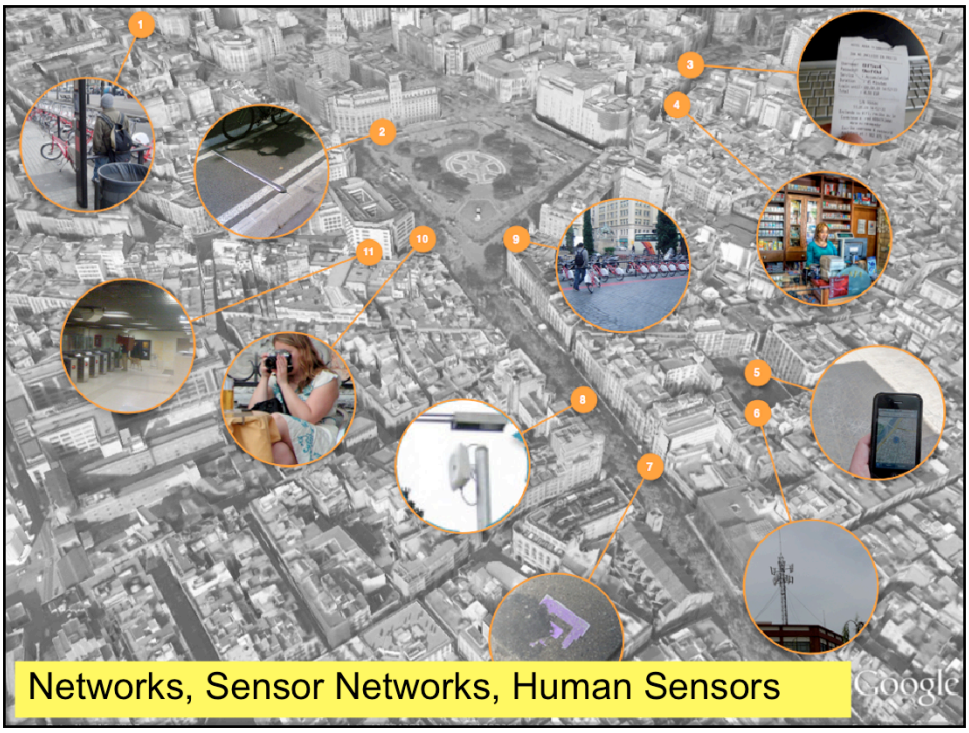


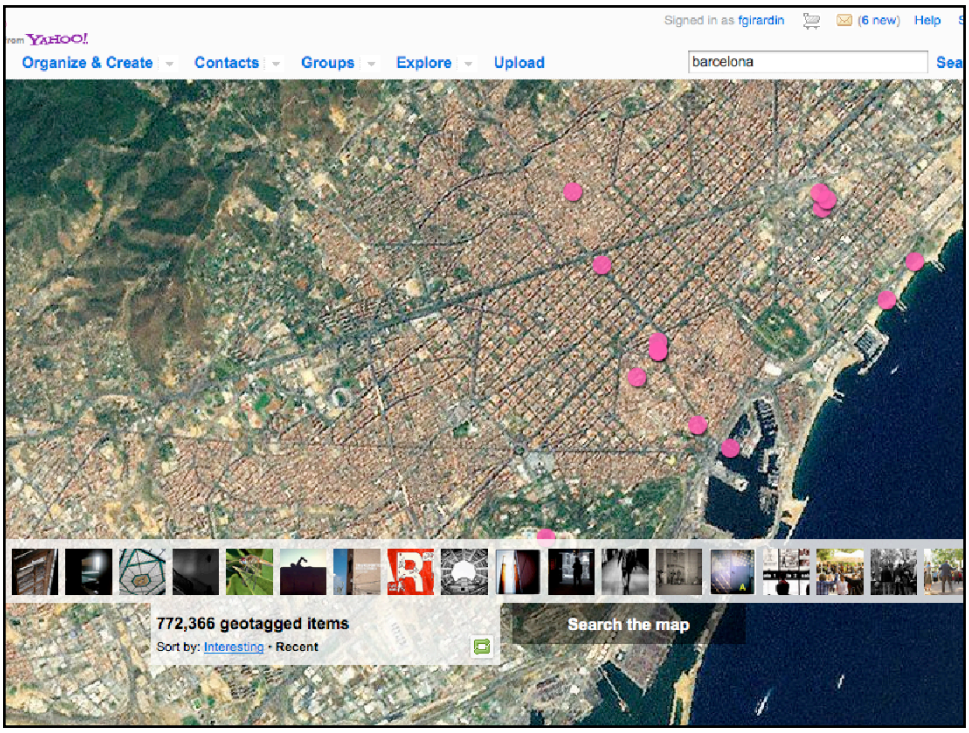
These network data are the result of interaction with the wireless, digital and software infrastructures that are now part of the cityscape. Some we are aware of, some we are not. We encourage you to pay attention to the situations you actually generate network data, examine what they are and where they are stored. (see Adam Greenfield and Nurri Kim's Systems/Layers walkshops http://speedbird.wordpress.com/2010/05/10/how-to-bring-a-systemslayers-walkshop-to-your-town/)

