Panel on SMART / MOBILITY / URBAN COMPUTING
Topic: Smart Cities: Real Needs versus Technological and Deployment Challenges

DataSys 2016 Conference, Valencia, May 22-26, 2016

PANEL Panel on SMART / MOBILITY / URBAN COMPUTING
Topic: Smart Cities: Real Needs versus Technological and Deployment Challenges

Moderator

Eugen Borcoci, University "Politehnica"of Bucharest (UPB), Romania

Panelists

Josef Noll, Basic Internet Foundation #Basic4All | University of Oslo/UNIK – Kjeller, Norway

Lasse Berntzen, University College of Southeast, Norway

Jaime Lloret Mauri, Universidad Politecnica de Valencia, Spain

Christine Perakslis, Center for Research and Evaluation, Johnson & Wales University, USA

S.R. Venkatramanan, PayPal, Inc., USA

Eugen Borcoci, University Politehnica – Bucharest, Romania

Smart cities needs

- **Estimation: 80-90% population will be living in a city by 2025-30, in many countries (World Resources Institute)**
- **Need: Integrate multiple information and communication technology (ICT) solutions in a secure fashion to manage city's assets**
  - local departments information systems, schools, libraries, transportation systems, hospitals, power plants, water supply networks, waste management, law enforcement, and other community services
- Smart city – oriented technologies → benefits for all sectors
  - government services, transport and traffic management,
  - energy, health care, water,
  - innovative urban agriculture, waste management, ..

- **Smart cities**
  - **Applications and services**
    - e-governance and e-services
    - Online operations(commerce, banking, payments, ..)
    - Navigation in the urban environment, urban traffic optimization
    - Emergency alert and crisis response systems
    - Large range of mobile apps and services with mobile/SmartPhones terminals
    - Energy distribution and saving, smart grid, smart metering
    - User-data interaction and data usage in heterogeneous environments
    - Social networks and content/media-related services
    - Dynamic kiosks to display real-time information
    - Crowdsourced data acquisition in the City
    - City Surveillance and public safety
    - Smart climate control systems in homes and businesses
    - …..

Additional question : could be the real needs prioritized– to save CAPEX and to reduce the risk of developing rather "useless" services?

Smart cities

- **Research/development challenges**
  - Business models, Architectures, protocols, implementation models for smart city – systems and supporting technologies
  - Development of
    - Smart Devices and Agents
    - Smart Urban Spaces
    - Web-based Applications and e-Services Broadband networks
- **Supporting technologies**
  - Networking: **Future Internet**: fixed networks + heterogeneous mobility enabled networks (2G, WiFi, 3G, 4G, 5G + IoT, D2D, M2M, V2X, ..)
  - Cloud/edge/mobile computing and networking - integration
  - Reliability and security/trust- oriented technologies
  - Big data, IoT, ….
  - …

- **Thanks !**
- **Floor for the speakers…..**

Panel on SMART / MOBILITY / URBAN COMPUTING

Topic: Smart Cities: Real Needs versus Technological and Deployment Challenges

Mobile Edge Computing – use cases

Eugen Borcoci
University Politehnica Bucharest
Electronics, Telecommunications and Information Technology Faculty (ETTI)

Eugen.Borcoci@elcom.pub.ro

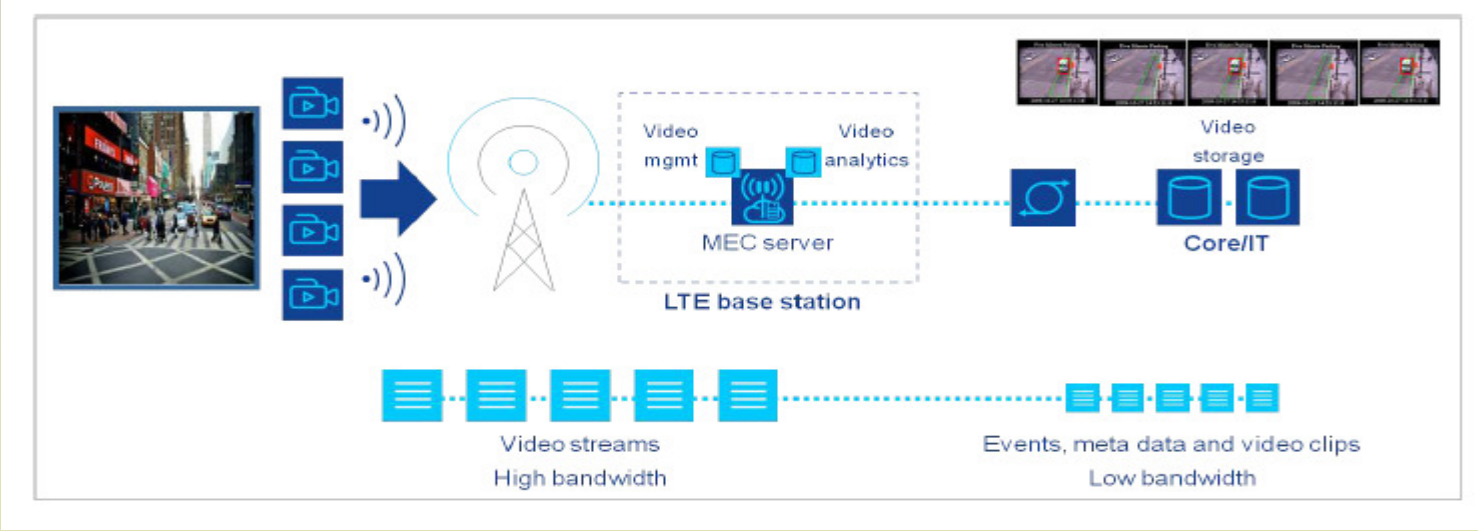
DataSys 2016, Conference, Valencia, May 22-26, 2016

Smart Cities: Real Needs versus Technological and Deployment Challenges

- **Mobile Edge Computing**
  - **Candidate technology included in the framework for smart cities**
  - **MEC**
    - **provides IT and CC capabilities within the Radio Access Network (RAN)**
    - increases responsiveness from the edge
      - low latency and high-bandwidth + direct access to r.t. RAN information
  - **Standardization actors:** ETSI, 3GPP, ITU-T
  - Operators can open RAN edge to third-party partners
  - MEC → Proximity, context, agility and speed→ it can create value and opportunities forMNOs,SP/CPs, *Over the Top (OTT)* players and *Independent Software Vendors (ISVs)*

Mobile Edge Computing

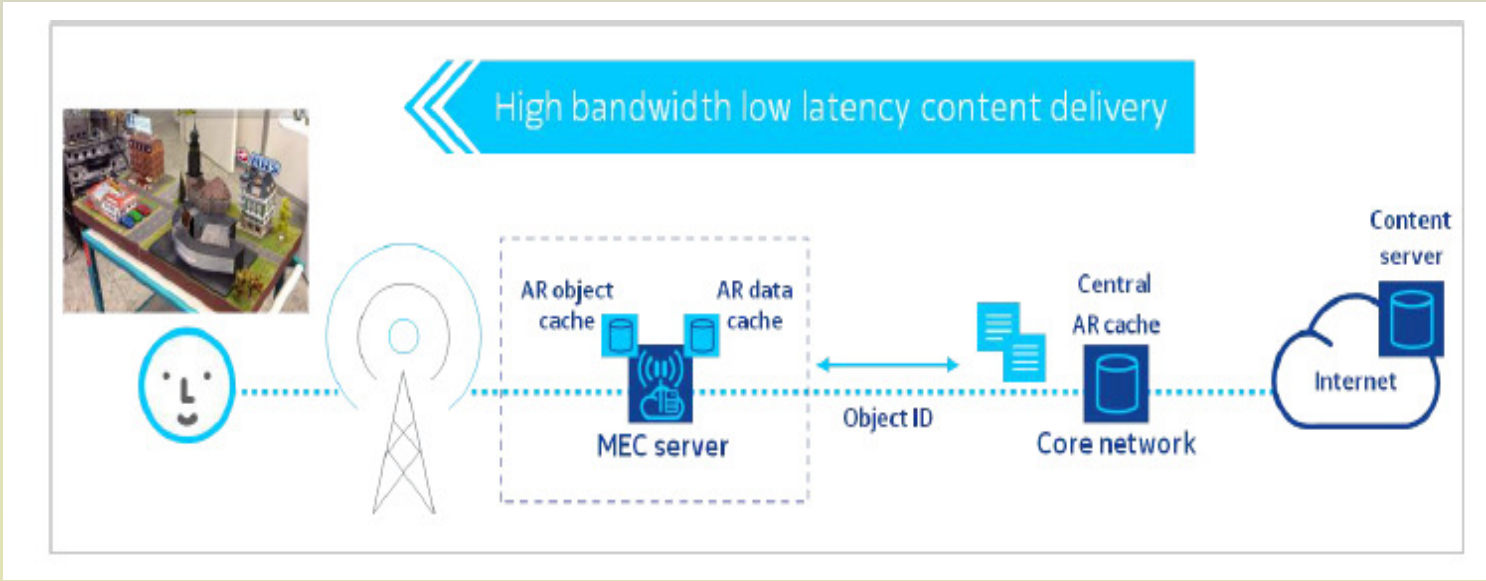
- **MEC Use Cases examples**
  - **Video Analytics**
    - **Applications : safety, public security to smart cities**
    - The video mgmt. application transcodes and stores captured video streams from cameras, received on the LTE uplink
    - The video analytics app. processes the video data to detect and notify specific configurable events e.g. object movement, lost child, abandoned luggage, etc.
    - The app. sends low bandwidth video metadata to the central O&M server for DB searches.



