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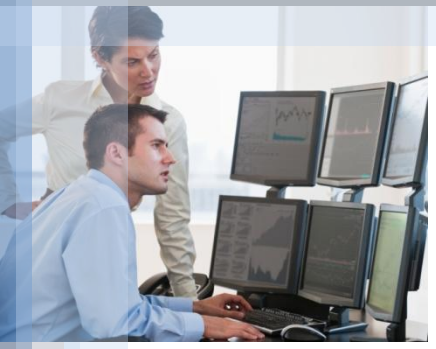

PUPPET – configuration management tool

Vitaliy Sinyayev

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- ✔ **PART II – PUPPET INSIDE**
- ✔ **PART III – DEPLOYMENT OF PUPPET**
- ✔ **PART IV - SCENARIO OF DEPLOYMENT WITH HELP OF PUPPET**

PART I

GETTING STARTED

TYPICAL SYSADMIN JOB

Repetitive

Manual

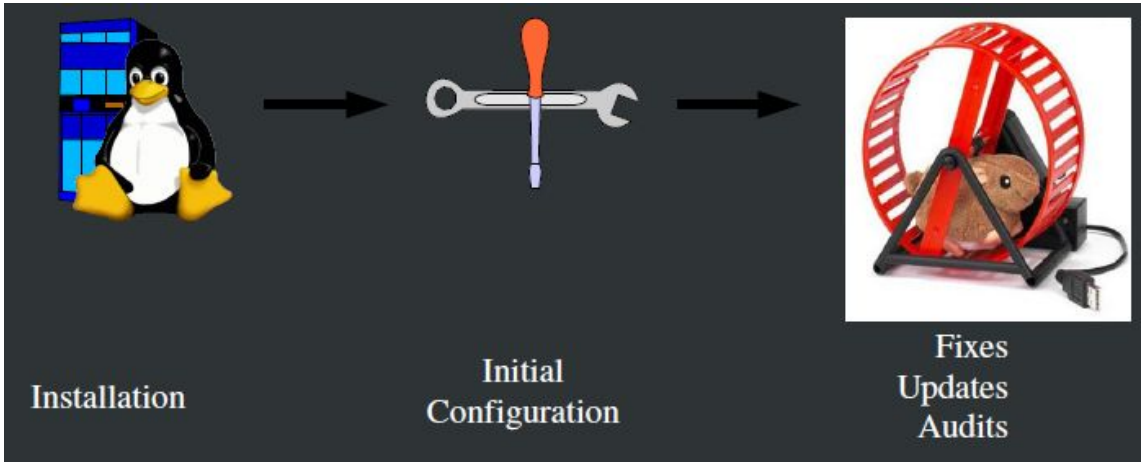
Tedious

WHO HELPS US

- Automation
- Unification
- Accuracy
- Reproducibility
- Centralized auditing
- Reduce time
- Save money

What is PUPPET ?

- configuration management tool
- open source
- Ruby-based system
- relying upon client-server model
- used to manage throughout lifecycle IT systems:



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PUPPET'S BENEFITS

- **Large developer base**
- **Optimized and easier configuration language**
- **Better documentation**
- **Abstracted from underlying OS (more platform support)**
- **Easily scalable and customizable**
- **Large installed base (**Google, Siemens, Red Hat, Cisco)

