaim_test/
                    ...
        manifests/
            init.pp
        lib/
            puppet/
                provider/
                    yumgrp.rb
```



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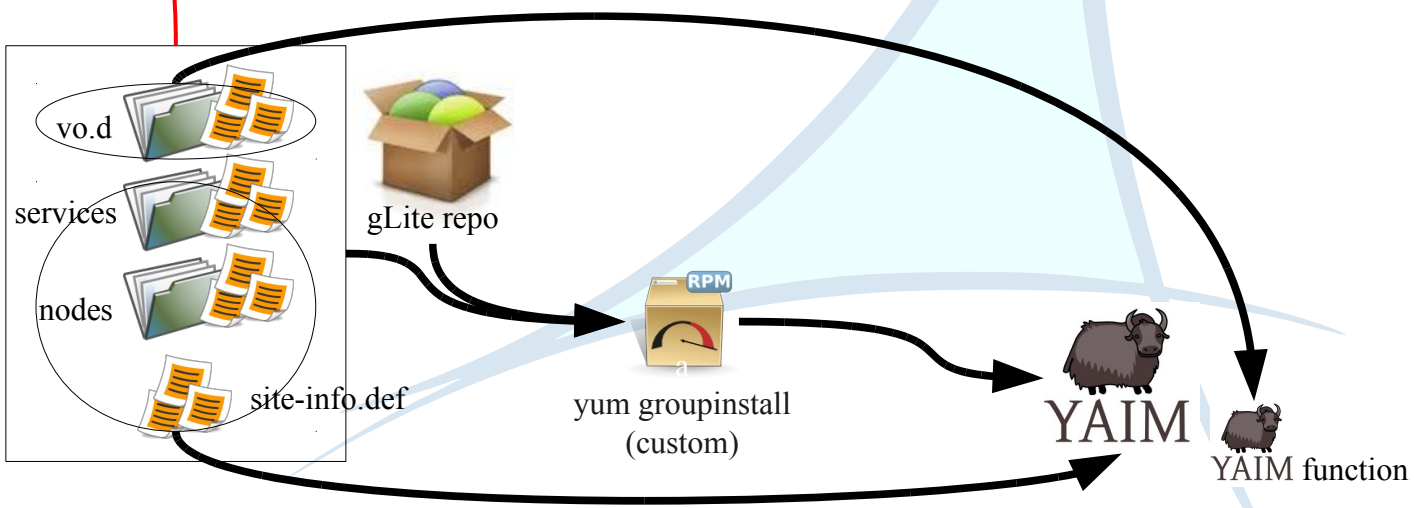
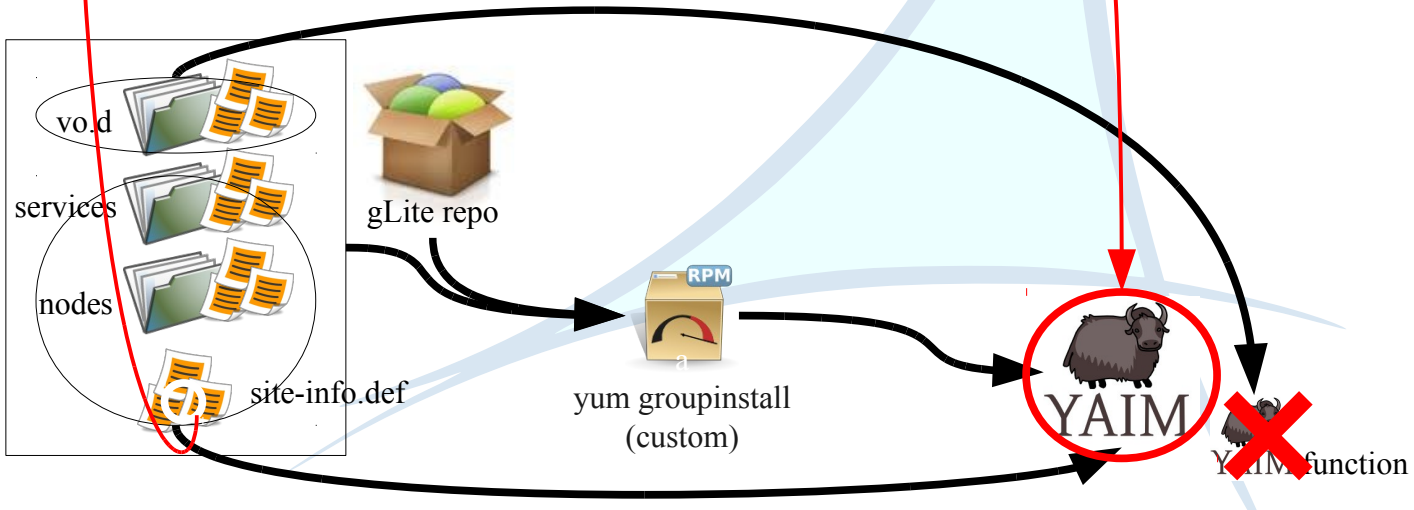
Puppet in production: YAIM module alternatives

