

**URISA**  
British Columbia Chapter

*GIS Anywhere, Anytime on Any Device!*

**Floating on a Cloud of Opportunity,  
GIS is Coming to Any Device Near You**

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Spatial Vision Group, Inc.  
North Vancouver, BC

June 4, 2015

**SPATIAL VISION GROUP**

URISA British Columbia Chapter

## Presentation Goals / Topics

- Provide a context and framework for today's seminar
- Discuss market drivers and trends
- Talk about suppliers and users of web and mobile GIS
- Explore the underlying data, functions and technologies
- Talk about interesting applications



## MARKET DRIVERS AND TRENDS



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### Today's seminar is trendy ...

- Geo-concepts are being used/discussed in popular media:
  - Articles in the Globe & Mail this week:
    - Special articles: Internet of Things / The Future is Smart
    - Advertisements: Canada Post FlexDelivery
  - Worldwide media – now major users of web/mobile GIS and visualization:
    - New York Times
    - Washington Post
    - The Guardian
- Larger trends:
  - Massive growth and ubiquity of smartphones & tablets
  - Cloud-based services taking away the pain
  - Major geo-related takeovers in real-estate and transportation



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**“Everywhere is anywhere is anything is everything”**  
 (Douglas Coupland)

**Every... Any... All ... Our ... Their ...**

**Where... Thing... Time... Place... Asset ... Customer ... User ...**

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**Charting the Effects of Graduate School:  
 Moving From Clamshells to Smartphones**

**Before Grad School** → **During Grad School** → **After Grad School**

$f_1(x)$        $f_{2B}(x)$

Cowabunga!  
+ Motorola Clamshell

Thinking deeply,  
I am!

Cowabunga  
+ Smartphones  
+ Web GIS APIs  
+ OpenStreetMap!!!

**BIG change!**

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**Everything from this  
1991 RadioShack Ad  
You Can Now Do With  
Your Smartphone  
... and way more!**

- All weather personal stereo
- AM/FM clock radio
- In-Ear Stereo Phones
- Microthin calculator
- Tandy 1000 TL/3
- VHS Camcorder
- Mobile Cellular Telephone
- Mobile CB
- 20-Memory Speed-Dial
- Deluxe Portable CD Player
- 10-Channel Desktop Scanner
- Easiest-to-Use Phone Answerer
- Handheld Cassette Tape Recorder

Source: Huffington Post

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## Samsung Teardown: What's Inside?

**Required Tools**

**Spudger**  
\$2.95

**Phillips #00 Screwdriver**  
\$5.95

**Plastic Opening Tools**  
\$2.95

**Tweezers**  
\$4.95

~=\$17.--

Cost of basic parts: ~=\$240.00

GPS: BCM4750, 4751  
Cost ~< \$9.00

www.ifixit.com/Teardown/Samsung+Galaxy+S4+Teardown/13947

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### Samsung Galaxy S5 Teardown

- Samsung KMV3W000M-8310 Multichip Memory - 16 GB MLC NAND Flash, 64 MB Mobile DDR SDRAM, Memory Controller
- Silicon Image SiI8240 MHL 2.0 Transmitter w/ HDMI Input
- Intel X-Gold 636 / PMB9820 Baseband Processor & Power Management
- Intel SMARTI UE3 / PMB5745 GSM / W-CDMA RF Transceiver
- Murata S14KN GKF48 Main Antenna Switch w/ Duplexers & Filters
- Murata 7 RAD08 7 Receive Diversity Switch w/ SAW Filters
- Invensense MPU-6500 6-Axis MEMS Gyroscope & Accelerometer
- Yamaha YA5532B 3-Axis Electronic Compass
- Broadcom BCM47531 GPS / GNSS Receiver
- NXP Semiconductor PN547 NFC Controller
- Maxim OS21A Heart Rate Biosensor

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### “Mobile is Eating the World”

**1995**

**35 million internet users**  
0.6% Population Penetration

**2014**

**2.5 billion internet users**  
39% Population Penetration

→ **80x more internet users**

**1995**

**80 million mobile phone users**  
1% Population Penetration

**2014**

**5.2 billion mobile phone users**  
73% Population Penetration

→ **65x more mobile users**

Key Sources: Benedict Evans (Andreessen Horowitz), Kleiner Perkins Caufield Byers

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## Smartphones and Tablets are Eating PC's

**Tablet Shipments = Surpassed Desktop PCs & Notebooks in Q4:12, < 3 Years from Intro**

**Global PC (Desktop / Notebook) and Tablet Shipments by Quarter Q1:95 - Q1:13**

KPCB

*Source: Kantar Analytics, eMarketer, Strategy Analytics, eMarketer, Statista, Statista, eMarketer*

*Keiner Perkins Caufield Byers*

**The smartphone industry dwarfs PCs**

4bn people buying every 2 years instead of 1.6bn buying every 5 years

**Quarterly unit shipments (m)**

*Source: Statista, Statista, Statista*

[www.forbes.com/sites/louisclumbus/2014/11/09/mobile-is-eating-the-world/](http://www.forbes.com/sites/louisclumbus/2014/11/09/mobile-is-eating-the-world/)

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## Popularity Contest: Statistics of Websites Using Web Mapping Technologies

**builtwith**

Top in Mapping : Week beginning Jun 01nd 2015

Name	10k	100k	Million	Entire Web
Google Maps	228	3,536	153,686	2,130,679
Google Maps API	240	2,472	48,796	917,262
Bing Maps	32	196	3,468	39,950
Leaflet	5	49	1,362	37,337
Map Point	31	133	2,959	37,313
Baidu Maps	0	2	1,111	34,147
MapBox	13	47	853	13,633
MaxMind	11	63	1,186	13,166
OpenLayers	2	15	676	6,393
MapQuest	0	9	1,283	3,457
OpenStreetMap	0	1	92	1,675
ArcGIS	5	39	187	1,477
CloudMade	0	1	178	941
Google Latitude	0	0	22	705
Google Ditu	0	0	27	424
Yahoo Maps	0	0	101	303
CartoDB	1	1	19	139
Trisplite	0	0	7	28
deCarta	0	0	2	25
Maptimize	0	0	3	8

**builtwith**

Mapping Usage Statistics

Statistics for websites using Mapping technologies

**Summary**

Vendor	% Market	# Sites
Google (Maps API, Earth, Maps Engine)	91.28	3,050,000
MapBox/Leaflet	1.52	51,000
ESRI ArcGIS (Pro, Server, Portal, Javascript)	0.04	1,500
CartoDB	0.00	150
<b>All Mapping</b>	<b>100.00</b>	<b>3,243,000</b>

