Kadecot: Android Web API Server for Home Appliances and Sensors

Shigeru Owada, Sony Computer Science Labs, Inc.
Kazuhito Nakamura, Sony corp.
Masahiro Karaki, Crestec Inc.

Talk Summary

- We develop a Web API server ‘Kadecot’ runs on Android for home appliances/sensors
- It internally adopts WAMP-based framework for managing the whole system.
- We develop a 3D agent-based user interface on top of them.

WAMP : The Web Application Messaging Protocol

WAMP is an open WebSocket subprotocol that provides two application messaging patterns in one unified protocol :
Remote Procedure Calls + Publish & Subscribe.

Copied from WAMP HP http://wamp.ws/

- Actually, WAMP does not require using WebSocket. Other transports are possible if some requirements are met.
  - We use both WebSocket connection and function call as the transport

System architecture

Applications

Web API Users

Server

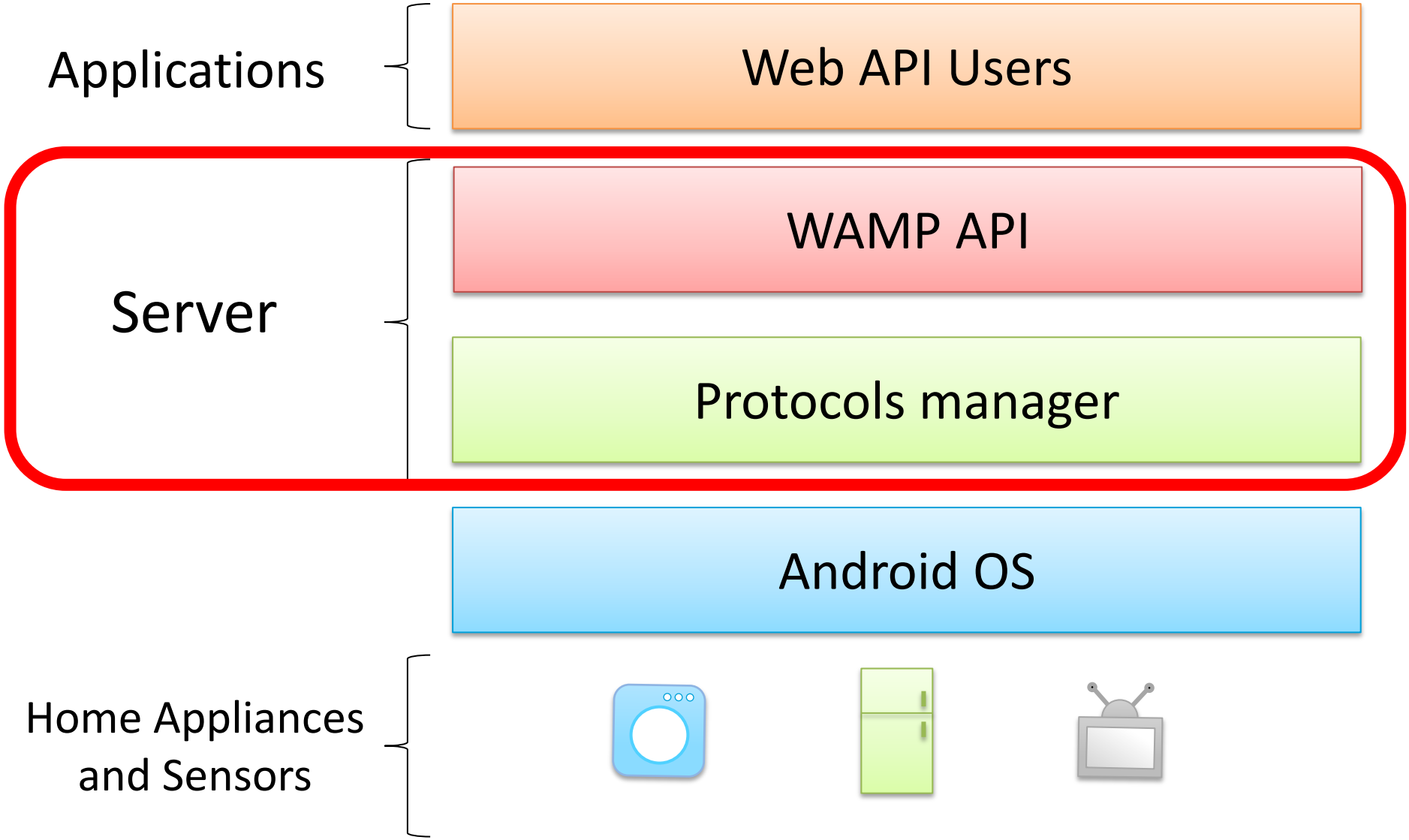
WAMP API

Protocols manager

Android OS

Home Appliances and Sensors

System architecture



Goal of Server Design

- Device communication protocol independent
- Flexible, Easy-to-use WebAPI
- Use public messaging protocol