Source: https://portal.etsi.org/Portals/0/TBpages/MEC/Docs/Mobile-edge_Computing_-_Introductory_Technical_White_Paper_V1%2018-09-14.pdf
Mobile-Edge Computing – Introductory Technical White Paper

Mobile Edge Computing

- **MEC Use Cases examples**
- **Augmented Reality (AR) content delivery**
  - An AR app.on a smart-phone or tablet - overlays augmented reality content onto objects viewed on the device camera
  - Applications on the MEC server can provide local object tracking and local AR content caching;
    - RTT is minimized and throughput is maximized for optimum QoE
    - Use cases: offer consumer or enterprise propositions, such as tourist /sporting event/ advertisements information, etc.

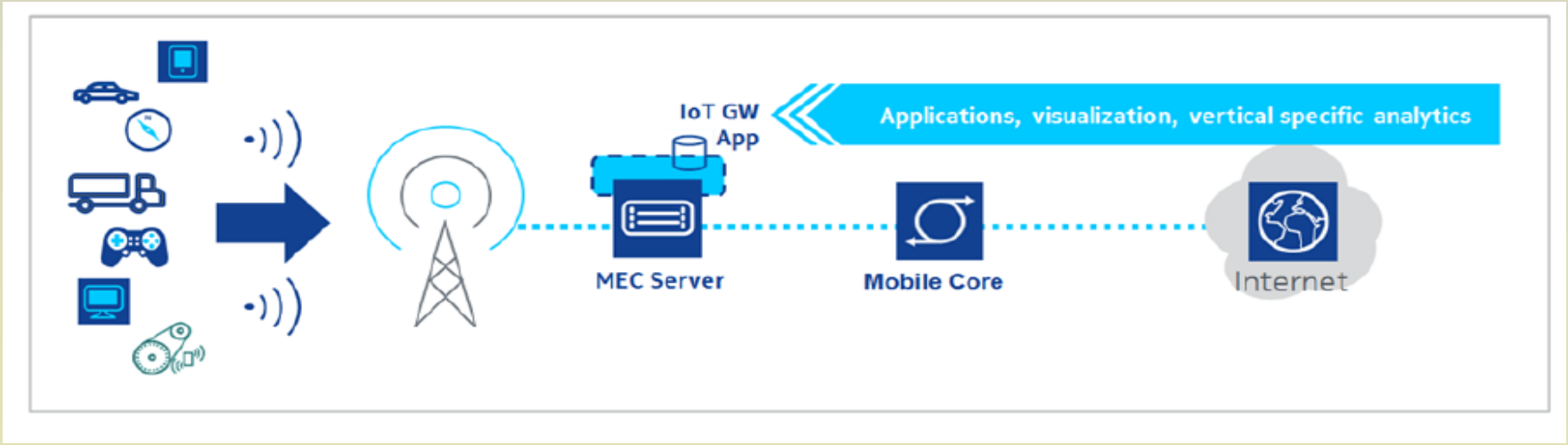


Source: ETSI

6. Mobile Edge Computing

- **MEC Use Cases examples**
- Internet of Things (IoT)
  - IoT devices
  - Often limited (processor, memory capacity)→ need to aggregate messages and ensure security and low latency
  - r.t. capability is required and a grouping of sensors and devices is needed for efficient service.

  - Solutions:
  - IoT messages connected through the mobile network close to the devices
  - This also provides an analytics processing capability and a low latency response time.



Yun Chao Hu et.al., "Mobile Edge Computing A key technology towards 5G" ETSI White Paper No. 11 September 2015, ISBN No. 979-10-92620-08-5

Mobile Edge Computing

- **Thank You !**

Mobile Edge Computing

- **References**

1. ETSI https://portal.etsi.org/Portals/0/TBpages/MEC/Docs/Mobile-edge_Computing_-_Introductory_Technical_White_Paper_V1%2018-09-14.pdf Mobile-Edge Computing – Introductory Technical White Paper

2. Klas I. G. 'Fog computing and mobile edge cloud gain momentum – Open Fog Consortium-ETSI MEC-Cloudlets'. November, 2015 Available from www.yucianga.info

3. "The Internet of Things: an overview ", https://www.internetsociety.org/sites/default/files/ISOC-IoT-Overview-201510

4. Yun Chao Hu et.al., "Mobile Edge Computing A key technology towards 5G" ETSI White Paper No. 11 September 2015, ISBN No. 979-10-92620-08-5

