MOBILITY/SMART [Panel]

Mobility, Smart Cities and Urbanicity: Handling Mobile Citizen Data

Moderator

Amnon Dekel

Shenkar: Engineering, Design, Art

The Hebrew University Jerusalem, Israel

Panelists

Amnon Dekel, Shenkar: Engineering, Design, Art

Andrey Krendzel, Huawei, Finland

Lars Fischer, University of Siegen, Germany

Sanjay Manney, Echelon Corporation, USA

Michelle Wetterwald, HeNetBot - Sophia Antipolis, France

Paul Wright, UC Berkeley, USA

MOBILITY/SMART [Panel]

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RULES:

1. Briefly Present Yourself
2. 5 Min to present your point
3. After we hear you all: OPEN DISCUSSION

MOBILITY/SMART [Panel]

Mobility, Smart Cities and Urbanicity: Handling Mobile Citizen Data

Andrey Krendzel
Huawei, Finland

MOBILITY/SMART Panel
Mobility, Smart Cities and Urbanicity: Handling Mobile Citizen Data

Major factors/drivers towards 5G

Dr. Andrey Krendzel (Huawei Technologies, Finland R&D Center)

What is known about 5G?

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- 5G (5th generation mobile networks or 5th generation wireless systems) is a term used to denote the next major phase of mobile telecommunications standards beyond the current 4G/IMT-Advanced standards
- *5G definition is not given yet in any official document*
- Currently, 5G technology is not described in any particular specification published by any telecommunication standardization body (ITU, 3GPP, 3GPP2, etc.)
- METIS is a project under FP7 Call 8 to provide concepts and technology solutions for 5G

Major factors/drivers towards *x*G
(*x*=2,3,4,5)

1) Demand for services/applications from different groups of end-users
   - Competitive market impact
2) Cost/performance ratio
   - Emerging new technologies/solutions/business models
3) Frequency bands and spectral bandwidth per frequency channel are limited
4) Political factors

Major factors/drivers towards 4G

1) Demand for services/applications from different groups of end-users (Competitive market impact)
   - Needs for data rates higher than 2-10 Mb/s
   - IP session continuity across multiple RATs
2) Cost/performance ratio
   - Rate requirements are achievable for reasonable price
   - Single unified standard
   - Interworking with non-3GPP ANs
3) Frequency bands and spectral bandwidth limitations
   - Technologies enable increasing channel spectral efficiency: Carrier Aggregation (CA), MIMO, etc.
4) Political factors
   - Collaboration between 3GPP, 3GPP2, IETF…

Major factors/drivers towards 5G

1) Demand for services/applications
   - support all kinds of on-line (as well as off-line) IP based services and applications
     - 5G promising services/apps: augmented reality teaching, multi-user UHD telepresence and hologram conference, somatosensory virtual game, intelligent farming, energy monitoring, connected iVehicle, HD remote diagnostic*
   - Always sufficient rate to get the perception of infinite capacity for the end-users* *
     - area capacity or area throughput Gbps/km2, 5G focus: **1000 Gbps/km2**
     - edge rate (the worst data rate that user can expect), 5G focus: 100 Mbps***
   - Advanced QoS guarantees (i.e. latency 0.1-1ms)
   - Massive D2D connectivity (i.e. 1000000 connections per km2)

* 5G vision, requirement and technology trends – ITRS's viewpoint", January 2014 (China)

**R. Tafazolli, "Why 5G", Summit on Future Mobile and Standards for 5G, November, 2013.

***Jeffrey G. Andrews, et al., "What will 5G be?", IEEE JSAC special issue on 5G wireless communication systems, May, 2014

Major factors/drivers towards 5G

2) Cost/performance ratio – new innovations/technologies, e.g.

- new effective radio technologies (w.r.t. channel modeling, multiple antenna schemes, interference handling, etc.)

to find a compromise in the context of cost/performance ratio taking into account:

  - shrinking cell size is inversely proportional to the cost
  - new frequency band extension towards tens of GHz is proportional radio wave attenuation

- IP flow mobility and per flow data offloading
  - flexible traffic allocation between network entities in heterogeneous densely environment

Major factors/drivers towards 5G

3) Frequency bands and spectral bandwidth limitations

- Innovations/ technologies evolution (Item 2) should give technical possibilities to use frequency bands at a level of tens GHz

4) Political factors

- Requirements/restrictions from the side of politicians and operators have not defined yet, but...
  - the "political decision" should be made at a level of the entire mobile industry that needs to lobby for access to more spectrum*

* Huawei 5G press-release, Tong Wen's speech, July, 2013

5G definition

(Andrey Krendzel's view)

