HOW TO MECHANISE AN IT AUDIT

Chris Parker
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The University of Queensland

- $1.6 Billion Organisation
- 40+ Sites
- 400+ Buildings
- 100+ Institutes, Schools, and Centres
- 50,000+ Students
- 100,000+ Network Ports
Effective Use of IT

UQ Uses IT

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Effective Use of IT

UQ Uses A Lot Of IT

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Effective Use of IT For Students

IT is used to Attract, enrol, teach, assess and graduate students

Attract → Enrol in Classes → eLearning Recordings → Online Assessment → Graduation

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Effective Use of IT For Researchers

IT is used to Create, store, protect & share and publish research material

Create → Store → Protect → Share → Publish

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130 Different Uses for IT
600+ IT Services
The organisation has become totally reliant on IT.
Purpose of the Audit

• To identify and understand the IT services at UQ,
• how important they are
• who looks after them
• How they interconnect
Objectives of This Audit

Identify the RISKS

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Risk Categories

Risks are divided into 3 categories:

- **Confidentiality**: the risk of unauthorised access to data
- **Integrity**: the risk of data being changed or incorrect
- **Availability**: the risk of the service or data not being available when needed.
Risks are divided into 3 categories:

- Common way of classifying risk in security standards such as ISO 27001
Confidentiality is gauged by the type of data stored in or captured by the service.

Course & subject information

Student Identity information
IT Risk Categories - Integrity

Integrity of the data depends on the system that is using it.

Student Name in the Student Portal = 5
Student Name for Diploma Printing = 9

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IT Risk Categories - Availability

Availability (uptime) will vary for each service

- e-Learning System - 24 x 7 = 9
- Staff Time-Sheeting System = 4

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For each service we want to set a Target CIA and a Actual CIA (Actual is after controls)
Questions about a service can contribute towards setting a target CIA:

- The data the service uses: 
  ✓
- Business impact of service outage: 
  ✓
- Data accuracy requirement: 
  ✓
- Business hours or 24/7: 
  ✓
Questions about a service can contribute towards setting a **Actual CIA**: *(What controls are currently in place to protect the service in the three areas)*

- **Behind firewalls:** ✓ ✓
- **Type of equipment used:** ✓ ✓ ✓ ✓
- **Location of equipment:** ✓ ✓ ✓ ✓ ✓
- **Backup & recovery strategy:** ✓ ✓ ✓
Process

35 questions for each service, some multi-value

20,000+ pieces of information about the IT services in the organisation

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How to capture all this information?

Using a web based system allowing IT staff to enter their own service details.

Processing the information centrally for reporting.
Using ServiceView we are able to delegate the task of:

- Adding a new IT service
- Setting service dependencies on other services
- Setting data centre dependencies & failovers
ServiceView records usage, capacity and availability data for all IT services. KPI performance is monitored and reported. Scheduled and unscheduled outages are recorded and communicated.

ServiceView models data centre dependencies and failover strategies for each service. The impact of a data centre or multiple data centres outages can be predicted. A restoration plan is automatically generated.

Staff and other costs are assigned to each service. By using the relationship between services, costs of underpinning services are escalated to give the true service cost. Total organisation spend is calculated itemising every dollar.

ServiceView can take feeds from other monitoring solutions or perform the monitoring itself. A server side browser simulates real client interaction with online services, and records screenshots at each step.
Overview

Service owner: Simon Collyer (Teaching and Learning Support)
Technical owner: Roy Duncan (Online Technologies)

Blackboard is the e-learning system used by UQ to provide online learning and assessment to students. It is accessible via the web and also by mobile device.

Blackboard is a tool that facilitates communication and online learning between students and course co-ordinators. It can also provide online assessment items, including online tests or electronic submission of assignments, as well as access to lecture theatre recordings.

2015 Availability: 100%
Not including scheduled work: 100%

<table>
<thead>
<tr>
<th>Date</th>
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<th>Event</th>
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Targets / KPI

<table>
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<tr>
<th>Service / Target</th>
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<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
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Service Events & Important Dates
Setting Service Dependencies on Other Services

Video SV Adding Service

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Targets / KPI

Service / Target | Tue | Wed | Thu | Fri | Sat |
--- | --- | --- | --- | --- | --- |
Blackboard - Blackboard Uptime 99% | o | o | o | o | o |

