Evolution to OS of Everything

Tizen Micro profile
for low-end IoT devices

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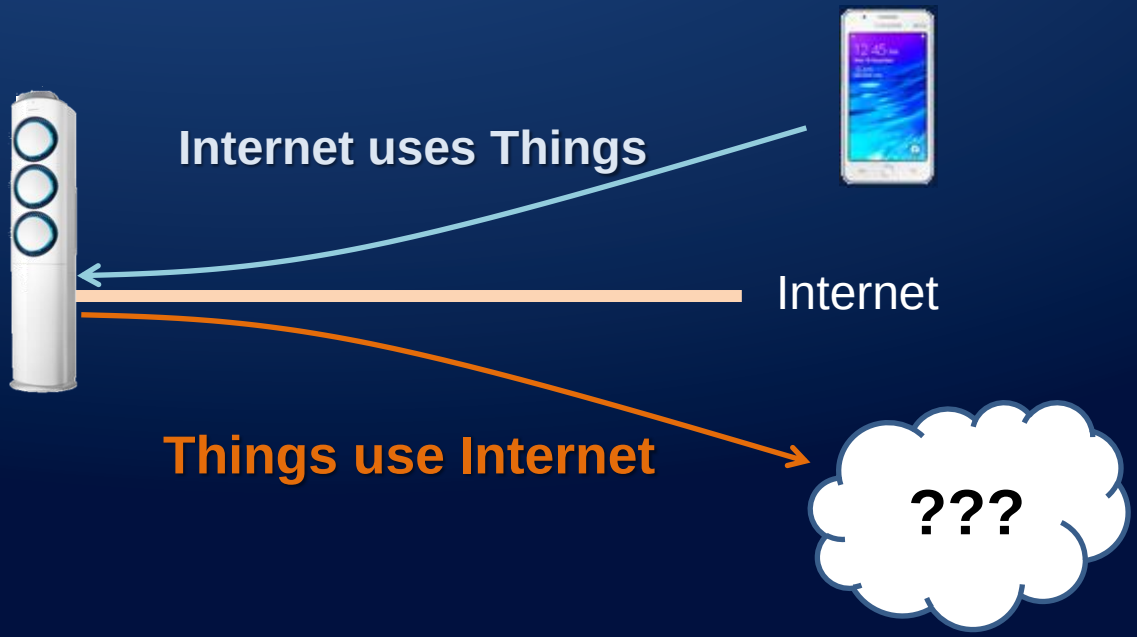
Contents

Part I,

OS of Everything in IoT

Internet of Things



Internet of Things

Q) Why do you want to use Internet?

A) If I know when my master is coming,
I can make room temperature
more comfortable for my master.
It will make my master happier.

Internet of Things

Q) How do you know when he is coming?

A) It depends.
My master is usually coming home by his car.
I may guess his arrival time,
if I know when he is parking his car at home.

Internet of Things

Q) If your master goes out after parking, ...

A) In the estimated time, if my master isn't coming home, I will send message to him.

"Air-conditioner: I started to make room temperature."

He can stop me or let me know his arrival by replying message.

"Master: I will be home at 4:00pm."

Internet of Things

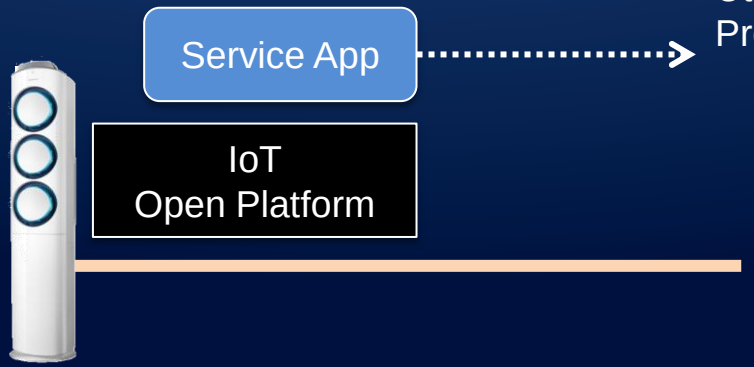
The more utilizations of Internet,
the smarter services by IoT devices

Things use Internet

What's needed in the things?

Open platform, allowing to add new IoT service app
which provides more personalized service and make the device much smarter