Here Fabien condensed the multiple frictions with sources of network data in his home town of Barcelona. Within a 40min time span, Fabien 1) checked out a bike from the Bicing network using his member card, 2) rolled over a loop detector 3) accessed a coffee shop WiFi network 4) a cashier swiped his fidelity card 5) checked-in Foursquare and accessed Google Maps on his mobile phone 6) As Fabien is moving, two mobile network antennas produced a hand-over of his communication 7) acquired a product with an RFID attached to it 8) passed nearby Bluetooth scanners deployed to measure the traffic at La Rambla 9) checked back in his bike 10) appeared in a photo taken by a tourist at Plaza Catalunya, later uploaded to Picassa and finally 11) used a T-10 ticket to access the subway system.

All these data are basic element of the functions of urban systems, services and infrastructures that archive them.

Timo showed us how wireless technologies are now embedded into our objects, our streets and our experience of the city. See Wireless in the World 2: http://www.nearfield.org/2010/06/new-film-wireless-in-the-world-2. This evolution and its implications raised our interest. Our constant interactions with network infrastructures generate data that aliment the integral function of services we use in our daily lives.


SENSEable City Lab
http://senseable.mit.edu/realtimerome/
Real-time Rome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Help
YAHOO!
Organize & Create
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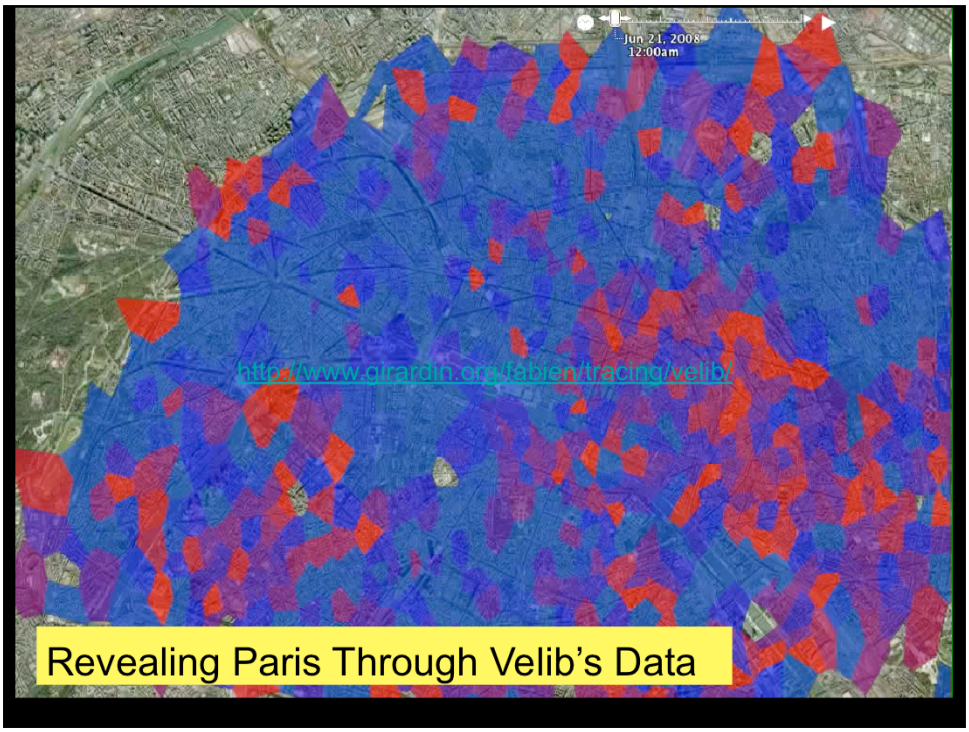
http://senseable.mit.edu/worldseyes/

