

Overview

UWB enables accurate **indoor location tracking**

Accurate location tracking enables **context-aware computing**

There are **large vertical markets** for context-aware computing

Ubisense is building a **range of products** for these markets

This has **implications for standards** now and in the future

Accurate location tracking enables context-aware computing

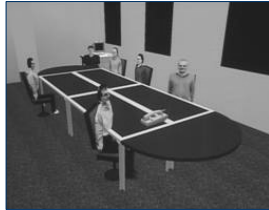
A real-world environment where people are wearing location tags



Location tags are **worn by people** and **attached to objects**

So accurate tag location allows us to **sense where people and objects are**

A 3D rendering of a world model constructed and updated in real time using a location system



This lets us build an up-to-date **model of the world** to be shared by applications, making them **context-aware**



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Context aware computing brings benefits to large vertical markets

Healthcare
Workplace
Security
Defence
Training

Better communications
Better record keeping
Easier measurement
Easier sharing
Easier audit
More effectiveness
More safety
More security



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Applications - Healthcare

- Streamlining hospital processes
 - Locating staff
 - Finding wandering patients
 - Ensuring records remain with the patient
 - Updating electronic records with current care status
- Asset tracking and management
 - Finding equipment
 - Evaluating equipment usage to improve purchasing
- Workplace safety
 - Panic alarms with position-finding capability



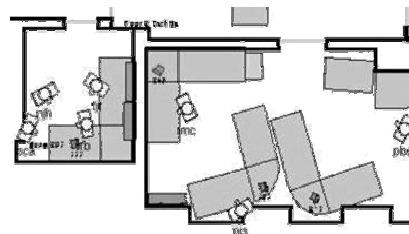
Demand now: Large US & UK ambulatory care hospitals



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Applications – Workplace Productivity

- Better communications between distributed sites
 - Moving maps
 - Phone call forwarding
 - Asynchronous messaging
- Sharing space more effectively
 - Low-overhead personalisation
 - Measurement of space utilisation
 - “Pay-as-you-go” billing for space
- Recording activity in a corporate memory
 - “Who was at the meeting last week?”



Demand now: Multinationals implementing distributed workplace strategies



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Applications – Security

- Enhancing CCTV coverage
 - Activity-based video stream selection
- Daytime intruder detection
 - Correlate data from active tracking and passive (IR, weight, radar) sensors
- Visitor management
 - Enforcing restricted zones and escort policies
- Asset tracking
- Automatic 'man-down' detection