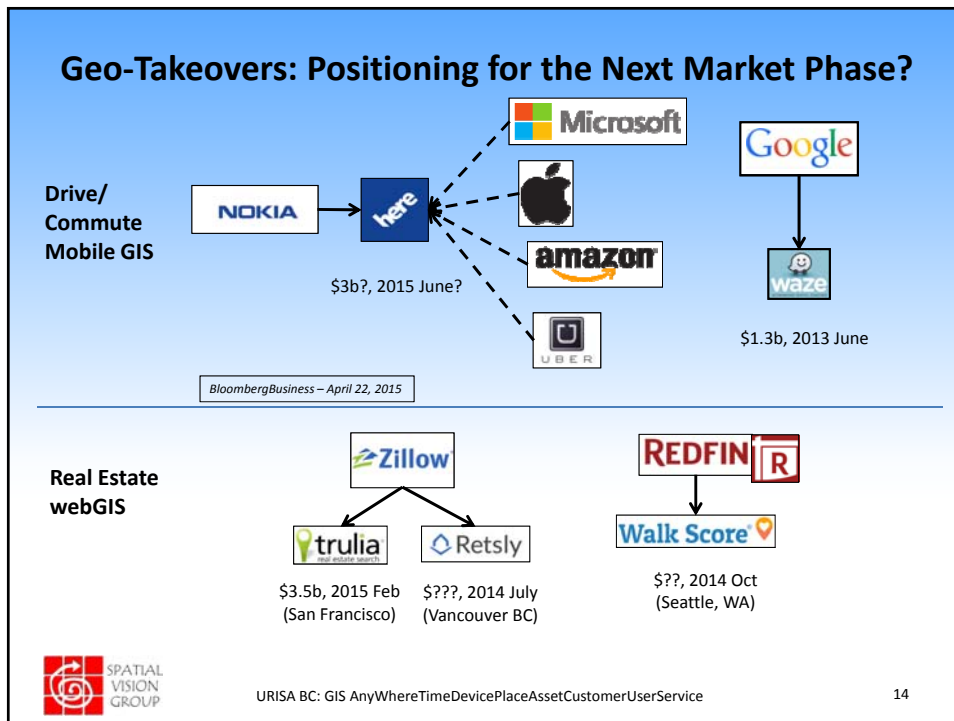
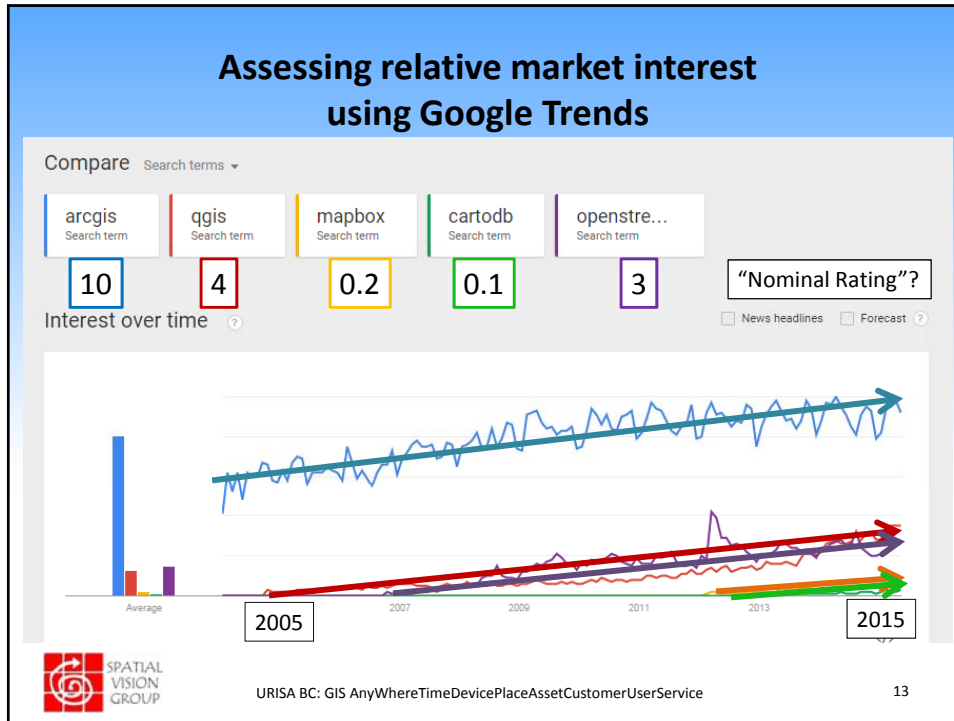
**Total Websites Worldwide:** 1,203,000,000

**Mapping Market Share:** 0.27%

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## WHO ARE THE SUPPLIERS AND USERS OF WEB AND MOBILE GIS?



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### Suppliers and Users of Web and Mobile GIS

- Suppliers:
  - Organizations, groups or individuals who create and develop the technologies, data, business processes, services, etc. that are required to build and deliver web and mobile GIS capabilities
- Users:
  - Organizations, groups or individuals who use the web and mobile GIS to meet their needs



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### Who are the Suppliers & Users?

Organizations	Examples
Public Sector	Cities, Provinces, Federal, Crown Corps, Trans-national
Private Sector	Utilities, Couriers, Railways, Ports and harbours, Forestry, Mining, Oil & gas
Public Utilities	Roads, Communications, Power, Gas, Water/Sewer
Goods and Services Providers	Food, Gas, Accommodation, Entertainment, Health, Real estate
Volunteers / Public interest groups	OpenStreetMap, Community heritage

Individuals	Examples
Employees	Office staff, Field crews, Couriers, Drivers, Public health nurse, First responder
Public	Residents, Customers, Tourists, Visitors



**Essentially: anybody and probably everybody**



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### Where are they? When are they there?

- In an office, at home, at school
- At a shopping mall, doctor's office, hockey game, ...
- On foot, on a bike
- In a vehicle: bus, truck, train
- On a seabus, ferry, sailboat, ...
- In an airplane, helicopter, .... Hangliding

- 24x7: Day & Night, Summer & Winter, Weekdays and Weekends, Work, Holidays, ...

