

Modifying first person shooter games to perform real time network monitoring and control tasks

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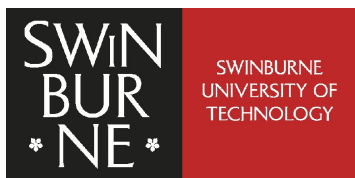
Outline

- The problem
- Previous work
- Metaphors for representation and interaction
- Overall architecture
- Advantages of leveraging 3D game engines
- Prototype
- Future work
- Conclusion

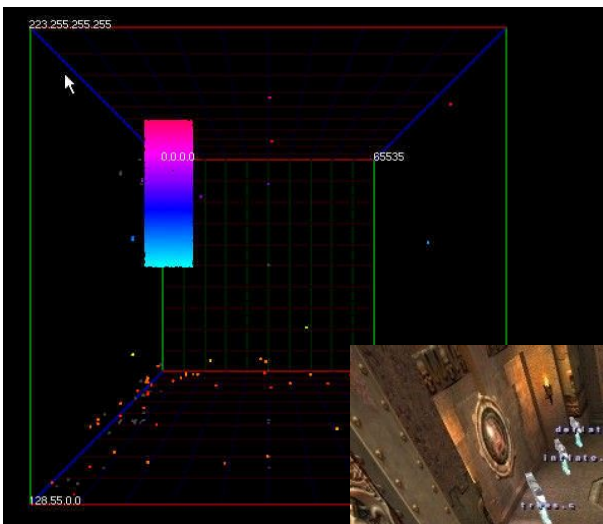


The problem

- Network administration is hard
 - Complicated
 - Compounded by attacks
- Question...
- Could suitably high-level, 3D interactive and real-time abstractions be created to...
 - Lower the skills needed to make a positive contribution to network administration?
 - Allow skilled personnel quicker diagnosis of network issues?



Previous work



•S. Lau, "The Spinning Cube of Potential Doom", Communications of the ACM, Volume 47, Issue 6, June 2004



•D. Chao, "Doom as an Interface for Process Management", Proceedings of the SIGCHI conference on Human factors in computing systems, Seattle, Washington, March 2001



•B. Kot, B. Wuensche, J. Grundy, J. Hosking, "Information Visualisation Utilising 3D Computer Game Engines Case Study: A source code comprehension tool", CHINZ '05: Proceedings of the 6th ACM SIGCHI New Zealand chapter's international conference on Computer-human interaction, Auckland, New Zealand, July 2005





Rationale

- Previous work
- 3D cheap and convenient to create
 - Convey large amounts of information quickly
- Keeping humans 'in the loop' in complex systems
 - Advantage over automated systems
- So how?
 - Definitions...



Metaphors

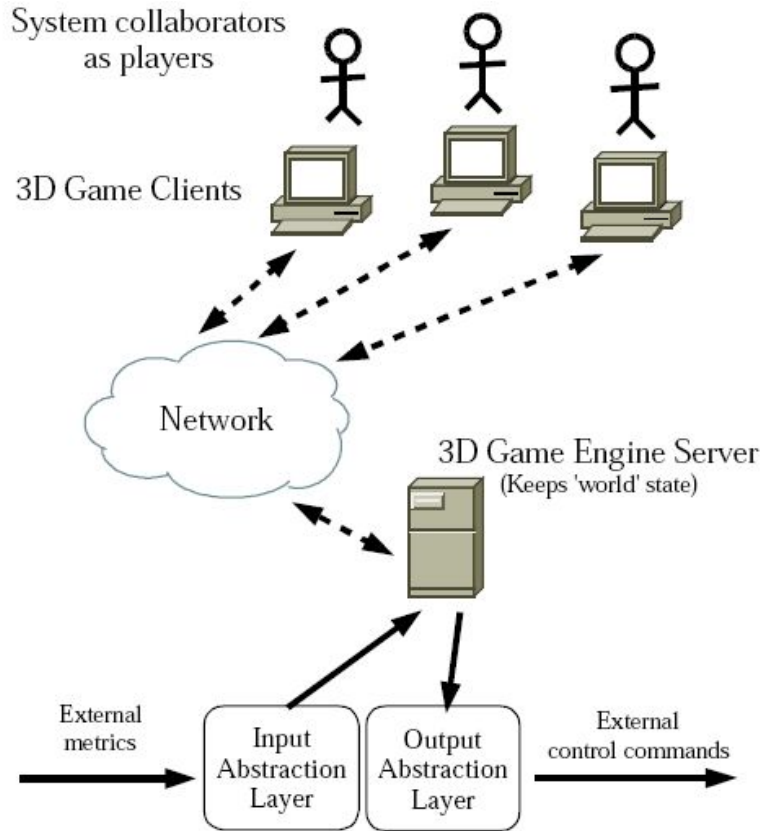
Visual Metaphor	Network Metric
Location	IP address, port number
Shape	Representation of object type (subnet, host or connection)
Size	Time aggregate of unique connections
Colour/Texture	Content type
Rotational Velocity	Throughput
Oscillation about a fixed point	User defined alert

