

Pervasive Computing 1.0

Vassilis Kostakos



Outline

- Pervasive Computing
- Human-Computer Interaction
- Cityware
- Pervasive Computing 1.0

Pervasive Computing

- Motivation: Make the world a better place
- “Simpler” technology
- More “humane” technology
- Embedded in the fabric of everyday life

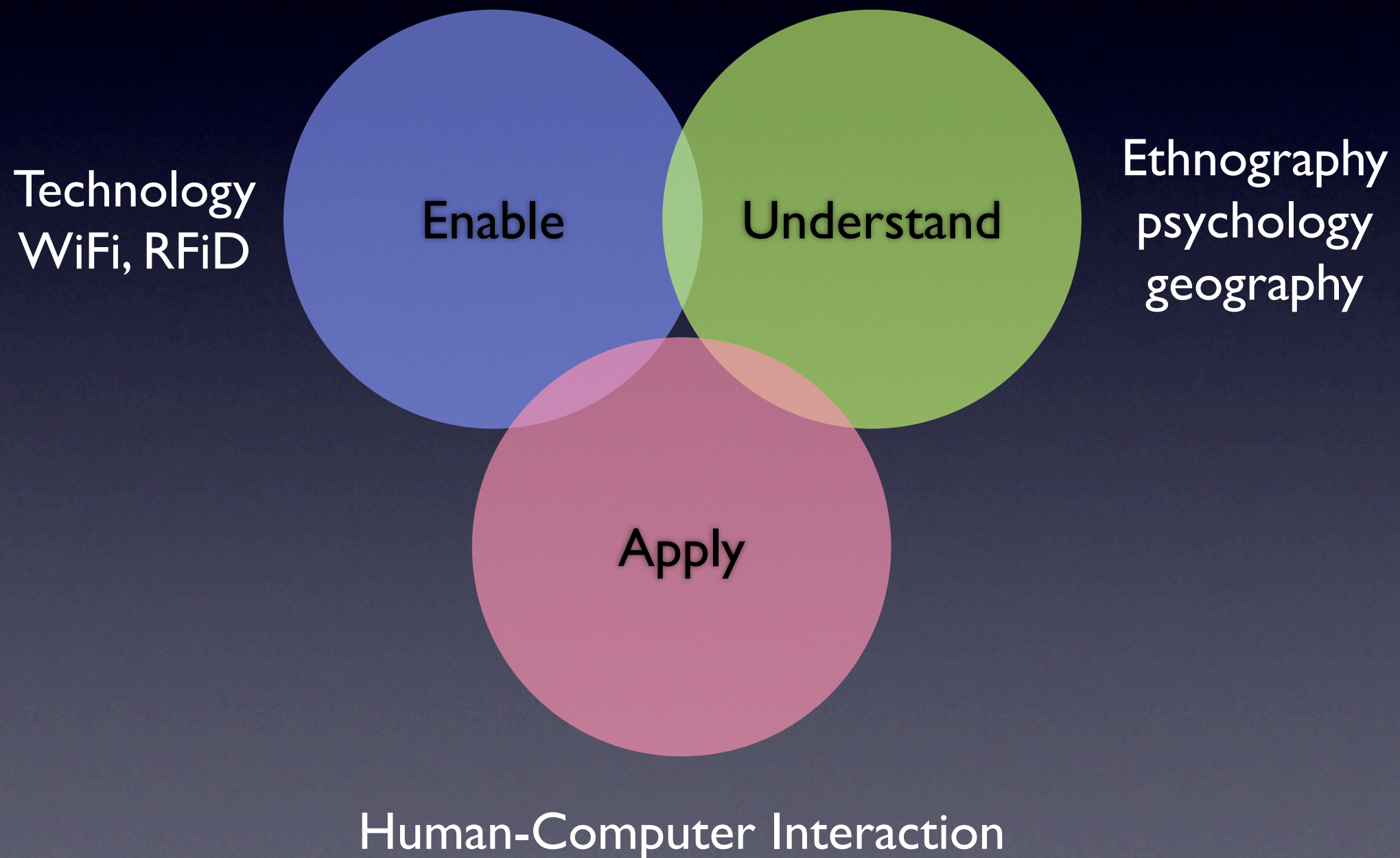
Pervasive Computing

- Ubiquitous Computing
(Mark Weiser, Xerox PARC 1988)
- Calm Computing
(John Brown, Xerox PARC 1996)
- Universal Computing
(James Landay, Berkeley 1998)
- Invisible Computing
(G. Barriello, UoWashington 1999)
- Tangible Computing
(Ishii, 1997)
- Pervasive Computing
(Academia, IBM 1999, SAP 2000)
- Context Based Computing
(Berkeley/IBM 1999)
- Hidden Computing
(Toshiba 1999)
- Post PC Computing
(Popular media)
- Ambient Intelligence
(European Commission, FP5)
- Everyday Computing
(Georgia Tech, 2000)
- Sentient Computing
(AT&T, 2002)
- Autonomous Computing
(IBM, 2002)
- Amorphous Computing
(DARPA, 2002)
- Spray Computing
(Zambonelli, 2003)
- Cityware
(O'Neill & Kostakos, 2005)

Pervasive Computing

- An *application domain*, not a discipline
- A potpourri of
 - computer science (AI & Agents - graphics)
 - hardware sensors
 - psychology (cognitive, experimental, clinical)
 - sociology (ethnography, ethnomethodology)
 - geography
 - architecture
 - history
 - arts & design (music, performance)

Pervasive Computing



HCI + Pervasive Systems

- Desktop systems are understood quite well
 - command prompts, GUIs, dialogues, metaphors, security mechanisms
- Pervasive systems are not understood so well (yet)
 - Mobility, sociability

Cityware

- People
- Space
- Technologies

Unpacking the layers of a city

Heritage

Representation of cities can take a variety of forms. A map from 1806 (right) shows plans for Bath New Town, designed by Robert Adam - a development of the city that remained unfulfilled due to financial constraints. Bath, now a World Heritage Site, has much of the same structure in the city centre.



The many heritage institutions represent different layers of the city's past, such as Roman and Georgian periods.



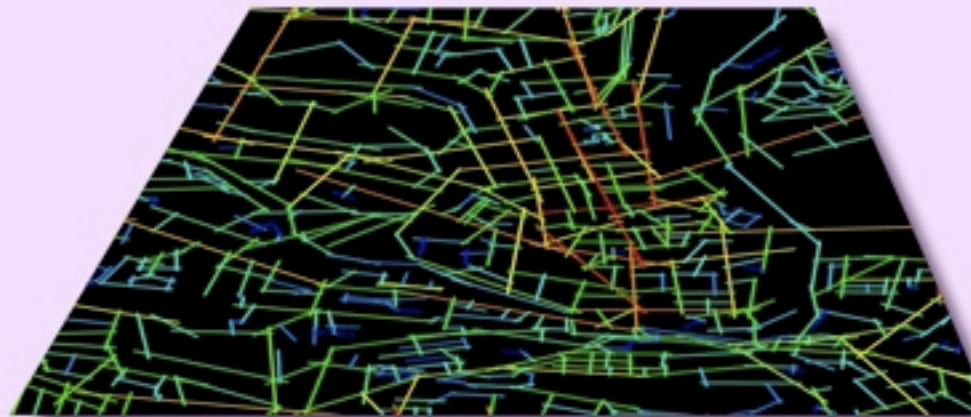
The project has begun monitoring temperature and relative humidity data in the Victoria Art Gallery, to examine how the presence of people's movement affects environmental conditions to which historic objects are sensitive. People add heat and moisture to rooms, which can damage objects. Methods to control this can be expensive and slow to respond. Using mobile applications to recommend alternative locations to visitors during critical times will lead to demand-led passive control of building environments.

Spatial analysis

In our research within the Space Syntax group and as part of the Cityware project, we seek to extend and adapt our understanding and practice of urban design by looking at the urban environment as an integrated system of the built environment and pervasive information and communication systems. For example, the images below depict the flows of Bluetooth devices across the city centre.



The image on the right depicts an axial map of the city of Bath. Such maps represent the least and longest lines of sight across the city. The axes are coloured to represent "integration" or how well a street is connected to the whole network (red: high integration, blue: low integration).



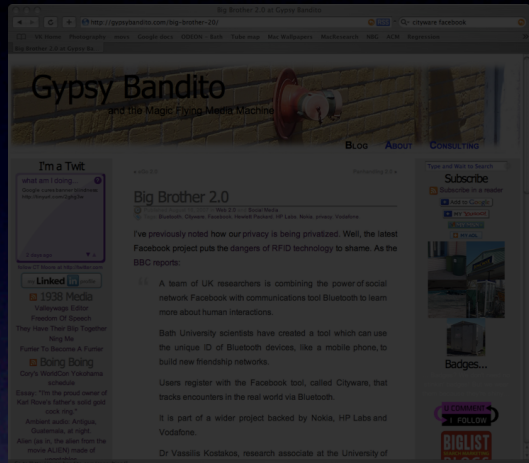
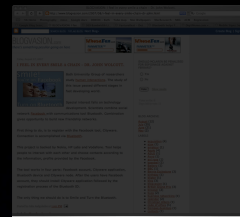
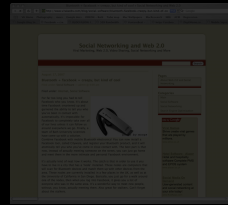
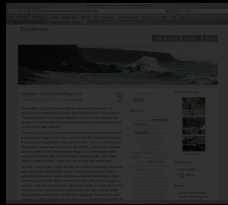
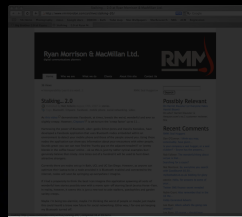
We intend to explore the effect of digital encounters in the city, and the use of digital platforms as a physical stage. We plan to use installations across the city of Bath, like the digital carpet shown below.



We are in the process of planning a study to explore our cohort's conceptions of their neighbourhoods. We are interested in understanding the features (spatial, economic, social) that define the boundaries of their neighbourhood. Additionally, we are interested in exploring the participants' cognitive maps, and the strategies by which they navigate, for example using landmarks.

Pervasive Computing 1.0

Controversy is a measure of progress



Bluetooth + facebook = creepy, but kind of cool

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VK HomePhotographyGoogle docsODEON - BathTube mapMac WallpapersMacResearchNBGACMRegression

Google Blog Search: city...Bluetooth + facebook = ...

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Bluetooth + facebook = creepy, but kind of cool

Filed under: [Internet](#), [Social Software](#)

For far too long you had to tell Facebook who you know. It's about time Facebook smartened up and garnered the ability to tell you who you've been in contact with automatically. It's impossible for Facebook to completely take over all of our lives unless it can follow us around everywhere we go. Finally, a team of Bath University scientists have come up with a solution. Combine Facebook with mobile Bluetooth electronics! You can now install a Facebook tool, called Cityware, and register your Bluetooth product, and it will atomically tell you who you've come in close contact with. The best part is that now, instead of actually meeting someone on the street, you can just go home and meet them in the more intimate and personal Facebook environment.



It's actually kind of neat how it works. The catch is that in order to use it you have to live in a city that has a 'node' installed. These nodes are computers that will scan for Bluetooth devices and match them up with other devices from the area. These nodes are currently installed in a few places in the UK, as well as at the University of California in San Diego. Basically, you just go for a walk around one of the nodes, then when you log into Facebook, it gives you a list of everyone who was in the same area. It's a wonderful way to meet new people, without, you know, actually meeting them. Also great for stalkers. Can't forget about the stalkers.