**Essentially: anywhere and probably everywhere, anytime and probably everytime**



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## What are they doing? How are they doing it?

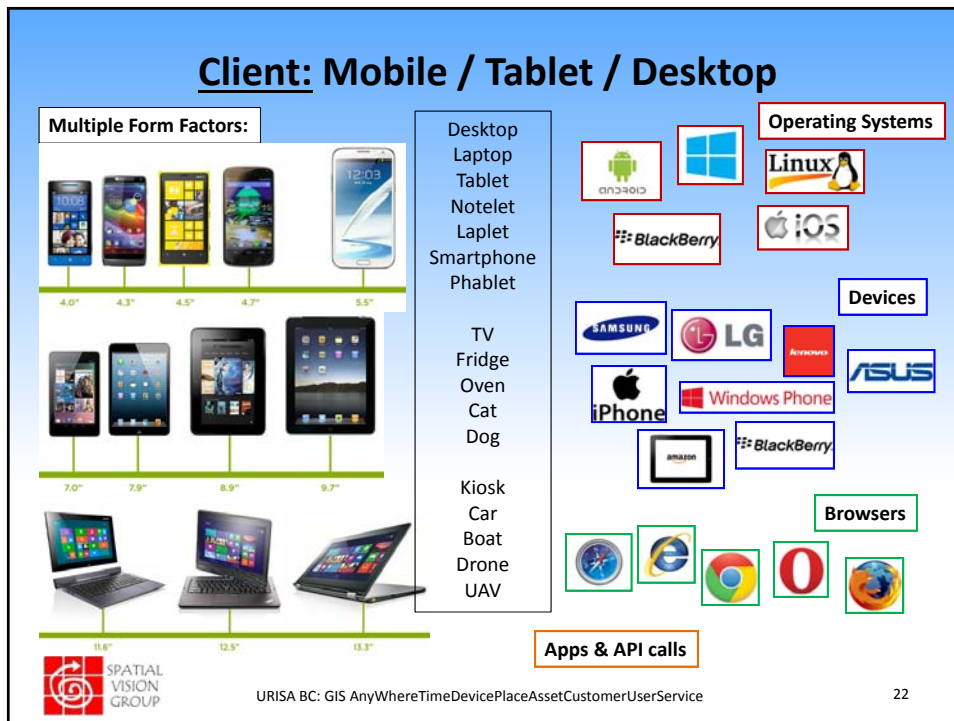
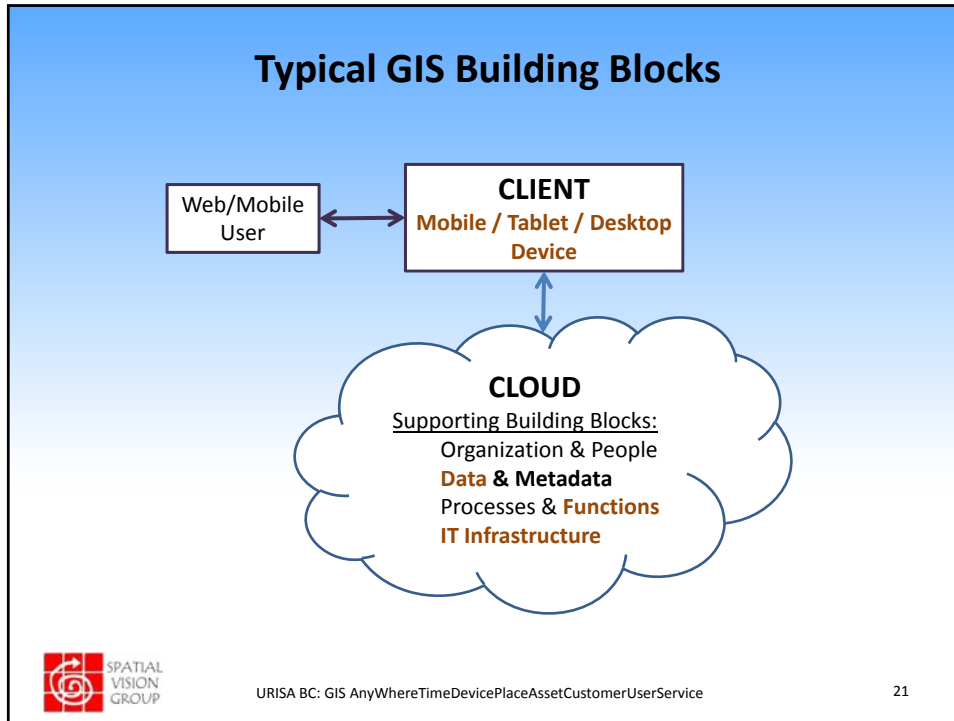
- Personal
  - commute, shop, exercise, travel ...
- Business Processes
  - Government Policy
  - Community Planning
  - Administration
  - Goods & Services
  - Asset-Infrastructure Lifecycle:
    - Plan
    - Design
    - Build
    - Operate
    - Inspect
    - Repair
    - Decommission
- Computer Applications:
  - Desktop Application
  - Office Productivity
  - Special purpose Design/Analytical
  - Long / Short Transaction
  - Machine-to-machine / Human-to-machine
  - Mobile Apps
  - Social Media

**Essentially: anything and probably everything**



## WHAT DO WE NEED TO MAKE WEB AND MOBILE GIS WORK?





## Cloud Data for Web and Mobile GIS

- Essential content used by most apps:
  - orthoimagery
  - jurisdictions/neighbourhoods
  - simplified natural features
  - road centreline / address ranges
  - Points of Interest (POI's)
- Task-specific content:
  - Natural systems
  - Political
  - Social, Demographic
  - Infrastructure (horizontal, vertical)
- Multiple Levels of Detail (LOD):
  - World
  - Country
  - Province / State
  - Region
  - City / Town
  - Neighbourhood
  - Operating Area
- Internal / private /proprietary
- Purchased or free/volunteered data (e.g. OpenStreetMap)
- Many gov's have open data portals

The baseline GIS data for web/mobile didn't just appear magically:



AutoDesk  
AutoCAD



ESRI ArcGIS



GE Smallworld

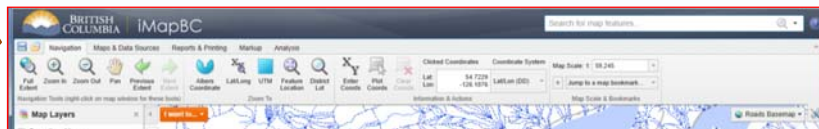


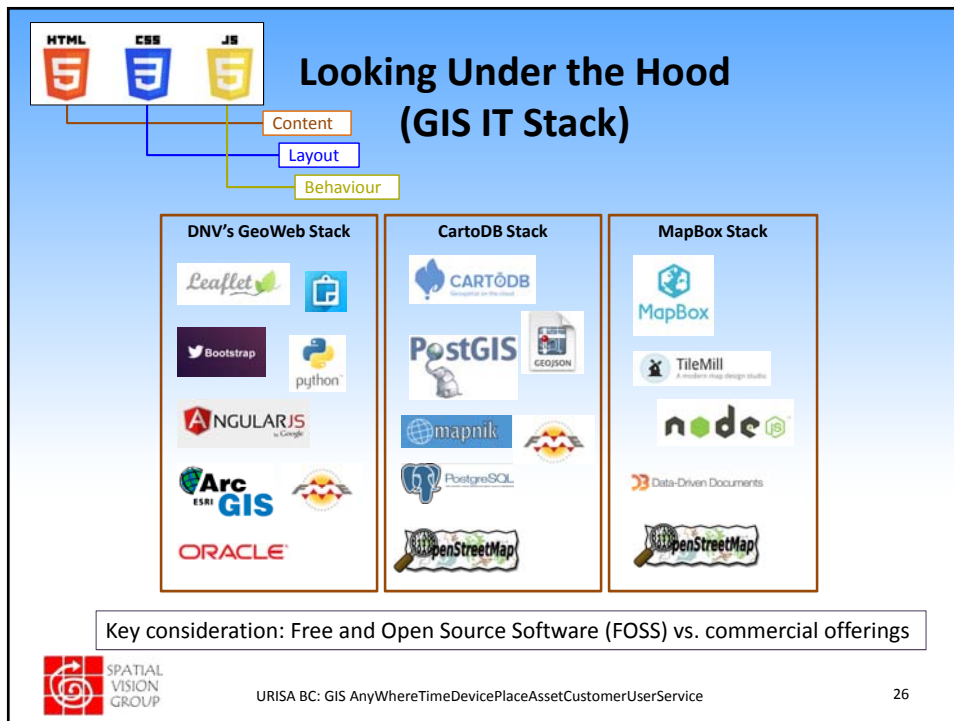
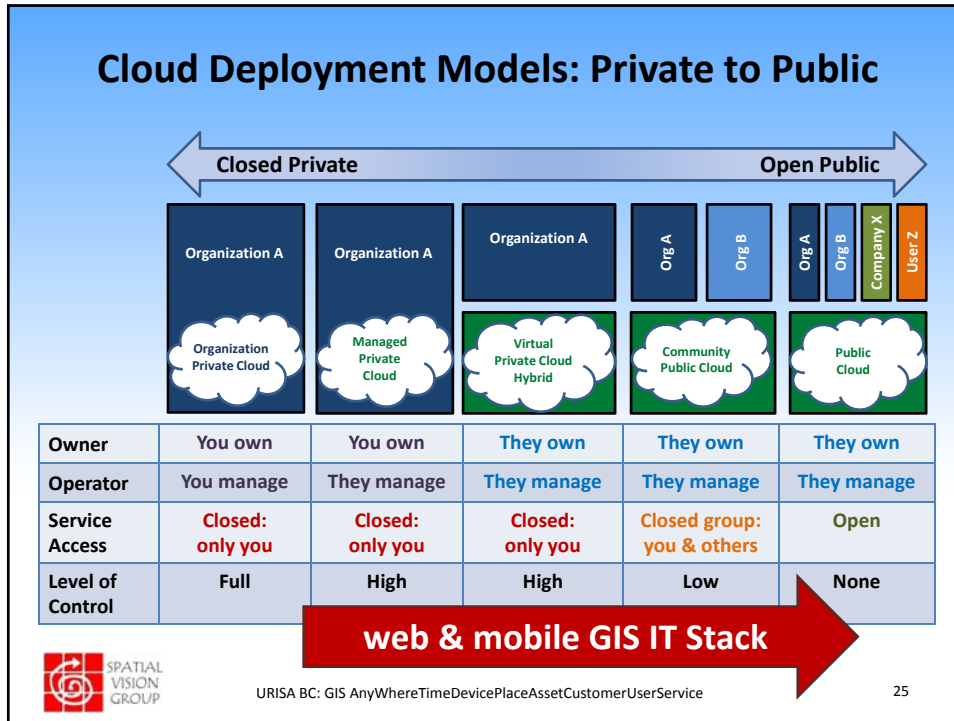
Bentley  
Microstation



## Functions: Either on Client or in Cloud

- Typical:
  - General navigation
  - Access maps and data sources
  - Markup and Edit / Revise
  - Query and Analysis
  - Report, Print, Plot
  - Disconnected / offline editing
- Unconventional / Emerging:
  - Business Analytics, Dashboards & KPI's: e.g.,
    - Tableau Software
    - Tibco Spotfire
  - Advanced visualization: e.g.,
    - Data Driven Documents - D3.js





## Commercial Products for Developing GIS webApps (e.g.): “You can code or configure”



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## Spatial Data Transformation, Integration and Interoperability



- Data Conversion
- Data Transformation
- Data Integration
- Data Validation
- Data Migration
- Spatial Extract-Transform-Load



More than “one-time” ETL. Also operational support of sensor-web inflows



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## GIS/Mapping Software as a Service (SaaS)+ Data

**MapBox PLANS**

You are currently on the **Starter plan**.  
50,000 map views / month + 100 MB Storage

Add more users, styles, and storage to your account:

	STARTER	BASIC	STANDARD	PREMIUM
	\$0 / month	\$5 / month	\$48 / month	\$499 / month
Map views	50,000 / month	50,000 / month	100,000 / month	1,000,000 / month
Monthly active users	50,000 / month	50,000 / month	50,000 / month	50,000 / month

**Pick your CartoDB**

None of our plans have lengthy contracts

How often would you like to pay?  Monthly  Yearly

Free	Magellan	Coronelli	Mercator
Unlimited time	US\$29/month 14-day free trial	US\$149/month 14-day free trial	US\$299/month 14-day free trial
Unlimited tables	Unlimited tables	Unlimited tables	Unlimited tables
Up to 50 MB of data	Up to 100 MB of data	Up to 500 MB of data	Up to 1 GB of data
Public maps	Private maps	✓ Private maps	✓ Private maps
Removable brand	Removable brand	✓ Removable brand	✓ Removable brand
Teams	Teams	✓ Removable brand	Teams
All features	All features	All features	All features

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## GIS/Mapping “Data as a Service” (Daas)

**DataBC**

Connect and Use WMS Services, KML, and WFS Viewers


DataBC offers data connection services that allows users to view thousands of data layers Geographic Warehouse in geospatial software or custom applications.

