ALLSEEN ALLIANCE

Programming the Internet of Things

Why Devices Need APIs

December 8, 2014

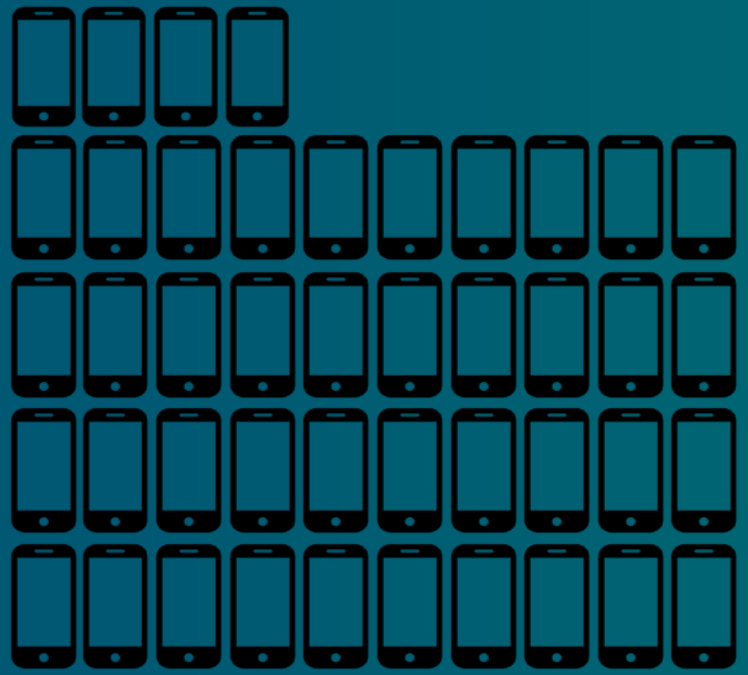
Greg Burns
Chair of Technical Steering Committee
AllSeen Alliance

