

Paul Anderson

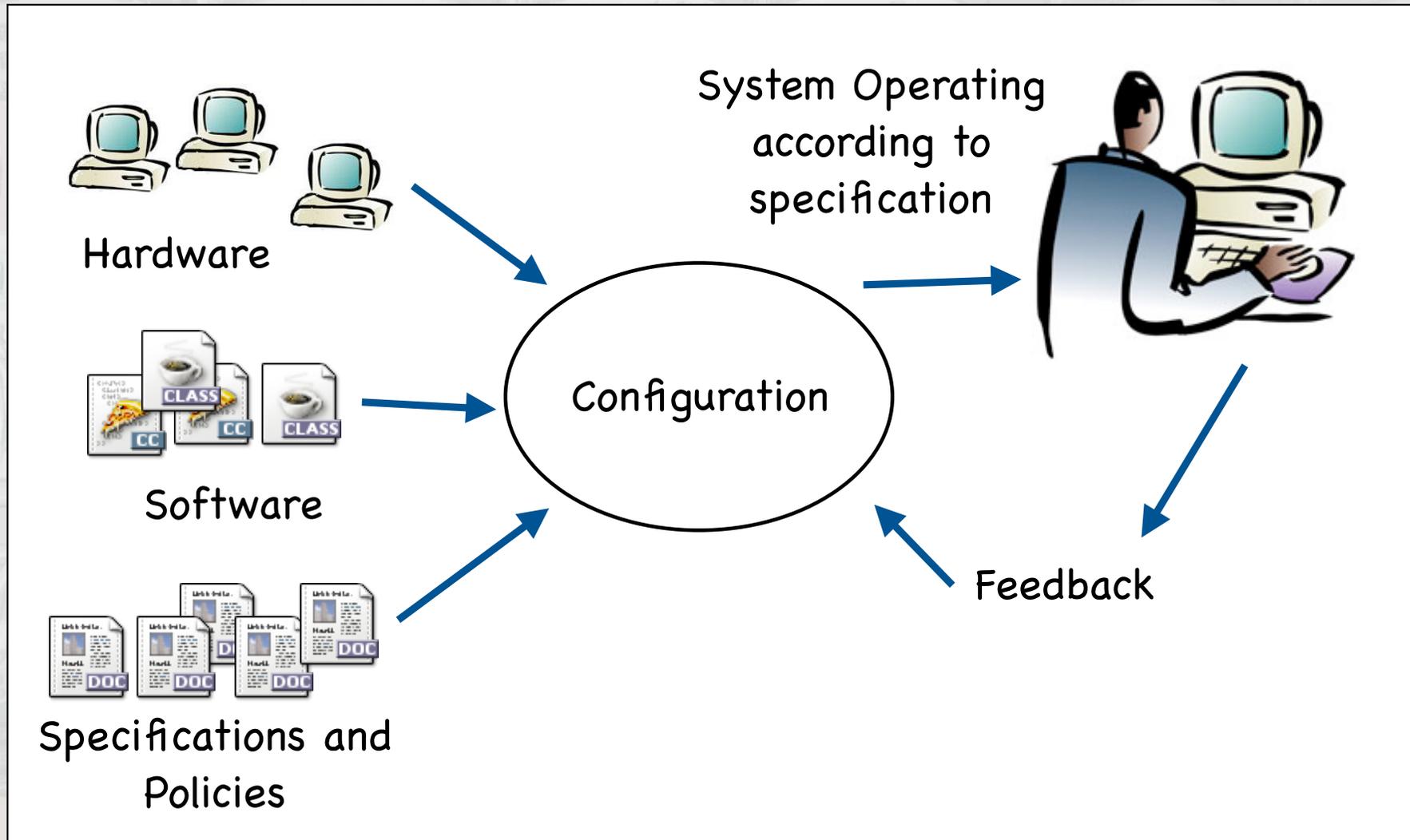
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System Configuration

School of
informatics



The system configuration problem



The system configuration problem

- **Starting with:**
 - Several hundred machines (with empty disks)
 - A "repository" of all the necessary software packages
 - A specification of the overall required service
- **Load the software and configure the machines to provide the service**
 - This involves many internal services - DNS, LDAP, DHCP, NFS, NIS, SMTP, Web ...
- **Reconfigure the machines whenever any of the inputs change**
 - Requirements, hardware, or software

The hard bit ...

- **Working out what to put in the configuration files**
 - To make the whole system perform according to the specification
 - The mechanics of getting the data into the configuration files, and the software on the machines is comparatively straightforward (this is configuration “deployment”)
- **Automating this is becoming more important**
 - For correctness & reliability
 - For autonomies

Some typical problems

- If we replace a broken machine with one of a slightly different type, how do we ensure that:
 - The apparent behaviour is the same as before
 - Even though some things may be different (display drivers, disks, network hardware)
- If we move a DNS server, how do we ensure that the clients change (before we decommission the old server)?
 - Do we even know all the clients?
- If we move a service, such as a web server, many related things may have to change ..
 - Firewall holes? DNS aliases? Authorisation lists? backup procedures? Database server?

