Dec.5th 2014

Internet of Things (IoT)
- Its markets and issues around Consumer Electronics (CE) -

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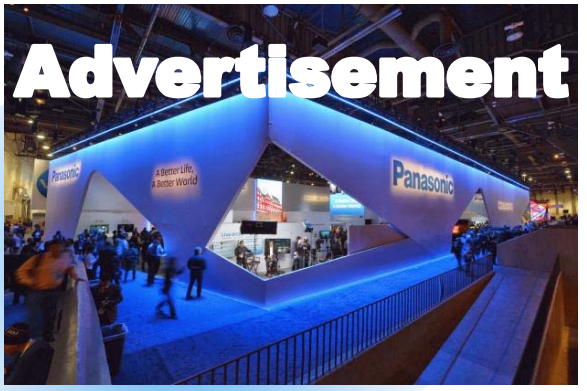
IoT Markets around CEs

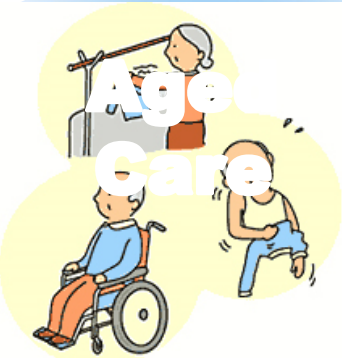
http://panasonic.net/center/tokyo/

http://www.panasonic.com/business/toughpad/us/best-rugged-tablet.asp



http://news.panasonic.net/japanstory/2014/0108_26069.html

http://www.panasonic.com/business-solutions/security-surveillance-solutions.asp



http://panasonic.biz/healthcare/afsh/reform/reform_condition/index.html

http://news.panasonic.net/archives/2010/0915_1748.html

http://panasonic.co.jp/ad/pks/global/index.html

http://panasonic.jp/car/special/tabinavi/

http://www.massage-sessel-berlin.de/

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Wonder Life-Box 2020

Panasonic has already started the smart home business globally.

Panasonic has opened Cloud Life Experience Show Room at Tokyo in Jun 7th, 2014. That is named “Wonder Life Box 2020”.

In this Show Room, thanks to “Internet of Things” technology, visitors really experience Convenient, Exciting, Relaxed high quality life in 2020. ■

Real Service Examples

my Home Cloud

my Home Cloud makes it possible to download a wide variety of content and apps, and to gain access to places for purchasing accessories via Panasonic's proprietary Cloud Technology.

Panasonic defined architecture from TV inside to Cloud as M2M, Customer Management based on Open PF such as Web Socket etc., and launched the service as “my Home Cloud”.

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T-connect (Toyota’s Cloud Service)

Panasonic launched Home Control Application which runs on Toyota’s T-Connect Service.
On the way to home, when the car comes near the owner’s home, air conditioners and/or lighting devices are automatically turn on according to the owner’s preference.

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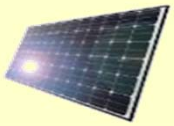
From Silo to Eco System (1)

Current Silo Situation ☹

Closed Silos in IoT World

Owner	LGE						
Owner	Samsung						
Owner	Panasonic						Toyota
Application Layer	- PV Controller (Panasonic) - Remote Maintenance (Panasonic)	- Remote Recording Management (Panasonic)	- My Home Cloud (Panasonic) - Third party's Apps (Third parties)	- Refrigerator Energy Management (Panasonic)	- Detergent based Washing control (Panasonic)	- Remote Control (Panasonic) - Sleep Control (Panasonic)	- Navigation Assistance (Toyota) - Home Control (Panasonic)
Platform Layer	PDSP (On Premise)	Dimora PF (On Premise)	Viera Connect (On Premise)	Gemini(On Premise)		AP Server (On Premise)	T-Connect (Open Cloud)
		PCPF(Open Cloud)					
Communication	Wired	WiFi		NFC		802.15.4g/d	3G, LTE
Device	Photovoltaic 	BD Recorder 	Smart TV 	Refrigerator 	washing machine 	Air Conditioner 	Connected Car 

Open Web World

Everyone	
Information Retrieval Web browse SNS Game etc.	
Open API module family (HTML, HTTP, RDF, XML, JASON,….) AWS, Azure, GAE, ….	
3G, LTE	WiFi
Smartphone 	PC 

Even in 1 company, platform is easy to be designed and updated respectively according to a variety of different "Things" characteristics.