Mobile – The largest technology platform

~3.3 billion unique subscribers

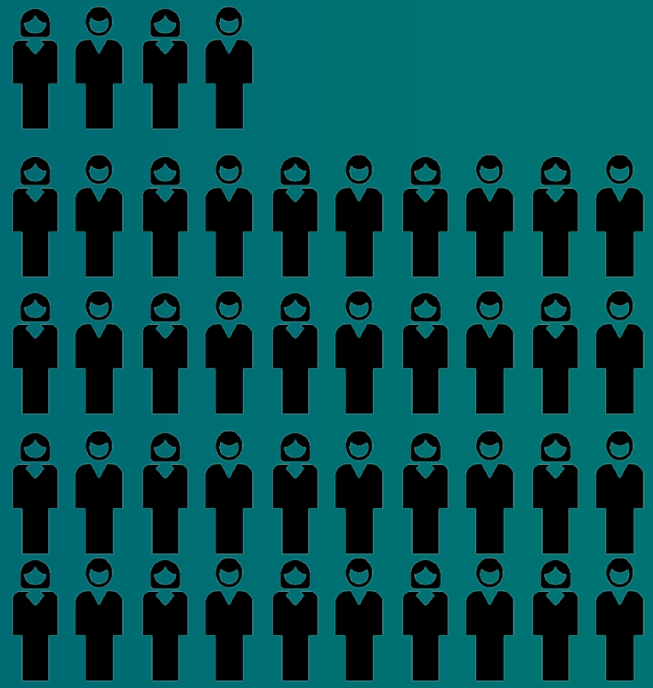
6.8 B

connections



7.2 B

people



Source: GSMA Intelligence, November 13; UN, November 2013

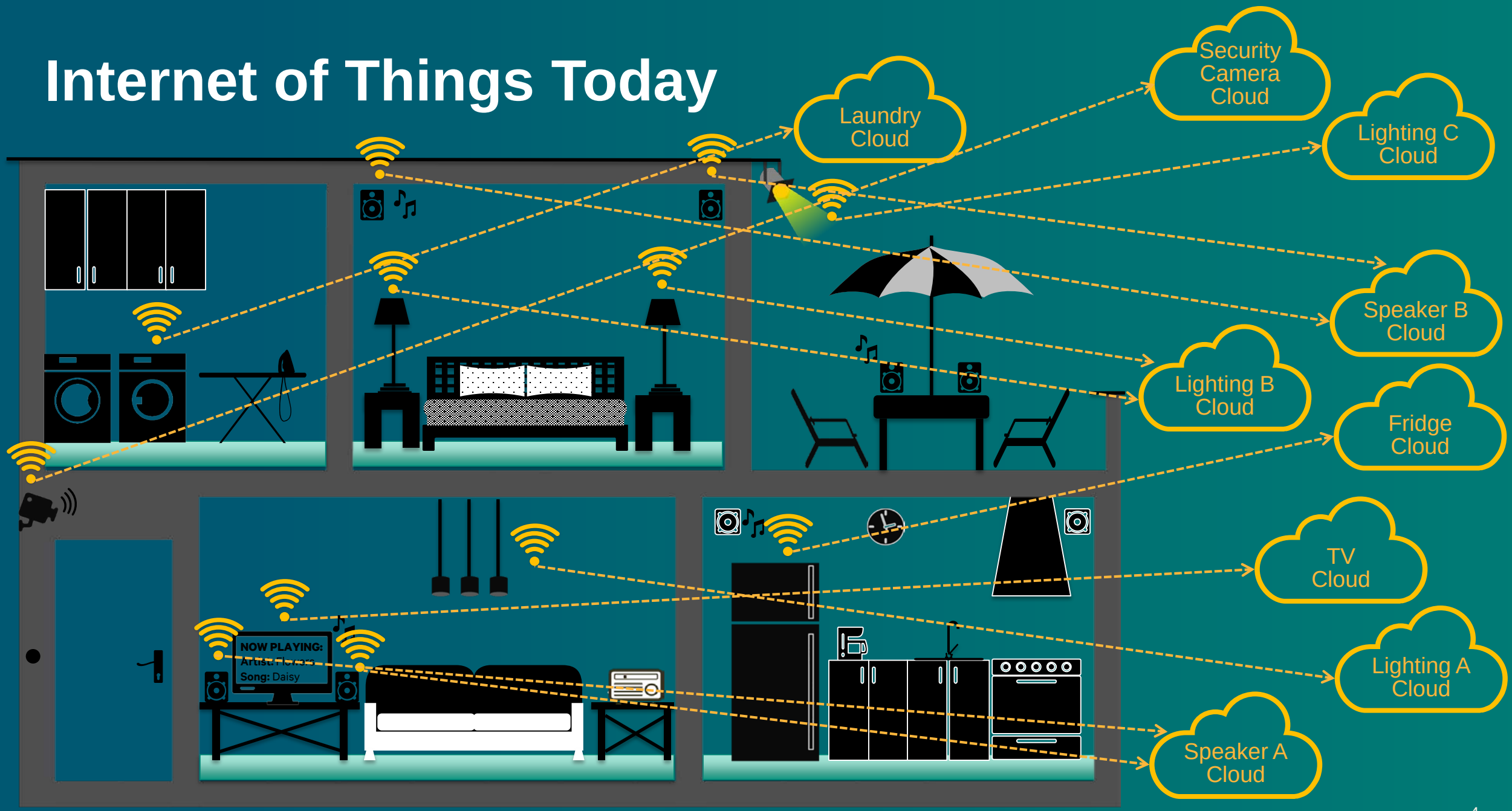
And that platform is about to be dwarfed…

Massive surge in connected things has already begun

- By 2020, 40.9 billion things will be connected*
  - Via Wi-Fi, wire line, cellular, and proximal networks
  - Benefiting billions of people worldwide
  - 75% of the growth between today and the end of the decade will come from non-hub devices
- Transforming:
  - Industry
  - Infrastructure
  - Media
  - Education
  - Work
  - Recreation
  - Family
  - Daily life

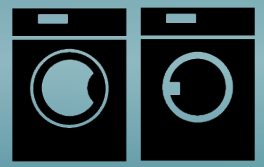
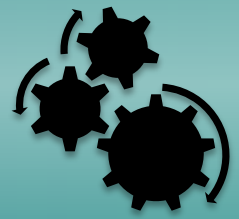
* Source: https://www.abiresearch.com/press/the-internet-of-things-will-drive-wireless-connect