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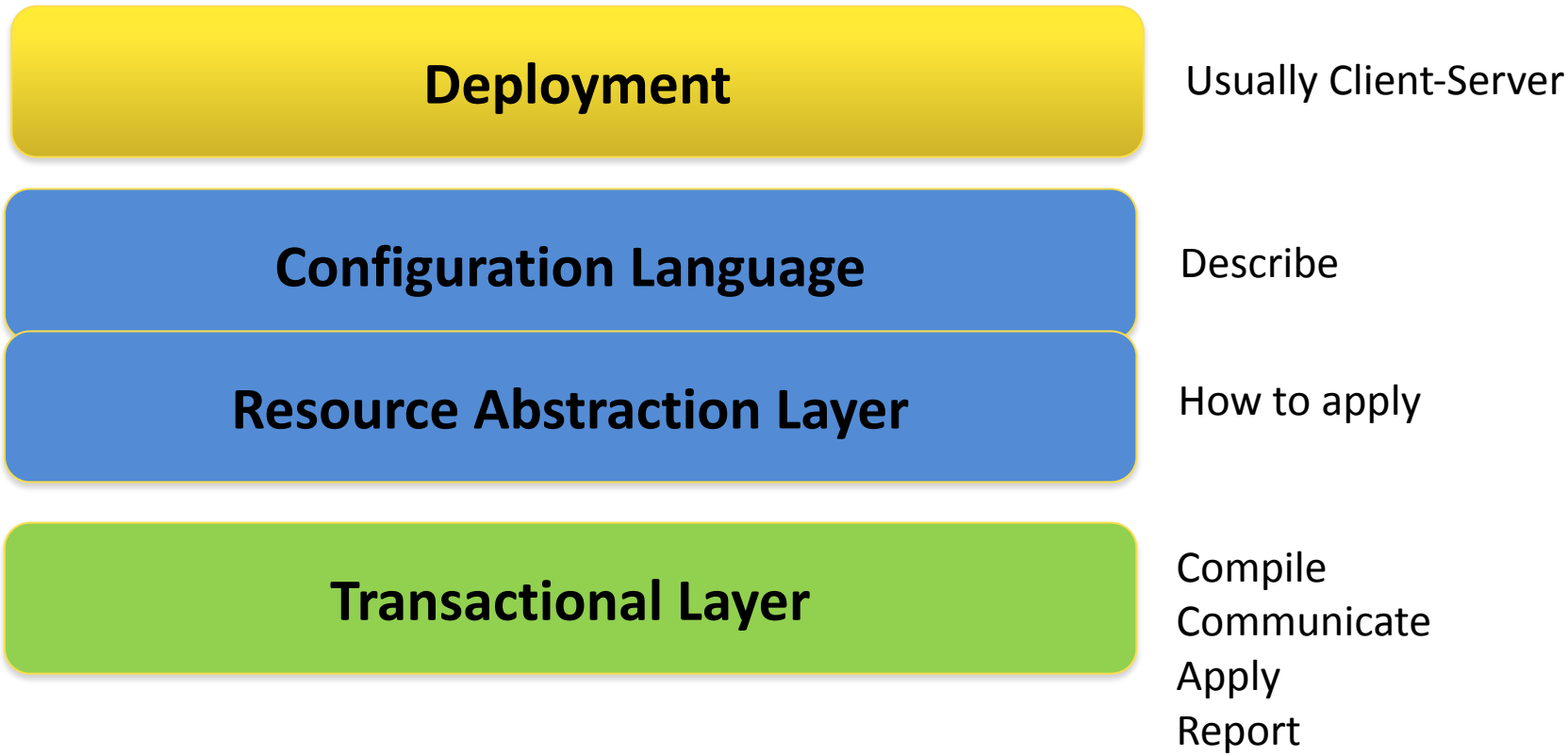
PART II

PUPPET INSIDE

PUPPET MODEL



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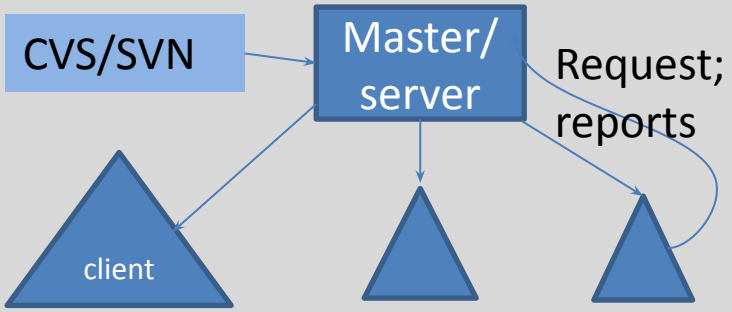
PUPPET DEPLOYMENT MODEL

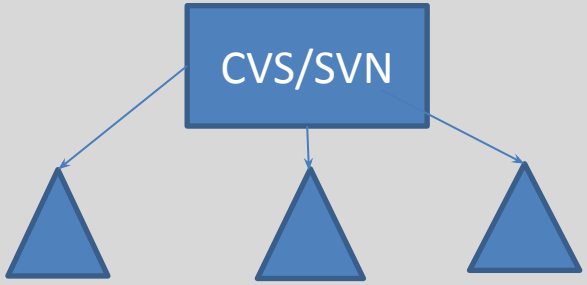
Client-server



Master - store & compile configs

Agent - pull configuration from master

Single (no master)



Client - apply & compile configs locally

CVS - just as repo for configs

PUPPET DEPLOYMENT MODEL (comparison)

