

# Beyond the Academics of Business Resilience using TSM

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Presentation for Tivoli Nation - Sydney 2008

By

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# Who am I?

- Tony CATALDO (tony.cataldo@its.monash.edu.au)
  - TSM/SAN Administrator @ Monash University – ITS.
  - Part of Infrastructure Services – Shared Systems – Data Storage Team
  - Enjoy good food and passionate about short blacks – espresso coffee of course!!
- Became a proud uncle for second time this year (2<sup>nd</sup> - boy, Valentino, 54cm, 5.2kgs, 7hr labour; 1<sup>st</sup> - boy: Massimo, 53cm, 4.1kg, 15hr labour).
- Began @ Monash Uni in August 2004 in the Data Storage Team.
  - 9 years @ Telstra Research Labs as Unix Sys Admin (1992-2001),
  - Unix Sys. Admin. @ Co-Cam Computer Group (1990-1992),
  - Bach. of Computing @ Monash University in 1990.

# Topics Covered

- Monash Uni CV.
- Pre-August 2004
- Primary reason of TSM for Monash
- People Resources/Infrastructure/TSM Resources.
- TSM @ Monash Uni.
- Challenges Along the Way
- Business Continuity/Resilience
- Future
- Acknowledgements/References
- Questions

# 1.0 Monash University CV.

- Established by Act of Parliament in 1958, first students in 1961.
- Founding member of the G8 (Group of Eight – Leading Universities) in Australia.
- Celebrating 50th year Jubilee in August/September this year.
- Campuses in VIC – Berwick, Caulfield, Clayton, Gippsland, Parkville, Peninsula.
- International Campus – Sunway, Malaysia; Ruimsig (Jo'burg) South Africa.
- International Presence – London (UK), Prato (Italy)
- Monash Abroad – 115 exchange partner Unis in 25 countries.
- Approx. 58,319 student enrolments and 6,590 (3,325 academic & 3,265 general) staff as at 31<sup>st</sup> March 2007. <sup>1</sup>
- ITS/Infrastructure Services: 100 of 380 IT staff.

<sup>1</sup> Statistics from Monash Uni web (<http://www.monash.edu.au/about/stats.html>)

## 2.0 Pre-August 2004.

- In 2002 Monash had a tender in the market for,
  - Disk Storage Facility (DSF),
  - Backup/Restore Facility (BRF).
- Submissions/presentations from most major IT vendors.
- Monash University primarily a Solaris site at the time.
- Tenders were evaluated against **approximately 150 criteria (corporate, technical, price, risk)** of various weighting.
- Typical tendering process, best vendors were shorted listed.
- Tivoli Storage Manager was selected together with other infrastructure. POC began in early 2004.
- Existing 24 TBs of SATA (isolated SAN) storage.
- No formal BC/DR strategy.

# 3.0 Primary Reason of TSM for Monash University.

- Initial implementation for corporate data and business critical applications managed by ITS;
  - Email for both students & staff,
  - My.Monash (web portal),
  - WebCT (learning portal),
  - Callista (Oracle student admissions/admin),
  - ESS (SAP Corporate HR),
  - Voyager (Library system used by major Unis worldwide).
- Approx. 350+ servers (Solaris8/9/10, Linux-RH, WIN2000 Server, Netware, Oracle, SAP)\*.
- Data protection and BC/DR resilience.

\* Non Supported Platforms (VAX VMS, SGI IRIS, WIN98, Solaris 7).

