



Disaster Management: the challenges for a national geographic information provider

Chris Parker

Head, Research & Innovation

21 March 2005

Geographic information:....because everything happens somewhere ..at some time



People perform tasks and activities



Geographic information adds value if it helps users make more effective decisions, executing tasks more effectively.

.....provided that barriers to accessing geographic information are minimised.

Users want to make informed decisions - an answer to their question

Users want the answer the whole answer and nothing but the answer

Disaster Management: phases

Risk assessment

Risk prevention and mitigation

Preparation

Disaster response

Recovery

Disaster
preparation

Disaster Event

Disaster
response

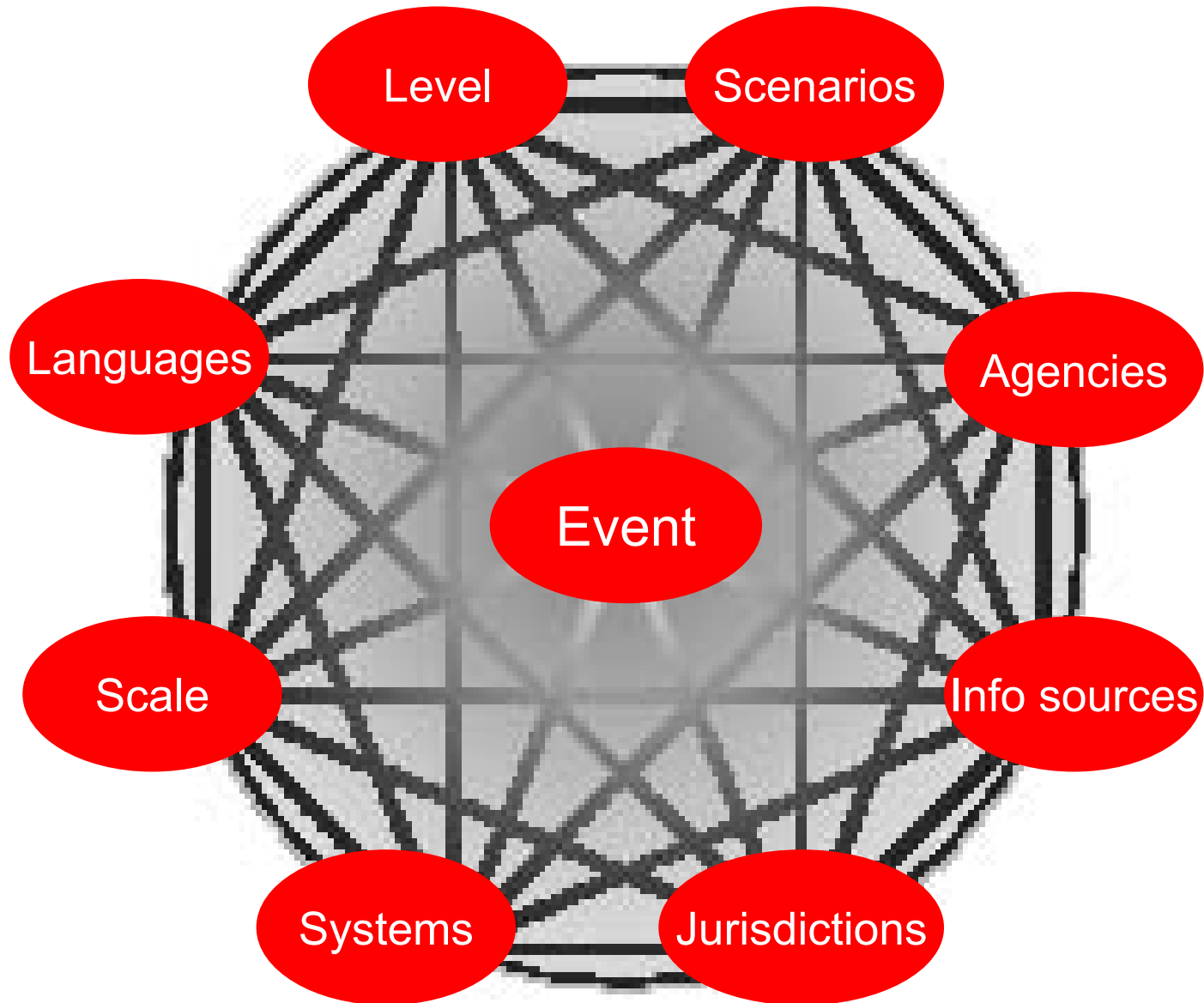


Information challenge: “time and information are the enemy”

“.....get the right resources to the right place at the right time....to provide the right information to the right people to make the right decisions at the right level at the right time.”

Robert MacFarlane, visiting Fellow to the Civil Contingencies Secretariat Emergency Planning College

High complexity – the challenge for interoperability

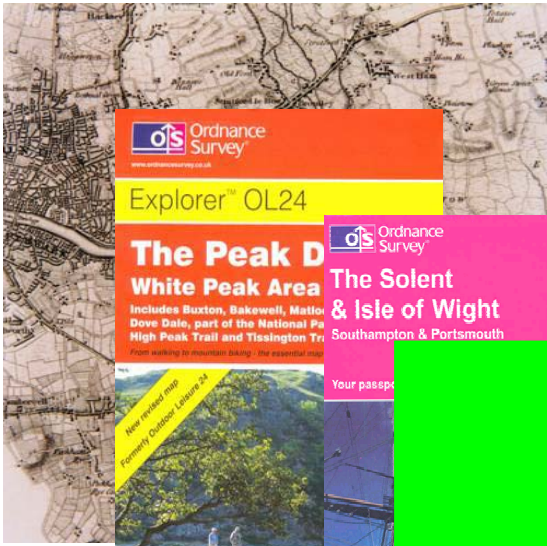


Historical



Ordnance Survey's first one-inch map, completed 1801

From Maps to Geographic Information



Ordnance Survey
www.ordnancesurvey.co.uk

Explorer™ OL24

The Peak District
White Peak Area
Includes Buxton, Bakewell, Matlock, Dove Dale, part of the National Park, High Peak Trail and Tissington Trail.
From walking to mountain biking - the essential guide.

New revised title
Formerly Ordnance Survey Leisure OL24

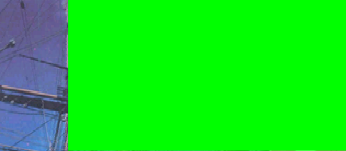


1:25 000 scale
4 cm to 1 km - 2 1/2 inches to 1 mile

Ordnance Survey
The Solent & Isle of Wight
Southampton & Portsmouth

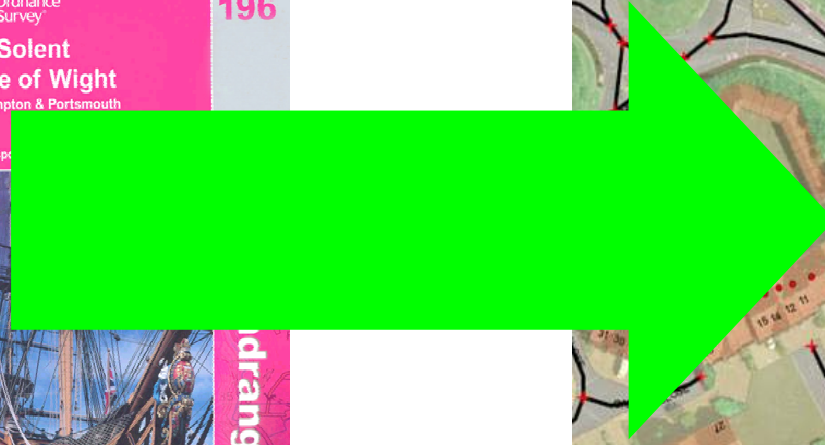
196

Your passport to...