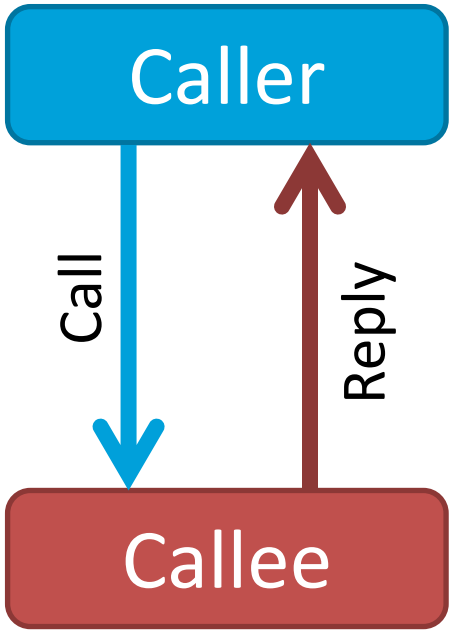
Definition

- Resource : a piece of information or a controlled property in a device
  - Eg. Power, Temperature setting, Brightness sensor value

WAMP messaging petterns

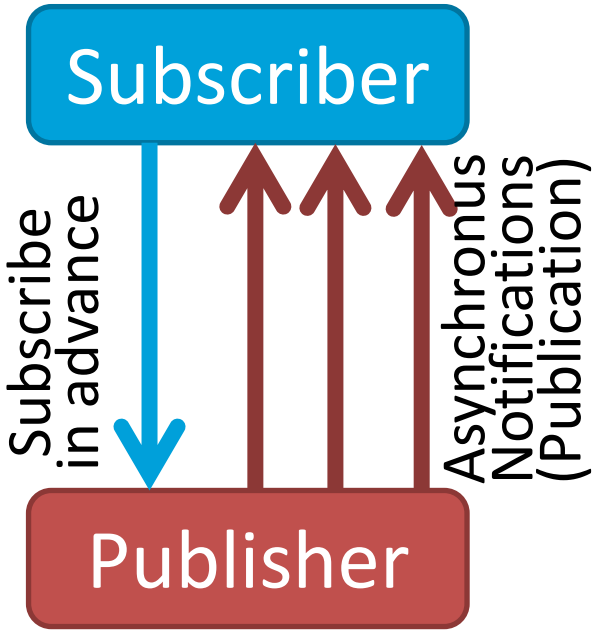
RPC pattern

- Active resource request from consumer ('Caller' in WAMP terminology) to provider (Callee)



