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Billions of sensors in the Cloud - Open source, Cloud and Smart cities

FUTURETEXT

OSS Watch
open source software advisory service

Billions of bilious blue blistering barnacles in a thundering typhoon!
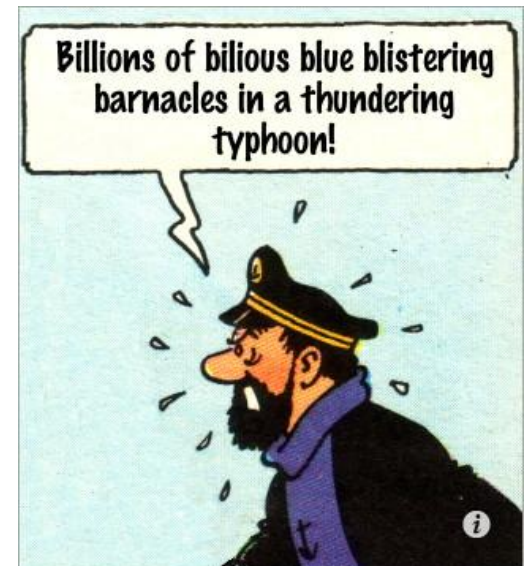
World Economic Forum - future of the Internet UK based - Hands on Publisher (futuretext) - Author (Mobile Web 2.0, Social Media Marketing, Open Mobile) - Chair: Oxford University's Next Gen Mobile Applications panel - PhD student UCL/UK - Consulting – Operators, Governments/EU, Startups –

Recent and forthcoming talks include
Mobile world congress(2007,2008,2009, 2011),

CEBIT, Stanford University - MIT Sloan - Web 2.0 expo - Ajaxworld

Supernova - CNN money - BBC - Oxford University European parliament

University of Oxford
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Delivering learning online

Global top 20 wireless blogger
www.opengardensblog.futuretext.com

Digital Policy Bloggers Network
Creating conversations for the evolution of Digital policy

WORLD SMART CAPITAL

The magic wand

The phone becomes a magic wand to the cloud services: Mobile sensor based interface to the cloud to jump start the Internet of things .. But ..

The magic wand

What prevents this vision from coming true?

Vision – connect the dots – and barriers
- Meaning of billions of sensors in the cloud
- Fax machine problem (M2M)
- Smart cities and **Open source (**two aspects - hardware and Platform enabler)
- At a network level - White space – also makes Telecoms like the Internet (Open platform)

Not an intro level talk – and takes a specific perspective
Extra slides for reference

The Cloud

- The Cloud can be seen to be 'on demand/metered' access to HW, SW and services.
- Cloud converts CAPEX to OPEX. The ideas are not new but the technology is here which makes the business model feasible. There are many advantages – ex scaling, outsourced sysadmin etc

- Amazon S3 and EC2 clouds provide access to computing resources – ex disk storage, CPU etc and are one of the best example of Cloud services

- The problems with Cloud are the same as that of any **'outsourcing'** – security, privacy etc etc

- Cloud computing – characterised by On-demand, Elastic, Online. Managed. – (Paul Golding - connected services)

- **Real time access (messages, content, social, sensor streams)**
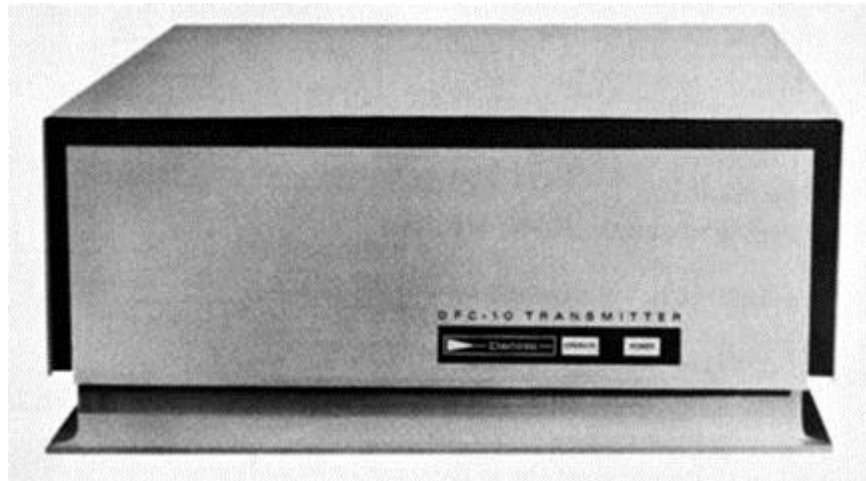
IOT has a fax machine problem .. P2P rarely works at network level – A2P has a better chance and Smart cities are a good possibility to create that ecosystem – coupled with Open source hardware ..