Moreover, every company thinks about only its own products.
So, currently we have plenty of Silo services in IoT World.

From Silo to Eco System (2)

- WoT (Web of Things)

W3C Workshop on the Web of Things

Enablers and services for an open Web of Devices

25–26 June 2014, Berlin, Germany

Home	How to Participate	Logistics	Program Committee

The workshop is free, although you will need to submit an brief expression of interest or a longer position paper. See How to participate.

Introduction

It is common to think about the Internet of Things from the perspective of sensors and transport protocols, but you can also think about it from the point of view of services, which is where most of the money is expected to be made:

> *Services, Not Sensors: Gartner expects Internet of Things vendors to top $309 billion in direct revenue by 2020, with most of that money deriving from services.*

This of course will depend on open standards to get us out of the current fragmentation where companies are working in isolated silos:

> *The trick will be whether hardware companies will push hard enough for standardization so they can capitalize on services revenue. Companies that see themselves as pure hardware manufacturers are likely doomed, but those that see beyond the "things" to instead focus on the services built on the "Internet," the future is very bright. Matt Asay, MongoDB*

from http://www.w3.org/2014/02/wot/

World Wide Web Consortium starts to discuss de facto standardization on IoT in “Web of Things” interest Group.

@2014/6/25-26 WoT Workshop
@2014/10/29 TPAC2014/WoT Breakout Session

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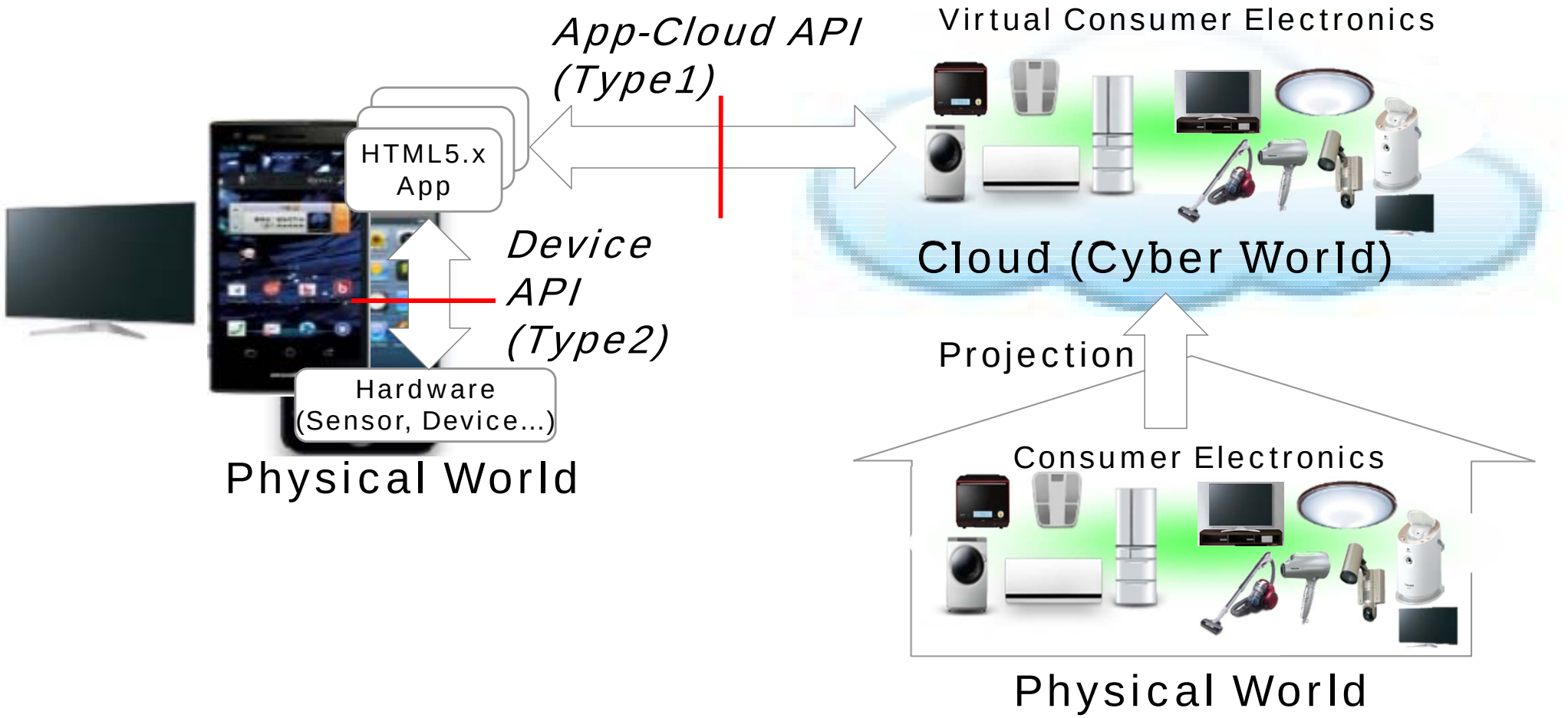
IoT Model Description and APIs