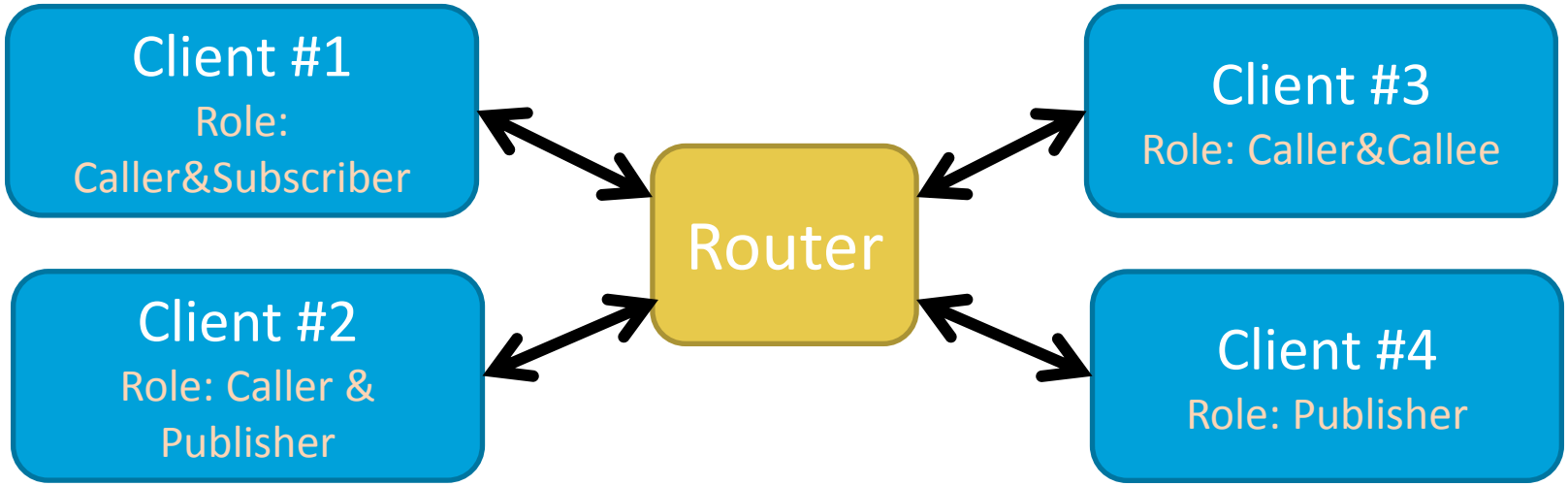
PubSub pattern

- Asynchronous resource delivery from provider (Publisher) to consumer (Subscriber)