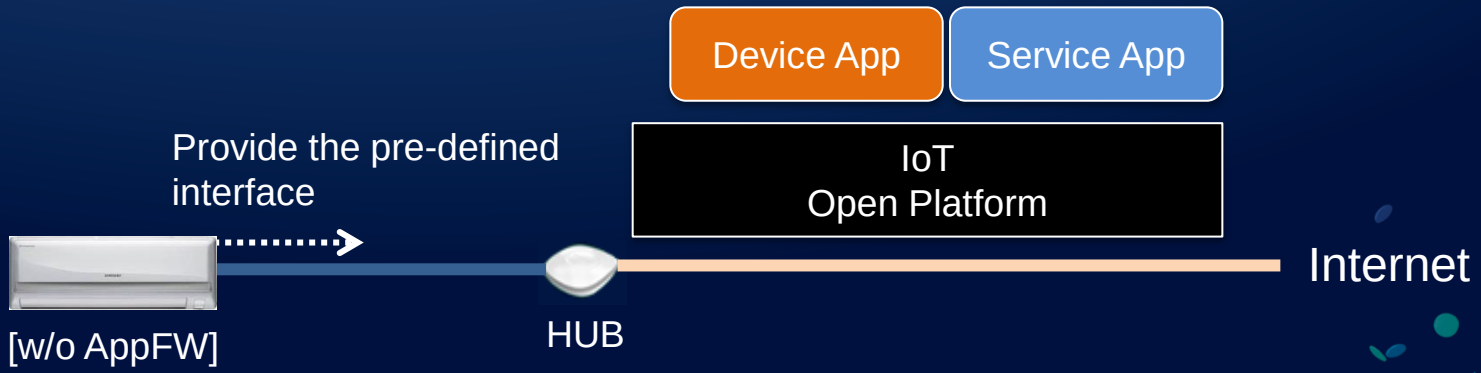
Application framework / API



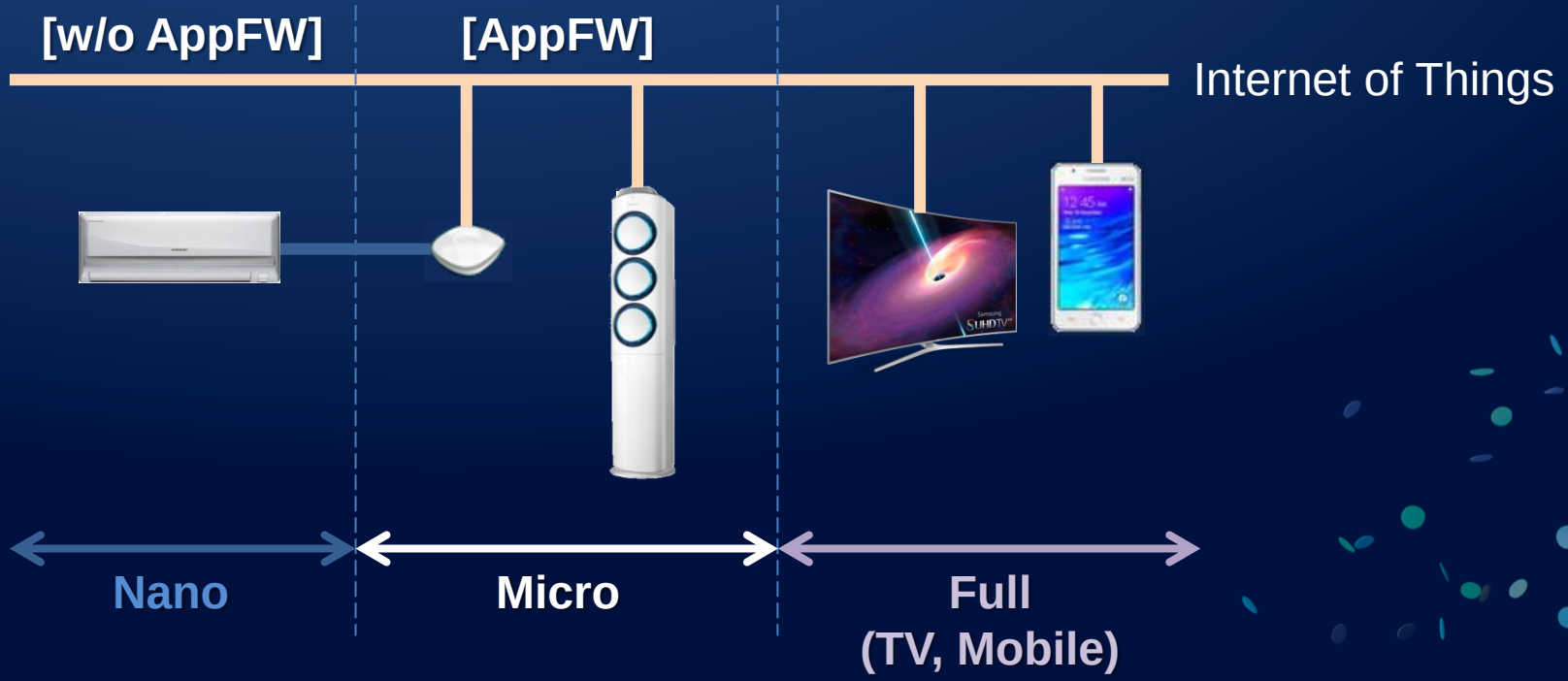
Utilize the information from Internet of Things
Provide smart service and add more value to device
- Personalized service
- Context-aware service

Another way?

Device provides only the pre-defined interface to the connected.
Service app is running on the other device or cloud which can provide the more personalized service.



OS of Everything in IoT, Tizen

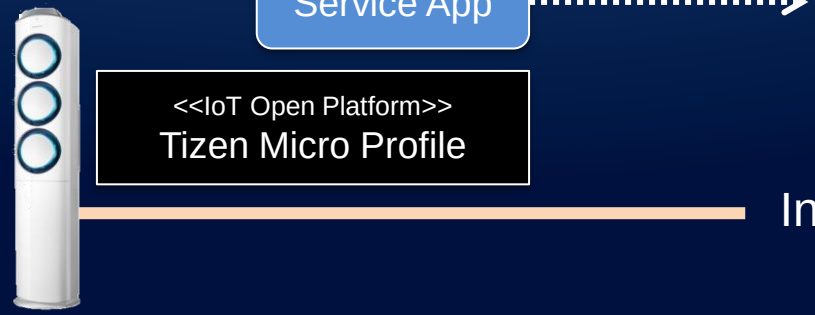


Part II,

Tizen Micro Profile

Tizen Micro Profile

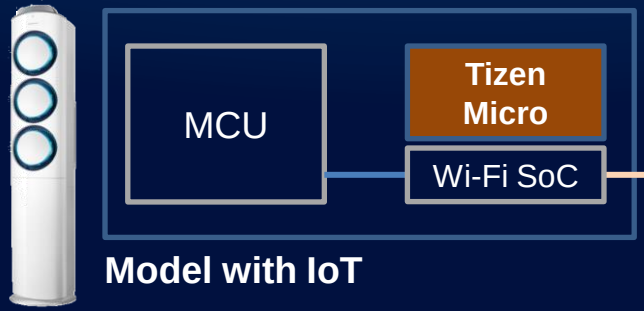
Tizen profile for developing IoT device which has application framework and exposes APIs, that allows to add IoT services.



Utilize the information from Internet of Things
Provide smart service and add more value to device
- Personalized service
- Context-aware service

Requirement - Market

Model w/o IoT



Model with IoT

Physical Integration

UART, I^2C, ...