Automated system configuration

- **Managing many similar machines is easy**
 - At least, not much worse than managing one
 - Using a simple clone & customise procedure
- **Managing many different machines is possible to some extent**
 - Classing mechanisms are a common approach
 - Aspect combination is still a current problem
- **Managing “relationships” is the real challenge**
 - If we move a “server”, how do we make sure that the clients are automatically reconfigured to match?
- **We really want to manage “high-level” services**

A practical approach

- ❑ System configuration involves translating high-level system requirements into implementable details (such as configuration files)
- ❑ There are no tools which automate this entire process
 - Most tools really do configuration “deployment”
- ❑ More sophisticated tools which support higher-levels involve a big commitment
 - These only tend to be suitable for larger sites
- ❑ Practical configuration management involves a smooth combination of manual procedures and automation

Levels of configuration automation

“Copy this disk image onto these machines”



“Put these files on these machines”



“Put this line in sendmail.cf on this machine”



“Configure machine X as a mail server”



“Configure machine X as a mail server for this cluster”
(and the clients will automatically be configured to match)



“Configure any suitable machine as a mail server for this cluster”
(and the clients will automatically be configured to match)



Configure enough mail servers to guarantee an SMTP response time of X
seconds

Issues in system configuration

- Proscriptive management
- Scale
- Change
- Diversity
- Devolved management and aspects
- Usability
- Security
- Distributed systems
- Uncertainty
- Autonomics

Some research areas

□ Languages and specifications

- “Loose” specifications (constraints) are necessary for devolved management
- “Loose” specifications are necessary for autonomics

□ Deployment

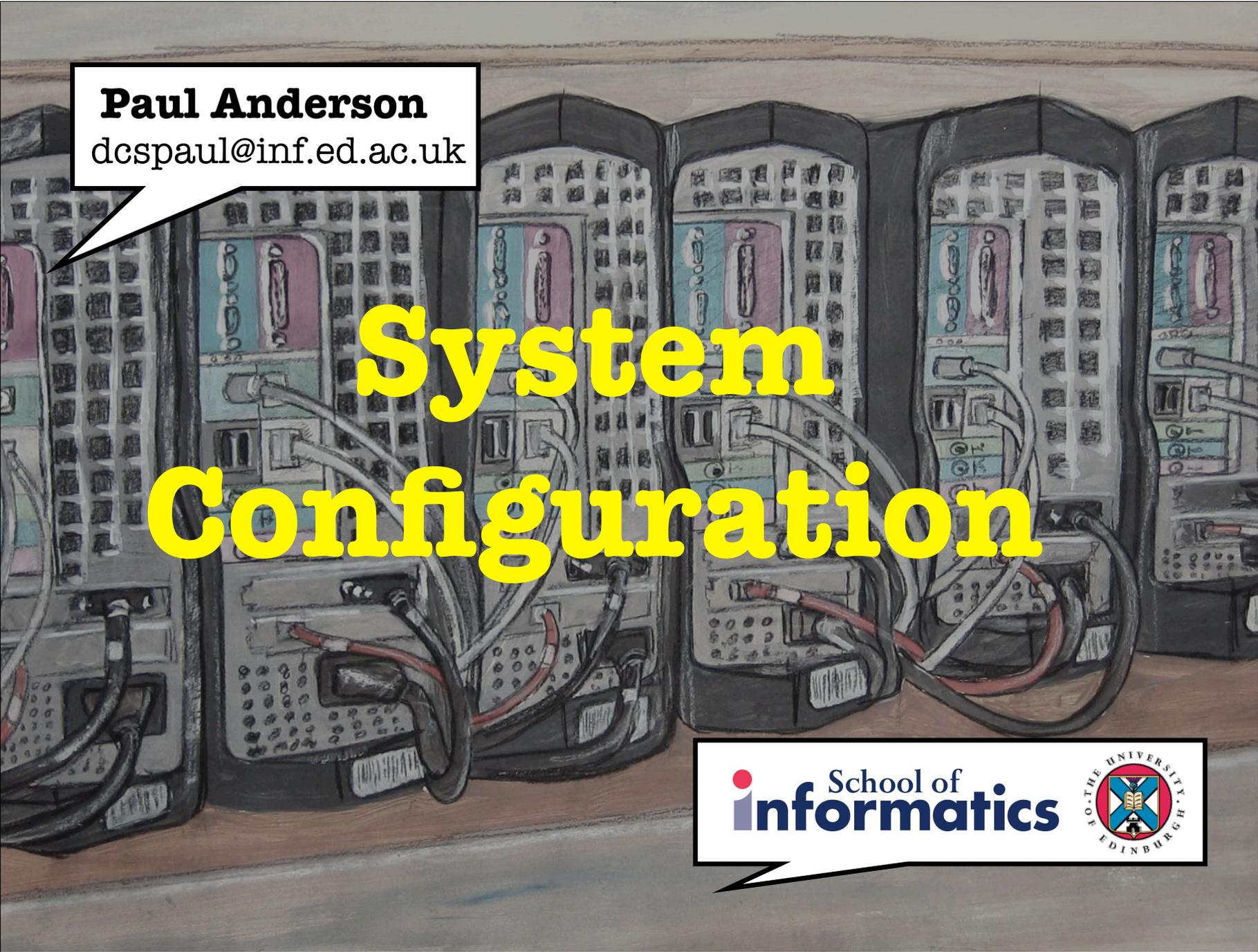
- Centralised systems are bottlenecks
- P2P systems require hard distributed reasoning

□ Implementation

- Practical implementations involve large amounts of detailed code
- Can we develop standards which allow the higher-level common functions to be separated out

Conclusions

- ❑ System configuration involves thinking about the behaviour of the entire system
- ❑ Do not be seduced into thinking that some tool will solve the problem
 - A combination of tools and manual procedures
- ❑ Keep the high-level objectives clear
 - Do not get bogged down in “scripts” and details
 - change, diversity, aspects, security, etc ...
- ❑ Read my new SAGE book :-)
 - Out early next year



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