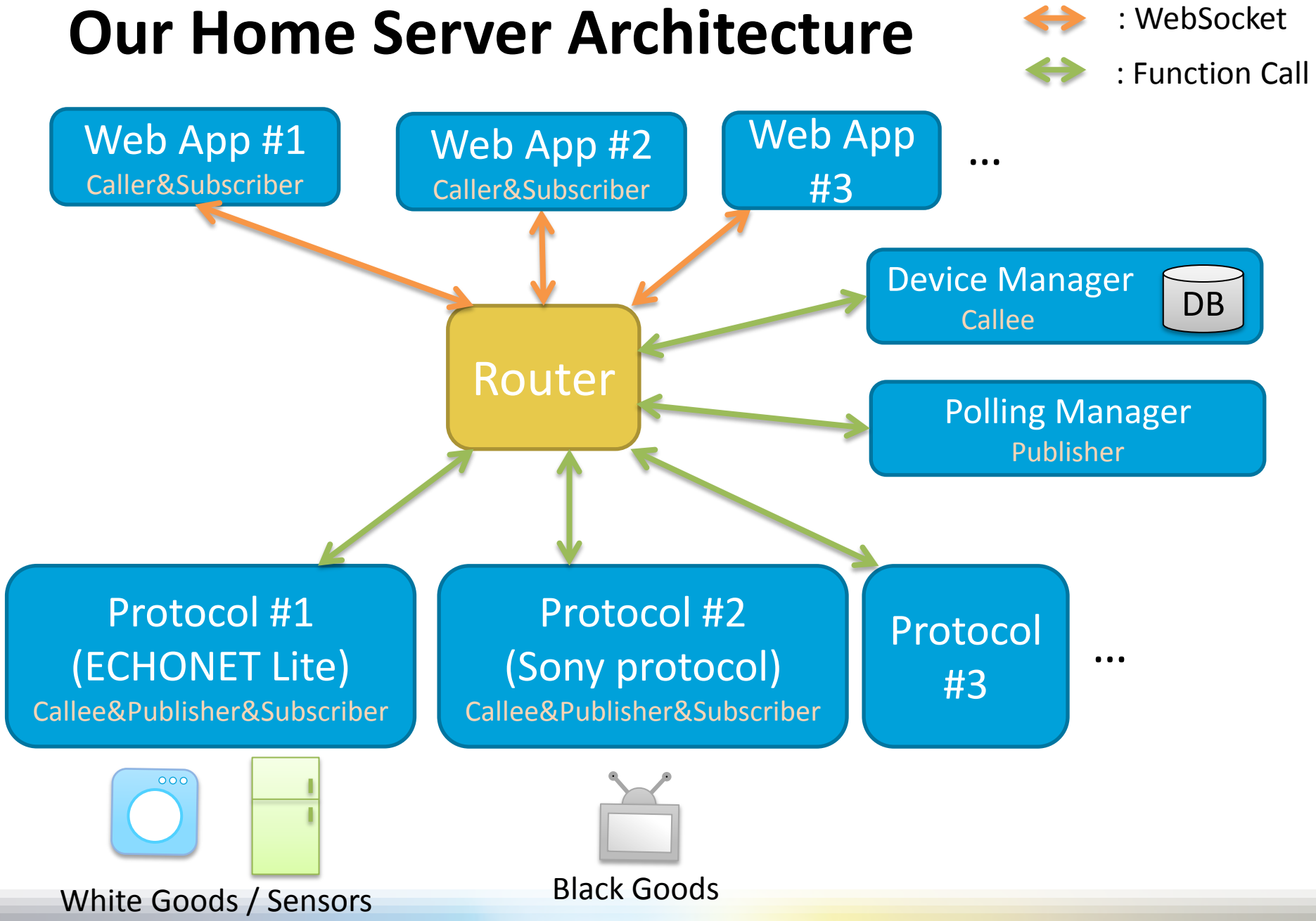


WAMP in-depth

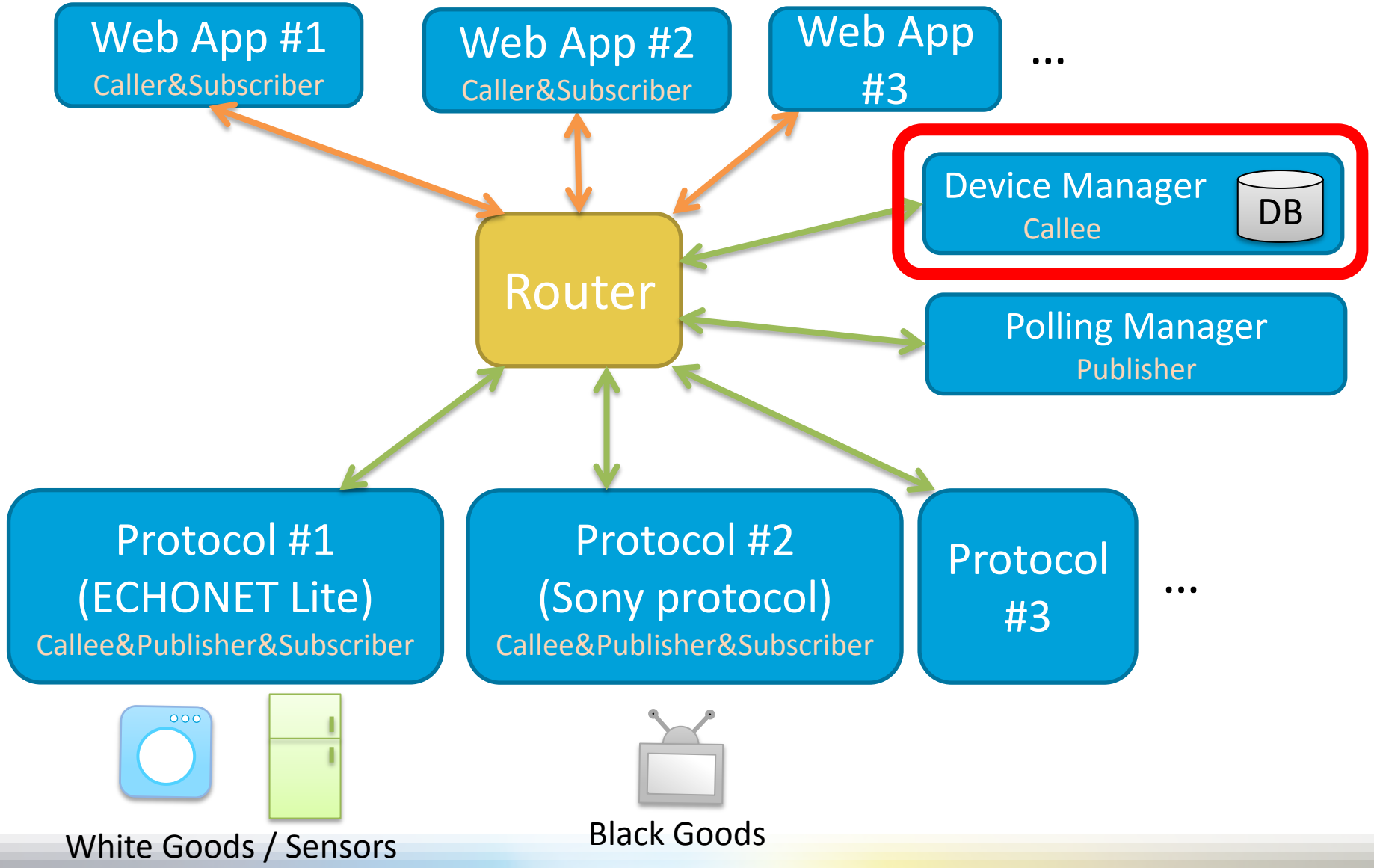
- WAMP is NOT a one-to-one messaging architecture
- There is another entity, called a 'Router', deals with message deliveries.
- All other entities are called 'Client'
- 'Caller', 'Callee', 'Publisher', 'Subscriber' are compatible *Roles* of each client.
  - They switch roles on types of messages