Client-server

+ *better security*
+ *advanced management*
+ *authorization*
+ *centralized execution*

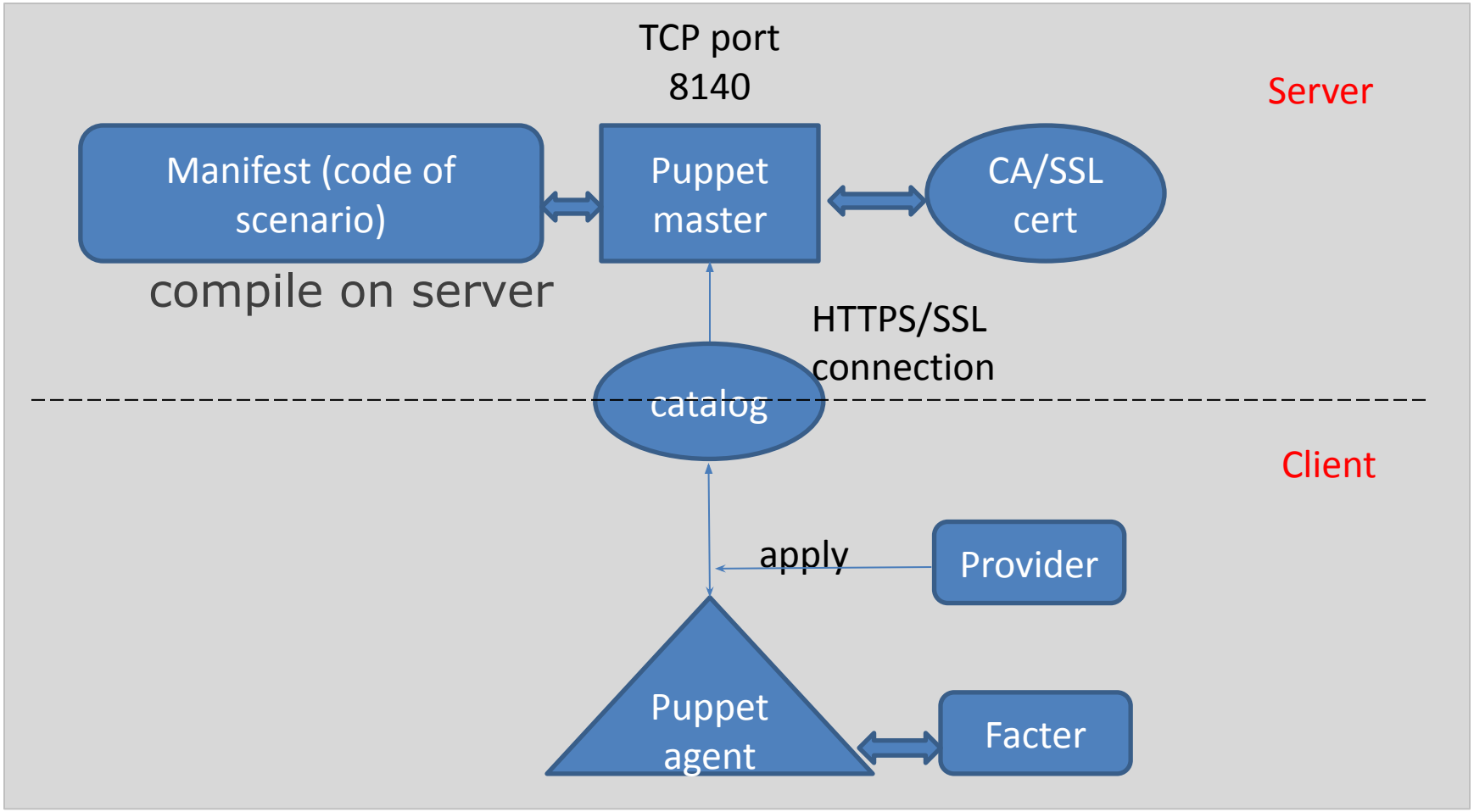
- *huge load on server*
- *single point of failure*

Single (no master)

+ *no bottleneck of master*
+ *no single point of failure*
+ *no PKI*

- *no advanced features*
- *loss in security*
- *loss ease of management*

ARCHITECTURE OF PUPPET



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MAIN COMPONENTS OF PUPPET SYSTEM

- Server daemon:
  - *puppet master* (uses WEBrick web server)
  - run as puppet user
  - can force client to pull new configs – *puppet kick*

