

**Presentation to Uk-  
UbiNet Workshop,  
12<sup>th</sup> July 2006**



# **The INtelligent Airport (TINA)**

## **A Self-Organising, Wired/Wireless Converged Machine**

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and Alwyn Seeds and Paul Brennan, University College London**



## *The INtelligent Airport*



# TINA

**Project Aims:** To develop a next generation advanced wired and wireless network for future *airport environments*

**Project Objectives:**

1. To study the feasibility of a single multi-service infrastructure to replace the many independently installed systems characteristic of current installations
2. To determine new system architectures which provide dynamic capacity allocation, wireless/wired interworking and device location
3. To determine new algorithms for addressing and routing able to operate seamlessly in a combined wired and wireless environment
4. To design a new form of wireless signal distribution network where multiservice antenna units cooperate, not only to provide communication, identification and location services, but also to provide network resilience
5. In collaboration with our industrial partners, to define and build small proof of principle demonstrators using the proposed architectures and technologies

## *The INtelligent Airport*



# TINA Industrial Partners

Strong industrial support from partners with complementary expertise and interests

**BAA** 

**LAING O'ROURKE**

 **BOEING**<sup>®</sup>

**Red-M**

**ERICSSON**   
TAKING YOU FORWARD

 **MOTOROLA**

Airport operator, end user:  
demonstrator planning

Airport construction: airport  
design and application context

Aerospace manufacturer: airport  
communications systems

Systems integrator: deployment  
scenarios and RF propagation  
planning

Network supplier: converged  
communications systems expertise

Equipment supplier: RFID  
expertise and equipment donation

## The Applications Challenge

Services to be supported in airport environment (mean data rates):

1,000 Fixed and 500 Mobile Video Cameras - 10 Gb/s

500 Displays - 10 Gb/s

500 Biometric Scanners - 10 Gb/s

Private and Public Fixed and Wireless LAN - 20 Gb/s

Cellular services - 10 Gb/s

TETRA and private radio - 0.5 Gb/s

Passive RFID - 0.2 Gb/s

Active locatable RFID - 5 Gb/s

Aggregate Mean Rate 65.7 Gb/s, assumed Aggregate Peak Rate 100 Gb/s

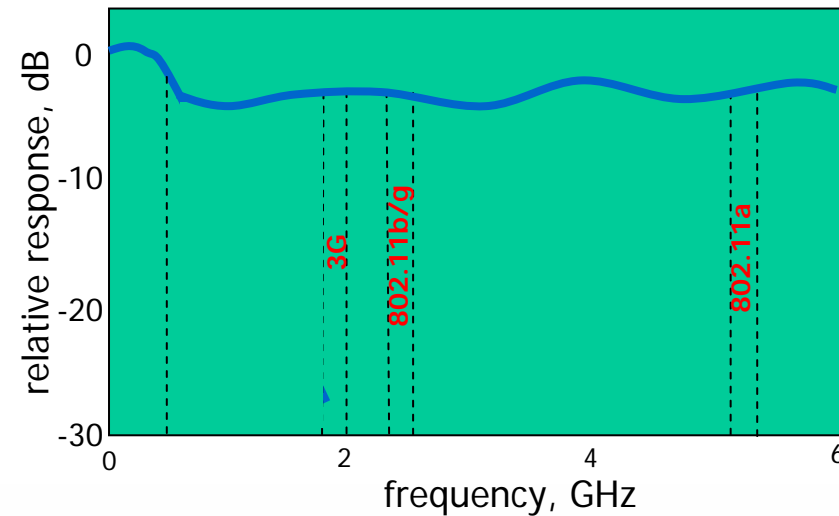
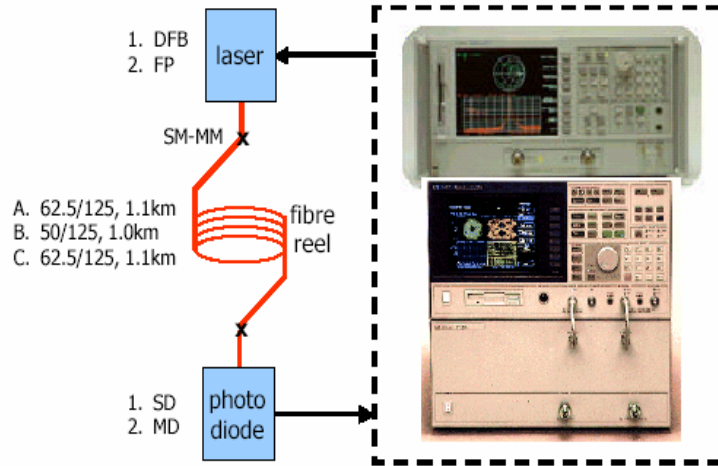
And

