COS10011
Creating Web Applications

Where to from here?

Contents

Recent (and some not so recent) trends in the Internet / Web

- Web Services

- Cloud

- Mobile

- Internet of Things – Sensor networks and RFID

- Security

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- **Web Services**

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Web – Two views

- **Consumer-oriented**
  - ☐ Service consumer is a browser
  - ☐ 'Web 2.0' / AJAX
  - ☐ *Mashups*

Focus in unit
COS30020/COS80021
Web Application Development
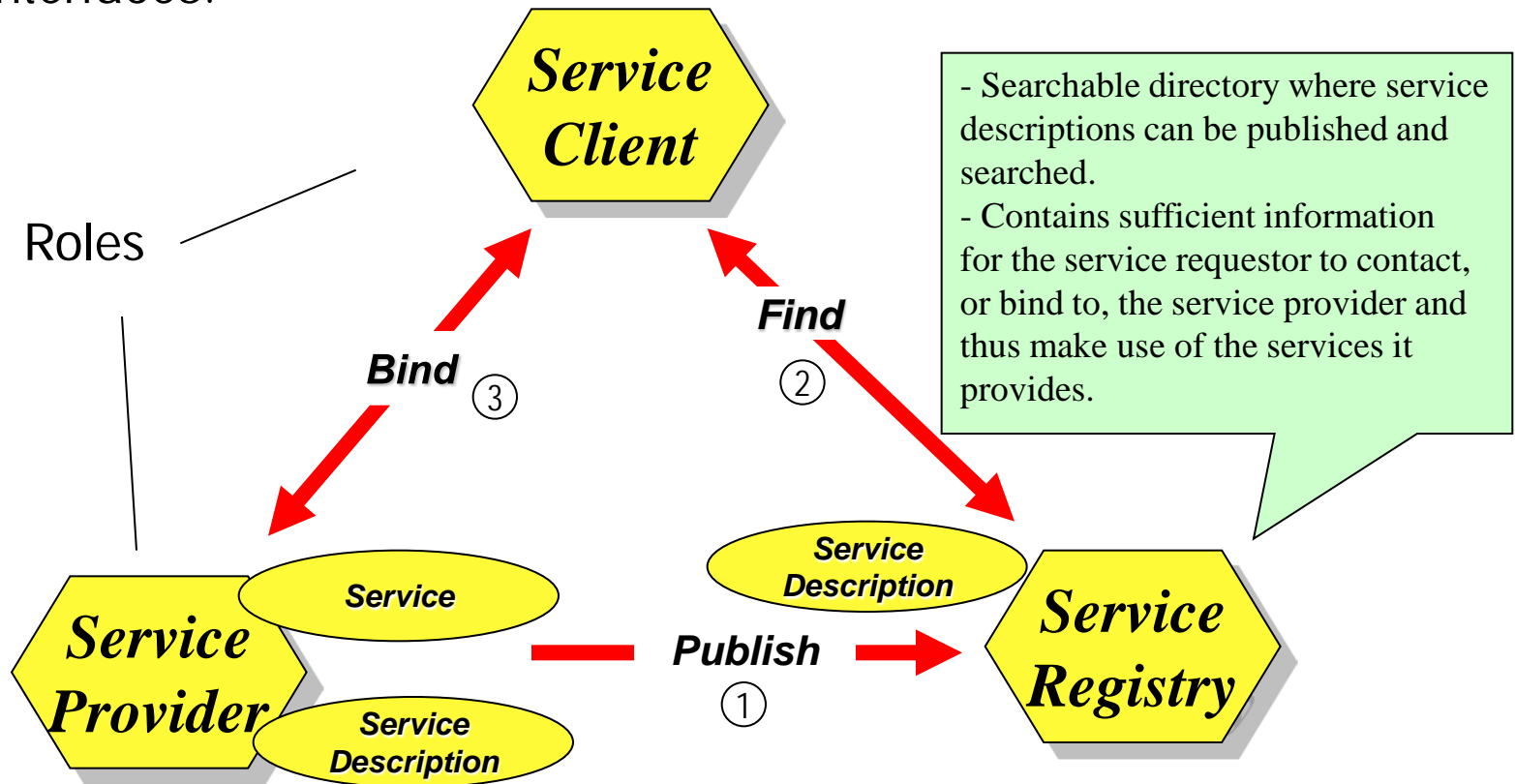
- **Enterprise-oriented (sometimes called Web Services)**
  - ☐ 'Programmable' Web
    - ☐ Exchange of XML documents
    - ☐ Consumed by software systems
  - ☐ Business Process Interoperability
    - ☐ EAI – Enterprise Application Integration
    - ☐ eBusiness
  - ☐ Web Services are the main implementation technology underpinning a broader push to *Service-Oriented Computing*