```
$yaim_location = "/opt/localconf/gLite/yaim/$common_yaim_environment"

File {
   ensure  => directory,
   mode    => 700,
   owner   => root,
   group   => root,
}

file {
   # ...
   "${yaim_location}":            require => File["/opt/localconf/gLite/yaim"] ;
   "${yaim_location}/vo.d":       require => File["${yaim_location}"] ;
   "${yaim_location}/nodes":      require => File["${yaim_location}"] ;
   "${yaim_location}/services":   require => File["${yaim_location}"] ;
}
```



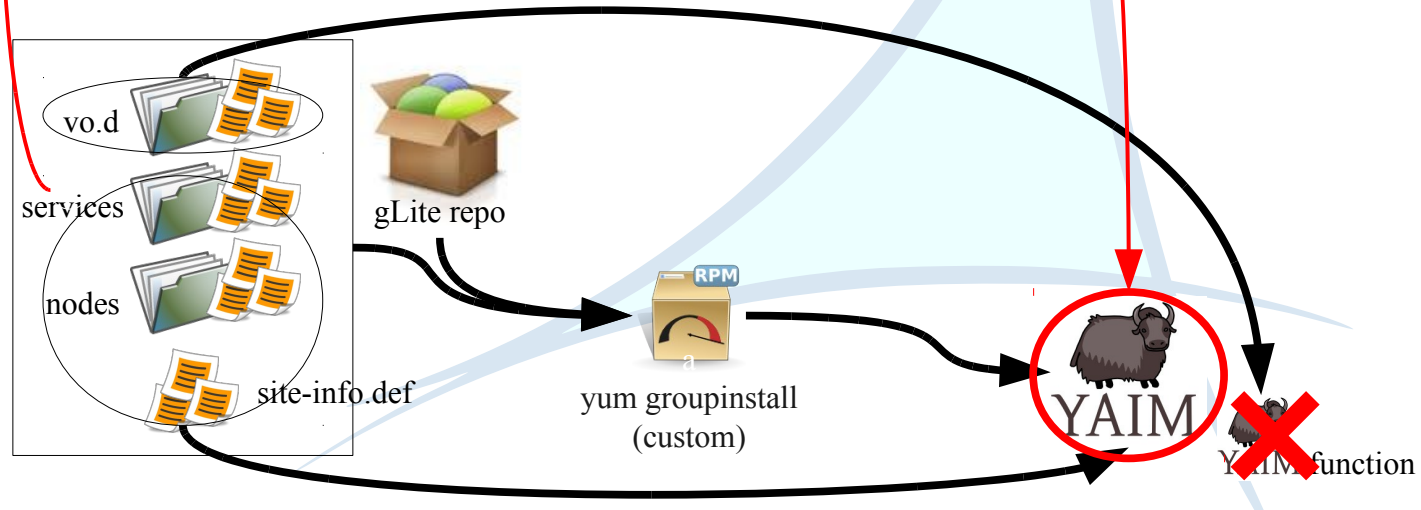
Puppet in production: YAIM module alternatives