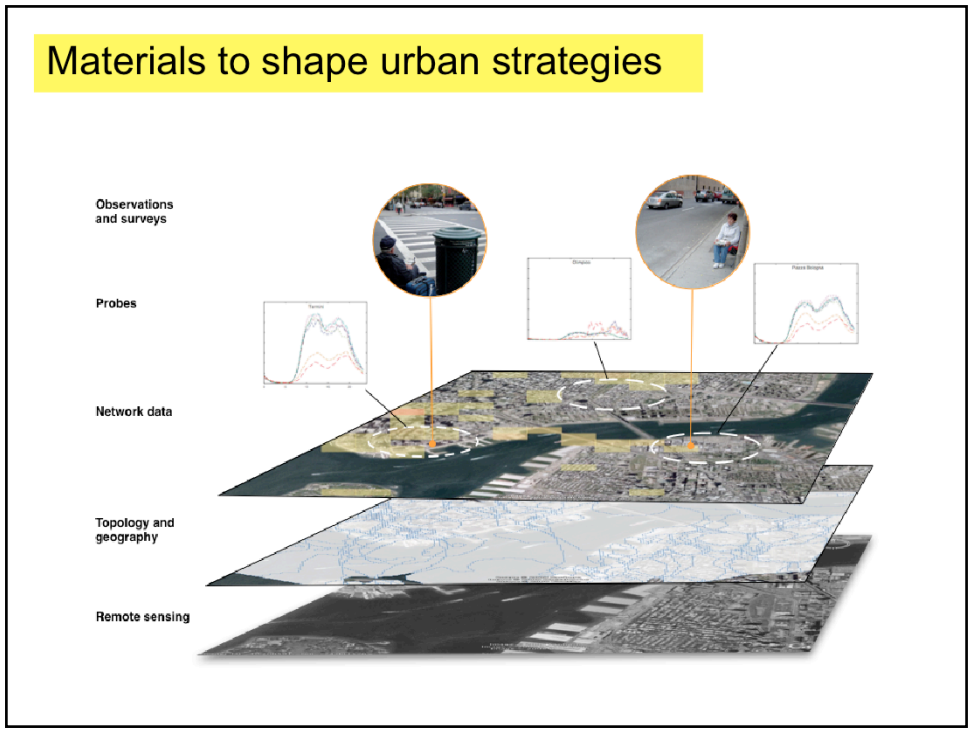
The World's Eyes
Where are the locals?

Current Week in 2007
20
38

The World's Eyes



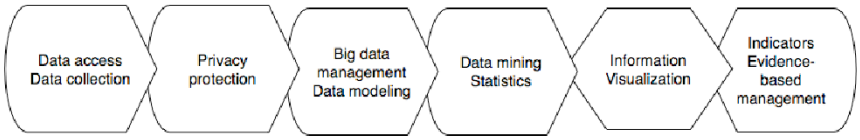
http://www.girardin.org/fabien/tracing/velib/



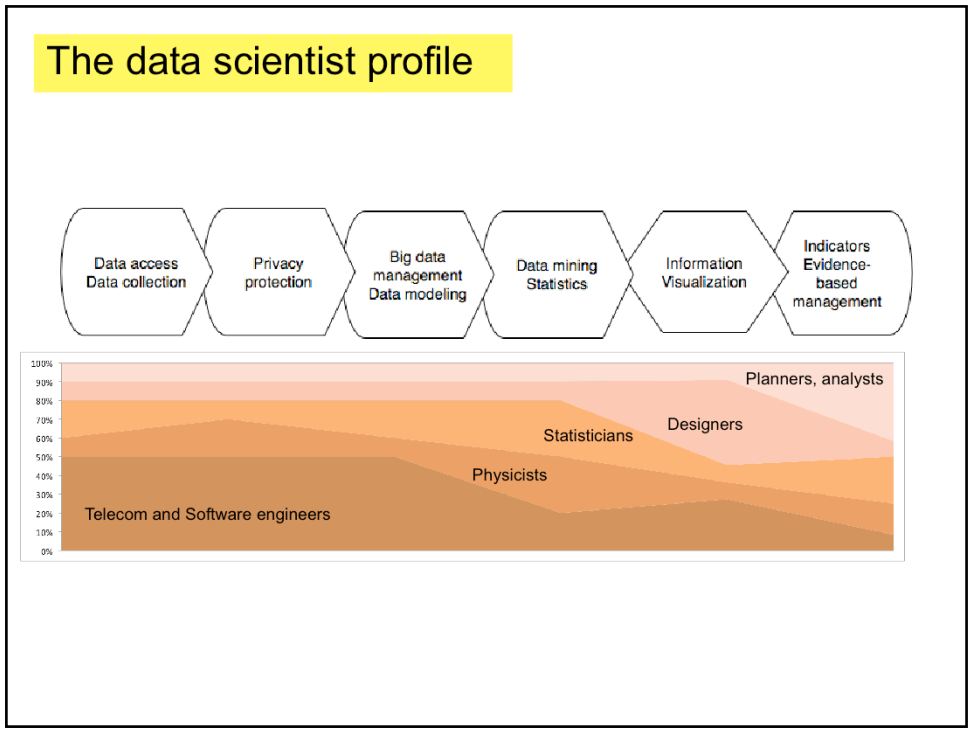
Practically, there are multiple sources of material to shape strategies in these domains, from the information on the physical aspects of the urban environment with remote sensing techniques augmented with topological (networks, infrastructures,services) and geographical information. Network data provide more dynamic evidences of urban activities with the ability to probe network activities in specific areas for specific periods of time. Our talk will focus on this specific layer.