Service Events & Important Dates
Service Dependencies

Required for service delivery

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Service Dependencies

LDAP

REQUIRED FOR SERVICE DELIVERY

BLACKBOARD

LECTURE RECORDINGS

BLACKBOARD

SOME FEATURES

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Service Dependencies

LDAP → BLACKBOARD: Required for Service Delivery

LECTURE RECORDINGS → BLACKBOARD: Some Features

BLACKBOARD → BLACKBOARD: No Updates

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Service Risk

Calculating the service risk

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<td>✔️</td>
<td>✔️</td>
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</table>

Service Events & Important Dates
Each data type is classified for confidentiality centrally.
<table>
<thead>
<tr>
<th>Confidentiality</th>
<th>Integrity</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Target Values</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>10</td>
<td>9.5</td>
</tr>
<tr>
<td><strong>Actual Values</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>10.25</td>
<td>11.5</td>
</tr>
</tbody>
</table>

- Equipment Access IP Restrictions: *Restricted to a subset of UQ IP addresses*
  
  - Target Value: 7
  - Actual Value: 9
- Equipment Location: Secure Data Centres (Multiple)
  
  - Target Value: 10
  - Actual Value: 10.25
- Lifecycle: Core
  
  - Target Value: 9.5
  - Actual Value: 11.5
- Service Type: Commercial Off The Shelf (COTS)
  
  - Target Value: 1
  - Actual Value: 1
- User Interface Connection: Connects Over Secure Network (e.g. HTTPS)
  
  - Target Value: 1
  - Actual Value: 1
- User Interface IP Restrictions: Restricted by Port
  
  - Target Value: 1
  - Actual Value: 1
- User Interface Login: Central UQ Usernames & Passwords
  
  - Target Value: 1.5
  - Actual Value: 1.5

**Availability requirements**

- Target: 9.5
- Actual: 11.6

**Measures in Place to Increase Availability**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Target</th>
<th>Actual</th>
</tr>
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<tbody>
<tr>
<td></td>
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</tbody>
</table>

**Availabilty**

- Technology: web servers, asset tracking, language, Java, programming languages

**Backup & Recovery**

- Scheduled Backups
  
  - Target: Scheduled
  - Actual: Scheduled
- Service Failure Tolerance
  
  - Target: No Failover
  - Actual: No Failover
- Service Failure Impact
  
  - Target: No Impact
  - Actual: No Impact
- End-to-End Impact of Service Outage
  
  - Target: Service Can Only Be Down For Scheduled Maintenance
  - Actual: Service Can Only Be Down For Scheduled Maintenance
- Service Recovery Time
  
  - Target: 24 Hours
  - Actual: 24 Hours

**Service Type:**

- **Commercial Off The Shelf (COTS)**

- **Technology:**
  
  - web servers, asset tracking, language, Java, programming languages
<table>
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<tr>
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</tr>
<tr>
<td><strong>Actual Values</strong></td>
<td>9</td>
<td>10.25</td>
</tr>
</tbody>
</table>

**Measures in Place to Protect Data Integrity**

- Backup & Recovery: *Scheduled Backups* | 1
- Equipment Access: *SSH* | 1
- Equipment Access IP Restrictions: *Restricted to a subset of UQ IP addresses* | 0.5
- Equipment Location: *Secure Data Centres (Multiple)* | 0.75
- Incident Logging: *Incident Management System e.g. LANDesk* | 1
- Lifecycle: *Core* | 1
- Service Monitoring: *Yes - With email or SMS alerting* | 1
- Service Type: *Commercial Off The Shelf (COTS)* | 1
- User Interface Connection: *Connects Over Secure Network (e.g. HTTPS)* | 1
- User Interface IP Restrictions: *Restricted by Port* | 1
- User Interface Login: *Central UQ Usernames & Passwords* | 1

**Measures in Place to Increase Availability**

- Task & Resource: *Scheduled Backup* | 1
- Equipment Location: *Secure Data Centres (Multiple)* | 1
- Equipment this service is run on: *Cloud or other balanced servers* | 1
- Lifecycle: *Core* | 1.6
- Release Process: *Testing & formal approval process done prior to release on production* | 1
- Service Monitoring: *1st - With email or SMS alerting* | 1
- Service Type: *Commercial Off The Shelf (COTS)* | 1
### Availability requirements

**Target:** 9.5

- **Business Impact of Service Outage:** Service Can Only Be Down For Scheduled Maintenance  
  - Actual: 8.5
- **Service Uptime hour requirements:** 24 Hours  
  - Actual: 1

### Measures in Place to Increase Availability

- **Backup & Recovery:** Scheduled Backups  
  - Actual: 1
- **Equipment Location:** Secure Data Centres (Multiple)  
  - Actual: 3
- **Equipment this service is run on:** Clustered or Load Balanced Servers  
  - Actual: 3
- **Lifecycle:** Core  
  - Actual: 1.5
- **Release Process:** Testing & formal approval process done prior to release on production  
  - Actual: 1
- **Service Monitoring:** Yes - With email or SMS alerting  
  - Actual: 1
- **Service Type:** Commercial Off The Shelf (COTS)  
  - Actual: 1
How Well Is the Service Being Run?