Internet of Things Today



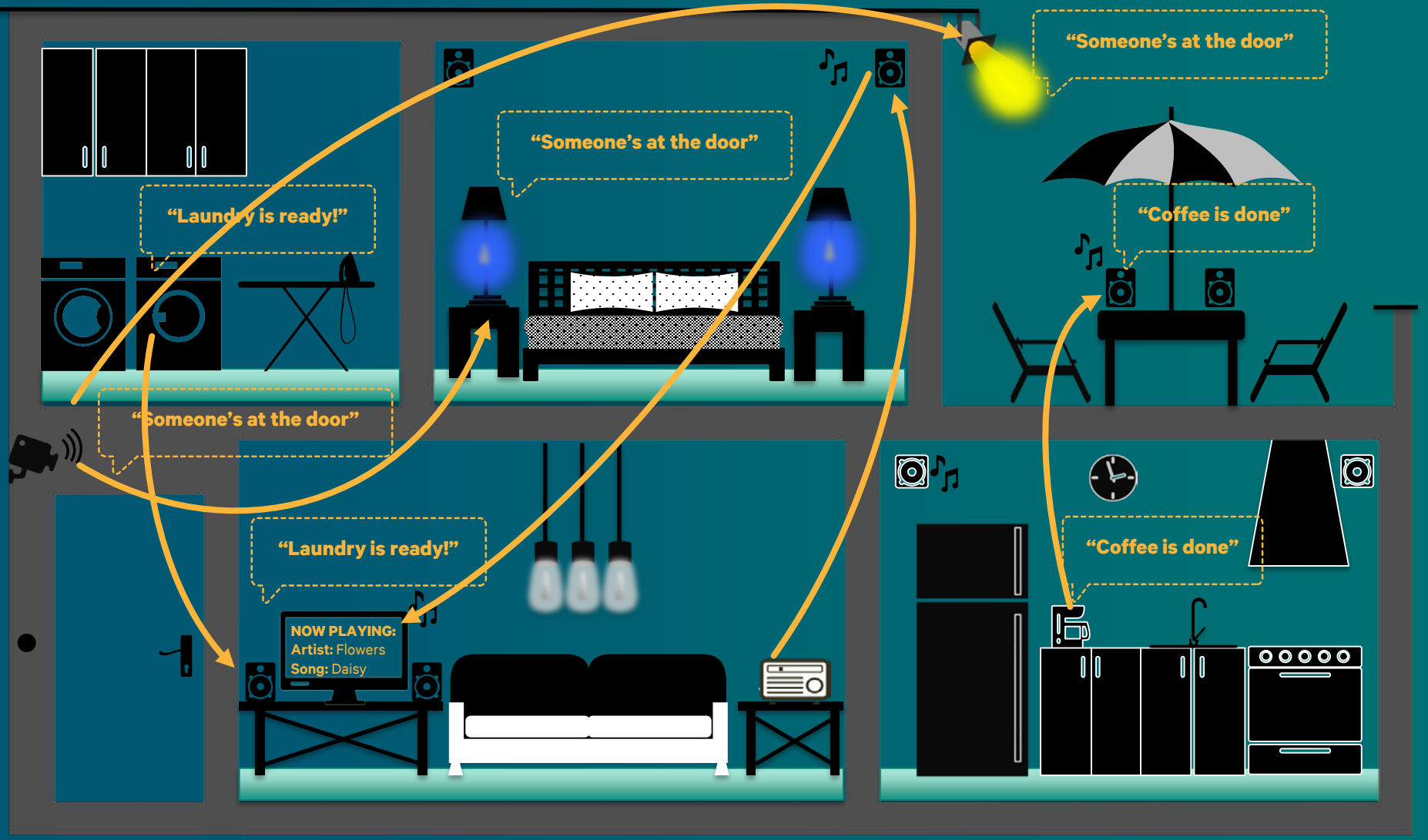
Ubiquitous connectivity promises to make devices “smart”

But ONLY if they speak the same language

hello world!	당신은 내 말 들려?	Tem alguém aí?	♒♏●●◆□❐♒♏	100010101011
				
Computing devices	Consumer goods and appliances	Home	Auto	Industrial

Devices that can’t connect across brands, categories, and operating systems will be left out