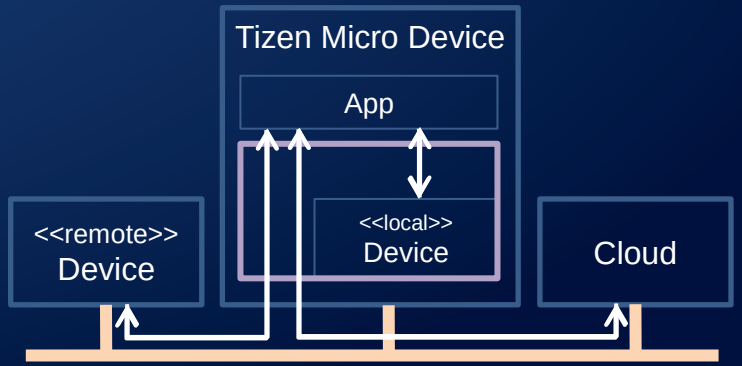
Cost Effectiveness

32M FLASH, 64M RAM

Requirement - Apps

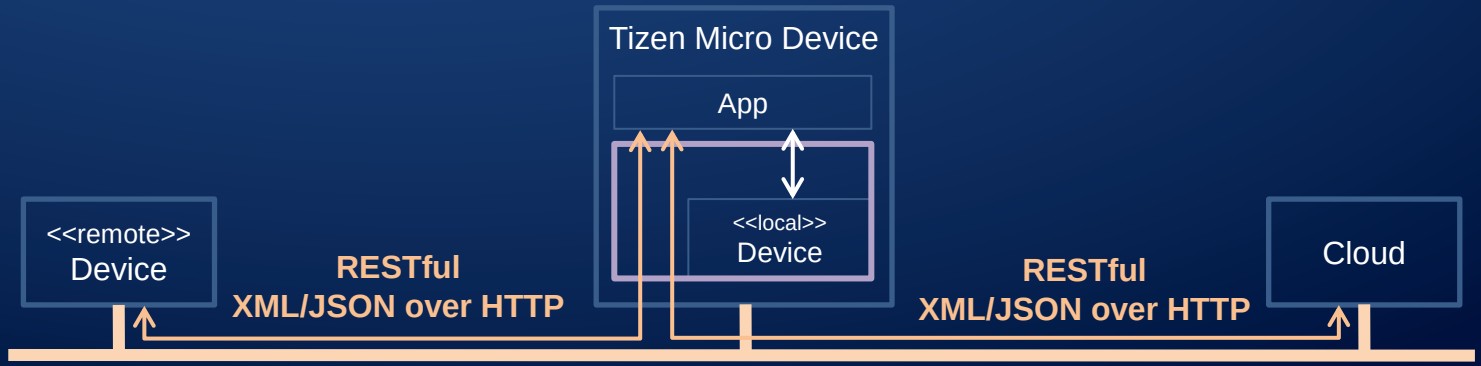
Tizen Micro Apps want to use
- Internet service from cloud
- Service from the other connected device
- Local device service

Tizen Micro Apps need to provide
- Internet service to cloud
- Service to the other connected device
- Event handler from local device



use service from IoT + provide service to IoT

Architecture

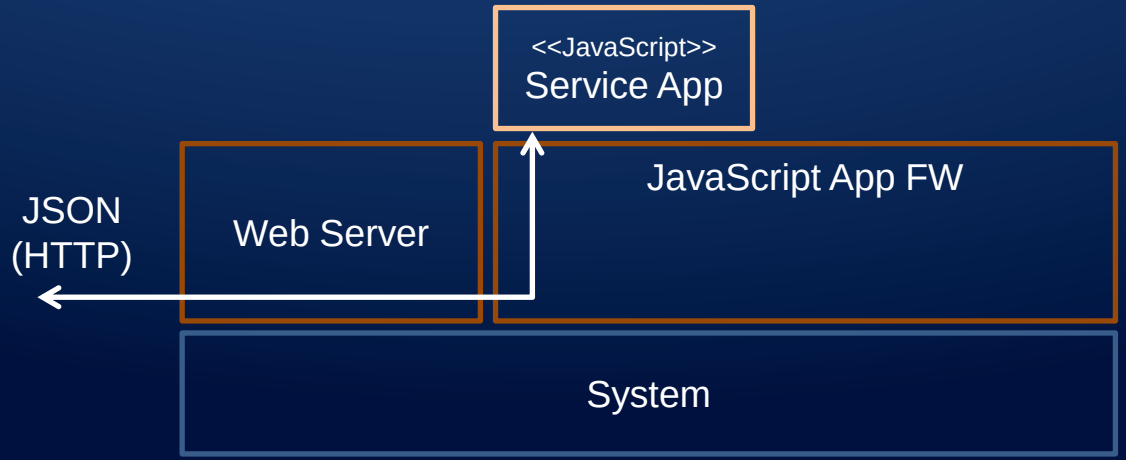


Web of Things

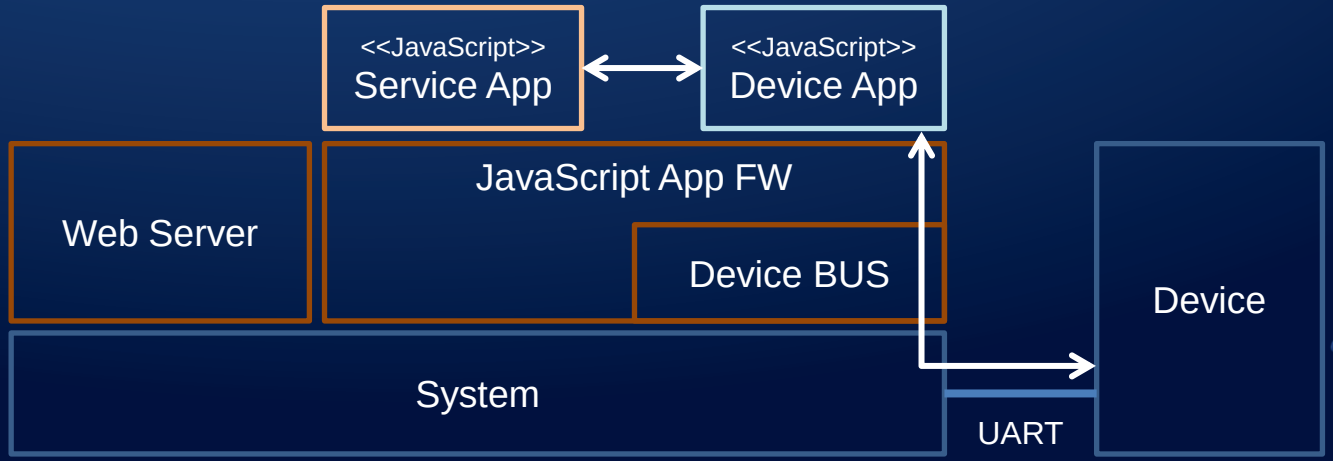
connects things through the existing Web technology (XML/JSON over HTTP)

Architecture – Web of Things

JavaScript is the most popular language in web, not only client-side but also server-side

