COMP283-Lecture 7
Applied Database Management

Introduction	
High Availability	Server Maintenance
	Redundancy
	Mitigation Plan

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DB Administration: Backups and Restore

- Backup, Backup, Backup!
  - Database backup and System backup
- Set a backup schedule.
  - On a regular basis.
- Verify backups are working.
  - How?
- Store backups securely

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DB Administration: Backup Scheme

- Backups should never be to the same disk as the data or system file disks.
  - Why not?

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DB Administration: Backup Scheme

- Identify a backup
- Determine when a backup can be replaced/overwritten
- Types of backups:
  - Full Backup
  - Differential Backup
    - Records all the changes since the previous full backup
  - Incremental Backup
    - Records the changes since the previous incremental backup
- Identify/label all backups on the backup medium

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DB Administration: Backup Strategies

- On-line Backup
  - Immediately available for recovery
- Near-line Backup
  - Files not immediately available, but can be made available easily.
- Off-line Backup
  - To a remote server or removable media.

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DB Administration: Backup Strategies

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DB Administration: Backup Strategies

Following a severe fire at one of Southampton University's buildings, Kroll Ontrack was brought in to help recover as much critical data as possible from the damaged hardware. The University, together with a salvage team, identified the hard drives that were likely to have valuable information stored on them – mostly R&D data from long term project work by PhD students – and sent them for analysis and recovery in Kroll Ontrack's data recovery lab in Epsom, Surrey.

Robert Winter, Chief Engineer at Kroll Ontrack, led the recovery of around 70 hard drives, and worked with his team to prioritise the recovery effort according to the drives that contained the most critical data. The engineers made an exact copy of each disk drive, extracted the users' files, copied them to a CD or another hard drive, and then returned these to the University.

Sixty percent of hard drives were suffering from smoke damage. The remaining drives were heat and smoke damaged, which proved more difficult to recover from since the electronic components had melted. Heat had also damaged the rotating disk in some of the hard drives, which caused them to buckle, and rendered those drives irrecoverable.

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DB Administration: Backup Strategies

- Most DBMS have utilities to create backups
  - e.g. `mysqldump`
- Many of these are "command line" programs - can be placed into a script
- Can use OS to schedule backups
  - e.g. unix/linux `cron` system

```
15 2 * * * root mysqldump -u root -pPASSWORD --all-databases |
gzip > /mnt/disk2/database_`date ' %m-%d-%Y'`.sql.gz
```

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DB Administration: Backup Strategies

- When to backup?
  - Check pattern of use of DB / System
  - Look for times of little / low use
  - Overnight? Weekends?
  - Perhaps do a differential or incremental backup to reduce downtime. Do fewer full backups.

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Server Maintenance: Mitigation Plans

- two main types of mitigation plans:
  - Disaster Recovery and Business Continuity
- Both require:
  - Up to date contact list
  - Decision tree for various scenarios
  - Info on recovering admin usernames and passwords
  - Details on backups
  - System configuration info
  - Definition of a successful recovery

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Server Maintenance: Mitigation Plans

- Disaster Recovery Plan:
  How will you deal with a total loss of data, equipment or infrastructure?
- Essential that you have:
  - Asset inventory
  - Adequate insurance
  - Backups
  - System configuration details
  - Details of essential infrastructure and equipment.

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Server Maintenance: Mitigation Plans

- Business Continuity Plan:
  How will you cope with loss of employees or business partners, business restructuring or reorganisation, business takeovers, and systems maintenance.
- What happens when the key personnel leave?
- System Maintenance Plan:
  - User group - consult for maintenance schedule
  - Users must check DB after e.g. updates to OS / DBMS

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Server Maintenance: Server Performance

- Some DBMS systems include facilities to monitor their own performance.
- Alternatively, OS tools will allow you to monitor the health / utilisation of e.g. the disk and report when it is getting full.
  - e.g. on Unix / Linux system `du` reports disk usage, `top` displays process stats
  - may be used as part of a script
- Monitored over time, you can get a feel for whether the system is tuned correctly.

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Server Maintenance: Server Performance

- Windows Management Instrumentation (WMI) is a Windows systems management suite of tools.
- MS-SQL Server supports alerts based on WMI events.
- Linux and Unix based DBMS - typically you have to "roll your own"
  - Oracle (the DBMS company) sell a complete Linux system which includes their DB and tools to administer it.
- However it's done you generally can't just setup your database (and server) and forget it.

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Conclusions

- Introduced server maintenance:
  - Failure planning and mitigation (including Backups!)
  - Maintenance planning