*The system must be **upgradeable, scalable, resilient and secure***

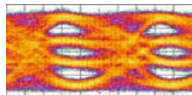
# The INtelligent Airport



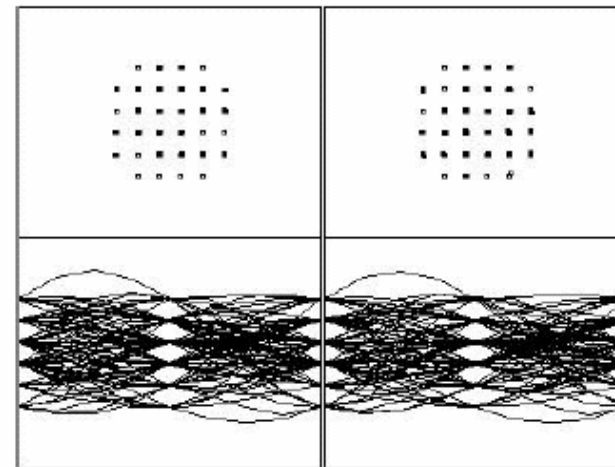
## Radio Distribution over MMF Fibre using SCM - Beyond the bandwidth limit!



**April 2002: The FRIDAY project won the award for 'Most Forward Looking In-building Solution Provider' at this year's In-building Coverage European Summit in Barcelona.**