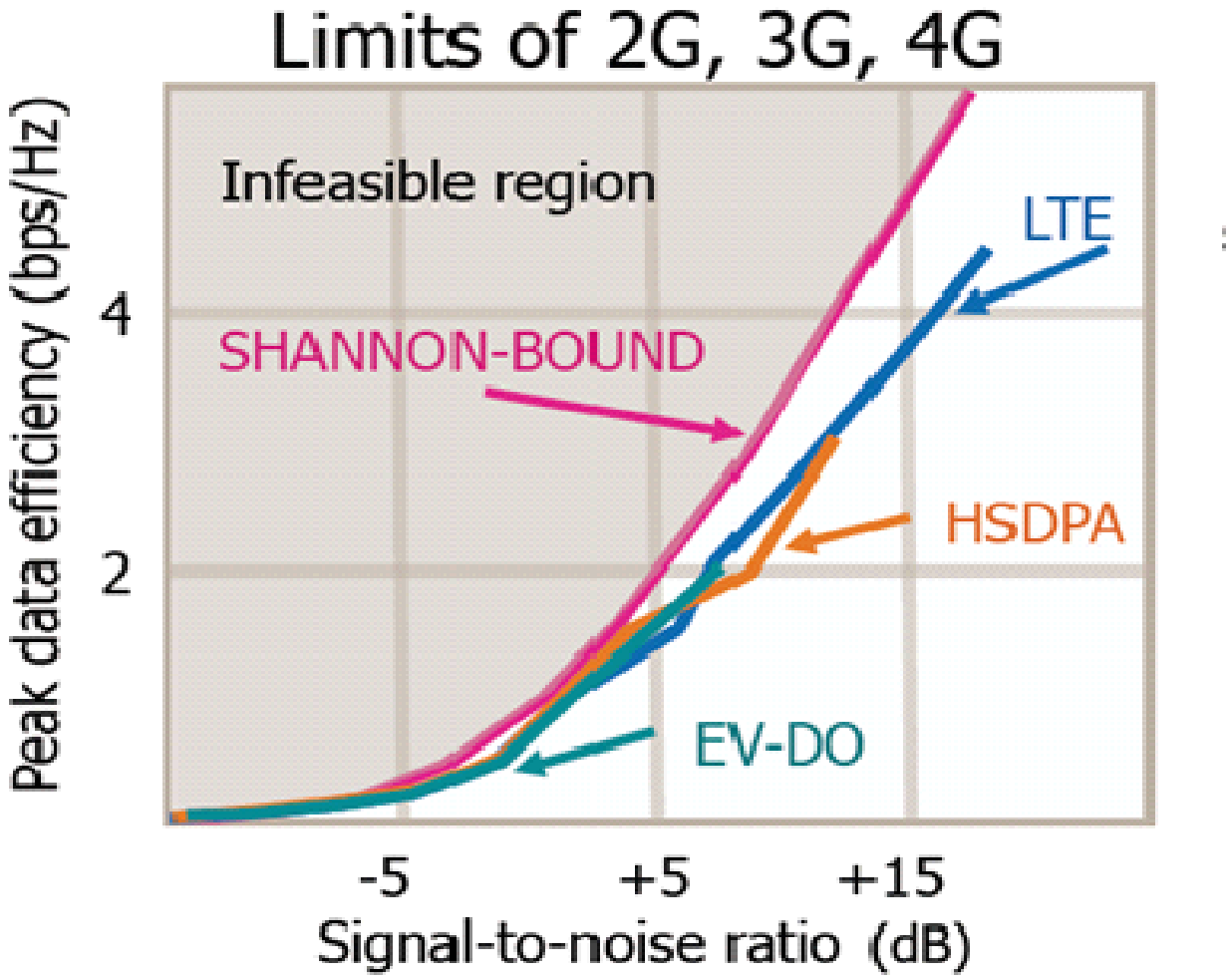
5G is a concept of the 5th generation mobile networks including functional innovations/technologies to support:

- all kinds of on-line and off-line IPv4/IPv6 based services and applications with advanced (from 4G) QoS guarantees
- seamless mobility in densely and heterogeneous environment of:
  - Multiradio UEs with multimedia capabilities,
  - a large set of multimedia services and applications
  - IP data flows through multiple RANs

for data rate (**bps/km2**) upper 1000 times higher in comparison with 4G by means of innovative solutions in both RANs and unified Core Network

Backup slides

Achievable spectral efficiency by means of different radio technologies*



* J. Weber, R. Sigle, "Neue LTE-Architektur als Antwort auf die Mobile Datenexplosion", Alcatel-Lucent Deutschland AG, Oktober 2012.