Focus in unit
COS80011
Web Application
Architectures

Service Oriented Architecture

- SOA is a logical way of designing a software system to provide services to either end-user applications or to other services distributed in a network, via published and discoverable interfaces.

Service Client

Service Provider

Service Registry

Roles

Bind ③

Find ②

Publish ①

Service

Service Description

Service Description

- Searchable directory where service descriptions can be published and searched.
- Contains sufficient information for the service requestor to contact, or bind to, the service provider and thus make use of the services it provides.

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Web Services and SOA

- There are a number of architectural styles for implementing SOA using Web services

  □ WS* (often referred to as "Web Services")

  □ Restful

  □ Event Driven

  □ Publish- Subscribe

  □ ….

- WS* approach

  □ Standards based, self-describing interfaces

  □ In the enterprise context often supported by middleware /Enterprise Service Bus (ESB) implementations

Types of Web Services

- *Informational services* are services of relatively simple nature. They either provide access to *content* interacting with an end-user by means of simple request/response sequences, or expose back-end business applications to other applications. Examples include:

  - ☐ Content services such as weather report info., simple financial info., stock quote info., news items

  - ☐ Simple trading services that can provide a seamless aggregation of information across disparate systems & data sources.

- *Complex services* that involve the assembly & invocation of many pre-existing services possibly found in diverse enterprises to complete a multi-step business interaction:

  - ☐ a supply-chain application involving order taking, stocking orders, sourcing, inventory control, financials and logistics.
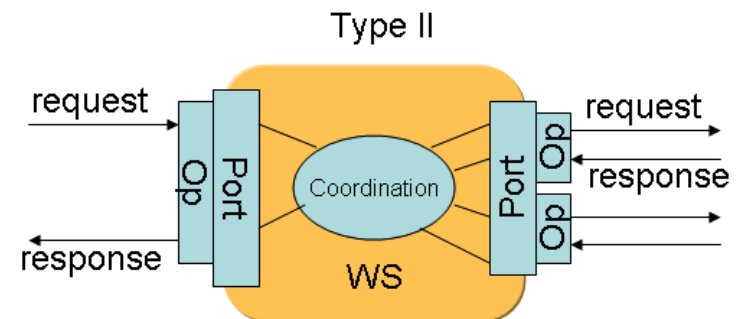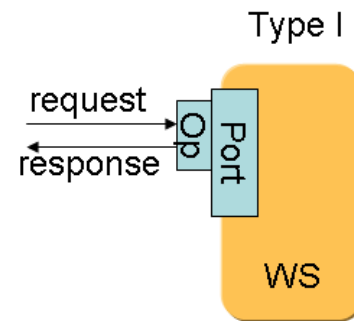
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Cloud Computing

Response to the complexities of computing structure ownership and management.

Cloud computing describes the abstraction of web-based computers, resources, and services that system developers can utilize to implement complex web-based systems.