# 4.0 People Resources - Infrastructure Services (approx. 100 staff in total)

## Working with TSM

### > Production Facilities:

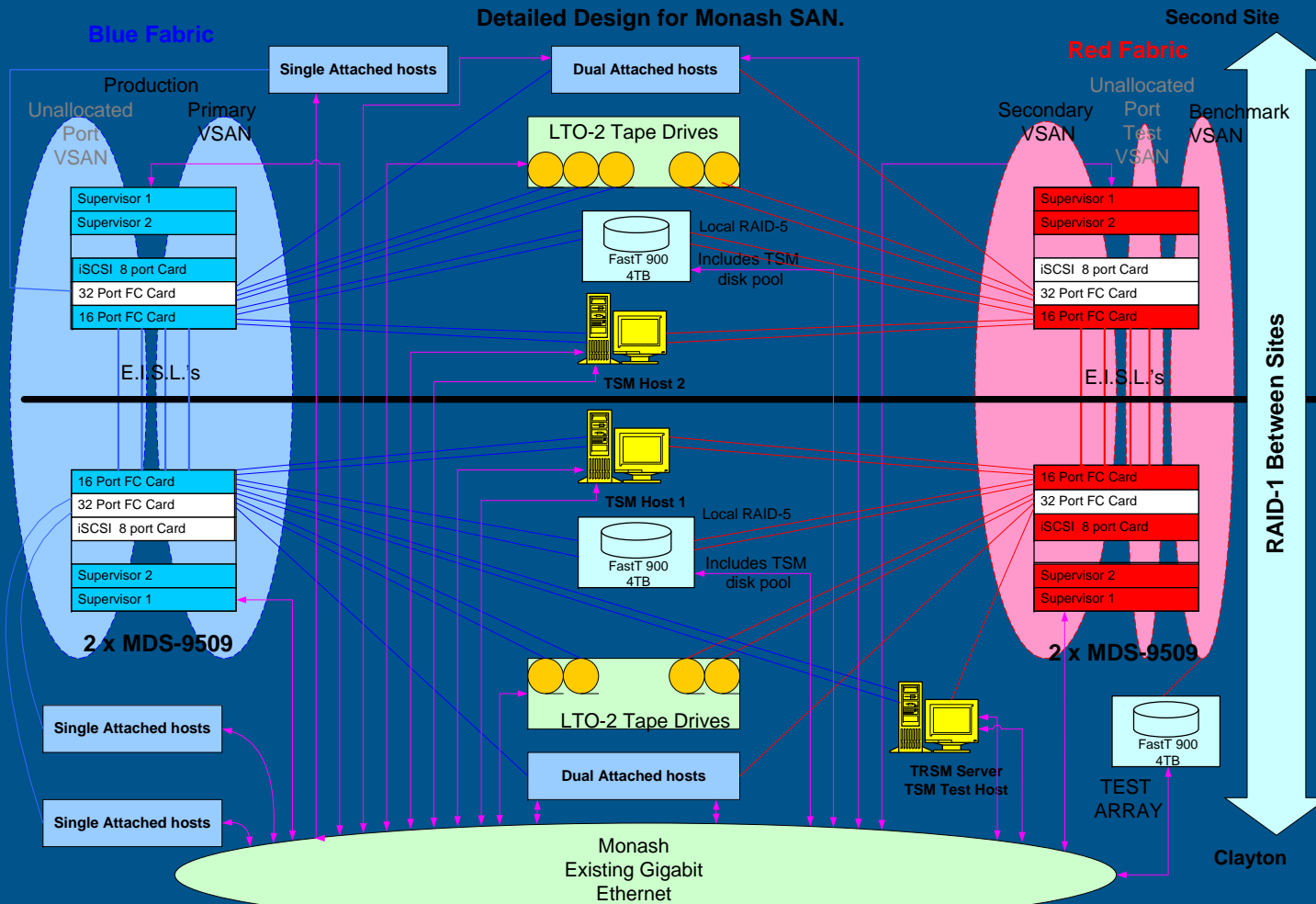
- 1 staff managing day to day – new installs, upgrades.
- 1 Senior Operator.
- 4 operators (rotating shifts 8am – 10pm).
- **Network: group size 30**
  - 2 staff that primarily manage fibre installation & configuration of 4 Cisco 9505 (now total of 6 switches – 2 for eResearch fabric).
- **Shared Systems: group size 26**
  - 3 people in Data Storage Team: manage backup (TSM), SAN (FC & SATA with Virtualisation).

## 4.0 People Resources - cont.

- Lots of time, resources, people & money been committed to this project,
  - 15 people completed TSM training (3 or 5 days training depending on their role),
  - estimate 90 - 150\* coffee & donuts consumed during this time.

(\* calc assumes: 15 people x 3 donuts x 3 or 5 days).