Our Home Server Architecture



Our Home Server Architecture

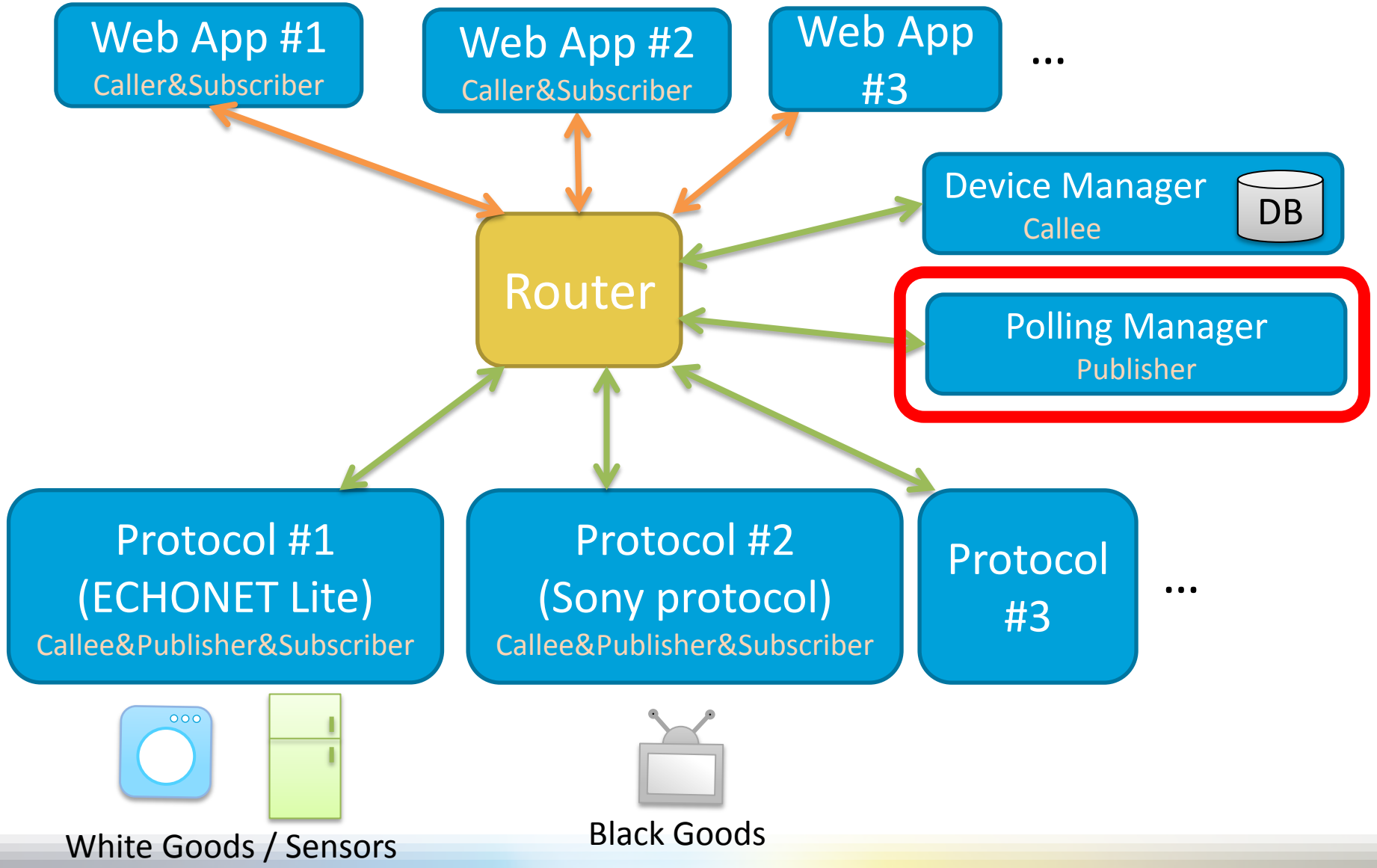


Device Manager

- Receives devices list information from protocols and assigns unique ID to each device