Demand now: Defense contractors, gemstone processing facilities



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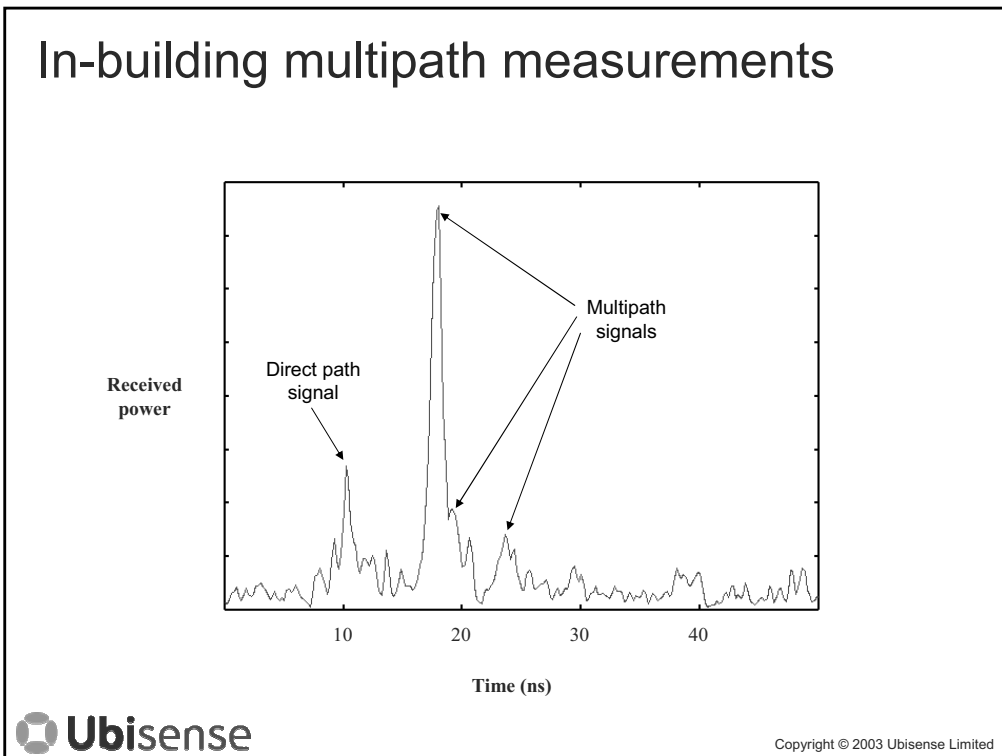
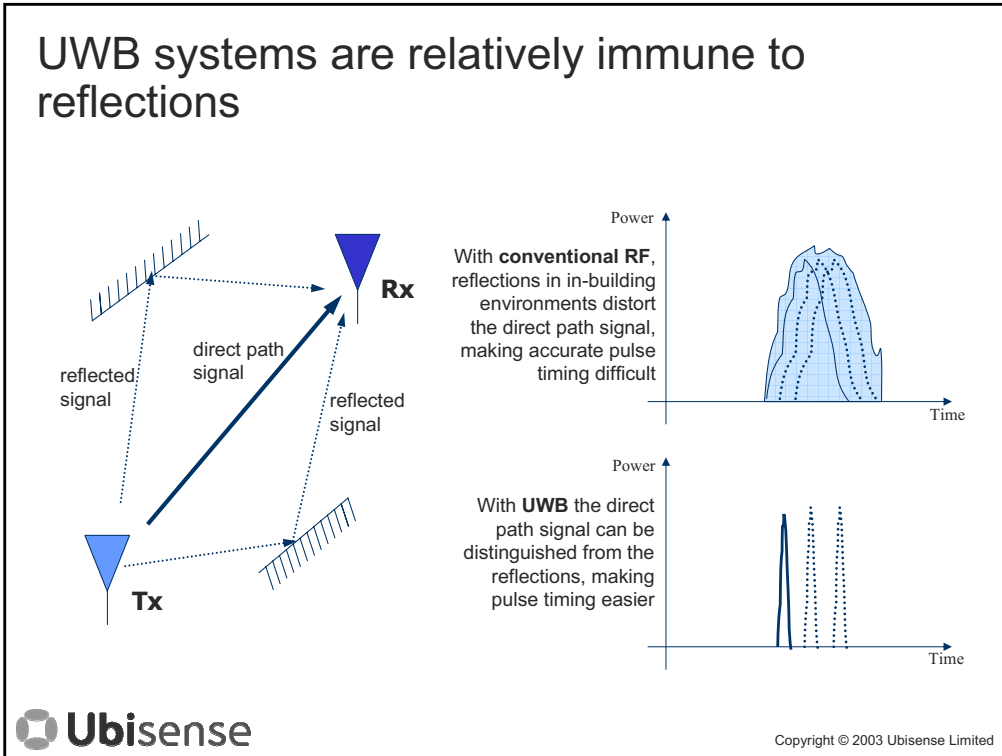
Location technology requirements

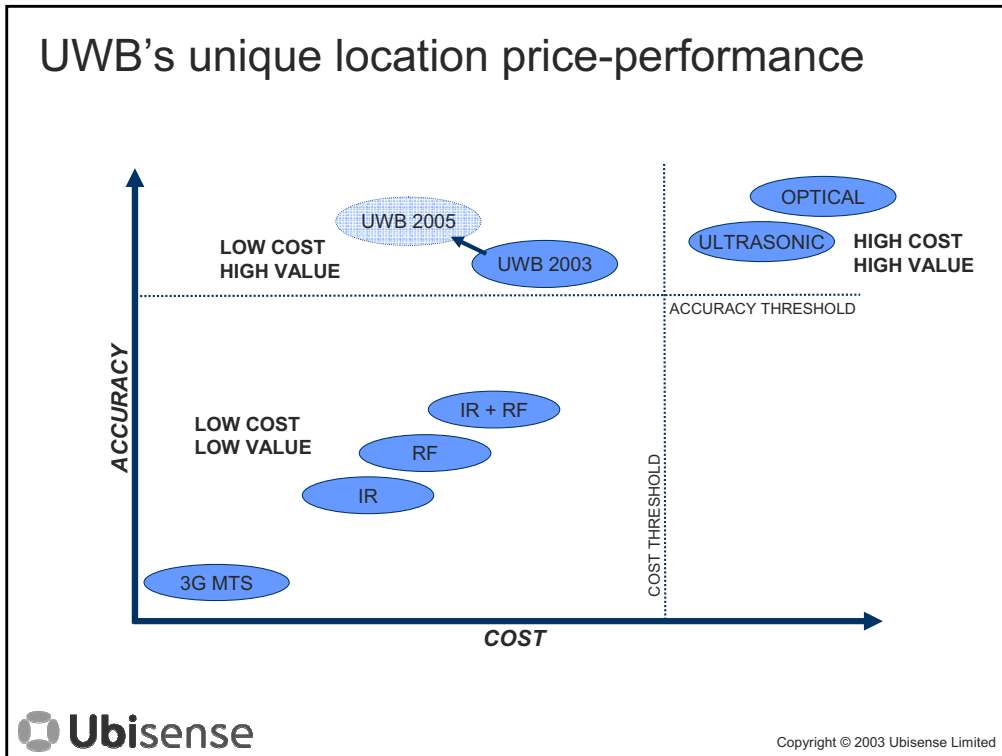
- Technology requirements are:
 - High position accuracy indoors (~15cm, 3D, 95% confidence level)
 - High update rate for real-time-response
 - Non-line-of-sight sensing