Finally, qualitative observations on the field and surveys form also part of the material to understand an urban environment and shape strategies.

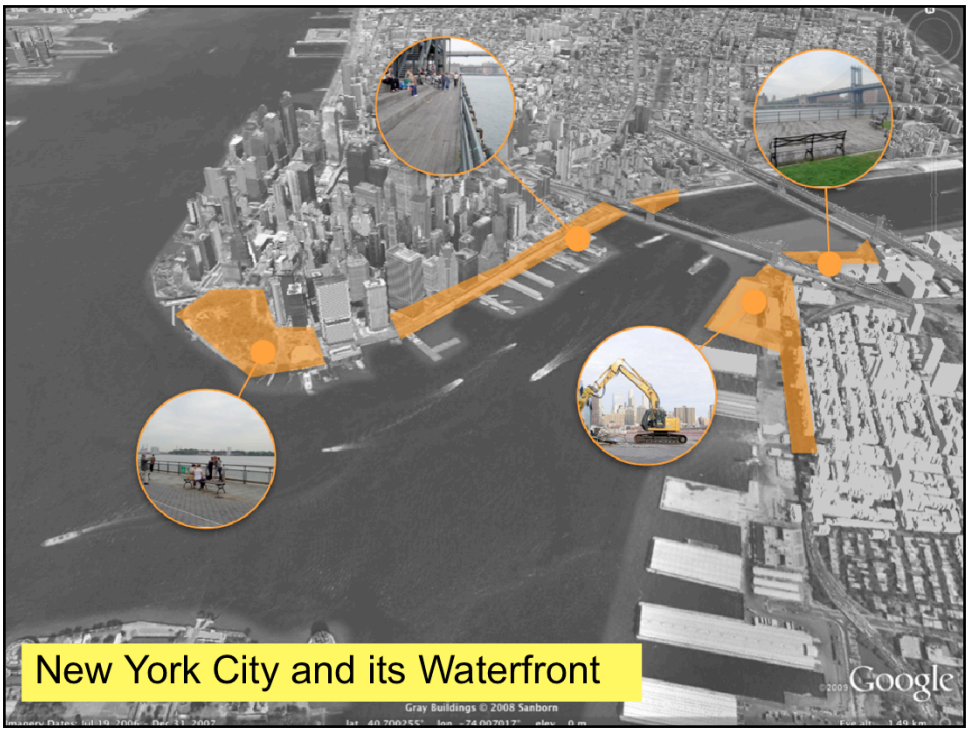
The materialization process



The process to generate material from network data takes a few steps and iterations.

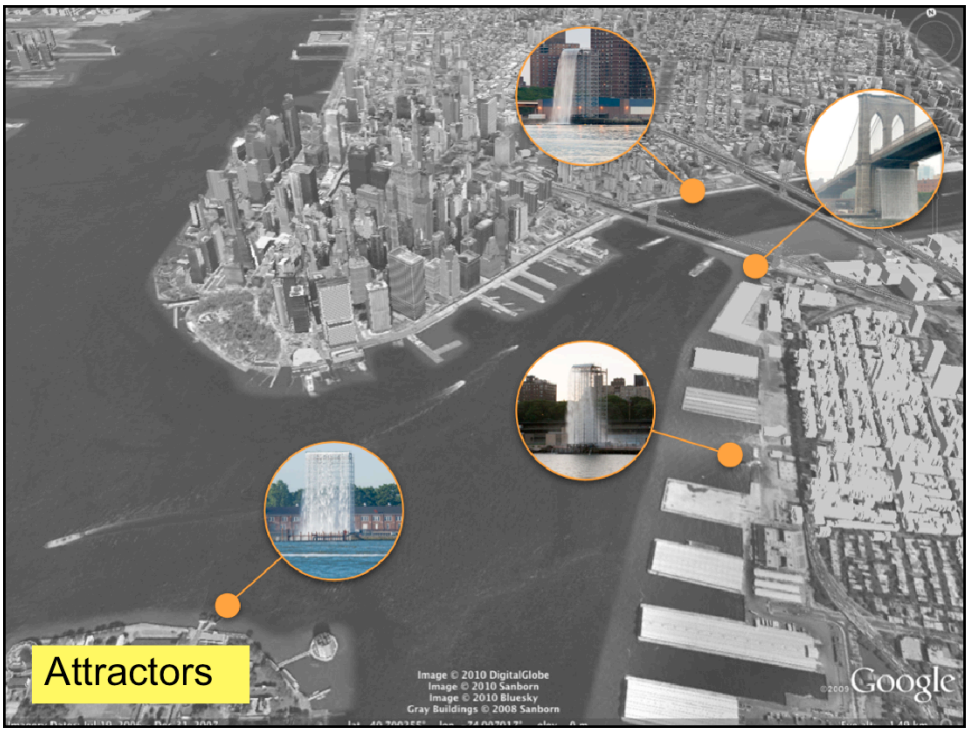


A major challenge in this process consists in applying the necessary skills for each phase, starting with Telecom and Software engineers techniques to collect and access network data and apply the necessary algorithms and processes to protect individuals' right to privacy (e.g. anonymization, encryption, obfuscation, aggregation, deletion). Besides data modeling capabilities of software engineers comes the long experience of physicists to extract information from the noise naturally embedded in massive amount of data. Skills in statistics is compulsory to produce and validate information. The particular kind of information that designers know to visualize and communicate to transdisciplinary audiences of planners and analysts (and by extension citizens, decision-makers, lawyers, lobbyists...).

