Smart Cities


Cities are for People
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Marble

Smart cities as a web of people, things and services

Workshop 2, Web technologies
for Smart Cities & Internet of Things

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Smart Cities

- Combining sensors, actuators and other information to enable services that allow people to lead better lives
  - Public/anonymised data
    - Public services, e.g. transport, and utilities
  - Private/personal data
    - Healthcare, security and personal services
- Geographic information services and the Web of Things
  - Presenting information in context
  - Simulations and planning for the future
- Machine interpretable data and the Semantic Web

http://www.smartcityexpo.com/

Smart City Expo World Congress 2012

Smart City Expo – Use Cases

- New cleaning systems
- Integrated energy solutions
- Interactive bus stops
- Shared bicycles
- Smart lighting
- Smart telecommunications
- Smart parking
- Recharging stations
- Emergency systems
- Geolocalized info
- Urban wind power
- Environmental sensors
- Smarter waste collection

Other examples

- Albertis Telecom & Paradox Engineering: Smart Zone smart city demo
  - see http://bit.ly/YRomYu
  - Advanced meter reading
    - Gas, electricity and water using wireless mesh network, as well as devices such as thermostats, sensors, actuators
  - Lighting management for streets and buildings
    - Based upon time of day and presence of people
  - Irrigation management
    - Monitor data from water meters and control pipes and sprinklers, and adjust to environmental conditions

Smart Meters

Electricity meter – Southern Electric (UK)

Gas meter – British Gas

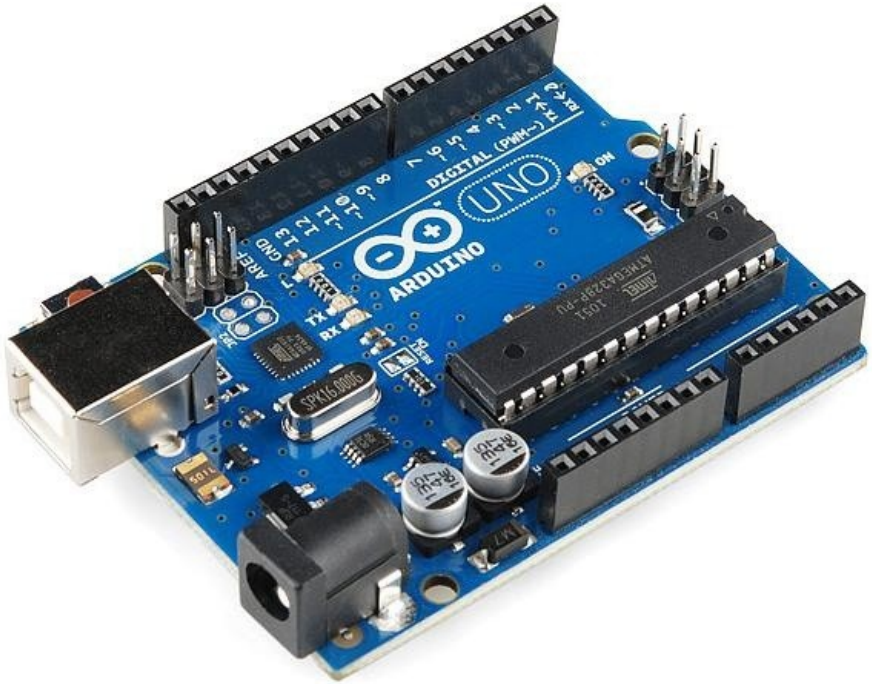
Enable people to learn to reduce their consumption, and lower the cost of their bills. If lots of people do this, we can reduce risk of power cuts from overloaded power grids, and help the environment!

Privacy Implications?

- Smart meter uses expert system to classify which kind of electrical device you are using
  - Intended to help users get smart about their power usage
- "Smart meter hacking can disclose which TV shows and movies you watch"
  - 28th Chaos Computing congress, 27-30 December 2011, Berlin
    - http://bit.ly/wCX95n
  - Based upon unique pattern for second by second power fluctuations for TV when playing the show/movie
- So we need clear privacy policies and secure communications!
  - to avoid snooping/hacking

Open source hardware

- For DIY projects



Publishing your sensor data

Devices/Feeds talking to Cosm (most recent 1,000)