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Posted on August 18, 2007

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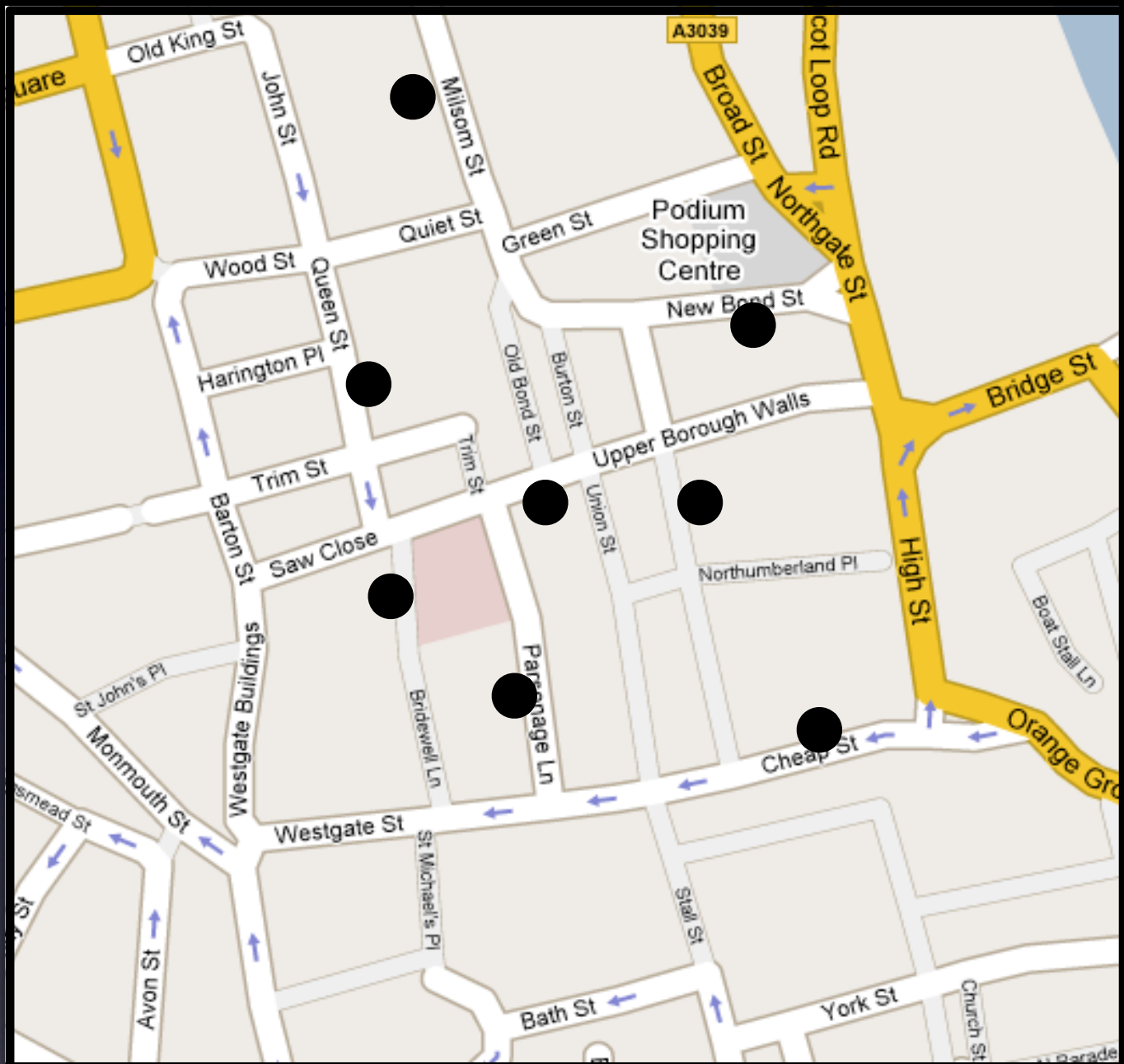
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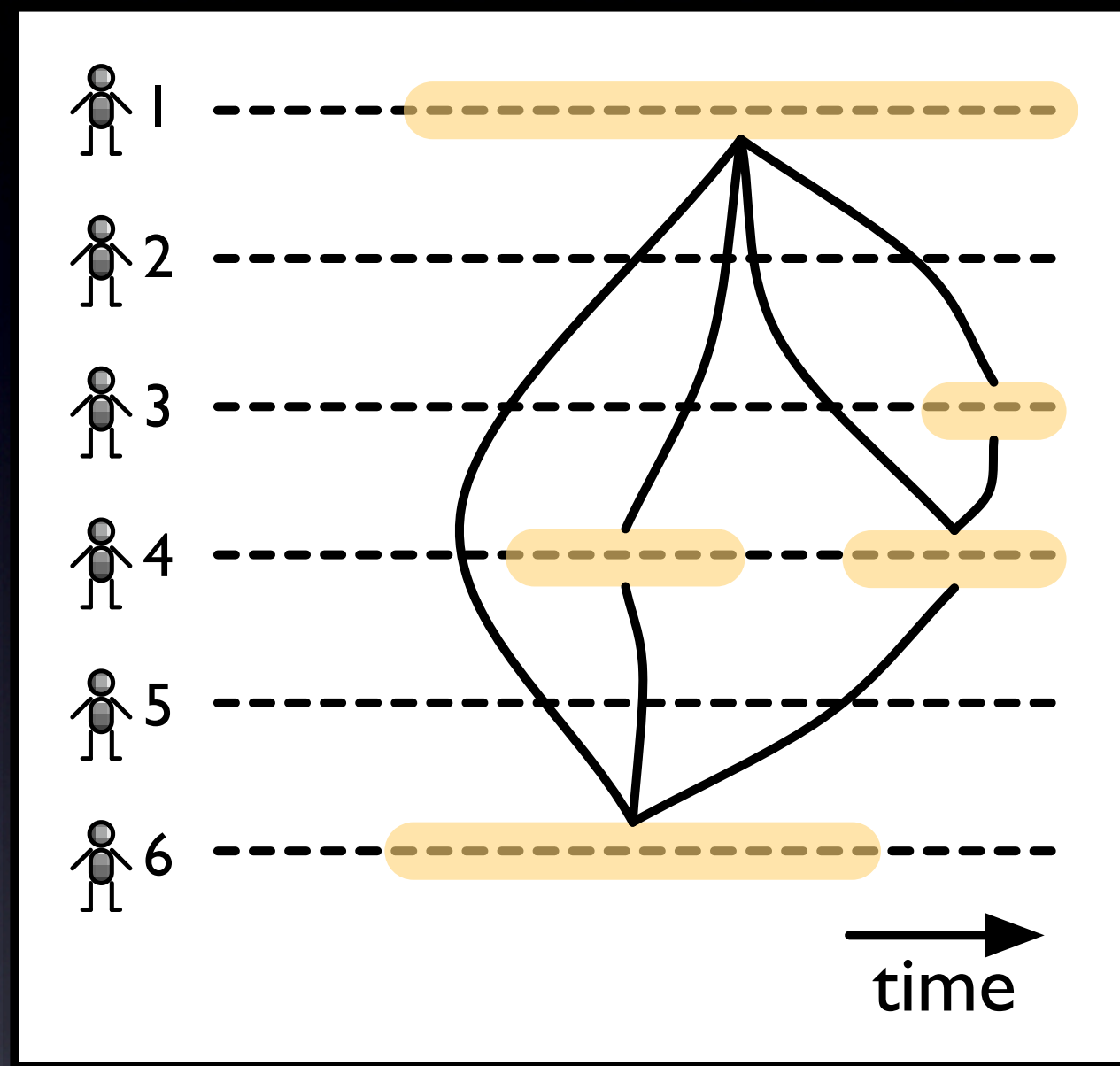
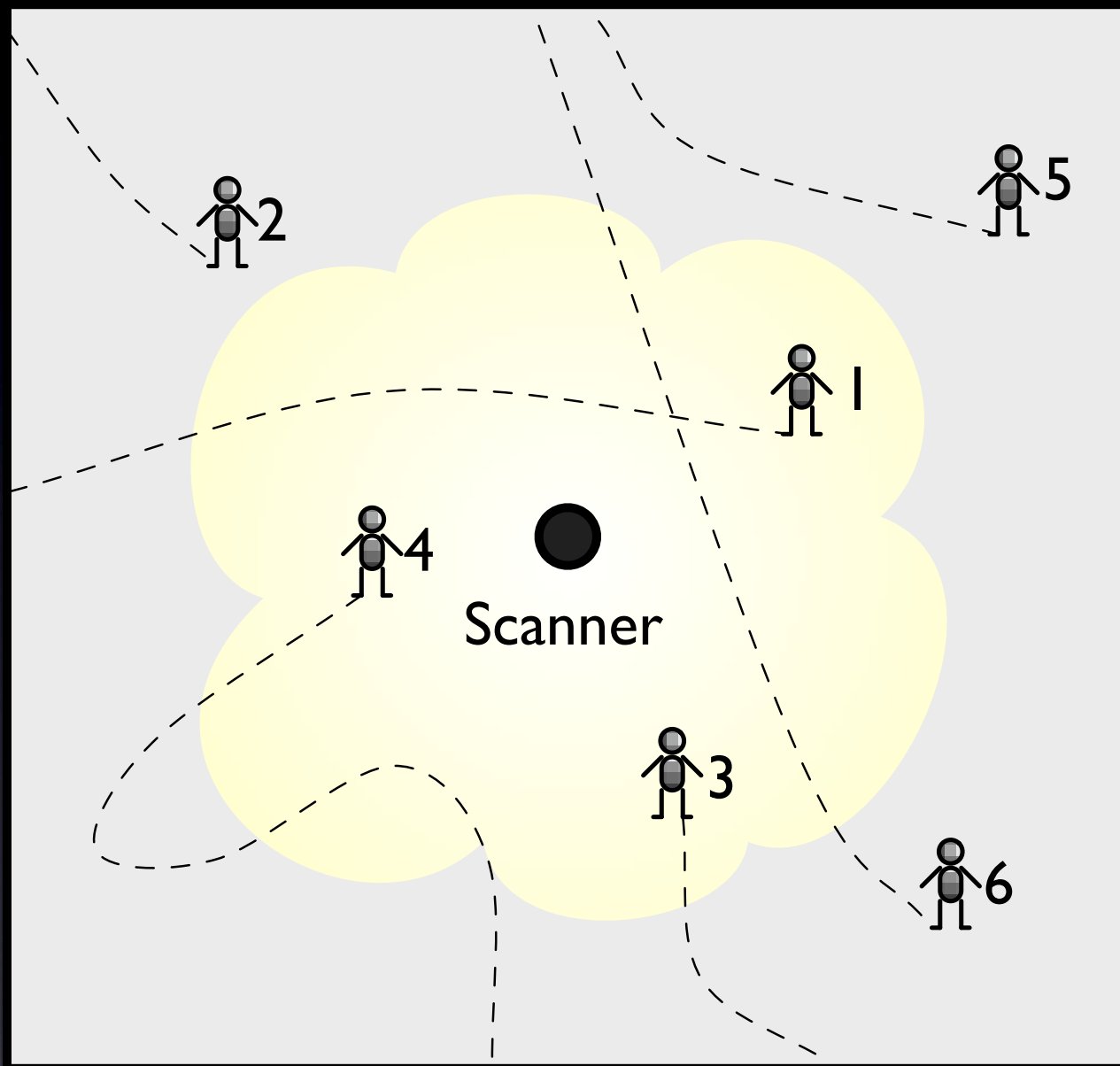
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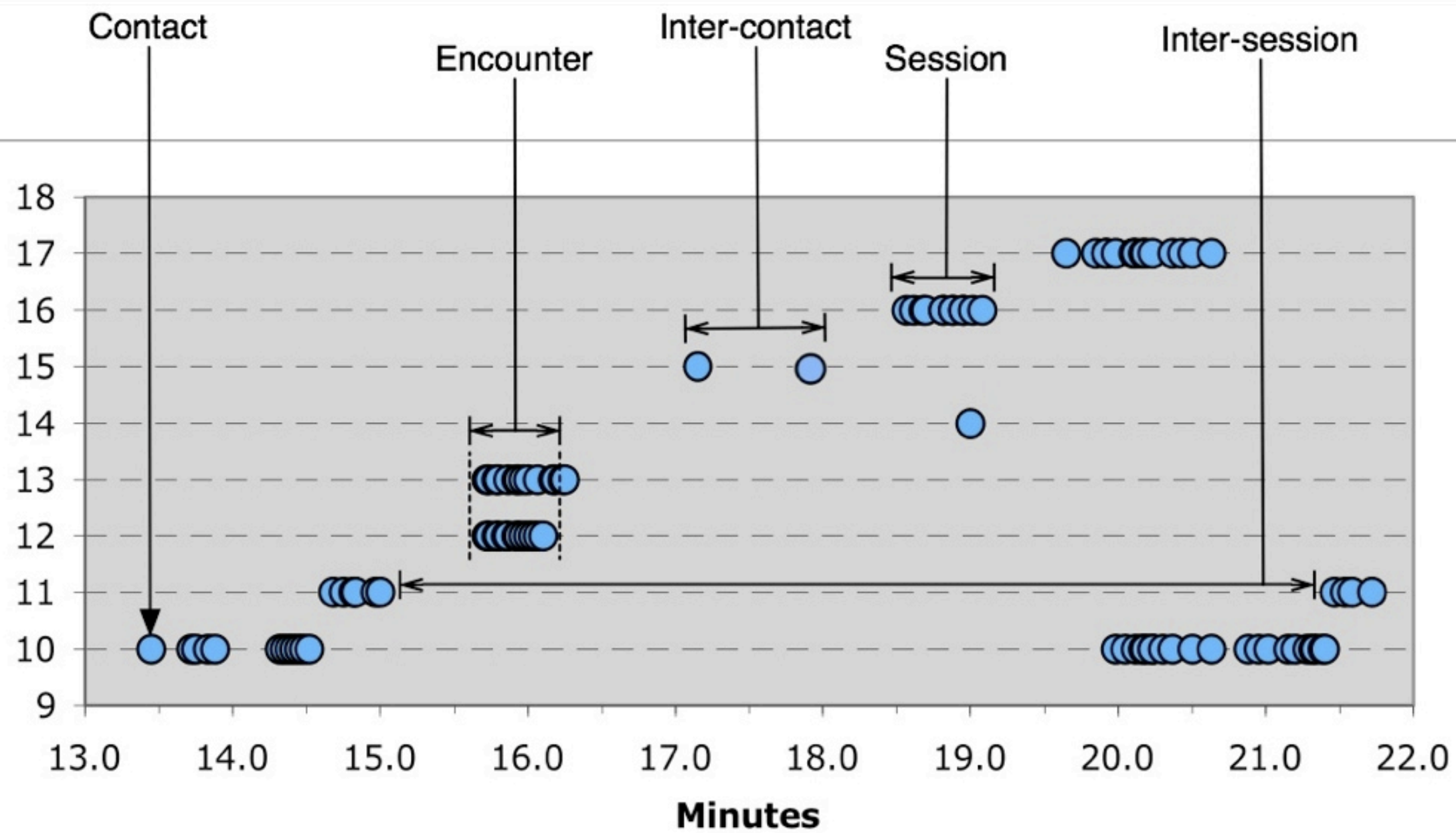
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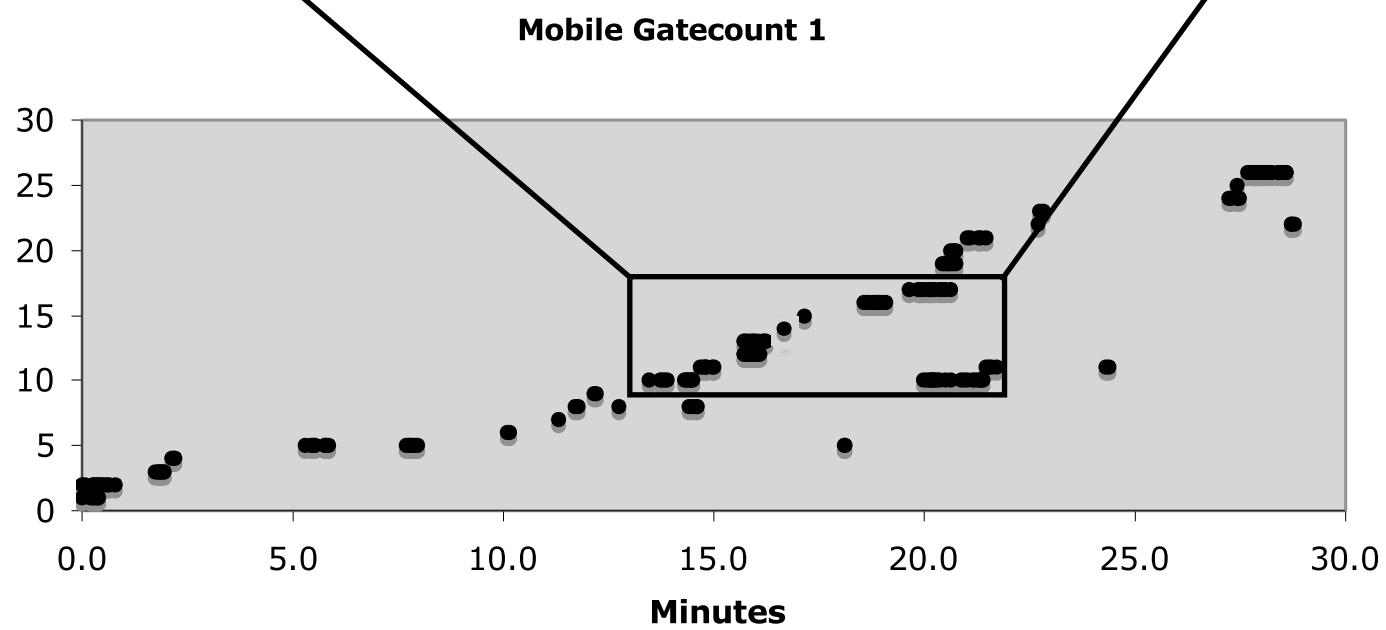
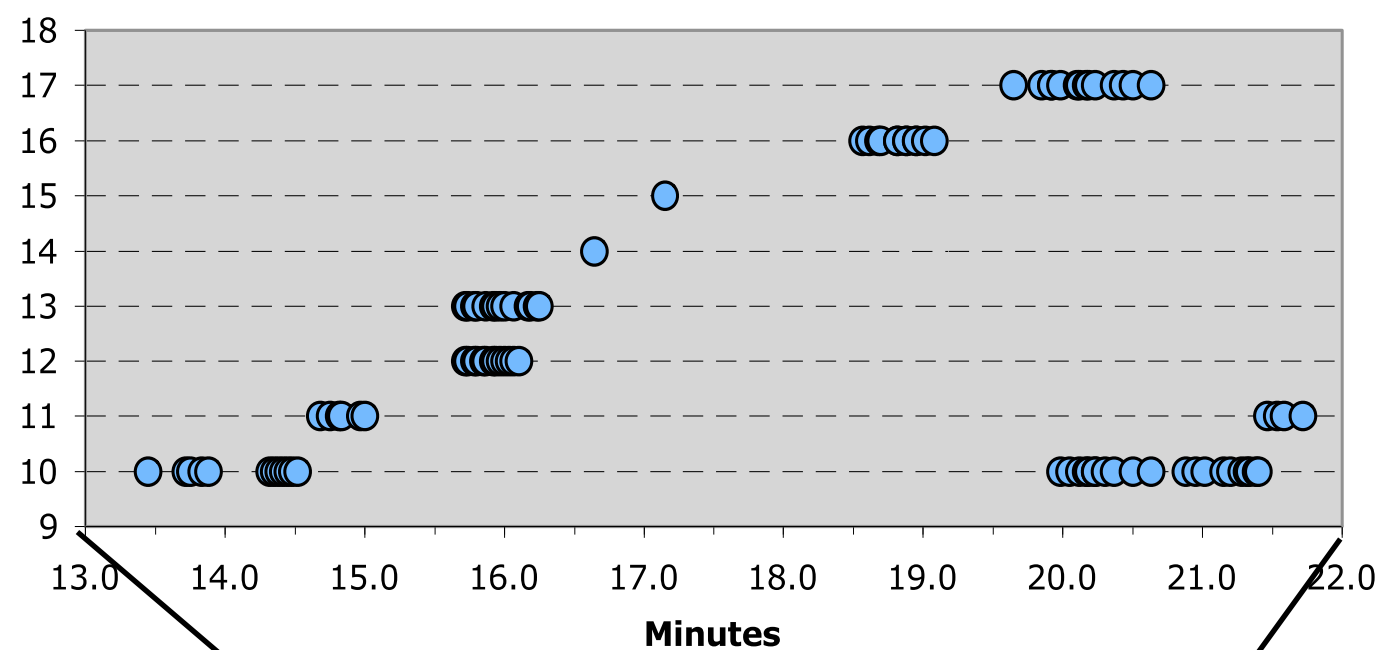
Mixed reactions