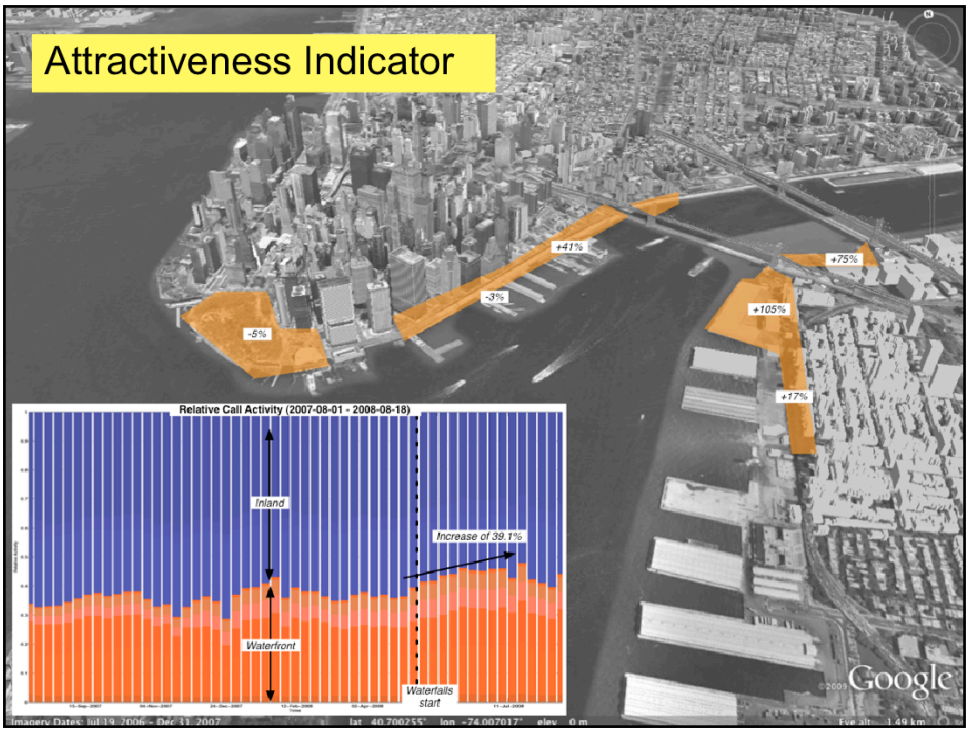


Now let's shift to the operational level. We will introduce you a couple of projects that we believe exemplify the exploitation of network data as material to shape and evaluate urban strategies.

For this first project, let us bring you back in time once again. In 2008 New York was completing several projects to remodel and refurbish the East River waterfront in the Lower Manhattan and West Brooklyn areas. The goal was to make these spaces more attractive to citizens and visitors.



In Summer 2008, as part of the strategy to invite citizen and visitors in discovering and re-appropriating the waterfront, a public art exhibit composed of 4 man-made Waterfalls was launched. The New York City Waterfalls that costed around $15mio of mainly private investments needed measures and metrics to evaluate its impact.