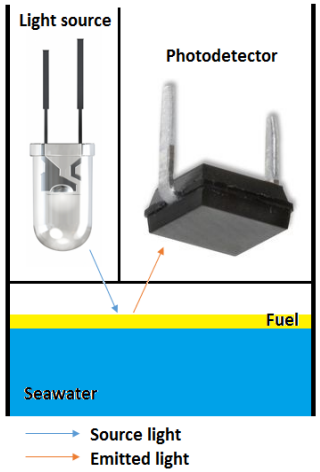
Making the city SMART

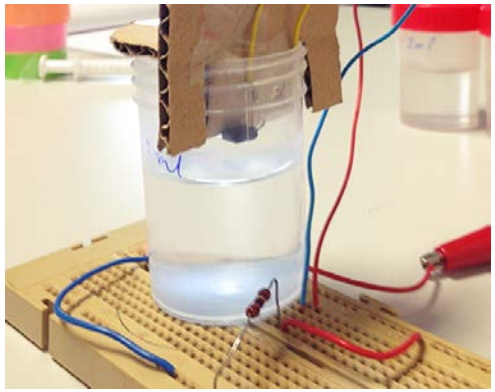
Jaime Lloret Mauri

1. Sensors and (Wireless) Sensor Networks

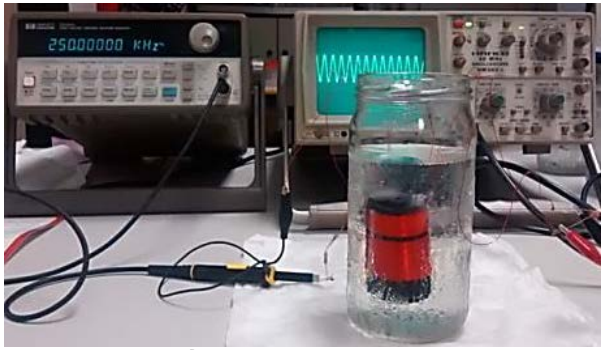
Making the city SMART

1. Sensors and (Wireless) Sensor Networks

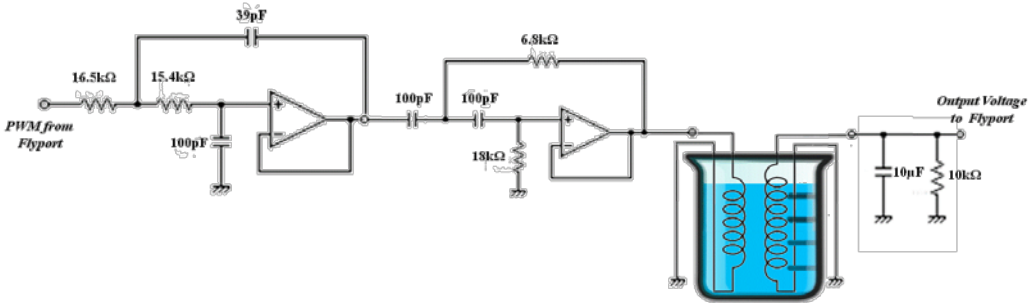


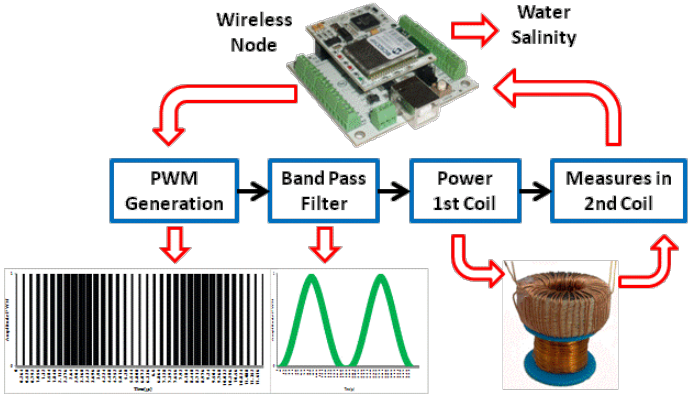


Sensor for Hydrocarbon Detection



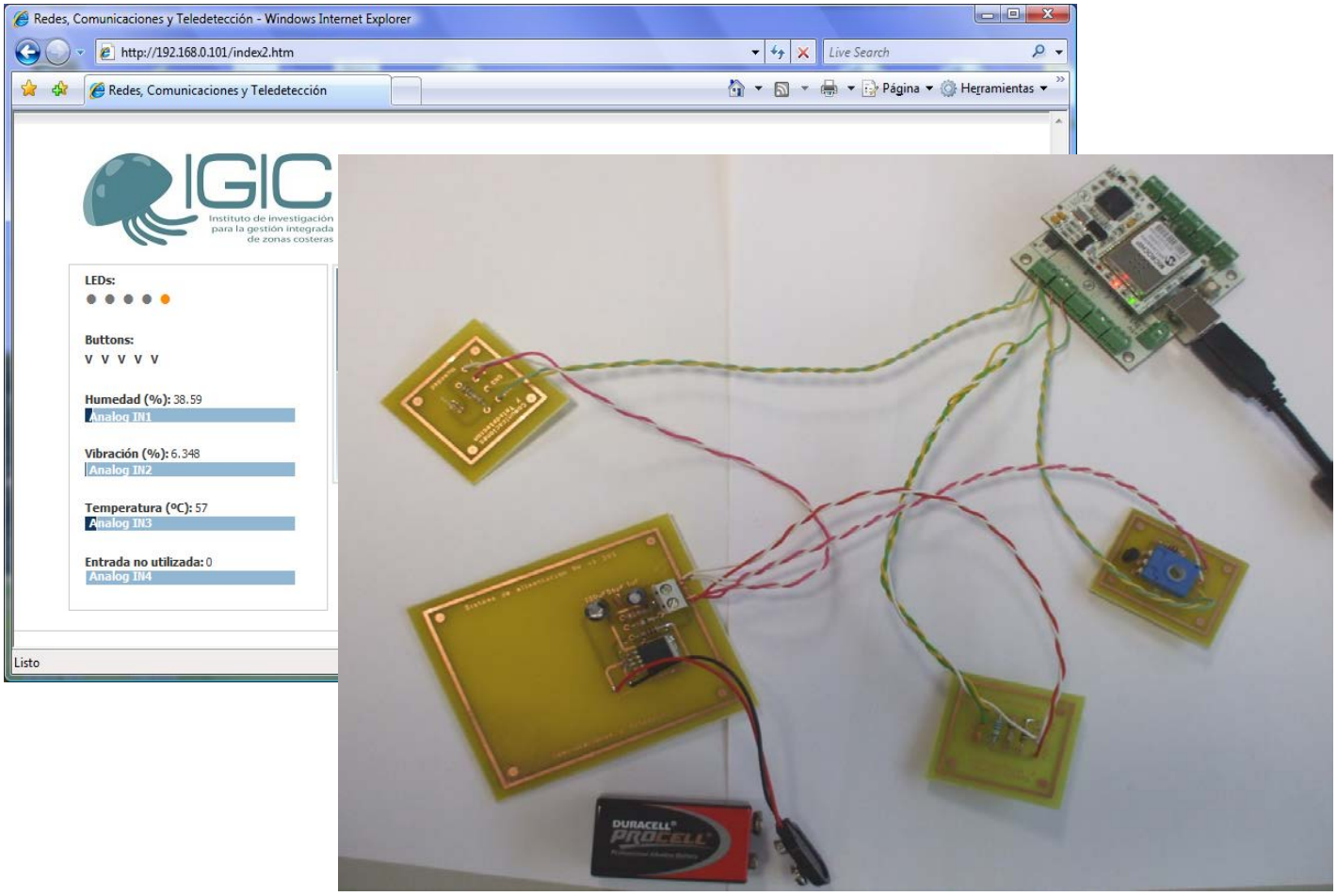
Water Conductivity Sensors





Making the city SMART

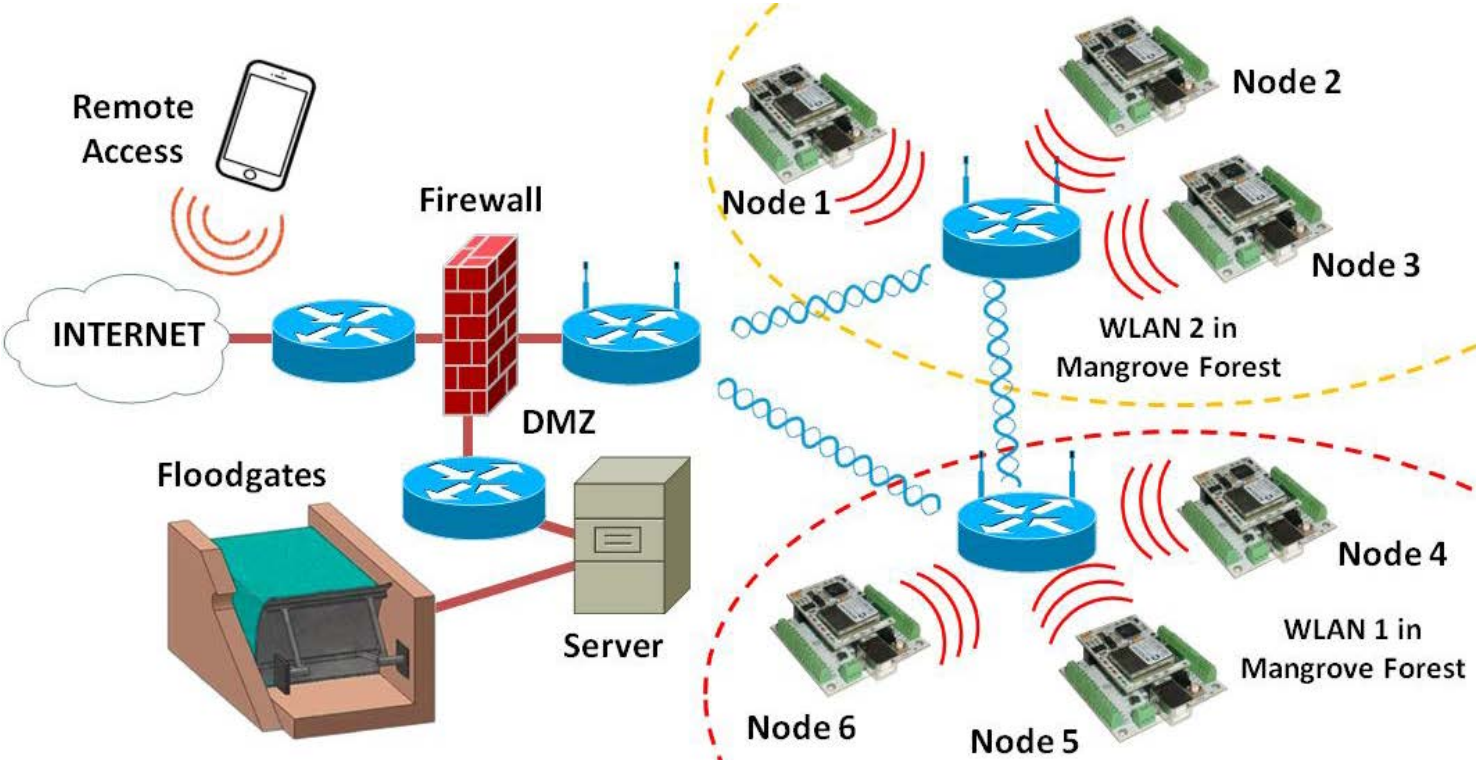
1. Sensors and (Wireless) Sensor Networks



Developing wireless sensor node to sense/monitor the environment

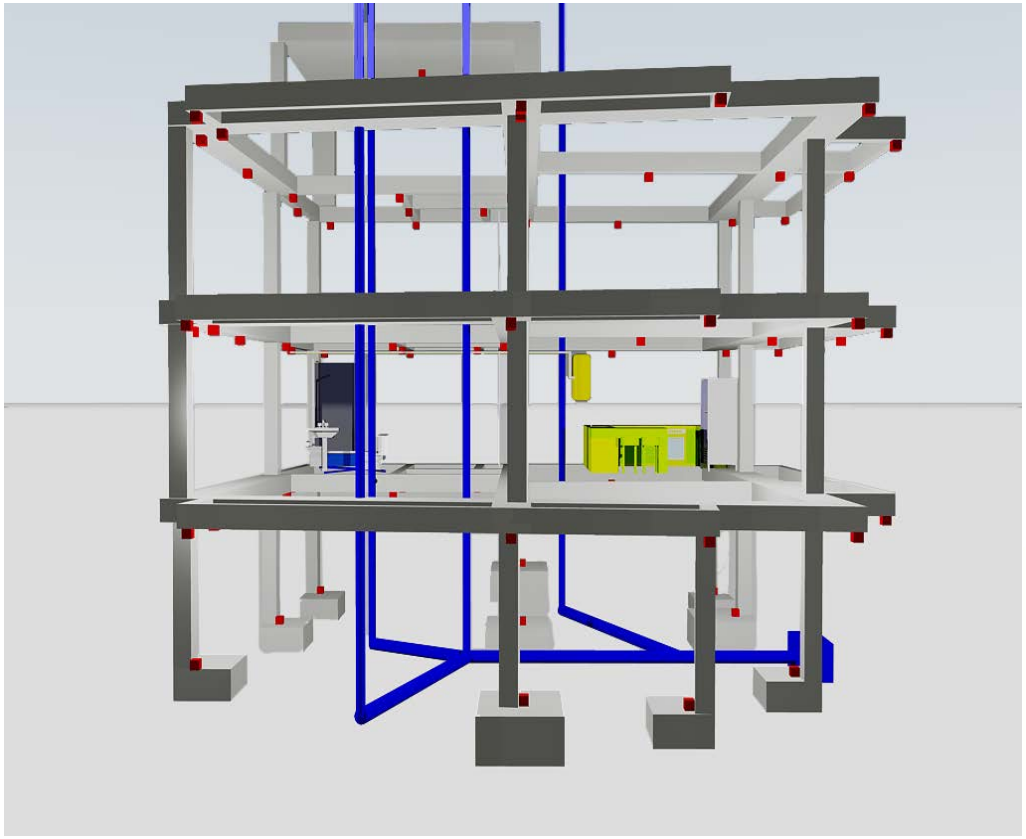
Making the city SMART

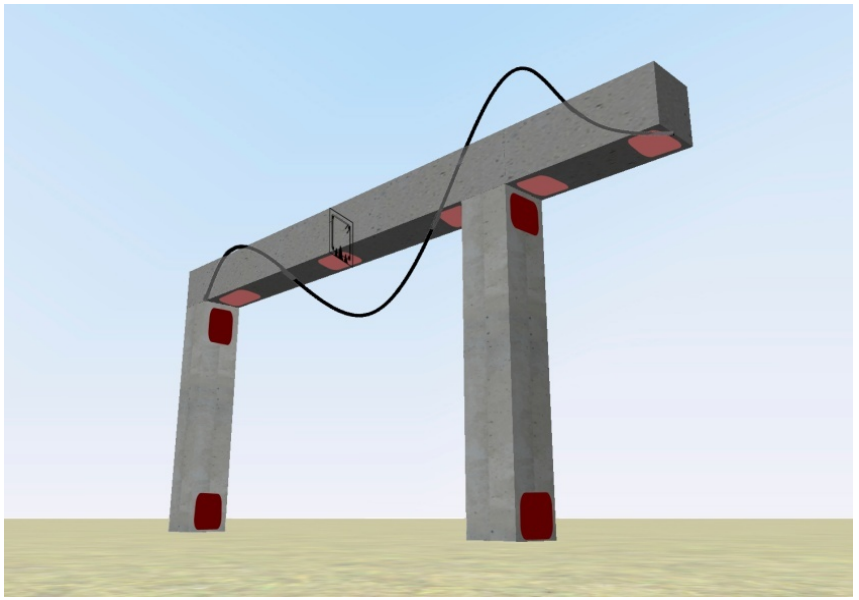
1. Sensors and (Wireless) Sensor Networks