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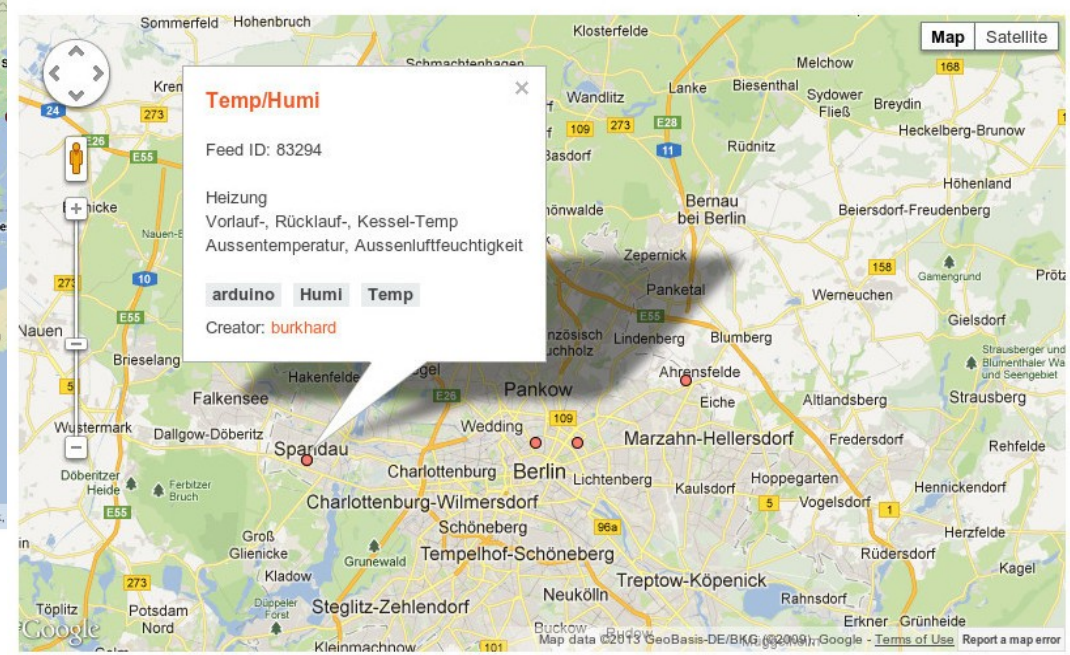


cosm Connect to your world

http://cosm.com/

Architectural Issues

- The role of biological metaphors
  - Sensor pipeline
    - Progressively higher levels of interpretation
    - Challenges for combining different sources of data
  - Actuator pipeline
    - Progressively lower levels of representation
    - Challenges for synchronizing different actuators
- Open markets and federated search
  - Counter to monopolistic walled gardens for app stores
- Dealing with very large amounts of data
- Heterogeneous vocabularies for metadata
- Reducing the barrier to creating services

