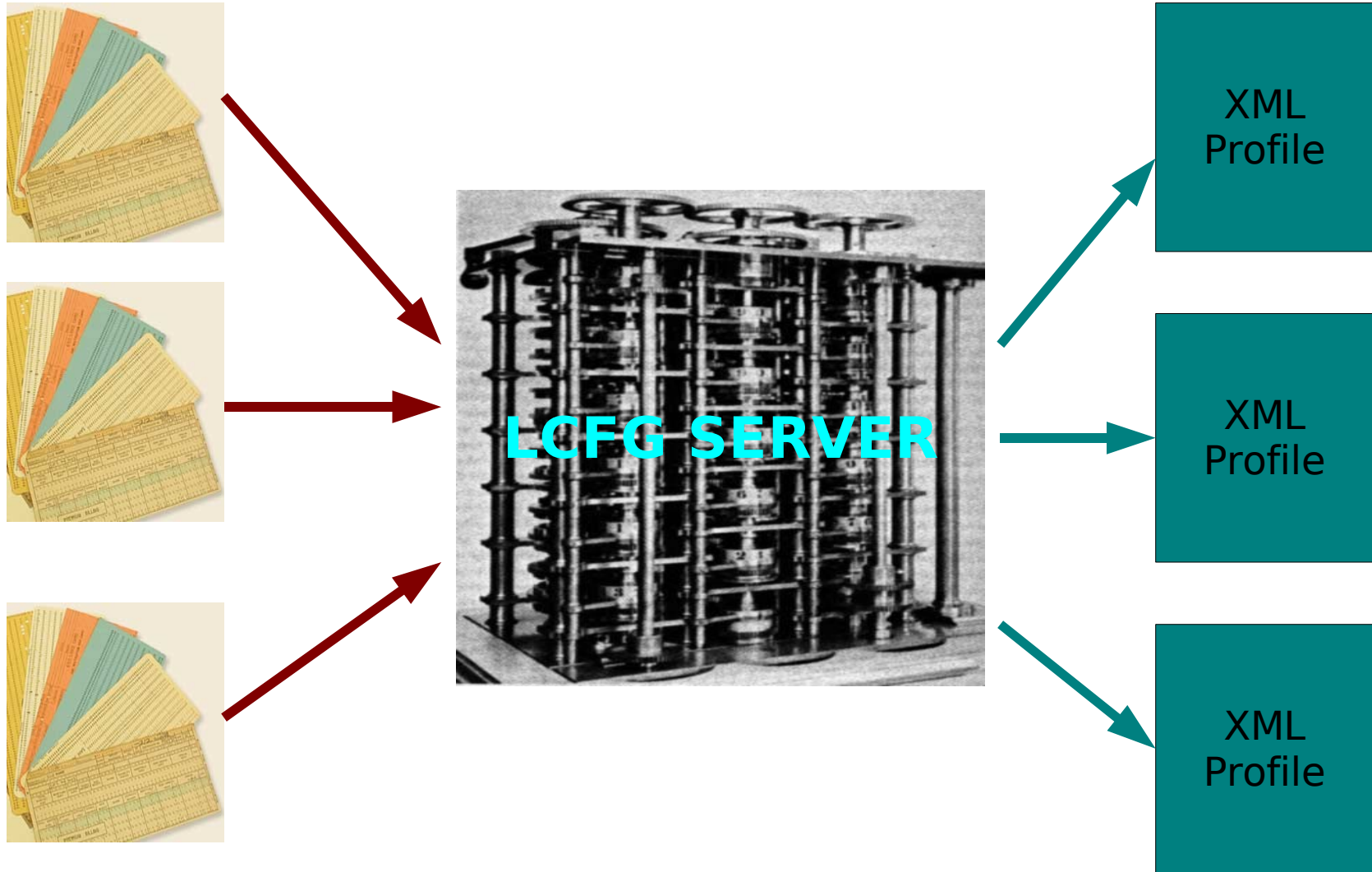


A detailed photograph of a complex industrial system, likely a steam engine or boiler, featuring numerous copper pipes, valves, and gauges. The system is mounted on a dark metal frame. In the foreground, two large circular gauges are prominent: the left one has a scale from 0 to 30 and is labeled 'VACUUM' and 'TRAIN PIPE', while the right one has a scale from 0 to 300 and is labeled 'STEAM' and 'LBS PER SQ INCH'. Several red-handled valves are visible throughout the system. The background shows more of the machinery and a blue-painted metal structure.