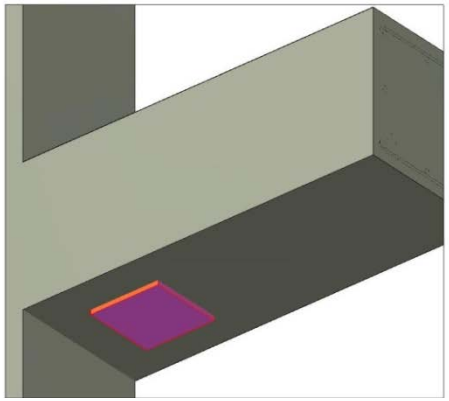


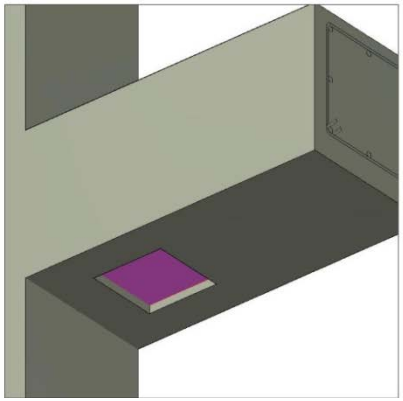
Making the city SMART

1. Sensors and (Wireless) Sensor Networks





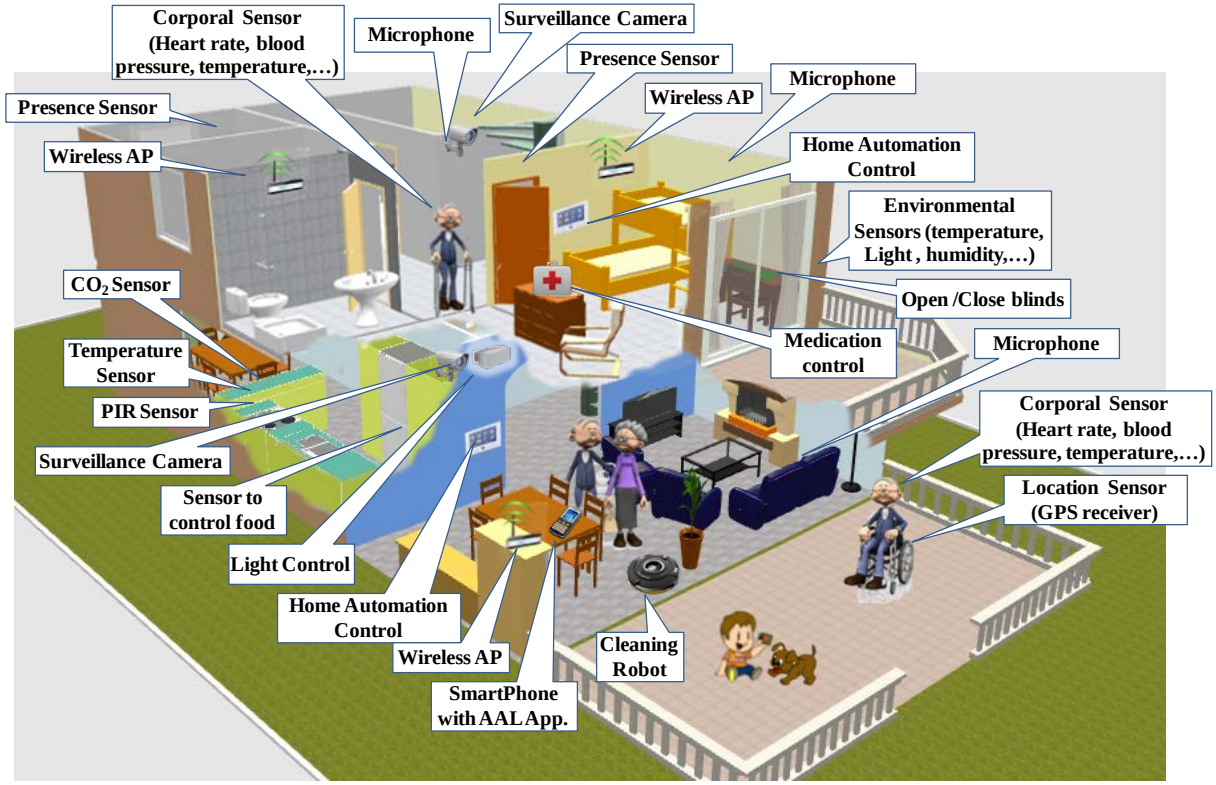




Many applications such as
Building state monitoring…

Making the city SMART

1. Sensors and (Wireless) Sensor Networks

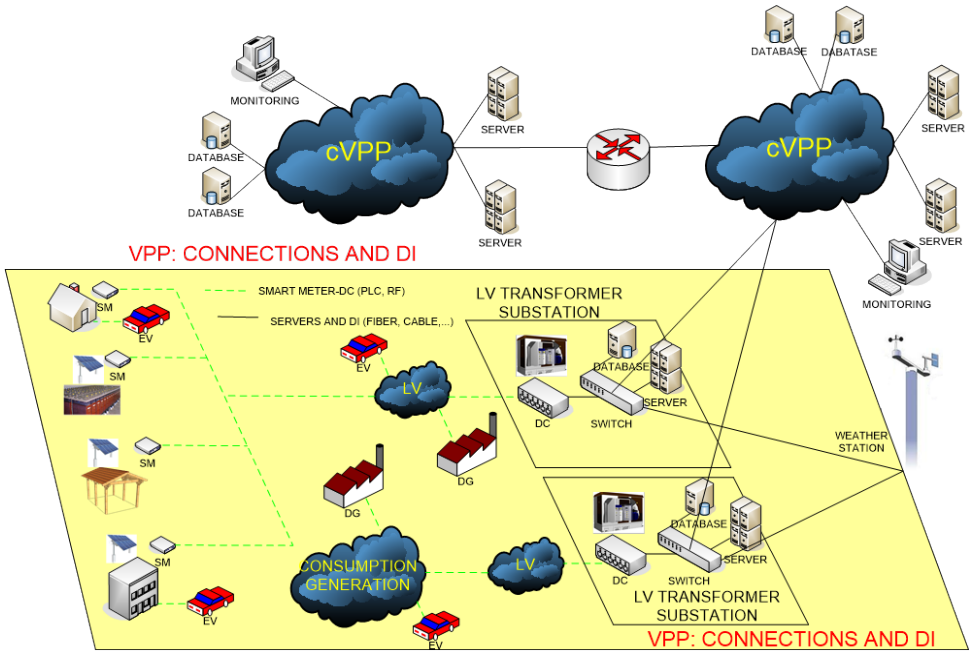


Ambient Assisted Living

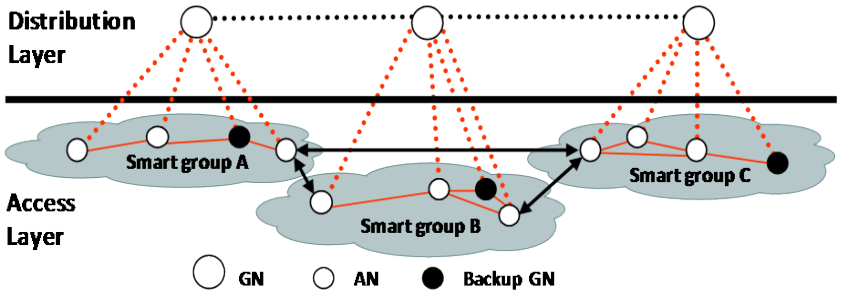
2. Network Protocols and Algorithms

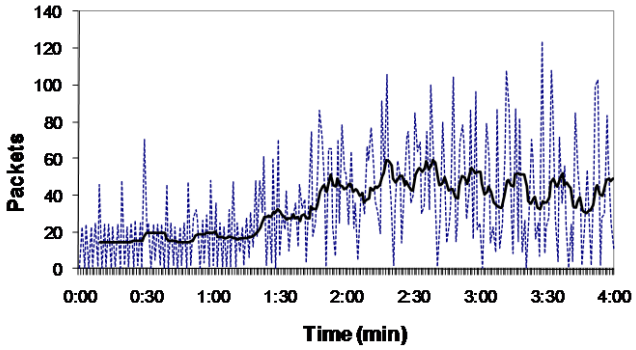
Making the city SMART

2. Network Protocols and Algorithms



Architectures to manage Smart Grids in order distribute electrical energy between virtual power plants