IoT could assume both App-Cloud API(Type1) and Device API(Type2) as its API to access physical Sensors, Devices and Sets such as CEs.

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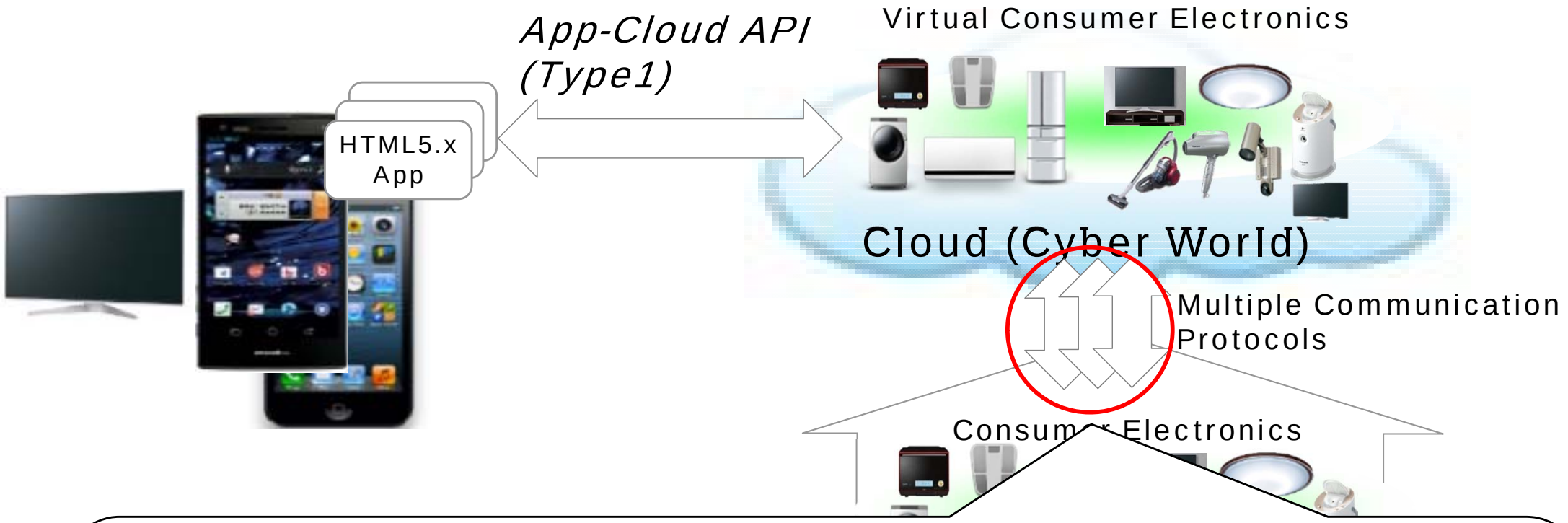
Comparison of App-Cloud API and Device API