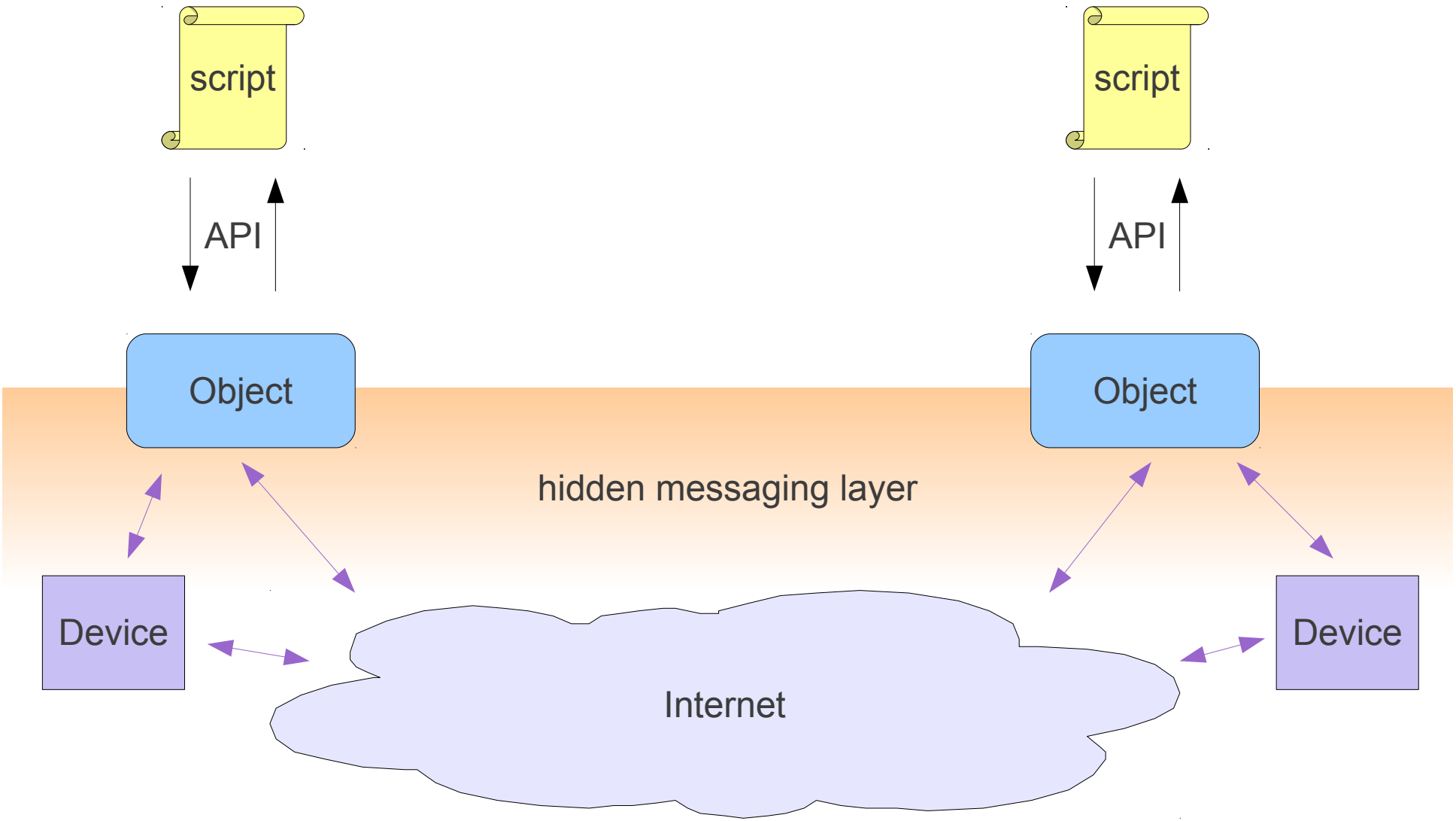
Web of Things

- Applying web technologies to reduce the cost of implementing services
  - RESTful HTTP, Web Sockets, etc. for communication
  - JavaScript APIs acting on local proxies
  - Overlay networking model to hide information that is best dealt with at a lower level of abstraction
  - Rich descriptions and live context management
  - Distributed processing (in devices and in the cloud)
    - Sticky policies for privacy and access control
  - Re-establishing control over your personal devices, apps, services and data
    - Personal Zones

