

Swansea University

An aerial photograph of Swansea University. The university's main campus is a cluster of modern, multi-story buildings with various roof colors, situated on a green hillside. To the left, a wide, sandy beach stretches along the coast, meeting the blue sea. The background shows a residential area with many houses and a large green field with a baseball diamond. The sky is clear and blue.

Library and Information Services

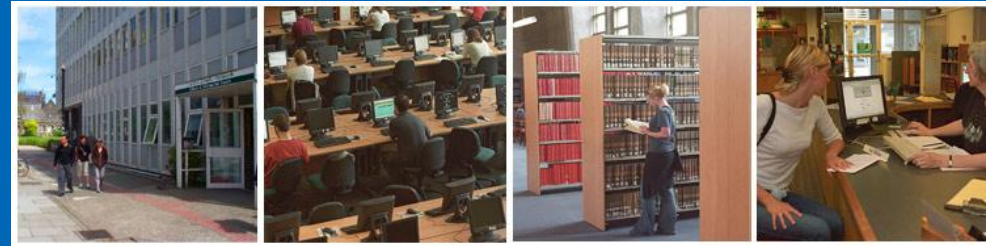
SWANSEA UNIVERSITY
PRIFYSGOL ABERTAWE

www.swan.ac.uk/lis

Location Awareness Wireless

Trial Programme 2008

By Gareth Ayres



Agenda

- 1 What is Location Awareness
- 2 Project Aims
- 3 Participants and Background
 - 1 Swansea
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- 4 Deliverables

1 What is Location Awareness

- Using the existing characteristics of a WLAN to extract positional cues about the devices using that WLAN
- Exploiting positional cues to provide novel or enhanced user services in a mobile context

2 Project Aims

- To conduct a baseline review of the 'state of the art' of Location Awareness and disseminate information on the technology to the JANET community
- To assess the validity of location techniques for security applications by examining their vulnerabilities, if any.
- To evaluate the suitability of location aware applications and their existing implementations for deployment within typical JANET connected organisations.
- To demonstrate a selection of relevant location aware applications operating at a number of participant organisations.

3 Participants and Backgrounds

- Trial Member Institutions:
 - Cardiff University
 - Daresbury and Salford University
 - Lancaster University
 - Swansea University
 - University of Ulster

3.1 Swansea University

Project Staff:

- Steve Williams
- Gareth Ayres
- Dr Rashid Mehmood



Swansea University
Prifysgol Abertawe

3.1 Swansea University

Existing Wireless LAN:

- Cisco-based, ~700 (1231 & 1121) APs, 12x WDS, 1x WLSE
- Open source Roamnode overlay
- Upgrading to thin mode APs and WiSM/WCS management

3.1 Swansea University – Trial Aims

Trial Aims:

- Overview of Location Technologies
- Location Accuracy and Security
- Different services according to access location
- Interactive Maps
- Asset Tracking

3.1 Swansea University

Focusing on:

- how to **extract location data** automatically
- possible solutions to aggregating / understanding the data - by access point, by mobile node, by user etc.
- a suitable **privacy/security policy** for the data gathered
- how best to **store the data centrally**, with controlled access by projects