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Internet + Internet of things = Wisdom of the earth - Wen Jiabo

1. Songdo, South Korea

The world's most expensive privately developed city (cost: $35 billion and climbing) is also the flagship of Cisco's Smart + Connected Communities Songdo will be the test bed Cisco's vision of ubiquitious telepresence –

10 smartest cities – Fast company

2. Lavasa, India

If all goes according to plan, next year Lavasa will become the first city in history to float itself in an IPO worth 20 billion rupees ($437 million) as part of a spin-off from its parent, Hindustan Construction Company. The smarts will be provided courtesy of Wipro and Cisco

3. PlanIT Valley, Portugal
The first city to be designed like software – complete with its own "Urban OS" – is slated to break ground this year in the hills outside Porto. brainchild of software startup Living PlanIT, plans call for 150,000 residents, nearly all of whom will be its partners' employees. In turn, they'll be expected to experiment on themselves. Buildings, sensors, and services alike will be connected through the cloud, and obsolete buildings will be "decommissioned"

Scheduled to break ground next year, Russian president Dmitry Medvedev's pet project is his country's second attempt to build its own Silicon Valley – the Soviet-era version didn't work out so well. "Technopolis Skolkovo's" centerpiece will be the campus of the Moscow School of Management .In June, Cisco pledged to invest $1 billion in the project and establish Skolkovo as Russia's first smart city, focused on smart grids, transportation, education, and health care.

5. Masdar, United Arab Emirates
Masdar is low-tech in its design, according to The Guardian's Rowan Moore: "The Masdar plan has been accused of being gated and exclusive. It is not, although there is something spooky in the controls it employs in the name of the environment – a touch of eco-Orwell or at least eco-Huxley. A hidden brain, for example, knows when you enter your building, so that your flat can be cooled before you arrive, while in public places flat screens broadcast uplifting news on the environmental performance of the complex."

6. Wuxi, China
"Little Shanghai" is the epicenter of China's evolving strategy to own the Internet of Things, an effort which kicked into high gear this summer after Chinese premier Wen Jiabao gave a speech in the city in which he offered the equation "Internet + Internet of Things = Wisdom of the Earth." **China appears ready to win the smart city market as surely as its manufacturers conquered solar panels.**

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7. King Abdullah Economic City, Saudi Arabia
Rising from the sands near Jeddah, King Abdullah Economic City – abbreviated KAEC, pronounced "cake" – is just one of four new instant cities explicitly intended create a million-plus jobs and to house nearly half of the 10 million Saudis under the age of 17 -- a largely uneducated workforce described as a "human time bomb." To that end, KAEC was conceived as Saudi Arabia's Silicon Valley (along with a port expected to open next year). KAEC's developers have promised a smart city that is "7-24-60," as in services are ready to go 24 hours a day, seven days a week, and are ready within 60 minutes.

8. Dubuque, Iowa
In 2009, IBM declared Dubuque would become the "first integrated, smart city" in America, with interlocking systems watching the interplay between water, electricity, and transportation.

9. Ho Chi Minh City, Vietnam
IBM dispatched a SWAT team of executives to Vietnam's largest city this year on a mission to develop a strategy for upgrading the city's infrastructure. The plan is to create a software model capable of predicting when the city's busiest thoroughfares will clog with motorbikes – so the city can change traffic signals as needed or dispatch extra traffic cops to the scene.
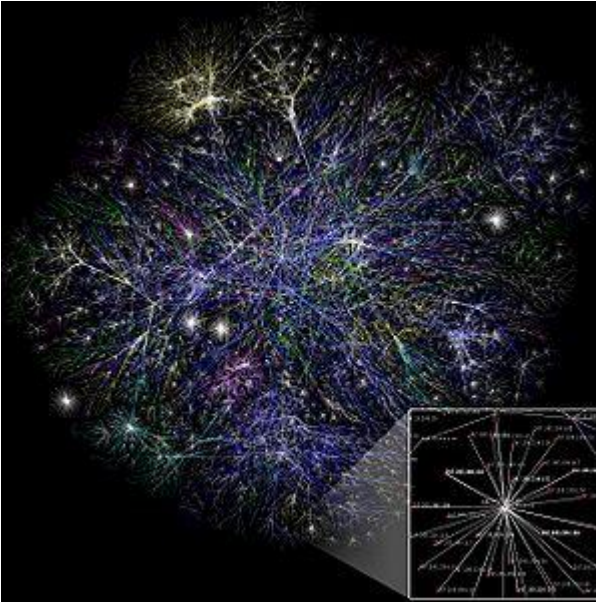
Designed by BqAP, Berkeley

10. Nano City, India
Maybe 2011 will be the year Hotmail creator Sabeer Bhatia finally starts construction of his dream city, which he hatched in 2006 as – you guessed it – India's answer to Silicon Valley.

