The Future

WHERE DO WE GO? WHERE DO WE GO NOW? WHERE DO WE GO?

In 2014, the 25th anniversary of the invention of the World Wide Web, a new type of interconnectedness is being created. The proponents of the so-called "Internet of things" envision a world with billions of devices, products, body implants and accessories that communicate with each other and to advertisers, health care providers and other agencies.

Our notions of privacy and sharing will continue to evolve . . . with new tradeoffs needing to be understood and dealt with.

– **J.P. Rangaswami**, chief scientist for Salesforce.com

In a survey of 1,606 experts (technology builders, analysts and futurists), 83 percent of those surveyed indicating that by the year 2025, the **Internet of things will have widespread and beneficial effects** on the everyday lives of the public.

SOME EXAMPLES OF THE INTERNET OF THINGS

Milk cartons containing sensors that send signals to the homeowner or grocery store when they are nearly empty.

Computer chip under the skin that provides real-time vital signs to self-trackers and medical providers.

Remote control apps that allow users' phones to monitor and control household activities, from pre-heating the oven to running your bath.

Smart cities, where sensors and GPS tracking facilitate smoother flows of traffic.

Sensors on infrastructure that give regular readings on wear and tear and provide alerts when repairs are needed.

Smart appliances, working with smart electric grids, that run themselves or perform their chores after peak loads subside.

WHAT EXPERTS EXPECT FROM THE INTERNET OF THINGS

The Internet of things will progess significantly between now and the year 2025.

Nearly everything in daily life will have a connected application associated with it. We can think of each person as a plug and each part of life as a socket . . . each step along the way will be able to recognize your common identifier and tailor your experience accordingly.

– **Patrick Stack,** manager for Accenture Interactive

The biggest impact by 2025 will be found in machine-to-machine interfaces, where devices talk to each other, rather than in human-centered communication.

This new data-saturated world raises substantial concerns about privacy and one's ability to control one's own life.

The 'Cloud' sounds nice but is only a corporation's huge bank of servers collecting your information. People will rebel against this, (but) if the corporations beat them to the game of locking them into their software and allow for no escape from their 'Cloud,' the corporations and governments win.

– **Larry Gell,** director-general of the International Agency for Economic Development

Voice and touch interfaces will advance, but few expect that brain-to-network connectivity will be typical in 2025.

I see three forms of interaction: some based on bodily signals, be they emotional or cognitive; some based on coded bodily signals (push buttons, etc.); and some based on speech. Eye movements will be very difficult to use regularly.

– **Niels Ole Finnemann,** professor and director of Netlab, DigHumLab Denmark

There will be complicated, unintended consequences.

We will live in a world where many things won't work, and nobody will know how to fix them.

– **Howard Rheingold,** Internet sociologist, writer, consultant and educator

Bridget Karlin

Managing Director, Internet of Things Group at Intel

- Experiences over functions
  - Smart sports glasses
- Three trends
  - Everything is connected
  - Computers gaining senses
  - Tech becoming extensions of the person (seamless integration)
- Consumer v. Industrial
  - 70% of $4 trillion comes from industry
- Speaking of Intel, major shift in their business strategy

Intel's Quark Line

- Earlier this year, Intel abandoned its *tick-tock* development cycle
  - Tick (shrink the processor architecture)
  - Tock (introduce new processor architecture)
- This is significant, as it could interrupt Moore's Law
- Tiny, low power, low cost (depending on volume)
- Why has Intel done this, and what does it say for the IoT?

New Input Methods

- We are the input method
  - Natural movement
  - Voice
  - Gestures
  - Sight
  - Touch
- We are not the input method
  - Not needed
  - Not necessary
  - Not important

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New Input Methods (that don't involve humans)