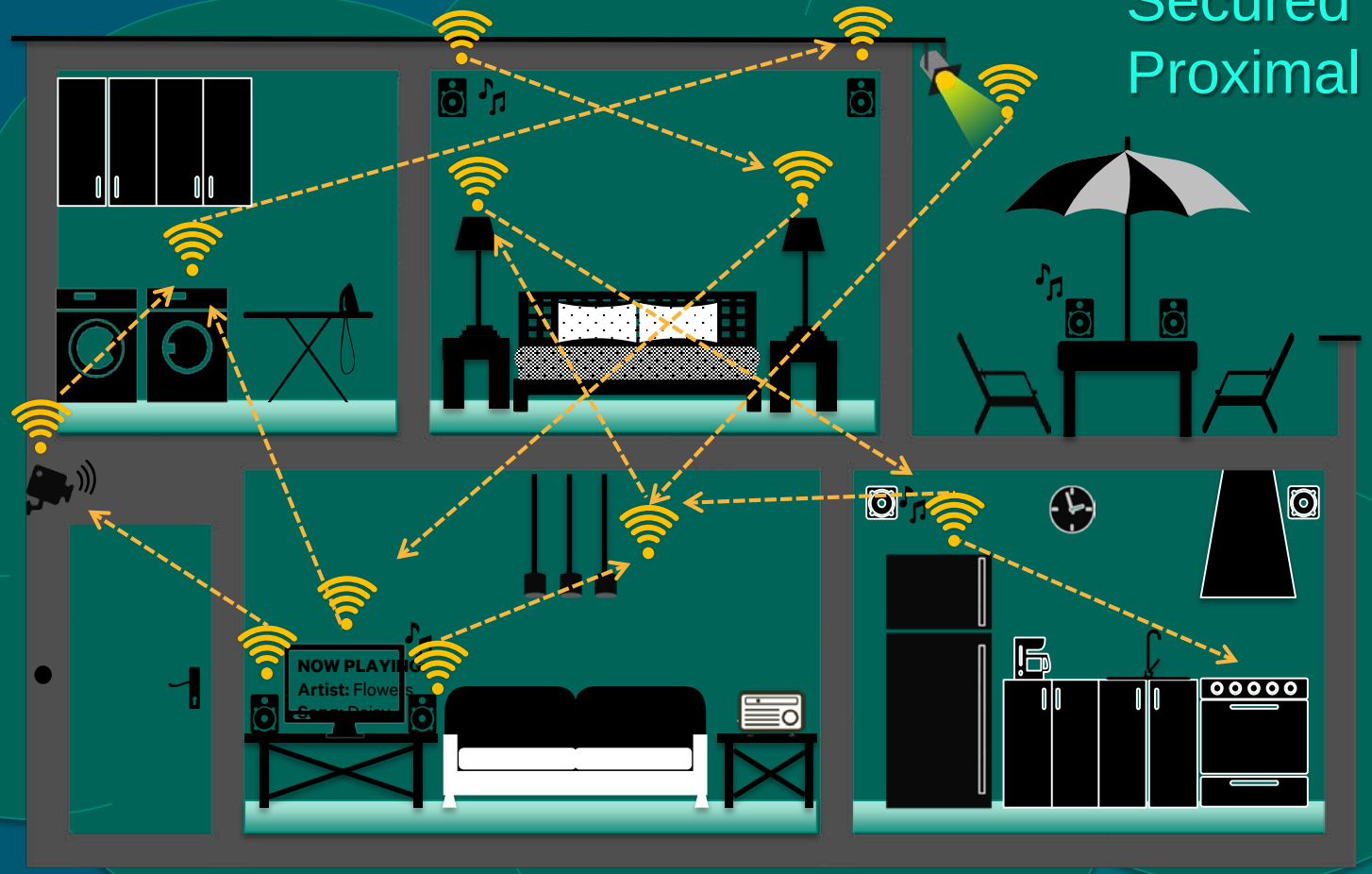
Network topology matters



Direct communication is fast, efficient, and secure.

No need to go out to the cloud to talk to the device right next to you!

Internet of Things Tomorrow



Secured
Proximal Cloud

Various Cloud
Services

What are these “*things*” of which you speak?

Without the right combination of hardware, connectivity and software a “Thing” is just a “Thing”. Ultimately it is software that makes a “Thing” an Internet-of -Things Thing.

APIs - how software talks to software

- Well constructed software has clean boundaries between the internals of the implementation and the external interfaces exposed to other software.
  - We generally call these external interfaces Application Programming Interfaces (APIs)
  - APIs are what makes it possible to incorporate existing functionality into new code
- Software platforms are simply collections of APIs
  - Windows, Linux, Android, iOS, OSX – are defined by the APIs they provide
  - Examples abound - OpenGL, PhysX, Webkit, every social network on the planet!