- A series of recycled ideas presented with a fresh twist
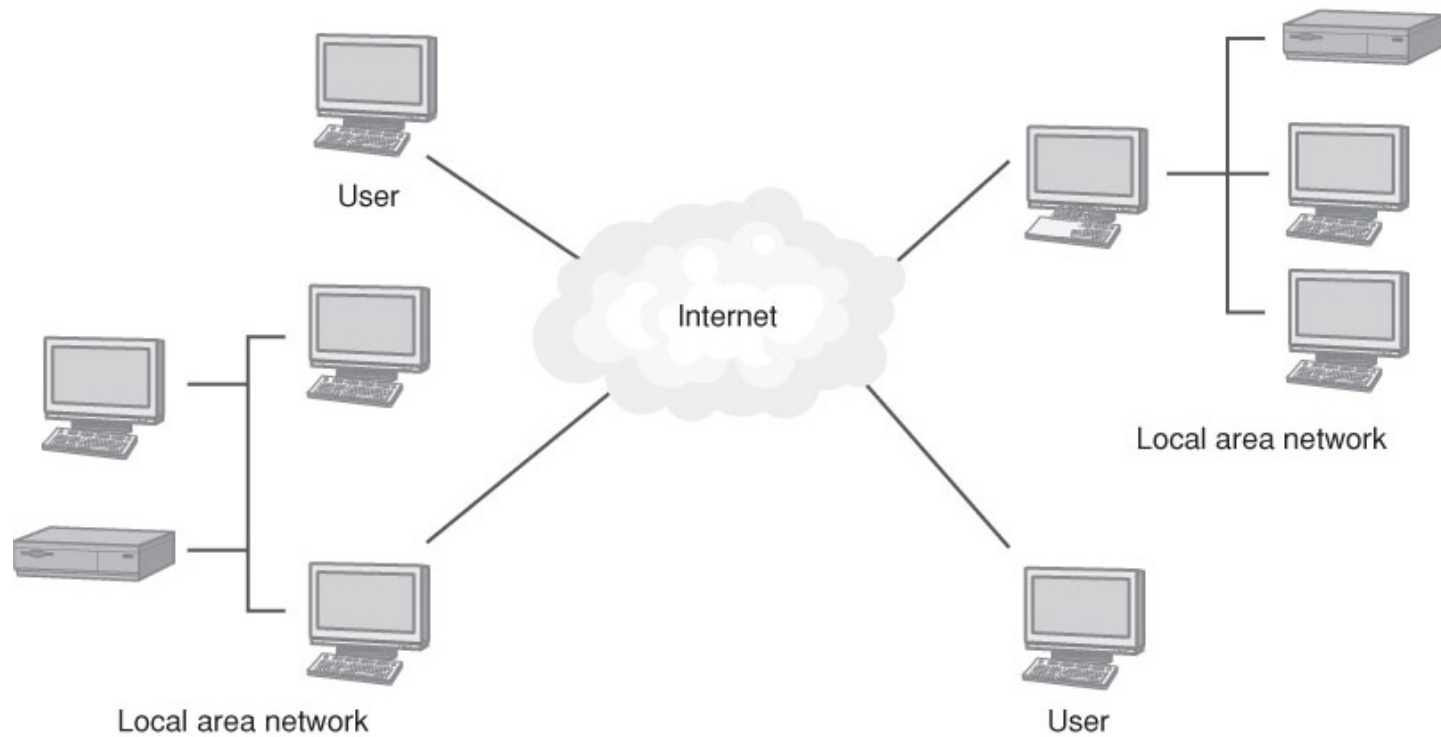
- Commoditisation of servers

- Virtualisation

- Automation

- Ubiquitous network access

Why Use the Term "Cloud"?

For years developers and network administrators have represented the Internet as a cloud.

e.g. iCloud

Features of Cloud-based Platforms

- **Scalability.** On demand resource scaling.

- **Redundancy.** Servers, storage, and networks.

- **Cost benefits from resource pooling.** Shares IT resources across a very large number of companies, which provides cost savings to each.

- **Outsourced server management.** Provides an IT staff who maintain operating systems and underlying support software.

- **Low cost of entry.** Companies do not need to invest in their own IT data center.

Google Data Centres

Your experience with Google !