	App-Cloud API (Type1)	Device API (Type2)
Network Type	Cloud-Client	None(Embedded) and/or P2P
Connected Device Ability Assumption	Web Server (Cloud might be agent of device)	Low Device
Overall System Complexity	Complicated	Simple
API Granularity	Relatively Abstract	Relatively Concrete
Number of Standardization Points	Relatively Less	Relatively More
Performance Requirement for UX device	Low	High
Main Standardization Partners	Set Manufactures, Cloud Servicers	Device Manufactures

Both App-Cloud API(Type1) and Device API(Type2) are important and co-exists.

IT vendors as service providers will set priority on Type1 discussion than Type2. Panasonic would like to contribute to define Type1 in W3C.

Physical Control Protocol Independency



Physical CE Control Protocols such as Echonet Lite, EE-Bus, IR Control and so on are independent from Type 1 APP-Cloud API.

Harmonizing a variety of multiple CE control protocols is out of scope of APP-Cloud API standardization, however, the model of some CE Control Protocols could be referred as App-Cloud API object model.

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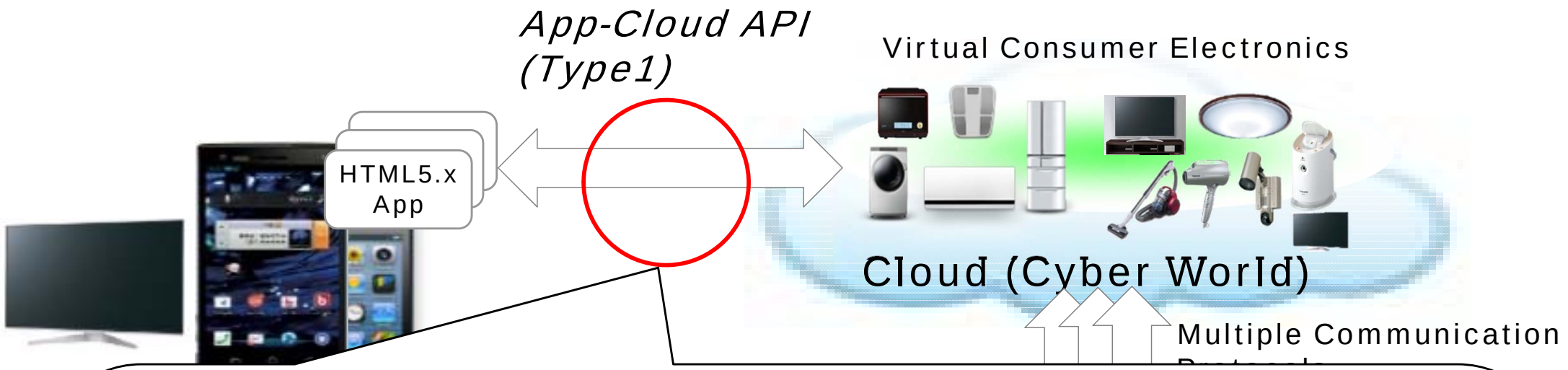
Variety of App-Coud API Description



A variety of App-Cloud API description should be supported.

HTTPS

```
GET https:// apipanasonic.com/remote/v1/111111/setOperationStatus?params=[ON] HTTP/1.1
```

WebSocket

```
{
    "id": 1
    "device_id": 111111,
    "method": "setOperationStatus",
    "params": ["ON"],
}
```