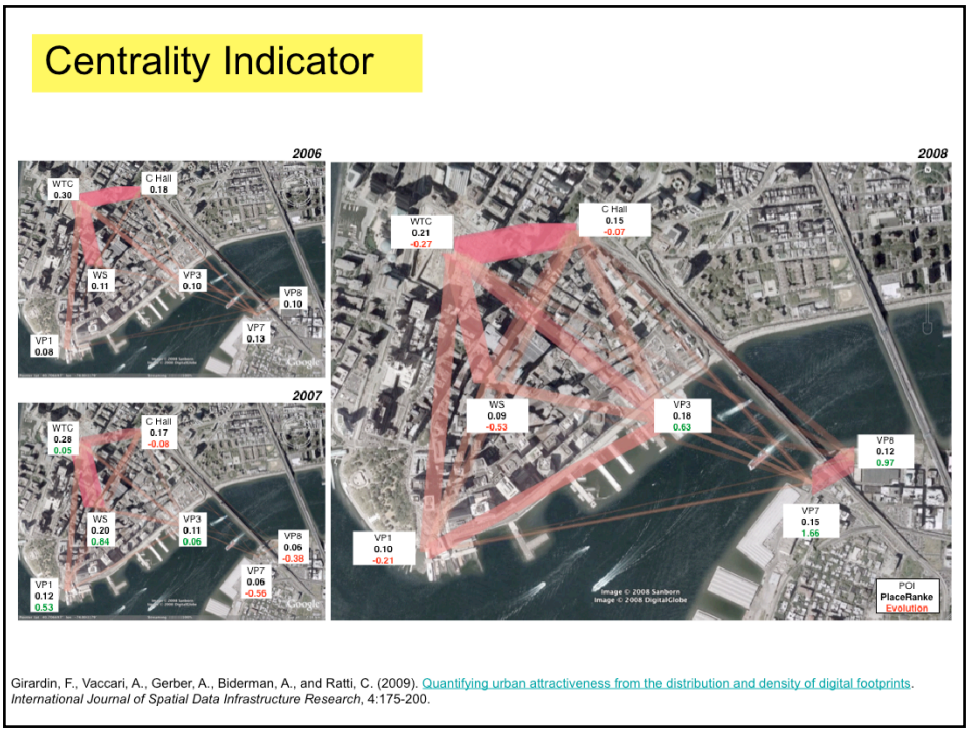


In collaboration with data scientist Andrea Vaccari http://andreavaccari.com/, we developed an attractiveness indicator based on the comparison of mobile network activity at the waterfront (the multiple vantage points of the NYC Waterfalls) with areas of the city that have no relations with the Waterfalls. This approach was inspired in the technical analysis of financial market (see Relative Strength Index http://en.wikipedia.org/wiki/Relative_Strength_Index). Since then other have inspired from our work (see Skyhook Wireless SportRank http://www.skyhookwireless.com/spotrank/)

When the exhibit opened our indicator revealed an relative increase of the network activity at the Waterfront in comparison to inland areas. This evolution from one summer to another testifies of an impact of the strategy on the presence of people from their activity on the network.

For more detailed description about the investigation, we invite you to read:
Girardin, F., Vaccari, A., Gerber, A., Biderman, A., and Ratti, C. (2009). Quantifying urban attractiveness from the distribution and density of digital footprints. *International Journal of Spatial Data Infrastructure Research*, **4**:175-200.
http://ijsdir.jrc.ec.europa.eu/index.php/ijsdir/article/view/147/152

We also looked at the evolution of the photographic activity over three years in Lower Manhattan and West Brooklyn. The dataset, of publicly available elements, was collected from the Flickr API http://www.flickr.com/services/api/.

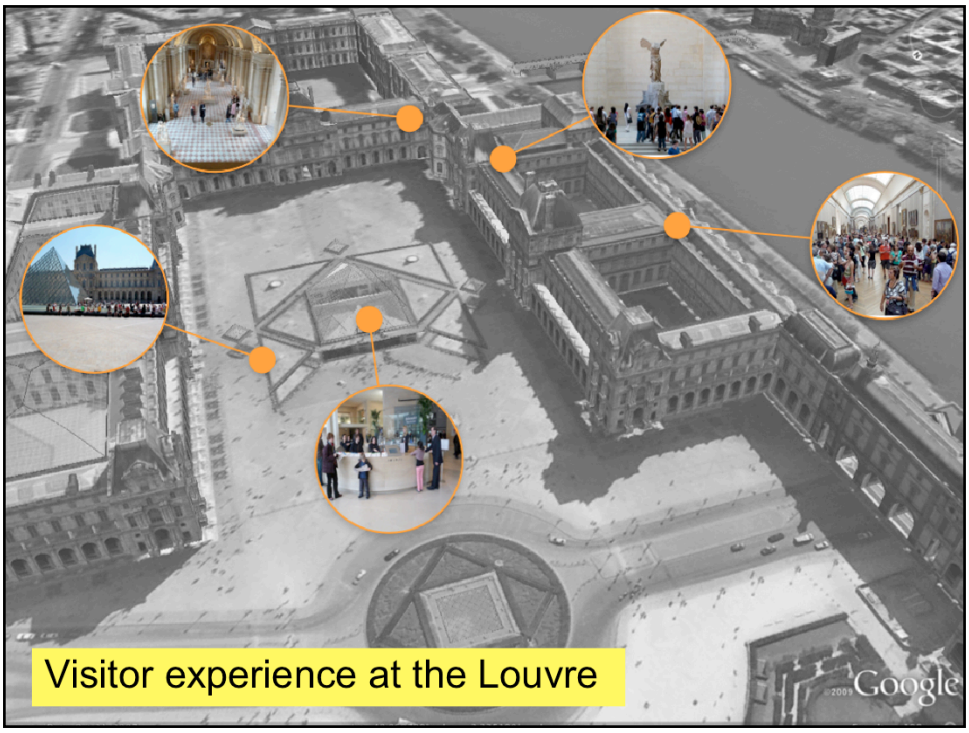


Based on the location and timestamp attached to public photos, we were able to extract the main flows of photographers in the area. With the application of a PlaceRank algorithm developed in collaboration with Andrea Vaccari (inspired from Google PangeRank http://en.wikipedia.org/wiki/PageRank) the evolution of the flow becomes measurable. In comparison with the previous years, the waterfront becomes more central to the flows of photographers in Summer 2008. Once again testifying of an impact of the strategy on the presence of people from their activity online.