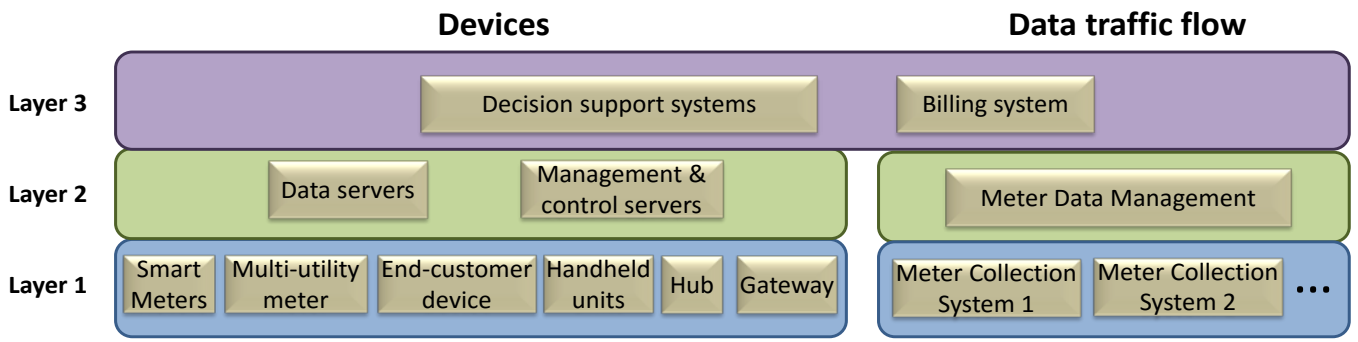


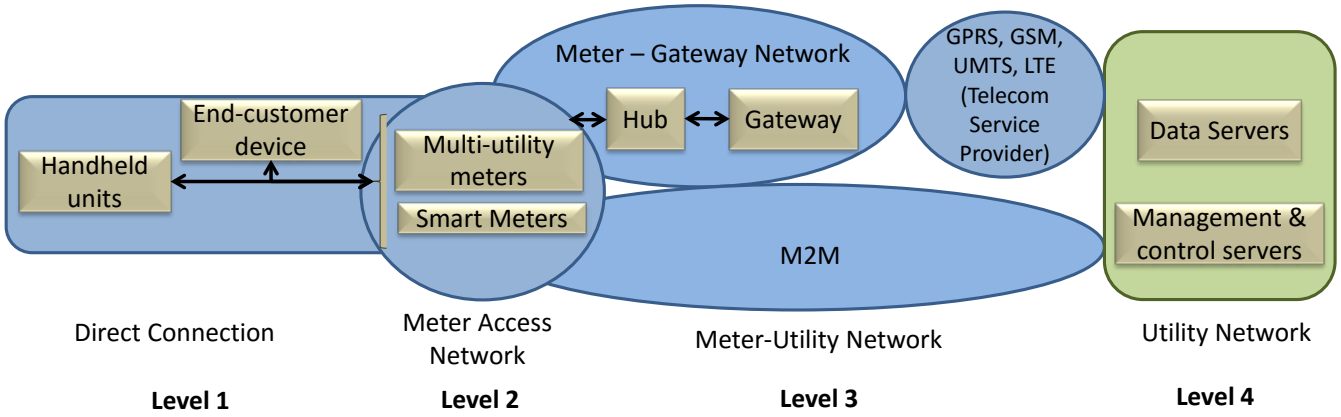


Optimum Protocols for energy distribution in Smart Grids

Making the city SMART

2. Network Protocols and Algorithms

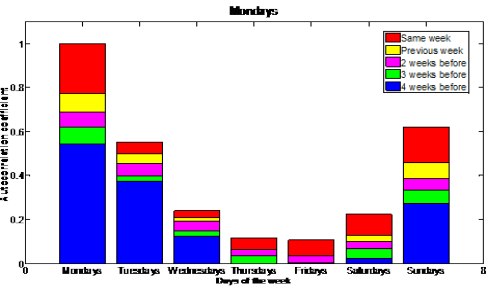


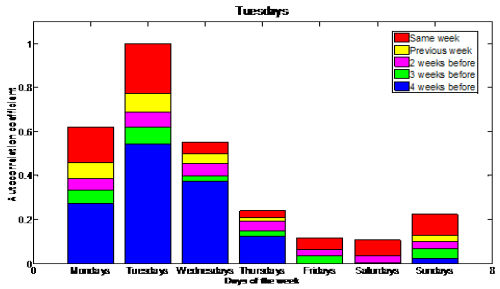


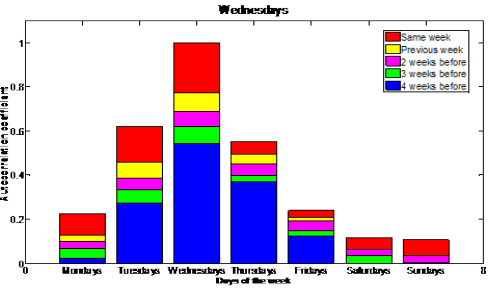
3. Artificial Intelligence and Smart Decision Systems

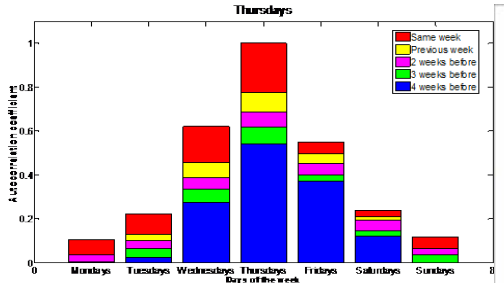
Making the city SMART

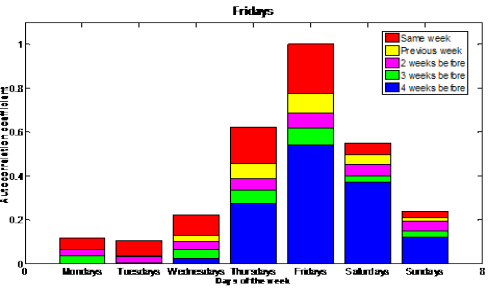
3. Artificial Intelligence and Smart Decision Systems

