“Distributed Systems & Networking” Discipline

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The Team ....

team with happy faces!

DSN staff

DSN students
DSN - discipline profile

- located mainly on 14.11 (end of corridor)
- 8 academic staff, 4 post docs, 25 PhD students
- 4 main areas of focus: networking, distributed systems and games&graphics, mobile computing
- funding over 4$ million from Australian Research Council (Discovery/Linkage)
- industry collaboration: Logistics (integrated platforms for trucking tracks in Australia), Security (SCADA), Mobile Platforms (for fire protection)

http://dsn.rmit.edu.au
DSN courses

- Foundations Distributed Computing
- Advanced Client/Server Architectures
- Advanced Data Communication
- Data Communications Net-Centric Computing
- WebServers and Web Technology
- Network Programming
- Network Security
- Enterprise Systems Architecture
- Interactive 3D Graphics and Animation
- Introduction to Graphics Programming using Java3D
- Real-Time Rendering and 3D Games Programming
- Web 3D Technologies
- Mobile Application Development
- etc

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**CYBER SECURITY**

- **security** of SCADA networks (intrusion detection systems tailored for distributed systems, network traffic analysis to detect “anomalies”)
- **survivability** of SCADA operations (by intelligently replicating, migrating .. essential services)
- **scalability** of SCADA systems (by reducing huge volume of data)

**Sources of Threats**

- Terrorist Threats
- General attacker threats
- Common criminal
- Regional political activism
- Disaffected staff
- Malicious code attack
- Organized crime
- Environmental groups

5 Computer Science (CS&IT) staff
2 Engineering (SECE) staff
data compression, encryption and prioritisation of ECGs
remote cardiac monitoring/diagnosis of elderly patients at home, soldiers in battlefield, wellness monitoring
ECG based biometric (authentication, integrity of data in BSN)
BSN for rehabilitation, sports, orienteering (with GPS)
Context Aware/Adaptive Mobile Applications

- **Context Awareness**
  - Monitor Hardware (e.g. CPU, RAM, Network, Power)
  - Physical Environment (e.g. Position, Light, Sound, Facilities)
  - User Preferences (General or Application specific)

- **Adaptation**
  - Object/Code mobility (execute code at most efficient location)
  - Automatic replication/caching (local code and data when efficient to do so)
  - Behavioural adaptation (different functionality in different contexts)

- **MobJeX Middleware**
  - Developed at RMIT (With many Honours, Masters, PhD & Summer students involved!)
  - 100+ packages, 1000+ classes
  - 50,000+ lines of code
  - Automatically adds adaptive capabilities to Java applications via pre-compilation and byte code transformation
  - Provides runtime support for context collection, object mobility, replication and behavioural adaptation
  - Runs on Windows, Linux and Windows Mobile

Dr C. Ryan (Leader)
Security

- **biometric security**
  - explore how to accurately identify a person based on his/her biometric features like fingerprint, face, etc.
  - explore how to integrate biometrics into mobile devices such as mobile phones, PDAs and smartcards (*mobile biometric*)

- **intrusion detection**
  - hackers can always penetrate network firewalls and modify your program or sensitive data.
  - new attacks are occurring everyday. Hard to detect new attacks!
  - investigate anomaly based intrusion detection techniques such as machine learning, Hidden Markov Models etc
Web Services

- performance performance performance … (of SOAP)
- real-time aspects (scheduling etc.)
- security (in XML): access control, aggregation or inference, etc.
- find services (based on specific semantic)
- verification of communication / negotiation
Service-Oriented Architectures (SOA)

- **Software as a Service (SaaS) on the Cloud** - integration between disparate services, Quality of Service (QoS), security and monitoring infrastructure
- **Business Process Modelling**
- **Service Modelling from the Software Engineering perspective** - identification, specification and realisation of software services

Dr Ryan (Leader), Dr Perepletchikov, Prof Tari
System Performance

- e.g. Web servers, P2P, **Cloud**
- Classical assumptions do not work
- New ways to do load balancing
  - Guessing tasks size
  - Traffic splitting
  - Theoretical modelling (e.g. approximating Pareto)
  - etc.
- New directions: energy-based scheduling algorithms