For more detailed description of the investigation, we invite you to read:
Girardin, F., Vaccari, A., Gerber, A., Biderman, A., and Ratti, C. (2009). Quantifying urban attractiveness from the distribution and density of digital footprints. *International Journal of Spatial Data Infrastructure Research*, **4**:175-200.
http://ijsdir.jrc.ec.europa.eu/index.php/ijsdir/article/view/147/152

and

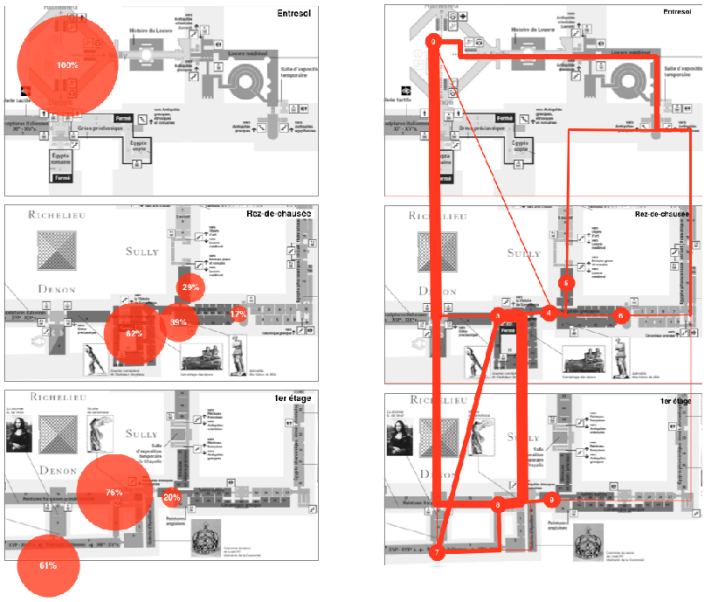
Girardin, F., Calabrese, F., Dal Fiore, F. , Ratti, C., and Blat, J. (2008). Digital footprinting: Uncovering tourists with user-generated content. *IEEE Pervasive Computing*, **7(4)**:36-43.
http://www.girardin.org/fabien/publications/girardin_ieee_user_generated_final.pdf



Another project led currently by Fabien Girardin at Lift Lab brings us to the Louvre, by far the most visited museum in the the world with 8.5 million visitors (in 2009) (40'000 visitors/day at peak time). In this context of "cultural enthusiasm" the museum witnesses levels of congestion, which, beyond a certain threshold can be described as hyper-congestion. This phenomenon has direct negative consequences on the quality of the visitor experience as well as on the organization and management of the Museum (e.g. increased stress level of the surveillance staff).

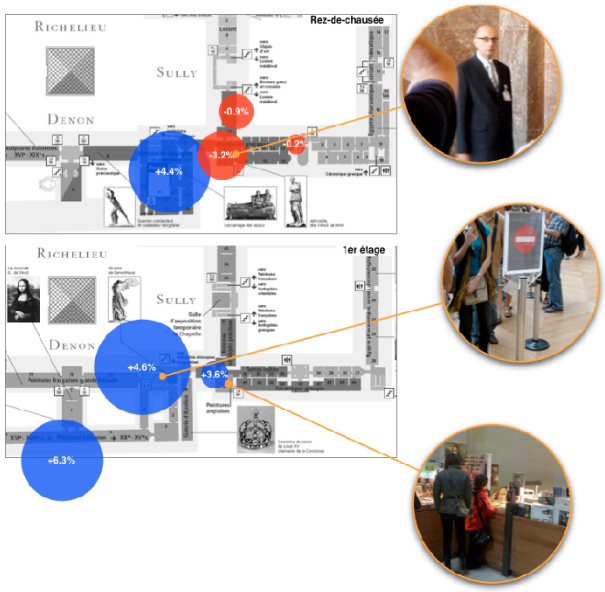
Lift Lab provide the Louvre with empirical and longitudinal indications of hyper-congestion that feed strategies to manage the space and ensure a good visitor experience. In collaboration with BitCarrier http://www.bitcarrier.com/ Lift Lab perform audits on the presence of mobile phones in key areas of the museum at key moment of the year.