Overlay Network Model

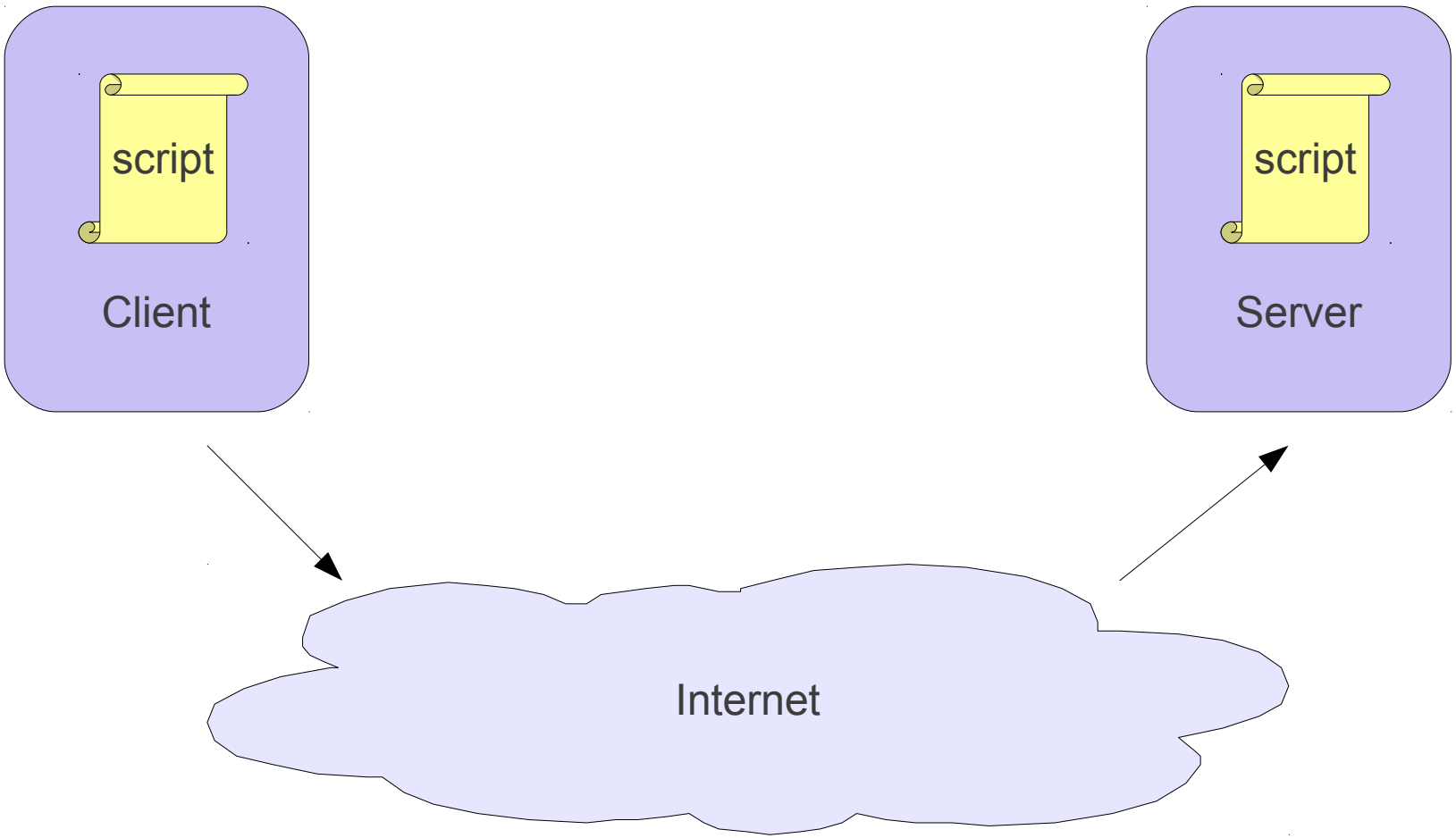
- Decoupling applications and services from things best dealt with at a lower level in the stack
  - Interconnect technologies
    - WiFi, BlueTooth, ZigBee, NFC, USB, IEEE 1394, IR, GPRS/3G/4G, WiMAX, the list keeps on changing ...
  - Some devices are low powered, requiring gateways
    - Pushing storage and computation close to the edge