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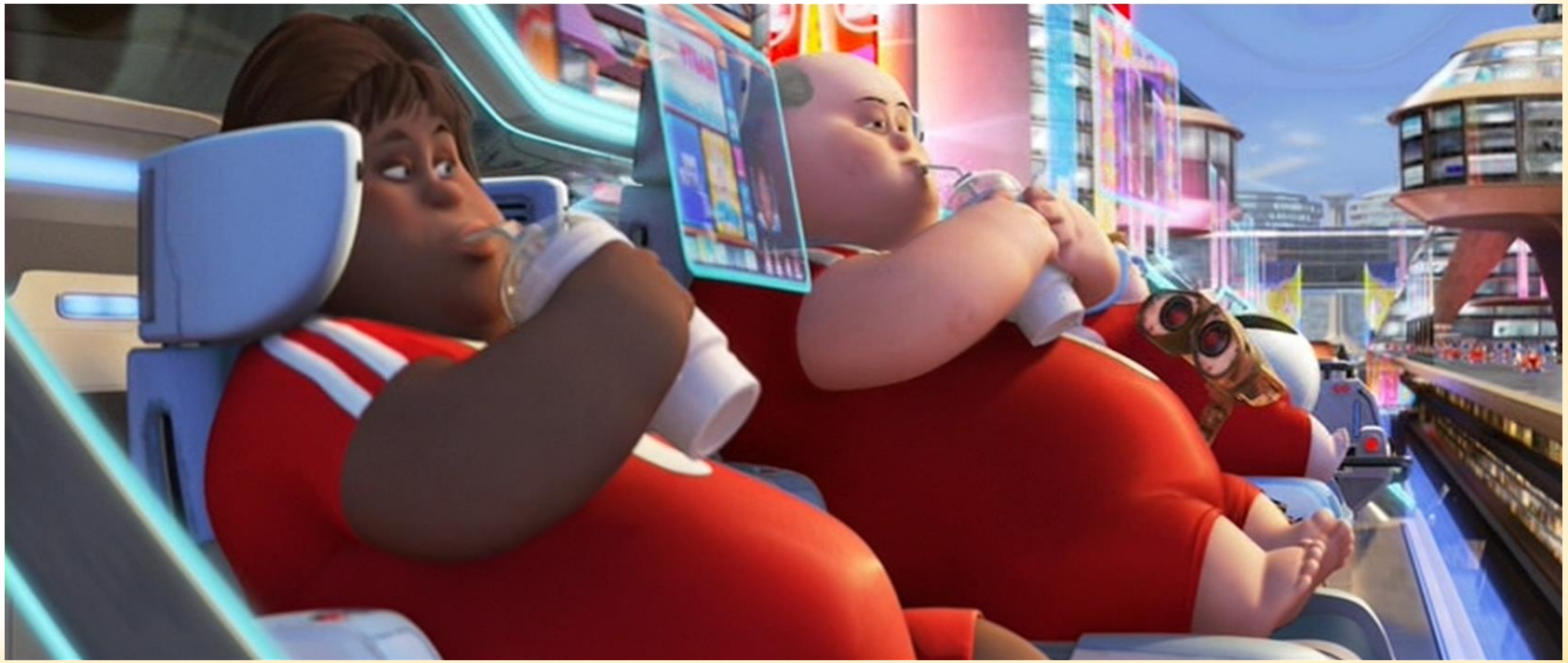


