New Models in Data Sharing and Dissemination
Hangzhou Forum on UN Global Geospatial Information Management
Hangzhou, China

Peter ter Haar, Neil Ackroyd
Ordnance Survey
Changing the data paradigm

1791 to 1850s
Initial Survey

1936 to ~1955
Metric, national CRS

1975 to ~1994
Digital spaghetti

2000 to 2001
Topological geometric object layers

2011
Classification, Componentisation Rules and 3D

✅ National Coverage
✅ Nationally consistent data
✅ GIS use
✅ Object Referencing, change mgmt
✅ Integrated maintenance, data-content separation, 3D models
GGIM Visioning Paper: Trends
Geography: underpinning the nation
The future satellite navigation environment

Now
66 (24 GLONASS + 29 GPS + 2 Galileo + 11 Compass)

2002
38 (8 GLONASS + 30 GPS)

2012
70 (24 GLONASS + 30 GPS + 4 Galileo + 12 Compass)

2015
≥100 (24 GLONASS + 30 GPS + 18 Galileo + ~ 24 COMPASS, & 7 IRNS, 3 QZSS)

2015
≥100 (24 GLONASS + 30 GPS + 18 Galileo + ~ 24 COMPASS, & 7 IRNS, 3 QZSS)
Basic dGPS: 1-5m
Standalone GPS: 5-10m
RTK: 2 cm
High Quality dGPS: 0.2-0.8m
GNSS Market Opportunity

- **Services revenues**
- **Product revenues**

![Graph showing GNSS market opportunity from 2000 to 2020 with increasing trends in both services and product revenues.](image-url)
Alternative Positioning Systems

Heat Map of Wifi Positioning Mobile Use (Skyhook 2011)

MEMS Sensor Technology plus cameras
UltraCam XP digital cameras
1:5000 Scale capture using 50cm satellite imagery

Building generalisation good, roads good, paths ok, road type information simple. Building divisions more challenging.
New Technology for Remotely Sensed Capture
High Altitude Long Endurance UAV’s & Satellites

30cm ground pixel from 18km high
60% overlap – 2.5Kg Camera payload
Pan and RGB
Trials in 2011

0.50 metre GSD & Improving Daily Repeat
Visible Imagery & Radar platforms
2.0 - 5.0m micro-satellites
“iPad-controlled Drone captures Tuscaloosa storm damage”
OS MasterMap® Integrated Transport Network™

Layer

- Updates every 2 months
- Database updated daily

Roads
- Geometry

Road Routing Information (RRI)
- Vehicle restrictions, traffic calming, one-way roads and other information

HGV Attribution
- Weights, widths

Updates every 2 months
Database updated daily

Roads
Geometry

Road Routing Information (RRI)
Vehicle restrictions, traffic calming, one-way roads and other information

HGV Attribution
Weights, widths
ITN helping transport to Go Green

ITN is being used in a project to help maximise efficiencies in car management systems……..

The use of the Enhanced Acceleration/ Deceleration has created between 25 and 30% efficiency savings over an identical car running the same route.
TomTom automated change detection

4-way intersection converted to roundabout
Key Issues

• Greater focus on Data Pedigree
  • Authorative vs. Open Sourced
• Collaborative Supply Chain Partnering
• Knowledge and Assurance become differentiators

Supply Chain Accreditation

“The process whereby Ordnance Survey satisfies itself that its suppliers, both external and internal, with an effective level of ongoing support, are capable of consistently delivering Geographic Information to the required quality, on time, in the necessary volumes and at the right cost.”
Use of Industry Standards

Operational Experience

ISO9000 series

ISO19113 & 19114

Ordnance Survey Supply Chain Accreditation

ISO 19158
Opening the use of geospatial data
Ordnance Survey's business model

As a Government Trading Fund, Ordnance Survey, its Board, and it’s Accounting Officer, are legally obliged under SI 1999, No 965, The Ordnance Survey Trading Fund Order 1999, and The Trading Funds Act 1973 to ensure that:

“The operations of the Crown service known as Ordnance Survey described in Schedule 1 shall be financed by means of the Fund ... be so managed that the revenue would consist principally of receipts in respect of goods or services provided in the course of the operations.”

Any change needs to be facilitated within this framework.
Public Sector Mapping Agreement (PSMA)

Public Sector Mapping Agreement (PSMA) for England and Wales

Welcome to the PSMA! If you are already a PSMA member login to the members' area now to find out more detailed news about your agreement.