Mobile Computing and Cloud

- Mobile 'thin-clients'. Pesonalised data strorage in the cloud

- Web 2.0 tools and sites, users essentially publish content directly to the cloud for access by other users.
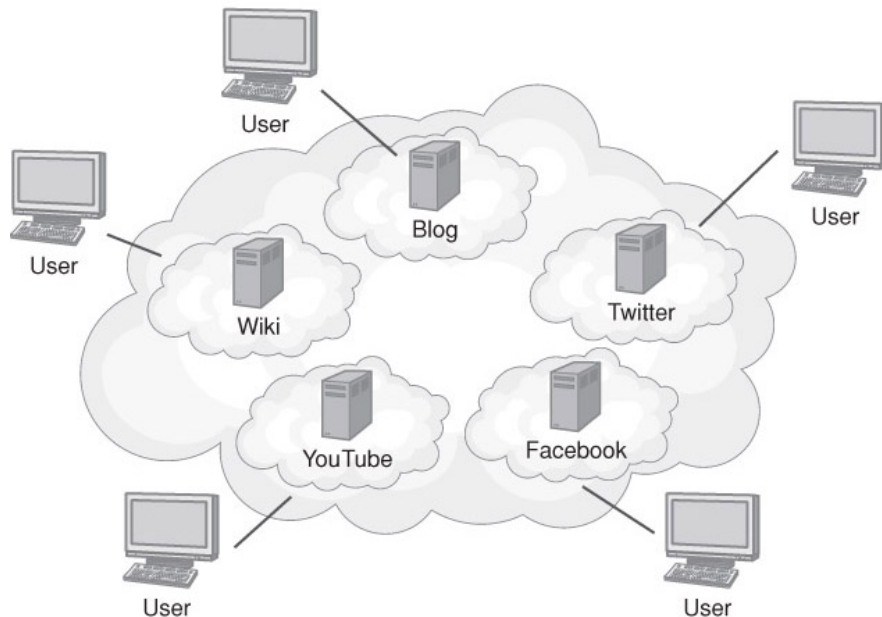
Cloud Computing

- Computing as a Service

  - Infrastructure-as-a-Service (IaaS)

  - Platform-as-a-Service (PaaS)

  - Software-as-a-Service (SAAS)

Some videos...

http://www.infoq.com/presentations/Patterns-for-Cloud-Computing

http://www.infoq.com/presentations/Deploying-on-Amazon-EC2

http://aws.amazon.com/resources/webinars/#recorded

Software as a Service (SaaS)

- SaaS provides a cloud-based foundation for software on demand.

- Web-delivered content that users access via a web browser.

- The software can reside within any of the deployment-model clouds.
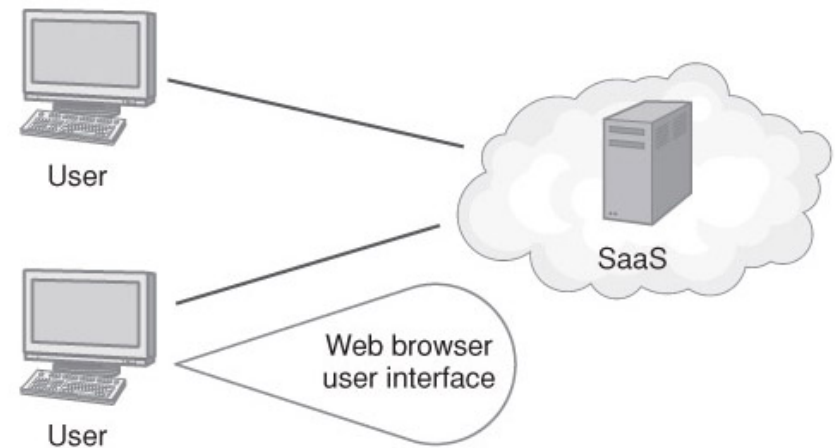
Real World: Salesforce.com

- One of the first companies to launch a large-scale SaaS.

- Leveraged the fact that as much as three-fourths of a salesperson's day was spent on non-sales tasks.