JavaScript

```
aircon.setOperationStatus("ON", function receive() {

});
```

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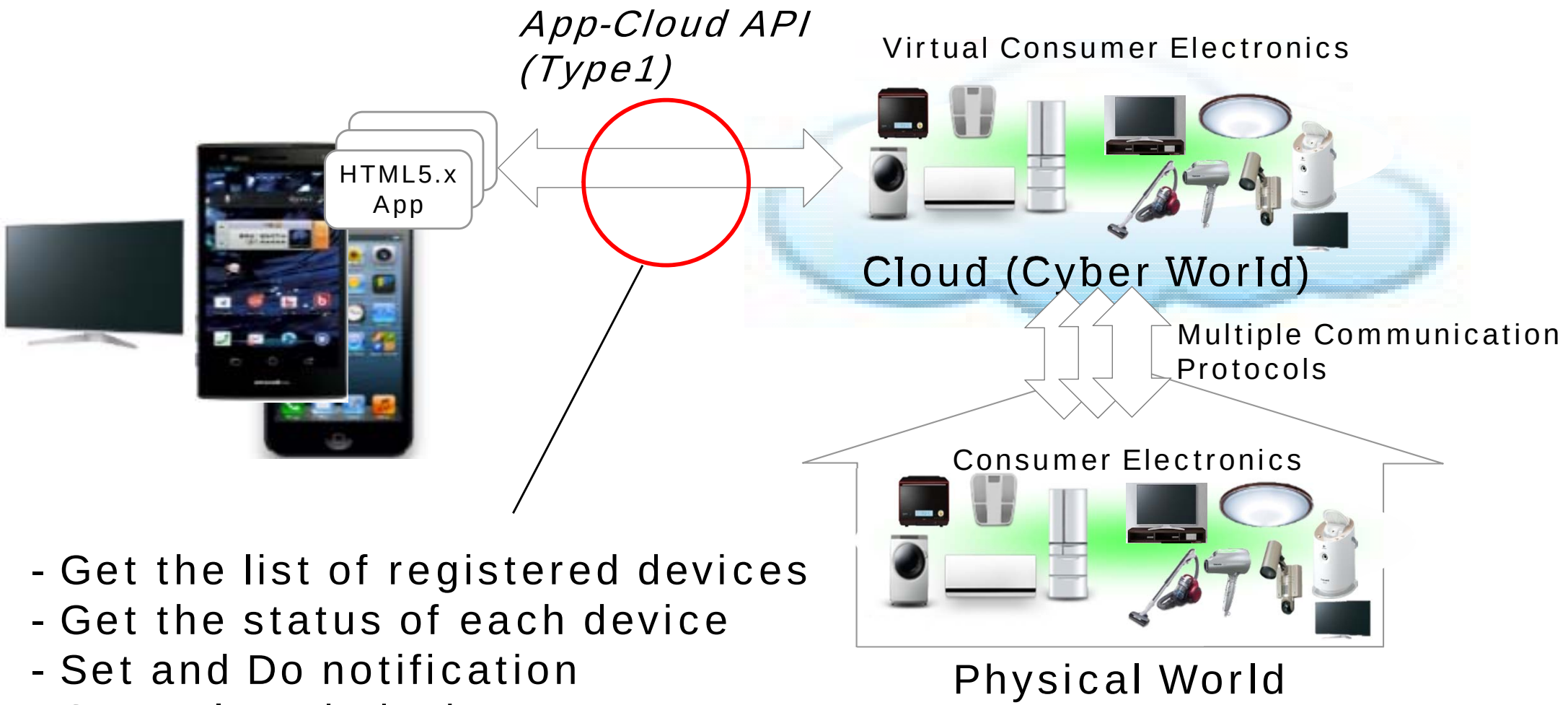
Type of App-Cloud API