3.2 Cardiff University

- **Project Staff**
- Anthony Cope
- Mike Jorgenson



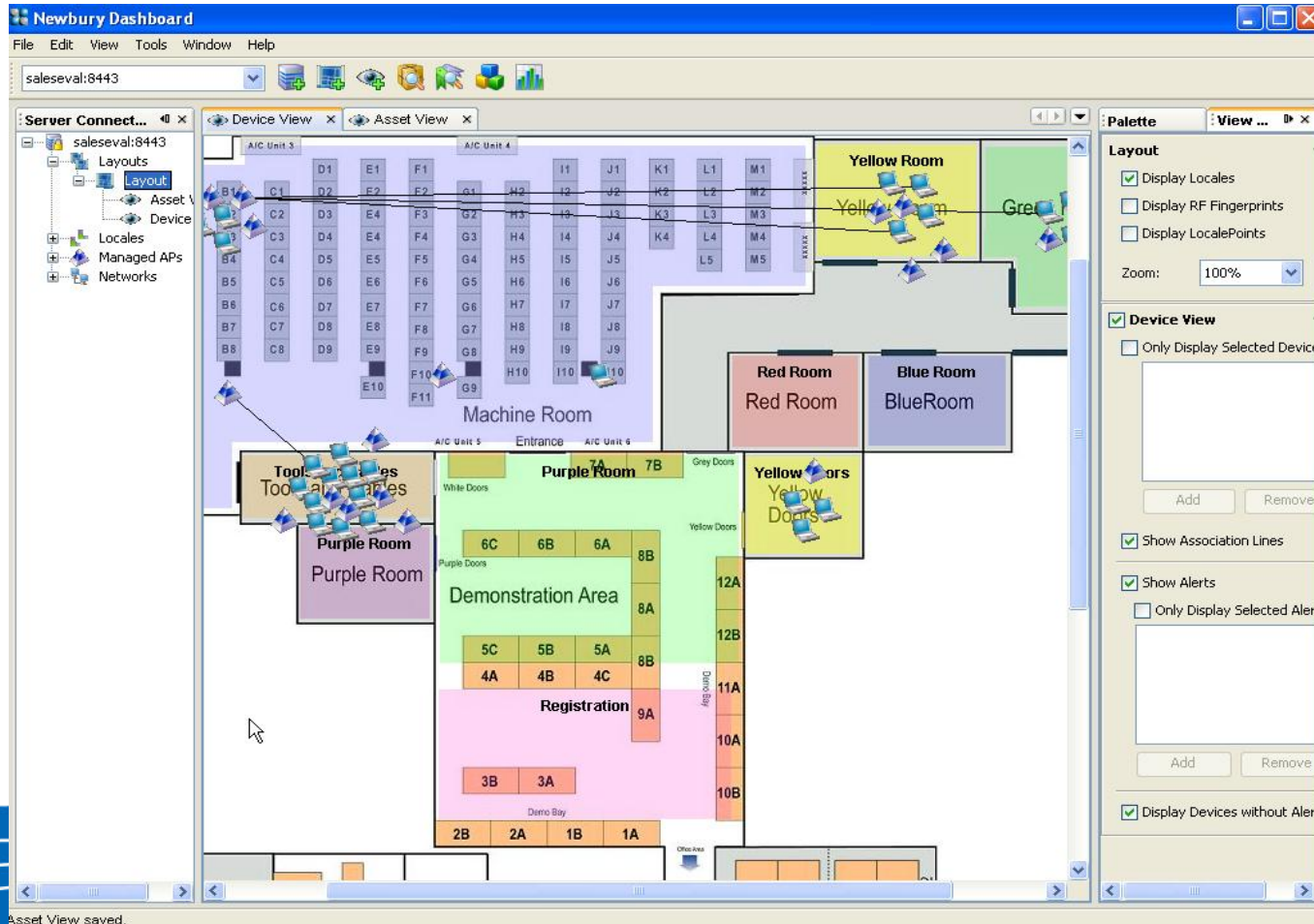
information **services**
gwasanaethau gwybodaeth

3.2 Cardiff University

Existing Wireless LAN:

- Trapeze-based, 55 buildings, ~90% coverage, 1200 APs (deployment ongoing)
- AirDefense 2200 Wireless IPS system
- Internally-developed application SOCKET. Used for MAC device registration, IP address, DHCP, VLAN and DNS control

3.2 Cardiff University - LA200 Dash Board



3.2 Cardiff University - Trial Aims

- Lecture theatre WLAN shutdown
- Mapping user flows
- Attendance registration
- Interactive Maps:
 - Nearest printer?
 - Where am I?
 - Where is my next class?
- Equipment / asset tracking
- Find nearest first-aider

3.3 Lancaster University

LANCASTER
UNIVERSITY



Keith Mitchell

Computing Department

Paul Astle

Information Systems Services (ISS)