Population density in some European cities

City	Average people/km^2
Athens	5400
Madrid	5200
London	5100
Barcelona	4850
Warsaw	4300
Naples	4100
Berlin	3750
Paris	3350
Helsinki	2850

Outside Europe, there are also extremely populated regions that have much higher population density than European cities, e.g. *Mong Kok, Hong Kong, Shanghai, Macau, New York, Taipei*

Major factors/drivers towards 5G

1) Demand for services/applications from different groups of end-users (Competitive market impact)

- Higher *area spectral efficiency* (**bps/km2**) in a densely environment
  - ITU-R IMT-Advanced requirements (ITU-R M.2134):
    - 2.2b/s/Hz/cell for downlink and 1.4b/s/Hz/cell for uplink (base coverage urban)
    - supported rate is **540 Mbps/km2** (500m cell range; 0.1625 km2 cell coverage area, 40MHz)
    - **not sufficient for 5G!**
  - Capacity needs (now):
    - peak density of 11 000 people/Km2 (New York metropolitan area)
    - of which 20% require access to a broadband service at the same time
    - each requiring 20Mbps (e.g. to watch a 4kHD movie)
    - 8,000 X 20% X 20Mbps = **44 Gbps/Km2**

→ **5G focus: 500-1000 Gbps/km2**

Ref: Mischa Dohler, 5G Ultra-High Capacity Network Design with rates 10xLTE-A, IEEE ComSoc Distinguished Lectureship Tour, November, 2012

MOBILITY/SMART [Panel]

Mobility, Smart Cities and Urbanicity: Handling Mobile Citizen Data

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University of Siegen, Germany

MOBILITY/SMART [Panel]

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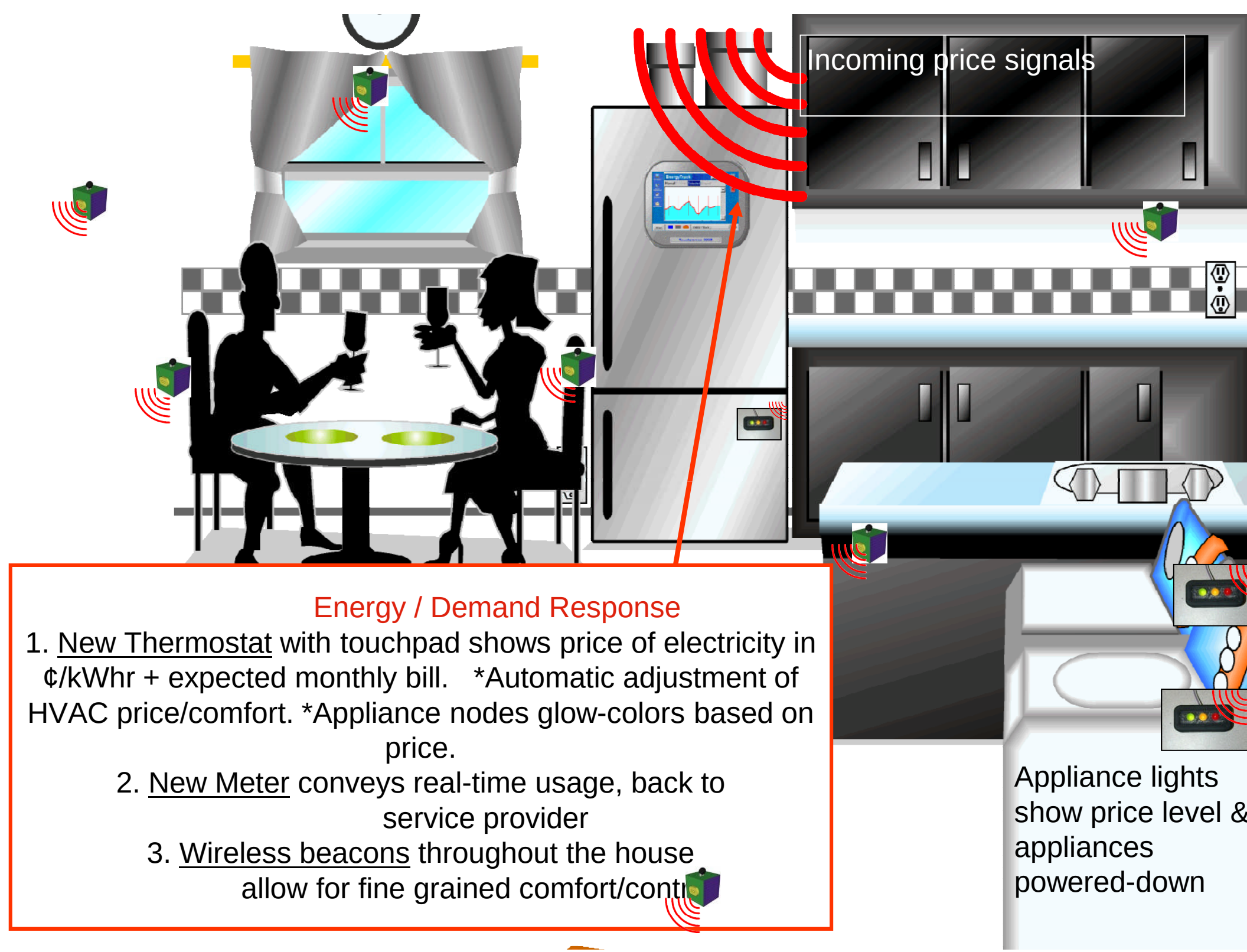
MOBILITY/SMART [Panel]