- Client daemon:
  - *puppet agent*
  - run as root (pulling server every 30min defaults or from cron)

Both have configuration file => *puppet.conf*

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MAIN COMPONENTS OF PUPPET SYSTEM (continued)

- Puppet's Certificate Authority:
  - *puppet ca, cert*
  - SSL certificates
- Provider
  - apply packages management on hosts
- Facter
  - gathers basic information about node's hardware and operation system

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ELEMENTS OF PUPPET SYSTEM

- **Manifests** (code on puppet/ruby language) on server => *.pp
  use some programming methods: variables, conditional statements, functions
- **Resources** (types) is a particular element that Puppet knows how to configure
- **Classes and defines** basic named collection of resources
- **Providers** specific implementation of a given resource type
- **Templates** apply code and variable substitution
- **Modules** collection of manifests, files, plugins, classes, templates and so on
- **Nodes** – machines being configured, identified generally by its hostname
- **Files, facters, libs, functions and so on**

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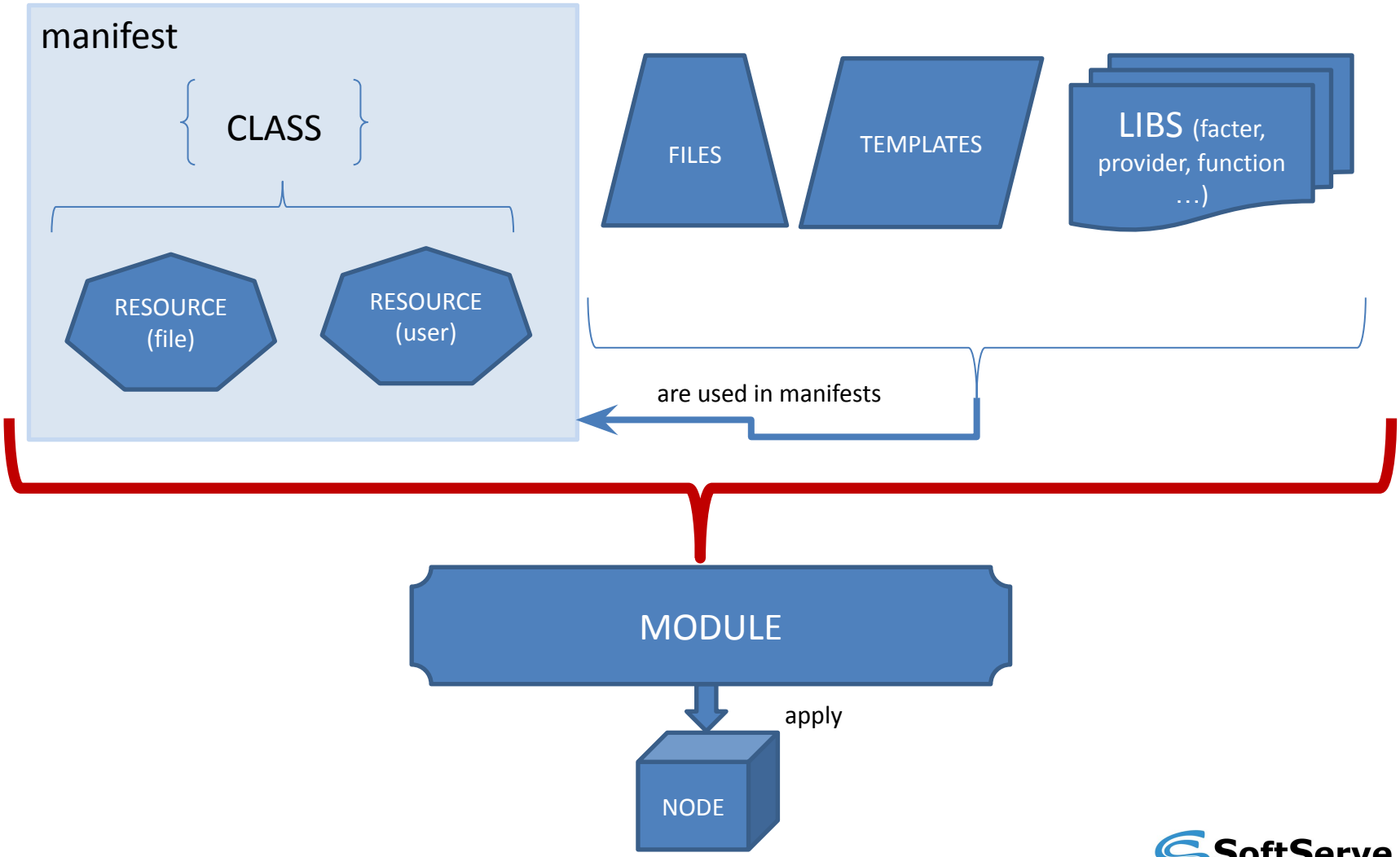
ELEMENTS OF PUPPET SYSTEM