- People are unsure how to react
- It is definitely 2.0

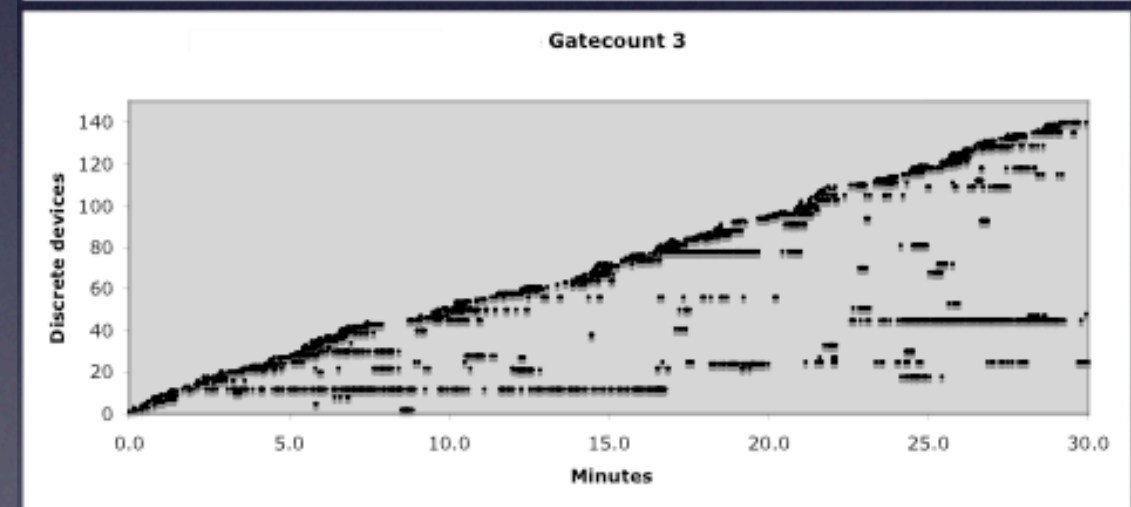
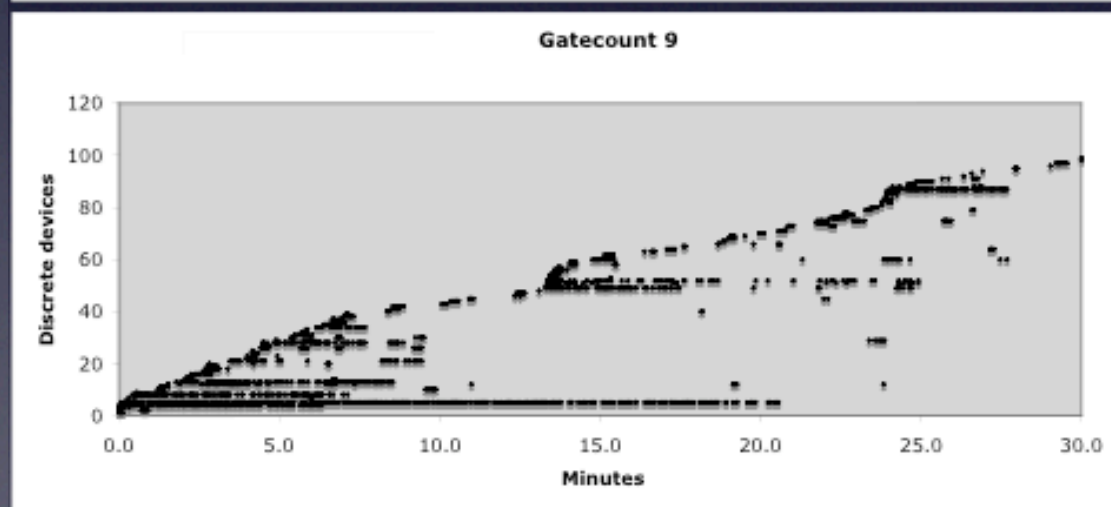
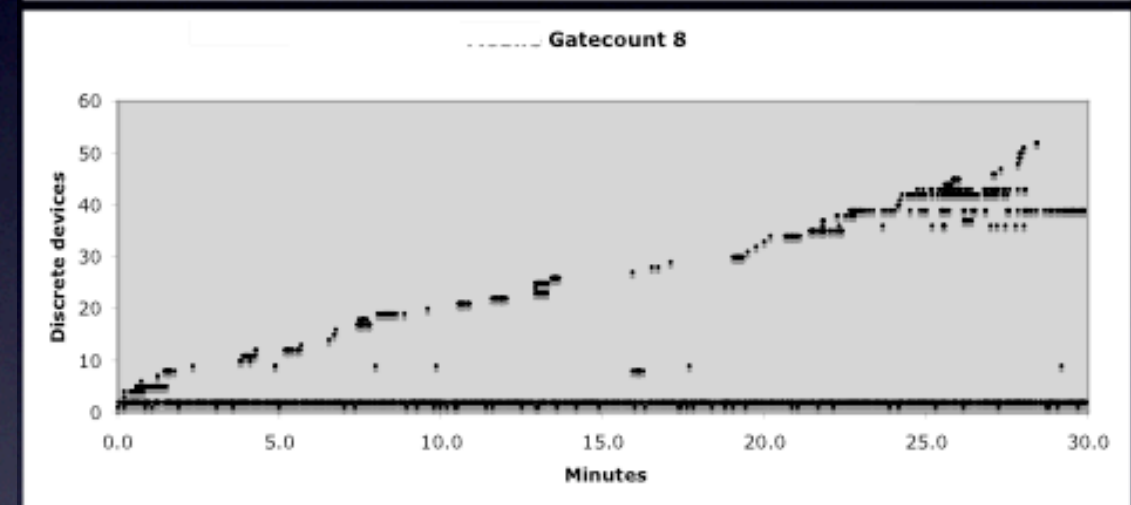
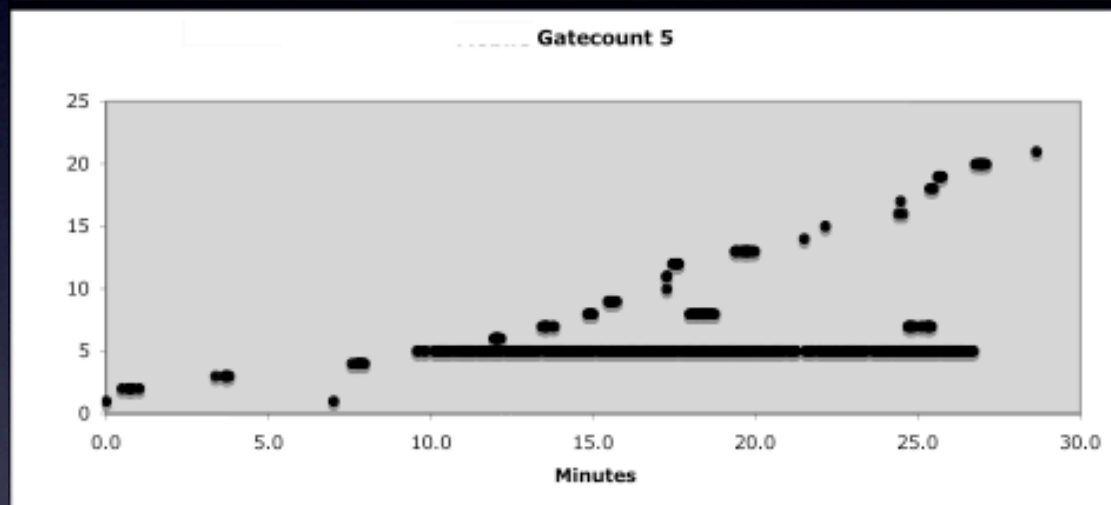
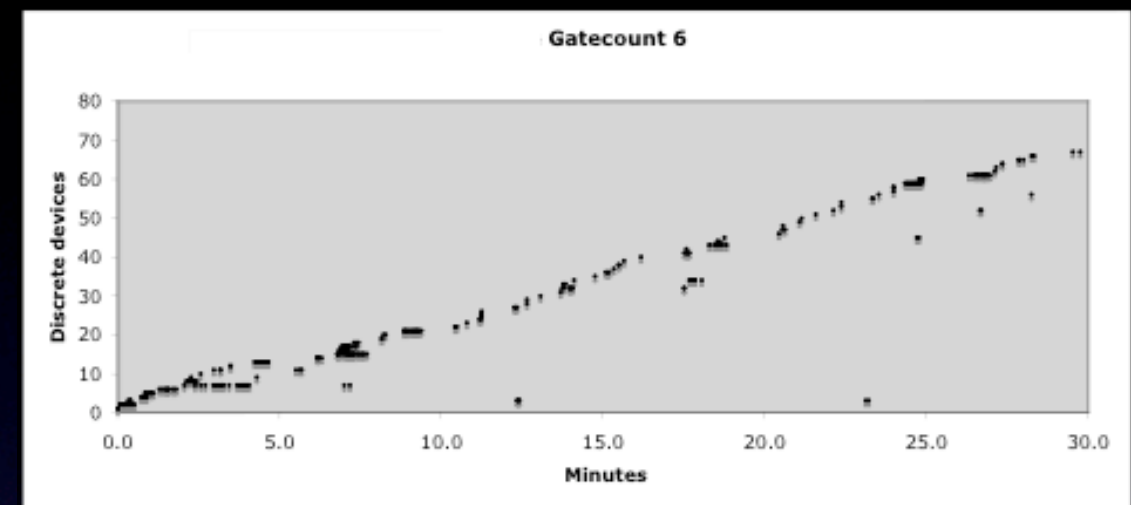
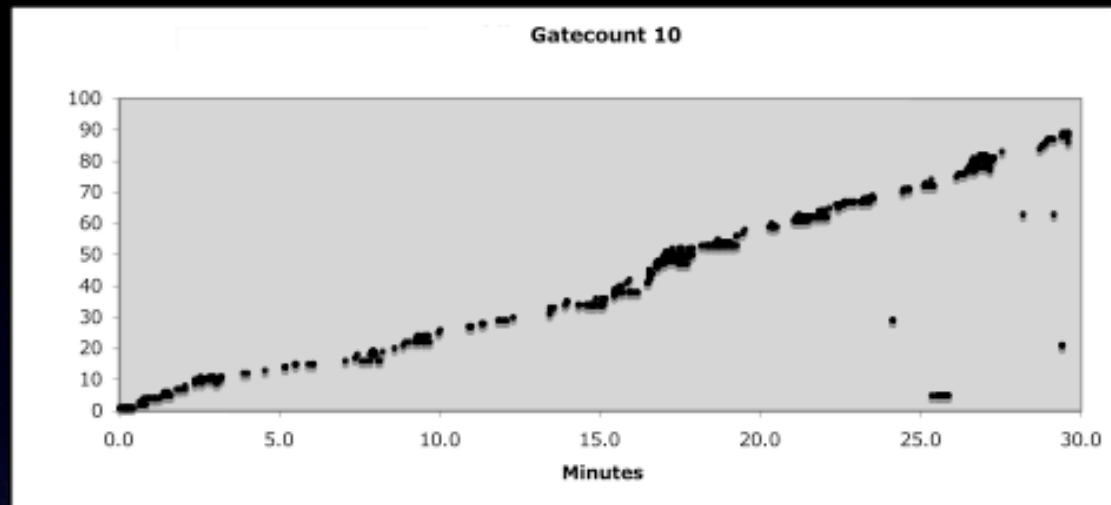