1. We have prototyped miniature platforms that sense communicate and self-power.
2. These provide the essential building blocks for resilient communicating infrastructures.
3. The later paper focuses on energy measurement.
4. The panel stresses the need for open standards and methods that allow cross-disciplinary cooperation.
5. Without this, smart cities will not be smart but silo-ed as they are today

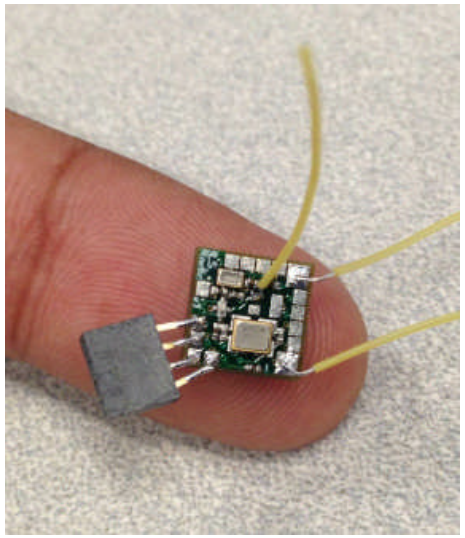


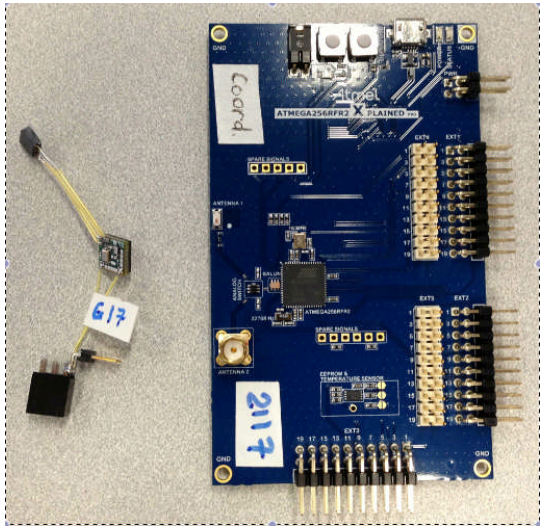
Energy / Demand Response

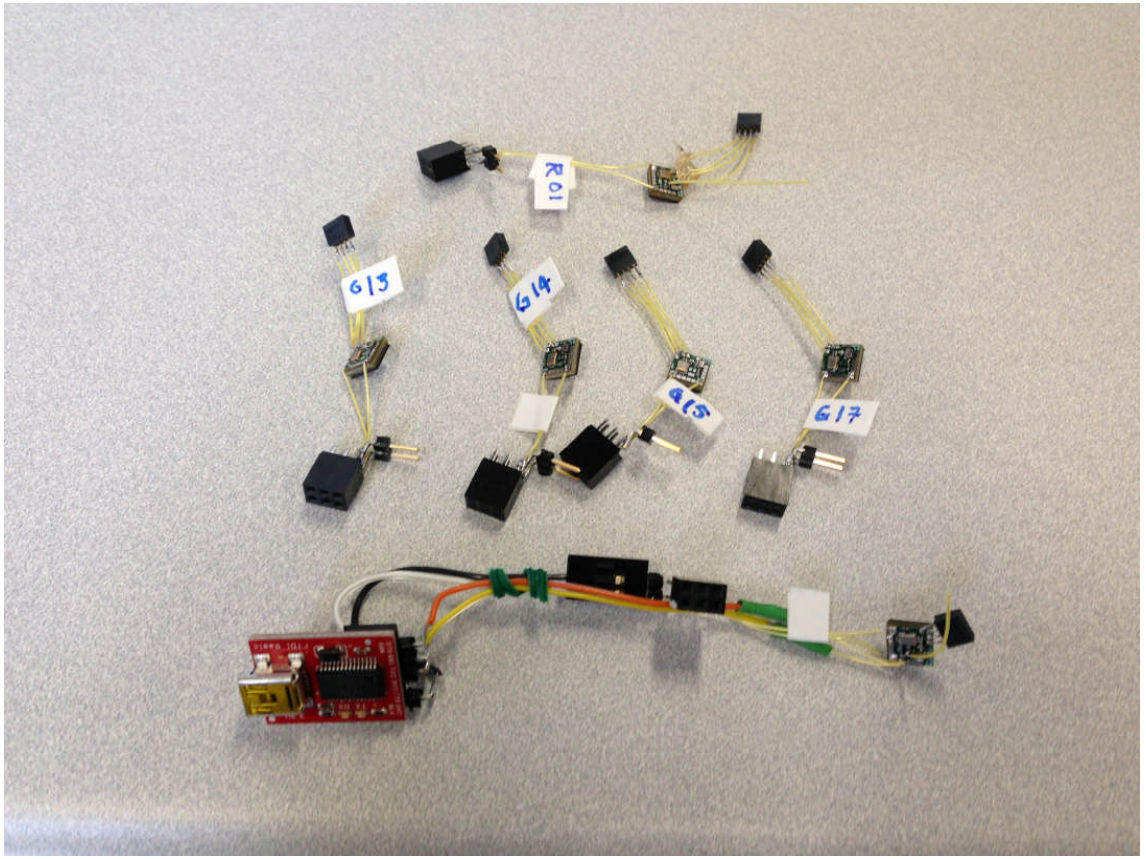
1. New Thermostat with touchpad shows price of electricity in ¢/kWhr + expected monthly bill. *Automatic adjustment of HVAC price/comfort. *Appliance nodes glow-colors based on price.
2. New Meter conveys real-time usage, back to service provider
3. Wireless beacons throughout the house allow for fine grained comfort/contr