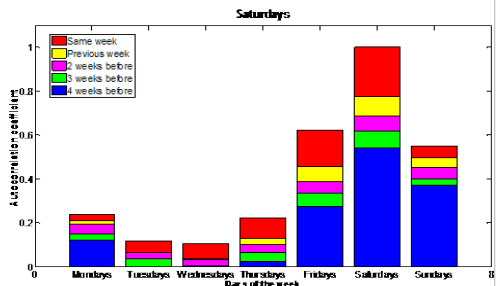


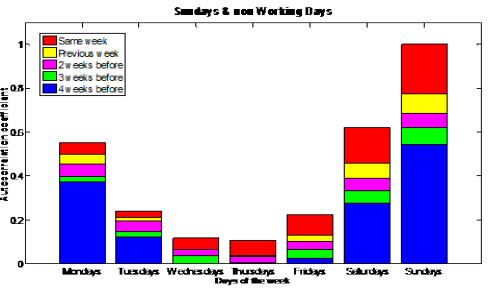




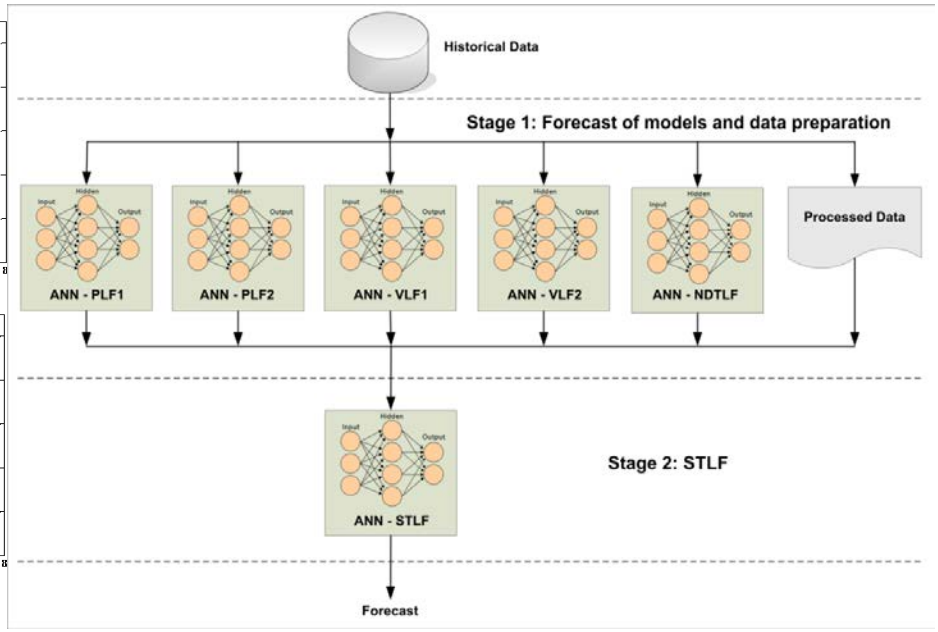






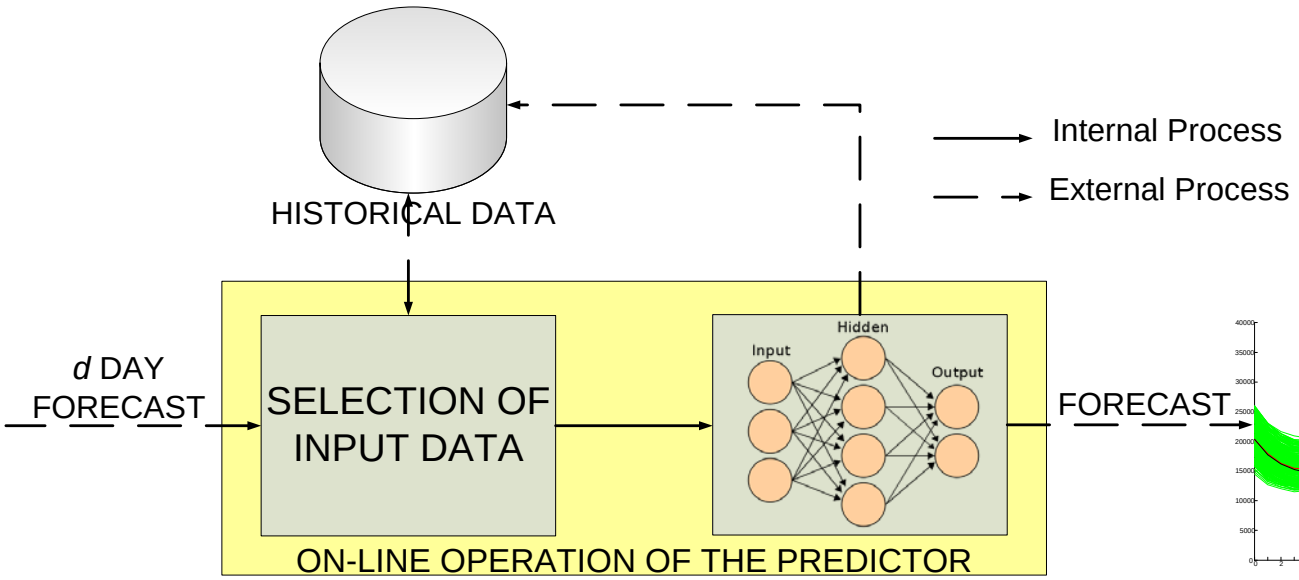


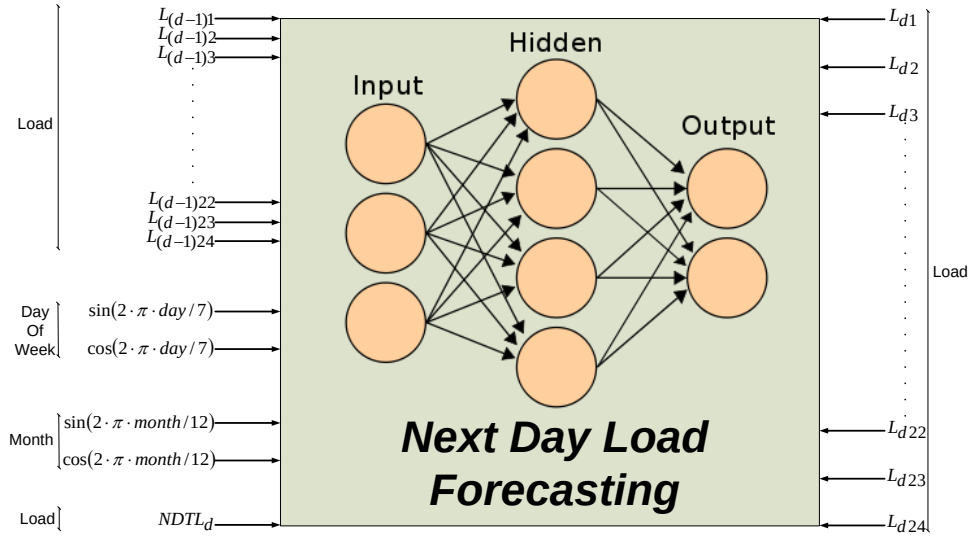
Each bar represents the autocorrelation coefficient of every week day, and each bar portion represents one week delay time



Making the city SMART

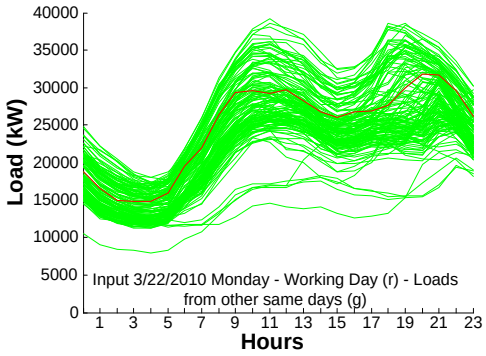
3. Artificial Intelligence and Smart Decision Systems

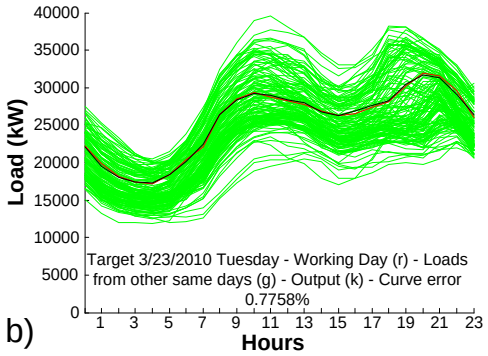




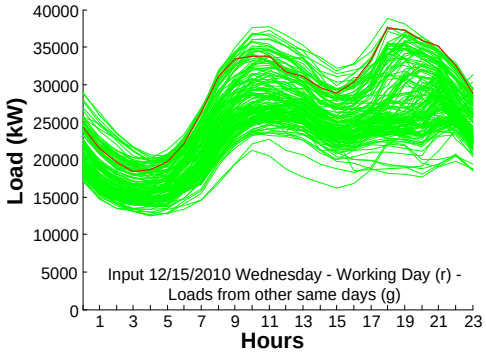
Making the city SMART

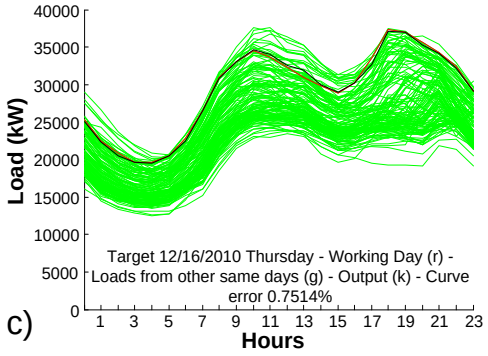
3. Artificial Intelligence and Smart Decision Systems



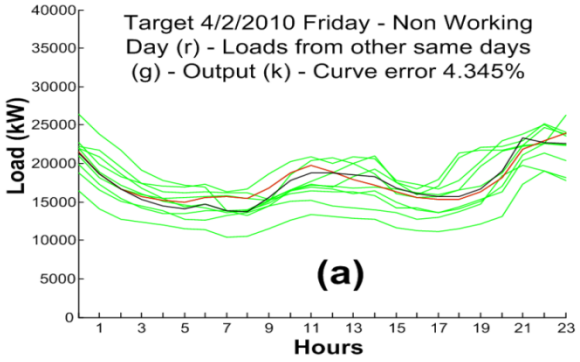


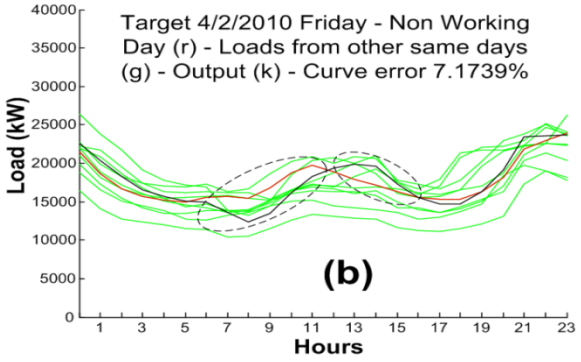
b)





c)