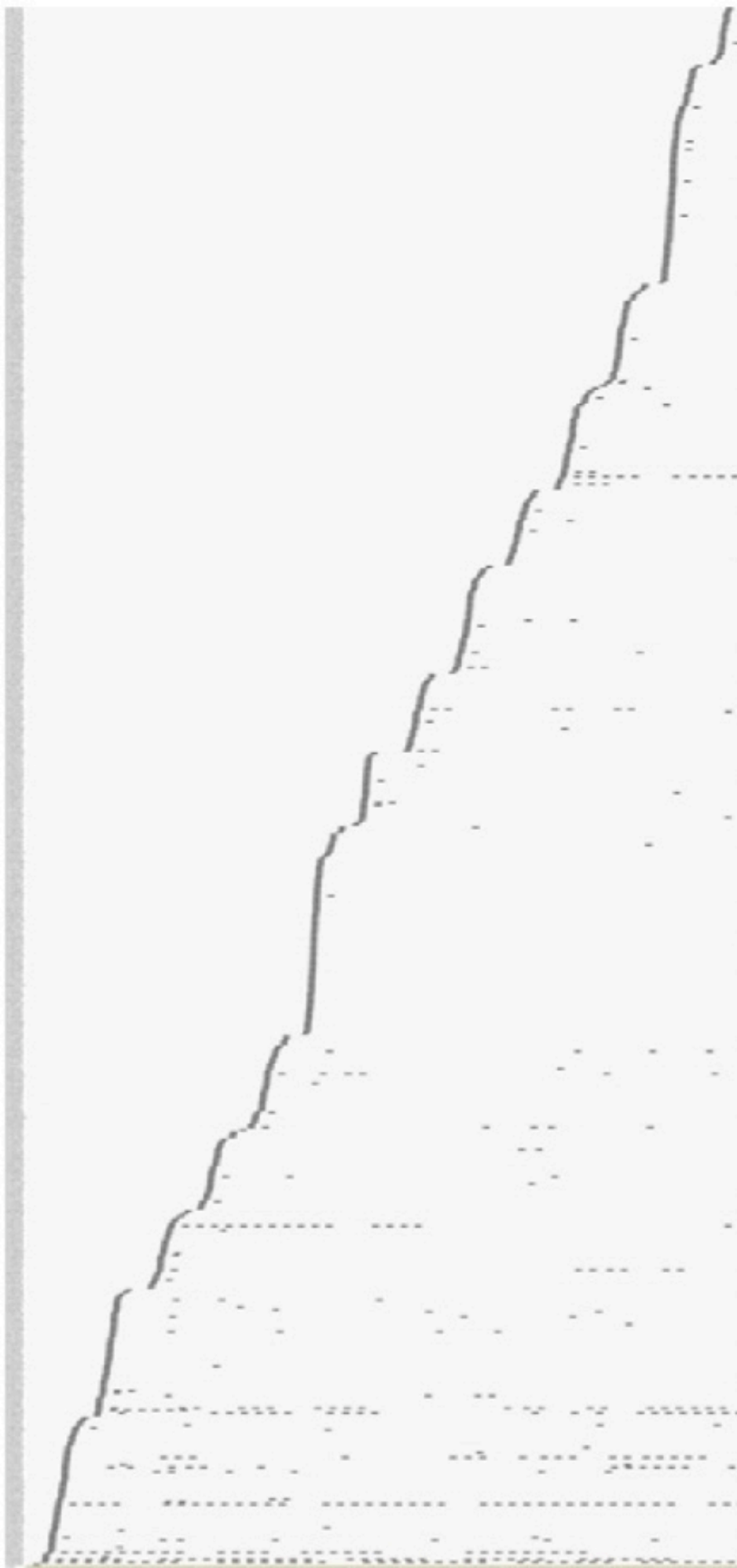
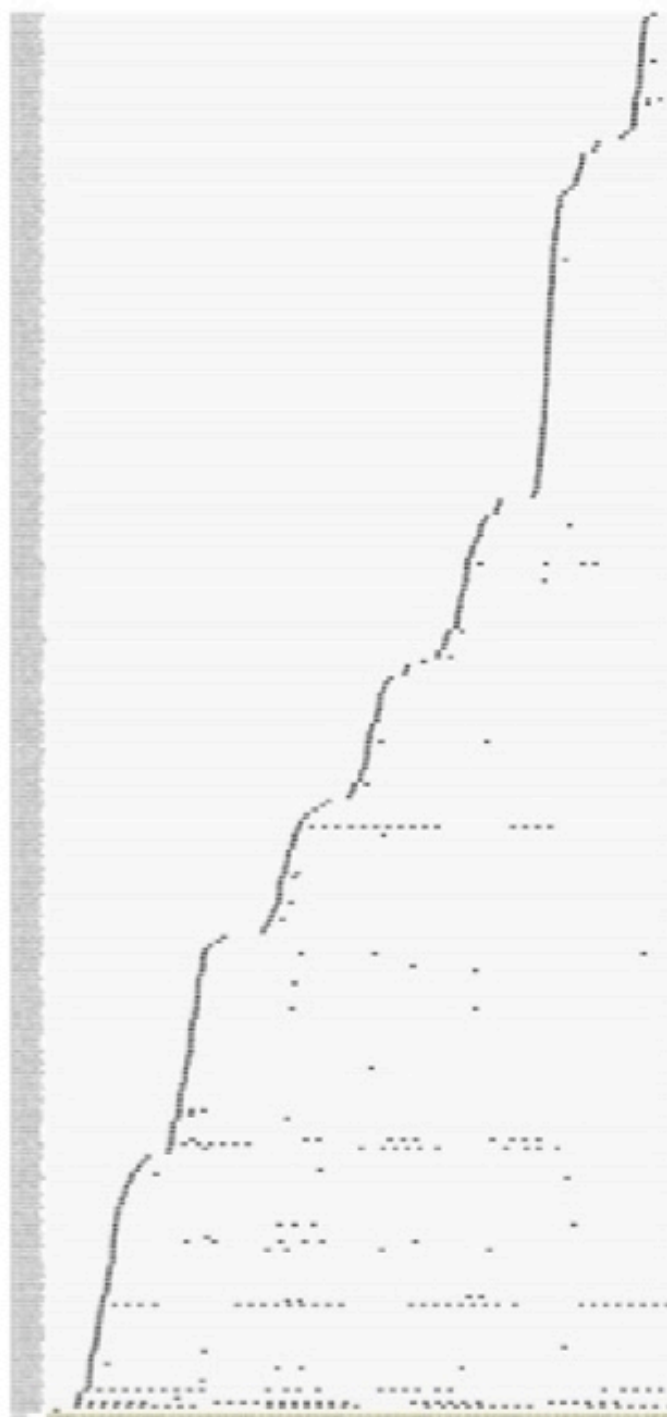
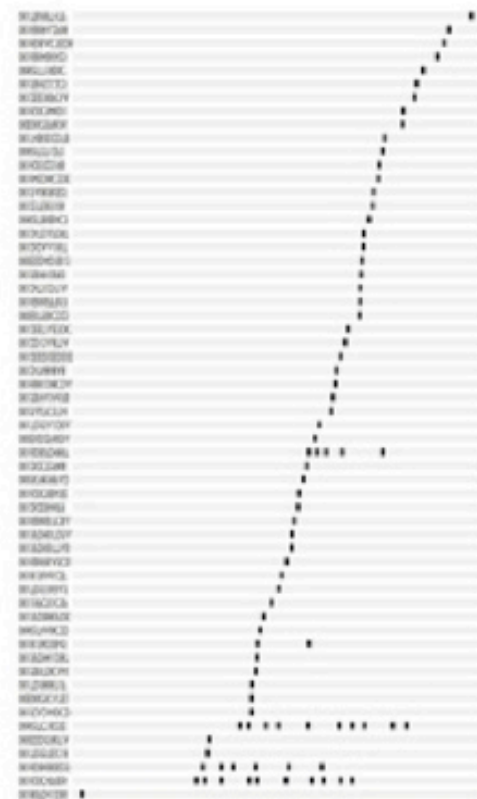


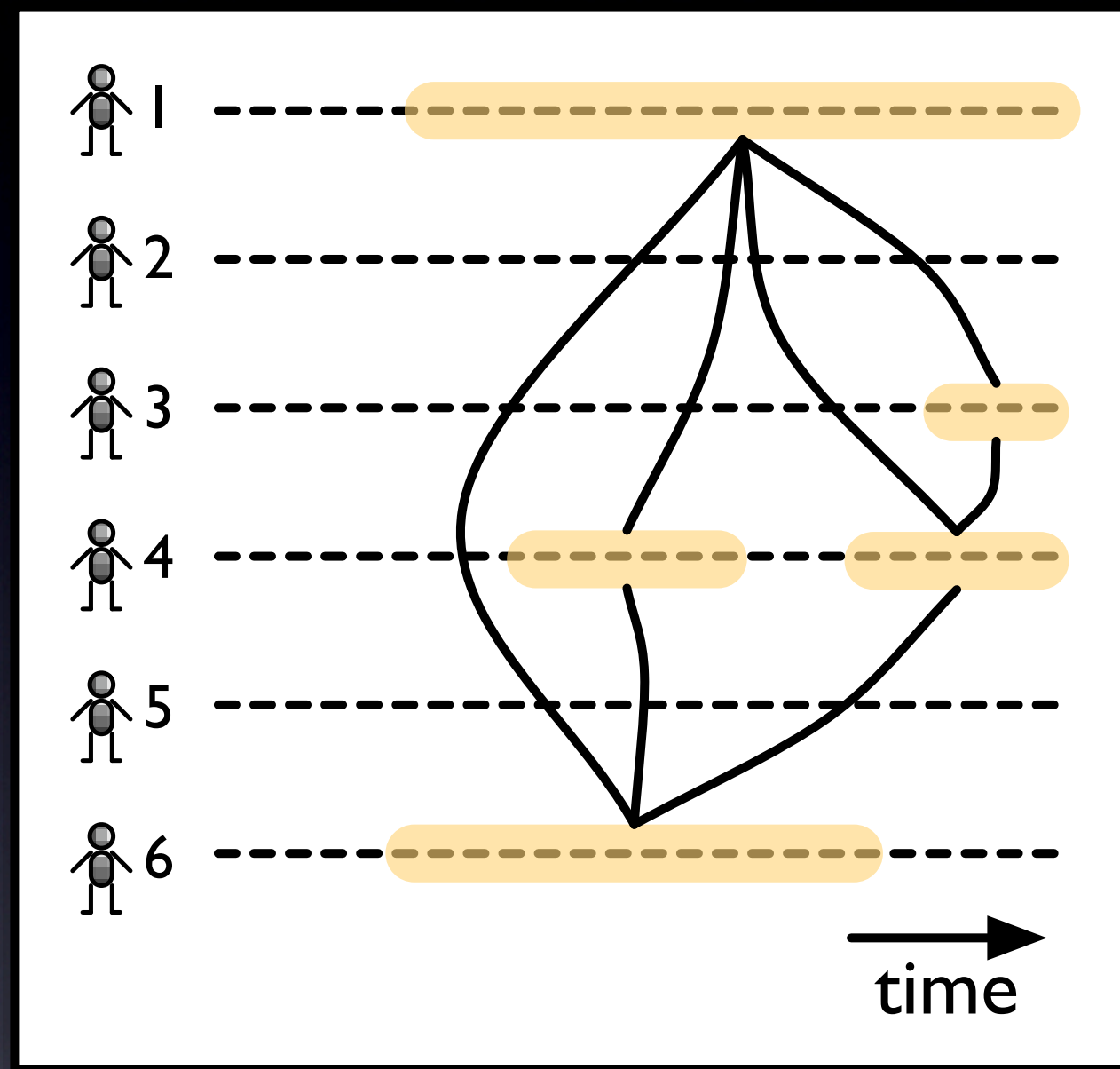
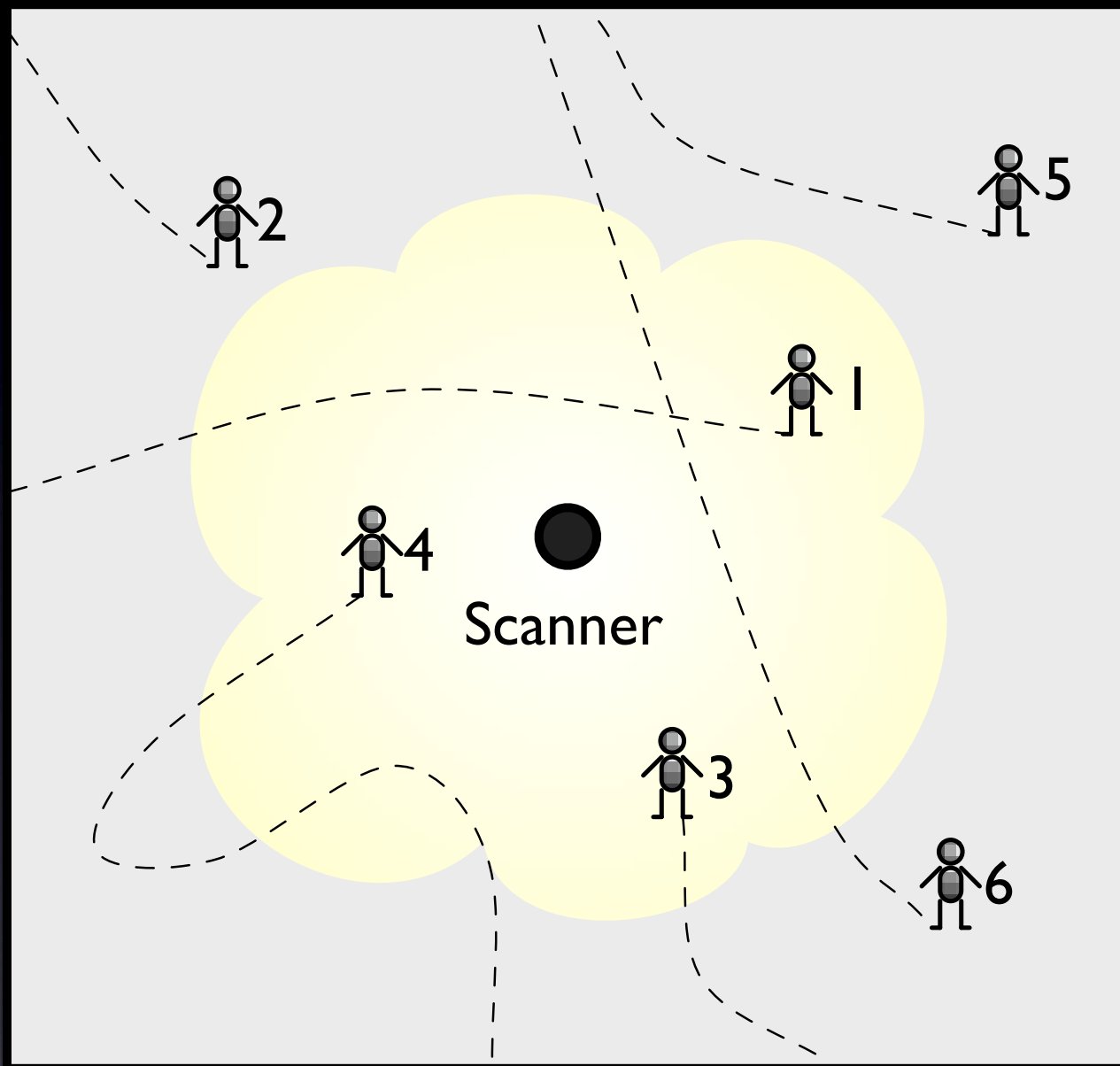