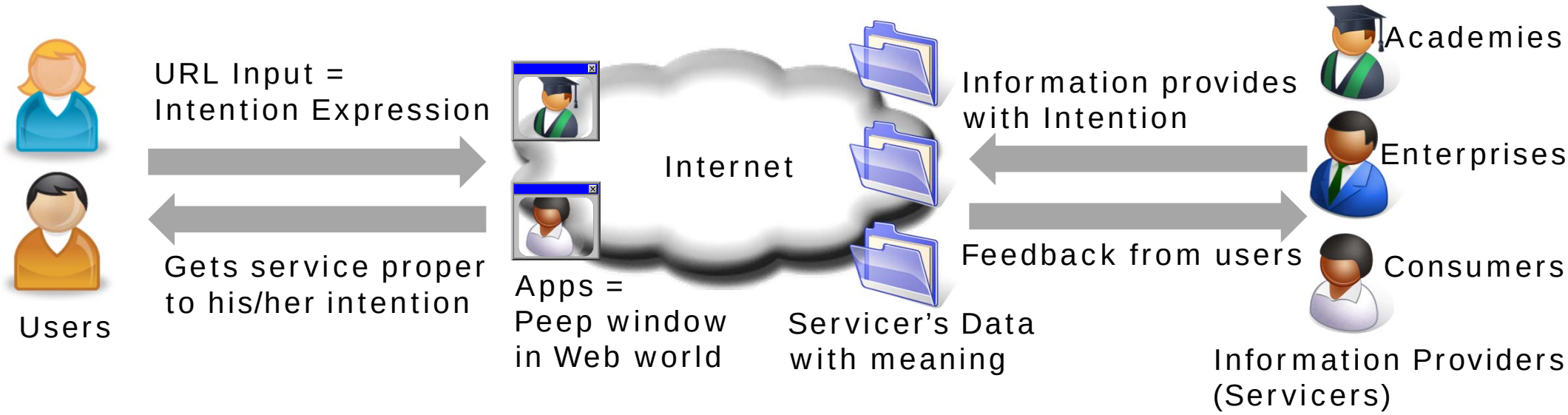


- Get the list of registered devices
- Get the status of each device
- Set and Do notification
- Control each device

Type 1 API might be better as RESTful one.
(REST: Representation State Transfer, that is, state transition is not stored in cloud)

Not only APIs but Rules and Operations(1)

- Current Web Service



- Information providers create web site with intention.
  The information is readable and understandable by users.
- There is common rule to declare and register global unique "URL" in Web service. And the rule is observed by some organizations such as ICANN, JPINIC, KRNIC and so on.
- There is common scheme to translate URL to reachable IP address, that is, DNS.
- Users can access the proper information on above scheme.

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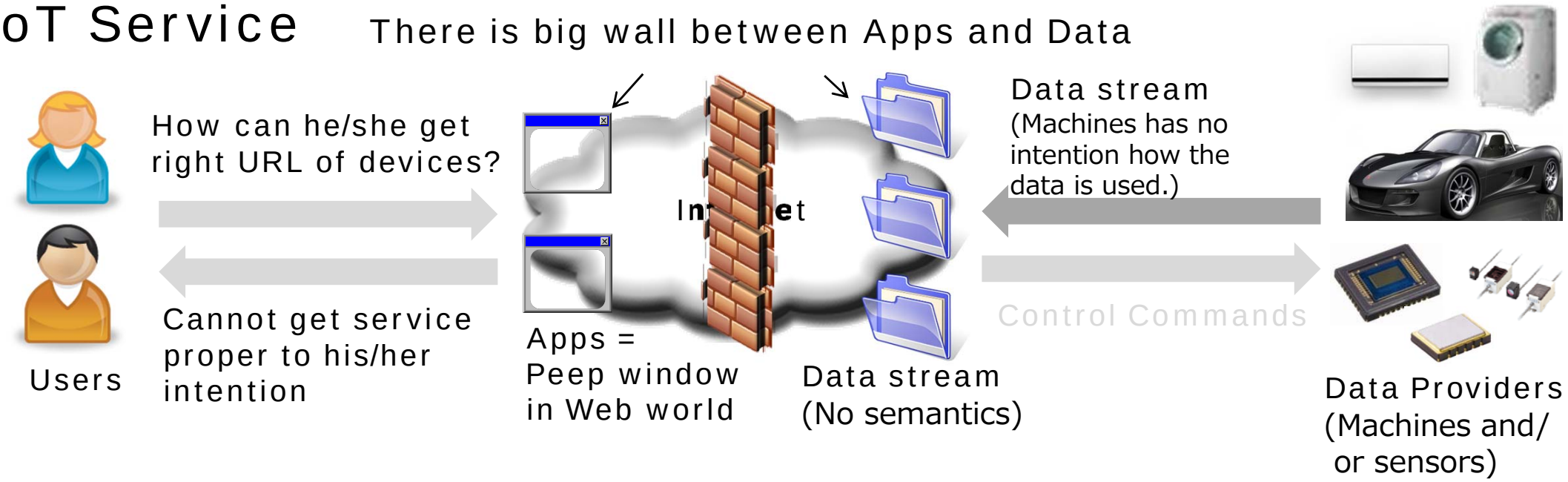
Not only APIs but Rules and Operations(2)