Appliance lights show price level & appliances powered-down

Node Construction







MOBILITY/SMART [Panel]

Mobility, Smart Cities and Urbanicity: Handling Mobile Citizen Data

Amnon Dekel
Shenkar: Engineering, Design, Art

MOBILITY/SMART [Panel]

1. What is a city?
   A. It is first and foremost the people who live in it.
   B. It is also the people who visit it- some daily for work, others occasionally for entertainment and tourism.
   C. And it is the physical infrastructure of buildings, roads, paths, parks, etc.
   D. It is the design of the urban experience.

MOBILITY/SMART [Panel]

1. As the world we live in becomes more and more digital (in the devices who carry and the devices we use daily)…
2. As our homes and offices become devices in and of themselves…
3. As everything is quantified…

MOBILITY/SMART [Panel]

There is the opportunity to leverage the power of the aggregated community and computing to use this data for the public good

Public Data for the Public Good

MOBILITY/SMART [Panel]

4. The potential for using contextual computing to help us improve the lives of groups and communities within a city is an very exciting prospect.
   A. As in all such things, arguments will arise as to what is the public “good” and who owns this knowledge.
   B. In this sense, the philosophy should be of openness, open source and crowdsourcing.

MOBILITY/SMART [Panel]

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DISCUSSION

The Fourth International Conference on Mobile Services, Resources, and Users

MOBILITY 2014
July 20 - 24, 2014 - Paris, France

MOBILITY/SMART Panel
Mobility, Smart Cities and Urbanicity: Handling Mobile Citizen Data

Major factors/drivers towards 5G

Dr. Andrey Krendzel (Huawei Technologies, Finland R&D Center),
andrey.krendzel@huawei.com

OUTLINE

- What is known about 5G?
- Major factors/drivers towards xG (x = 2,3,4,5)
- Major factors/drivers towards 4G
- Major factors/drivers towards 5G
- 5G definition
- References

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   - Needs for data rates higher than 2-10 Mb/s
   - IP session continuity across multiple access networks
2) Cost/performance ratio
   - Rate requirements are achievable for reasonable price
   - Flat architecture
   - Single unified standard
   - Interworking with non-3GPP access networks
3) Frequency bands and spectral bandwidth limitations
   - Technologies enable increasing channel spectral efficiency: Carrier Aggregation (CA), MIMO, etc.
4) Political factors
   - Consensus between 3GPP, 3GPP2, IETF was reached...

Major factors/drivers towards 5G

1) Demand for services/applications
   - support all kinds of on-line (as well as off-line) IP based services and applications
     - 5G promising services/apps: augmented reality teaching, multi-user UHD telepresence and hologram conference, somatosensory virtual game, intelligent farming, energy monitoring, connected iVehicle, HD remote diagnostic, etc.[2]
   - Always sufficient rate to get the perception of infinite capacity for the end-users[3]
     - area capacity or area throughput Gbps/km2,
       - 5G focus: **1000 Gbps/km2**
     - edge rate or 5% rate (the worst data rate that user can expect),
       - 5G focus: **100 Mbps**[4]
   - Advanced QoS guarantees (i.e. virtually zero latency ~1 ms)
   - Massive device connectivity (i.e. 1000000 connections per km2)

Major factors/drivers towards 5G

2) Cost/performance ratio – new innovations/technologies, e.g.