What makes a city Smart? A non vendor driven definition of a 'Smart City'
The closer a city behaves to the ethos of the Internet, the smarter it is
That means, the city is a platform – an enabler for the people ..
So, empowering people is at the centre of the perfect storm

Smart city applications are similar to conventional mobile applications. However, in conjunction with mobile devices which often include sensors, Smart city applications would interface with hardware – typically open source hardware – which enables 'intelligent data' spots in the city

Smart city apps are oriented towards empowerment of citizens and to **'Long Tail'** applications

Smart city applications could use many existing and new mobile technologies including augmented reality, Android and other platforms but they also include hardware technologies **typically open source hardware**

Smart city applications could be based on the following themes
- Smart Manufacturing,
- New production tools(home produced food, energy, micro manufacturing, 3D printing)
- Collaboration / sharing of resources via the Internet
- Urban farming
- Apps relating to Open data
- Apps relating to Smart energy
- Apps relating to Smart transportation
- Smart health
- Technology(especially related to open source hardware and s/w)
- Culture(hacker movement)
- Sustainability
- And Art

**SMS, WAP, Voice MMS, V.s
Facebook , iPhone, Android, Twitter**

Platform - light bulbs and transmission towards FUTURETEXT

**Apps for Smart city
=
Intelligent places + Data + Mobile apps + Community + Services
=
City as a platform**

So, what does a Smart City look like?
A city can be defined as smart when investments in human and social capital and traditional (ex transport) and modern(ex ICT) communications infrastructure fuel sustainable economic development and a high quality of life with a wise management of natural resources through participatory governance

7 important elements in most cases of smart city **Source: Xi She**

1) sensible - sensor sensing the environment

2) connectable - a networking devices bring the sensing information to the web

3) accessible - the broader information of our environment is published on the web, and accessible to the user in web, (web)
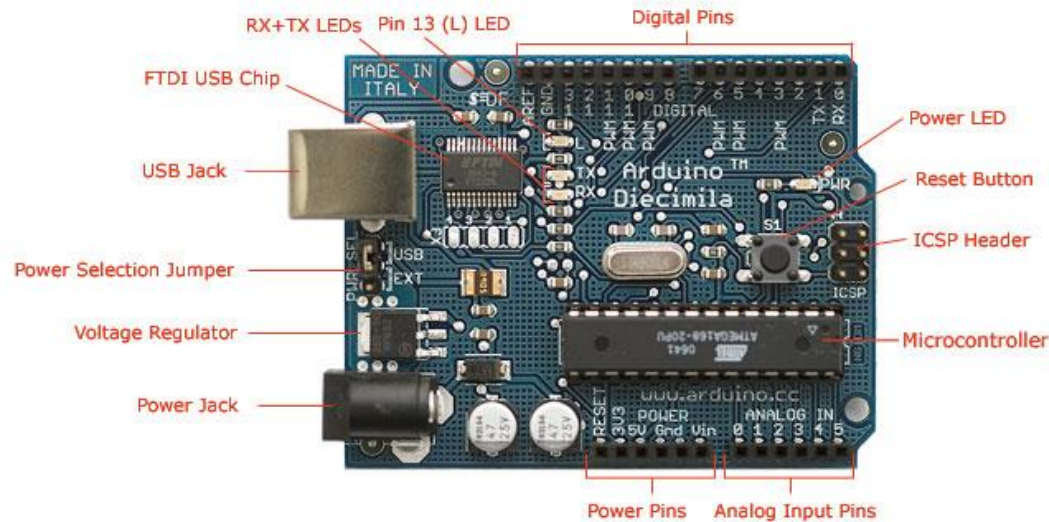
4) ubiquitous - the user can get access to the information thought web, but more importantly in mobile any time, any place (mobile)

5) sociable - the user acquired with the information, and publish it though his social network (social network)

6) sharable - shared are not limited to data, but also to the physical object, when some object are in free status, the people can get the notification and use them. (web, mobile)

7) Visible/augmented - to retrofit the physical environment, make the hidden information seen not only through mobile device by individual but seen in naked eyes in more border range of the physical places like street signs

RX+TX LEDs Pin 13 (L) LED Digital Pins
FTDI USB Chip
MADE IN ITALY
USB Jack
Power LED
Power Selection Jumper
Reset Button
Arduino™ Diecimila
ICSP Header
Voltage Regulator
Microcontroller
Power Jack
Power Pins Analog Input Pins

Photograph by SparkFun Electronics. Used under the Creative Commons Attribution Share-Alike 3.0 license.