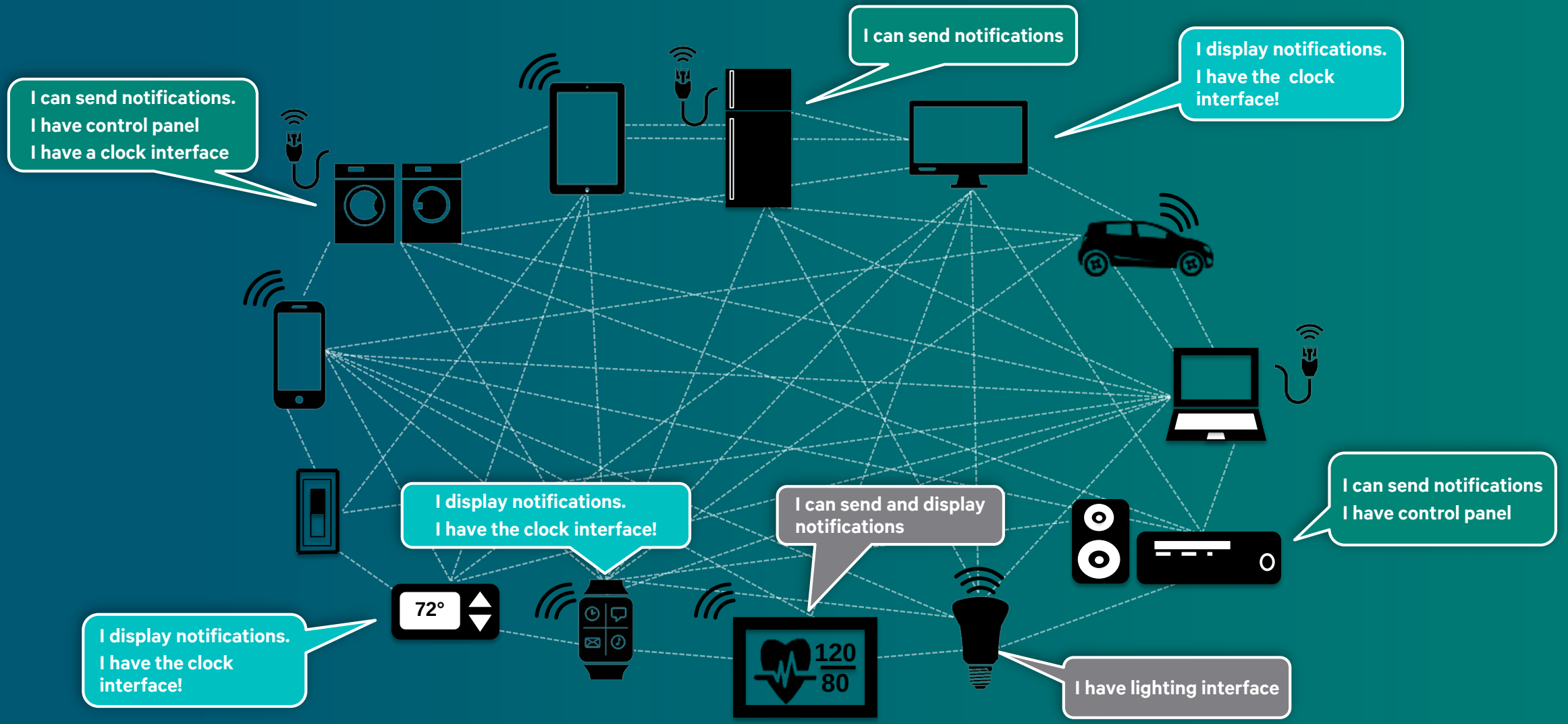
APIs – for IoT devices

- IoT devices are characterized by the software they run so:
  - When IoT devices talk to IoT devices it is software talking to software
- IoT devices should have APIs
  - But these IoT devices are all so different
  - But often have very similar functions
- What APIs should IoT devices have?
  - Some standard APIs
  - Some device specific APIs

IoT needs a framework to expose the various APIs of connected devices in a consistent way.

A single platform allowing products to expose their capabilities

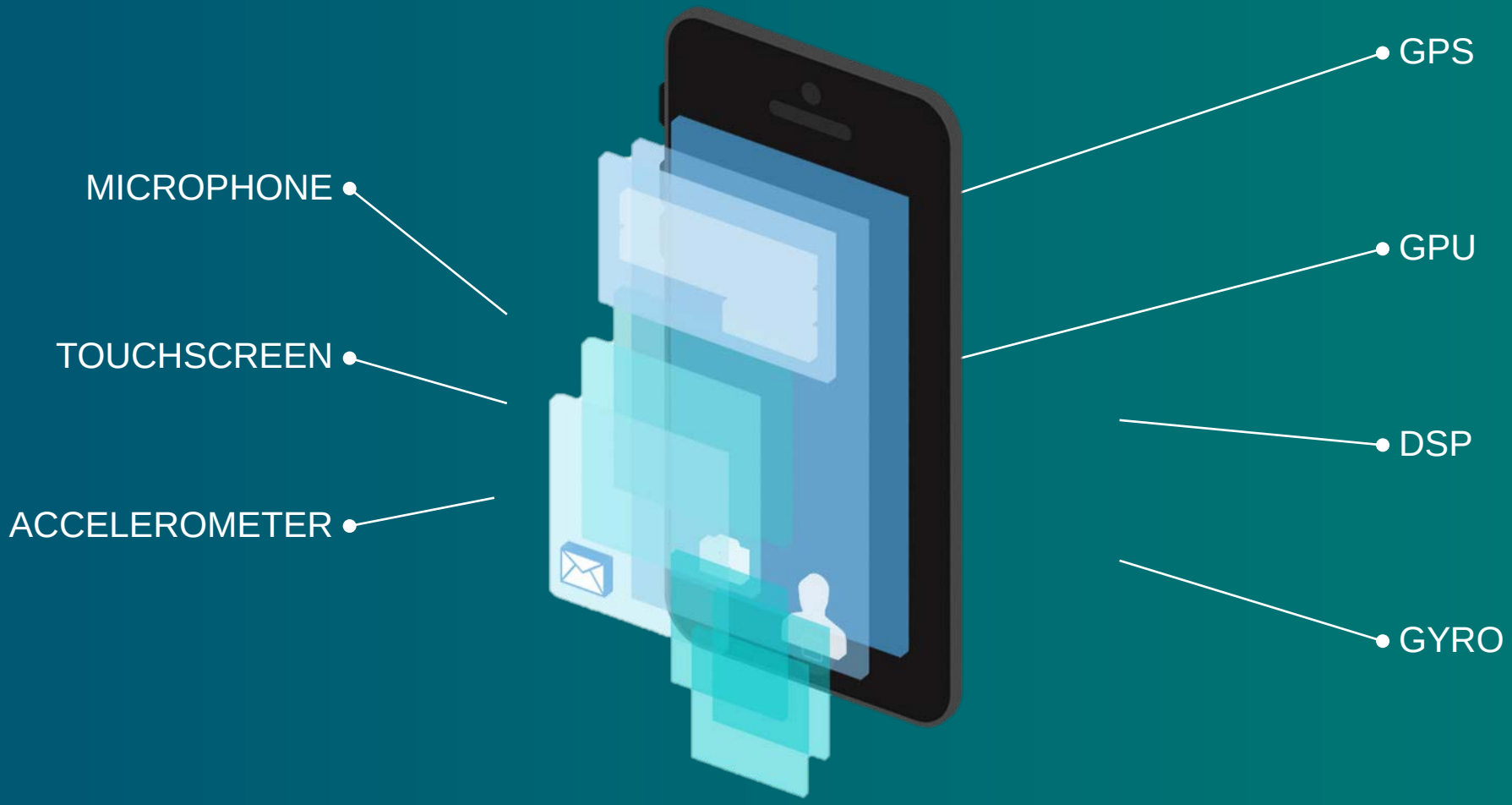
Devices describe their capabilities via discoverable self-describing service interfaces