  - Mix of discovery technologies, e.g. mDNS, UPnP
    - Plus federated and intent-based search across the Internet
  - Heterogeneous mix of old and new devices
    - Ensuring applications work with yesterday's and tomorrow's devices
    - Establishing design principles for fault tolerance

Objects as Proxies for Services



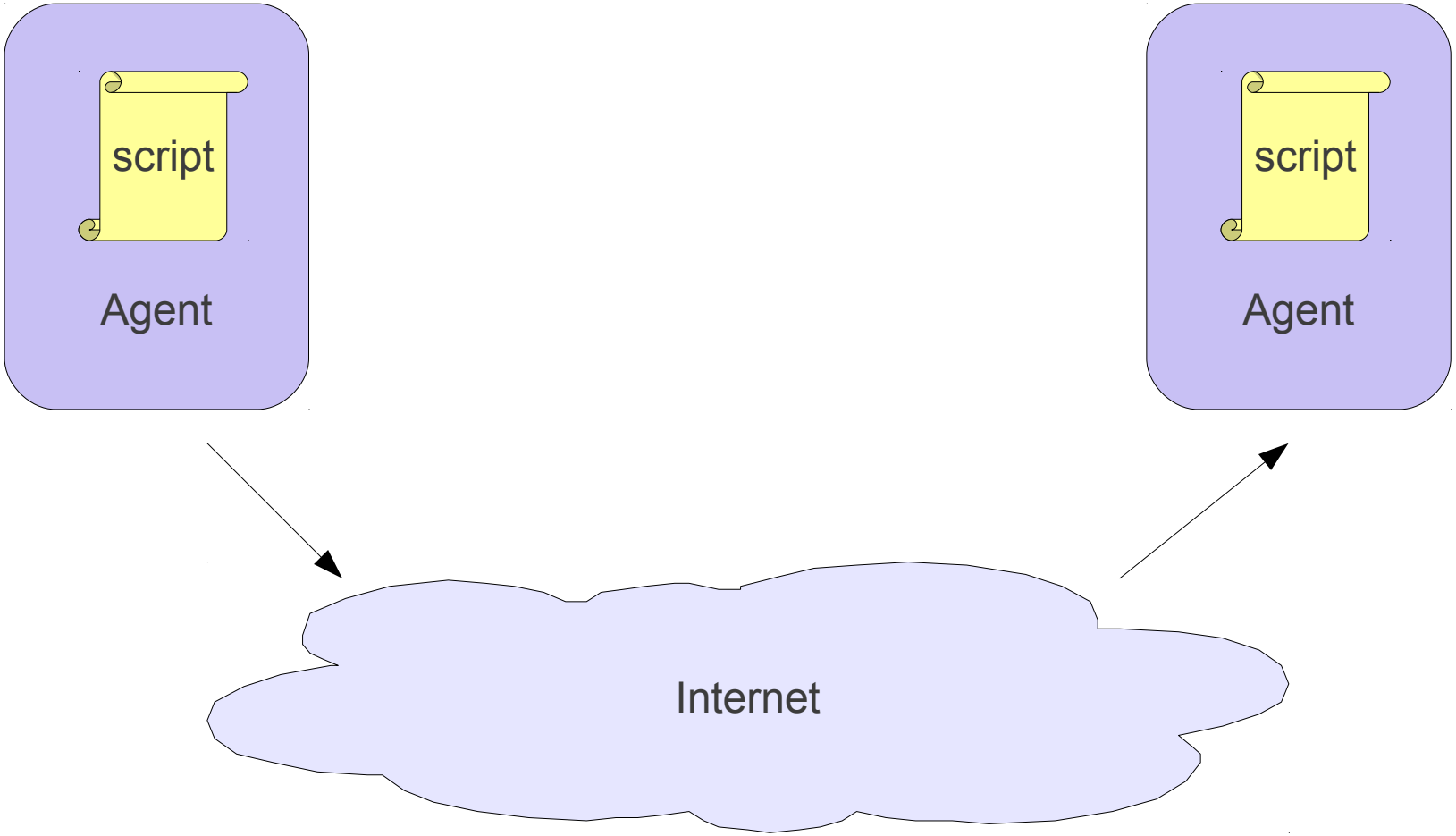
Scripts running within web run-time, or embedded agent or cloud, e.g. using node.js