Arduino can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators.

The boards can be built by hand or purchased preassembled; the software can be downloaded for free.

The hardware reference designs (CAD files) are available under an open-source license and users are free to adapt them to their needs.

The paper *Open Wireless vs. Licensed Spectrum: Evidence from Market Adoption* *by*Yochai Benkler

Conclusion (Benkler)
The primary way in which open wireless policy contributed to the development of wireless infrastructure is to harness an Internet model of innovation in the wireless space, instead of depending exclusively on an older, telecommunications-carrier model of innovation.
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-	The paper addresses the long standing spectrum policy question surrounding how much of the future of wireless innovation will depend on exclusively-licensed spectrum, allocated by auction and traded in secondary markets, relative to how much will utilize bands in which open (unlicensed, dynamic frequency sharing, license-by-rule etc.) wireless systems are permitted.

-	Yochai benkler reviews evidence from eight wireless markets: mobile broadband; wireless healthcare; smart grid communications; inventory management; access control; mobile payments; fleet management; and secondary markets in spectrum.

-	He finds that markets are adopting open wireless strategies in mission-critical applications, in many cases more so than they are building on licensed strategies.

-	Eighty percent of wireless healthcare; seventy percent of smart grid communications; and forty to ninety percent of mobile broadband data to smartphones and tablets use open wireless strategies.

\- The limitation, or the real economic scarcity, is computation and the (battery) power to run calculations. The regulatory model of command and control was created at a time when machine computation was practically impossible. ***Exclusive licensing was a way to use regulation to limit the number of transmitters in a band, so as to make it possible for very stupid devices to understand who was saying what.***

\- The economic models on which auctions are based were developed in the 1950s and 1960s, when computation was still prohibitively expensive. Practically, thinking about "spectrum" as a scarce commodity still made sense in that era.

\- ***As computation becomes dirt cheap, the assumption that spectrum is a stable, scarce resource is no longer the most useful way of looking at optimizing wireless communications systems.*** The question is more: which configuration of very smart equipment, wired and wireless infrastructure, network algorithms, and data processing will allow the largest number of people and machines to communicate what they want, when they want it, where they want to be?

There were a number of compelling reasons for white space technology for M2M applications -

1. **Capacity:** Capacity = The number of terminals that can be connected to a base station at any given time and the amount of data that can pass through the network.

five billion cellular connections worldwide for people
M2M connections are widely projected to reach 100 billion by 2020,

2a. Cost: cellular networks were designed for voice – hence based on modems. Not necessary and expensive for M2M
2b. Cost: White space spectrum is not subject to a licence fee and consequently the cost of data for users is very significantly reduced.

3. Power consumption: M2M applications such as utility meters require battery lives in perhaps years without battery replacement. M2M bandwidth requirements are typically much lower - perhaps only a few bytes per hour or less for example. This means that battery life is determined not by power consumption of the transmitter but rather the leakage characteristics of the cell itself.
Source: http://www.businessweekly.co.uk/hi-tech/12790-powerful-backing-for-neul-weightless-sig

4. Range: 90% is not enough(coverage)
5. Size: Efficiency, security, size, power consumption, cost etc + co-existence

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We've seen this picture before: It's what happens just before monolithic industries fragment in the face of countless small entrants, from the music industry to newspapers. Lower the barriers to entry and the crowd pours in. and Thus the new industrial organizational model. It's built around small pieces, loosely joined. Chris Andersen Wired
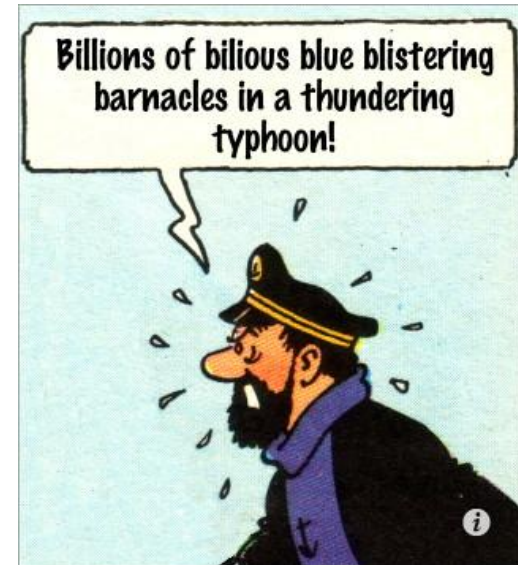
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BUG http://www.buglabs.net/
is a modular, open source system for building devices. a US based open source hardware company, recently it unveils a plan to corporate with Ford