These data connection services are listed in the table below. They are available in Google Keyhole Markup Language (KML) and industry standard Web Map Service (WMS).

Name	Description	Google Earth	WMS	REST
BC Albers Base Cache	Base Cache using Google Scale Levels and BC Albers Projection EPSG:3005.			
BC Web Mercator Base Cache	Base Cache using Google Scale Levels and Web Mercator Projection EPSG:3857.			
BC Albers Roads Cache	BC Roads Cache using Google Scale Levels and BC Albers Projection EPSG:3005.			
Quick Base	This wms offers base geographic features at 1:20 000 scale optimized for drawing speed.			
BC Web Map Library	This service includes the entire layer library of Web Map Services, available as individual services below.			
Administrative Boundaries	This web map service offers seamless, administrative boundary data for the province of British Columbia.			
Administrative Forest Boundaries	Data relating to the subdivisions of the province for organizational reasons and used for forest administration purposes, e.g., districts, regions, timber supply, tree farm, etc.			
Administrative Water Boundaries	Data relating to the subdivisions of the province for organizational reasons and used for water administration purposes, e.g., water management precincts and districts, community watersheds, etc.			
Air and Climate	Data relating to patterns of wind, temperature, precipitation, etc., over a period of time, for a specified area.			


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## Open/Public API's




**Google API's**

- 1 Google Maps Android API v2
- 2 Google Maps JavaScript API v3
- 3 Google Maps API for Work
- 4 Google Maps SDK for iOS
- 5 Google Places API
- 6 Google Places Autocomplete
- 7 Google Static Maps API v2
- 8 Google Street View Image API
- 9 Google Maps Embed API
- 10 Google Directions API
- 11 Google Distance Matrix API
- 12 Google Elevation API
- 13 Google Geocoding API
- 14 Google Time Zone API
- 15 Google Maps Tracks API






programmableweb lists 825 mapping API's




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## Specific-Purpose Mobile Apps




Focused, optimized.  
Strong consideration of UI/UX



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## WEB & MOBILE GIS EXAMPLES



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### Interesting webGIS and Mobile Apps (some with data)

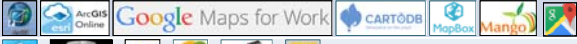
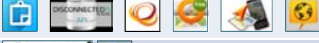












Type	Example
General webGIS & Mobile GIS	ArcGIS for Mobile, ArcGIS Online, Google Maps for Work, CartoDB, MapBox, Mango Map
Loggers	ESRI Collector, DisconnectedJS, TerraGo, OsmAnd, Google MyTracks, Open GPS Tracker, Twitter
Office Productivity	In a conventional desktop office application (e.g., ESRI Maps for Office) , Microsoft PowerMap for Excel
Social/Food/Hotel	MapQuest, Yelp, ...
Driving / Transit Apps	HERE, Mapquest, Waze, OnStar + BusLink, Inrix, Transitmix , Uber, ...
Transit/Translink	15+ apps you can find for Android, iOS, Windows Phone
Fitness	Strava, FitBit, ...
Cycling	Tour de France, Giro d'Italia, etc. Cycling News
Real Estate	Trulia (Zillow Group), Walkscore (Redfin)
Indoors	Wifarer, Think Wireless: building management, museums, etc.
BC Gov & Muni's	District North Vancouver's GeoWeb App, Geoscience BC app, iMap BC 5.
Utilities	Ubisense, GE Smallworld, Bentley, AutoDesk,
Weather	Weather Underground
Media/Press	Web + Print, NY Times, The Guardian, Globe & Mail (visualizations, D3.js)




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### Interesting webGIS and Mobile Apps (some with data)

Type	Example
General webGIS & Mobile GIS	
Loggers	
Office Productivity	
Social/Food/Hotel	
Driving / Transit Apps	
Transit/Translink	
Fitness	
Cycling	
Real Estate	
Indoors	
BC Gov & Muni's	
Utilities	
Weather	
Media/Press	

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- ### Selected Examples
- Business Logistics:
    - Canada Post FlexDelivery and API
  - Transit:
    - Bus Link, Translink APIs and “The Internet of Things”
    - Transitmix
  - Tracking / Field Data Gathering:
    - ESRI Collector
    - Open GPS Tracker
    - OsmAnd
    - CartoDB
    - QGIS
  - Real Estate:
    - Trulia Real Estate
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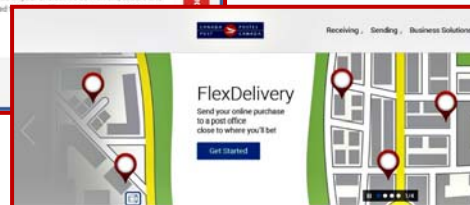
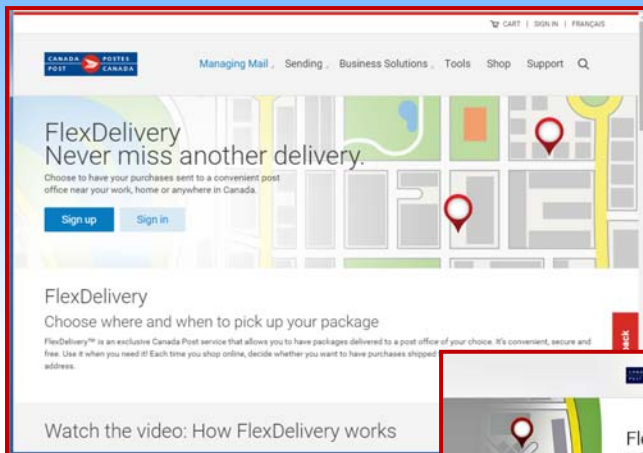
## EXAMPLES: BUSINESS LOGISTICS



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## Canada Post - FlexDelivery



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### EXAMPLES: TRANSIT



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### BusLink

The screenshot shows the BusLink mobile application interface. On the left, there is a list of bus routes under the 'Nearby' tab. Each entry includes a route ID, a description of the route, and the distance from the user's location. On the right, a map view shows the current location and nearby bus stops with their respective arrival times and route numbers.