Client or Server?

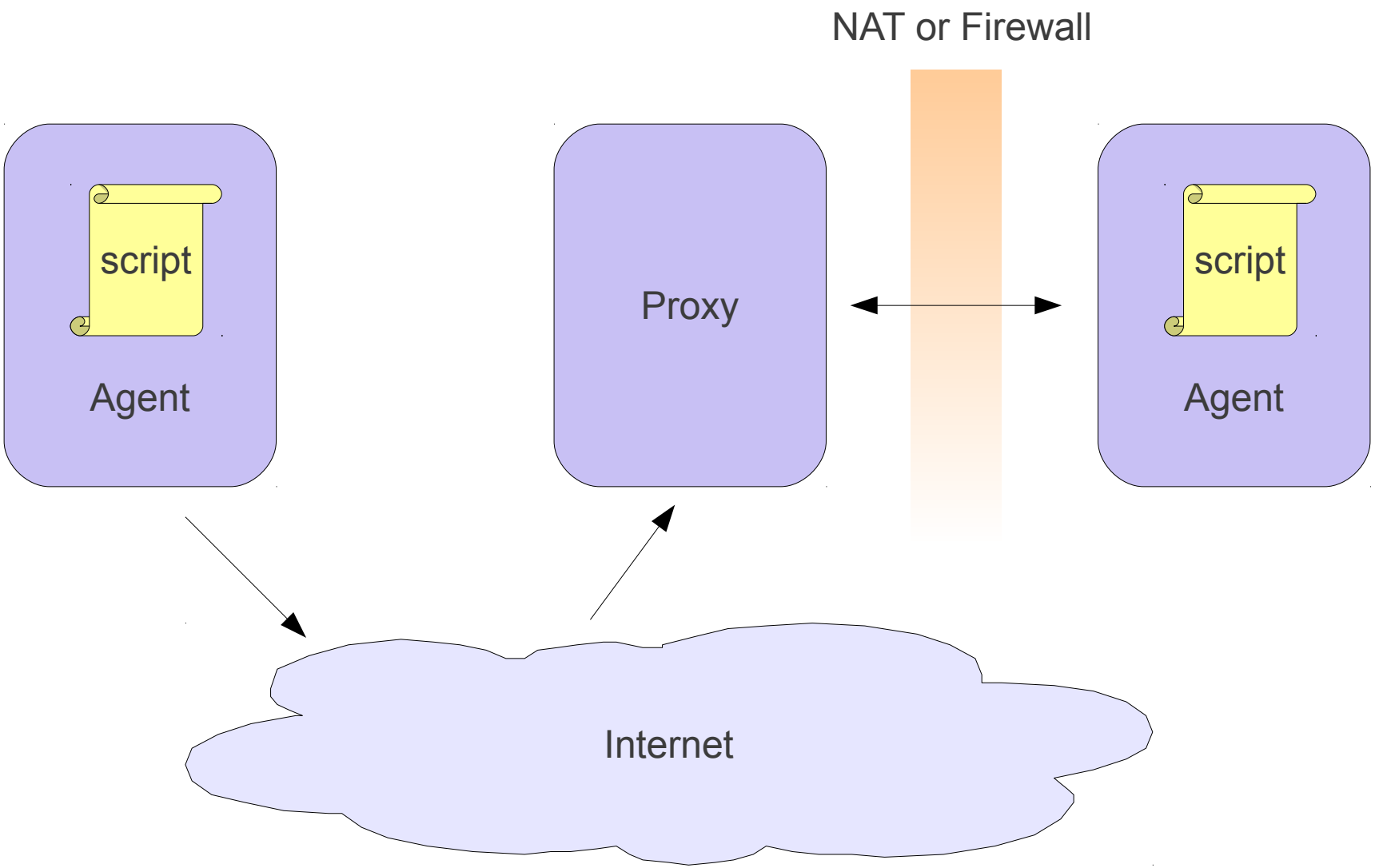


Client or Server?