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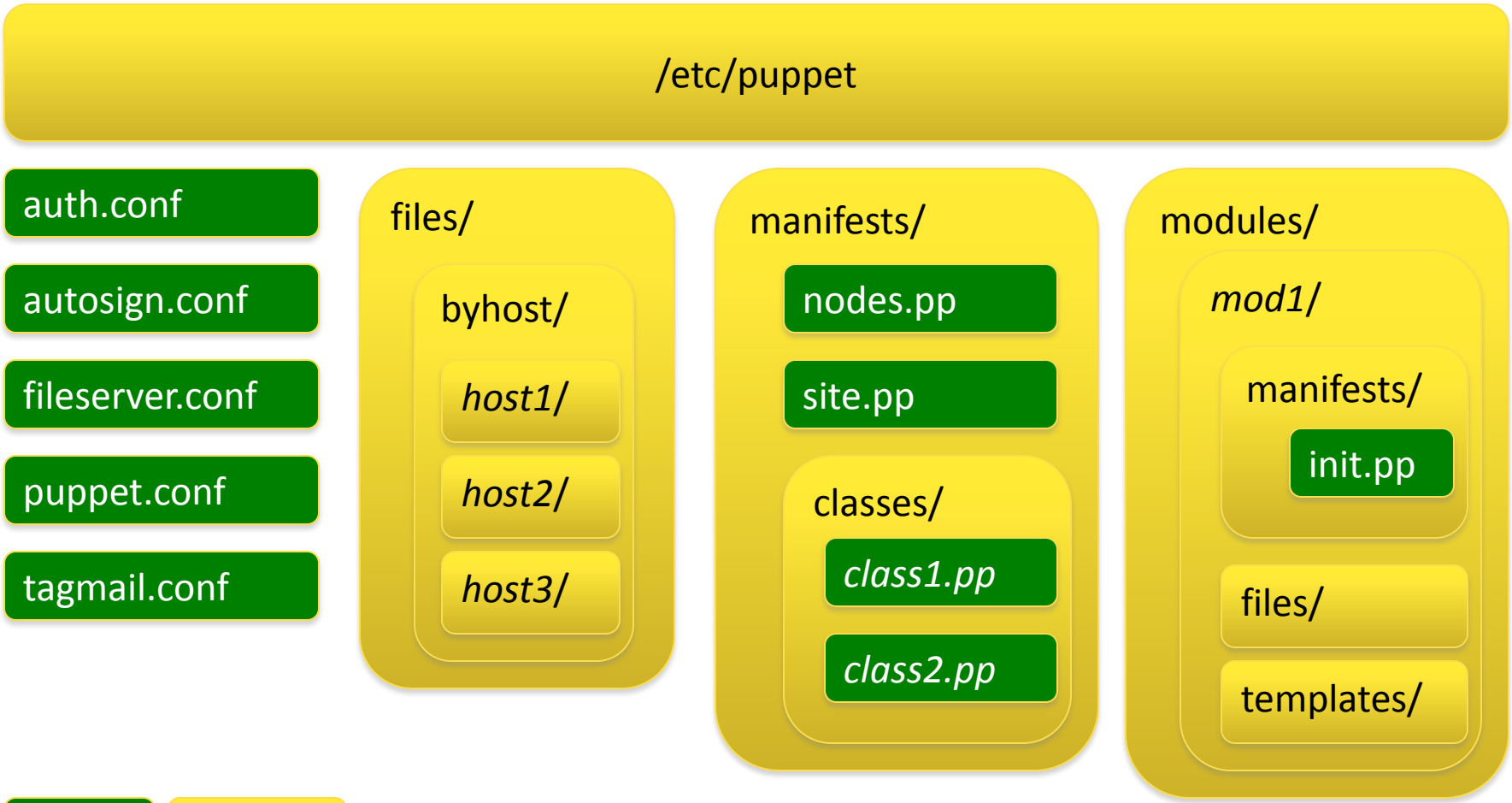
PUPPET INFRASTRUCTURE