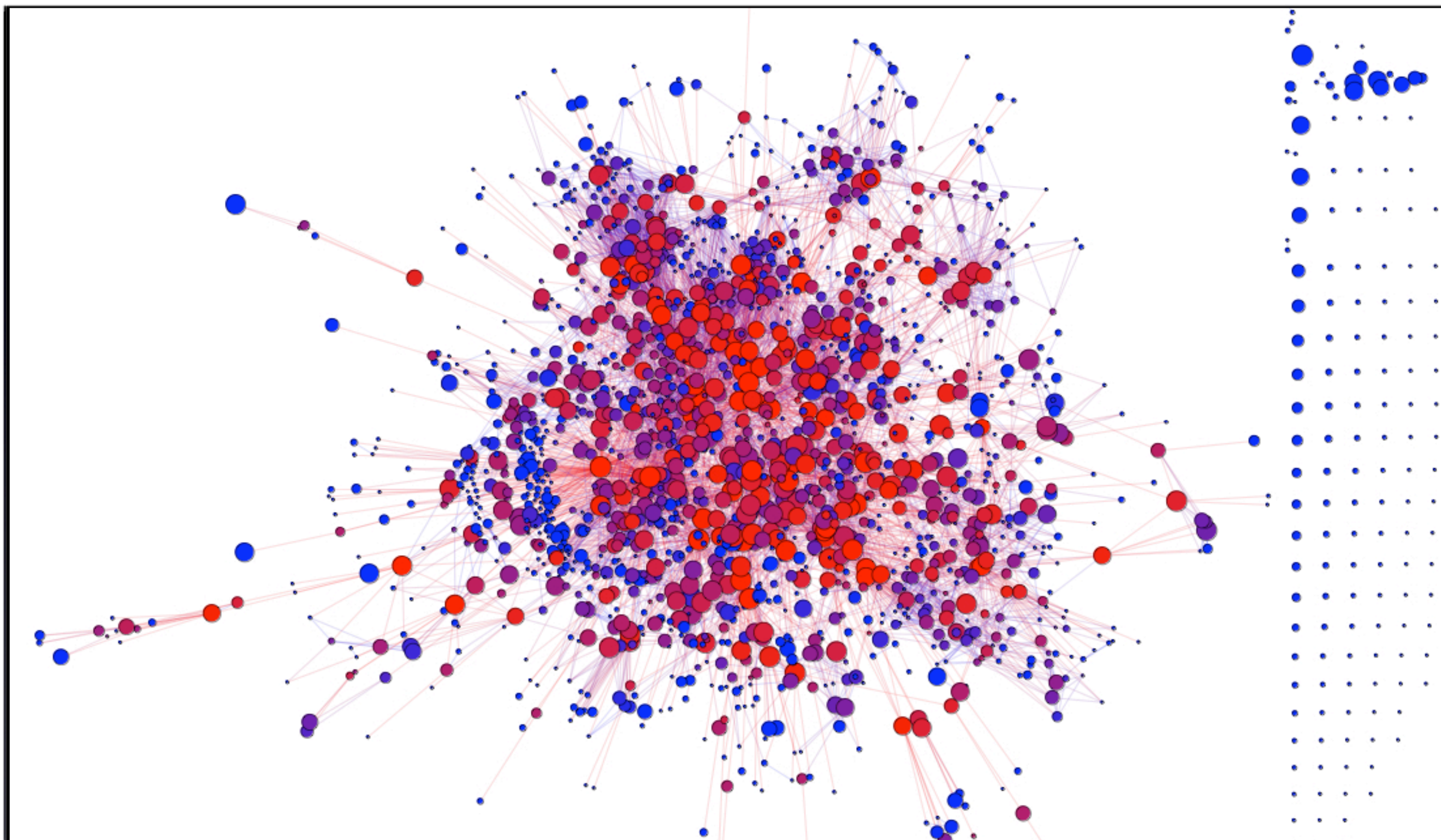


Gatecount timelines

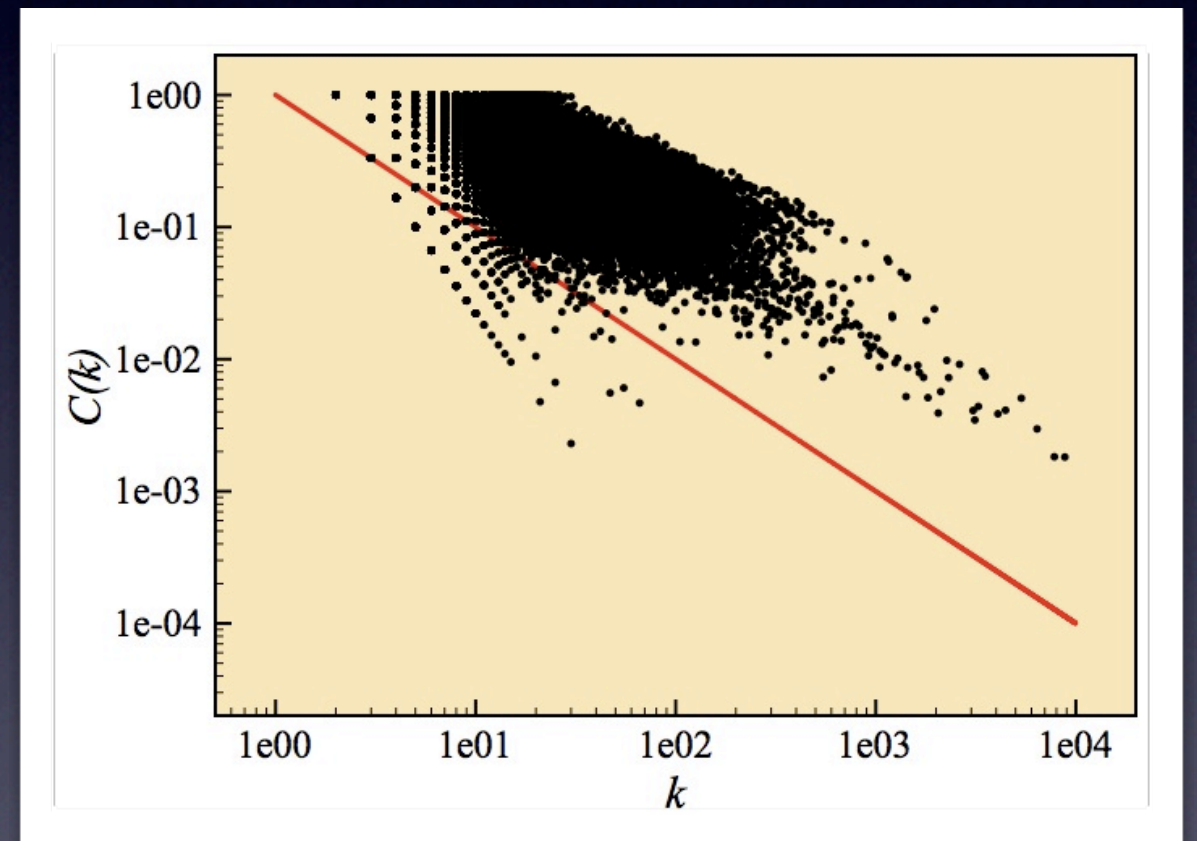
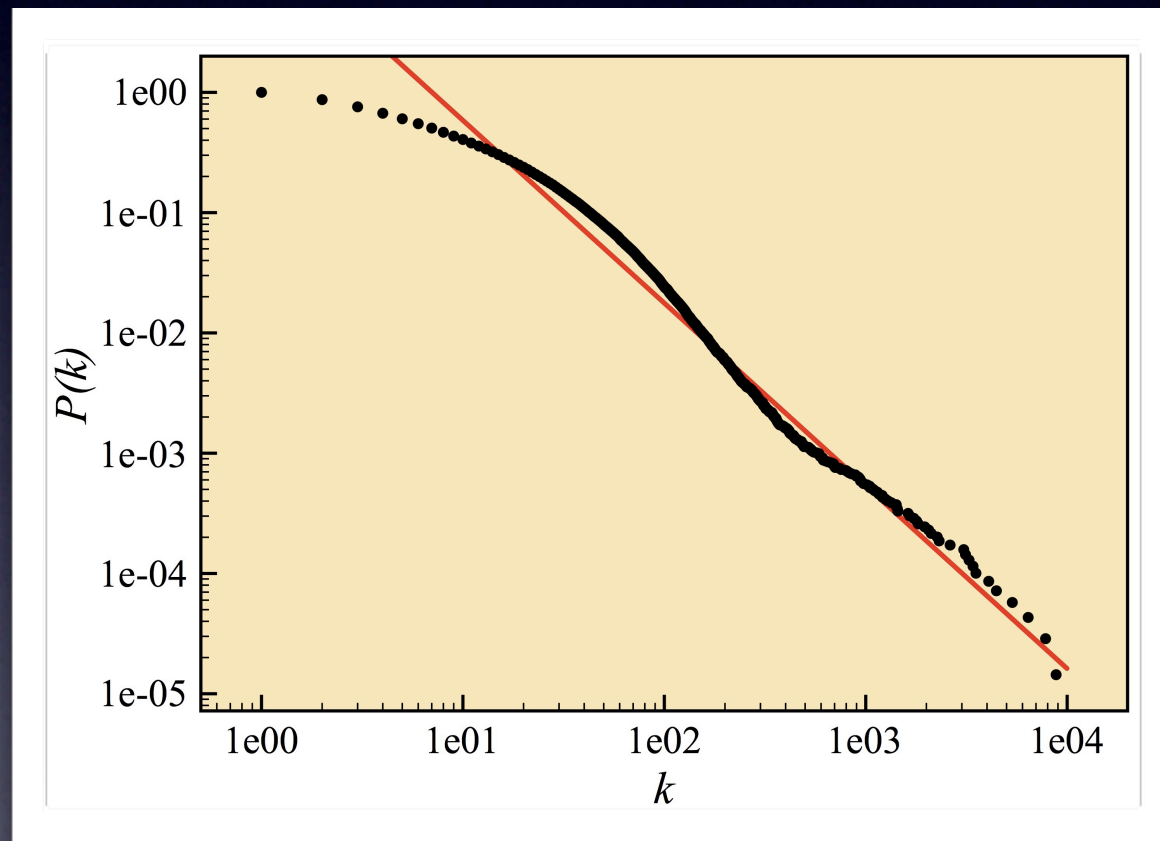