Dranger Map

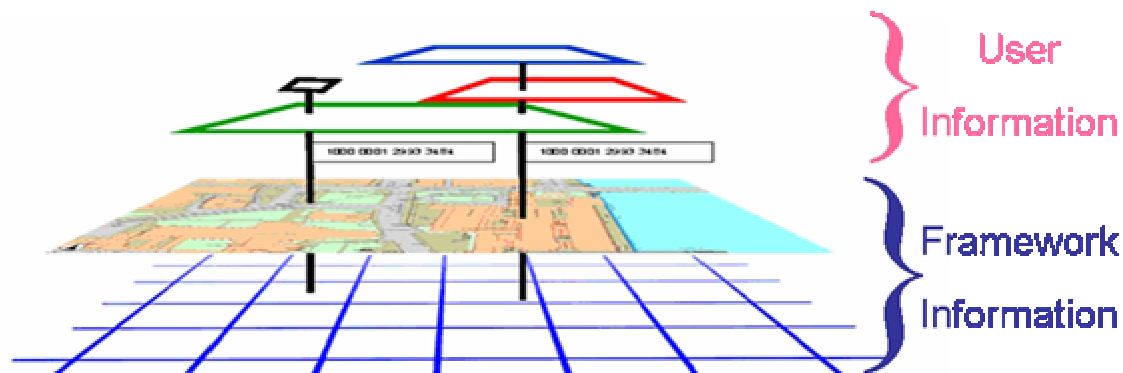
1:50 000 scale 2 cm to 1 km - 1 1/2 inches to 1 mile



Providing the GI information framework for the nation - Digital National Framework

'DNF is a set of enabling principles and operational rules that underpin and facilitate the integration of geo-referenced information from multiple sources'

- Developed in consultation with the British GI community in 1999-2000
- Gradually evolving with partners in government, utilities and private sector
- Principles and rules have been tested through four pilots with other GB public data providers



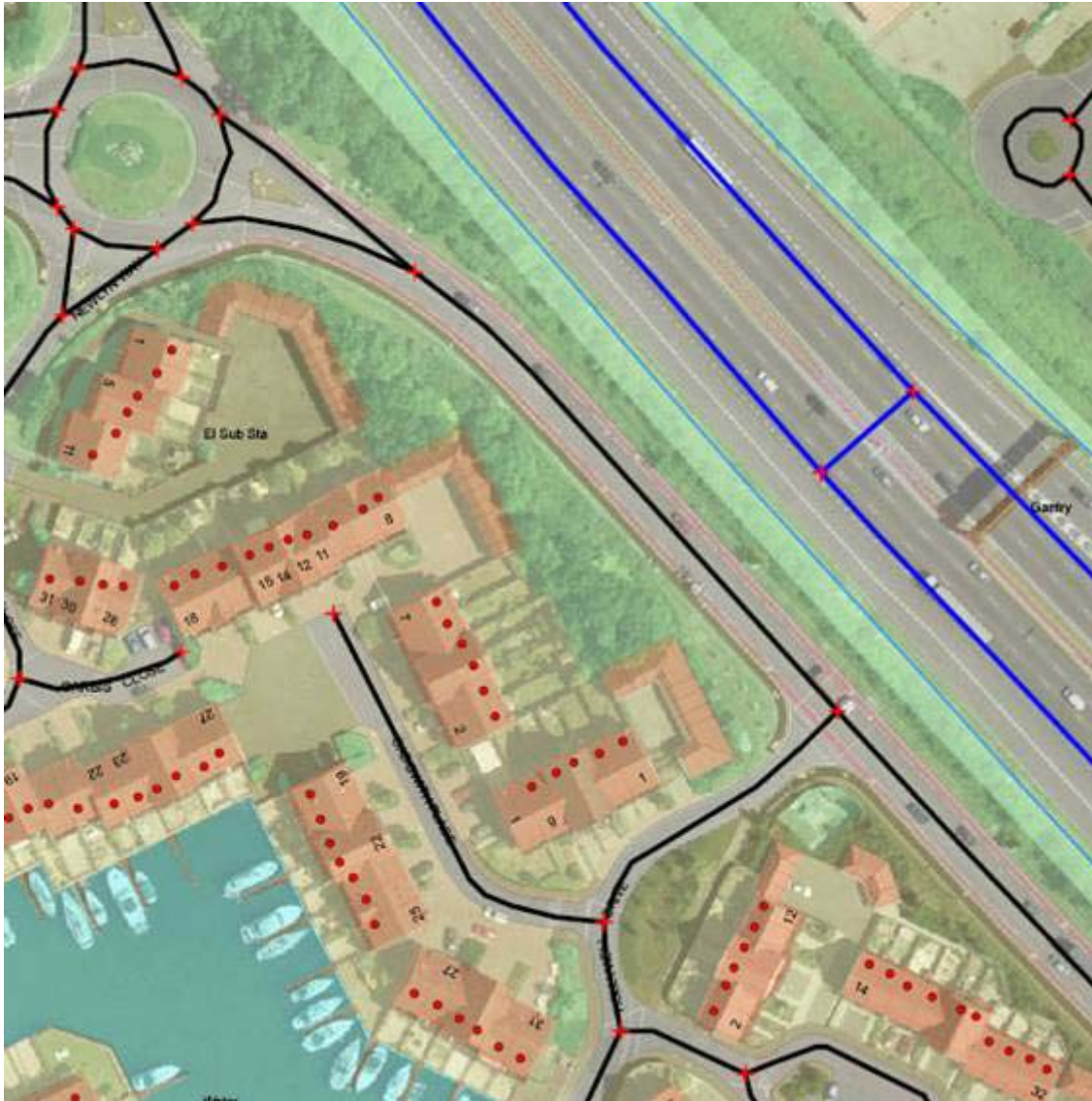
Digital National Framework

The scope

'DNF is primarily concerned with geospatial information and its relationship to other data and information'

- Within the DNF model, each feature is uniquely referenced by the TOID
 - Enables geo-referencing and data linking
 - Supports unambiguous data exchange
- DNF incorporates the national co-ordinate system with GPS and other datums
- Crucially, it also allows for the association of 3rd party data

Layers of OS MasterMap



Topography

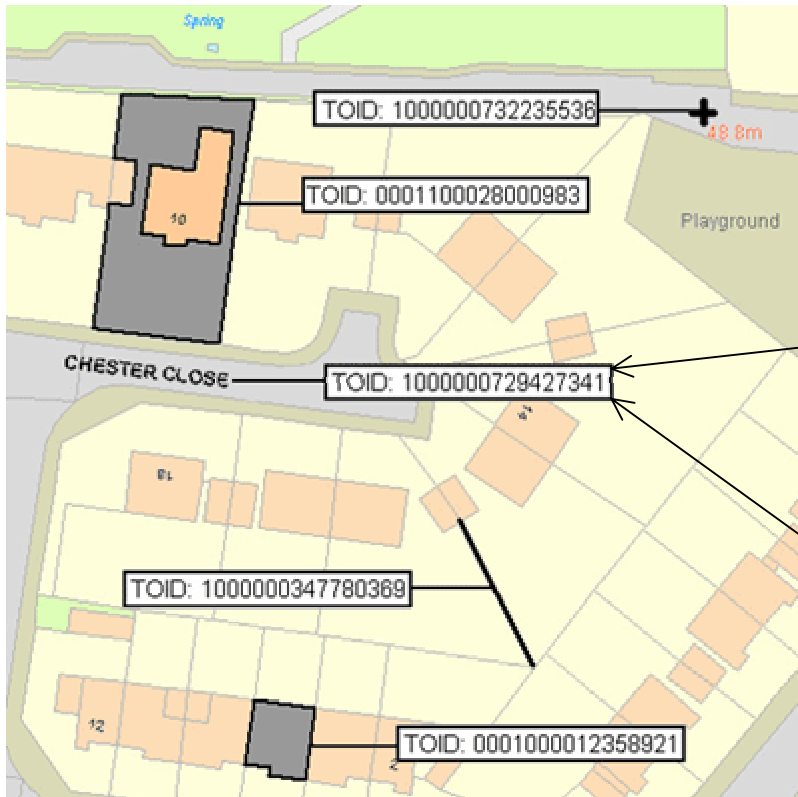
Addresses

Integrated
Transport
Network

Imagery

A geographic database... to what benefit?