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PART III

DEPLOYMENT OF PUPPET

PROCEDURE OF DEPLOYMENT

- Setup (master and clients)
- Set up configuration files
- Deploy certificates
- Write and deploy manifest and describe nodes

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INSTALLATION OF PUPPET

- Most platforms will use the default package manager to install Puppet or from source
- Prerequisites: ruby, ruby-libs, facter

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SAMPLE PUPPET CONFIG FILE

Can be configured via CLI or configuration file

```
[main]
        vardir = /var/lib/puppet
        logdir = /var/log/puppet
        ssldir = $vardir/ssl
        moduledir = /var/lib/modules
    [agent]
        server = <ip or dns name>
        localconfig = $vardir/localconfig
        report = true
    [master]
        reports = http
        autosign = /etc/puppet/autosign.conf
```

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SETUP CERTIFICATE

Multiple ways to resolve this

1. Setup puppetmaster to automatically sign certificates
2. Setup puppetmaster to pre-sign certificates
3. Perform manual certificate signing each time

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AUTO CERTIFICATE SIGNING

Setup automatic certificate signing you must specify so in the /etc/puppet/autosign.conf file:

```
*.sample.domain.com
server1.sample.domain.com
```

\+ will automatically sign certs

– security risk, not good to automate the certificate signing mechanism

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PRE-SIGNING CERTIFICATES

- Generate a pre-signed certificate for clients:

puppet cert --generate client1.example.com

- Transfer the private key, the client certificate, the CA certificate to the new client:

/etc/puppet/ssl/private_keys/client.pem
/etc/puppet/ssl/certs/client.pem
/etc/puppet/ssl/certs/ca.pem

\+ better controlled security
– have to provide transferring

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MANUAL CERTIFICATE SIGNING

Doesn’t require the autosign.conf file

List of the waiting requests on the puppetmaster by using:

```
#  puppet cert --list
   server1.sample.domain.com
   server2.sample.domain.com
```

to sign a specific request run the following:

```
#  puppet cert --sign
server1.sample.domain.com
```

+ most secure way to sign certificates
– can get cumbersome when scaling your puppet installation

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CREATE MANIFEST AND DESCRIBE NODE

Create main manifest in /etc/puppet/manifests/site.pp

Node definitions can be defined:

- configuration block matching a client in manifest
- outside of puppet - LDAP, external script

```
node default { include <module>….}

node "www.domain.com" { …}

node  /^www\.\w+\.com/ { … }      # can use regular expression
```

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CREATE MANIFEST AND DESCRIBE NODE (CONTINUE)

```
node default {

    user {"testpup":
        ensure => present,
        shell => "/sbin/nologin",
        home => "/nonexistent",
        password => "test",
        }
     }
```

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PART IV

SCENARIO OF DEPLOYMENT WITH HELP OF PUPPET

WORKSHOP (LIVE EXAMPLE)

TASK

APACHE SERVER
(main address - 192.168.30.20:80 only)

APACHE VIRTUAL HOSTS
(192.168.166.84:3080)
(192.168.166.84:4080)
……..

WHAT WE HAVE

with PUPPET
agent installed
(freesvv)

PUPPET MASTER
(puppetbig2)

WHAT FEATURES WE USE => modules, classes, class-definitions, templates

RESULT ??????