The service is being run properly.

<table>
<thead>
<tr>
<th>Confidentiality</th>
<th>Integrity</th>
<th>Availability</th>
</tr>
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<tbody>
<tr>
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<td>10.25</td>
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</tbody>
</table>

OK OK OK

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### Integrity requirement

<table>
<thead>
<tr>
<th>Data Accuracy</th>
<th>Target: 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measures in Place to Protect Data Integrity</td>
<td>Actual: 10.25</td>
</tr>
<tr>
<td>Backup &amp; Recovery: Scheduled Backups</td>
<td>1</td>
</tr>
<tr>
<td>Equipment Access: SSH</td>
<td>1</td>
</tr>
<tr>
<td>Equipment Access IP Restrictions: Restricted to a subset of UQ IP addresses</td>
<td>0.5</td>
</tr>
<tr>
<td>Equipment Location: Secure Data Centres (Multiple)</td>
<td>0.75</td>
</tr>
</tbody>
</table>

### Equipment Location

- **Secure Data Centres (Multiple)**: Recommended: Secure Data Centre (Single)

### Availability requirements

| Service Uptime hour requirements: 24 Hours | Actual: 5.5 |

### Equipment this service is run on

- **Single PC**: Recommend: Clustered or Load Balanced Servers
How Well Is the Service Being Run?

The service is not being run properly.

<table>
<thead>
<tr>
<th>Service Risk:</th>
<th>HIGH - Integrity, Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confidentiality</td>
<td>7</td>
</tr>
<tr>
<td>Integrity</td>
<td>10</td>
</tr>
<tr>
<td>Availability</td>
<td>9.5</td>
</tr>
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</table>

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How Important Is The Service?

Some services are more important to the organisation

Classify services into “Tier 1”, “Tier 2” etc based on their importance.

Blackboard
Tier 1
Some services are more important to the organisation

Classify services into “Tier 1”, “Tier 2” etc based on their importance. Any service this service depends on automatically classified in same tier or higher.
Calculating Residual Risk?

Combine all this information to get residual risk

How well are we running this service

\[ \text{How important is this service} + \]

\[ = \]

RESIDUAL RISK

LOW MODERATE HIGH SIGNIFICANT

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Confidentiality Important For All Services

We cannot expect hackers to only target our most important services, all services are equally venerable for confidentiality.

How well are we running this service?

What data does this service use?

\[\text{RESIDUAL RISK} = \text{LOW} + \text{MODERATE} + \text{HIGH} + \text{SIGNIFICANT}\]
Reporting

How do we extract the information in a meaningful way?
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Mobile Number: 0423 784 473

Email KPI results:
- Daily
- Weekly
- Never

Email DR Plan:
- Weekly
- Monthly
- Never

---

### Services

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Service</th>
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<tbody>
<tr>
<td>$</td>
<td>Account Management PrISM Servers (Infrastructure)</td>
<td>No targets/KPI</td>
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<tr>
<td>$</td>
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<tr>
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</tbody>
</table>
GP North DC Outage

Outage of GNDC1 (GNDC1 Building 39A - St Lucia Campus)
Outage of GNDC2 (GNDC2 Building 39A - St Lucia Campus)

Services Running in Affected Data Centers

Service Name
- Avion Application Servers
- Avion Database Servers
- Avion Application Servers
- Avion Database Servers
- Avion Application Servers

GP North DC Outage Cont.