- new effective radio technologies (w.r.t. channel modeling, multiple antenna schemes, interference handling, etc.)

  to find a compromise in the context of cost/performance ratio taking into account:

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  - a large set of multimedia services and applications
  - Dynamic handling of individual IP data flows through multiple accesses

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References

1. Mobile and wireless communications enablers for the 2020 Information Society, EU FP7 METIS, 2013, www.metis2020.com
2. 5G vision, requirement and technology trends – ITRS's viewpoint", China, January 2014
3. R. Tafazolli, "Why 5G", Summit on Future Mobile and Standards for 5G", November, 2013.
4. Jeffrey G. Andrews, et al., "What will 5G be?", IEEE JSAC special issue on 5G wireless communication systems, May, 2014
5. Tong Wen, "Huawei invests in 5G networks", Huawei 5G press-release, July, 2013, http://blogs.wsj.com/digits/2013/07/17/huawei-invests-in-5g-networks/

Fakultät Wirtschaftswissenschaften,
Wirtschaftsinformatik und Wirtschaftsrecht
Department IT-Security Managment

UNIVERSITÄT SIEGEN

Adapting Systems to Spacial Relationships for Usable Secure Systems

MOBILITY 2014 — Panel "Mobility, Smart Cities and Urbanicity: Handling Mobile Citizen Data"

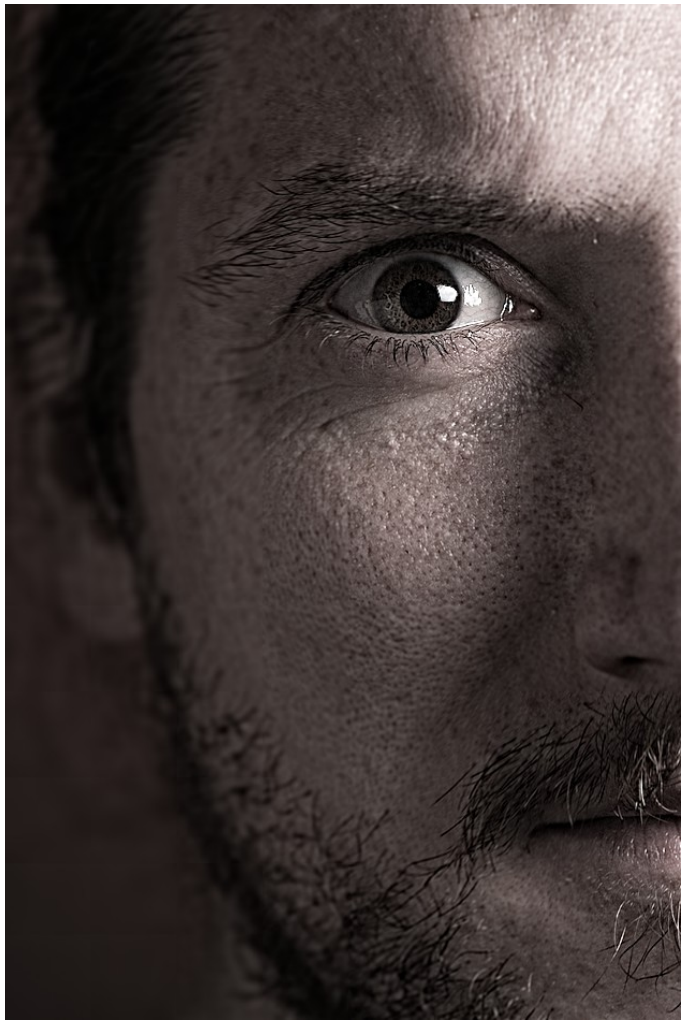
Lars Fischer

Siegen University

2014-07-24

Lars Fischer

- Dipl. Inf. Uni Bremen
- Dissertation (TU-Darmstadt): Measuring Unlinkability for Privacy Enhancing Technologies
- Consultant IT-Security
- University Siegen
  - IT-Sec Group
  - WiNeMe Group (Prof. Wulf)



Authentication Conjectures

...the single, most fundamental Sec Feature

- Prerequisite to
  - Integrity
  - Secrecy
- "Natural" form: Recognition
- IT-Sec form: Unique Identity

IT-Sec Authentication

- Usability
  - Users want Functionality
  - Crypto/Auth is not Function
  - User don't want keys
- Global Uniqueness
  - Too much for most communication
  - Requires effort (e.g. infrastructure)
  - Separation of Identities
  - Social Circles