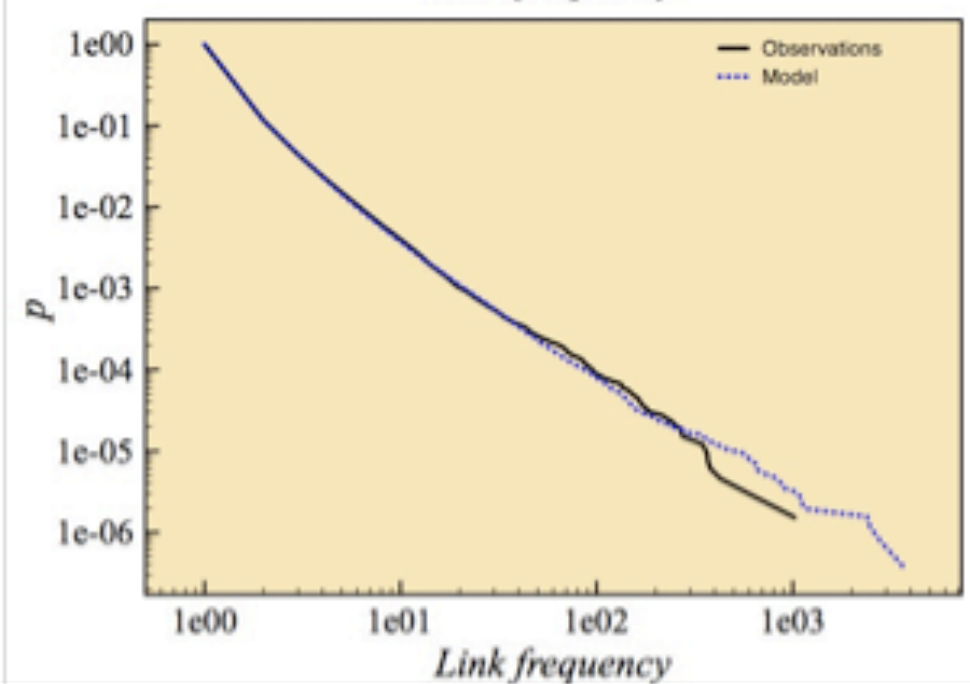
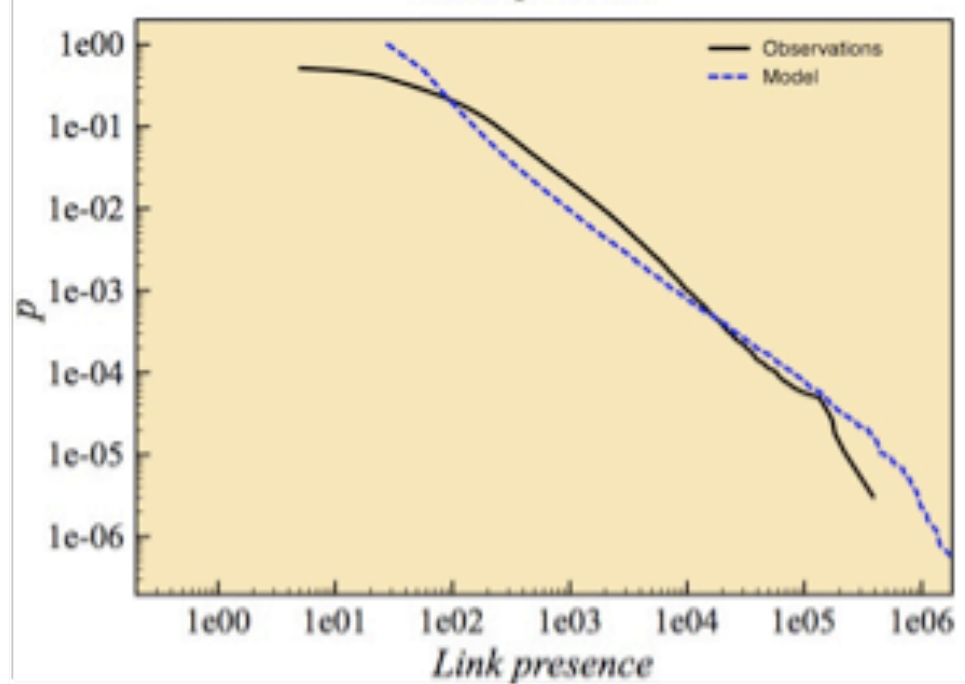
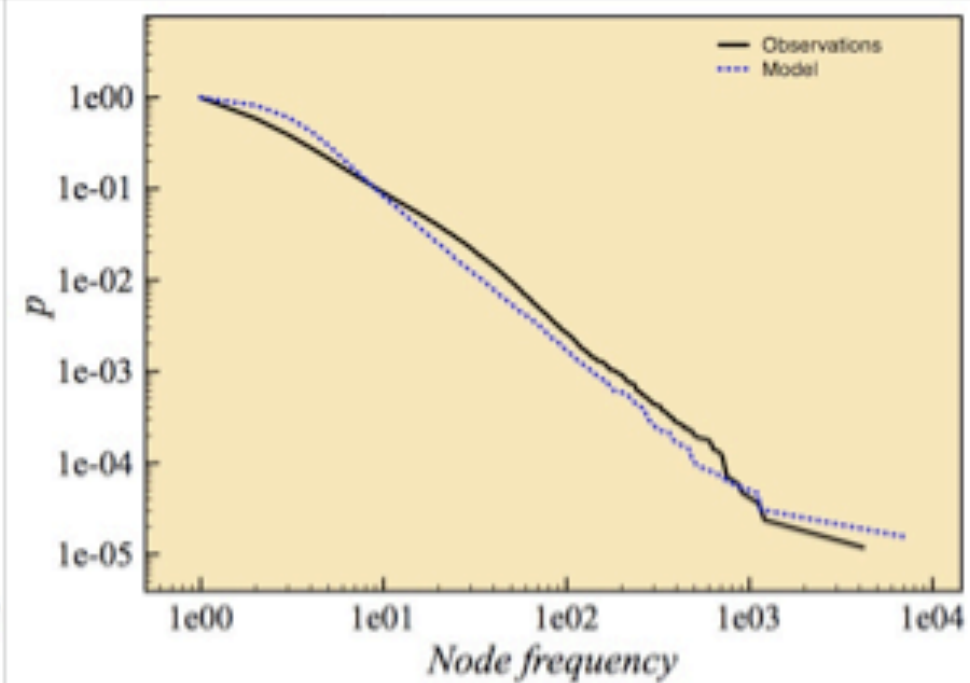
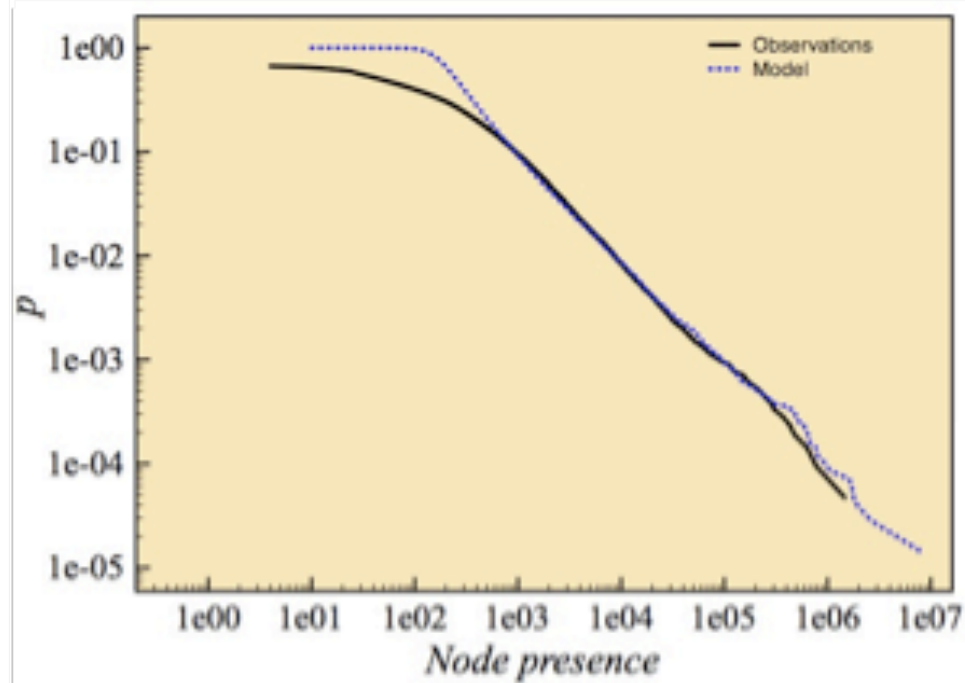


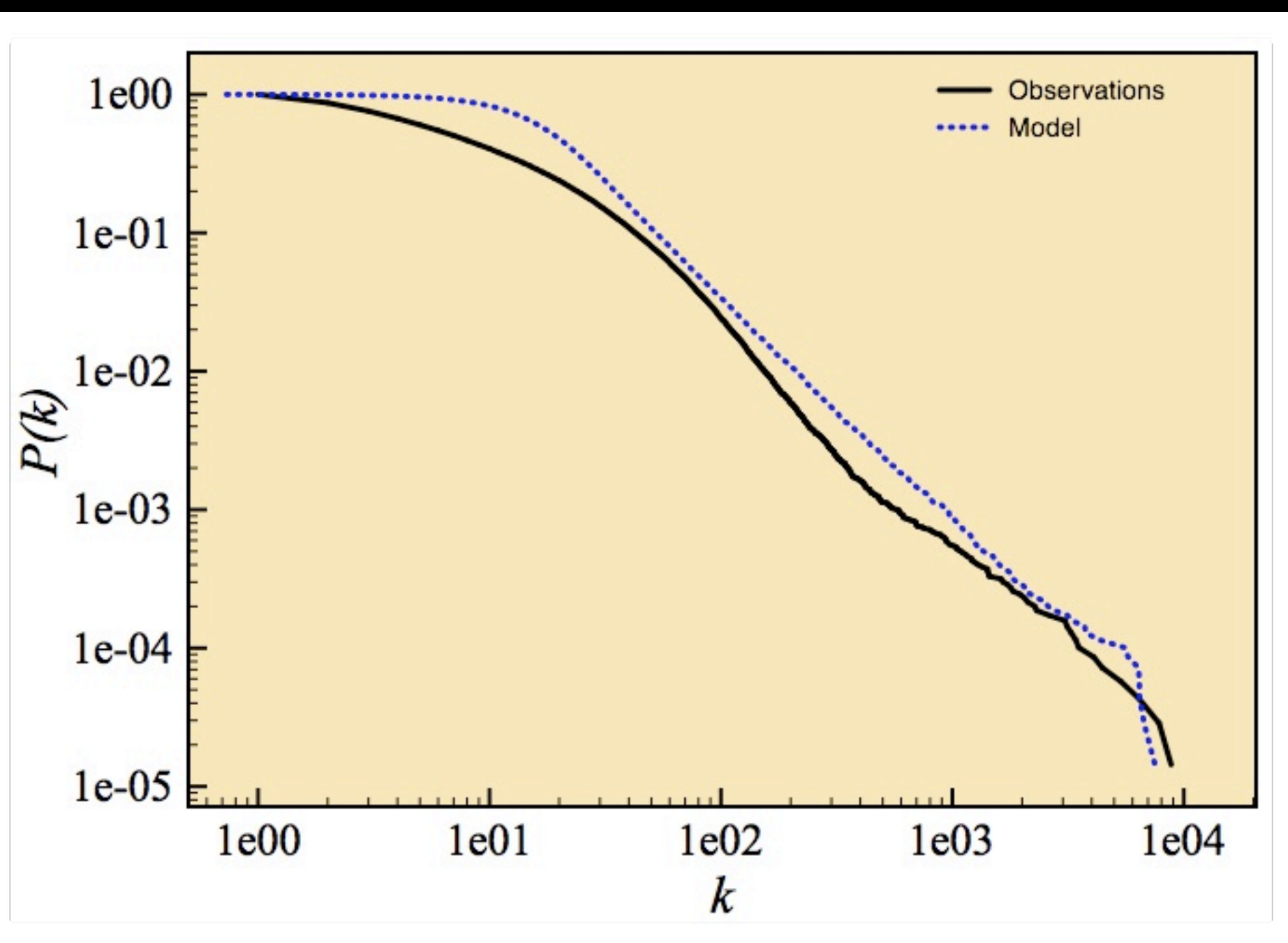


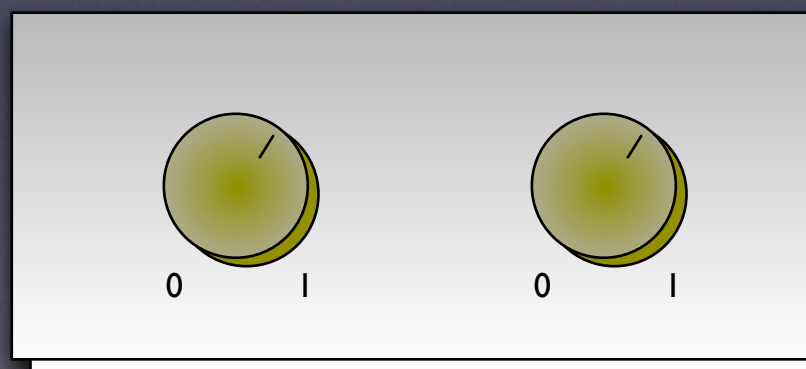


Power laws and exponential decays





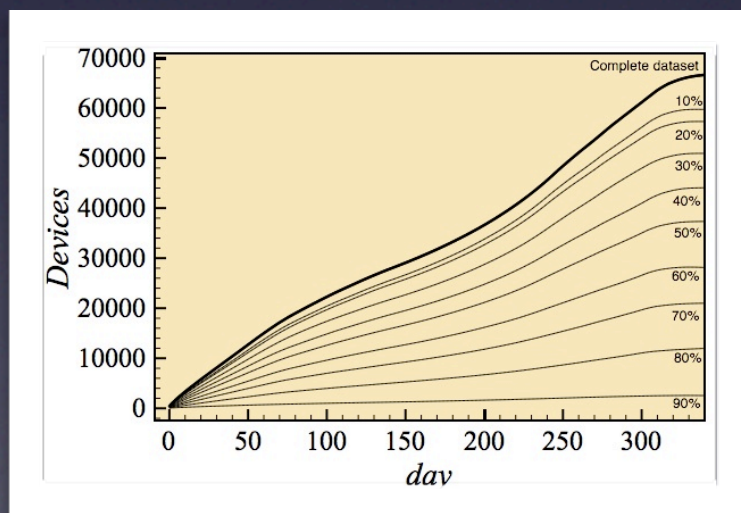
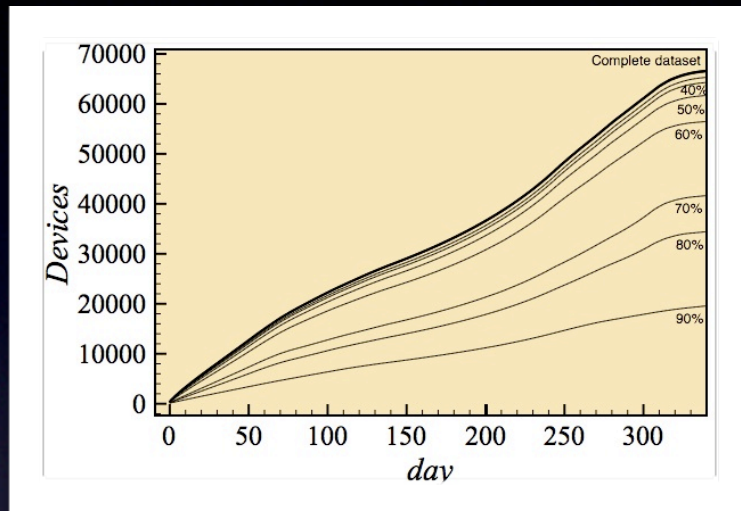