Centre for Photonics Systems



Coaxial cable reference

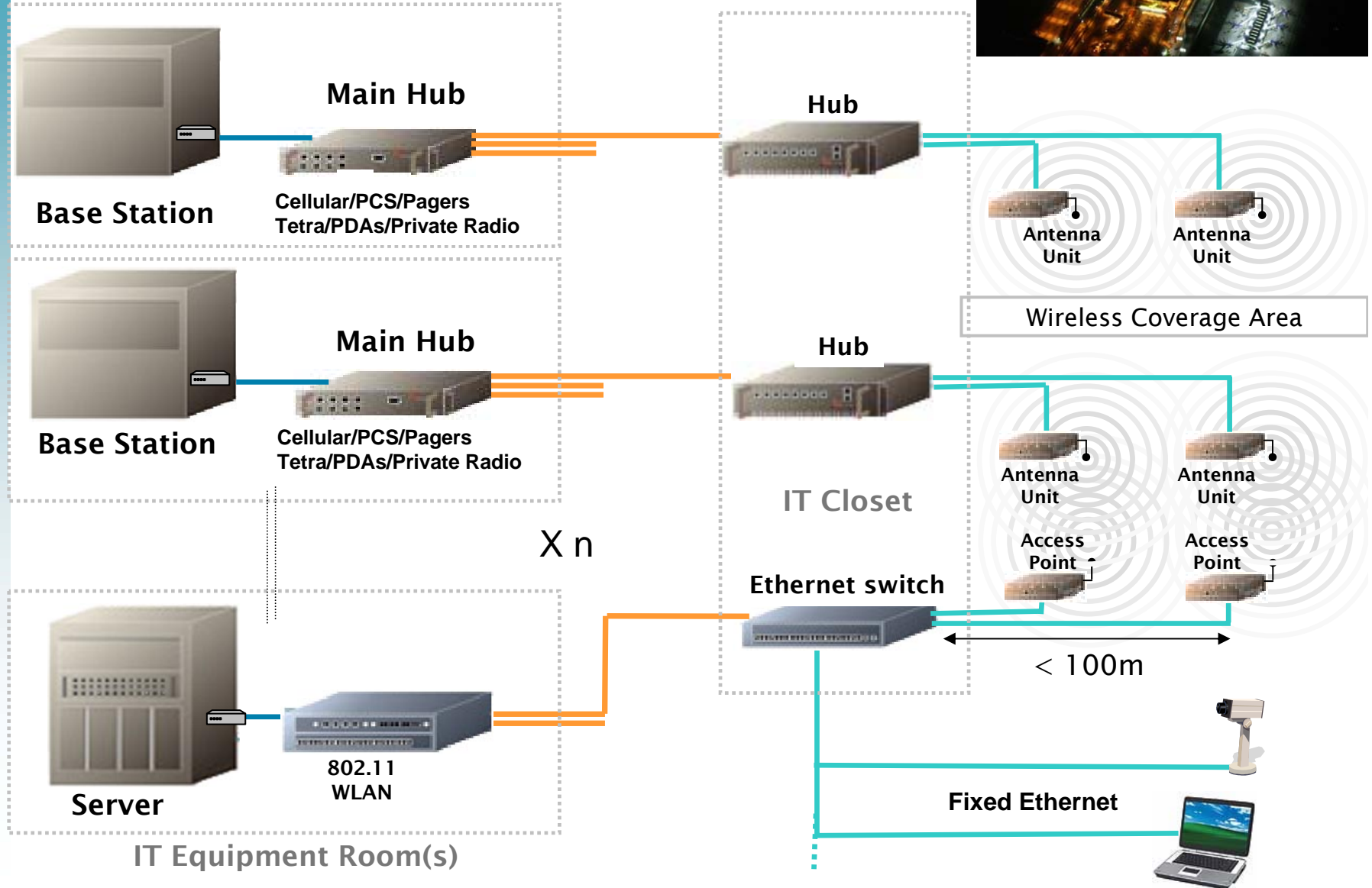
FP + 1km 50/125 + MD

Frequency = 2 GHz  
Bit rate = 10 Mb/s

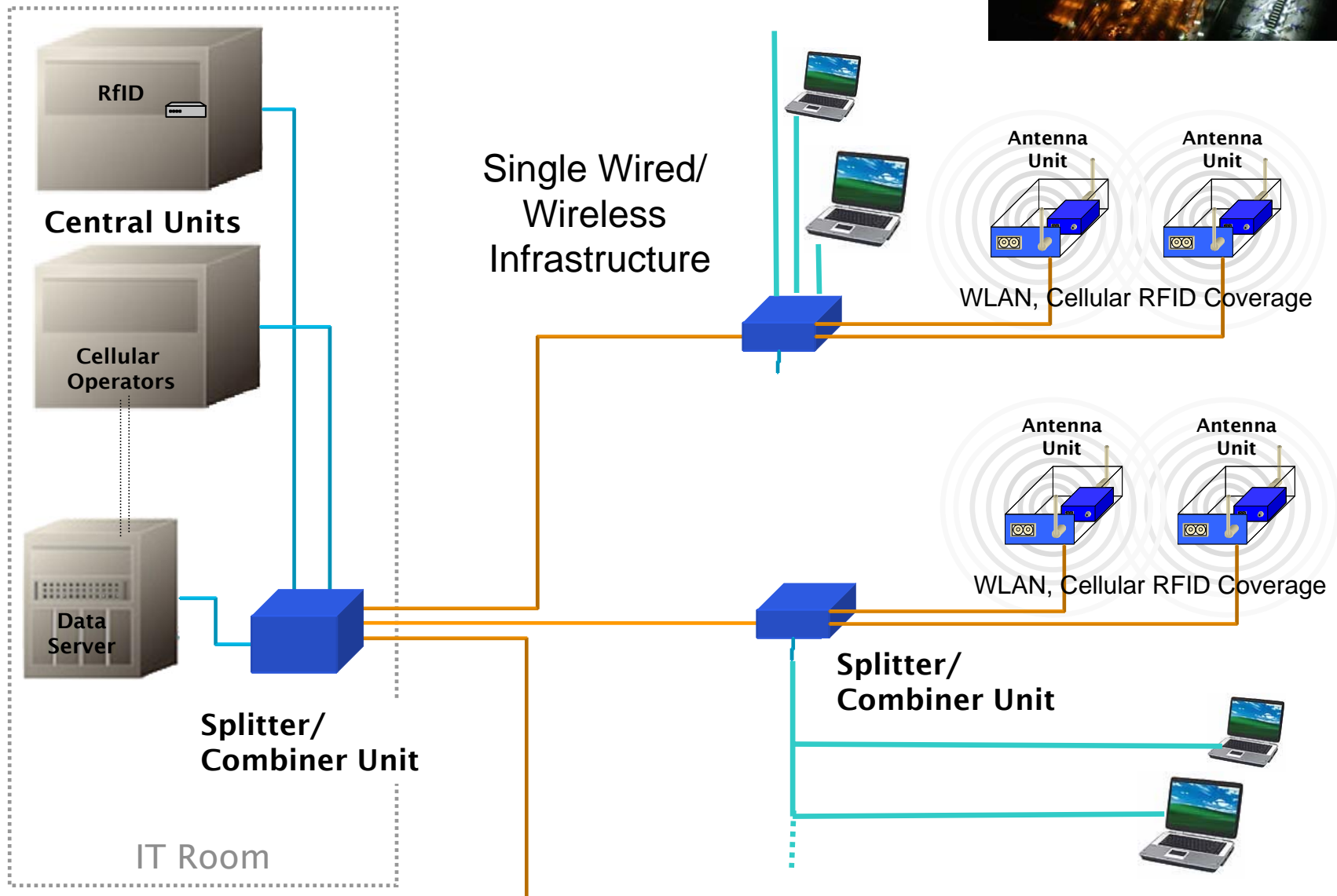


# The INtelligent Airport

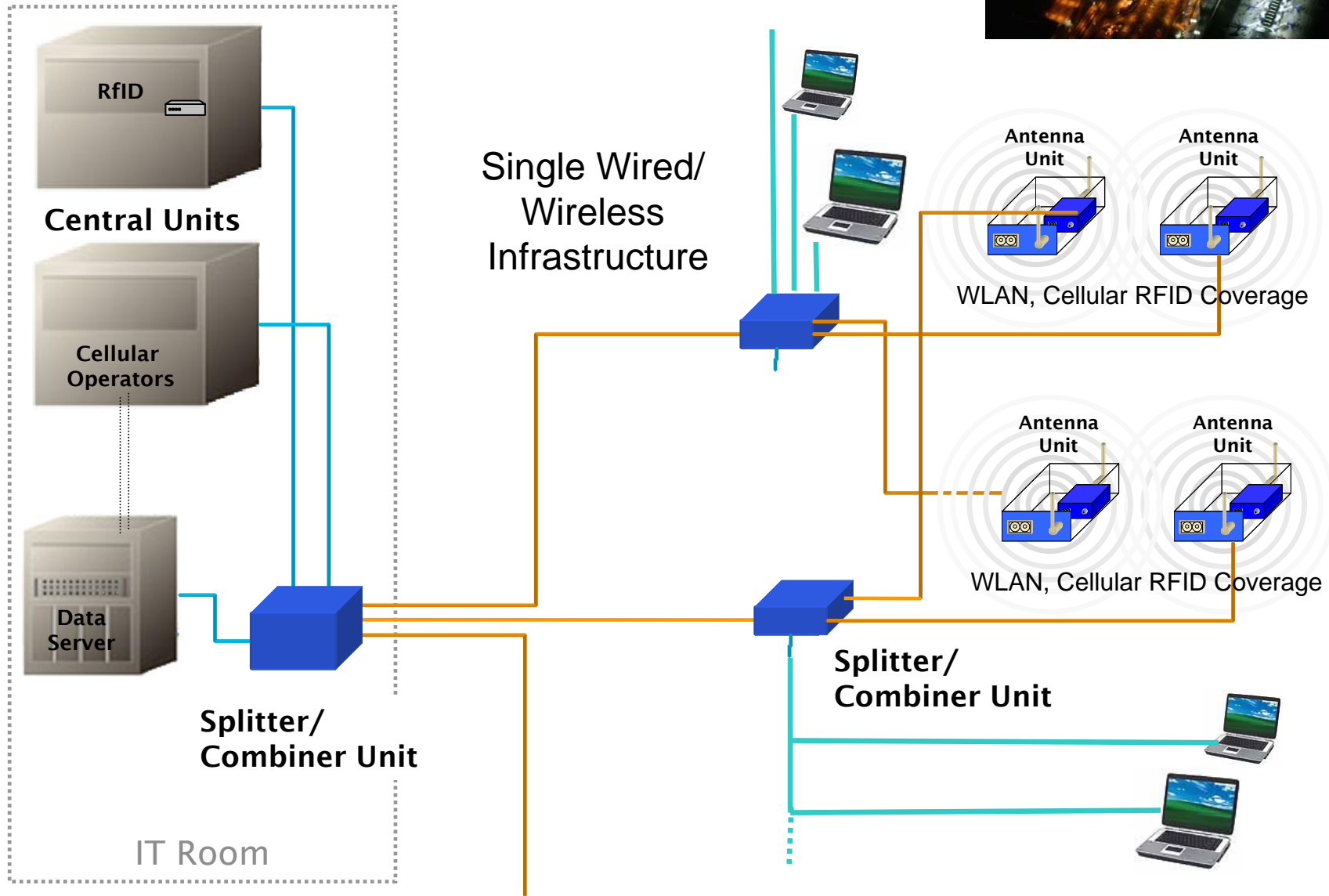
## Current Airport Installations



# First Phase Airport Network