Measuring occupancy levels and flows



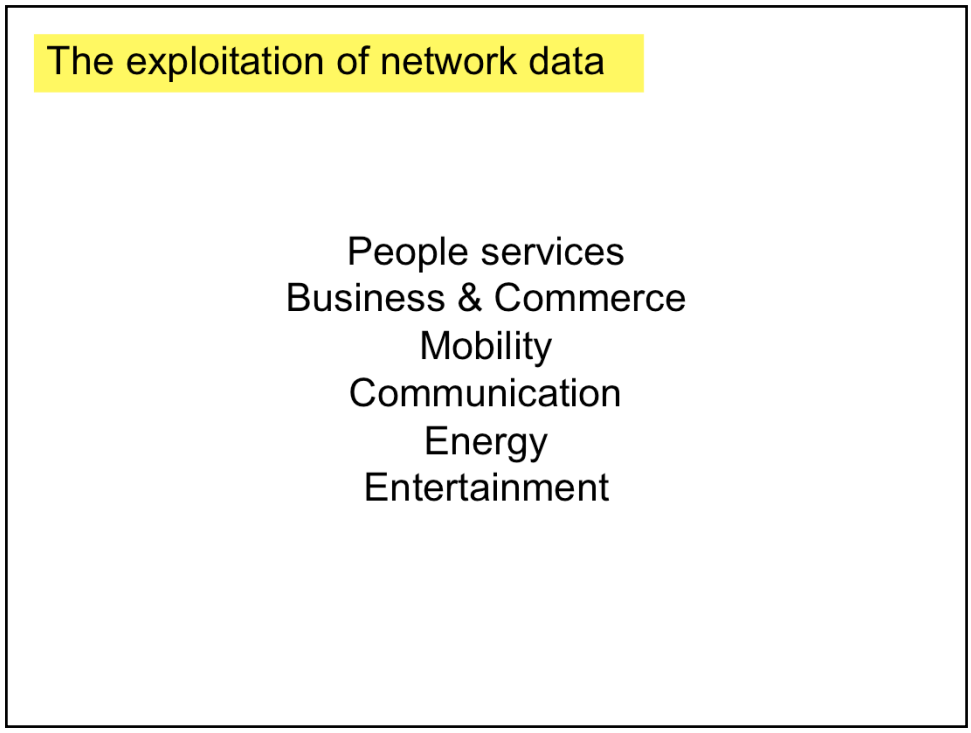
From the data of the aggregate presence of mobile phones we can generate raw material on the evolution of occupancy levels and flows within the museum (here obfuscated), particularly useful to measure the impact of certain strategies (such as the open doors of the first Sunday of each month).

Hyper-congestion indicator



But particularly, this raw information is crucial to detect hyper-congestion situations (here obfuscated) to feed particular strategies that aim at dissolving the presence of visitors. For instance. the surveillance team can temporarily redirect certain flows or use signs to close accesses. In a more indirect fashion, the museum thoroughly studies the location of information desks in less popular areas.

Of course, there is a big assumption in seeing the world as consisting of bits of data that can be processed into information that then will naturally yield some value to people, institutions and cities. The network and quantitative data we collect are not the sole sources of evidences to feed the design of the space and its strategies. They are often incomplete to fully grasp a context and dynamics in a space. Qualitative observations on the field can prove very valuable. For instance, the surveillance staff is essential to help qualify the flows we measure at the Louvre.



In many ways these data are becoming the “lifeblood of today’s economy” (see Daniel Kaplan’s Digital Privacy Revisited http://www.slideshare.net/slidesharefing/digital-privacy-revisited). We are, of course, not the unique institution interested in trying to extract value from this massive amount of data in the context of the city. Some leading players of the ICT and engineering world such as IBM, CISCO and Arup and leading major initiatives (Smarter Cities, Connected Cities, Networked Cities, ...) strongly based on data and their analysis to innovate in the domains (often described as “systems”) of public services, business, mobility, communication, energy and entertainment). The projects we present in this talk certainly lay at the crossroads of these domains.

Summarising

Networks as data sources
Implicit Interaction – Sensor Networks
Explicit Interaction – Human Sensors
Data exploitation methodology
From revealing phenomena to evidence
Urban/micro-urban examples

Some references

Timo Arnall
http://www.nearfield.org/2010/06/new-film-wireless-in-the-world-2
Adam Greenfield and Nurri Kim
http://speedbird.wordpress.com/2010/05/10/how-to-bring-a-systemslayers-walkshop-to-your-town/services
Dan Hill
http://www.cityofsound.com/blog/2008/02/the-street-as-p.html
Daniel Kaplan
http://www.slideshare.net/slidesharefing/digital-privacy-revisited
MIT SENSEable City Lab
http://senseable.mit.edu/

Fabien Girardin's blog
http://liftlab.com/think/fabien

Merci!

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We hope that this talk has helped you further understand the opportunities in exploiting network data, and data coming from networked humans with a more human perspective.