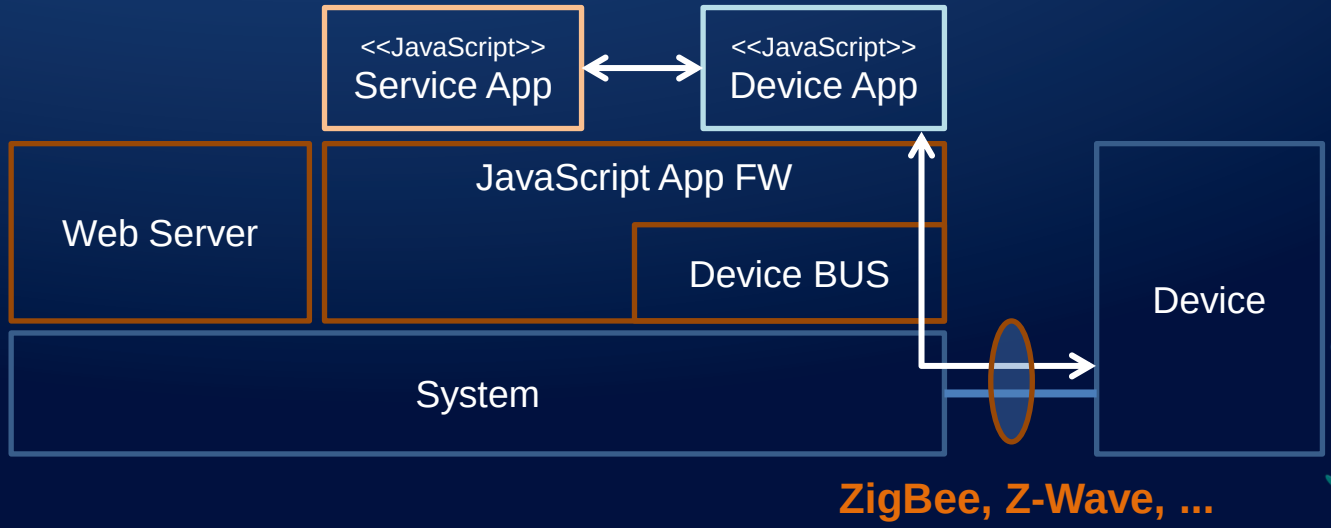


Architecture – Device BUS

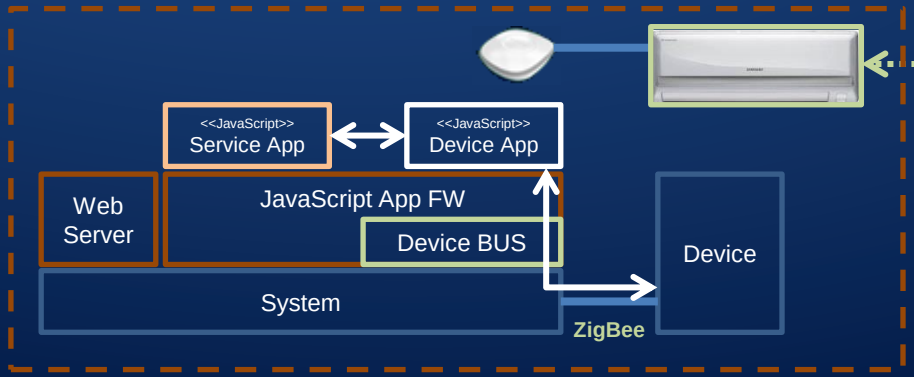


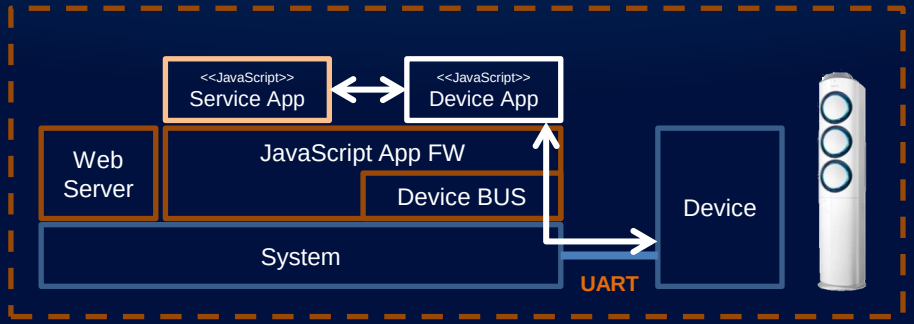
Architecture – Device BUS

Extends to the external device



Tizen Nano Device





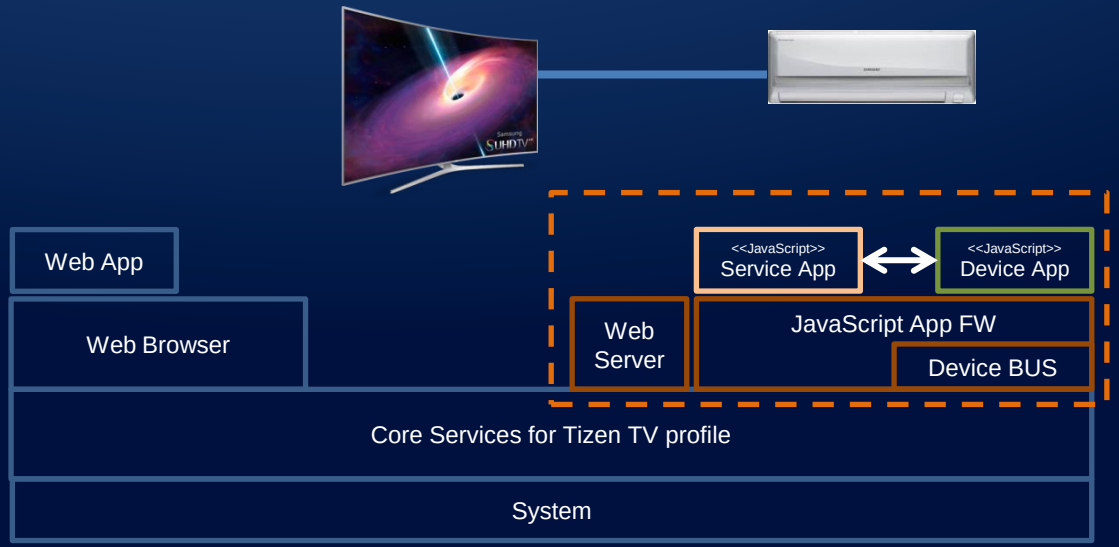
Tizen Nano Device

- Tizen Companion Device
- Device App installed on Tizen Device
- Equivalent Device Function of Tizen Micro, added to Tizen Device

Equivalent Service Model (Tizen Micro)

Tizen Full Profile & Micro

Web of Things and Device BUS features in Tizen Micro profile can be integrated into the existing Tizen profiles.