Basic Re-Identification

1. Alice meets Bob (the first time)
   - (their computers exchange credentials)

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   - Relationship model in background
   - (Authenticity grows, Trust grows)

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```
<Alice> a Person;
        knows <Bob>.
<Bob> a Person;
      cert:key [....
            contact_history [a Seq;
                  contact [medium <jabber> ...]
                  contact [medium <spatial>...]
               ...]].
```

Chance/Challenge Smart City

- Computers Everywhere
  - Personal
  - Networked
- Co-Presence/Co-Location
- Better-Than-Nothing Sec
- Natural Separation

Concluding

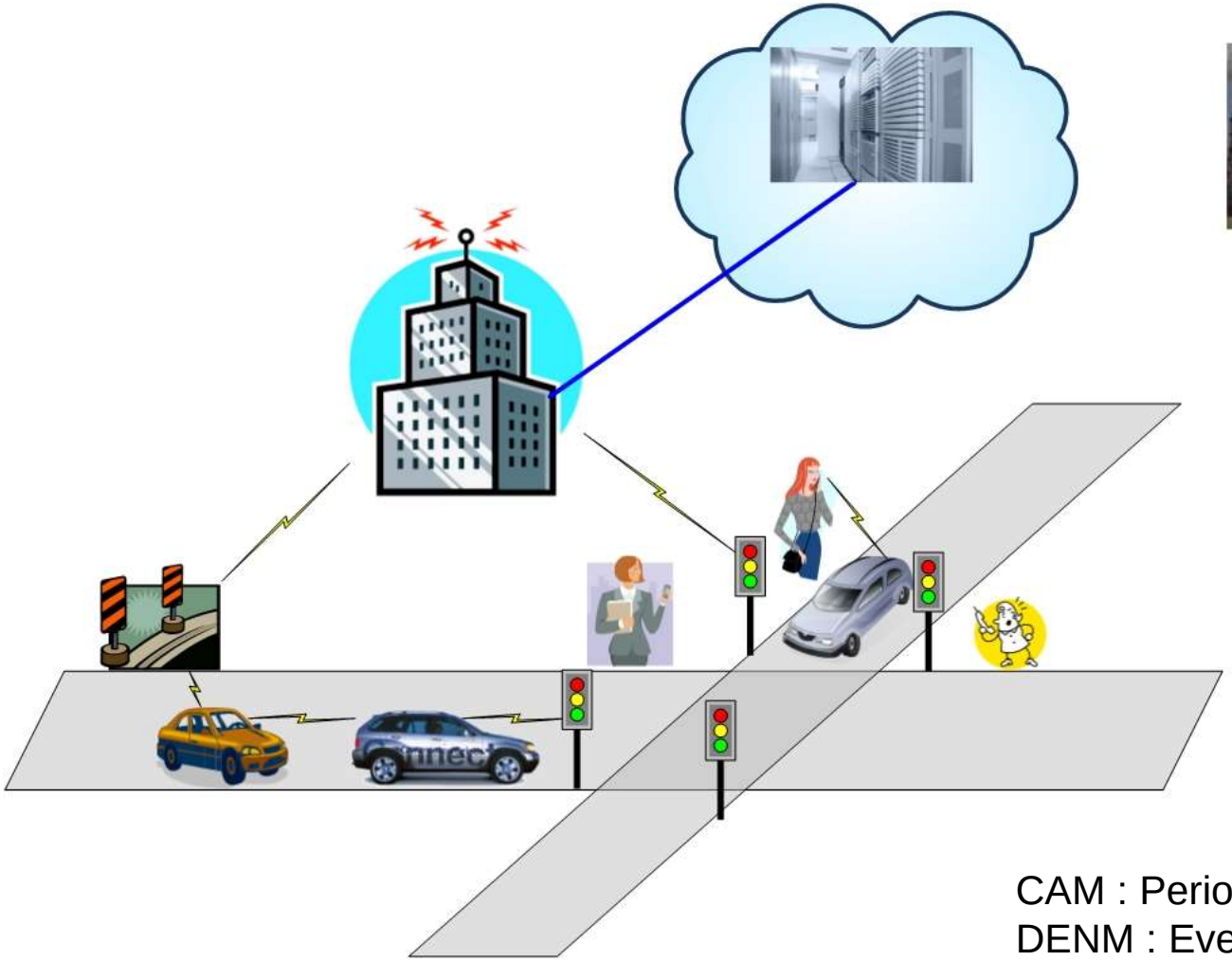
- Adapt to Human Needs and Social Structure
- Sustainability of Contacts $\rightarrow$ S.of Data
- Authenticity needs Critical Mass

Panel Session
MOBILITY / SMART

Michelle WETTERWALD

MOBILITY 2014
July 24, 2014

Handling Mobile Citizen Data