- Every object represented in OS MasterMap has a unique identifier called a TOID. These TOIDs can be used to connect other information.



Highways database
road_name: Chester Close
road_type: cul-de-sac
lighting: none
TOID: 1000000729427341

Crime report database
crime_type: vehicle break-in
date: 09/05/2003
TOID: 1000000729427341



Highways
and Police
can share
information

Increasing effectiveness and time - Dumfries and Galloway Police



Photograph courtesy of Dumfries and Galloway Police

Savings of 70% over their previous system

Pinpointing the location of emergency services quickly and accurately.

'Because it is web friendly, we can network OS MasterMap[®] across our Intranet and allow all our officers to see the location of calls.' Bob Ovens, Deputy Chief Constable Dumfries and Galloway Police

Increasing effectiveness and time – Greater Manchester Ambulance Service



Photograph courtesy of Essex Ambulance Service

Greater Manchester Ambulance Service (GMAS) now use GI for predictive analysis, plotting where and when emergency calls are likely to be made.

'...improving technology and mapping systems helps us to remain at the cutting edge in terms of response times.' Derek Cartwright, Director of Operations of Greater Manchester Ambulance Service (GMAS)

The role of technology

Nano-, bio-, information, communications technology and artificial intelligence will converge....

Technology will enable virtually everything (objects and people) to be identified, tagged, sensed and monitored.....



The role of technology continued

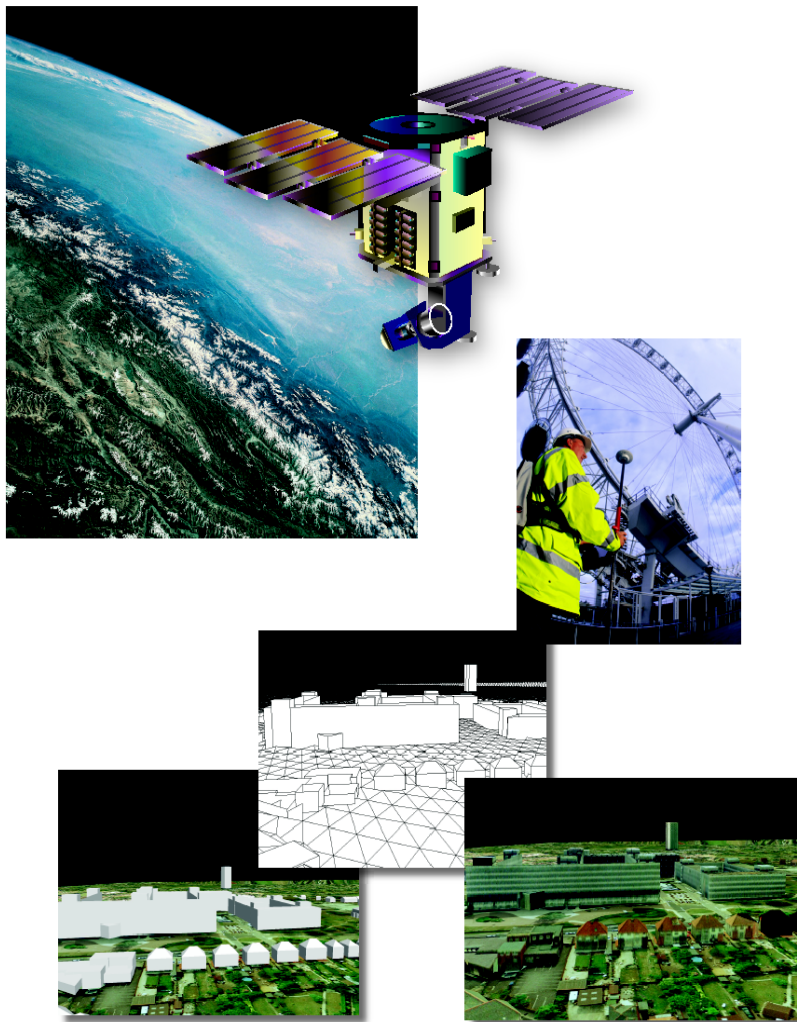
Miniaturisation will allow processing on the device and geographic intelligence to be held on the network.....

Increased bandwidth, and processing power will allow complex distributed analyses across trusted super computing environments.....

What can be automated, will be automated.....

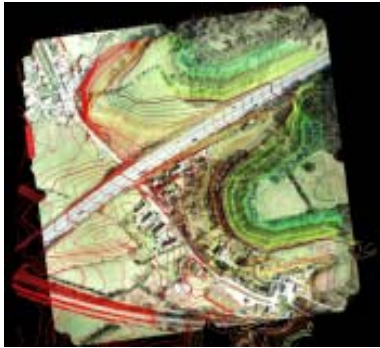


Goal 1 Introduce automated, near real-time capture to database processes



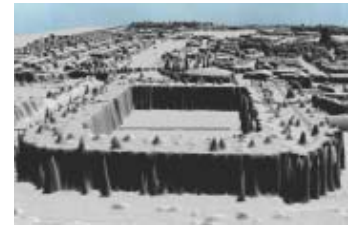
Goal 1 Improving data capture methodologies

Moving towards an automated data capture process



Improving capture of height, vector and imagery data models iteratively

3D vector and attribute capture techniques from imagery and LiDAR point clouds



Detecting and capturing objects and attributes through combinations of image primitives (eg: spectral, spatial, contextual and textural and shape characteristics)

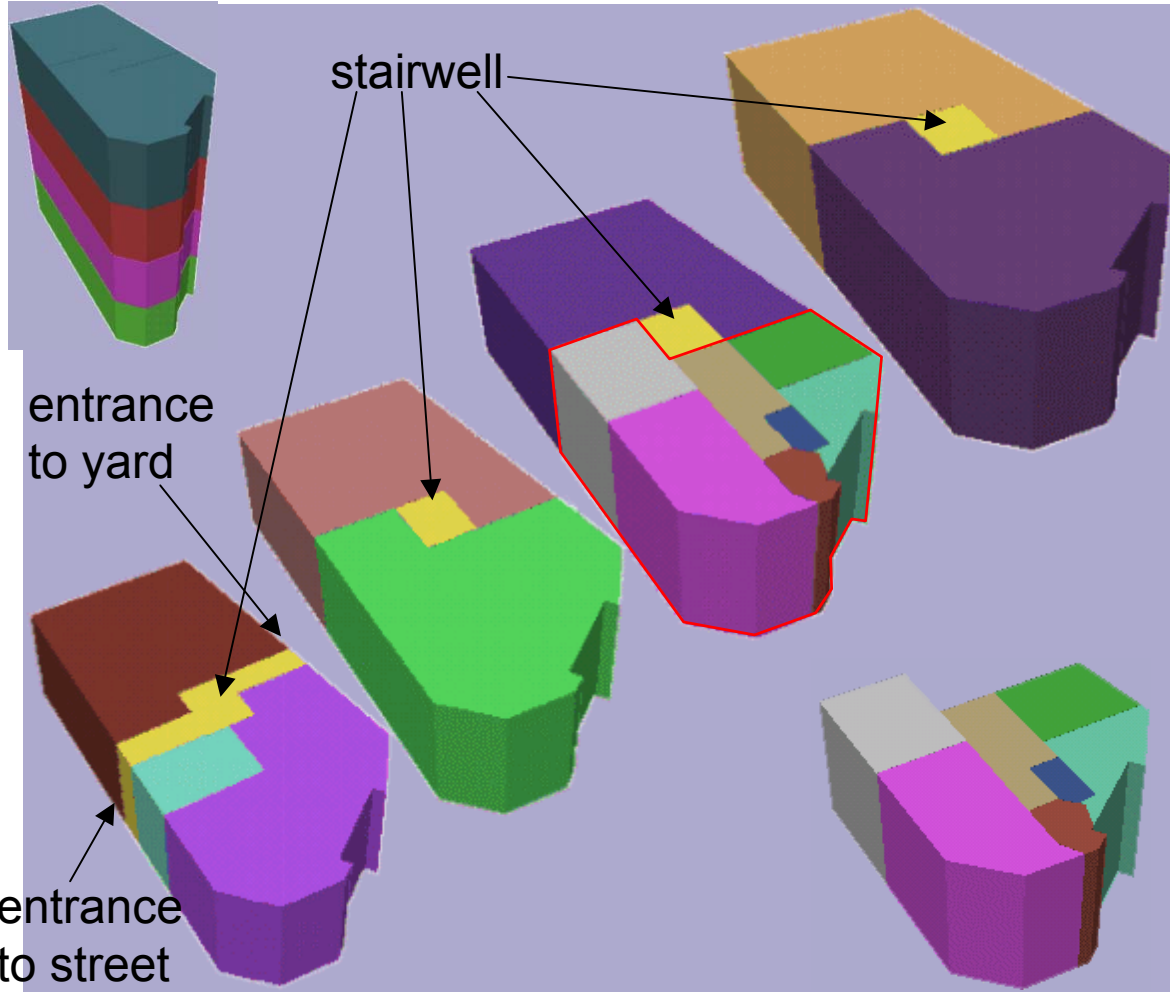
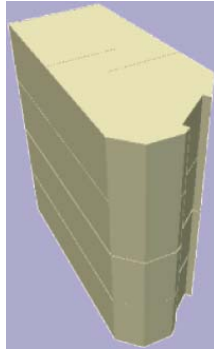
Goal 2