# First Phase Airport Network



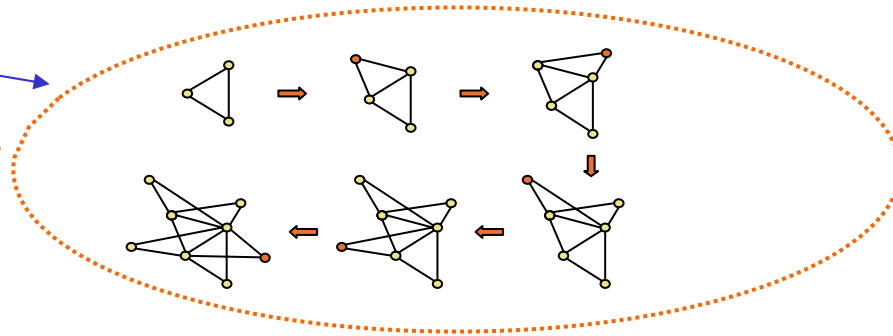


## Research into Protocols

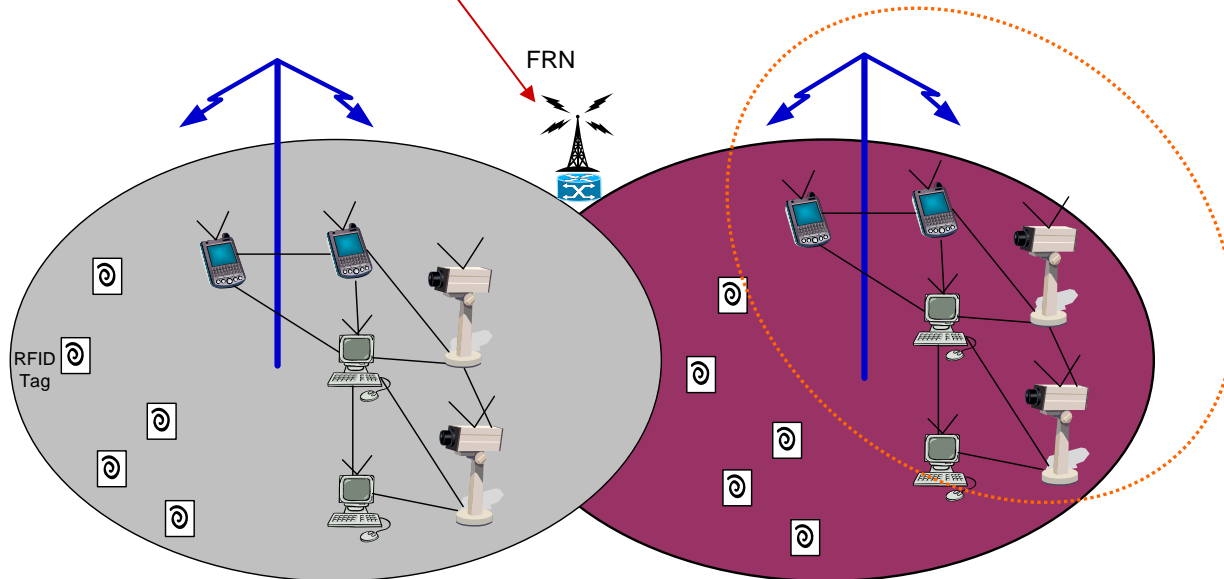
- Key is that core PONs are protocol agnostic
- Allows Smart Edge to implement **any** new interconnect
  - Dynamic re-configuration for all protocols
    - Decentralised resilience through multiple spanning tree
    - Deployment of multiple versions of resilience mechanisms on live net i.e. no down time for upgrades
    - Fast reconfiguring multi-spanning tree standards not there yet
  - Virtual Private Nets easy to overlay too
    - Privacy & protection combined
    - High availability and security both key requirements