Tizen 3.0 & Micro Profile

Tizen GIT repository

git://review.tizen.org

- /platform/framework/native
- /platform/framework/web
- /platform/kernel/linux-3.10
- /platform/upstream/glib
- /platform/upstream/nodejs
- /platform/profile/mobile
- /platform/profile/tv
- /platform/profile/micro
- ⋮

Tizen Mobile Profile

Tizen TV Profile

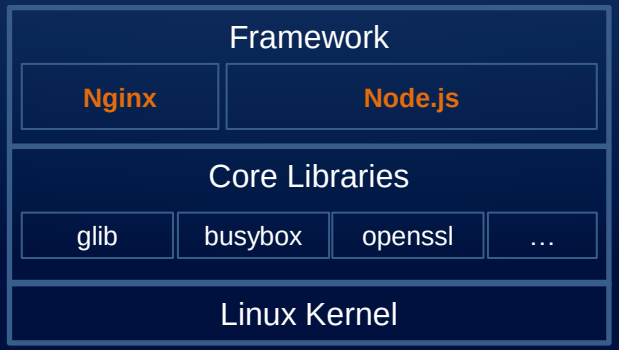
Tizen Micro Profile

Part III,

PoC of Tizen Micro Profile

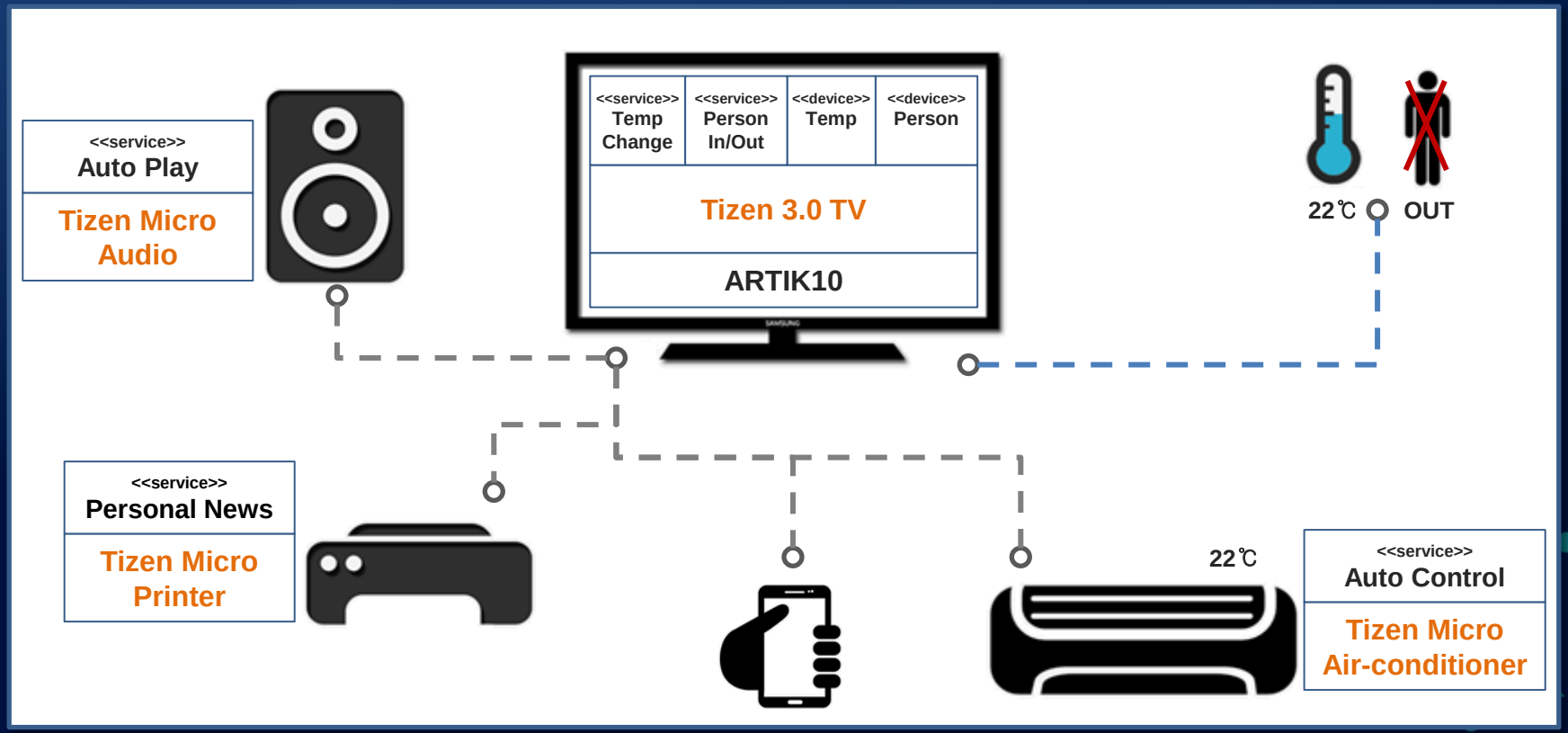
Proof of Concept

- Memory footprints: 32M FLASH, 64M RAM
- Web of Things with JavaScript framework
- IoT scenarios



20M FLASH
40M RAM
(Remote UI scenario)

Demo Scenario



Part IV,

Future Plans

Future Plans

[Release 1. ’15. 4Q]

step 1. building Tizen Linux kernel and system on Raspberry Pi2 using Yocto
step 2. integrating Nginx and Node.js
step 3. building Device BUS

[Release 2. ‘16. 1Q]

- foot print optimization: 32M FLASH, 64M RAM
- product-line management

[Release 3. ‘16. 4Q]

- additional features: remote access, multimedia, etc.

Tizen Micro profile on RTOS

Samsung opened development of IoT.js, JavaScript engine and application framework for low-end IoT devices.