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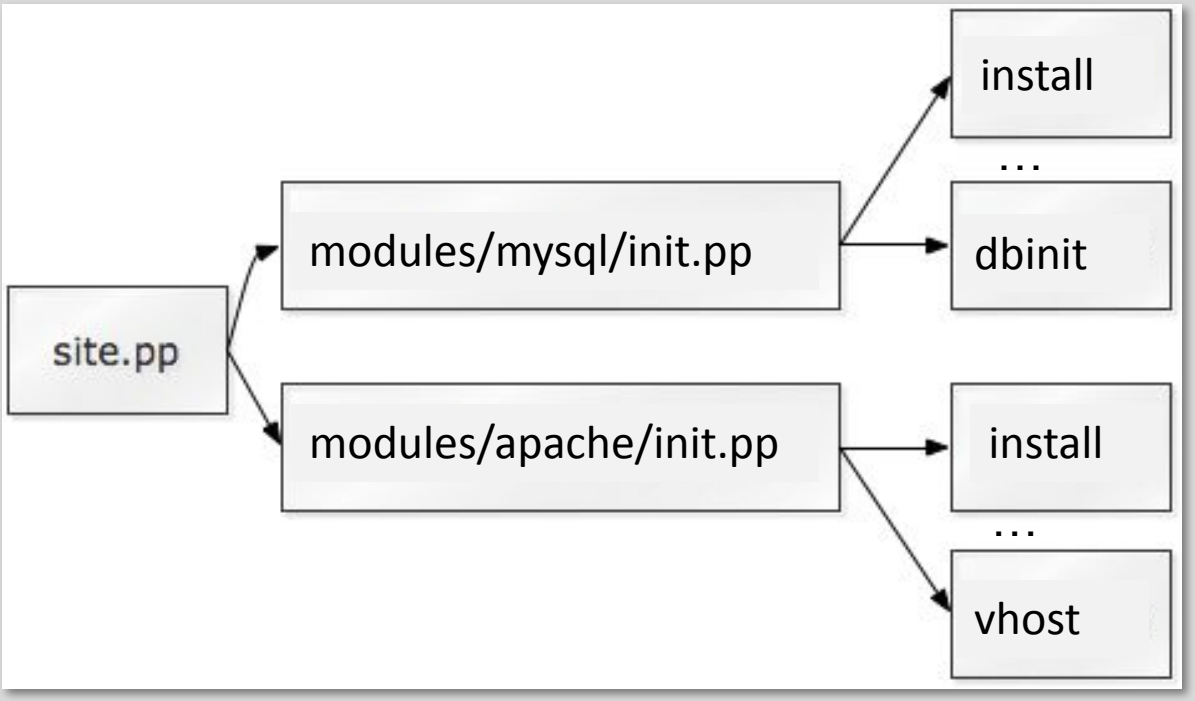
HOW TO ORGANIZE MANIFESTS



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ROOT MANIFEST - SITE.PP

Global master manifest is `site.pp` which typically defines the node types puppet can configure

```
node ‘server1’ {
          include pkg-mgmt   # use module
          include apache
             }

node ‘server2' {
          include apache
          include mysql
           }
```

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BUILDING MODULE

- Storing modules separately in /…/…/modules/module_name assists in management
- We can store module specific files within the module instead of all together
- Inside each module, we have several directories: manifests, files, templates, plugins
- The manifest is where the module's definition lives and starts - "init.pp"

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MODULE STRUCTURE

{module}/

- files/# serve files from modules
- lib/ # executable Ruby code
- manifests/ # can hold any number of other classes and even folders of classes
  - init.pp
  - {class}.pp
  - {defined type}.pp
  - {namespace}/
    - {class}.pp
    - {class}.pp
- templates/ # templates written in the ERB language

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MODULE START FILE - INIT.PP

```
class apache {                  # main class
    require apache::params      # class dependencies
      case $operatingsystem { # variable
        FreeBSD: { include apache::install }
        Centos: { include apache::instyum }
                        }
    include apache::service
      }
```

Can use variables, conditional statements;

Call new subclasses

Convenient way – organize special class(subclass) for variables

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SUBCLASS FOR INSTALL

```
class apache::install {
    file { $apache::params::install_option: # resource - type of file
        ensure => directory,
        recurse => true,
        recurselimit => 1,
        owner => "root",
        group => "wheel",
        mode => 0644,
        source => "puppet:///modules/apache/install",
        }
    package { $apache::params::apache_pkg_name: # resource - type of package
        provider => portupgrade,
        ensure => installed,
        require => File[$apache::params::install_option],
        }
}
```

Each resource has its own parameters & properties

More about resources:

http://docs.puppetlabs.com/references/stable/type.html

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SUBCLASS FOR SERVICE

```
class apache::service {
   service { $apache::params::apache_ser_name:
          ensure => running,
          hasstatus => true,
          hasrestart => true,
          enable => true,
          require => [Class["apache::install"],
File["$apache::params::apache_main_conf"]]
          }
       file { $apache::params::apache_main_conf:
       ensure => present,
       owner => 'root',
       group => 'wheel',
       mode => '644',
       source => "puppet:///modules/apache/config/httpd.conf_free",
       require => Class["apache::install"],
       notify => Service["$apache::params::apache_ser_name"],
       }
}
```