- IoT Service

There is big wall between Apps and Data



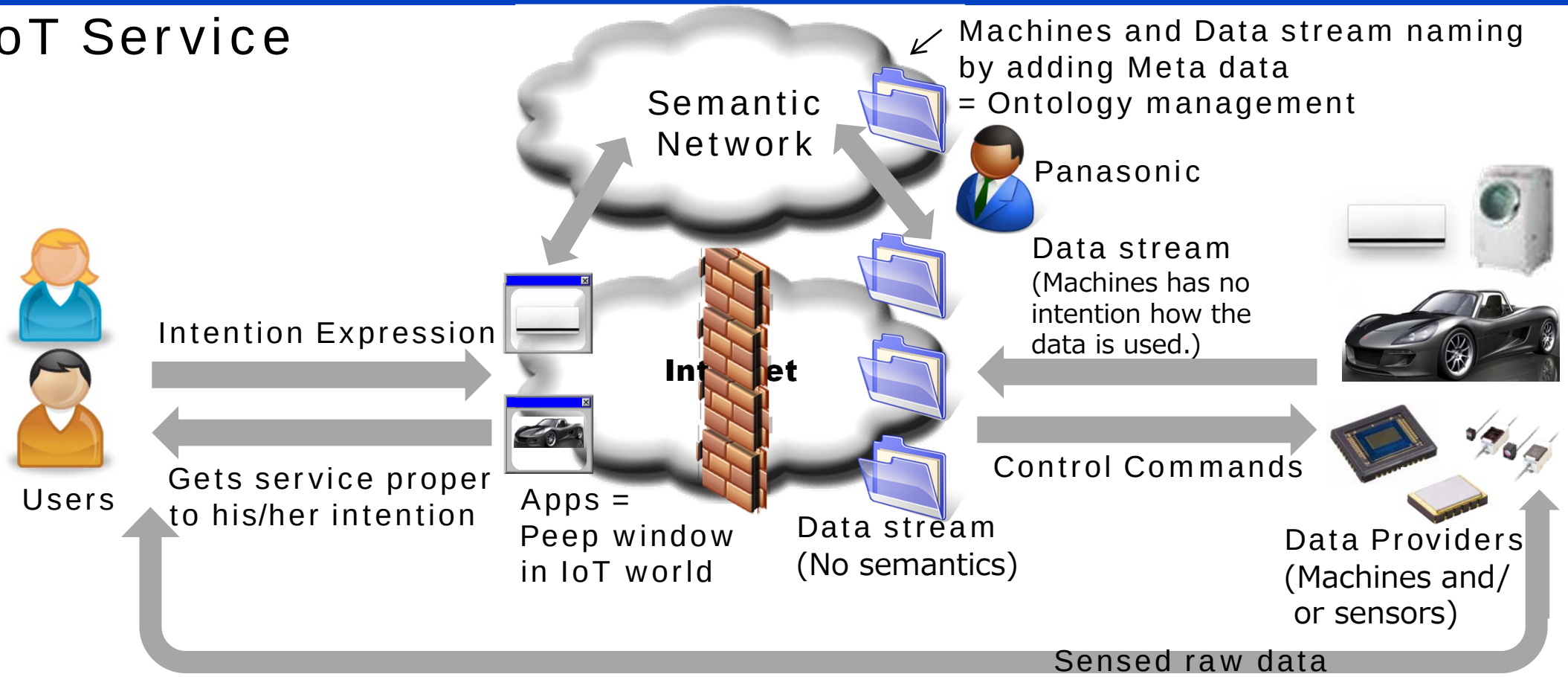
- Machines provides just data stream which is not understandable by users without the definition and semantics
- There is no common rule to link proper data stream according to users intention, no common rule to name data stream.

e.g. “I’d like to know current temperature of the living room of my home.