What does the PSMA provide?

- A new 10 year agreement for the Public Sector in England and Wales.
- The PSMA provides access to core geographic datasets from Ordnance Survey.
- The PSMA datasets are free at the point of use for all eligible public sector bodies.
- Providing common geographic framework for the Public Sector will enable sharing of information.

PSMA Member licence key facts »
Optimising waste collection using OS MasterMap Integrated Transport Network Layer

- Daventry generated new waste collection routes in all seven districts using OS MasterMap Integrated Transport Layer with Route Restriction Information

- Daventry has been able to rationalise the number of domestic waste collection routes from nine to eight, reducing diesel costs by 12%, increasing spare capacity by 14% and eliminating overtime costs.

‘OS MasterMap ITN Layer and Road Routing Information has made it possible for us to meet our challenges of increasing efficiency, planning for growth and reducing landfill. In Daventry alone we are on target to achieve savings of around £100 000 per year, with much greater savings expected for the whole county.’

Jo Gilford
Corporate Manager for Public Space
Daventry District Council

Photograph courtesy of Daventry District Council
Increasing patient registrations

Birmingham Health and Well-being partnership

- **Identifying patient spread**
  - OS MasterMap Address Layer 2 is used with multiple occupancy information
  - The Trust can quickly identify addresses where there is no record of a registered patient

- **Reaching the unregistered**
  - Targeted mail shots encourage people to register with a GP

- **Maximising the benefits**
  - An increase in patient registrations in areas identified as having low registrations
  - Improved patient address list will support future health campaigns and surveys
Emergency Management: Carlisle floods
Simplification of partner contracts, all available under a single Framework Contract (Partners)
Utilities - using OS MasterMap® to improve service levels and business performance

‘We get our Return On Investment (ROI) by having lots of people using the data intelligently’

‘The GIS system provides.....an estimated saving of at least £1 000 000 per year to United Utilities and its highway excavation contractors’

Peter Mahon
Asset Information Services Manager
Insurance - understanding underwriting risk

- Unit Postcode Polygons
- Flood Risk Extent
- Affected Unit Postcode Polygons
  - All Individual Addresses
  - Individual Addresses within Affected Unit Postcode Polygon
  - Addresses at Risk of Flooding

© Environment Agency 2008
© Ordnance Survey 2008
'The initial cost of the solution, including the Ordnance Survey mapping, was less than £35 000, with ongoing annual costs of £9 000 for support and Ordnance Survey licence fees. We will have saved £100 000 over three years on the grounds maintenance contract and will have saved many thousands of pounds through a reduction of ground maintenance calls from residents, faster resolution of disputes and identification of chargeable work.'

Alex Hill,
GIS Officer at Dane Housing
Partnerships underpin everything we do
OS OpenData

Create and support innovative, exciting ideas and applications using our mapping.

With OS OpenData™ you can access a selection of the most detailed mapping datasets available for Great Britain.

Changes to the OS OpenData Licence

We now incorporate the new Open Government Licence into our OS OpenData Licence.

The Open Government Licence, developed by The National Archives, is designed to provide a single set of terms and conditions for anyone wishing to use freely available government information. Importantly, this does not alter what users of OS OpenData can do. All the data available through OS OpenData is still open for commercial or non-commercial use without restriction.

As before, we ask for little more than an acknowledgement of the source of the data.

More information on the change, and why we have made it. »
New applications developed using OS OpenData
New applications developed using OS OpenData

- OS Street View with OpenStreetMap

Source: http://wiki.openstreetmap.org/wiki/Ordnance_Survey_Opendata
The value of Open Data

“As an OSM activist and commercial cartographer both, I find myself using OS OpenData more and more… yet have never even started using OSM data for commercial purposes”

GeoVation runs challenges to address specific needs within communities, which may be satisfied in part through the use of geography.

www.geovation.org.uk
GeoVation - problem focussed

 Needs identified through expert “PowWow” and fed into GeoVation Camp

 Campers ground solutions and ventures in identified need

 INNOVATION = PROBLEM X SOLUTION X EXECUTION
GeoVation Transport Challenge winners

How can we improve transport in Britain?