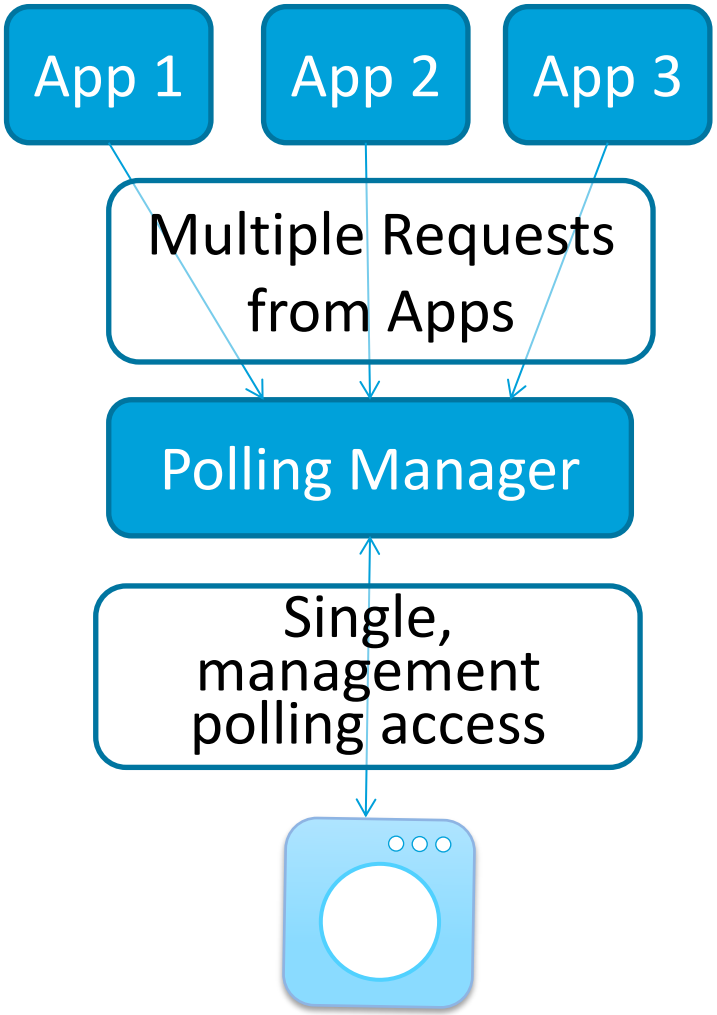
- Keeps all recognized devices list and their available resources as a cache
  - Provides fast replies on..
    - Devices ability query from the apps
    - Information recovery on reboot

Our Home Server Architecture



Polling requirement

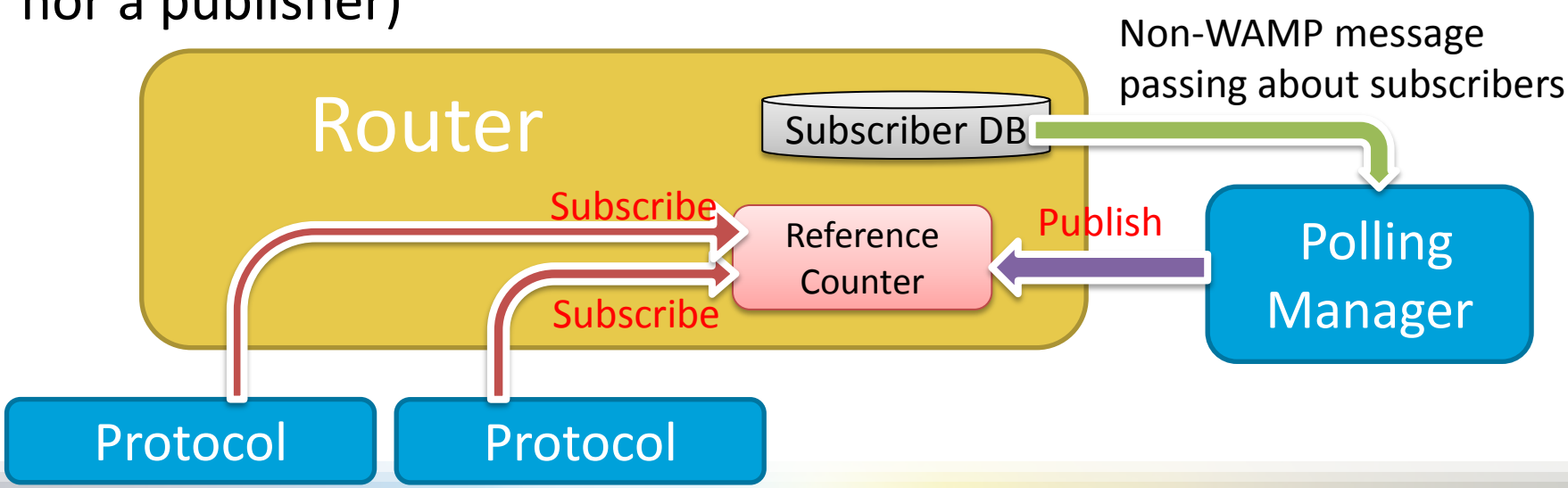
- Polling is necessary to let passive sensors act as a publisher
- However, in IoT environment, it is not desirable to poll all available resources
- Even if a resource is subscribed by multiple apps, the polling should not be multiplied.