System Configuration with LCFG

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How it Works



The Profile

- Describes the required state of a client machine.
- Consists of a set of *components* and, optionally, a list of packages.
- Built by the LCFG server.
- Shipped to the client as an XML file.



A Component

- Consists of:
 - Set of *resources* – basically key/value pairs.
 - Optional *templates* for config files
 - Optional control code, to manage daemons, for example, stop/start/configure, based on a framework provided by LCFG – shell or perl.




Example 1a: MOTD

- Manage a single file on a single machine

```
#include <local/site.h>
#include <lcfg/os/minimal.h>
```

```
!file.files      mADD(motd)
file.file_motd  /etc/motd
file.tmpl_motd  Welcome to <%profile.node%>.<%profile.domain%>
file.type_motd  literal
```


Template variables

Example 1b: MOTD

- Configuration re-use for multiple machines

```
#include <local/site.h>  
#include <lcfg/os/minimal.h>  
#include <local/motd.h>
```

Just put it into a file that can be included



Example 1c: MOTD

- Configuration re-use and modification

```
/* local/staff-computer.h */
```

```
#include <local/motd.h>
```

```
!file.tpl_motd mCONCAT(This is for staff usage only)
```

```
/* source profile */
```

```
#include <local/site.h>
```

```
#include <lcfg/os/minimal.h>
```

```
#include <local/staff-computer.h>
```



Minimal Platform

- Able to manage contents of individual files
- Might be able to manage daemons
- Problems:
 - We do not control the entire state.
 - Multiple system admin approaches will almost certainly end up with conflicts.



Managed Platform

- The aim is to describe the characteristics of the machine in the source profile:
 - Operating System
 - Hardware type
 - Staff machine? In a public lab?
 - Available for condor pool?
 - Special software required?



Example 2: Authorization

```
/* local/computer.h */
```

```
!auth.users mSET(@sysmans)
```

```
/* local/staff-computer.h */
```

```
#include <local/computer.h>
```

```
!auth.users mADD(@staff)
```

```
/* local/lab-computer.h */
```

```
#include <local/computer.h>
```

```
!auth.users mADD(@staff)
```

```
!auth.users mADD(@students)
```



Example 2: Authorization

```
/* source profile */  
  
#include <local/managed-site.h>  
#include <lcfg/os/fc6.h>  
#include <local/staff-computer.h>  
  
/* allow a non-staff user access */  
  
!auth.users mADD(fred)
```

Example 3: Managing a Server

```
/* local/web-server.h */
```

```
!tcpwrappers.allow    mADD/apache)  
tcpwrappers.allow_apache httpd : 192.168.
```

```
!ipfilter.export     mADD(http)
```

```
/* local/rsync-server.h */
```

```
!tcpwrappers.allow    mADD/rsyncd)  
tcpwrappers.allow_rsyncd rsyncd : 192.168.1.1
```

```
!ipfilter.export     mADD(rsync)
```



Example 3: Managing a Server

```
/* source profile */
```

```
#include <local/managed-site.h>  
#include <lcfg/os/fc6.h>  
#include <local/web-server.h>  
#include <local/rsync-server.h>
```



Spanning Maps

- A component in one profile can *publish* resources to which a component in the profile for another machine *subscribes*.
- Usage includes:
 - dhcp
 - ipfilter
 - inventory



Conclusion

- Usability – common config language
- Can describe required state completely.
- Devolved management.
- Easy to manage relationships within the network.
- Autonomics – machine configures itself.



Further Information

- <http://www.lcfg.org/>
- lcfg-discuss@inf.ed.ac.uk