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MODULE DEPENDENCY

- Handy when an application needs to have certain files in place before installing the rest
- The more complex your Puppet environment becomes the greater the need for inter-module dependencies are.
- inter-, intra-module dependencies

require, before - guarantees that the specified object is applied later or before than the specifying object

notify, subscribe - causes the dependent object to be refreshed when this object is changed

Class[x] -> Class[y] – another form of dependencies

Stages - creates a dependency on or from the named milestone

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DEFINITIONS

Definitions are similar to classes, but they can be instantiated multiple times with different arguments on the same node (**looks like functions for resources**)

```
define apache::vhost ( $port, $docroot, $template='apache/vhosts.erb') {
file { "/etc/apache2/sites-available/$name":
 content => template($template),
      owner => 'root',
      group => 'wheel',
      mode => “644’, }
 }
```

Example of usage

```
node ‘www’ {
include apache
apache::vhost { ‘www-second':
     port => 80,
     docroot => '/var/www/www-second',
     template => ‘apache/www_vhosts’,
     }
}
```

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TEMPLATES

- **Templates** are flat files containing Embedded Ruby (ERB) variables
- Allows you to create template configuration files

```
NameVirtualHost *:<%= port %>
<VirtualHost *:<%= port %>>
    ServerName <%= name %>
    DocumentRoot <%= docroot %>
    <Directory <%= docroot %>>
        AllowOverride None
    </Directory>
ErrorLog /var/log/apache2/<%= name %>_error.log
CustomLog /var/log/apache2/<%= name %>_access.log combined
</VirtualHost>
```

<%= ... %> - variable field

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CUSTOM FACTER

- **System inventory tool on client**
- **Can be used as variables in manifests**
- **You can add custom facts as needed**

Examples of facters:

domain => soft.com
fqdn => puppetclient.soft.com
hostname => puppetclinet
ipaddress => 172.20.88.132

Steps to create custom facts:

- create file in module directory ../module_name/lib/facter/<name>.rb

- write code on Ruby

- enable on client and server – “pluginsync=true”

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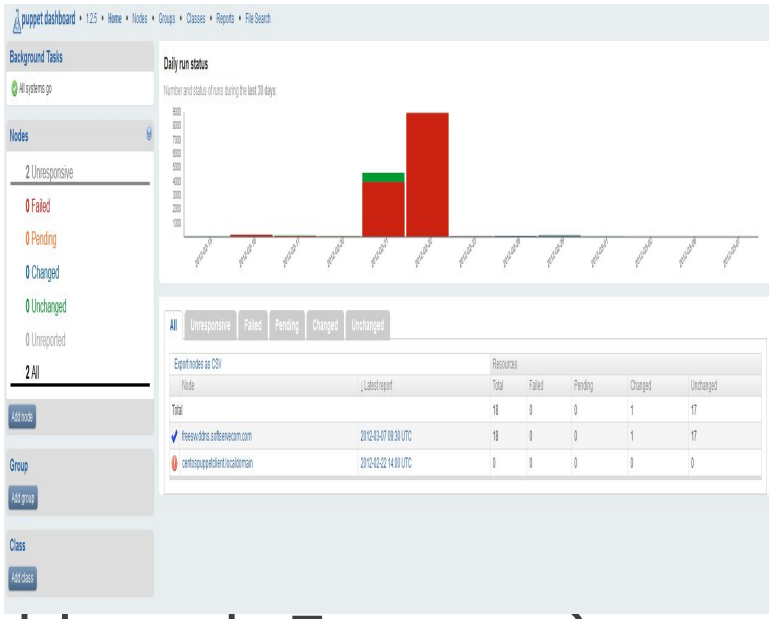
REPORTS, MONITORING

Puppet has a few reporting options:

- YAML files
- RRD files
- EMAIL with changes
- HTTP - web interface (Dashboard, Foreman)



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CONCLUSIONS

What is the profit ?

- Quick and flexible deployment of our complicated system in production
- Quick re-deployment of existing system in case of failure (previously generating data backups)
- Easy deployment of huge numbers of servers
- Easy generation and modification of configuration files

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ADDITIONAL RESOURCES FOR PUPPET

- http://docs.puppetlabs.com/guides/
- http://rubular.com/
- http://github.com/puppetlabs/
- http://forge.puppetlabs.com/
- **Book "Pro Puppet"** by James Turnbull, Jeffrey McCune
- **Book "Puppet 2.7 Cookbook"** by John Arundel

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