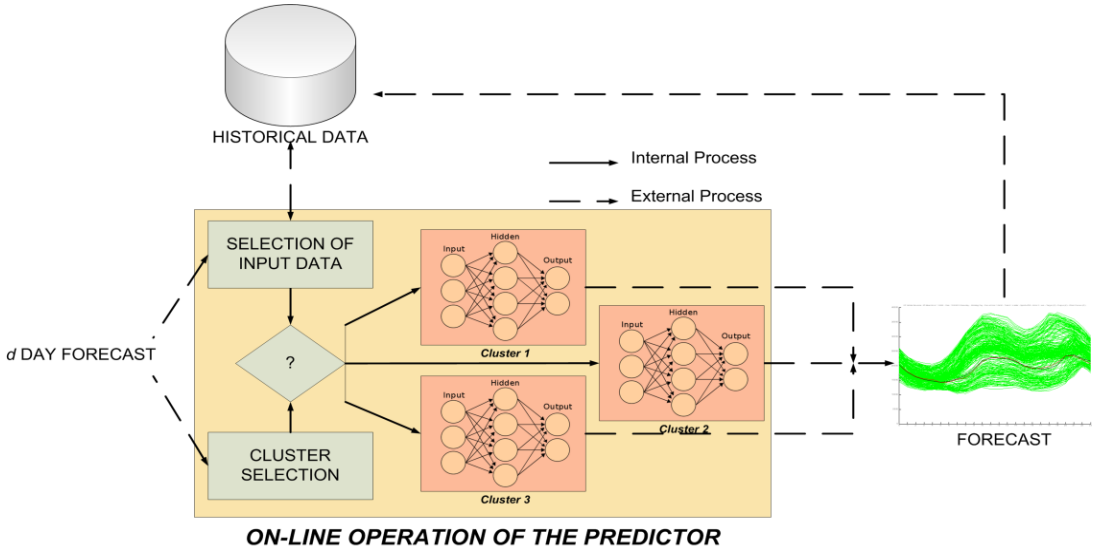


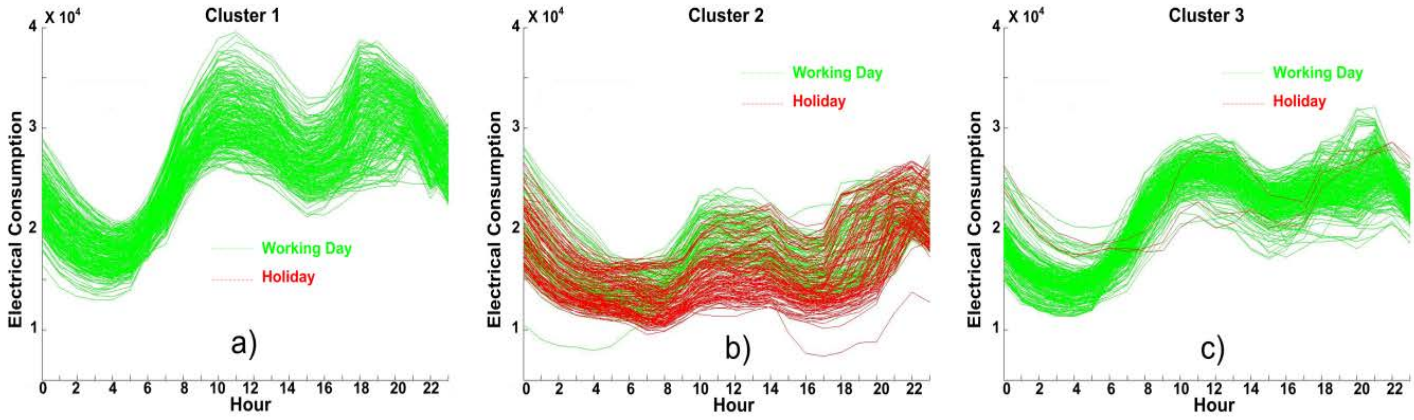


the mean error for the 730 days in the testing set was 2.40%

Making the city SMART

3. Artificial Intelligence and Smart Decision Systems

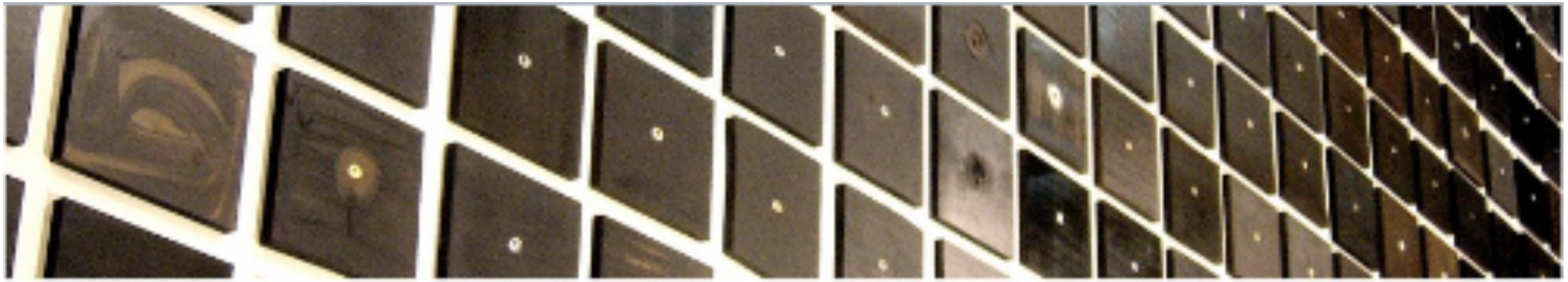




Making the city SMART

Jaime Lloret

jlloret@dcom.upv.es



UiO : Universitetet i Oslo

Panel on SMART / MOBILITY / URBAN COMPUTING
Topic: Smart Cities: Real Needs versus Technological and Deployment Challenges

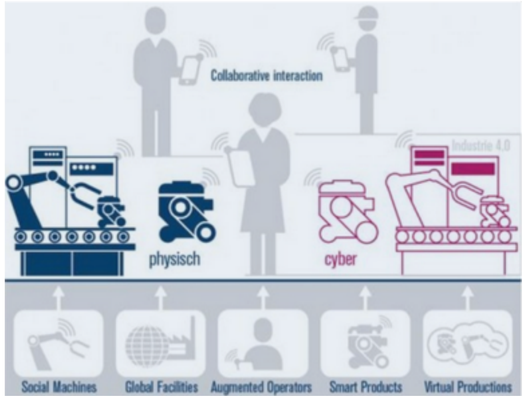
Economic Benefit of Investments in Smart Cities

Josef Noll

Co Founder and Visionary at **Basic Internet Foundation**
Prof. at **University Graduate Studies (UNIK), University of Oslo (UiO)**
Head of Research at **Movation AS**
Norway

Examples of Challenges for Smart Cities

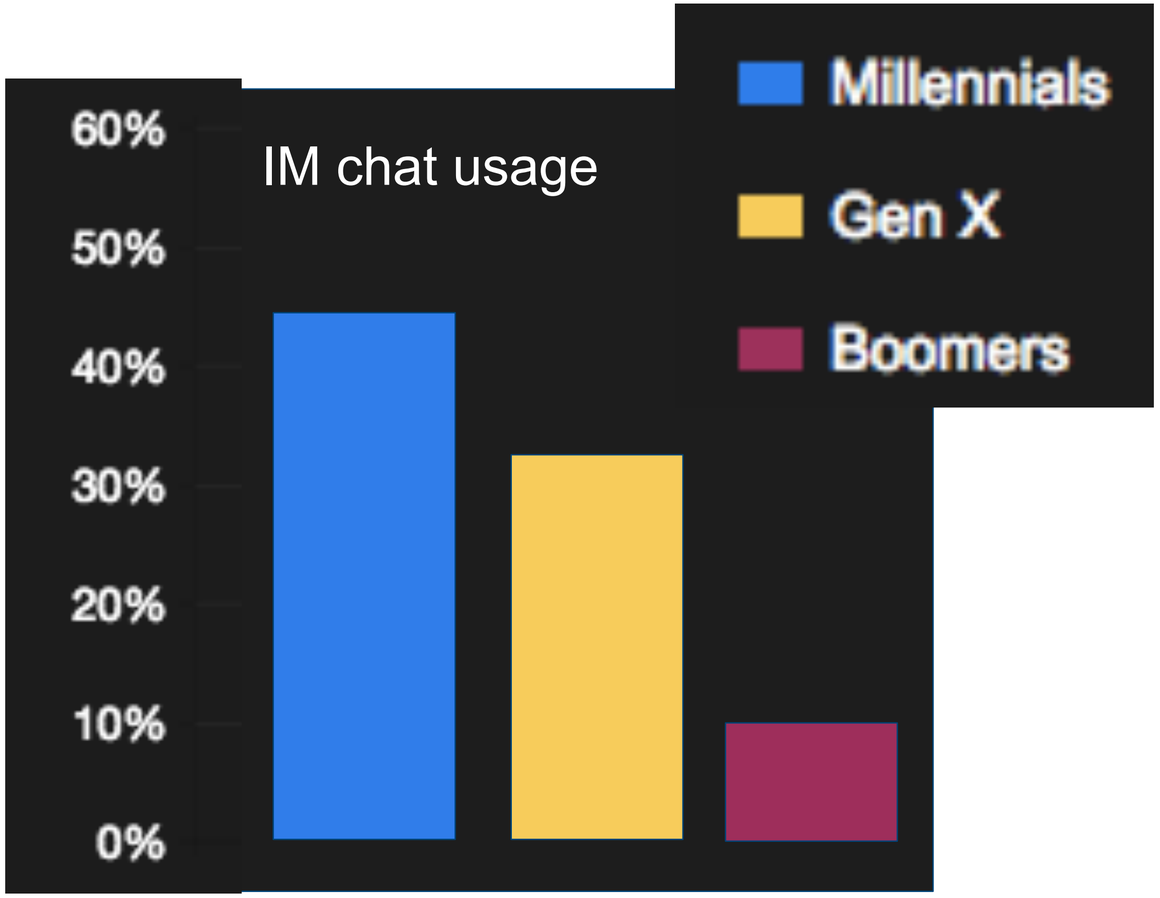
- Changing demography
  - ➡ increased need for personalisation
    - care functionality
  - ➡ demanding customers: “I know”
  - ➡ “digital natives”
- Digital Divide
  - ➡ data-driven economy (apps++)
  - ➡ “live-long” learning
- Economics
  - ➡ cost-intensive services
  - ➡ stagnating income (“sharing economy”)



Source: Trumpf / Forschungsunion Wirtschaft & Wissenschaft

The first digital natives will dominate the cities
[Source: http://www.goldmansachs.com/our-thinking/pages/millennials/]

- A larger cohort
  - 92 M people age: 15-32
  - 77 M people age: 51-70
- The first digital natives
  - 2-3 x online Chat, online TV, social media, video games
- Social and connected
  - online search & buy
  - “communicate with others about a brand”
- Less money to spend
  - lower employment level
  - smaller incomes (social
- Debt: “student loans++”
- Different Priorities
  - less marriage, less home ownership
    - 56% of those born 1968 at age 18-31
    - 27% born 2007, 23% born 2012



Learn from India and the world

Knowledge-based management for Investments in Smart Cities

- "The user in the center"
  - ➡ social media, digital natives
  - ➡ "DongCheng": complaints
- Pilot-based approach
  - ➡ "forget about planning" :-)
- knowledge on effects
  - ➡ semantic knowledge handling
  - ➡ big data analytics
- Information flow management
- "Sensors (IoT) will come where needed"

Bangkok: Improving neighborhoods through citizen-led planning

Hyderabad: Soliciting citizen feedback to improve service delivery

Increasing recycling citizen incentives

Barcelona: Promoting solar energy to increase sustainability

London: Automating congestion pricing

Istanbul: Pedestrianizing streets to improve public mobility

DongCheng: Local government addresses complaints with mobile technology

[Source: http://www.smartcitieschallenge.in]

Panel on SMART / MOBILITY / URBAN COMPUTING Topic: Smart Cities: Real Needs versus Technological and Deployment Challenges

Lasse Berntzen

University College of Southeast Norway

Smart Cities

- A new wrapping of old ideas..
- Provide better services, quality of life and democratic participation by using technology in innovative ways
- But technology is not smart in itself
- We need to talk of smart use of the technology

Smart

- Smart must be good..
- Value proposition
- Not only by the city, but also companies

Technological Challenges

- Big Data
  - Amount and quality
- Integration
  - Silos
  - Systems are not well integrated
- But smart cities are much more than technology. The need for “smart citizens”

“Smart Citizens”

- Education
- Information

$\Rightarrow$ Common understanding

$\Rightarrow$ Participation

- No city will be smart because of technology, only because of smart use of the technology
- Citizens must share the ideas

EMERGING TECHNOLOGY
IoT & Opting-in

Is Autonomy Diminished or Rescinded?

e.g. Is Informed Consent really Informed?
Is it Persuasion? Coercion?

Christine Perakslis, Ed.D.
Center for Research & Evaluation and
Johnson & Wales University, Graduate Studies, MBA Program
Providence, RI, USA
cperakslis@jwu.edu

JOHNSON & WALES UNIVERSITY

EMERGING TECHNOLOGY: IoT

Real Needs

Autonomy

Diminished
or ever more
Rescinded?