The best way to connect everything

Full

Micro

OS of everything in IoT

Inter-operability

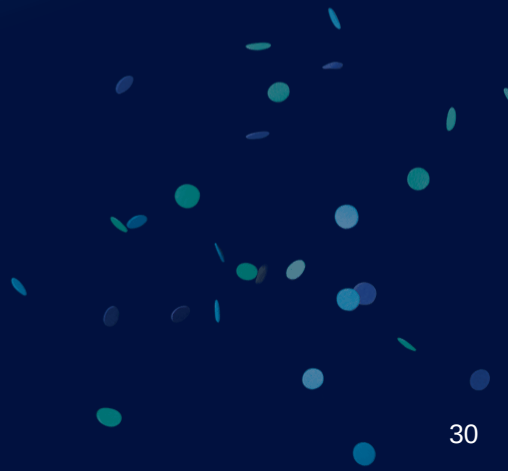
OIC

Nano

WoT

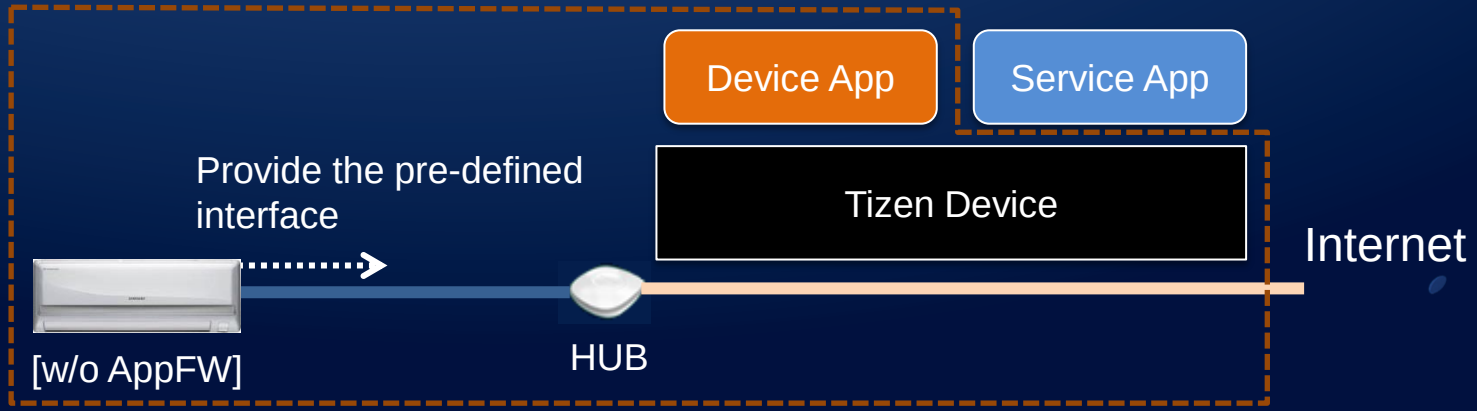
Easier integration and spread of IoT

Q & A



Tizen Nano Device

Tizen companion device, which adds device function into another Tizen device with installing device app on it



Packages Used in PoC

Package Name	Git Repository	
linux-3.10	platform/kernel	
openssl-1.0.2	platform/upstream/openssl	1.0.1
nodejs-0.12.5	platform/upstream/nodejs	0.12.0
nginx-1.6.2	platform/upstream/nginx	[new]
libglib2-2.42.0	platform/upstream/glib	
busybox-1.23.1	platform/upstream/busybox	1.22.1
gettext-0.19.4	platform/upstream/gettext	0.18.3.2
pcre-8.36	platform/upstream/pcre	8.31
libffi-3.1	platform/upstream/libffi	
zlib-1.2.8	platform/upstream/zlib	
uclibc-0.9.33.2	platform/upstream/uclibc	[new]

Internet of Things

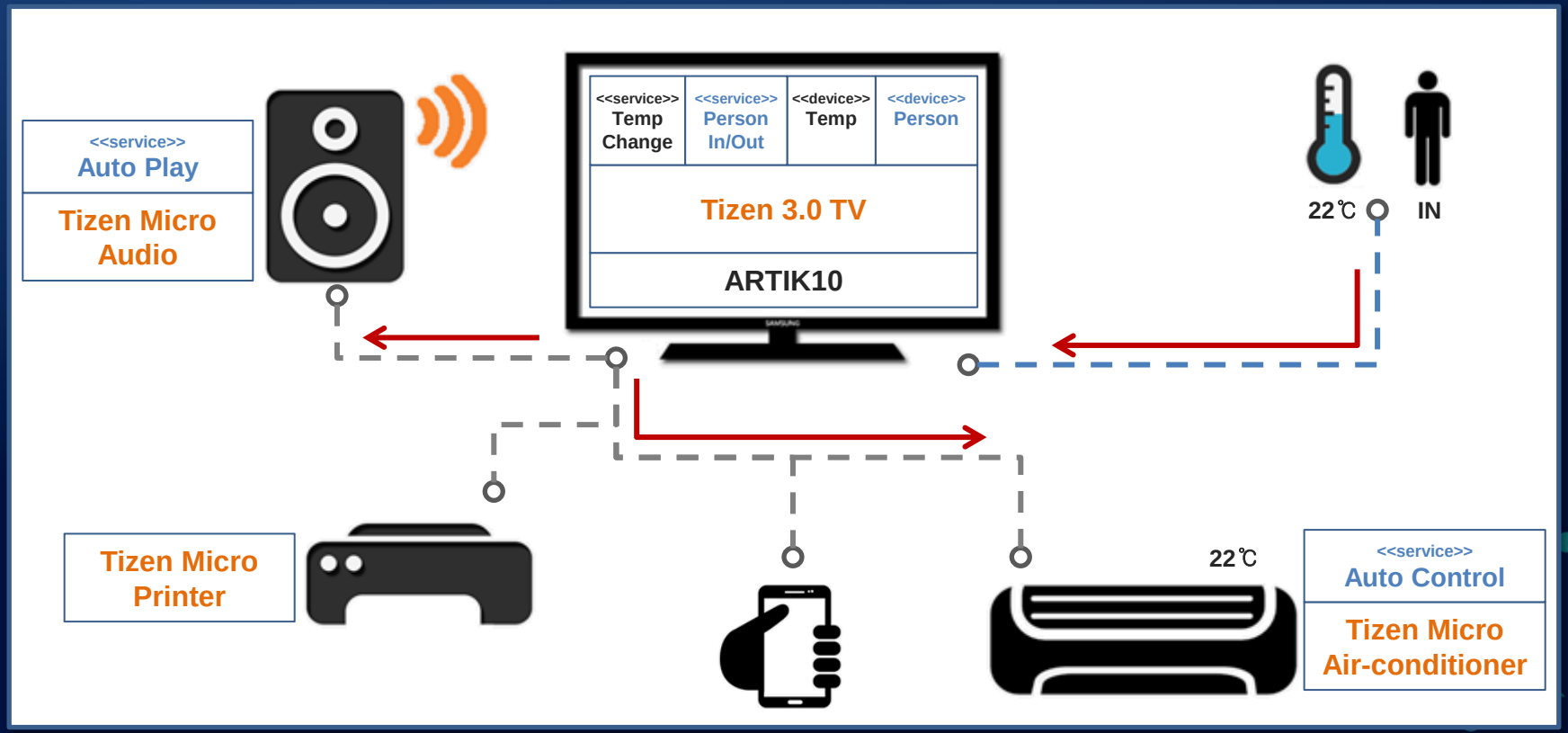
Q) What else do you want more?