Funnel http://gainer.cc/
Funnel is a toolkit to sketch your idea physically, and consists of software libraries and hardware. By using Funnel, the user can handle sensors and/or actuators with various programming languages such as ActionScript 3, Processing, and Ruby. In addition, the user can set filters to input or outputs ports: range division, filtering (e.g. LPF, HPF), scaling and oscillators. It is actually a redesigned arduino platform

Gainer http://gainer.cc/
Gainer is an environment for user interfaces and media installations. By using the Gainer environment, the user can handle sensors and/or actuators with a PC on various programming environments such as Flash, Max/MSP, Processing and so on.

Make controller http://www.makingthings.com/resources/downloads/
The Make Controller 2.0 & Interface Board Kit includes the Make Controller Version 2.0 and the new Interface Board that makes adding sensors and motors easier than ever! Also available with the Application Board. The Make Controller is built around the AT91SAM7X256, and adds the essential components (like the crystal, voltage regulator, filter capacitors, etc.) required to run it, while bringing almost all the processor's signal lines out to standard 0.1″ spaced sockets.

Wiring http://wiring.org.co/
Wiring is an open source programming environment and electronics i/o board for exploring the electronic arts, tangible media, teaching and learning computer programming and prototyping with electronics. It illustrates the concept of programming with electronics and the physical realm of hardware control which are necessary to explore physical interaction design and tangible

Sun SPOTs   https://spots-hardware.dev.java.net/
Project Sun SPOT was created to encourage the development of new applications and devices. It is designed from the ground up to allow programmers who never before worked with embedded devices to think beyond the keyboard, mouse and screen and write programs that interact with each other, the environment and their users in completely new ways. A Java programmer can use standard Java development tools such as NetBeans to write code.

Pinguino   http://pinguino.cc/
Pinguino is an Arduino-like prototyping platform based on 8-bit or powerful 32-bit ©Microchip PIC Microcontrollers with built-in USB module (no FTDI chip).

Firmata http://firmata.org/wiki/Main_Page
Firmata is a generic protocol for communicating with microcontrollers from software on a host computer. It is intended to work with any host computer software package. Right now there is a matching object in a number of languages. It is easy to add objects for other software to use this protocol. Basically, this firmware establishes a protocol for talking to the Arduino from the host software. The aim is to allow people to completely control the Arduino from software on the host computer.

Scope of smart cities – source Smart cities survey – www.igsystems.co.uk

City Planning & Management

Geovisualisation , Seismological Systems, Digital Mapping,   City Safety & Security, Property & Asset Management , Disaster Planning & Recovery, Remote Sensing

Smart Business & Commerce

Ecommerce, Billing & Payment Systems, Distribution & Logistics
Smart Cards, Smart Retail, Smart Manufacturing , Factory & Plant Management Systems, Smart Materials, Banking & Financial Systems

Smart Education
Smart Classroom , Assessment, Computer Based Learning, ComputerAided, Learning Management Systems, Computer supported collaborative learning (CSCL), Knowledge Management, Digital Libraries

Smart Health & Care
Smart Hospital Systems, Health Informatics, Electronic Health Records, Remote Diagnostics, Telemedicine, Assisted Living Systems

Smart Community: Digital Citizenship, City Smartcards, Digital Inclusion Online Consultation

Smart Media & Entertainment:: Social Media, Interactive Digital Display, Video on demand, Smart & 3D TV, Gaming, Digital Radio, Sports & Stadia Systems

Webinos scenario - A scenario could be based on an open energy monitor based device such as emonbase. It is based on the idea that customers own their own data and consequently could use that data to either negotiate or switch energy providers. Once again, you could have many devices within the home each running a PZP connected to a PZH which runs on a PC or a home gateway. The above principles apply for distributed and secure data management and also for a**secure, third party managed service independent of the specific energy provider (in which case, the PZH is managed by the third party)**.

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