Introduce a flexible, multi-dimensional, information rich database, and the means by which Ordnance Survey products and services are derived.



Goal 2 The 3rd Dimension - Building modelling

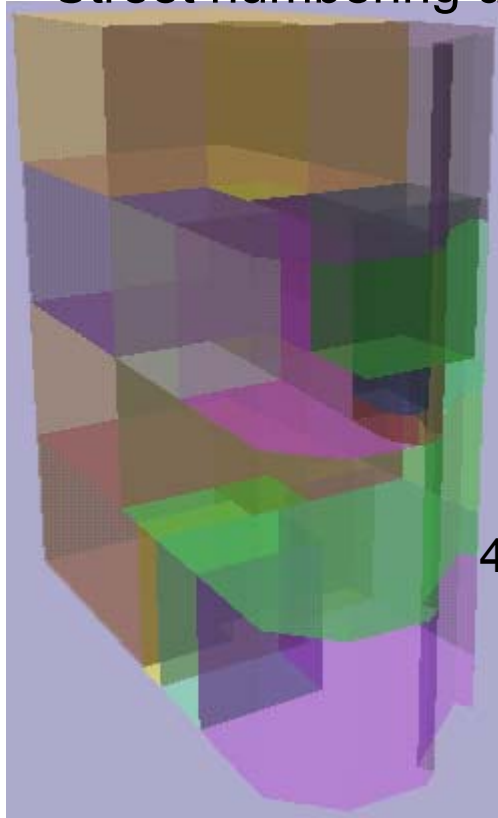
OS. ©Crown. Digimap. an IJSC/Edina service.



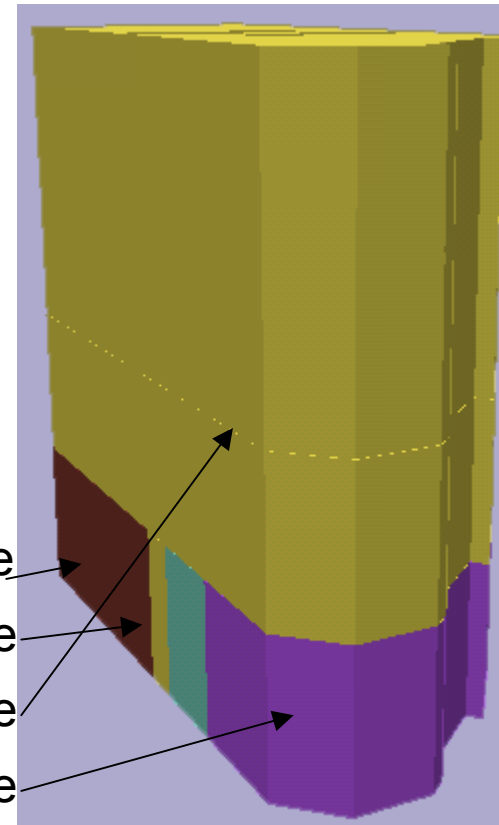
Aidan Slingsby, CASA, University College London: Feature based mapping in 3D space, incorporating pedestrian accessibility

Building modelling continued

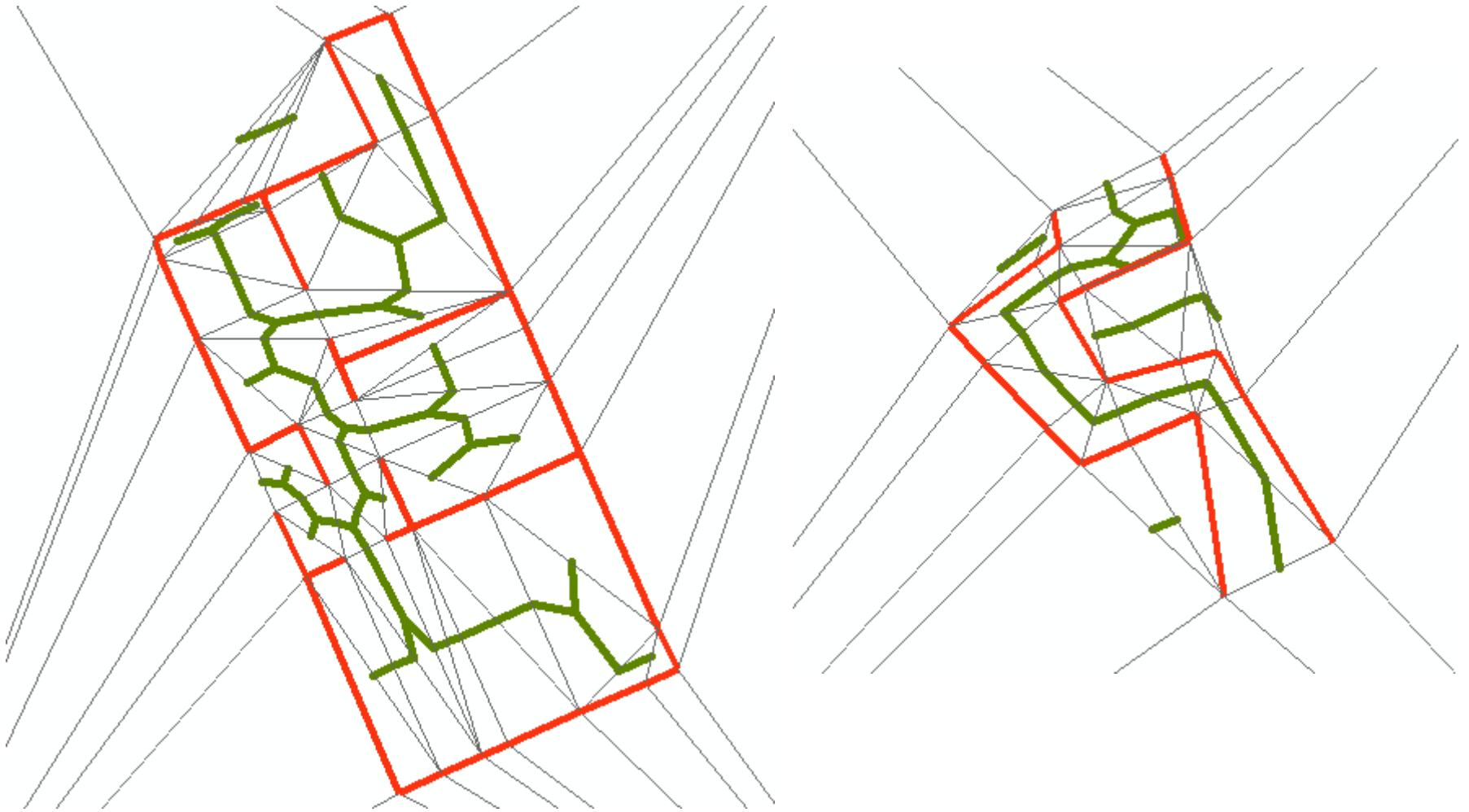
- Street numbering units



4-5 Bruntsfield Place
3 Bruntsfield Place
2 Bruntsfield Place
1 Bruntsfield Place