Service Restoration Priority

<table>
<thead>
<tr>
<th>Service Name</th>
<th>Failover</th>
<th>Restoration</th>
<th>Technical Owner / Team</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Directory (Infrastructure)</td>
<td>Not impacted</td>
<td></td>
<td>Rochelle Harrison (Microsoft Services) - 0421 055 349</td>
</tr>
<tr>
<td>Avion (HR Division IT Services)</td>
<td>Automatic</td>
<td>30 mins</td>
<td>Shiva Risco (HR Information Systems)</td>
</tr>
<tr>
<td>1. Avion Database Servers</td>
<td>Auto to DC3</td>
<td>30 mins</td>
<td>Bogdan Ianandeli ( Unix Servers Group) - 0422 958 178</td>
</tr>
<tr>
<td>Process: Automatically</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Avion Application Servers</td>
<td>Auto to DC3</td>
<td>30 mins</td>
<td>Bogdan Ianandeli ( Unix Servers Group) - 0422 958 178</td>
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<td>Process: Automatically</td>
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<td></td>
<td></td>
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<tr>
<td>3. Exadata Database Servers</td>
<td>Auto to DC2</td>
<td>5 mins</td>
<td>Andrew King (Corporate Applications &amp; Database Services) - 0413029762</td>
</tr>
</tbody>
</table>
| Process: Failover of production database services occurs automatically via Oracle Fast Start Fail Over (FSFO) to a standby Oracle Data Guard
instance in the alternate data centre. |           |             |                                                 |
| 4. Storage Arrays                                 | Auto to DC3 | 5 mins      | Tim Criddle (Enterprise Provisioning) - 0435 960 562 |
| Process: Automatic                                |           |             |                                                 |
| 5. Uniti & Sintel Batch Servers                   | Auto to DC3 | 30 mins     | Bogdan Ianandeli ( Unix Servers Group) - 0422 958 178 |
| Process: Automatic                                |           |             |                                                 |

Blackboard (eLearning & Collaboration)

1. LDAP
   Process: Automatic
   Failover: Auto to DC2
   Restoration: 0 mins
   Technical Owner: David Fairbrother (Core Infrastructure Services)

2. Exadata Database Servers
   Process: Failover of production database services occurs automatically via Oracle Fast Start Fail Over (FSFO) to a standby Oracle Data Guard
   instance in the alternate data centre.
   Failover: Auto to DC2
   Restoration: 5 mins
   Technical Owner: Andrew King (Corporate Applications & Database Services)

3. LDAP & RADIUS Servers
   Process: Automatic
   Failover: Auto to DC2
   Restoration: 0 mins
   Technical Owner: Bogdan Ianandeli ( Unix Servers Group)
Reporting

Complete Risk Report

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<td>Service</td>
<td>Actual CIA</td>
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<td>CMS - ITS Drupal (Web Services)</td>
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<td>Shibboleth IdP (Infrastructure)</td>
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<td>UQ Search (Web Services)</td>
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<td>Web proxy (Networks)</td>
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<td>Websites - Unix (Web Services)</td>
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40 Seconds and 18,000 database queries later
How do we know it works?
Another 40 Seconds and 18,000 database queries later
IT Risk Report

Overview
An in-depth review of 16 core (and an additional 38 underpinning) services operating at The University of Queensland was conducted. The review identified:
- Purpose and owners of each service
- Users and availability requirements of each service
- Measures in place to ensure services are being managed appropriately
Of the 16 services 6 presented a significant risk, 4 presented a moderate risk, 8 were low risk.

Confidentiality of Data
All core and non-core IT services containing corporate data were reviewed to ensure adequate measures were in place to protect the confidentiality of the data.
Of the 164 services reviewed 4 were found to have inadequate measures in place. See Appendix 1 for full list.

Recommendations
A list of 10 recommendations have been made as a result of the review. See Appendix 2 for full list.

Blackboard
Blackboard is the e-learning system used by UQ to provide assessment to students. It is accessible via the web and mobile device. Blackboard is a tool that facilitates communication and online assessment between students and course coordinators. It can also be used as a tool for lecturer and student interaction.

Purpose: Learning Environment
Primary Users: Staff and Students (10000 and over)
Availability: 24 Hours
Operated by: Teaching and Learning Support
Storied Data: Admitted Students, Course Enrolments, Course Resources, Courses, Results
Technology: Apache, Java, JavaScript, Oracle, Perl, R, Linux, Tomcat

1. Inadequate measures are in place to ensure a high enough availability of Health Sciences VM Farm. A failure in Health Sciences VM Farm will result in a failure to Blackboard.
2. Inadequate measures are in place to ensure a high enough availability of Isilon Storage - Herston. A failure in Isilon Storage - Herston will result in a failure to Blackboard.

RECOMMENDATIONS

2. Improve Health Sciences VM Farm availability
3. Improve Isilon Storage - Herston availability
More Information

If you would like more information email me at:

chris.parker@uq.edu.au

Thank you for your time.

Chris Parker
chris.parker@uq.edu.au
What Constitutes an IT Service

- Applications or other IT services that perform a critical business functions without which would impact on your ability to conduct your business efficiently

OR

- Applications or other IT services which store sensitive data