- What kind of format to name the temperature sensor at living room ?
- Who can name the sensor as “Kajimoto’s living room temperature sensor” ?
- Who and how protect other guys except me access to the sensor ?

Not only APIs but Rules and Operations(3)

- IoT Service



- Ontology management which consists of a pair of data stream and meta data is introduced to create semantic network with intention.
- There should be common rule of naming and name space.
  There should be organizations who authorize registered unique name.
- Device manufacturer has better position to name data stream, because of its multiple customer contact chance.

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Home related global IoT organizations

- Home service deeply depends on local life style. So, we have many IoT standardization organizations region-wise.
- Roughly, they could be classified as follows;
  1:Sheme, Framework and Semantics: W3C(Global)
  2:P2P Communication: Echonet Consortium(J), EEBus(E), Qivicon(E), Zwave(US), AllSeen Alliance(US,Asia), OIC(US,Asia)
  3:OS, Platform: Google-nest(US), Apple HomeKit(US)
  4:Applications: Home Connect(E), iControl(US), Control4(US), HomeChat(K)

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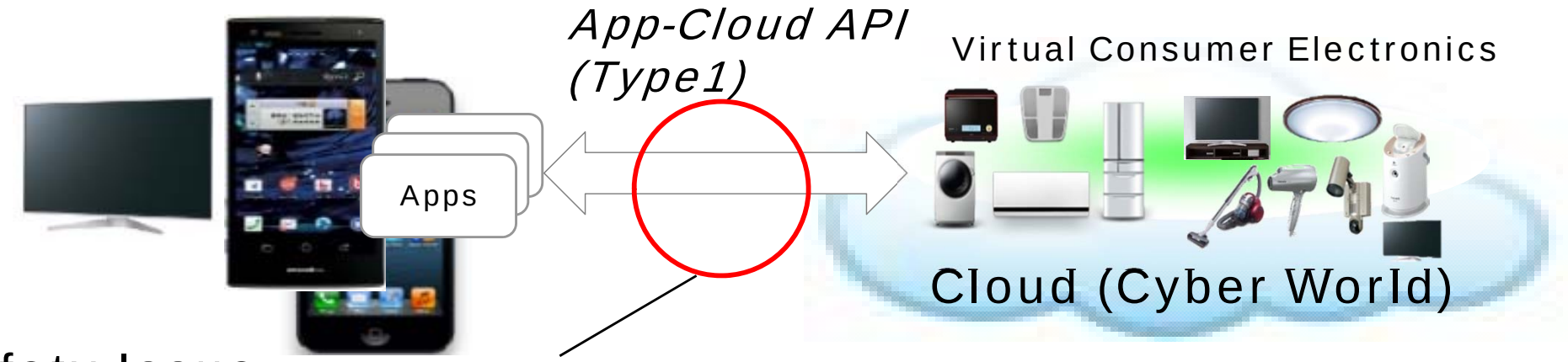
Concerns



Safety Issue

e.g. Some CEs treat heat cycle. App might be able to make fire.

Privacy Issue

e.g. App might be able to peep other person's house through Robot Cleaner which has camera.

Business and Security Issue

e.g. User and/or Device Authentication might be better as close API because of vendor business dependency and security.

It might be better provide both Open API and Authority Managed API.
We also take care local law such as Product Liability Law.

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Software Council Activity in Panasonic

1. Future Vision and Strategy

Tasks: = Groupwide CTO Office's mission (since Oct 2014)

Read the trend of Information Technology
Draw the IT roadmap to future and Panasonic's position on it
Communicate with Planning Section and break down to action plan

2. Software Architecture Governance

Tasks: = Software Technology Leaders Committee's mission (since Jun 2014)

Share software issues on Architecture across companies in Panasonic
Make recommendation for issues
Educate software designers

3. Software Compliance Governance

Tasks: = Software Management Committee's mission (since Apr 2009)

Share software issues on Compliance across companies in Panasonic
Make recommendation (sometimes mandate) for issues
Educate software management

Wonders!

by Panasonic

감사합니다!