- Recognised that regardless of the items a company sold, the selling process was similar across companies and even industries.

- Automated these tasks and put the underlying data storage in the cloud—the sales cloud.

Platform as a Service (PaaS)

- PaaS provides the underlying hardware technology, such as one or more servers (or virtual servers), operating systems, database solutions, developer tools, and network support, for developers to deploy their own solutions.

- The hardware and software within a PaaS solution is managed by the platform provider.

- Developers need not worry about performing hardware or operating system upgrades. Instead, developers can focus on their own applications.

Real World: Microsoft Azure

- Microsoft platform for developers to move applications to the cloud.

- Provision of OS support for .NET applications and a cloud-based SQL server (SQL Azure)

http://channel9.msdn.com/posts/dunnry/What-is-Windows-Azure/

- Also Google App Engine

Infrastructure as a Service (IaaS)

- IaaS provides a virtual data center within the cloud.

- IaaS provides servers (physical and virtualized), cloud-based data storage, and more.

- Developers must install their own operating system, database management software, and support software.

- Then the developers (or the company's system administrators) must manage both the hardware and the software.

Real World: Amazon AWS

- Companies can use <u>Amazon Web Services</u> **(AWS)** to host their own systems.

- Today, AWS process hundreds of thousands of web-based requests for companies every second!

Cloud provider examples

Different providers provide various combinations of IaaS/PaaS/SaaS.

- Amazon
  - Provides high control to the developer to select hardware stack as they need (can select till the kernal) so that the developer can use many technique/technology to develop the application. D
  - Down side is automation of scalability is less due to low level of abstraction. Each developer has to tackle the resource allocation and removal implementation of different layers through provided APIs

Google AppEngine
  - Provides full automation of scaling. However, application has to be written adhering to certain rules and designs to be deployed in the environment. Loose coupling of tiers is required.
  - Mainly, targeted for traditional web application.

Microsoft Azure :
  - For .Net applications, hardware stack cannot be altered drastically.
  - However, many types of applications and languages can be deployed.
  - Some automation of scalability is provided.

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Mobile Units @ Swinburne

- COS30007/COS80020 Creating Data Driven Mobile Apps (iPhone)

- COS30017/COS80019 Software Development for Mobile Devices (Android)