 - Moderate range / good scalability
 - Low power
 - Simultaneous low bitrate telemetry
 - Low cost implementation
- UWB is only technology which can satisfy these constraints





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Ubisense location system components

- System has three main components:
 - Tags
 - Carried by people and attached to objects
 - Fixed sensor infrastructure
 - Networked units placed around building
 - Location management platform
 - Processes and distributes location information to applications

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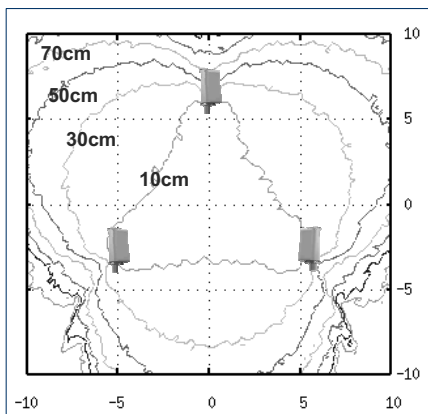
Ubisense's UWB location technology

- Cellular system architecture
- Asymmetric ranging architecture
 - Mobile tags only transmit UWB signals
 - Fixed base stations only receive UWB signals
- Combined range and bearing measurement at base stations
 - Helps to reduce infrastructure requirements / increase robustness
- Bidirectional communications link using conventional RF
 - Buttons and paging for context-aware user interface features
 - Tag status monitoring supports easy battery maintenance, etc.
 - Variable tag scheduling supports aggressive power management
- Architecture can evolve to use a fully-UWB solution
 - Currently uses discrete-component UWB technology + conventional RF chip
 - Long range ideal is an integrated UWB ranging and communications chipset
 - For example, Artimi
 - Move to a mass / consumer market will depend on lower cost devices



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UWB location technology characteristics