# Self-Organising RF Edge Networks

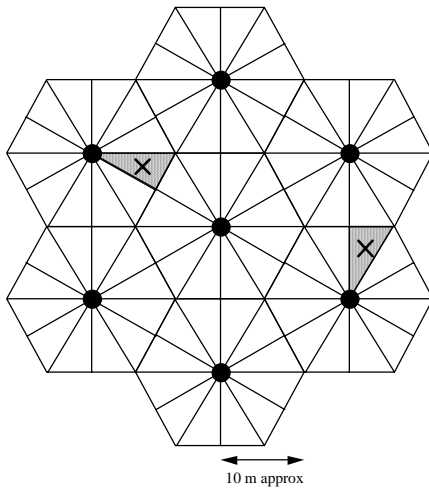
Nodes self-organise and attach preferentially to well connected nodes



Relay nodes extend range and coverage, provide resilience



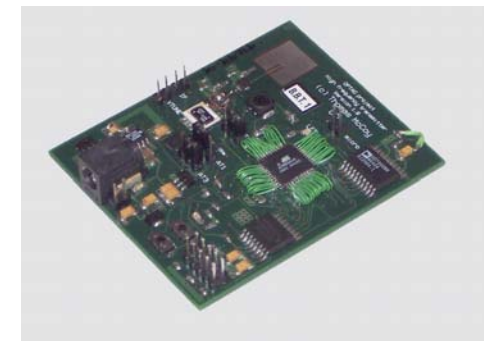
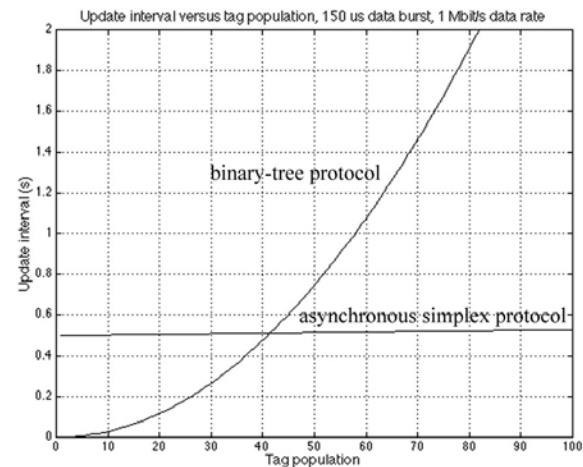
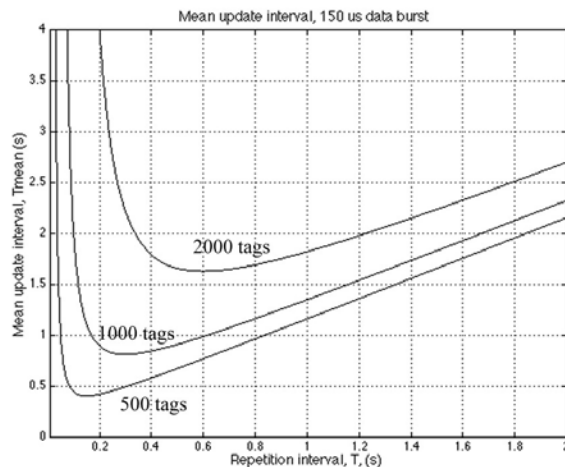
# Proposed Research on RF-ID



- Innovative far-field protocol allowing efficient identification and location of thousands of co-located tags with simple, cost effective and low power RF-ID tags.

- Intelligence is referred to the network, allowing cross-reference of tag IDs to numerous data, including personal details, photos, flight information. Hence flexibility to apply approach in a variety of areas.

- Collaboration with a leading UK RF-ID tag development company.