- Content

  - ☐ Introduction to Development Tool Kits

  - ☐ Developing interactive touch driven applications

  - ☐ Working with tabular, grid and list data

  - ☐ Building user interfaces for different layouts and screen sizes

  - ☐ Drawing and animation

  - ☐ Persisting data and memory management

  - ☐ Using built-in sensors and actuators

  - ☐ Debugging and Optimising mobile applications

  - ☐ Current mobile platforms and eco-systems

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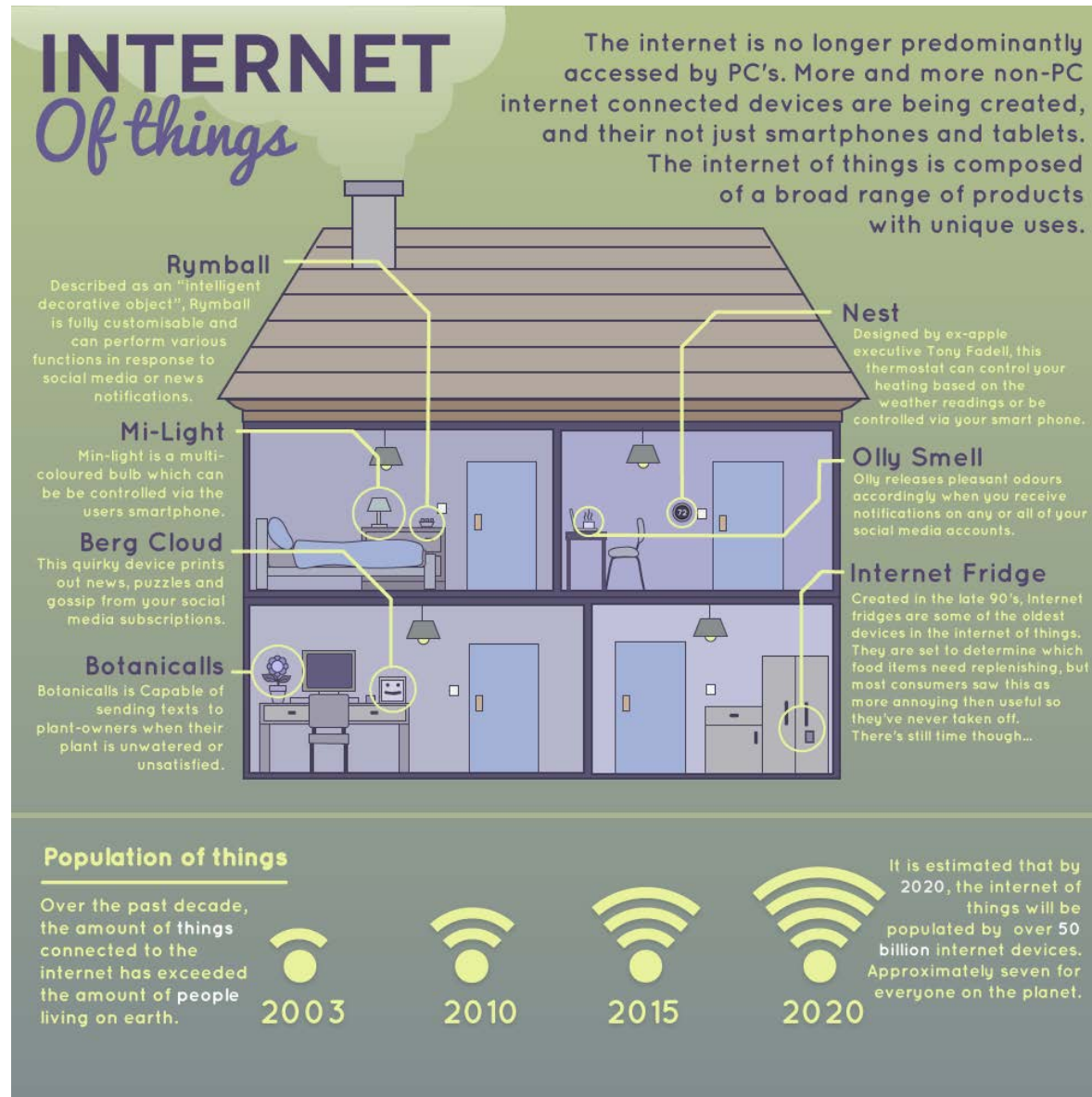
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IoT, Sensor Networks and RFID