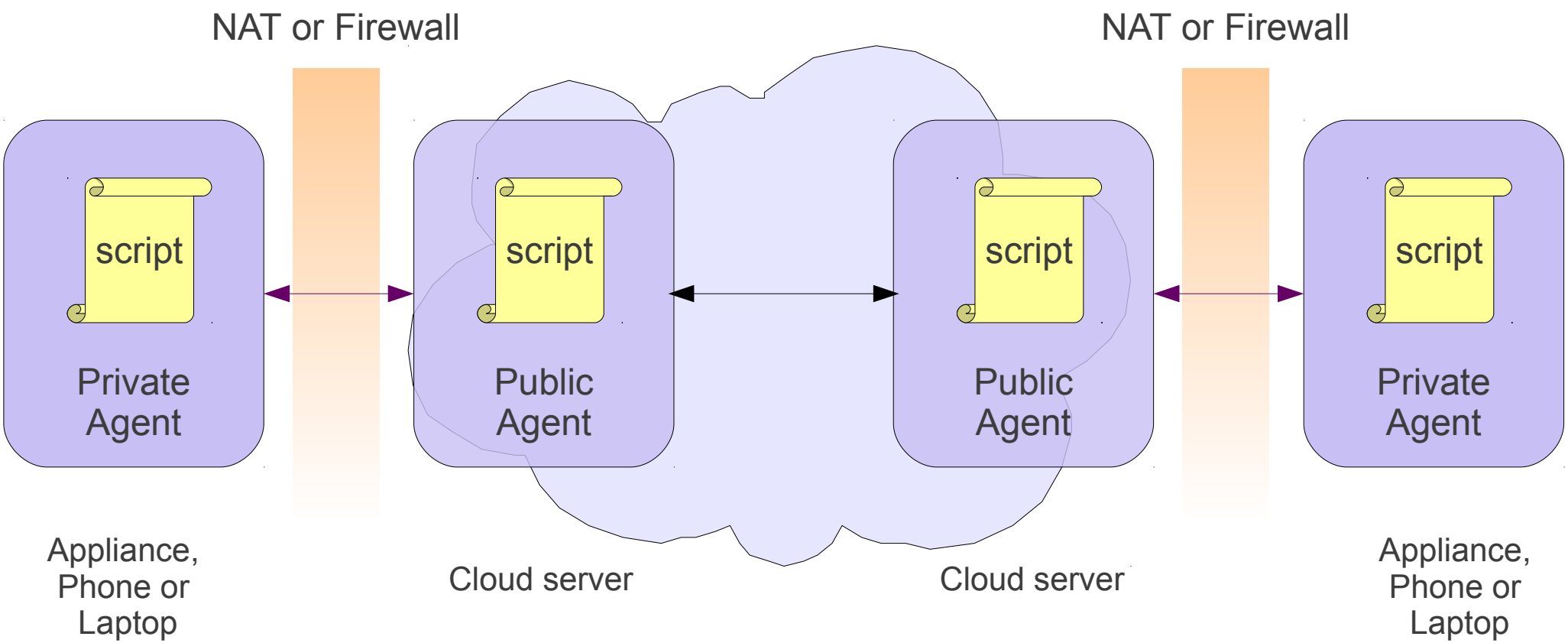
Agent combines client and server



Proxies



Public / Private



Personal Zones

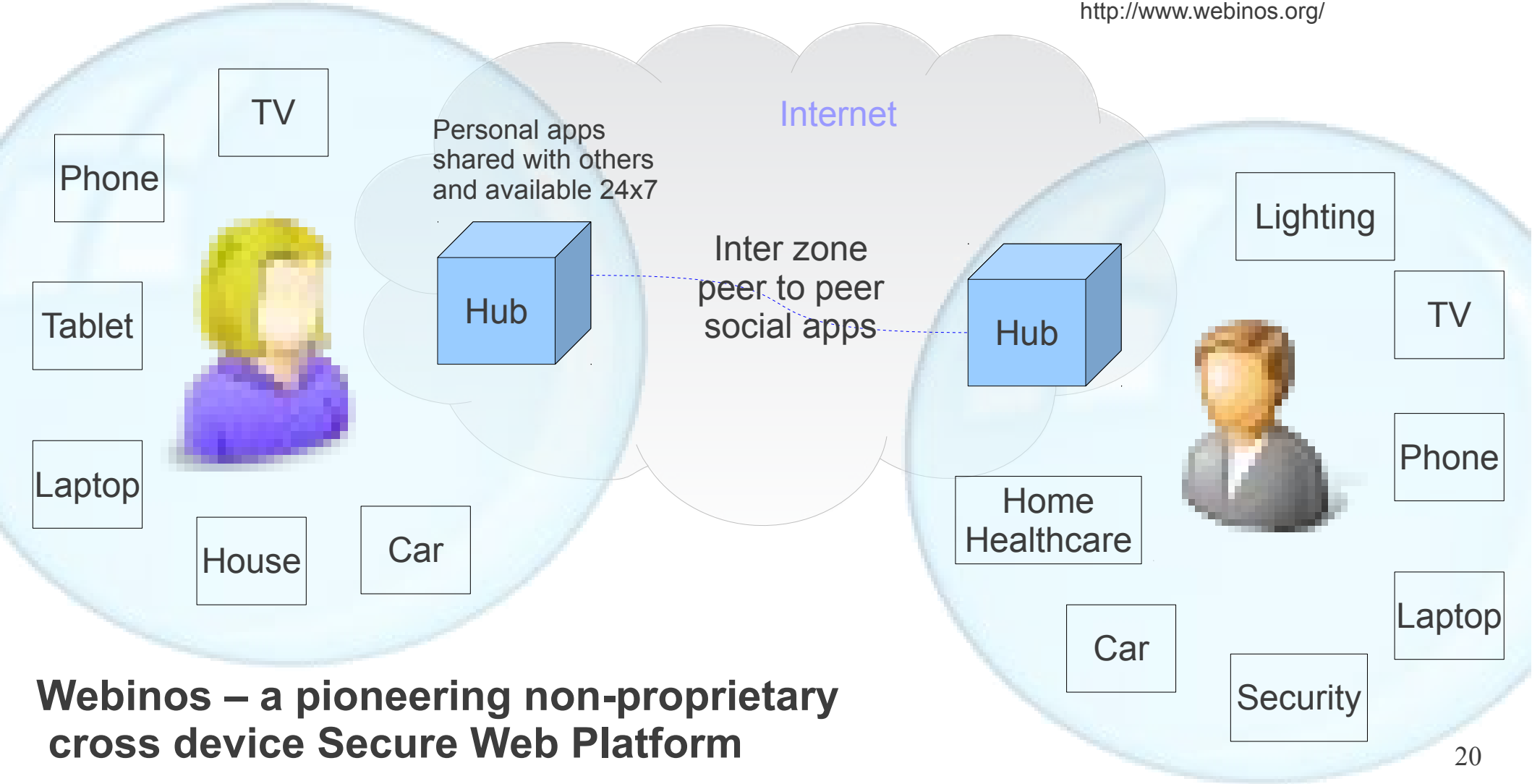
webinos
Secure WebOS Application Delivery Environment