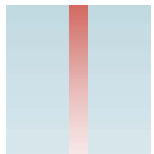
# The INtelligent Airport



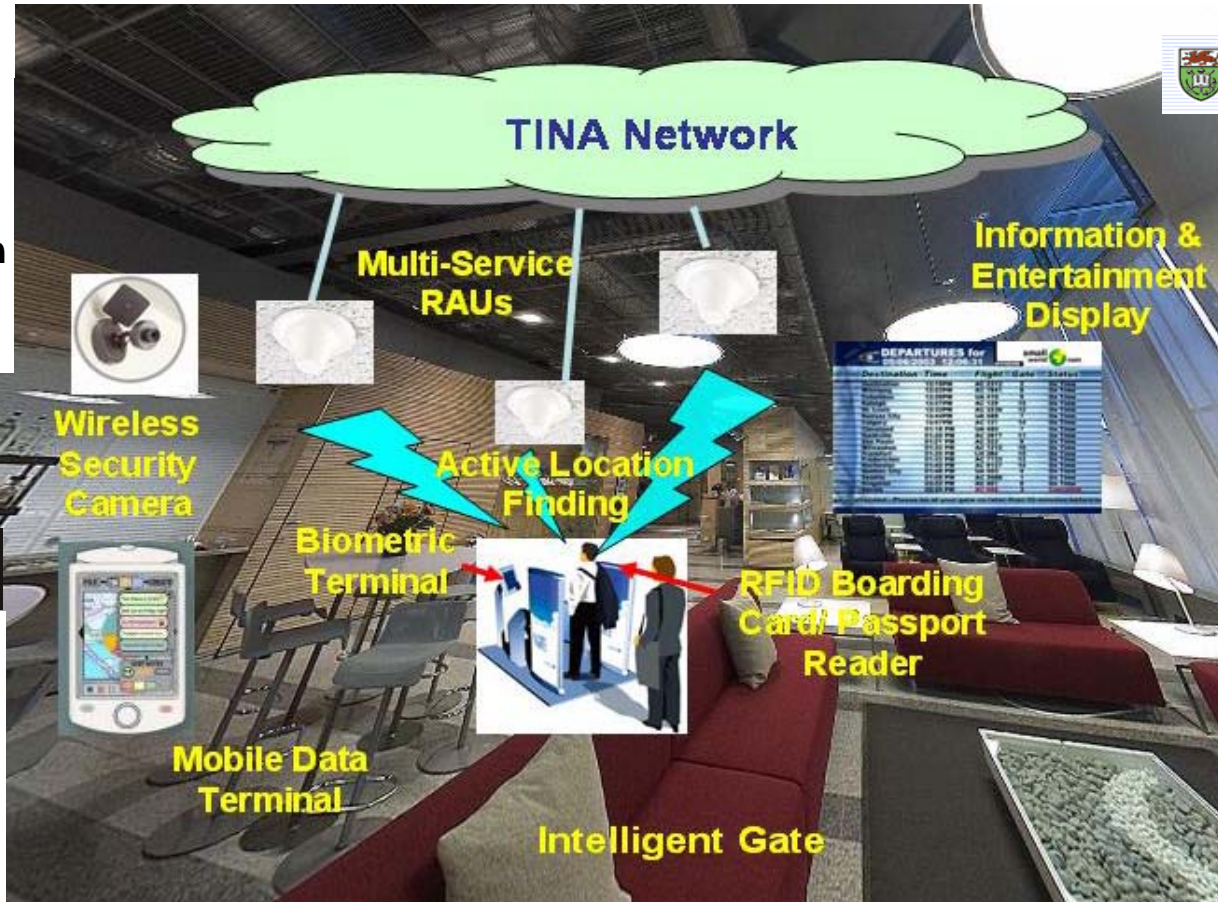
## Intelligent Gate Demonstrator



Computer Lab  
Architectures  
Protocols  
System simulation  
Demo  
Specification



Demo Spec.  
Active RFID  
systems  
Multi-service RoF  
Network  
construction



Architectures  
Protocols  
Passive RFID  
systems  
Demo  
Specification



Engineering  
Demo Spec.  
RoF Links  
System design  
Network  
construction

## *The INtelligent Airport*



"Mobile biometrics, RFID, ubiquitous wireless and a converged network as proposed by TINA are essential for the operations of the future airport."

**Head of Product Development, BAA**

"TINA is an innovative and collaborative initiative with great potential. Its radical approach will challenge the way that airports are designed, built and maintained by driving out inefficiencies of independent islands of high specificity to achieve smarter and more effective airport operations."

**C.O.O Construction (Europe), Laing O'Rourke Group**

**Thank you**