# 4.0 SAN Infrastructure



Russ for DMP Team Version 4.5 19/10/04

[www.monash.edu.au](http://www.monash.edu.au)

# 4.0 TSM System Resources 1<sup>st</sup> Generation

- **TSM Servers (running 4 instances)**
  - 2 x SUN Microsystems v440 (1 @ each site)
    - > 8GB RAM, 4 x 36GB Internal hdd, 4422 GB SAN hdd
    - > 4 HBA (2 JNI – for hdd, 2 Sun/QLogic for tape library).
- **Storage Used (entirely SAN hdd)**
  - 26.1 TBs of FC hdd.
- **DR Servers**
  - 2 x SUN Microsystems v440 (1 @ each site)
    - > 8GB RAM, 4 x 36GB Internal hdd.

# 4.0 TSM System Resources 1<sup>st</sup> Generation

– cont.

- **Tape Library (IBM 3584 now called T3500)**
  - 2 frames at each site with LTO2 drives.
  - Added more frames as required.
  - Changeover of most LTO2s to LTO3s, swapping of tapes.
- **Statistics**
  - Backing approx. 300 servers (Solaris, WIN, Novell, Linux RH4).
  - Performing 1TB incremental backup (change per night)

# 4.0 TSM System Resources 2<sup>nd</sup> Generation

## May 2008 (server refresh)

- **TSM Servers running 7 instances**
  - 2 x SUN T5220 servers (Sol 10) 1 @ each site
    - > 32GB RAM, 2 x 72GB Internal hdd.
    - > SAN hdd for TSM, direct attach hdd for TSM STG pools.
    - > 12 HBAs (4 Emulex – for hdd, 8 Sun/QLogic for tape drives in two libraries).
- **Storage**
  - TSM's db on SAN hdd.
  - TSM db log file mirrored across sites on SAN.
  - Dedication array of 24TBs holding last 24 hrs of backup (on disk STG pools) then gets migrated to tape.

# 4.0 TSM System Resources 2<sup>nd</sup> Generation

## May 2008 (server refresh) – cont.

- **DR Servers** - to be implemented
  - Using the existing hardware and use Solaris Zones
- **Tape Library (IBM T3500)**
  - Site 1: 4 frames with 8 x LTO4 & 4 x LTO2.
  - Site 2: 4 frames with 10 x LTO3 & 2 x LTO2.
  - LTO2 drives dedicated to TSM db backup.
- **Statistics**
  - Backing up 550 servers (Solaris, Novell, Linux RH4/RH5, WIN, Vmware).
  - 4 TB/day in incremental backup.

## 5.0 TSM at Monash today

- **566 servers servers being backed each day.**
- **Other groups using TSM.**
  - Business Economics IT support.
  - Monash South Africa ITS
- **Currently storing an average of 25 TBs per week on tape.**
- **Data protection and DR resilience is improved as data on tape is replicated in both silos.**
  - Recently tested a Tape Library “failure”