Building modelling - TINs for internal routing



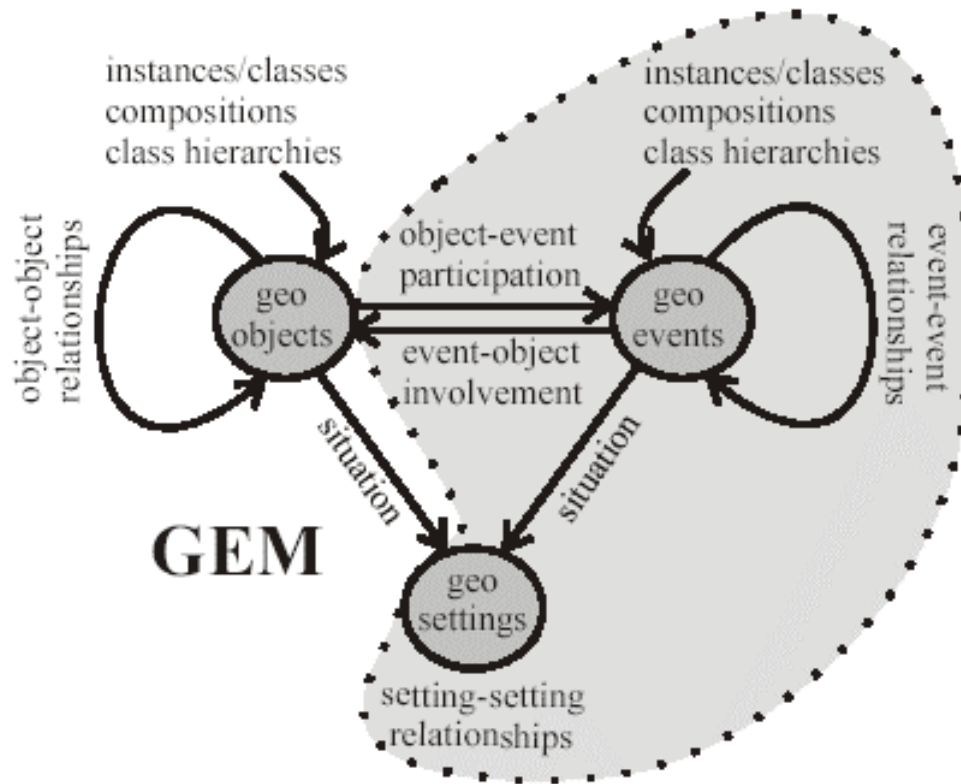
Aidan Slingsby, CASA, University College London: Feature based mapping in 3D space, incorporating pedestrian accessibility

Goal 2 The 4th dimension

- Spatio-Temporal databases
- Databases that hold the usual features but also the dynamic aspect of those features: events