```
#### $yaim_location
define yaim_base {
   file { "$name":
      path    => "${yaim_location}/${name}",
      source  => "puppet://$pserver/opt/yaim_${environment}/${name}",
      require => File["${yaim_location}"],
      notify  => Run yaim node[$yaim_nodetype];
   }
}
yaim_base { [ "site-info.def", "users.conf", "groups.conf", <...> , "edgusers.conf" ]: }
```



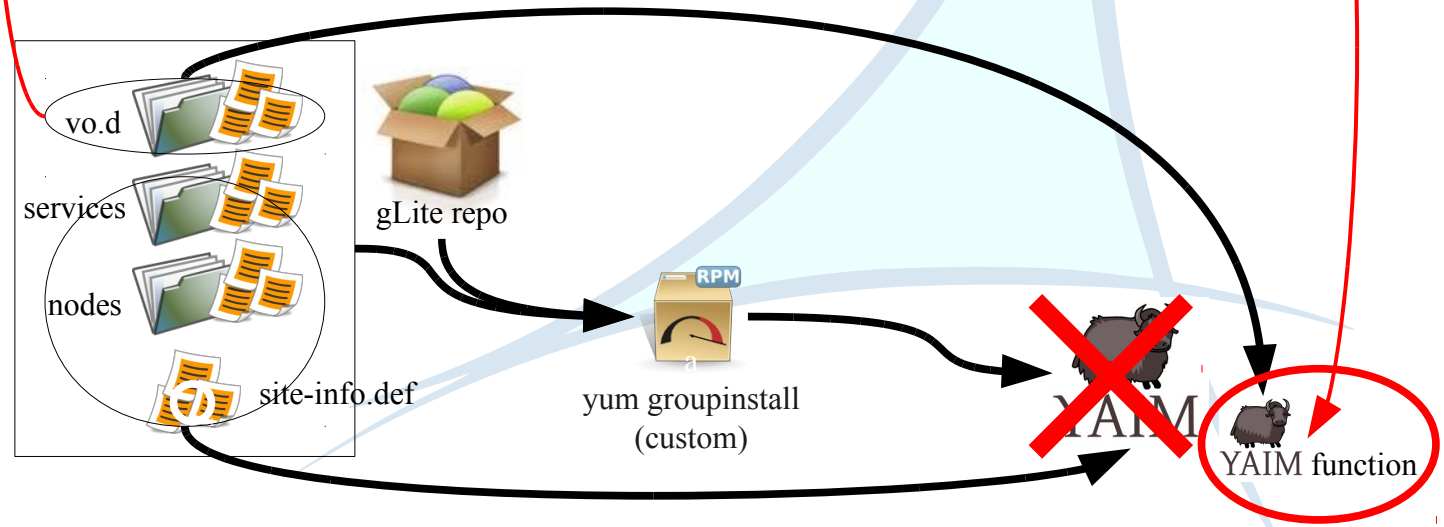
Puppet in production: YAIM module alternatives