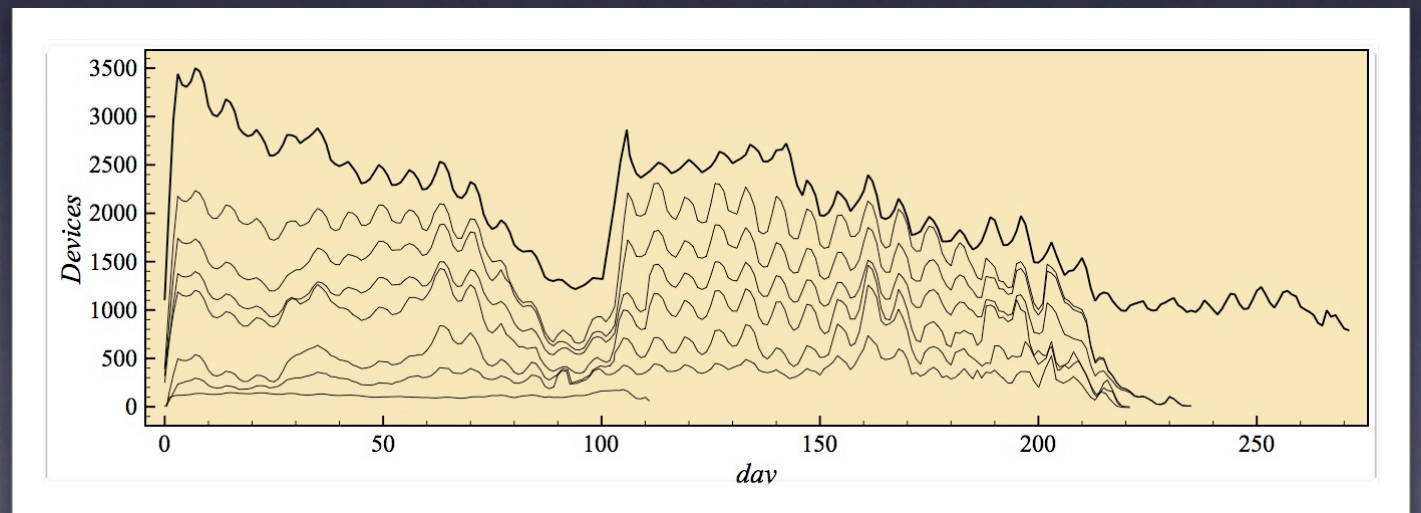
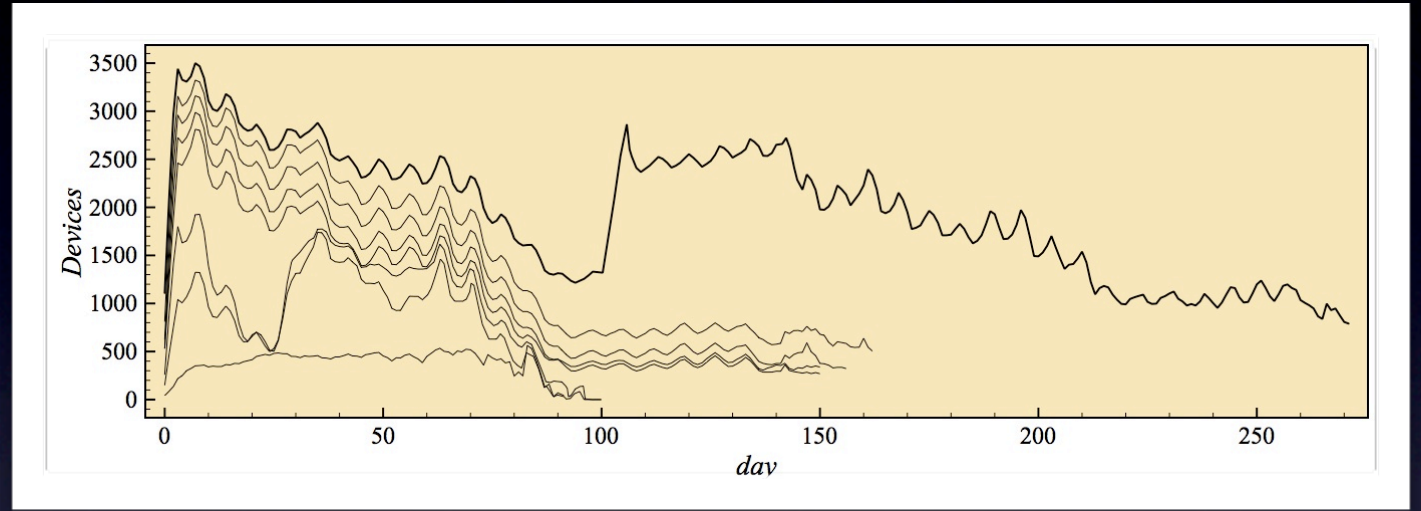
No Friends

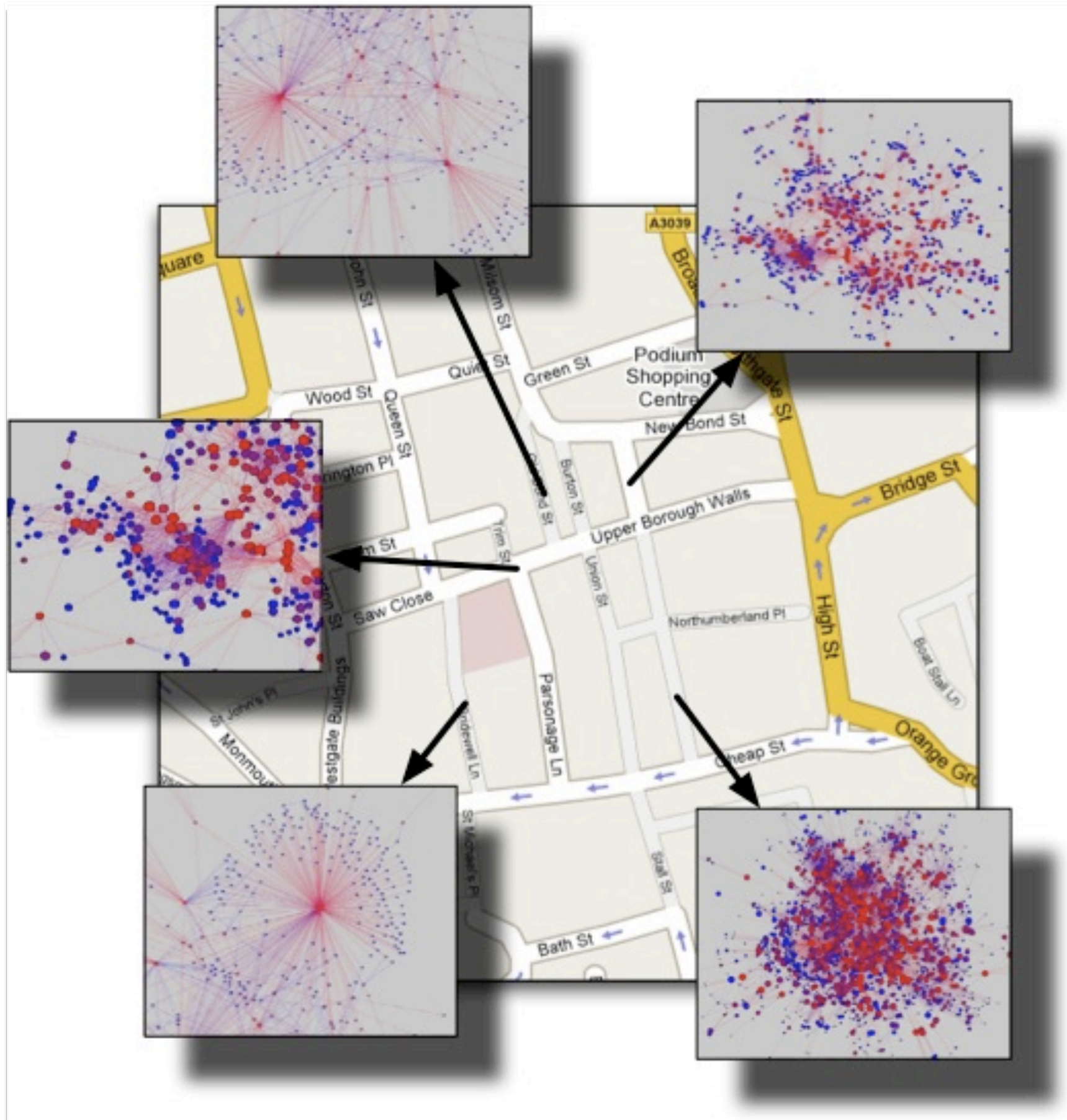
No Strangers

Information



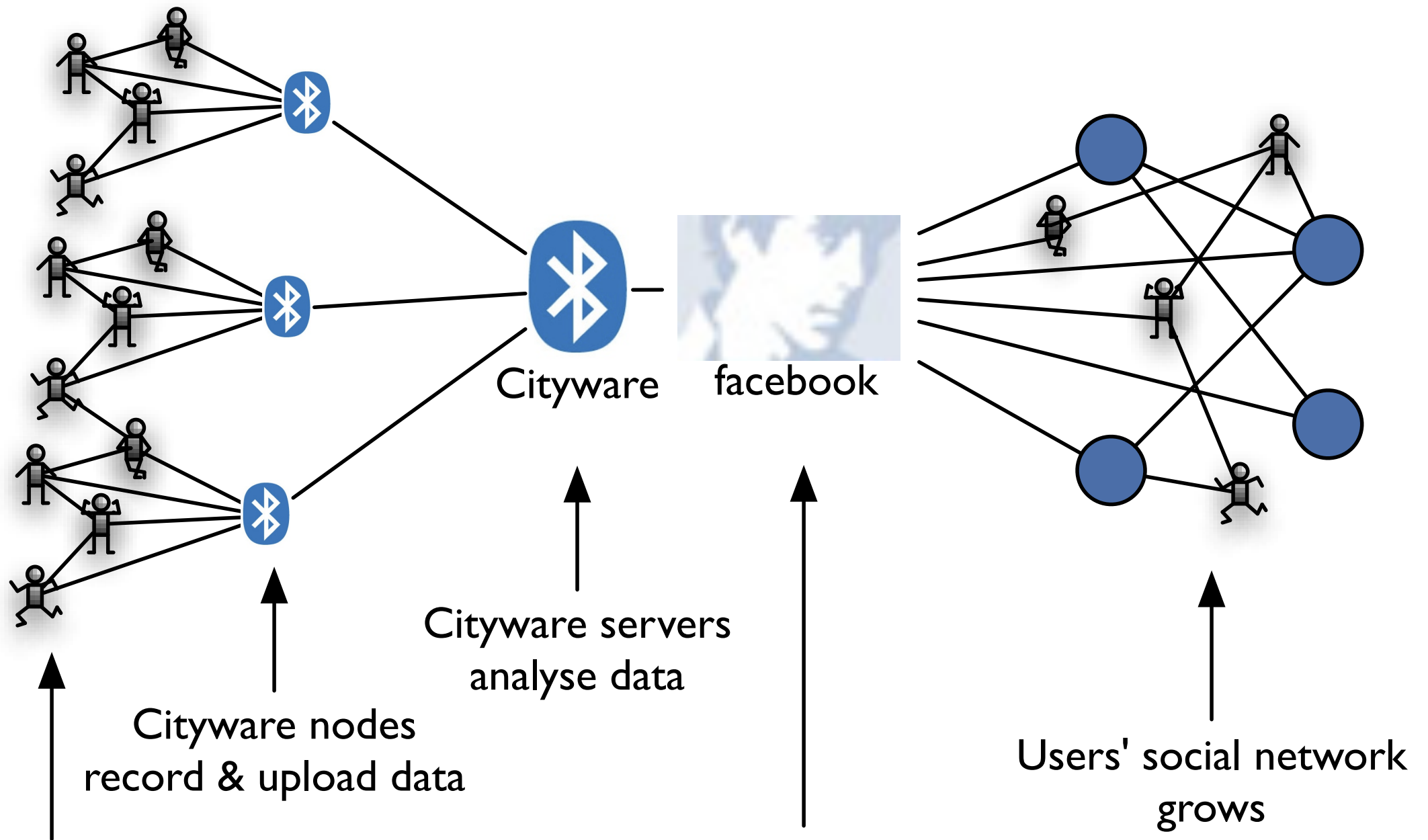
Viruses





Data annotation





People with Bluetooth devices
bumping into each other
(shopping, school, work)

