

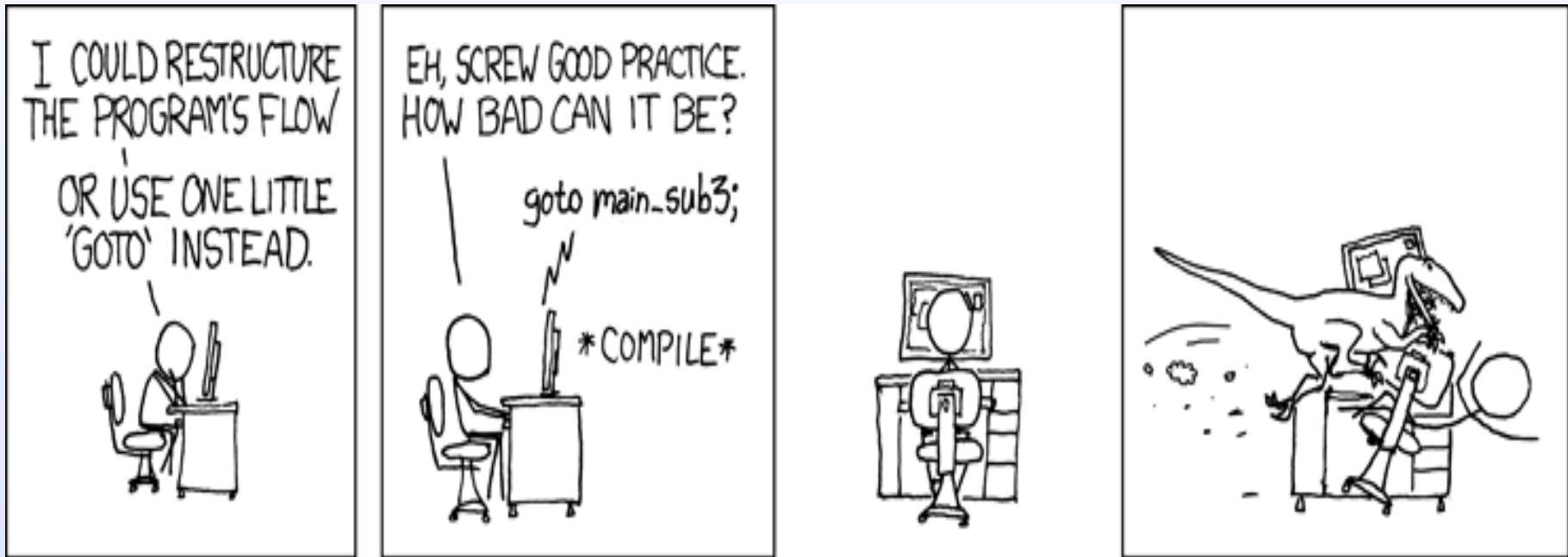
System Configuration : An end to hacky scripts?

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The life of a Systems Administrator should never be dull!







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Example - resolv.conf

- Controls host name resolution
- Text file – designed to be simple
- Looks similar to:

```
nameserver 129.215.46.246
nameserver 129.215.64.240
search inf.ed.ac.uk
sortlist 129.215.46.0/255.255.255.0 129.215.144.0/255.255.255.0
```



Manual Approach

- One machine
 - Easy
- Several machines
 - Boring
- Many machines
 - Utterly Tedious



“I’ve got Perl* here and I’m not afraid to use it!”

*Substitute cool flavour-of-the-month scripting language



A “hacky” solution

- Recipe:
 1. Create list of all machines
 2. Write new config file
 3. Write short install script utilising scp



Problems

- What about uncontactable machines?
 - Need to handle timeouts
 - Need to keep a list of busy and dead
- What about machines belonging to others?
- What about new machines?



Further Issues

- What happens if you aren't a specialist?
 - Can you grok/edit sendmail configs?
- How can individual tasks be delegated?
- Typical solutions involve:
 - Templates
 - Version control system for config files



Push v Pull

- “Pushing” new config files to a host leads to various issues:
 - Typically involves manual intervention
 - Typically a “serial” approach - inefficient
 - Hard to handle dead and busy hosts
 - Harder to check successful installation
- Why not get the client to pull changes automatically and report back?



Extending the Example

- New requirement:
 - The order of the nameserver list must be randomised on a per-host basis.
- Simple solution:
 1. Generate all possible files.
 2. Make your script even hackier so it copies a random selection.



Still more problems!