```
#### $yaim_location/services ($yaim_location/nodes should be the same)
define yaim_services {
   file { "$name":
      path    => "${yaim_location}/services/${name}",
      source  => "puppet://$pserver/opt/yaim_${environment}/services/${name}",
      require => File["${yaim_location}/services"],
      notify  => Run yaim node[$yaim_nodetype];
   }
}
yaim_services { [ "glite-fta2" , "glite-fts2", <...>, "glite-creamce" ]: }
```



Puppet in production: YAIM module alternatives

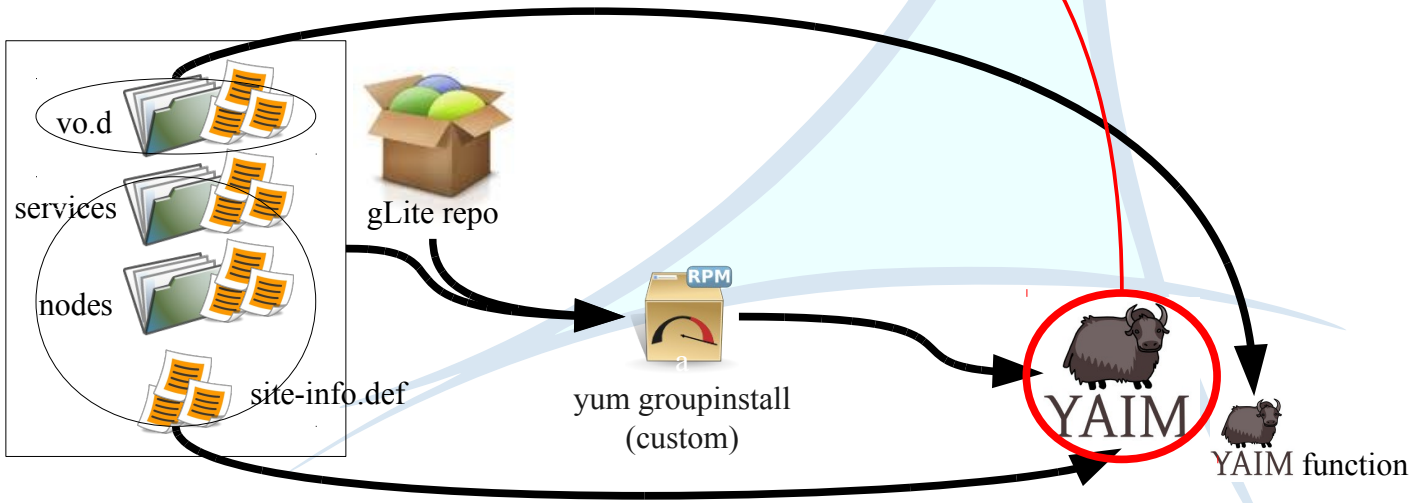
```
#### $yaim_location/vo.d
define yaim_vod {
   file { "$name":
      path    => "${yaim_location}/vo.d/${name}",
      source  => "puppet://$pserver/opt/yaim_${environment}/vo.d/${name}",
      require => File["${yaim_location}/vo.d"],
      notify  => Run yaim function vomsdir[$yaim_nodetype];
   }
}
yaim_vod { [ "ops", "cms", "lhcb", "atlas", "dteam", "magic", <...> , "t2k.org" ]: }
```



Puppet in production: YAIM module alternatives

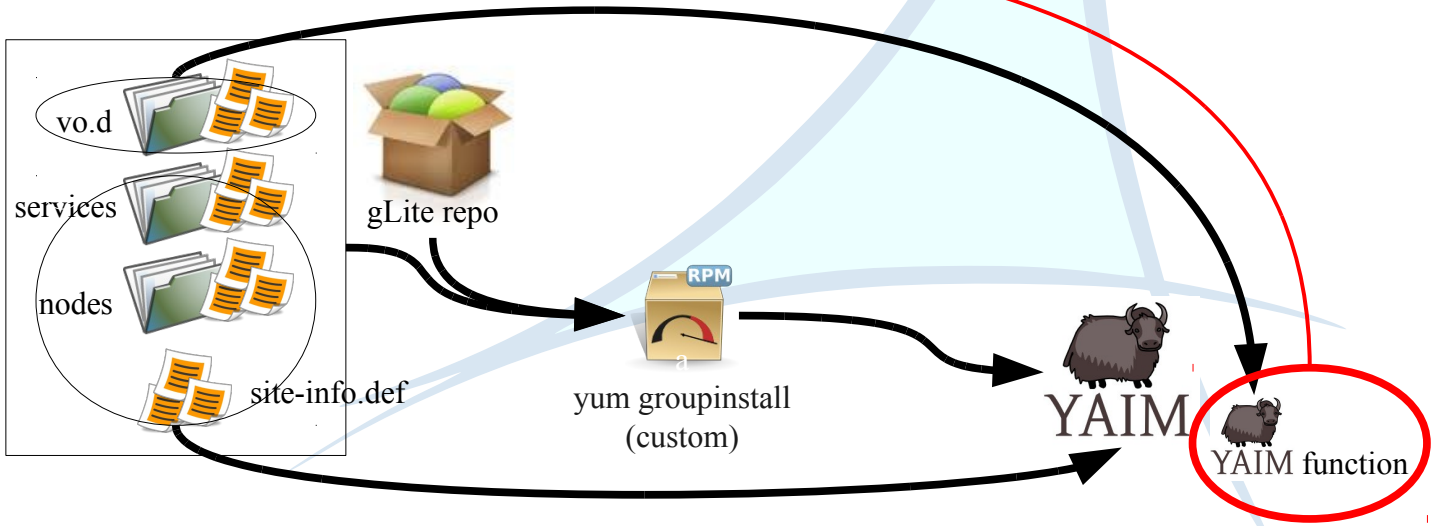
```
#### Run entire YAIM node configuration
define run_yaim_node() {
    exec { "run_yaim_node_$name" :
        command => "/opt/glite/yaim/bin/yaim -c -s $yaim_location/site-info.def -n $name",
        refreshonly => true,
    }
}
run_yaim_node { $yaim_nodetype: }
```

```
### case "$nodetype" {
###    "fta":{ $yaim_nodetype = "FTA2" }
###    "fts":{ $yaim_nodetype = "FTS2" }
###    # ...
###    "wn": { $yaim_nodetype = [ "glite-WN",
                "TORQUE_client","glite-GLEXEC_wn" ] }
### }
```



Puppet in production: YAIM module alternatives

```
#### Run a single YAIM function. Condition: service must have this function
    define run_yaim_function_vomsdir() {
       case "$config_vomsdir" {
          "yes": {
             exec { "run_yaim_function_vomsdir_$name" :
                command     => "/opt/glite/yaim/bin/yaim -r -s $yaim_location/site-info.def -f
config_vomsdir -n $name",
                refreshonly => true,
             }
          }
       }
    }
    run_yaim_function_vomsdir { $yaim_nodetype: }
```



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3. Conclusions

- Dramatic reduction in service administration loads
- Standardization of service profiles
- Possibility of full site homogeneization
- Fast disaster recovery capability when combined with streamlined installation system (ie. kickstart)
- Time invested in maintaining a puppet infrastructure is negligible when compared with the gain
- High flexibility, hence fast integration of new projects/requirements
- Abstraction level used allows sysadmins to deal with all services

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Backup Slides: Automation tools evaluation

	Quattor	cfEngine	Puppet
Flexibility	-	+	+
Config. Control	+++	+++	+++
Complexity	+++	+	+
Gradual Integration	+	++	++
Documentation + Support	+	++	+++
Supported O.S.	-	++	+
Execution Speed	+	++	+