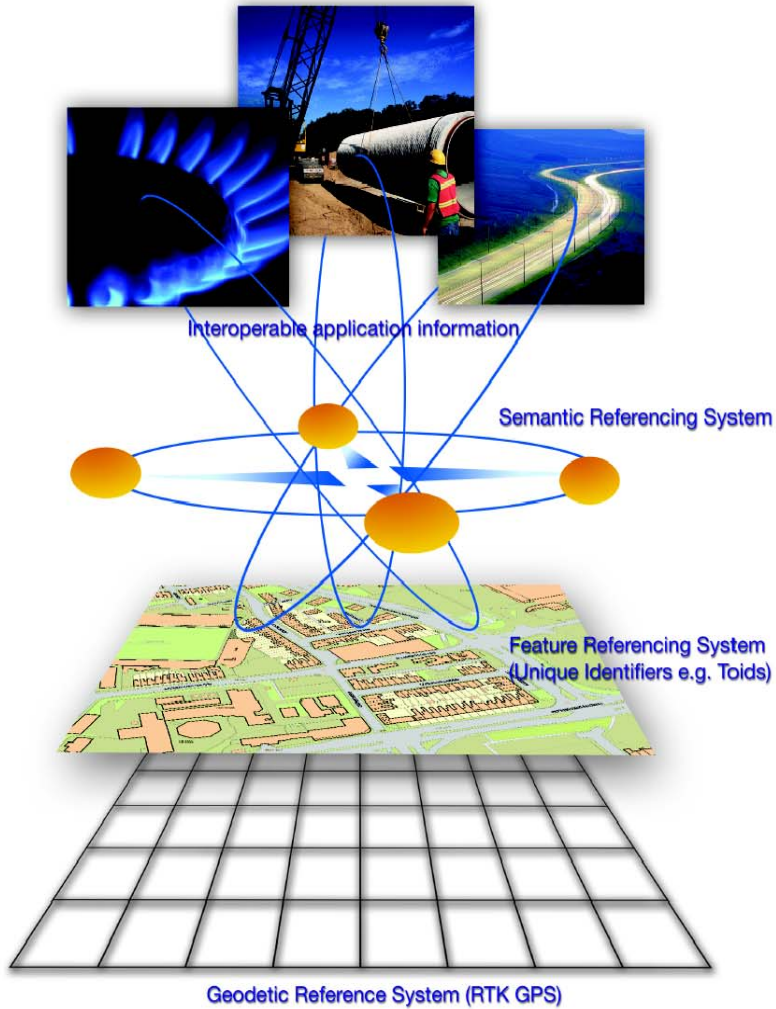


Goal 2 The 4th dimension

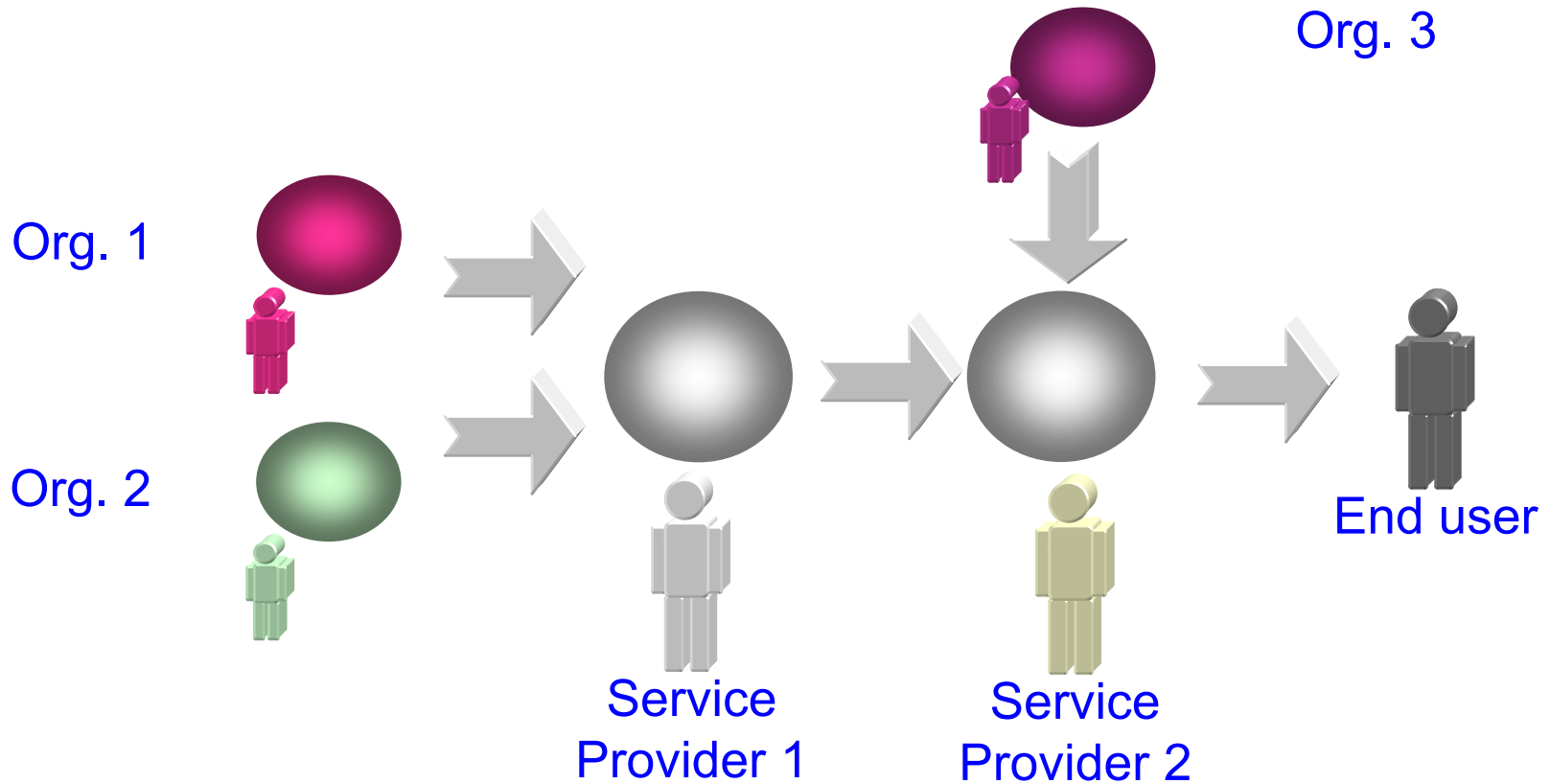


The Geospatial Event Model (GEM): Objects, events and their interaction (from Warboys and Hornsby, 2004)

Goal 3 Introduce semantic reference systems, enabling GI to be automatically understood, exchanged and integrated



Web services: Providing the end user with the answer to their question?



Semantic interoperability



River: A large natural stream of water emptying into an ocean



(river has
(superclass (...)))

**Shared Human
Consensus**

**Text
Descriptions**

**Semantics
hardwired;
used at
runtime**

**Semantics
processed and used
at runtime**



Implicit

**Informal
(explicit)**

**Formal
(for humans)**

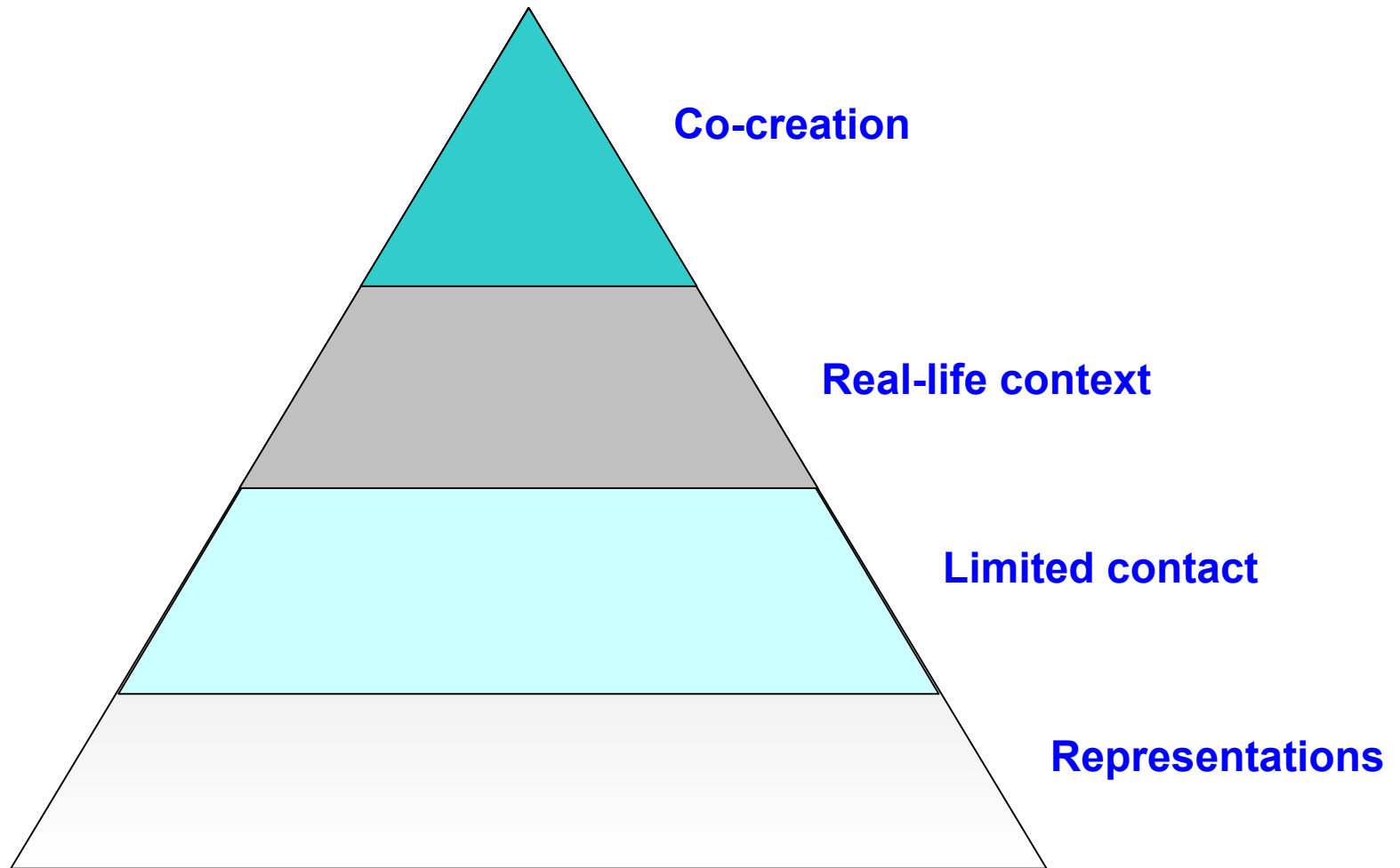
**Formal
(for machines)**

(After Mike Uschold of Boeing)