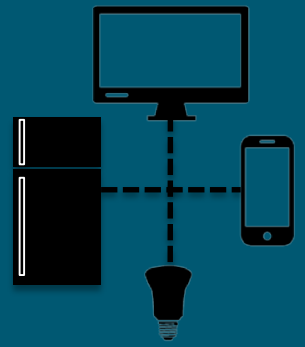
Standards

- What we don’t want:
  - There’s an App for that thing
  - And an App for that thing
  - And yet another App for that thing
  - …
- Devices that have similar functionality should expose the same APIs
  - Every device with a clock should expose a set-clock API
  - Every device that has a battery should expose a battery level API
  - Manufacturers cannot differentiate by exposing necessary functionality in different ways

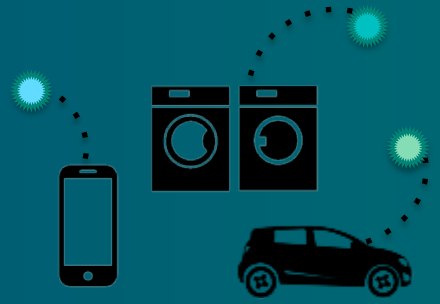
Exposing smartphone APIs enabled new experiences - that no one had ever thought of



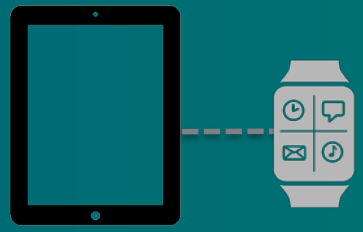
The problems to be solved…in an open interoperable way



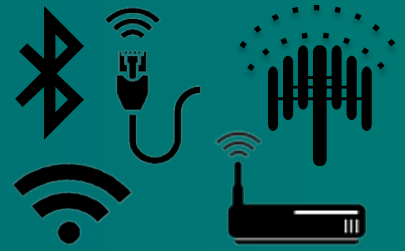
DISCOVER
nearby friendly devices



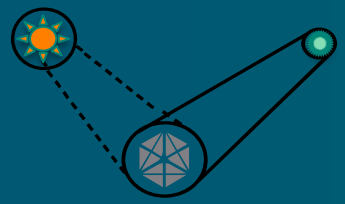
IDENTIFY
services running on those devices



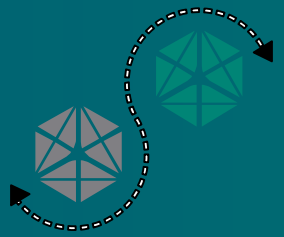
ADAPT
to devices coming and going



MANAGE
diverse transports



INTEROPERATE
across different OSes



EXCHANGE
information and services

SECURE
against nearby bad actors

Baseline for an API framework for IoT

- Must be designed to work with existing programming languages
  - Java, C, C++, C#, JavaScript, Python, etc
- Must support modular construction
  - To allow standard building blocks
  - To allow innovation
- Must include facilities for discovery
  - Find out what APIs a device has rather than what the device is
- Must support privacy and security
  - Which APIs can be used by other devices
  - Authentication and data encryption

The AllJoyn™ Project

An Open Source Framework for the Internet of Things

A year ago a group of companies formed the AllSeen Alliance

- A nonprofit consortium dedicated to enabling the widespread adoption of products, systems and services that support the Internet of Things through an open environment, vibrant ecosystem and thriving technical community.

- Hosts and advances an industry-supported software and services framework based on the collaborative AllJoyn open source project.

- This collaborative open source framework enables hardware manufacturers and software developers to create interoperable products that can discover, connect and communicate directly with other devices, systems and services regardless of brand.

Alliance and Objectives

Supporting the Internet of Things through an open environment, vibrant ecosystem and thriving technical community.