- You might need to embed information which is host-specific.
- You might need information which is only on the physical host.
- Are your scripts **generic** and **reusable**?
- Do you share your scripts? Could anyone else use them?
- Are your scripts **documented**?



Managing Services

- A further extension of the “*managing file contents*” problem.
- Requirements:
 - Know **when** services should be restarted.
 - Know **how** to restart each service.
 - Only restart if the new config file is **valid**.
 - **Report** back success or failure of restart

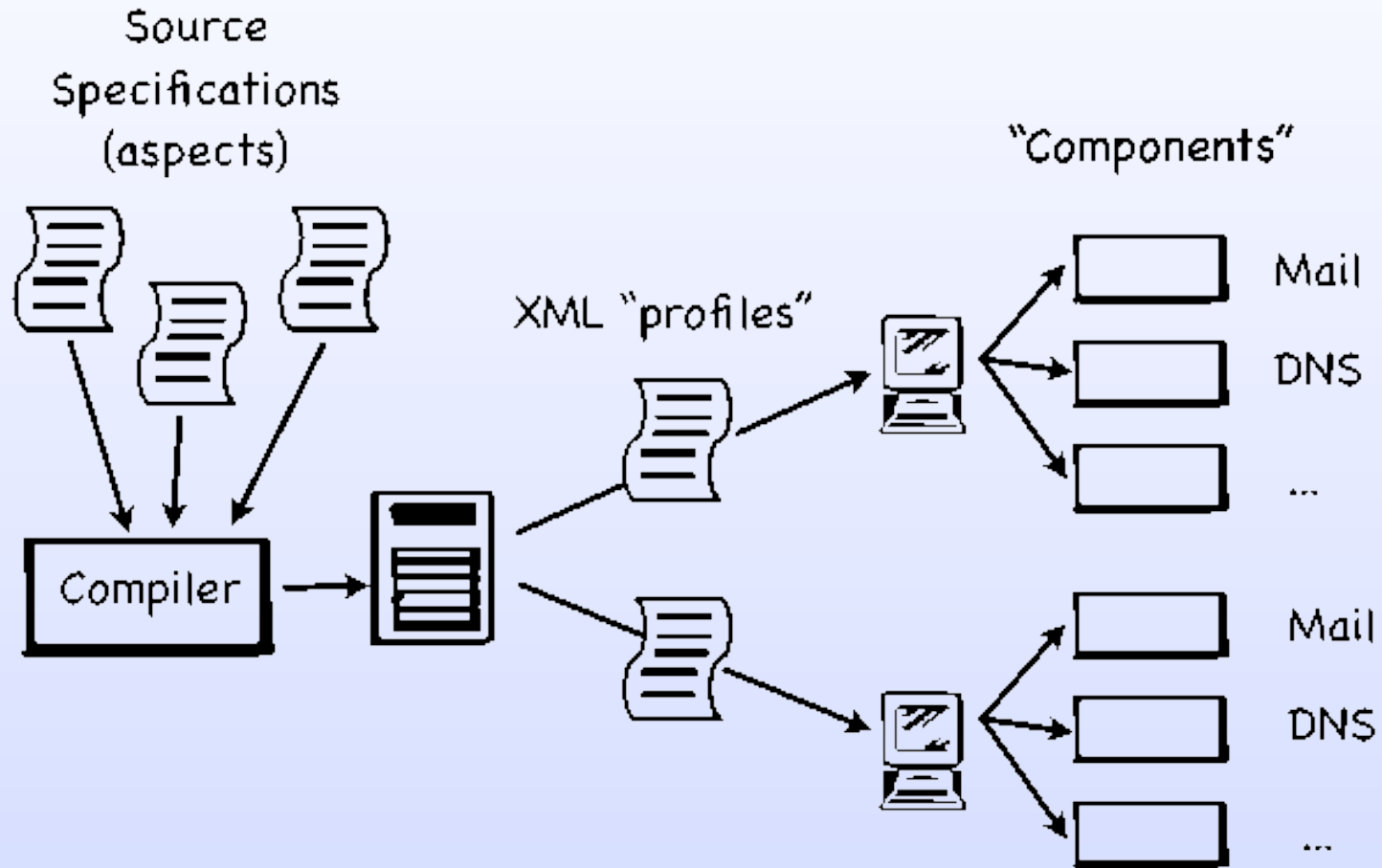


LCFG – Overview

- Client/Server Architecture.
- Each client has a “*source profile*”.
- Config files are built on the client using:
 - Data stored on the server as “*resources*”.
 - Scripts and templates stored on client.
- Server processes the source profile and generates an XML representation.