Route ID	Description	Distance
64461	WB E 15 ST FS MOODY AVE 240, 255	255m
64460	EB E 15 ST FS MOODY AVE 240, 255, 881	285m
64459	EB E 15 ST FS RIDGEWAY AVE 240, 255, 881	288m
64462	WB E 15 ST FS RIDGEWAY AVE 240, 255	302m
64019	SB E GRAND BLVD FS E 17 ST 228, 255	341m
64180	NB E GRAND BLVD FS E 17 ST 228, 255	352m
64776	WB E 15 ST FS E GRAND BLVD 255	380m
64018	SB E GRAND BLVD FS E 19 ST	380m

Map view details:


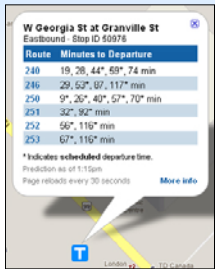

- 15TH STREET/VANCOUVER: 19min VANCOUVER, 27min VANCOUVER, 10:22am VANCOUVER, 10:35am VANCOUVER
- DUNDARAVE/CAPILANO UNIVERSITY: 13min DUNDARAVE - TO 25TH & MARIN, 10:19am DUNDARAVE - TO 25TH & MARIN, 10:49am DUNDARAVE - TO 25TH & MARIN, 11:19am DUNDARAVE - TO 25TH & MARIN




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## Translink Open API: A Public Sensor Web



- **Regional Traffic Data System:**
  1. **Real-Time traffic data / speed profiles**
  2. **Travel time by corridor and roadway segment**
    - Get Tile                      Return a map tile for provided position, show roadways
    - Get Live Data Timestamp    Return date and time of last live data update
    - Get All Live Data            Return real-time data for all links (length, speed, travel time)
    - Get Live Data At Point      Return real-time data for the specified point
    - Get Colour Legend          Colour legend details
- **Real-Time Transit Information:**
  1. **Provide services for Stops, Buses, Stop estimates and Route details.**
  2. **Return XML or JSON data**
    - Stops                      Stop identity, Location (lat/lon), City, At/On street, Distance, Routes, ...
    - Stop Estimates            Next Buses, NextBus, RouteNo, RouteName, Direction, ...
    - Buses                      Vehicle ID, Location (lat/lon), RouteNo, Direction, ...
    - Routes                     RouteNo, Name, OperatingCompany, Patterns, ...
    - Status                     Statuses, Name, Value




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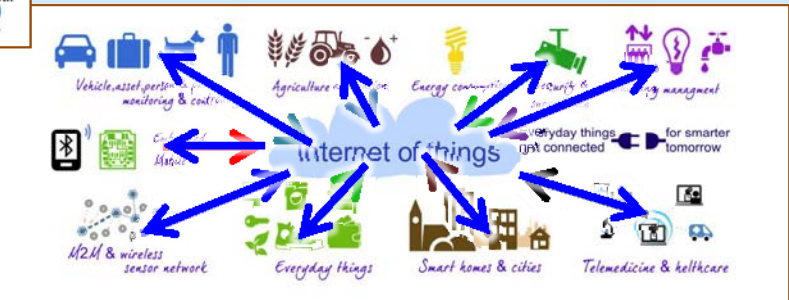



## Internet of Things (IoT)


“Industrial Internet”, “Sensor Web”



- Combines wireless, sensors and the internet
- Allocate unique id's to objects / vehicles / people / rivers / etc.
- Transfer/aggregate data over a network: machine-to-machine (M2M)
- Use the combined data to create awareness, make decisions, etc.



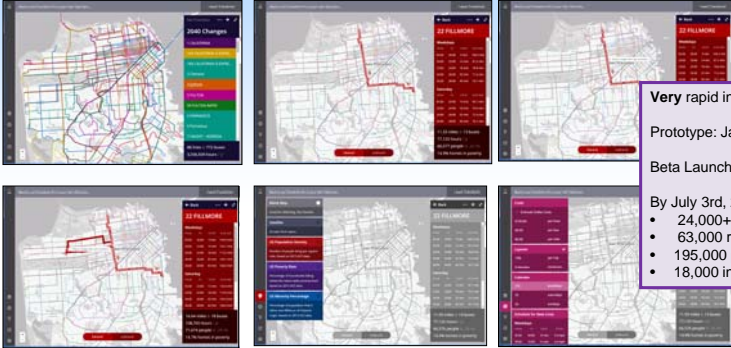


The diagram illustrates the Internet of Things (IoT) ecosystem. At the center is a cloud labeled 'Internet of things'. Surrounding it are various icons and labels representing different sectors: 'Vehicle, asset, personnel monitoring & control', 'Agriculture', 'Energy community', 'Smart homes & cities', 'Telemedicine & healthcare', 'Everyday things', 'M2M & wireless sensor network', and 'Everyday things (not connected) for smarter tomorrow'. A 'Bluetooth 4.0 Low Energy' logo is also present in the top left of the diagram area.



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## TRANSITMIX Transitmix (Transit Planning)




**Very rapid invention and growth:**  
Prototype: January 2014  
Beta Launch: June 18, 2014  
By July 3rd, 2014 transitmix.net had:

- 24,000+ maps
- 63,000 routes
- 195,000 page views
- 18,000 individual users.



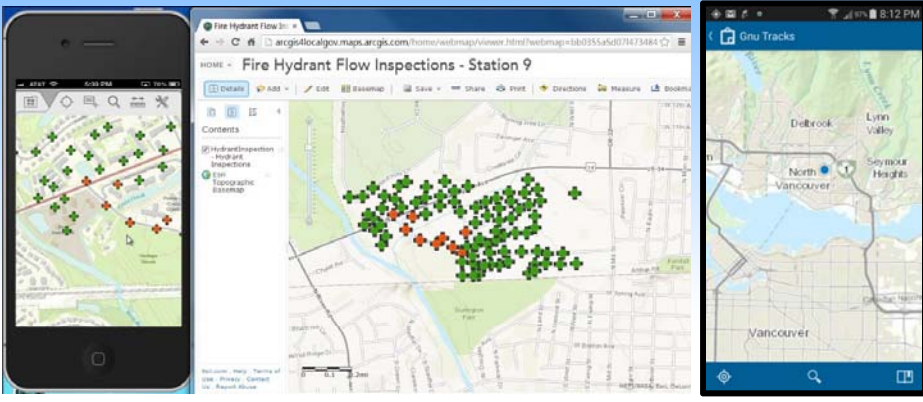
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## EXAMPLES: TRACKING / FIELD DATA GATHERING