Mission: Explore were awarded £36,500 for their idea to encourage children and their families to cycle by inviting them to seek out and complete irreverent, geography-themed ‘missions’ located across the National Cycle Network. The team also won an additional £1,000 prize after winning the Community Award, as voted for by the audience.

My PTP, which stands for Personal Transport Planner, also took home a cheque for £36,500 to help build their vision of a journey planner that enables businesses and consumers to make informed travel choices in real-time.

CycleStreets received £27,000 to help them build their cycling advocacy toolkit which will help groups across the country work for better cycling facilities.

MySociety won £27,000 to implement the mobile element of their FixMyTransport initiative. They want to encourage travellers to become micro-activists when they find problems with the transport network, allowing them to automatically report issues to the relevant authority.

The @ccessAdvisR team were also awarded £27,000 for their idea of a disabled access route planner to help take the stress out of journeys for travellers with limited mobility.

And finally, £6,000 was presented to the London Cycle Map Campaign for their idea of creating a colour coded Tube-style map of the Capital’s cycling network.

Enter the GeoVation challenge

http://www.geovation.org.uk/geovationchallenge/
What is OS OpenSpace?

- It is a free service that provides free access to Ordnance Survey mapping data.
- Makes it really quick and simple for clubs, societies, businesses, individuals, government and charities to add our mapping to their websites.
- Has a commercial upgrade path that makes it easy for those that want to generate significant revenue from their mapping applications.
Example websites

Brent
- Environment and planning
  - Recycling, rubbish and waste
    - Recycling sites
      - Furniture and electrical item collection
      - Garden waste bio-sack collection
      - Green Zones
      - Home composting
      - Recycling collections
      - Reuse and recycling centre
      - Rubbish collections
      - Waste and environmental education

Eastleigh District Scouts
- "News and events from around the District"

District map
Example websites

Planning

Planning and you

Welcome to our online planning section – one of the best used sections of our website. In this section you can search for and download plans and proposals for development across the district – from new shopping centres, to house extensions.

You can also comment on the. For more, plans will be discussed by the District Council, just use the icons below to find what you are looking for.

Current Planning application electronic case file

Use this system to access detailed drawings, associated documents and forms since January 2006.

Access our electronic case file...
OS OpenSpace Pro

- Provides an upgrade path for those who wish to migrate from the free offering to a paid-for service with enhanced products and features (basic ‘freemium’-style model)
- Offers a fully supported Application Programming Interface (API) mapping service for small, medium and multi-national companies
- Example users include Times Walks and Walk4life
A complete framework: Freemium Business Model

Availability:
Government: PSMA / OSMA (central agreement)
Private sector: Direct or through Business Partners (licensed use)
Consumer: through Business Partners (end products)

Everyone: OS OpenData (centrally funded)
Also through Business Partners

Increasing detail & specialist use
Increasing data cost/value

Topographic Mapping
Business
Consumer

Address
Location
Route
Networks
Terrain
Models
Data distribution
Supply Models

Custom generated

Content

Pre-generated

Media

Paper  DVD  FTP  HTTP

On-Line

Online

On-Demand

Linked data

Web 2.0

GIF  SVG  GML

Format

Paper  DVD  FTP  HTTP
Standards

- Open Geospatial Consortium
  - Board of Directors
  - Business level
  - Technical level

- British Standards Institution Committee for Geographic Information
  - Chair

- ISO TC211
  - Technical level

- CEN TC287
  - Observing

- W3C
  - Observing
Internal use of standards

• OGC reference model/lower digit 19100s
• SOA (web services / ETL)
• BPEL (Business process execution language)
• WFS as internal data connector
• GML as internal transport format
• ISO 19135 compliant registry management
• Spatial Data Infrastructure (SDI) approach
• Inspire data specification development process
• ISO 19157/58 quality management
• ID management from data capture to product generation
• ID conventions (URI schema)
The Nice Thing About Standards…
Upgrading from one standard to the next
On-Line Ordering
Off-line supply
OS OnDemand WMS

All map data is remotely hosted and maintained to be made available using an open standard (OGC) web protocol providing raster images of:

- Overview map of Great Britain
- MiniScale®
- 1:250 000 Scale Colour Raster
- 1:50 000 Scale Colour Raster
- 1:25 000 Scale Colour Raster
- 1:10 000 Scale Raster
- OS Street View™
- OS MasterMap® Topography Layer (six views, standard and background palettes)