A) It will be helpful to know
- how the temperature is in the car
- whether he is excising or not
- where he is exactly at home
- how the weather or the forecast is

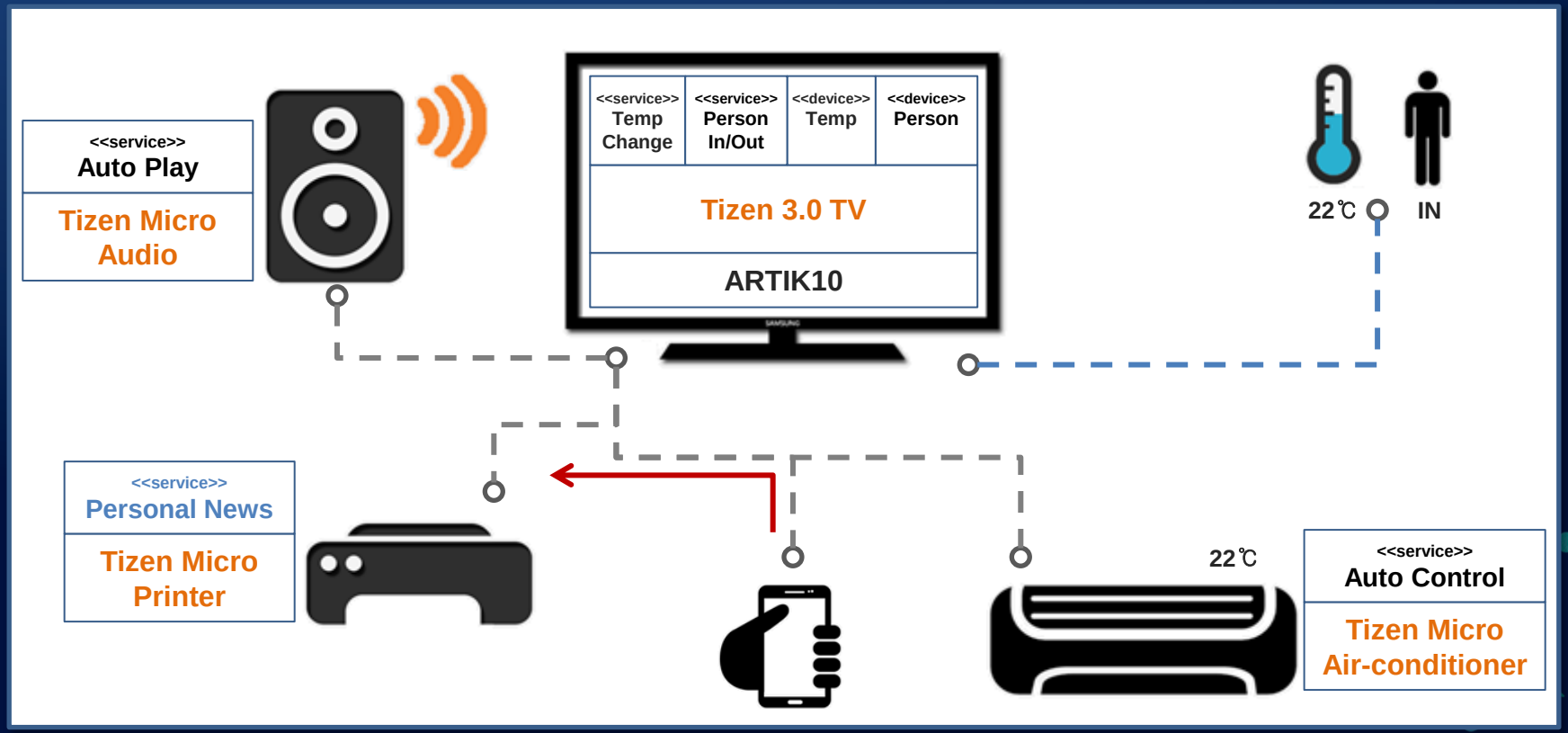
…

I can provide more personalized service.