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### ESRI Collector

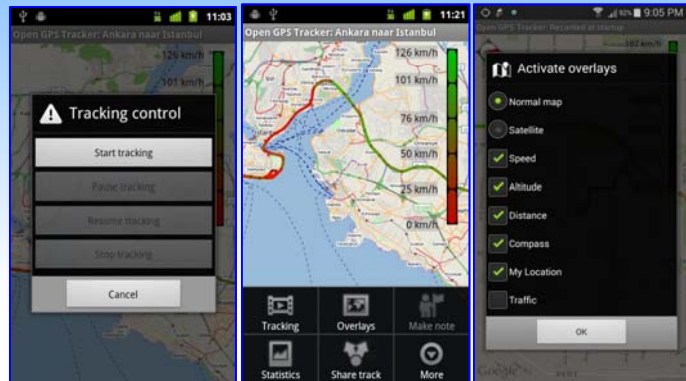


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### Open GPS Tracker

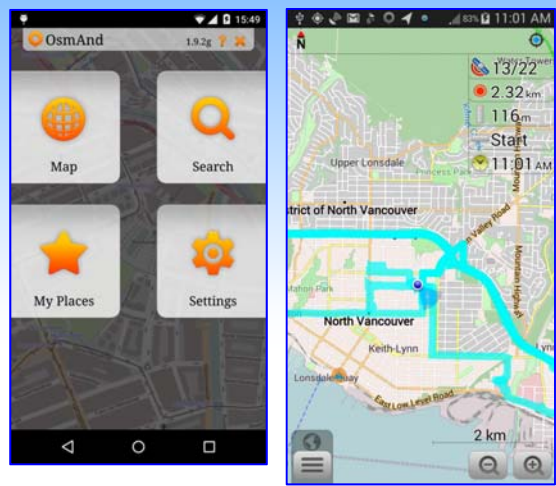



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 **OsmAnd** 



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 **OsmAnd** 





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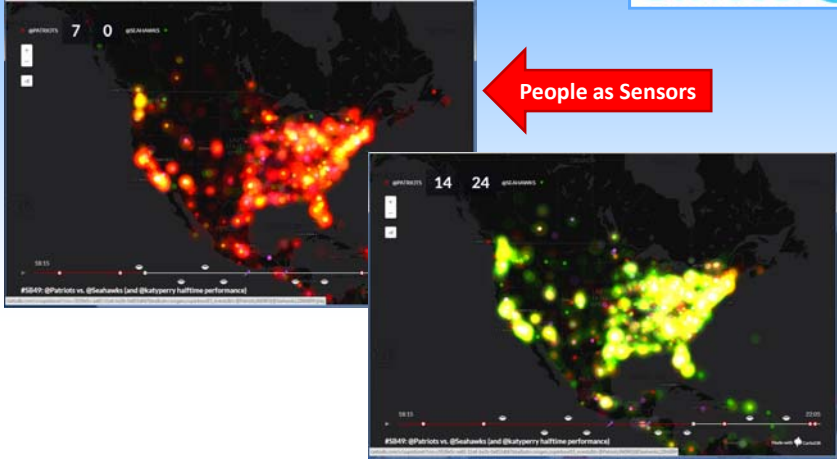
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 **CartoDB – SaaS + Data:**  
**Super Bowl 2015 Tweets**




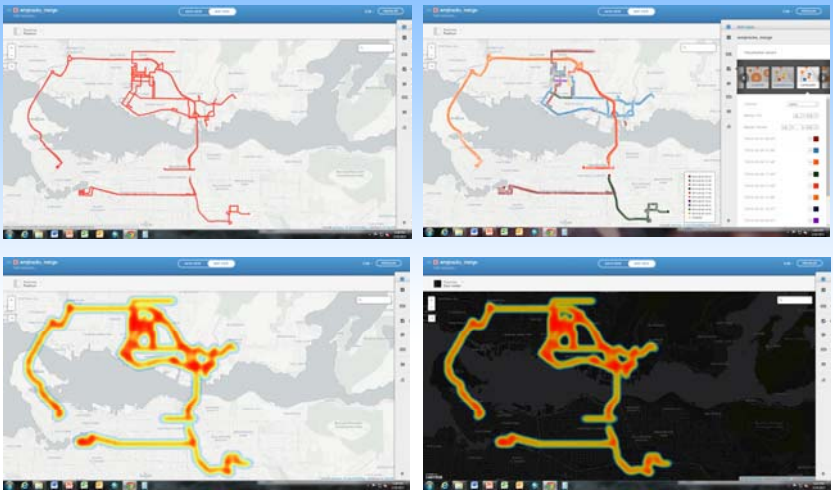



**People as Sensors**

 <http://t.co/8jDXejaces>


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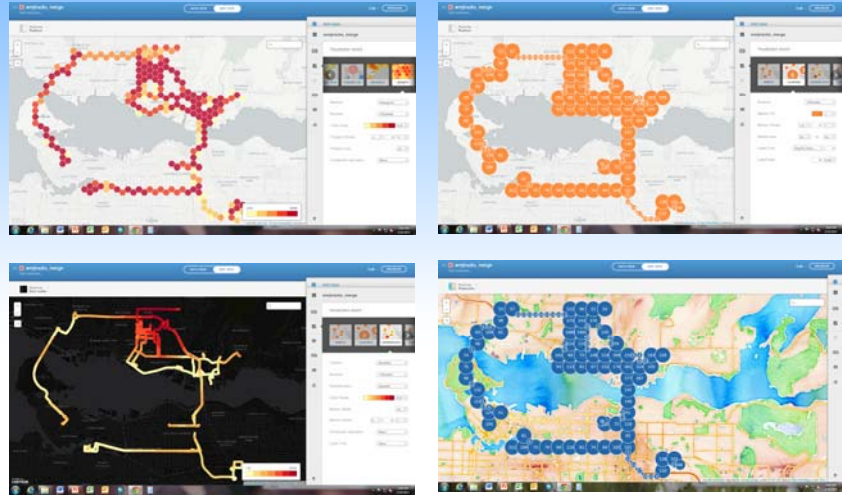
 **“Freemium” Cartographic Renderings**  
**of My GPX Tracks**