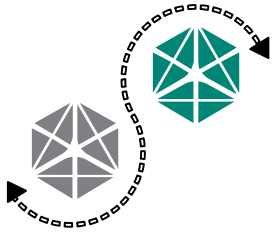
Alliance

Open Source Community

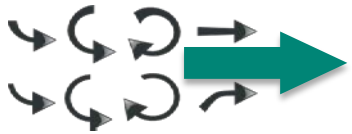
Industry leaders

Tech/software innovators

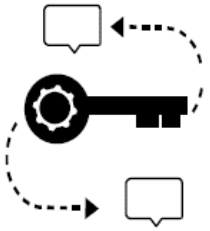
Enable Vibrant Ecosystem



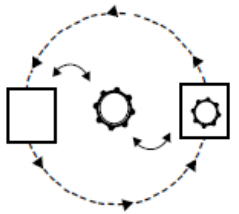
Evolution of AllJoyn



Evangelize



Contribute & Use



To learn more about the AllSeen Alliance visit: www.allseenalliance.org

To find out about participating in the AllSeen Alliance contact: Joe Speed <jspeed@linuxfoundation.org>

AllJoyn Software Framework: High-level architecture

A comprehensive software framework lets devices and applications communicate

AllJoyn App Layer

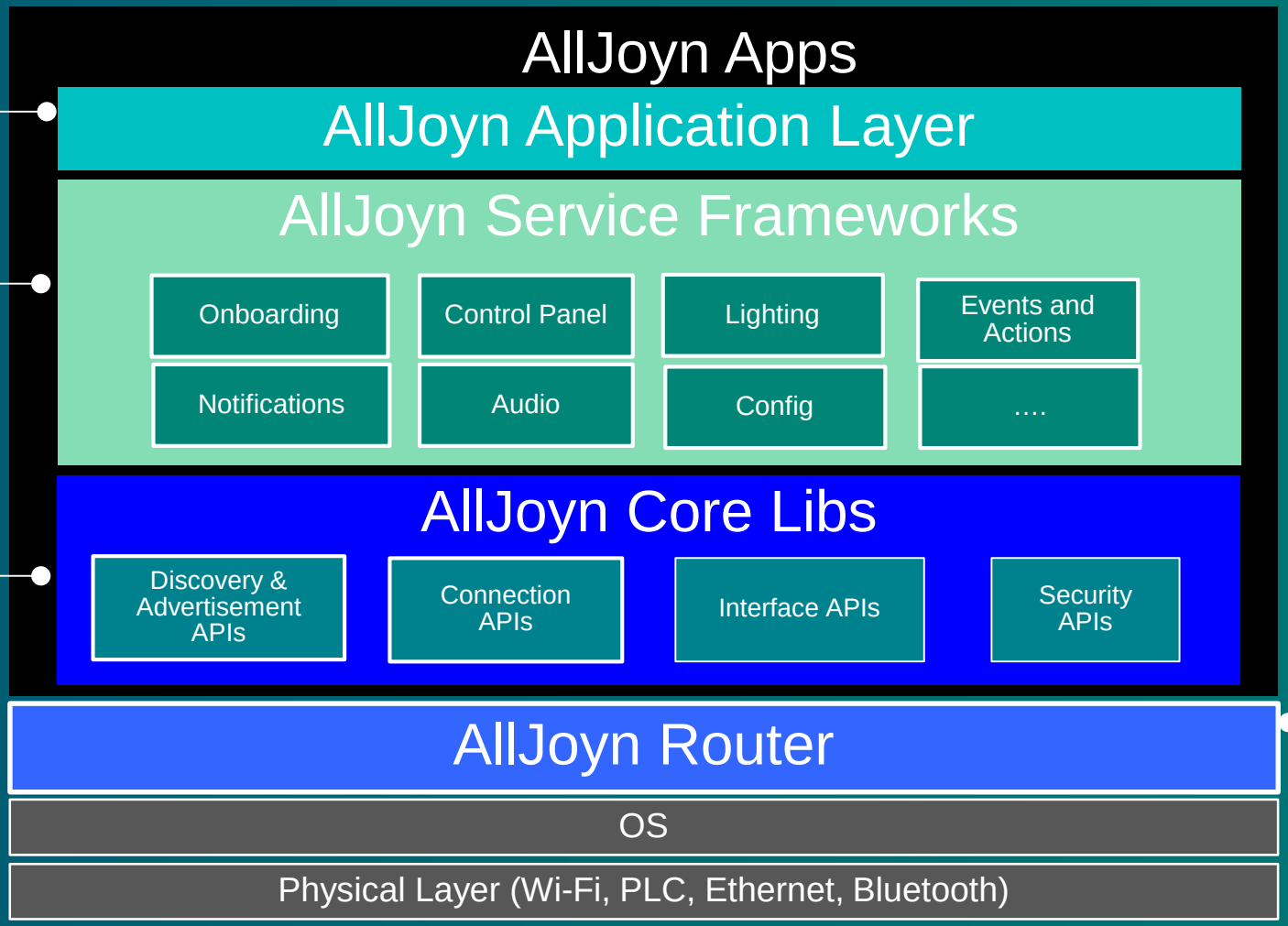
- Defines the User experience

AllJoyn Service Frameworks

- Interoperable, cross-platform modules for common IoE functionality
- Defines common interfaces between devices