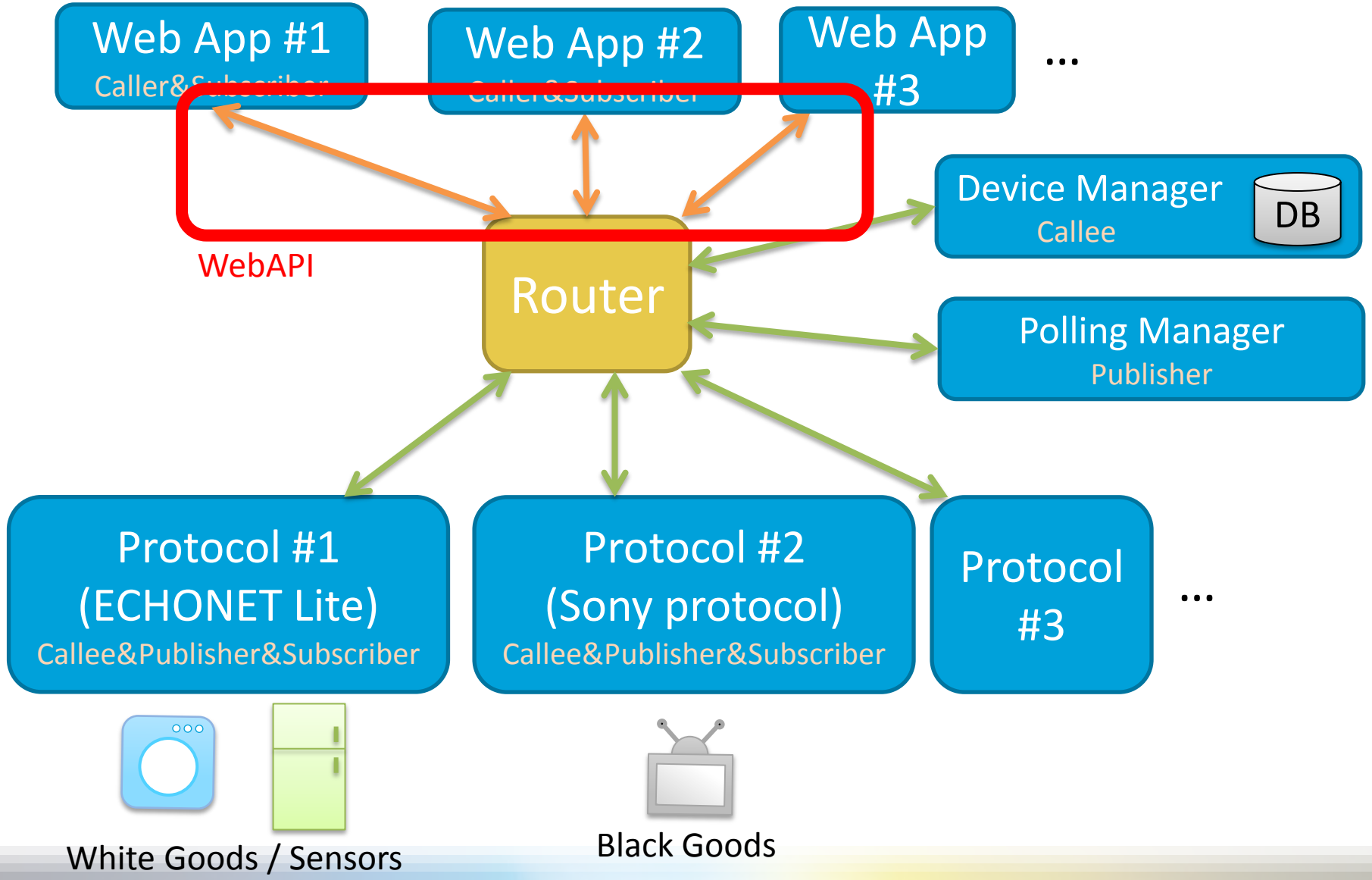
Polling Manager

- Our solution
  - Polling manager publishes the counter how many apps are interested in each resource.
  - Each protocol subscribes the related counter to determine which resource value should be polled.
  - Polling interval is internally determined within protocol client.

- This violates WAMP framework, since information about subscription exists in the router (router cannot be a callee nor a publisher)