Facebook application
presents data

Users' social network
grows



Cityware toolbar

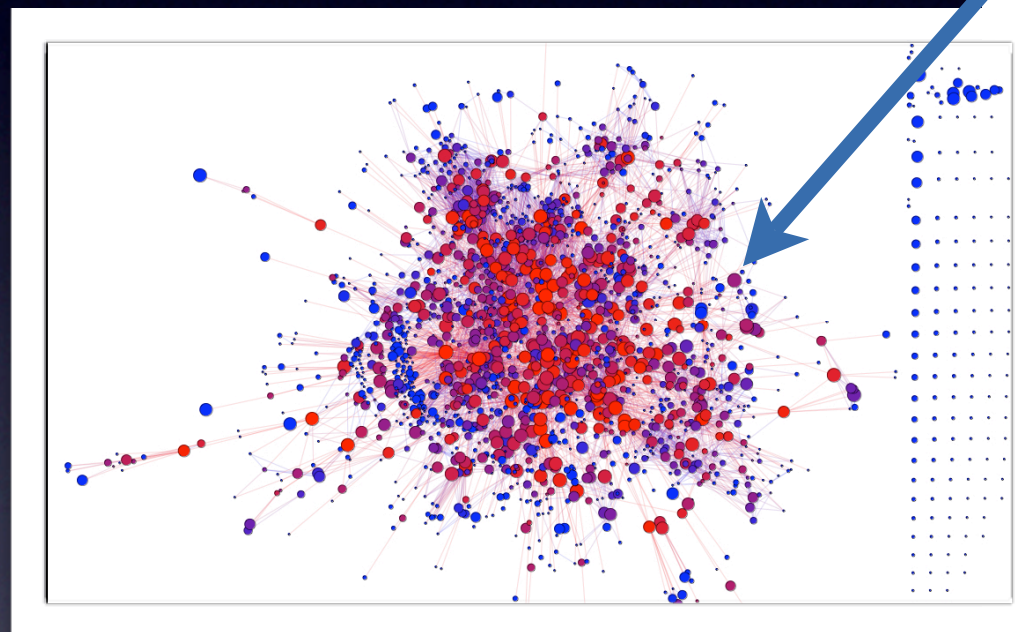
Bluetooth devices linked
to a user's profile

Encounters grouped by
recency, duration, frequency

Encounter with a device
linked to a profile

Encounter with an
unknown device





Facebook | Cityware

http://apps.facebook.com/cityware/index.php?active=duration&use Google

VK Home Photography Google docs ODEON - Bath Tube map Mac Wallpapers MacResearch NBG ACM

Google Facebook | Cityware

facebook Profile edit Friends Networks Inbox home account privacy logout

Cityware | My Settings | Getting Started | About Cityware

Cityware






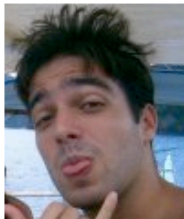


Search

Applications Cityware Photos Groups Events Developer

Vassilis Kostakos's Cityware Profile - Displaying device: vk

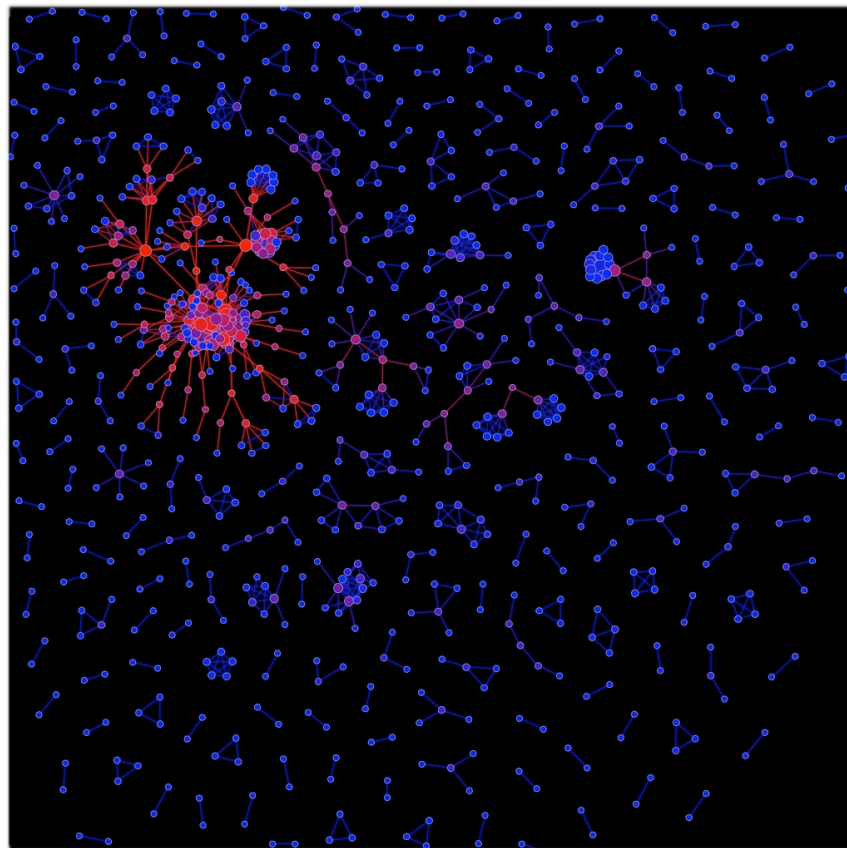
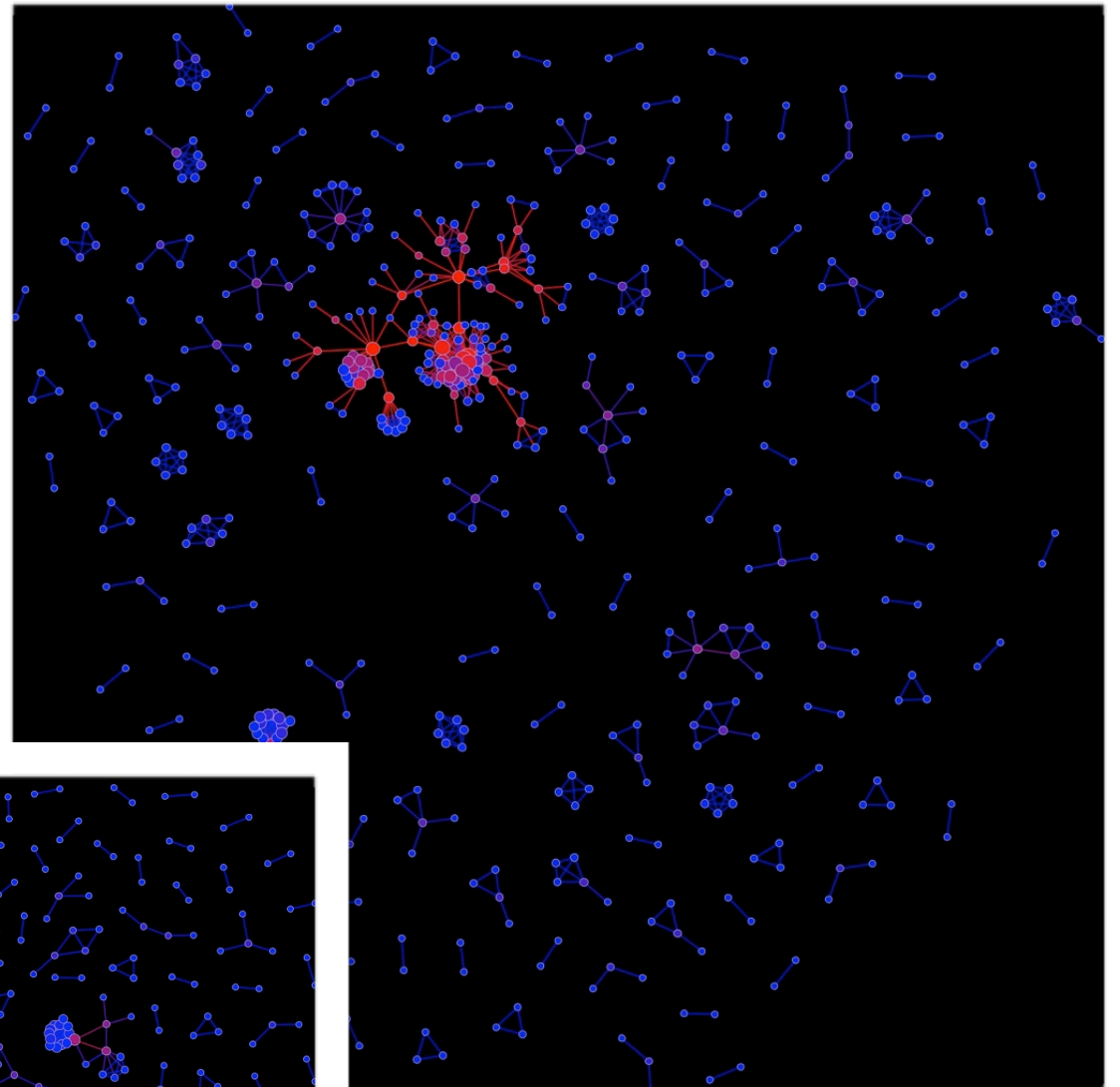
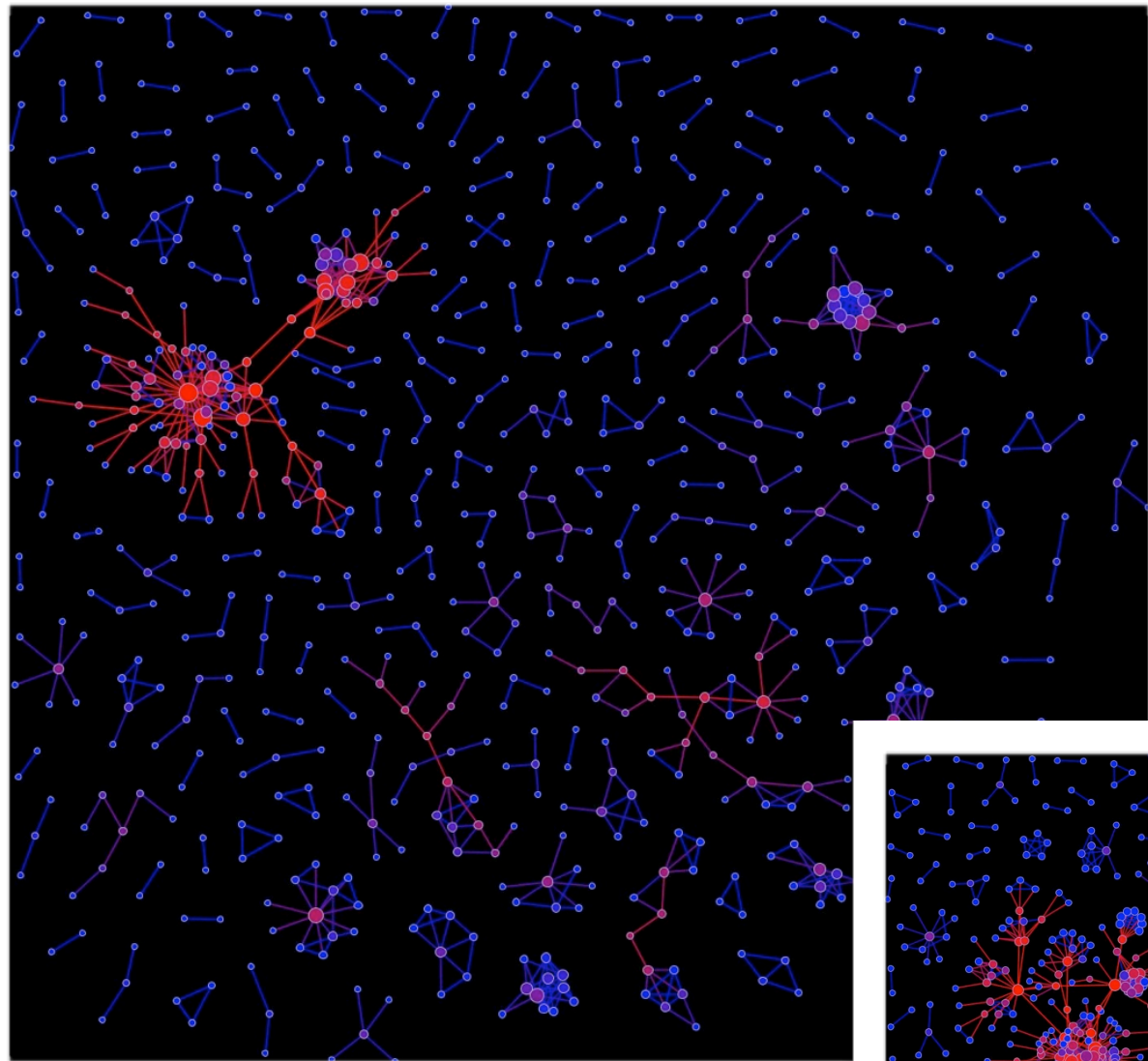
Last Seen With... Spends Most Time With... Meets Most Often...


Show more

 CSR - bc4 BT ID: XXXXXXXXXX7A4 Time together: 2 hours Tag this device	 Lulu BT ID: XXXXXXXXXXB2A Time together: 1 hour Tag this device
 Tim Coughlan BT ID: XXXXXXXXXX288 Device Name: TimsLaptop Time together: 54 minutes Tim is your friend Tim's Cityware Profile	 Eamonn BT ID: XXXXXXXXXXB37 Time together: 53 minutes Tag this device
 Vassilis Kostakos (You) BT ID: XXXXXXXXXXFC1 Device Name: v Time together: 51 minutes This device belongs to you Vassilis's Cityware Profile	 Marcus L. Da Silva BT ID: XXXXXXXXXX2C9 Device Name: Vicky Time together: 45 minutes Marcus is your friend Marcus's Cityware Profile
 minime9 BT ID: XXXXXXXXXXE73 Time together: 44 minutes Tag this device	 minime10 BT ID: XXXXXXXXXXD1E Time together: 44 minutes Tag this device

Page built by Cityware about developers jobs advertisers polls terms privacy help

Future work



The top of the slide features a banner image. On the left, the 'cityware' logo is displayed in a white, lowercase, sans-serif font. Below it, the tagline 'urban design & pervasive systems' is written in a smaller, white, lowercase font. The background of the banner is a photograph of a sunset or sunrise over a city skyline, with silhouettes of three people standing on a bridge or walkway in the foreground.

cityware

urban design & pervasive systems

Thank you

Vassilis Kostakos
vk @ cs. bath. ac. uk

[http :// www.cityware.org.uk](http://www.cityware.org.uk)