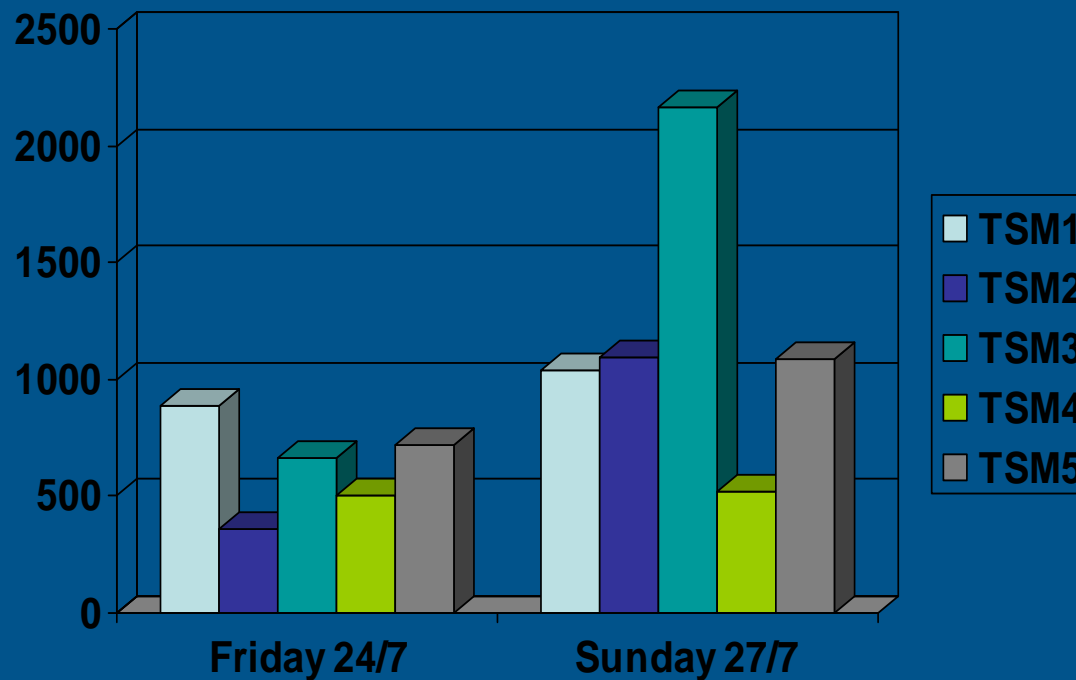
# 5.0 TSM at Monash today

- **5 TSM instances (soon 6) & 1 TSM configuration manager.**
- **For each TSM instance,**
  - Database can have max. size of 120GB (made up of 4 x 5 x 5GB files – allows multiple threads for speed).
  - 2 x DB log volumes are 8GB. One copy at each data centre (resilience and BC).
- **TSM Configuration Manager instance,**
  - Allows centralised management of users, policies, scripts, libraries, etc ...
  - Manages the tapes on behalf of the other TSM instances.
  - Libraries size: como has 1355 tapes, mani has 1500 tapes.

## 5.0 TSM at Monash today (Sunday 27/7/2008)

Instance	Total STG GB	Daily BKP GB	DB usage %	Clients
TSM1	3,887	1,041	62.1	162
TSM2	6,123	1,094	49.4	118
TSM3	8,677	2,166	56.3	105
TSM4	4,584	520	53.1	91
TSM5	2,271	1,085	61.6	90
<b>Total</b>	<b>25,542</b>	<b>5,906</b>		<b>566</b>
<b>Avg</b>	<b>5,108.4</b>	<b>1,181.2</b>	<b>56.5</b>	<b>113.2</b>

# 5.0 TSM at Monash Clayton (Friday 25/7 & Sunday 27/7)



## 6.0 Challenges along the way – TSM Clients

- **Issues with solaris server with large # of small files.**
  - Use of snapshots (scripting with storage array).
- **Issues with Netware servers with over 4 million files.**
  - Took time for Novell to write patches.

# 6.0 Challenges Along the Way - TSM Servers

- **Limited # of tape drives restricted daily reclamation process.**
  - Adjusted expiration policy & added extra drives.
- **Solaris 9/RDAC combination only allows maximum 32 luns, with 2 logical tsm systems on each server, limited to 15 lun/tsm server.**
  - Increased stg pool luns from 100GB to 200GB (In 2008, now have direct attached hdd for tsm stg pools).
- **Initially used “file” (OS file) storage pools used then swapped to “disk” (raw disk) storage pools.**
  - When re-configured LUNs changed TSM stg pools type to improve TSM threading (reads/writes).

# 7.0 Business Continuity/Resilience

- **Recent Incidents;**
  - SAN Array outage at one site.
    - > Impact: 3 TSM instances down.
      - lost TSM db file & log volume
    - > Resolved in 2 hrs after discovery, pointed log file to mirror copy across site on the other array.
  - Tape Library down due power/configuration issues.
    - > Impact: No tape drives available at secondary site.
    - > Divert “tape traffic” to library @ Primary site for 2 days.

# 8.0 Future

- **Green Computing.**
- **New Data Centre (15 kms away).**
- **Upgrade to v5.5, then v6.1.**  
(Waiting on TSM DB2 backend in v6.1 – should be able to then consolidate the multiple TSM instances).
- **Storage Resource Management (TPC for Data).**
- **De-duplication?? – hardware/software/both.**
  - WAIT, especially with IBM's changes in v6.1.

# 9.0 Acknowledgements/References

- **Acknowledgements**

- Current Monash Staff;

- > Prod. Fac: Steve White, Cyrus Khavar & King Hii.
- > SS: Russell Keil, Richard Spindler.

- Former Monash Staff;

- > George Scott, Stuart Lamble & Chris Bourke.

- **References**

- [www.monash.edu.au](http://www.monash.edu.au)

- *The dollars and the scholars* by Sushi DAS, “The Age”, Insight Section page 3, Saturday 26/7/2008, Fairfax Media.

# 10.0 Questions