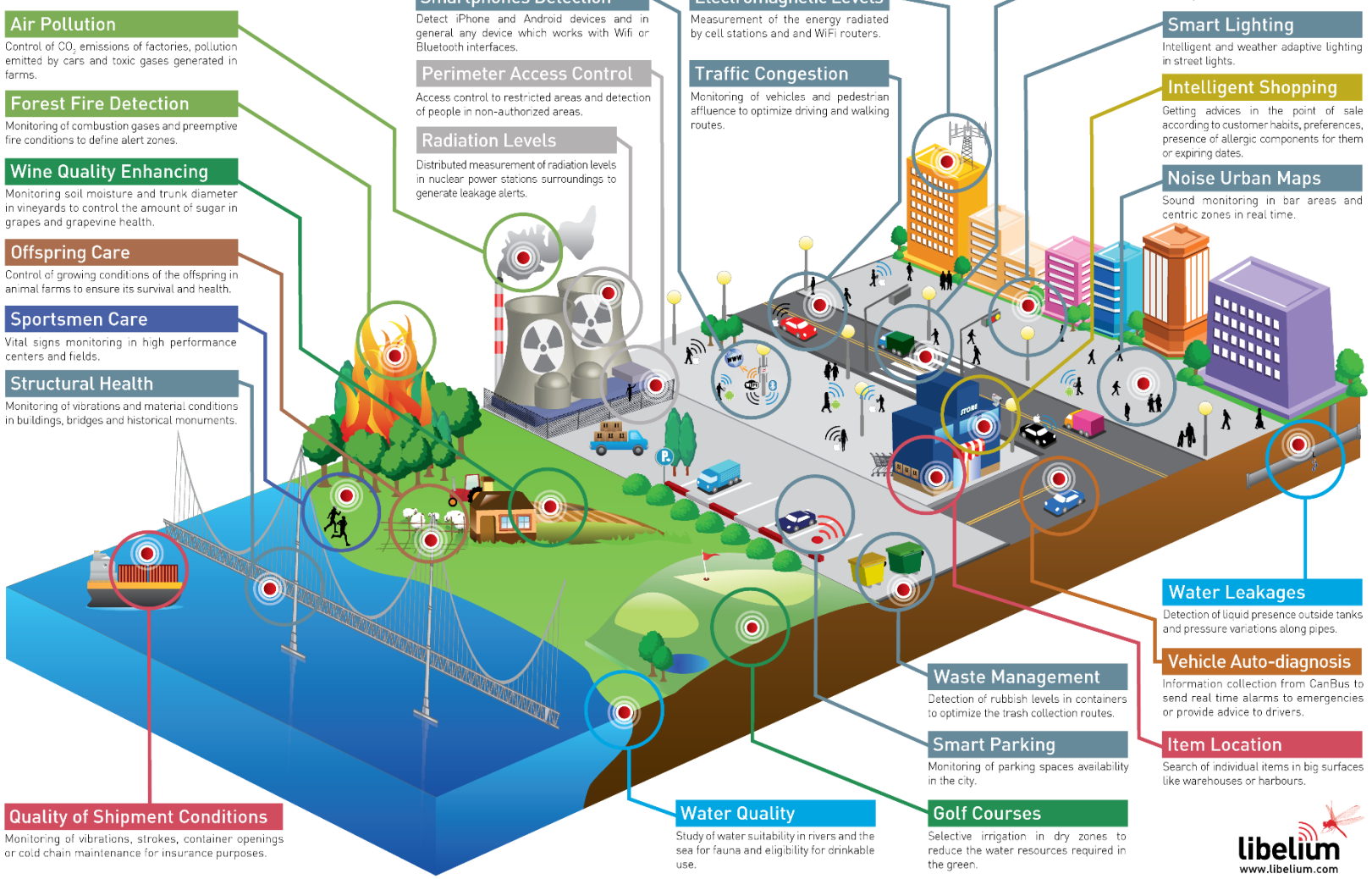
New Input Methods

- We are the input method
  - Natural movement
  - Voice
  - Gestures
  - Sight
  - Touch
- What about the data collected?
- How can local, state, and federal governments use this technology?
  - Should they?
  - What can they do, and what can't (shouldn't) they do?

Adapting to the IoT

- Retrofitting sensors into existing infrastructure
- Building sensors into new infrastructure
- What's the cost? Especially of not doing it right?
- What about standards?
  - Encourage growth, innovation and adoption, reduce costs

Libelium Smart World



Air Pollution
Control of CO_2 emissions of factories, pollution emitted by cars and toxic gases generated in farms.

Forest Fire Detection
Monitoring of combustion gases and preemptive fire conditions to define alert zones.

Wine Quality Enhancing
Monitoring soil moisture and trunk diameter in vineyards to control the amount of sugar in grapes and grapevine health.

Offspring Care
Control of growing conditions of the offspring in animal farms to ensure its survival and health.

Sportsmen Care
Vital signs monitoring in high performance centers and fields.

Structural Health
Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.

Quality of Shipment Conditions
Monitoring of vibrations, strokes, container openings or cold chain maintenance for insurance purposes.

Smartphones Detection
Detect iPhone and Android devices and in general any device which works with Wifi or Bluetooth interfaces.

Perimeter Access Control
Access control to restricted areas and detection of people in non-authorized areas.

Radiation Levels
Distributed measurement of radiation levels in nuclear power stations surroundings to generate leakage alerts.

Electromagnetic Levels
Measurement of the energy radiated by cell stations and and WiFi routers.

Traffic Congestion
Monitoring of vehicles and pedestrian affluence to optimize driving and walking routes.

Water Quality
Study of water suitability in rivers and the sea for fauna and eligibility for drinkable use.

Smart Roads
Warning messages and diversions according to climate conditions and unexpected events like accidents or traffic jams.

Smart Lighting
Intelligent and weather adaptive lighting in street lights.

Intelligent Shopping
Getting advices in the point of sale according to customer habits, preferences, presence of allergic components for them or expiring dates.

Noise Urban Maps
Sound monitoring in bar areas and centric zones in real time.

Water Leakages
Detection of liquid presence outside tanks and pressure variations along pipes.

Vehicle Auto-diagnosis
Information collection from CanBus to send real time alarms to emergencies or provide advice to drivers.

Item Location
Search of individual items in big surfaces like warehouses or harbours.

Waste Management
Detection of rubbish levels in containers to optimize the trash collection routes.

Smart Parking
Monitoring of parking spaces availability in the city.

Golf Courses
Selective irrigation in dry zones to reduce the water resources required in the green.