Continuums of Autonomy?

Paradigm Shifts?

IoT Deployment

Opting-in …

across multiple
platforms…

multiple agents…

complex, murky & mutable environs…

data
now …& into future ?

BACKGROUND: Emerging Tech - IOT

- IoT (Calm Technology, Persuasive Technology, Pervasive Tech, Ambient Technology
- Wearables / Lifelogging / QS or Self-Quantification Movement
- Citizens as Sensors / Crowd Sensing / Participatory Sensing
- Implants / Uberveillance / Electronic Skin/ Digital Tattoos

EMERGING TECHNOLOGY: IoT
Real Needs in IoT Deployment

2.2.2 List of values, and principles

Based on our analysis we produced a list of values and principles based on the EU Charter, EGE Opinions, and other documents:[13]

Human Dignity

Freedom

- Autonomy
  - Control
  - Responsibility
  - Persuasion and coercion
  - Informed consent
- Freedom of Arts
- Freedom of Research
  - Dual use
- Privacy
  - Data protection
  - Surveillance

Foci

Justice (Equality and Solidarity)

EMERGING TECHNOLOGY
IoT & Opting-in
Is Autonomy Diminished or Rescinded?

Diminished

- Compulsory
- Incomprehensible
  - Bait & Switch/Mutable
  - Murky/Convoluted-Complex
- Risk Habituation = Delay
- Participate in Society /Social Conformity

Rescinded

- Compensated
  - Financial
  - Security/Safety
  - Convenience
  - Participation (Social/Belonging)
- Ticking = Autonomy?
- Trends (Generational, e.g. QS)
  - Longitudinal Study
  - Transnational Study

AUTONOMY: PARADIGM SHIFTS?

Methodology: Phase One

- **Participants:** Small Business Owners (N = 453) within four countries:
  UK (*n* = 111), USA (*n* = 117), Australia (*n* = 114), and India (*n* = 111)

- **Quantitative Findings** (Chi-Square)

  GENERATION: Very significant relationship ($x^2 = 29.11,\ df = 2,\ p = .000$)
  generation and opinion (yes-no).

  - Baby Boomers "yes" fewer than (16 vs. 35, adjusted residual = 4.7)
  - Millennials "yes" more than expected (31 vs. 16.5, adjusted residual = 4.4)
  - Gen X no such differences of opinion.

TABLE 2

Generations and Surgically Implanted Transponders as a More Secure Technology for Employee Identification			GENERATIONS			
			Millennials	Generation X	Baby Boomers	Total
Q55 - Do you think radiofrequency identification (RFID) transponders surgically implanted beneath the skin of an employee is a more secure technology for instituting employee identification in your organisation?	Yes	Count	31	34	16	81
		Expected Count	16.5	29.5	35.0	81.0
		% within Q55	38.3%	42.0%	19.8%	100.0%
		Adjusted Residual	4.4	1.1	-4.7	
	No	Count	61	131	180	372
		Expected Count	75.5	135.5	161.0	372.0
		% within Q55	16.4%	35.2%	48.4%	100.0%
		Adjusted Residual	-4.4	-1.1	4.7	

Methodology: Phase Two

How would you personally feel about being implanted for ease of identification with your own organisation? (OPEN-ENDED QUESTION)

- **Participants:** Small Business Owners: Categorized as Baby Boomers (*n* = 196)
  Small Business Owners: Categorized Millennials (*n* = 62)
  Graduate Students: Millennials (*n* = 20) enrolled in U.S.

- **Qualitative Findings: MILLENNIALS vs. BABY BOOMERS**
  - More positivity (and more inquisitive responses "what if later I decide to …")
  - Far Less Negativity ("I wouldn't agree to it" vs. "I would sooner stick pins in my eyeballs" or "Not a chance in h*ll")
  - More Neutrality (Similar responses: "I don't care" or "I don't know" or "unsure", far more neutrality expressed by Millennials)

- **Qualitative Findings: MILLENNIAL THEMES**
  - Positive comments: Innovation ("Cool")
  - Positive comments: Security ("I will feel more secure." or "It would make me feel secure about my work and position.")
  - Ambivalence (Neutrality) toward chipping

Study #1: Shifts with Millennials 2005 - 2010

"How willing would you be to undergo implantation of an RFID chip in your body as a method …

Willingness to implant an RFID Chip (U.S.): Research in 2005 compared to Research in 2010

		Strongly & Somewhat unwilling	Neutral/no opinion	Strongly & Somewhat willing
IDENTITY THEFT:				
Willingness to implant a chip to reduce identity theft	**2005: Research (Perakslis & Wolk; 2006)**	**55.0%**	**11.0%**	**34.0%**
	2010: Research (Perakslis, 2010)	**32.6%**	**24.2%**	**43.2%**
	% change	***-22.4%***	***+13.2%***	***+9.2%***
POTENTIAL LIFESAVING DEVICE:				
Willingness to implant a chip as potential lifesaving device	**2005: Research (Perakslis & Wolk; 2006)**	**42.0%**	**14.0%**	**44.0%**
	2010: Research (Perakslis, 2010)	**22.1%**	**9.5%**	**68.4%**
	% change	***-19.9%***	***-4.5%***	***+24.4%***
NATIONAL SECURITY:				
Willingness to implant a chip to increase national security	**2005: Research (2006)**	**50.0%**	**18.0%**	**32.0%**
	2010: Research (Perakslis, 2010)	**33.7%**	**24.2%**	**42.1%**
	% change	***-16.3%***	***+6.2%***	***+10.1%***

Thank you for your time.

Christine Perakslis
Johnson & Wales University
Graduate Studies, MBA Program
and
Center for Research & Evaluation
cperakslis@jwu.edu

mart Cities: Real Needs versus Technologic and Deployment Challenges

S.R. Venkatramanan

How to make a city smart?

- Define scope
- What is current – demographics?
- Appropriate policy
- Stakeholders – citizen participation

Categories of Needs

- Communication
- Energy
- Transportation
- Environment

Communication

- Available (Always and Ubiquitous)
- Low Bandwidth
- Low Cost
- Integrated – Public service, Schools, Libraries, Permits
- Apps, QR codes, Amber Alert!!

- Slow user mobility – towers farther apart
- Ricochet kind on utility polls
- Utilities can share cost

Energy

- Clean, Renewable, Unlimited
  - Local PV arrays
  - Rooftops
- Low Cost

- Schools and Public buildings
- More subsidies for faster bootstrap
- Residential – incentives and subsidies
- Cross with Transportation

Antwerp station

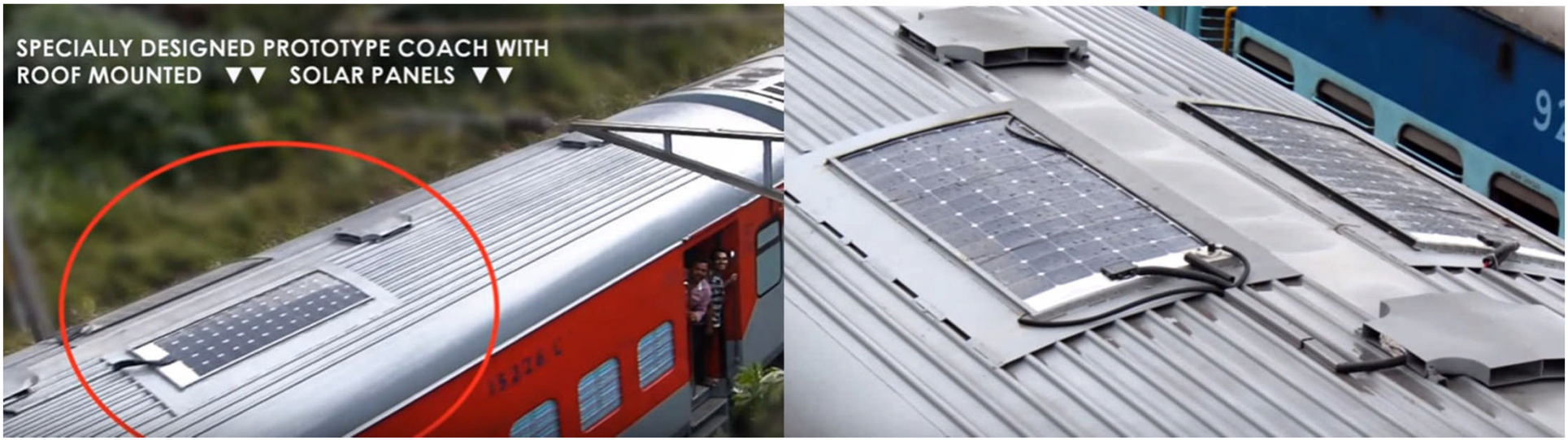
High-speed Euro train gets green boost from two miles of solar panels….. and Belgian train network

London Blackfriars station

orld’s largest solar powered bridge

Indian Railways…..

will test its first all solar train in Jodhpur by May end



http://zeenews.india.com/business/news/economy/check-out-indian-railways-first-all-solar-paneled-train_1884774.html

.

Transportation

- Traffic management
  - –Sensors and Central Management
  - –Synchronized signals -> Less Congestion, Pollution, and Total Fleet Energy
- Traffic Pattern analysis used for prediction
- Mass transportation vehicles with PV arrays
- Inter-vehicular communication
  - –Geography cognizant mobile apps
  - –Efficient Road-use
  - –Public Safety

Environment

- Waste management
  - 38K tons/day!
  - 53 stories worth waste every single day in NYC alone
- Quality of Life

Challenges

- Aesthetics
  - Cities for humans with emotions, not robots
- Individual preferences
- Variety of speeds to accommodate
- Metrics for measurement to assess resiliency of smart systems
- Population distribution – lot in developing nations