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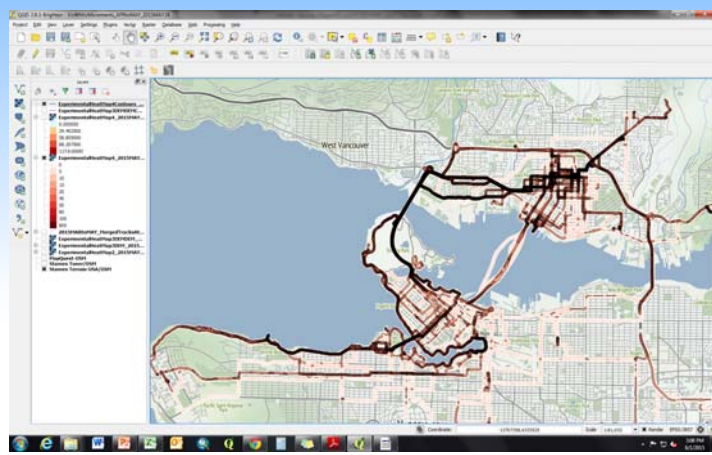




 **“Freemium” Cartographic Renderings of My GPX Tracks**




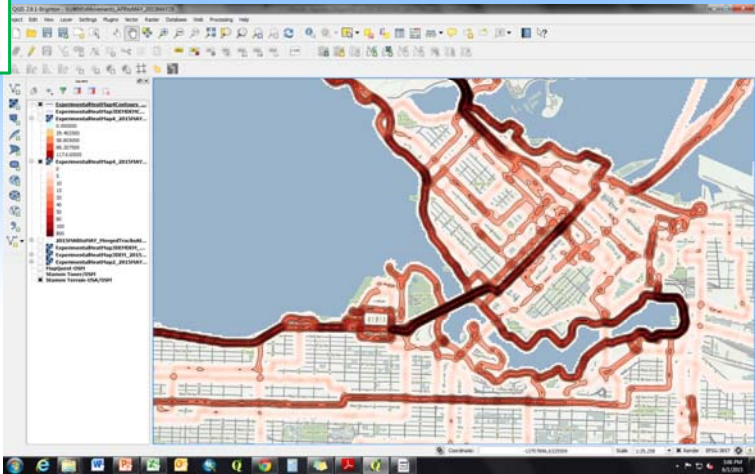
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**Tracks Analysis Using QGIS:  
Probability Surface of My Location in Vancouver**



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### Tracks Analysis Using QGIS: Probability Surface of My Location in Vancouver



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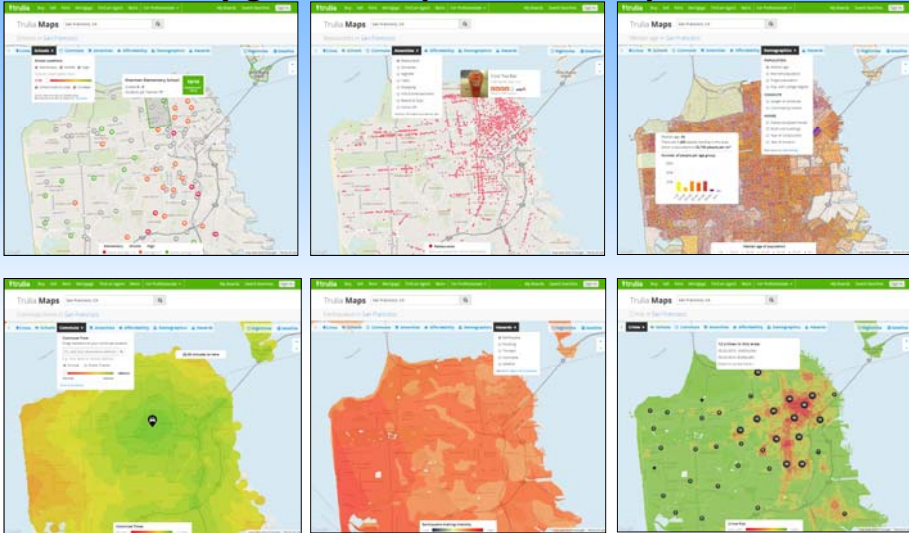
### EXAMPLE: REAL ESTATE

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### Trulia Maps (Real Estate): A very good example of what is possible



The image displays six screenshots of the Trulia Maps real estate application. The top row shows three different map views: a standard street map with property markers, a map with a red overlay indicating a specific area, and a map with a yellow and orange overlay and a small bar chart. The bottom row shows three more views: a map with a green and yellow overlay, a map with a red and orange overlay, and a map with a green overlay and several black circular markers. Each screenshot includes the Trulia logo and navigation controls.

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### What is Driving Your Organization's Investment in Web / Mobile GIS?

- Improved operations
- Improved customer service
- Financial savings
- Regulatory / Legal
  
- Public health, lifestyle, safety, security
- Create a sense of community / Facilitate public consultations
- To advocate for a cause
  
- Improved corporate reputation
- Increase market share, enter new markets
- To keep up (are your competitors are doing it better?)

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## SUMMARY



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## We're trendy ...

**Every...  
Any...**     **Where...  
Thing...**

**All ...  
Our ...  
Their ...**     **Time...  
Place...  
Asset ...  
Customer ...  
User ...**



**GIS AnyWhereTimeDevice  
PlaceAssetCustomerUser**



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## We're ready ... (pretty much)

- It is not about:
  - new GIS functions ...
  - more baseline imagery ...
  - creating road centrelines & address geocoding ....
  - new building inventories, demographics, land use maps, ...
  - ... we have **plenty** of each of these already in place.



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## Floating on a cloud of opportunity ...

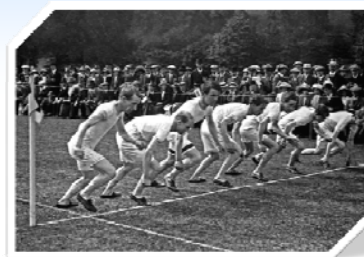
*GIS suppliers and users are being carried along in a worldwide social and technological transformation to “mobile” and “web-cloud” computing.*

*The scope is much bigger than simply pushing GIS out to more users. We need to support business process and create value.*

*New vendors, users, applications, datasets and competitors are emerging.*

*We will see major opportunities and changes for our suppliers and users:*

*... are you ready?*



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**Thank you**

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