Our Home Server Architecture



WebAPI

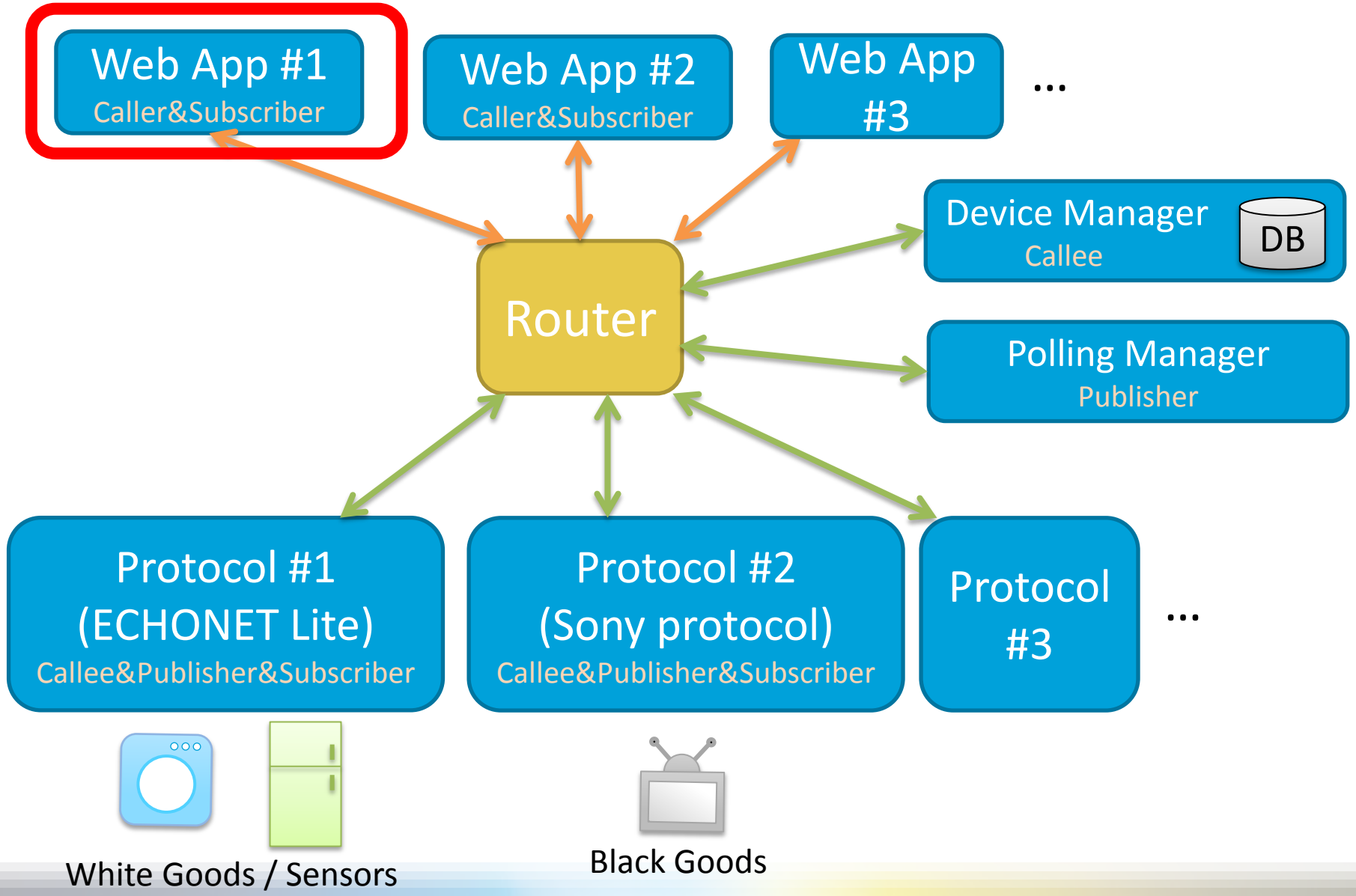
- Web (and other) application participate in the system through standard WAMP protocol
  - Such as ‘HELLO’, ‘SUBSCRIBE’, etc..

- Tips:
  - Resource types are represented as topics/procedures string
  - Device ID (, assigned by Device Manager client,) is specified as ‘Options’ field in WAMP

Eg)
[CALL,1,{“deviceID”:1},”com.sonycsl.kadecot.provider.procedure.getDeviceList”]

, in the format of RPC messsaging : [CALL, Request|id, Options|dict, Procedure|uri]

Our Home Server Architecture



APPLICATION

Moekaden Project

- We are currently running the “Moekaden” project which tries to combine IoT service and personification / concierge characters

Personified Blu-ray recorder acts as a concierge

Moekaden.mp4

Demos

RPC demo

- The remote controller function uses RPC messaging

PubSub Demo

- Error notification is subscribed by the application. If an error is notified, related manuals are shown

Conclusion

- We develop a home WebAPI server with WAMP
- Efficient polling requires non-WAMP message sharing between router and polling manager
- We run Moekaden
- Announcements
  - Moekaden HP (http://moekaden.com) is currently under maintenance, will be open on July 5th
  - New version of Moekaden will be released on September.
  - Pure Java implementation of WAMP (not available on WAMP HP) will be soon released by us