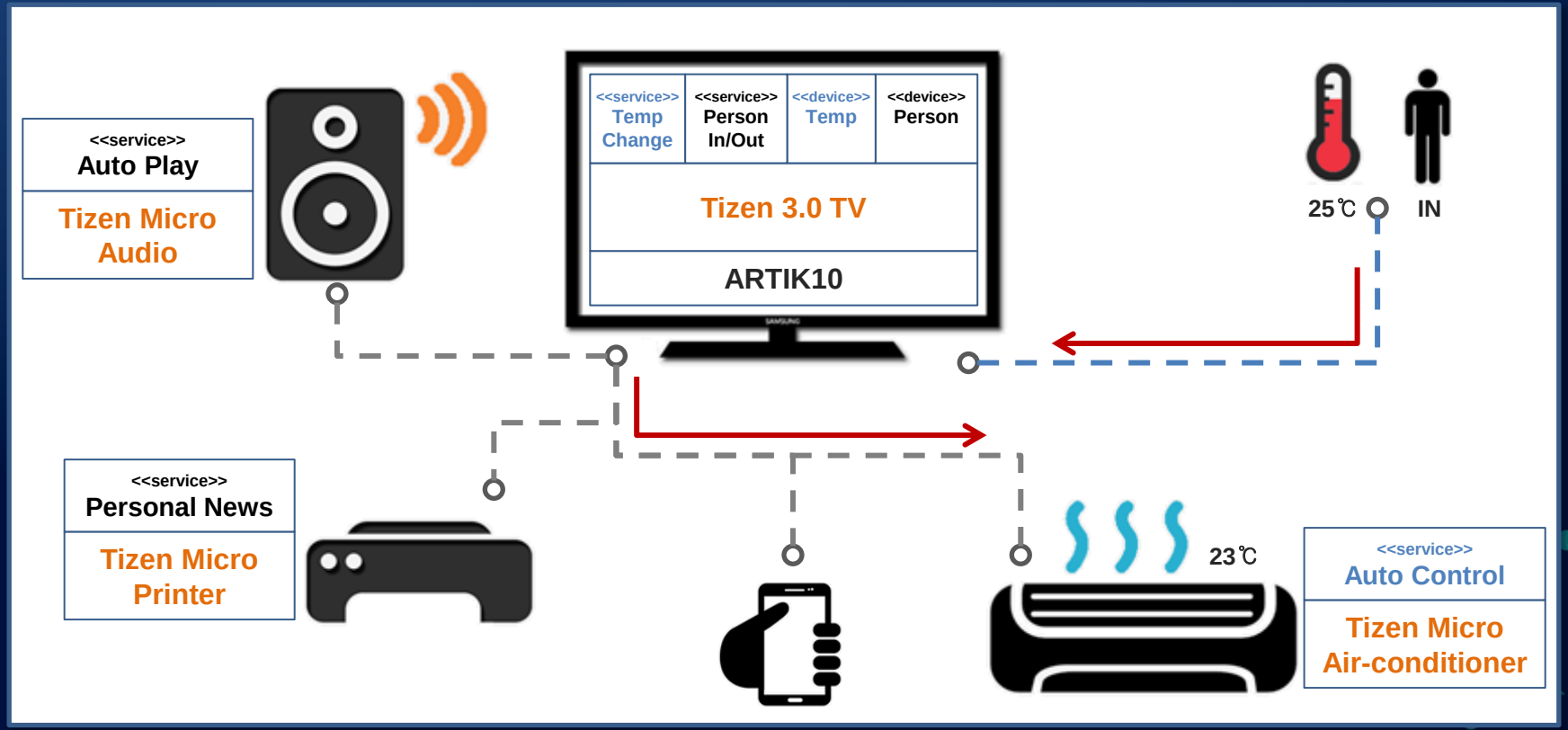
Demo Scenario(1) person in



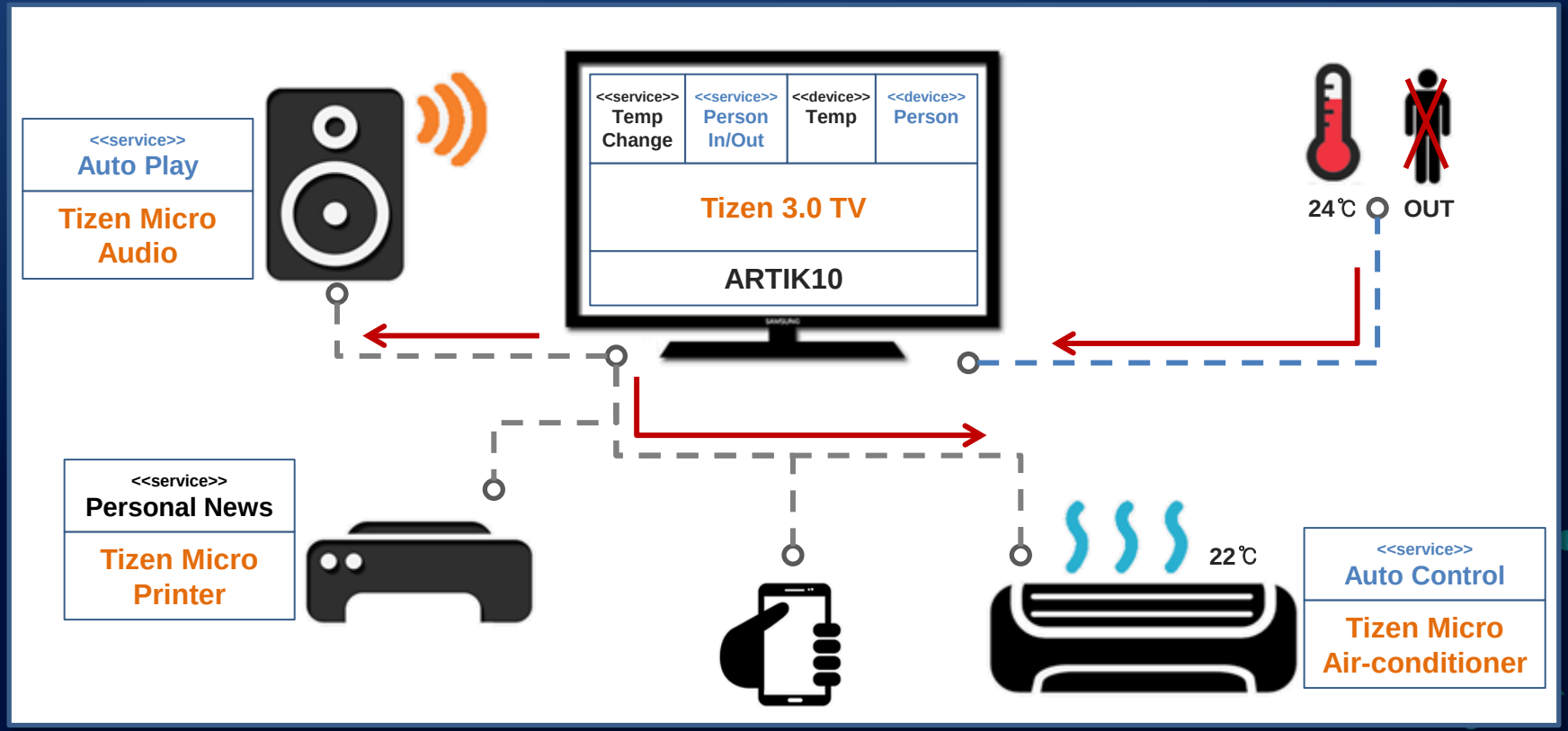
Demo Scenario(2) new service added



Demo Scenario(3) temperature up



Demo Scenario(4) person out



Demo Scenario(5) scheduled