Interaction Metaphor	Network Administration Action
Shoot (with gun)	Place firewall rule
Heal (with syringe)	'Undo' (remove changes)
Fine tune (with pliers)	Bandwidth rate-shape





Architecture

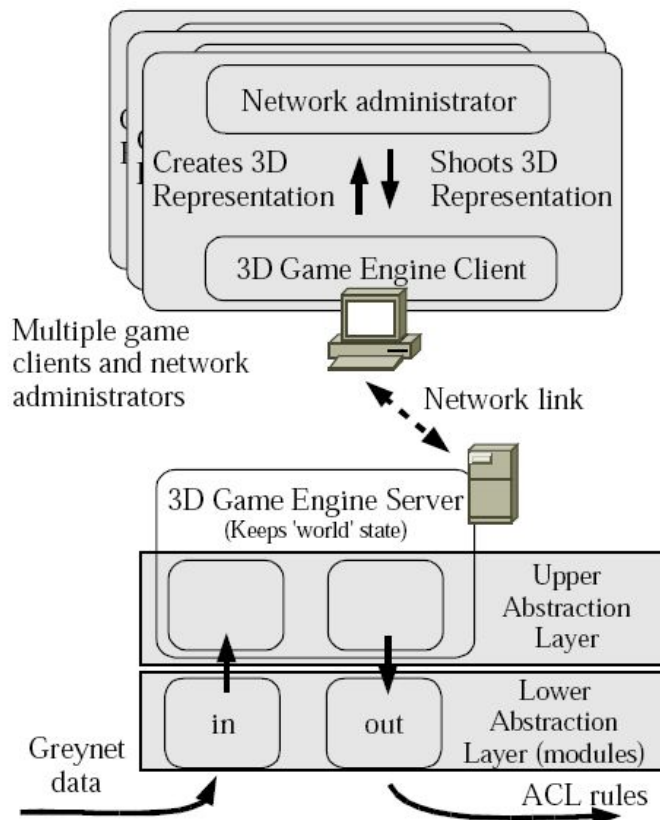


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Architecture (Detail)



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Leveraging 3D Game Engines

- Proven Code
 - Distributed
 - Collaboration
 - Real-time (10s of ms)
- Provides advanced 3D capabilities
- High level content creation tools
- Hooks for 3rd party modifications