New INSPIRE-driven product additions

- 1:50 000 Scale Gazetteer
- Boundary-Line™
- Land-Form PANORAMA® (contours)
- Land-Form PANORAMA (DTM)
- Land-Form PROFILE® (contours)
- Land-Form PROFILE (DTM)
- Meridian™ 2 communication theme
- Meridian 2 topographic theme
- OS Locator™ Open
- OS MasterMap Integrated Transport Network™ Layer, Roads and Urban Paths Themes
- OS VectorMap® Local
- Strategi®
- OS VectorMap District
OS OnDemand WMTS

All map data is hosted in Amazon® cloud technology and maintained to be made available using OpenLayers 2.10 JavaScript® API - providing raster images of:

- Overview map of Great Britain
- MiniScale
- 1:250 000 Scale Colour Raster
- 1:50 000 Scale Colour Raster
- 1:25 000 Scale Colour Raster
- OS Street View
- Boundary-Line
- OS VectorMap Local
- OS VectorMap District
- Code-Point® Open
- Zoom map stack – 10 layers of consistently-styled data over a range of zoom thresholds.
Big Data, Linked Data
Big Data
Big Data: constants streams of “interesting” information

Etc etc etc …
Everything Happens Somewhere
Event type: Natural
Classification: Volcano
longitude: 502913.319
latitude: 128478.583
Hours since event: 4

Event type: Infrastructure
Classification: Bridge Collapse
longitude: 502913.319
latitude: 128478.583
Hours since event:

Event type: Infrastructure / Industrial Accident
Classification: Oil spill
longitude: 502913.319
latitude: 128478.583
Hours since event: 1

Event type: Natural
Classification: Crop Failure
longitude: 502913.319
latitude: 128478.583
Hours since event:

Event type: Industrial Accident
Classification: Nuclear
longitude: 502913.319
latitude: 128478.583
Hours since event: 4

Event type: Natural
Classification: Flood
longitude: 502913.319
latitude: 128478.583
Hours since event:

Event type: Logistics / Accident
Classification: Motorway Closed
longitude: 502913.319
latitude: 128478.583
Hours since event: 3

Event type: Social
Classification: Riot
longitude: 502913.319
latitude: 128478.583
Hours since event: 2

Event type: Natural
Classification: Hurricane
longitude: 502913.319
latitude: 128478.583
Hours since event:
Sourced and Collated

Cache for live event data

Geo-coding / Quality Control / Analysis

Web scraping

Social Media algorithms

Reporting agencies

Authoritative sources

Web scraping

Social Media

Reporting agencies

Authoritative sources
Distributed Cache for live event data

Finance  Retail  Industrial  Logistics
Data Silos

Place

Organisation

Person

Opening up government
Using a geographic database to connect information

- Every object represented in OS MasterMap has a unique identifier called a TOID. These TOIDs can be used to connect other information.
Linked Data: Connect through the World Wide Web

[SOUTHAMPTON map]

Place

http://data.ordnancesurvey.co.uk/id/7000000000037256

http://xmlns.com/foaf/0.1/based_near

Person

http://reference.data.gov.uk/id/department/os/post/5

organisation

http://reference.data.gov.uk/id/department/os

org:works_for

http://xmlns.com/foaf/0.1/based_near
Towards a web of linked data…
Towards a URI for every ‘place’ in GB

The City of Southampton:
http://data.ordnancesurvey.co.uk/id/7000000000037256

Bevois:
http://data.ordnancesurvey.co.uk/id/7000000000017707

The postcode unit SO17 1DP:
http://data.ordnancesurvey.co.uk/id/postcodeunit/SO171DP
# The City of Southampton

A description of the resource identified by http://data.ordnancesurvey.co.uk/id/70000000037256

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Behind the data: GeoSPARQL
A Big Bucket of Data – Hyperlocal Example

“Find me all doctors in my ward, bus stops within a 500 metre radius of those doctors but exclude bus stops in areas of high crime”
Conclusions

• Global trends demonstrate ubiquitous availability of Positioning technology, of Authoritative Data and of Computing resources

• These trends are now demonstrating that there are complementary roles for Volunteered Geographic Information and Authoritative Government Geographic Information

• In many countries this transforms the National Mapping Agency into the National Mapping Authority, responsible for authoritative data collection, frameworks and standards