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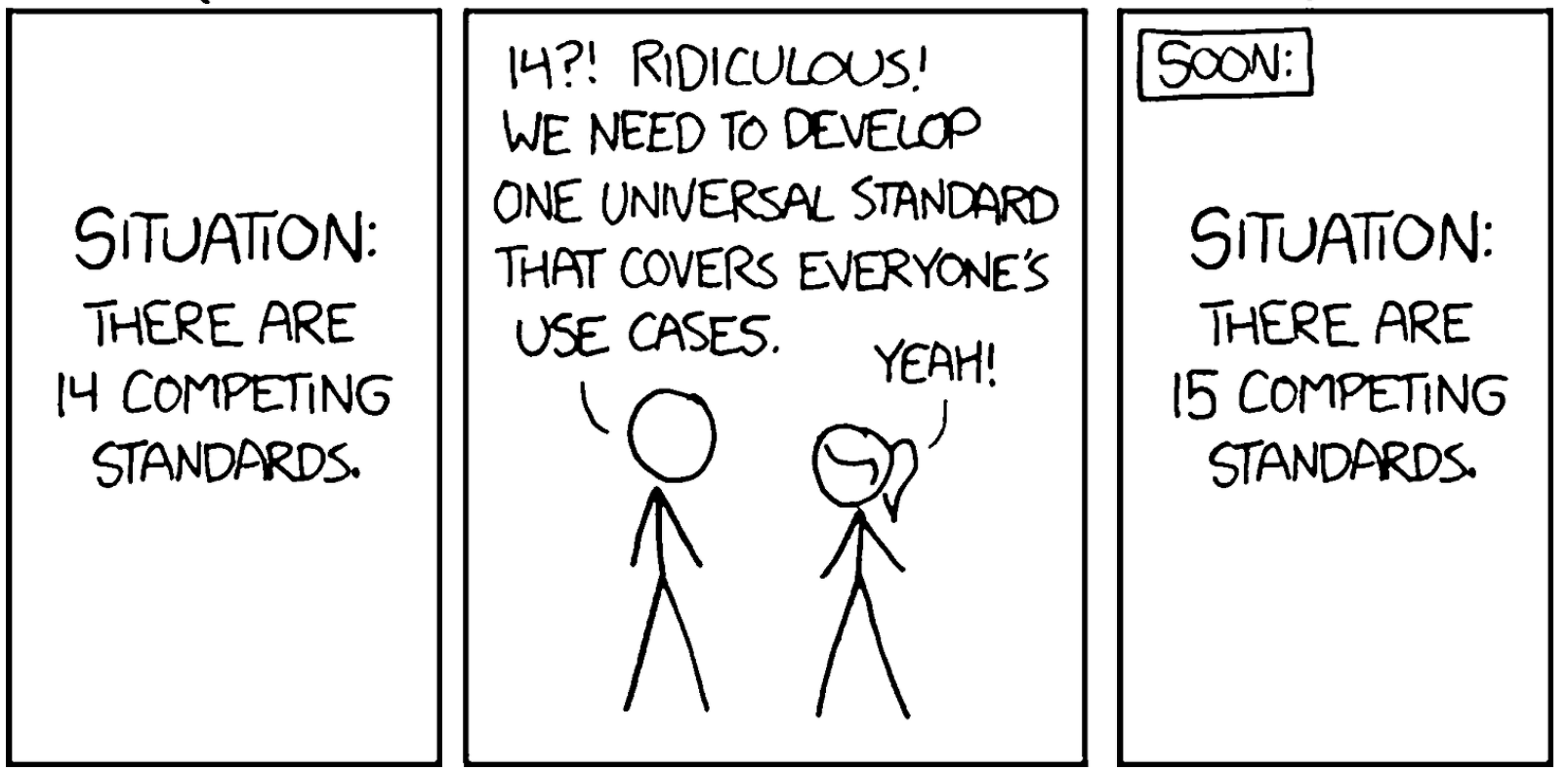
- What's the cost? Especially of not doing it right?
- What about standards?
  - Encourage growth, innovation and adoption, reduce costs
  - Otherwise, waste $341 billion by 2025*
    - Standardized implementation ~$781 billion*
    - Non-standardized implementation - $1.12 trillion*

*Machina Research, 2016

HOW STANDARDS PROLIFERATE:

(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC)




MY MAGIC 8-BALL UPDATED ITSELF TO A MAGIC 10-BALL LAST NIGHT WITHOUT MY PERMISSION.
HOW IS IT?
OUTLOOK'S NOT SO GOOD.
Cyanide and Happiness © Explosm.net

Tech issues

- Will require continued development in underlying tech
  - Faster, more efficient networking
  - Low cost, low power, adjustable performance chips
  - Lightweight
  - Security must be addressed
    - For example, connecting things to the electrical grid
    - Or preventing unauthorized access (the ant colony problem)

Larger concerns

- What is being done with all the data being generated?
  - Who has access to it?
  - Who doesn't?
  - What is being done with it, both good and not so good?
  - Will we become reliant on it?
  - What happens when it doesn't work properly?
  - Do we need it?

  - Could we even see a new target for division or discrimination?

Ultimately, what becomes the role of the human?

- Machines can communicate with each other, self-diagnose, self-repair, self-drive, select songs for us, tell us what we should eat, when we should wake up, sleep and brush our teeth and for how long and where, how to get from point A to point B, even drive us there, monitor and adjust the temperature, change channels, set reminders….
- There has already been some resistance and backlash
- Are we ultimately reduced to vectors for generating data?
- Why are we here? What are the dependencies? What will our role be?