- Now more interconnected devices than people

- Devices talking to each other

- Sensors providing information on the state of the environment

- Not new. First Internet enabled Coke Vending machine at Carnegie Mellon University in 1982!
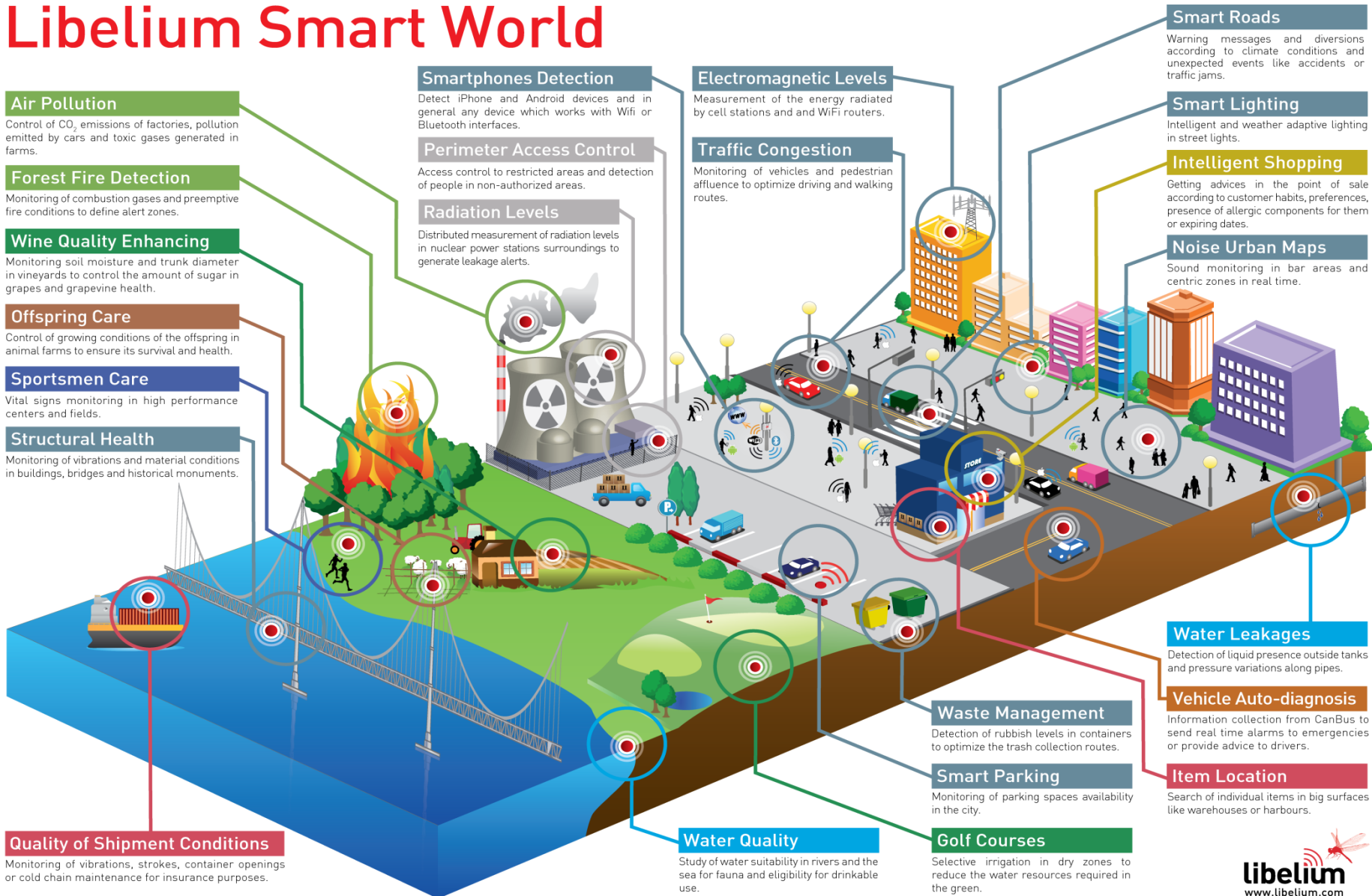
IoT examples - Home

IoT – Smart Cities

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.

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.

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.

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

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

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.

libelium
www.libelium.com

IoT - Scenarios

The example

All the monuments of the world are described in detail on the Net.

The packages that we send are tracked on the Web and we know where they are.

Lost or stolen objects (eg keys or car) can tell us where they are.

Plants can water themselves when they are thirsty.

The alarm can ring earlier in case of traffic or bad weather.

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How it works				
Objects are identified by their position in the World. They have an information shadow on line, but there is no direct interaction with the object.	Moving objects are uniquely identified by a code. They have an information shadow on line, but there is no direct interaction with the object.	The objects are connected to the Internet and interact with people: they communicate, take orders and state information about themselves (e.g. their position if they are lost).	Objects communicate with each other and action each other to the occurrence of certain conditions.	Objects communicate with the Net to which they provide information that can be elaborated and used as new knowledge.

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Technologies				
Augmented Reality Geotagging GPS	RFID NearFieldCommunication Barcode Visual Recognition	Remote control	Machine2Machine	Object Generated Content (OGC) Device to grid

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