Getting the most out of my devices

Multiscreen/multidevice apps

Trusted Applications with rich access to device Capabilities

http://www.webinos.org/



Webinos – a pioneering non-proprietary cross device Secure Web Platform

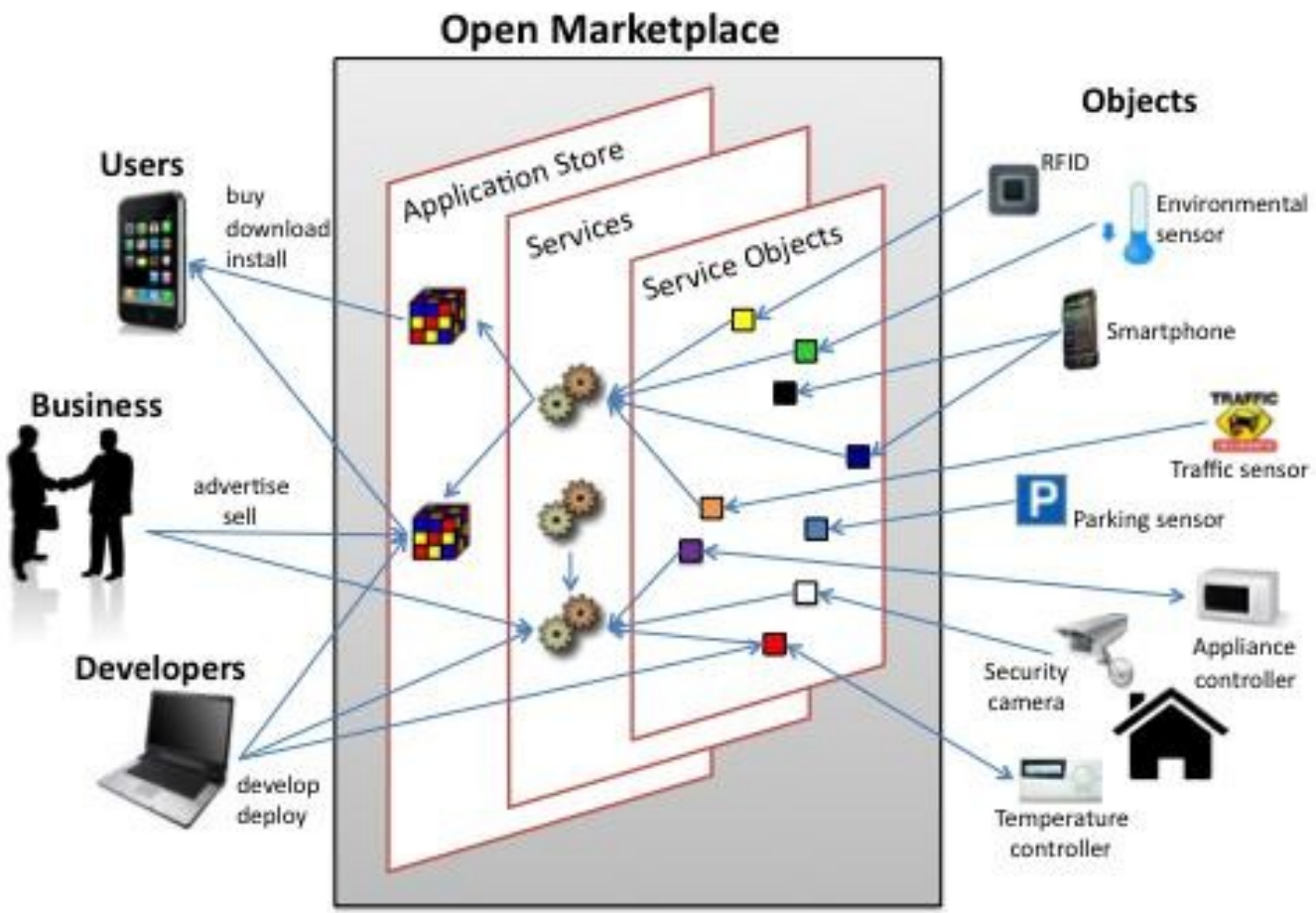
Home Services

- Extended warranty services for home devices
  - Central heating, washing machine, refrigerator, etc.
  - Preventative maintenance based upon access to sensor data
    - Very low incremental cost to manufacturers
    - Ability to sense impending failures
- Home security
  - Remote monitoring and peace of mind
- Home healthcare
  - Improved quality of life, outcomes and reduced costs

Re-establishing control over your devices and personal data

- Today companies provide services, but require centralization of personal data over which you have little control, making it hard to switch companies
- Personal Zones provide an architecture for reclaiming control!
- You decide what/when to share with 3rd parties
- This facilitates intent based smart search!
- Your data is managed within your zone, by the services you install

EU FP7 Compose Project



- Enabling open markets of services for the Internet of Things

http://www.compose-project.eu/

Coming soon: W3C Community Group for the Web of Things

- See http://www.w3.org/community/
- Open forum without fees
  - W3C provides free infrastructure support
  - Very easy to set up, and anyone can join
- Work with wider community to
  - Help with organizing workshops and tutorials
  - Discuss use cases and requirements
  - Develop specifications and test suites
  - Develop open source implementations
  - Develop documentation and training materials
  - Feed into subsequent standardization activities

Any other questions?

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Join W3C to help drive the Web to its full potential – http://www.w3.org/