Existing WLAN

- 400 1200 / 1100 Cisco Aironet AP's (deployment ongoing)
- Using Cisco WiSM solution
- All social areas, teaching spaces and lecture theatres covered

Lancaster - Past locaware activities



- The Lancaster GUIDE Project (~1996 – 2001)
- Web Based Context-Aware Mobile Tourist GUIDE
- Real Tournament Mobile Game
- Part of Mobile IPv6 Testbed (~2001-2005)
- Industry funded



Lancaster - Trial Aims

1. Context-Aware Security
 - (dis/en)abling technologies via LWAPP
 - simple service to disable wi-fi for short periods of time
 - Location specific
 - Authentication / timetabling
2. Student attendance records

Trial activities

- Community mesh network in Wray Village
- Investigate an alternative open source approach to LWAPP and Asset Tracking solutions.
- Develop a service for the local online centre
 - If a user receives help from a person, can they be notified when that person is next in the online centre?
 - Tie-in to local school projects

Now for Eoghan Furey's Half of the Presentation...

3.4 University of Ulster – Magee, Derry



Project Staff

- Dr Kevin Curran
- Eoghan Furey
- Dr Tom Lunney
- Derek Woods
- Dr Jose Santos



Introduction to Ulster

- The proposed work fits with current research carried out by ISRC in the areas of wireless sensor networks, network protocols, location determination technologies, wireless media streaming, and ambient intelligence.
 - ISRC embraces the topic of intelligent systems in the widest sense; our activities encompass research into a range of intelligent and hybrid technologies, internet technologies and computer networking.
 - The group has gained financial support for a number of projects funded by local industry, EU, EPSRC, DTI, DETI and the European Union to £20 million+.
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Past locaware activities

- **Wireless Technology Research Centre**
 - **Wireless Technology Consultation, Demonstration, Research & Development**



Project Objectives & Deliveries

We will deliver the following:

- **A. Location Accuracy & Security Document**

Here we will deliver a technical review of the reliability and accuracy of location specific data and investigate factors that might compromise it with regard to security and privacy.

- **B. Case Study – Wi-Fi trial Testbed**

Here we will evaluate the suitability of location aware applications and their existing implementations for deployment within typical JANET connected organisations and demonstrate a selection of relevant location aware applications operating at the Magee campus.

Platforms we will investigate

802.11 Wi-Fi – Accuracy approx 2m plus – Large scale

- PlaceLab
- *Trapeze Networks* LA-200 Location Appliance
- *Ekahau* RTLS kit

UWB and RFID – Accuracy < 2m – Small Scale

- *UbiSense* Precise RTLS system
 - *Trolley Scan* RFID-radar
-

Conclusion

- Investigate accurate systems for Wi-Fi positioning in Indoor environment
 - Deploy and test market leading systems
 - Test in creative technologies software applications
 - Produce reports and case study < 12 months
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3.5 Salford & Daresbury



Project Staff

- Professor Nigel Linge
- Dr. Robin Tasker
- Dr. Martin Hope
- Dr. Adil Al-Yasiri
- Dr. Duncan Bates



Existing WLAN

- Network test bed at CNTR
 - Prototype design / development
- Museum of Science and Industry
 - Guide application
- Daresbury campus
 - outdoor trials



Trial Activities

- Mapping positional resolution to interactive mapping services
 - UWB, RFID, GPS, Beacons, Wi-Fi, Bluetooth, Cell ID (Wi-Fi / Digital cellular).
 - Positional *and rotation* location information
 - Digital compass / accelerometers
 - Optimisation of data via location
 - User profiling, logging location history
 - Active tracking / location prediction algorithms
 - Embedded smart tags
 - Mobile GIS, (Vector based interactive multilayer mapping)
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4 Deliverables

- Review papers:
 - Overview of location aware technologies
 - Location accuracy, spoofing and security considerations
 - Case Studies in the areas of:
 - WLAN Security (RF firewalls etc.)
 - Interactive maps
 - Asset tracking

 - Available end of 2008!
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Questions