CAM : Periodic (1-10Hz)
DENM : Event (Multi-hop)
SPAT : when required (traffic light)

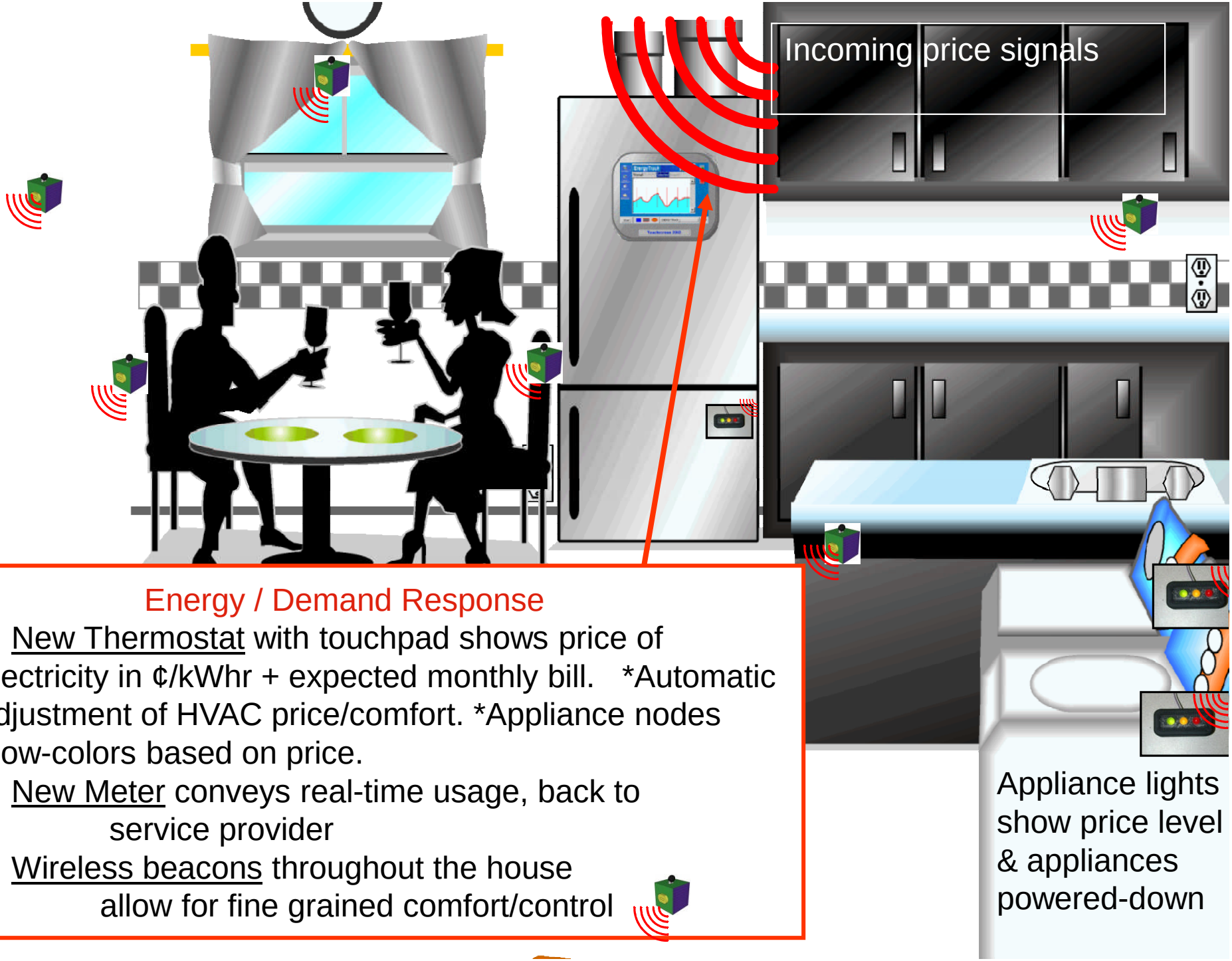
Impacts

- Huge amount of data from vehicles (and citizens) generated every day
- Data fusion creates monetary value: reliable predictions, traffic / travel efficiency (multimodality), enhanced services
- Data are stored in an increasing number of data centers
- Running these data centers mandates security, energy, ….

Questions

- Which amount of the data created should go to The Cloud?
- Who owns the data?
  - Citizen user, storage owner, aggregator,
  - New legal concepts and solutions are required.
- How is privacy ensured?
  - Pseudonyms, cryptography.
- What about flushing the data which is not needed anymore? How to make the selection?
- Research needs to focus on reducing the energy cost of the digital era.

Thank you for your attention



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Node Construction