GI when, where and how the user wants it – in time



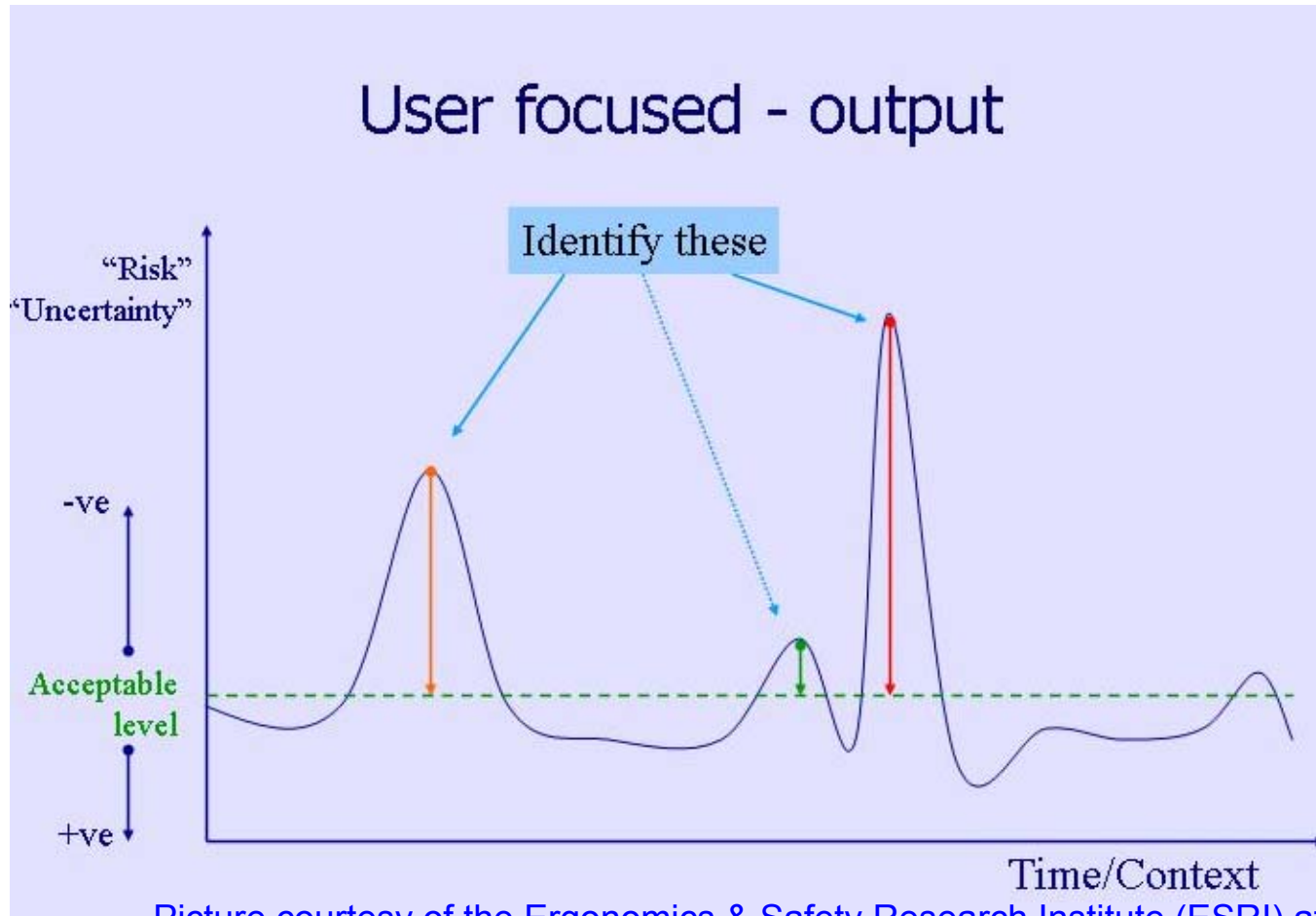
The pyramid of user-based design methodologies



From Aarts and Marzano, 2003

User centeredness

Useful GI = that which enhances effectiveness



Picture courtesy of the Ergonomics & Safety Research Institute (ESRI) at Loughborough University