Collaboration



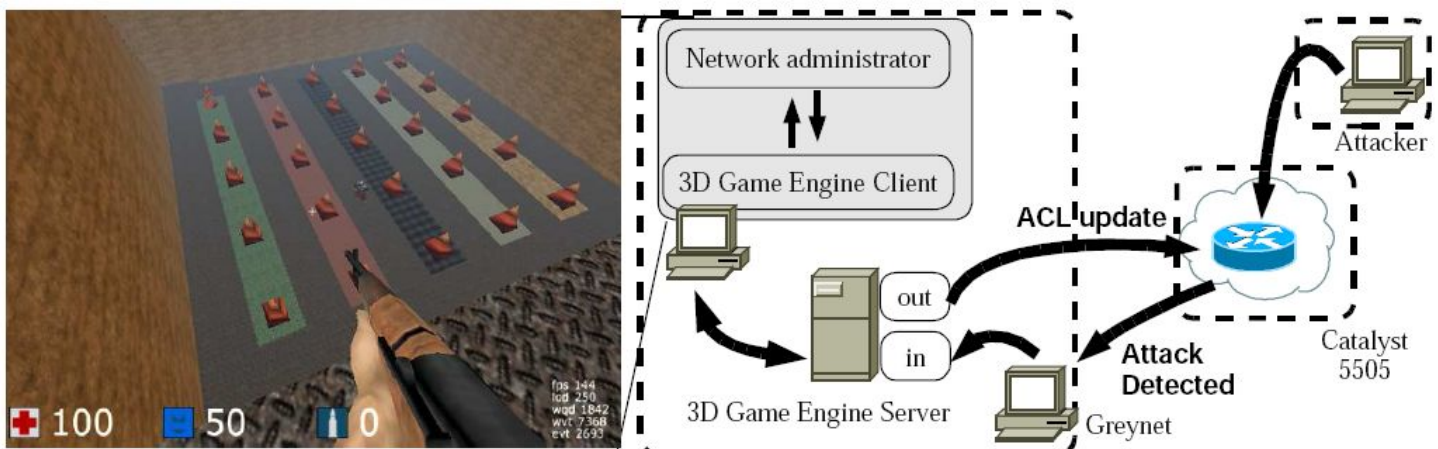
- Collaborative monitoring of systems
 - Multiple administrators as players in the same world
 - Physically remote of system under control
- Advanced control possibilities
 - Multiple players required to 'shoot' to instantiate changes
 - Different abilities can be set for each 'player'
 - Allowing a permissions system to be developed



Prototyping a System

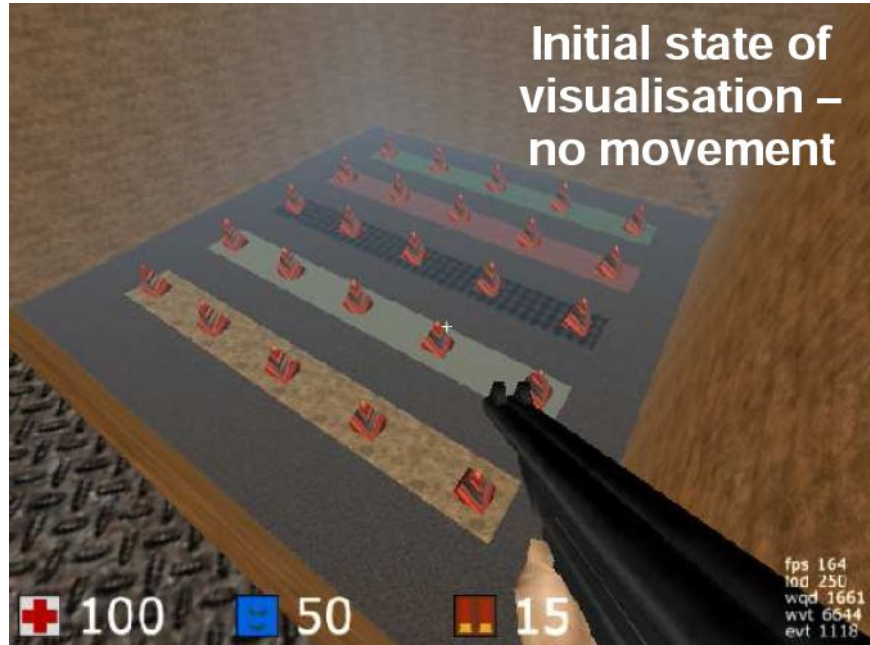
- Cube
 - Open source 3D game engine
 - Cosmetic changes
 - Avatars
 - Source changes
 - To allow input and output to the system
- Input to the system was a greynet¹
- Output are Cisco ACLs