LCFG Overview



LCFG – Component Overview

- Resources are logically grouped into “*components*”.
- A profile consists of several components.
- Components have scripts which are based on a standard framework.
- Respond to a set of methods:
 - start, stop, restart, configure, run, etc..



LCFG – Client Overview

1. Pulls down the generated XML file.
2. Notices any resource changes.
3. Calls the “*configure*” method for affected components.



Back to resolv.conf

- Perl-based component (we also support shell).
- Need to sub-class `LCFG::Component`.
- Overrides the default `Configure` method.



lcfg-resolvconf - Code

```
sub Configure {
    my ( $self, $res ) = @_ ;

    my $status = LCFG::Template::Substitute(
        $res->{template}{VALUE},
        $res->{configfile}{VALUE},
        4, $res );

    if ( ! defined $status ) {
        $self->LogMessage($@);
        $self->Fail( "update failed (see logfile)");
    }
    elsif ( $status == 1 ) {
        $self->LogMessage("successful update");
    }

    return;
}
```



lcfg-resolvconf - Resources

```
#include <lcfg/options/resolvconf.h>
```

Sets up default resources & adds package

```
resolvconf.nameservers      129.215.46.33\  
                               129.215.46.246\  
                               129.215.64.240
```

```
resolvconf.sortlist        129.215.46.0/255.255.255.0\  
                               129.215.144.0/255.255.255.0\  
                               129.215.41.0/255.255.255.0\  
                               129.215.32.0/255.255.255.0
```

```
resolvconf.randomize      true
```

Component

Resource name



lcfg-resolvconf - Template

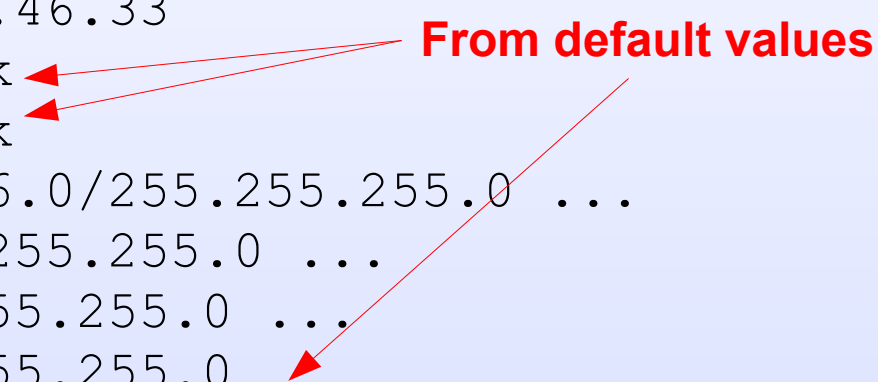
```
[% FOR server IN nameservers.split('\s+') -%]  
nameserver [% server %]  
[% END -%]  
[% IF search.length > 0 -%]  
search [% search %]  
[% END -%]  
[% IF domain.length > 0 -%]  
domain [% domain %]  
[% END -%]  
[% IF sortlist.length > 0 -%]  
sortlist [% sortlist %]  
[% END -%]  
[% IF optstring.length > 0 -%]  
options [% optstring %]  
[% END -%]
```



lcfg-resolvconf - Output

```
nameserver 129.215.46.246
nameserver 129.215.64.240
nameserver 129.215.46.33
search inf.ed.ac.uk
domain inf.ed.ac.uk
sortlist 129.215.46.0/255.255.255.0 ...
129.215.144.0/255.255.255.0 ...
129.215.41.0/255.255.255.0 ...
129.215.32.0/255.255.255.0 ...
options ndots:1 timeout:5 attempts:2
```

From default values



Components for Services

- Make Configure call Restart on change
- Need to also override Start, Stop
- This might be as simple as:

```
Start() {  
    /etc/init.d/openssh start  
}
```

```
Stop() {  
    /etc/init.d/openssh stop  
}
```



Extra Benefits

- Resource validity checking
- Useful defaults – minimal effort needed
- Boot-time and configure-time sequencing
 - e.g. Add a user before using it for file owner
- Automated installer



Conclusions

- System configuration frameworks make life less dull!
- Provides the ability to:
 - Manage change automatically
 - Stop focussing on the implementation
 - Start thinking about the intentions
- System management moves to a higher level



Where To Now?

- <http://www.lcfg.org/>
- <http://wiki.lcfg.org/>
- info@lcfg.org
- SAGE System Configuration booklet - http://www.sage.org/pubs/14_sysconfig/
- SAGE LCFG booklet – coming soon!