User centeredness – location and direction enabled devices



Nokia 5140 with integrated digital compass



Honeywell



Sanyo A5505SA



HMC6052

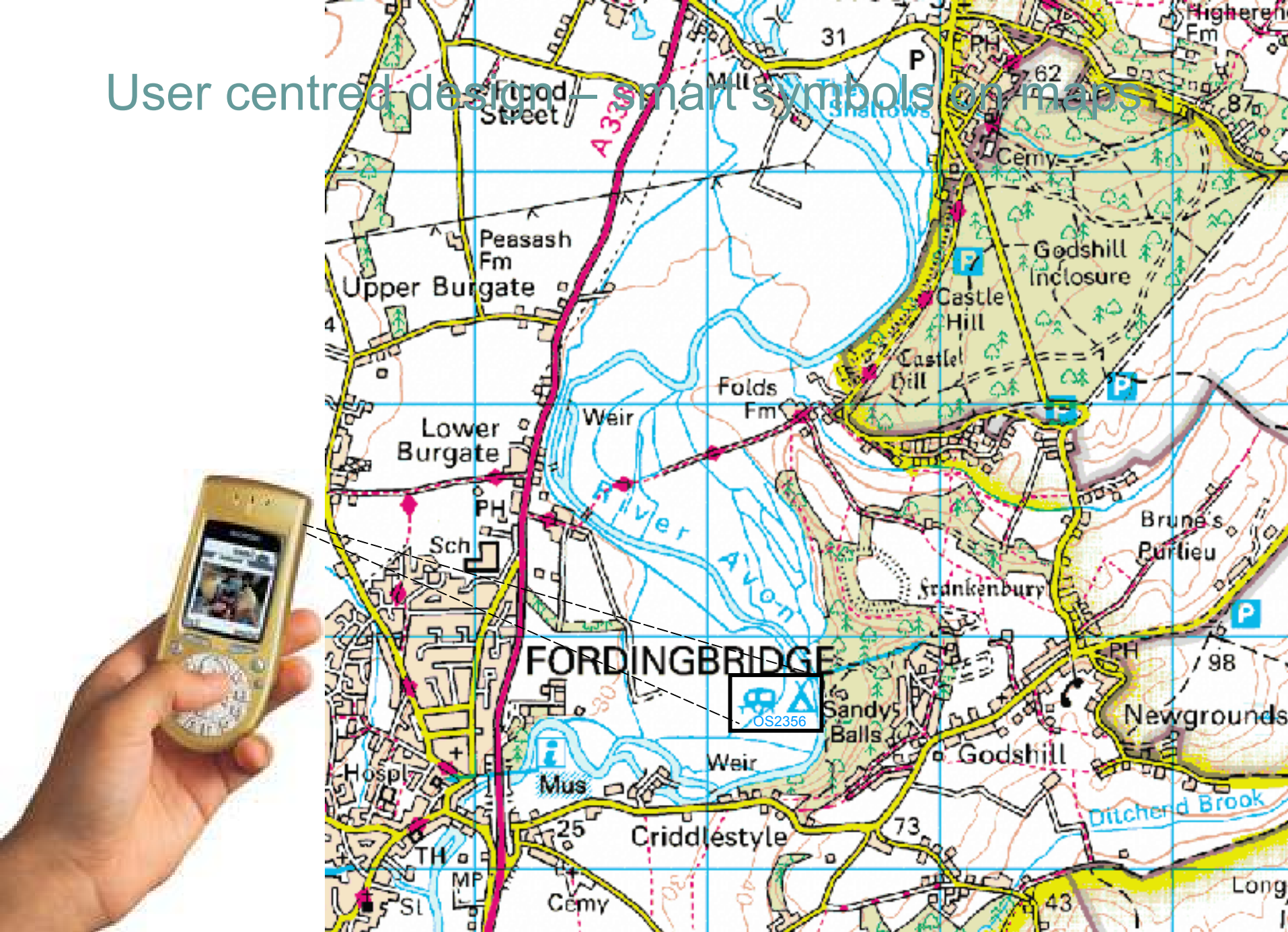
4 x 4 x .9 mm



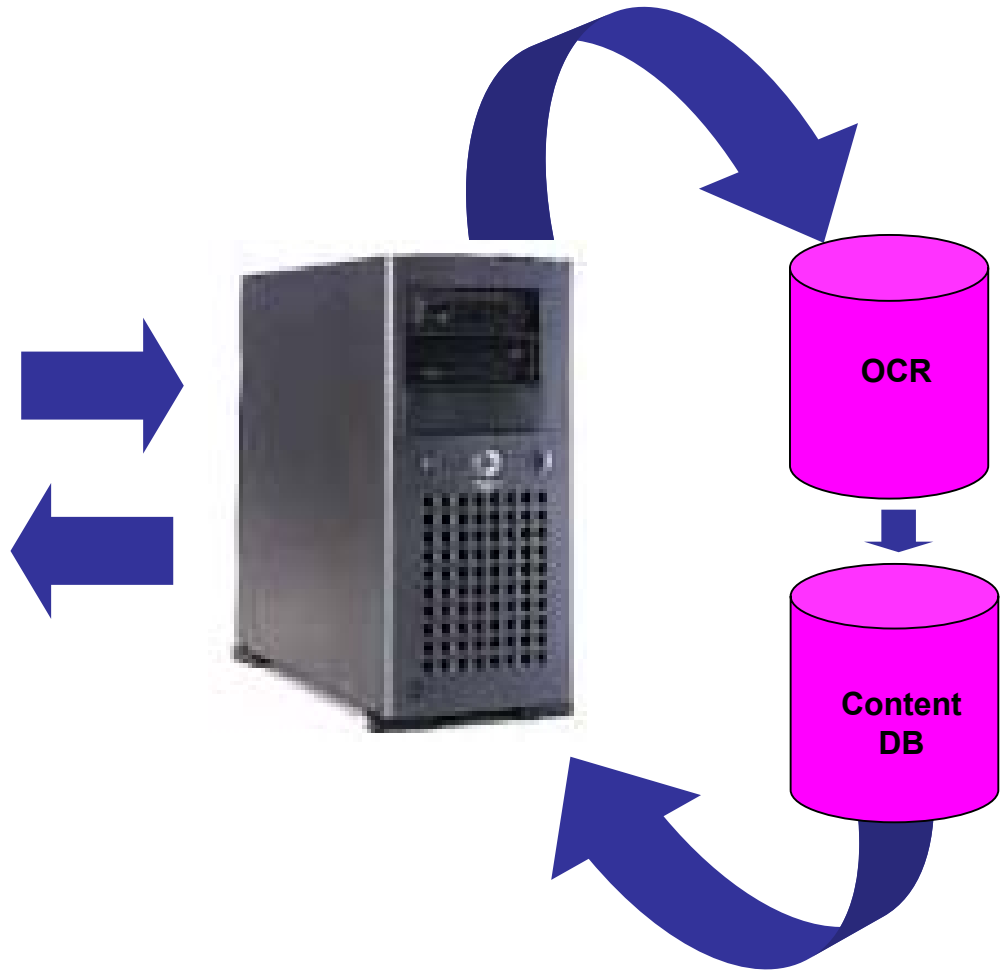
LGG5300



User centred design – smart symbols on maps

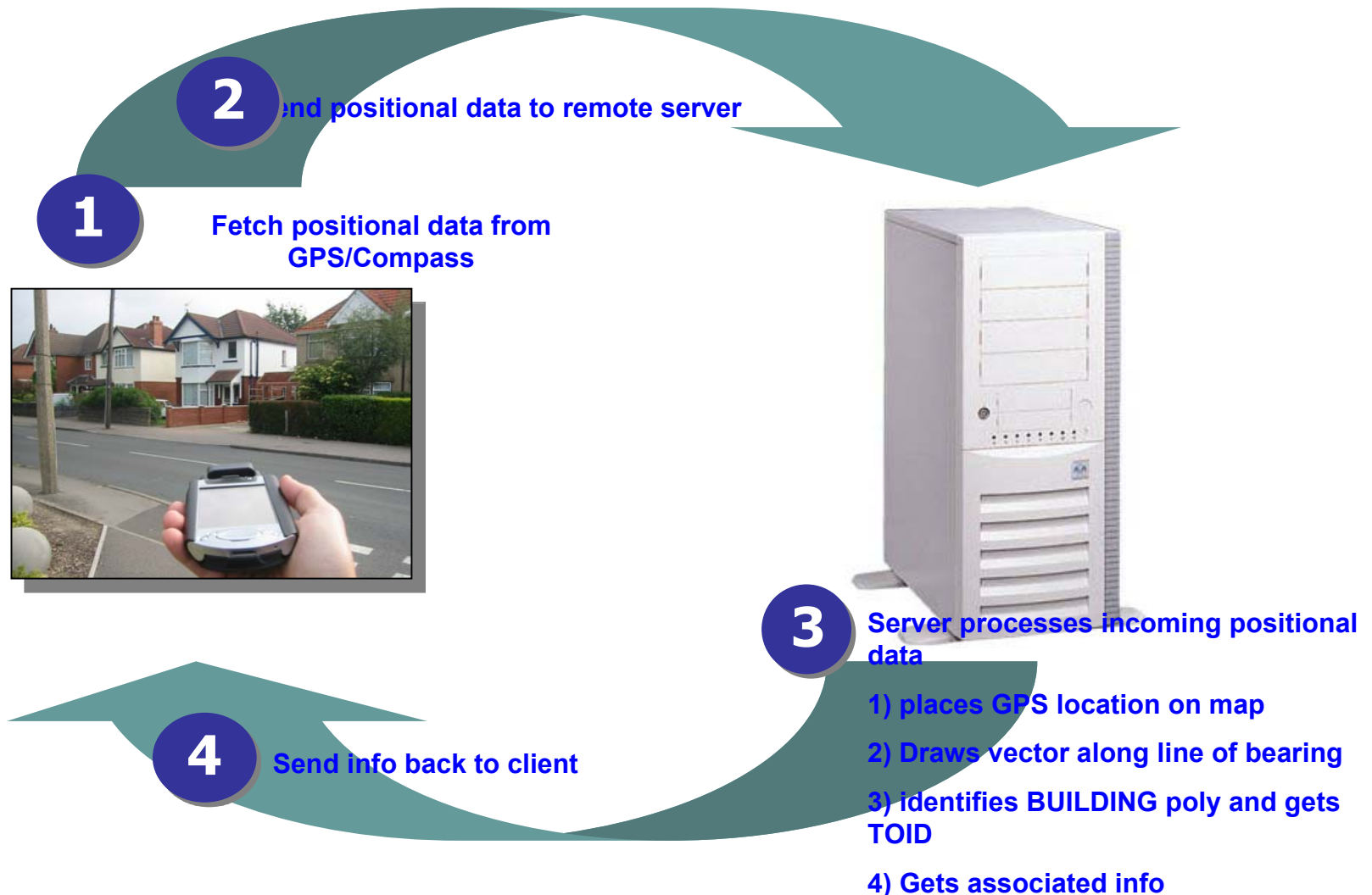


User centeredness – smart symbols on maps



User centeredness – not only where but what?

Pointing applications



LOCATION = N50.4356, W1.3876

ROAD = **NO**

MANMADE SURFACE = **NO**

MULTIPLE SURFACE(GARDEN) = **NO**

BUILDING = YES!!!

CLIENT DATA RECEIVED: LOCATION = N50.4356, W1.3876, BEARING=SSW156



User centeredness: – Soundstage



The user moves across the map floor (representing the real world environment) equipped with a headset and PDA linked to an ultrasonic receiving unit.

Software developed by the Mobile Bristol <http://www.mobilebristol.com> project defines the ultrasound network's effective range. Multimedia content to be embedded at specific locations or zones corresponding with features appearing on the map floor. As the user walks passed the pub feature audio visual information is received on the PDA screen.

User centeredness: augmented reality

Overlaying spatially accurate, computer-generated images of data on views of the real world.



Conclusion

Disaster management is highly complex

Providing the right information at the right time with clarity and simplicity is vital if practitioners are to carry out their task effectively

Future technological developments offer greater complexity and the means to resolve complexity for the user

High complexity requires high design

By applying principles of user centred design to GI product and service design

The role of a national GI provider is to provide the infrastructure and GI that enables the right information to be received at the time



Thank you

chris.parker@ordnancesurvey.co.uk

www.ordnancesurvey.co.uk/research