System Layout

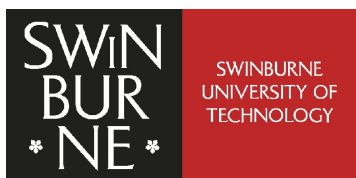
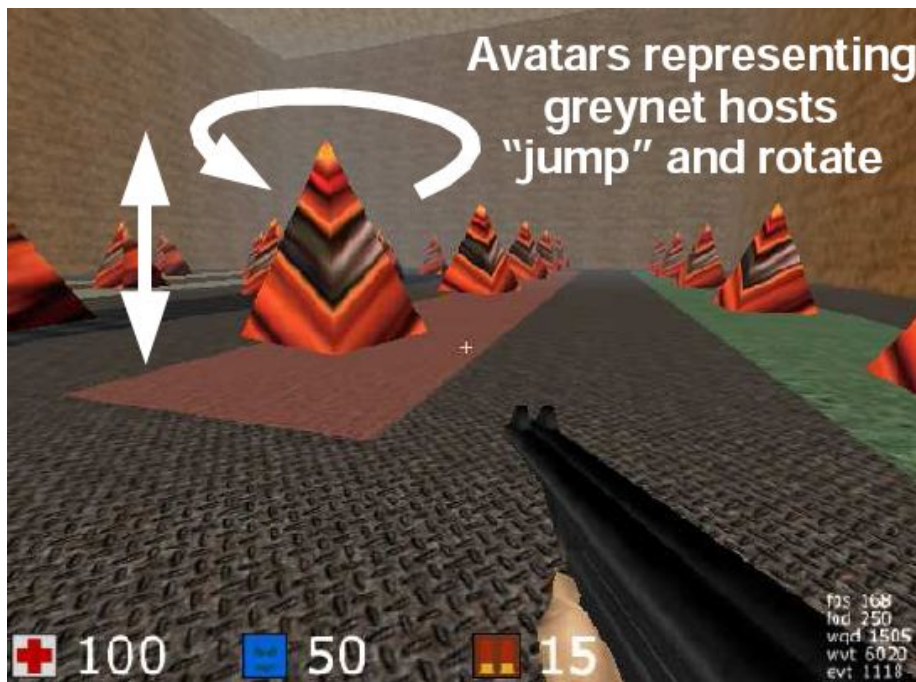




A day in the life...



A day in the life...

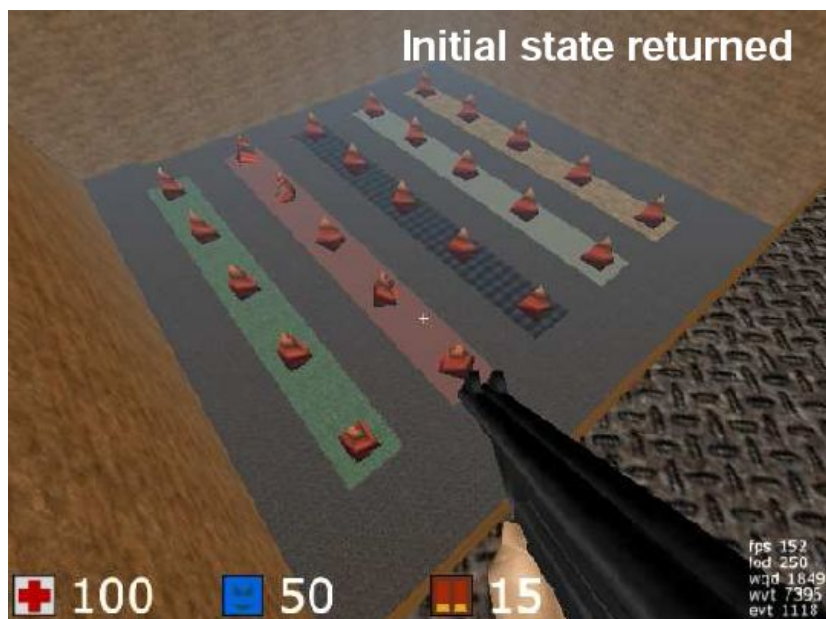




A day in the life...



A day in the life...





Future Work

- Different engine
 - Quake 3
- More network metrics monitored / controlled
- User trials
 - Technical tests (bugs / scalability...)
 - Usability
- Cisco funding
 - Full time development



Conclusion

- Inspired by previous work
- Defined interaction metaphors
- Created prototype software
- Many plans for the future...
- Thanks:
 - Thanks to Carl Javier for creating the 3D pyramid avatars
 - This work has been made possible in part by a grant from the Cisco University Research Program Fund at Community Foundation Silicon Valley.