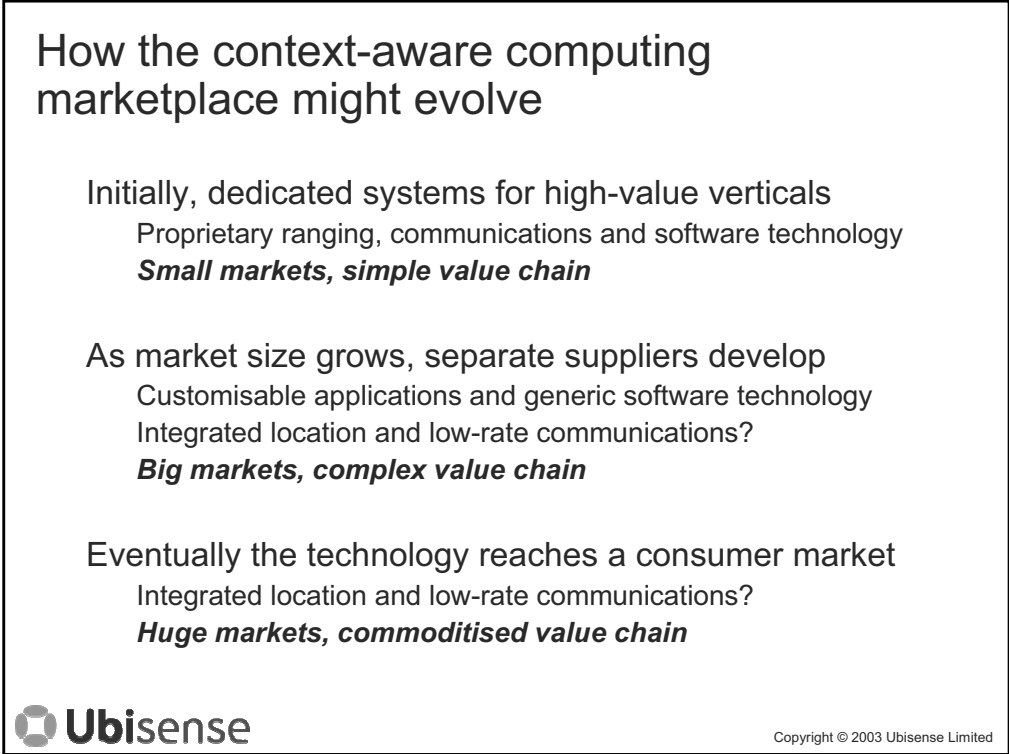
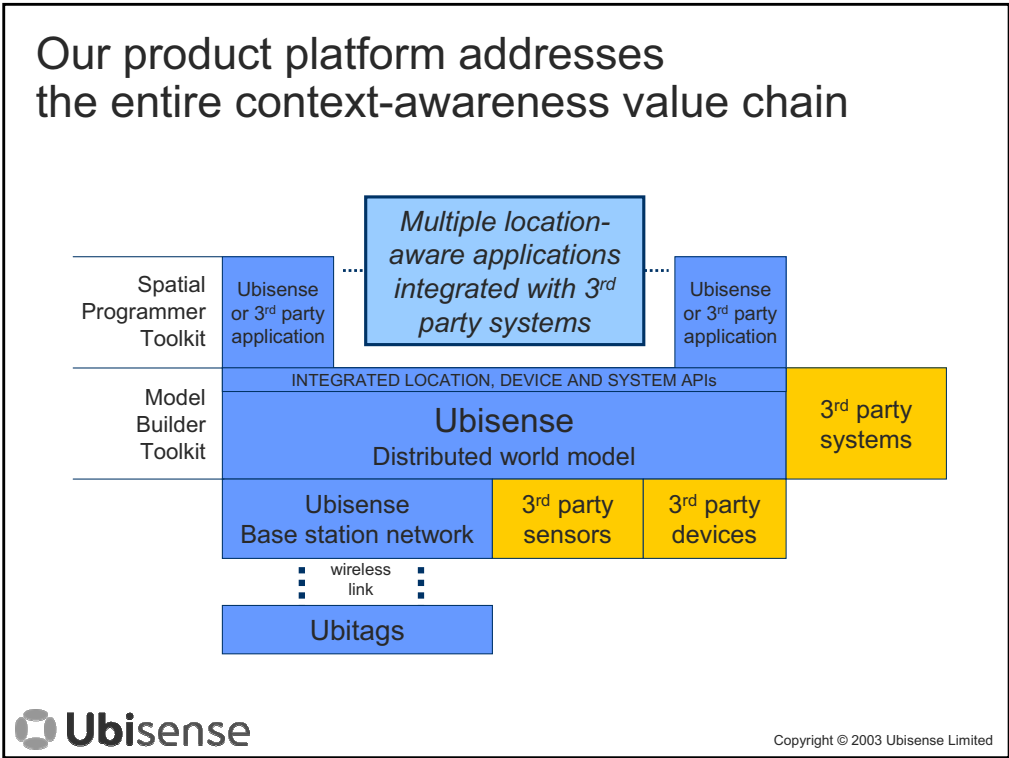


95% confidence contours for a cell with 3 base stations each 10m apart

- Accurate enough for real context-awareness
- Battery life about 1 year for a very mobile tag to 5 years for a mostly-stationary tag
- Practical update rate density about 40Hz per cell
- Comms data rate 56kbps
- Area of coverage unlimited
- Tag population unlimited



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The role of standards

In the long term, an integrated location and low-rate comms standard (e.g. ZigBee) could create huge value

But we are still learning!

Context-aware application requirements are still not well-understood and these requirements will directly impact device characteristics

The context-awareness market is in its infancy and the standardisation process must be rooted in the market

The standardisation process needs to nurture this industry

Band allocation for ranging and low-rate comms channels

Ensuring that we have open and collaborative discussions

Ensuring that any decisions do not impede market adoption



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UWB Regulation Issues

FCC (USA) Ruling

- UWB was given approval for commercialisation by the Federal Communications Commission on 14th February 2002 in three different device categories:
 - Imaging systems;
 - Vehicular radar systems; and
 - Communication and measurement systems
- Re-confirmed Feb 2003

“UWB technology holds great promise for a vast array of new applications that we believe will provide significant benefits for public safety, businesses and consumers.”

From “Revision of Part 15 of the Commission’s Rules
Regarding Ultra-Wideband Transmission Systems”
FCC Report adopted February, 14, 2002



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UWB Regulation Issues

In contrast...the EU Situation

- Under review by various member state radio regulatory authorities (including German and UK)
- While not yet unlicensed, research and 'pilot' licences are likely available in 2004
- Unlicensed commercial usage will be a key factor
- Ubisense and Artimi are leading a drive accelerate adoption of unlicensed commercial usage
 - Artimi is a fabless semiconductor company developing silicon solutions for high bandwidth wireless connectivity based on Ultra Wideband (UWB) technologies
 - Other contacts and interested parties welcome!



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Questions?



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