AllJoyn Core Libs

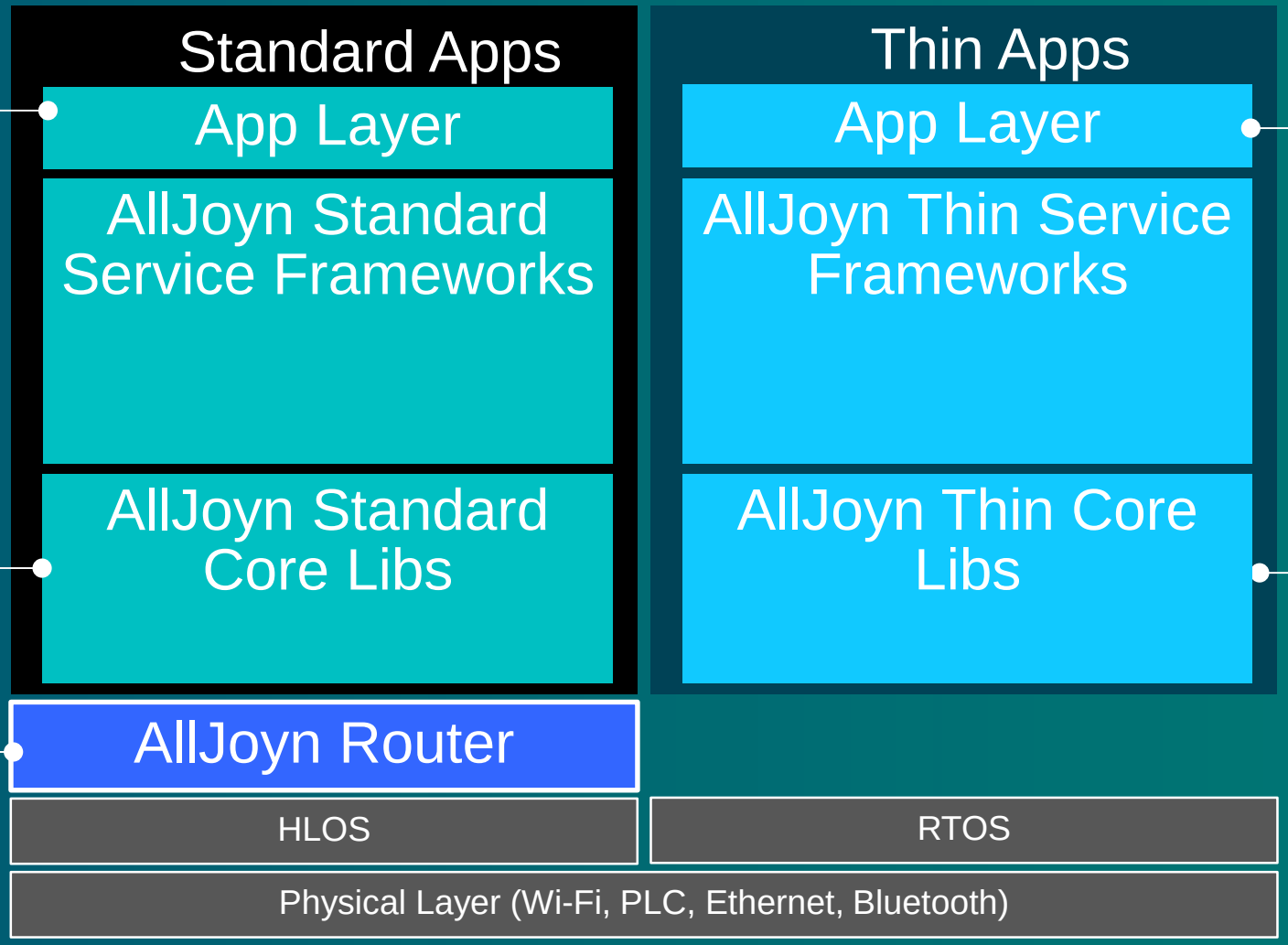
- Provides ability to find and connect to devices to do interesting things.
- Core libraries interact with the AllJoyn Router
- Provides access control and encryption



AllJoyn Router

- Manages communications between devices and apps
- Dynamic network management

Two Versions of the AllJoyn Framework To Choose



Standard App Layer

- App dev or OEM writes this

Standard Core Libraries

- Multiple bindings, runs on HLOS

AllJoyn Router

- AllJoyn Router can be bundled with a Standard App or run standalone

Thin App Layer

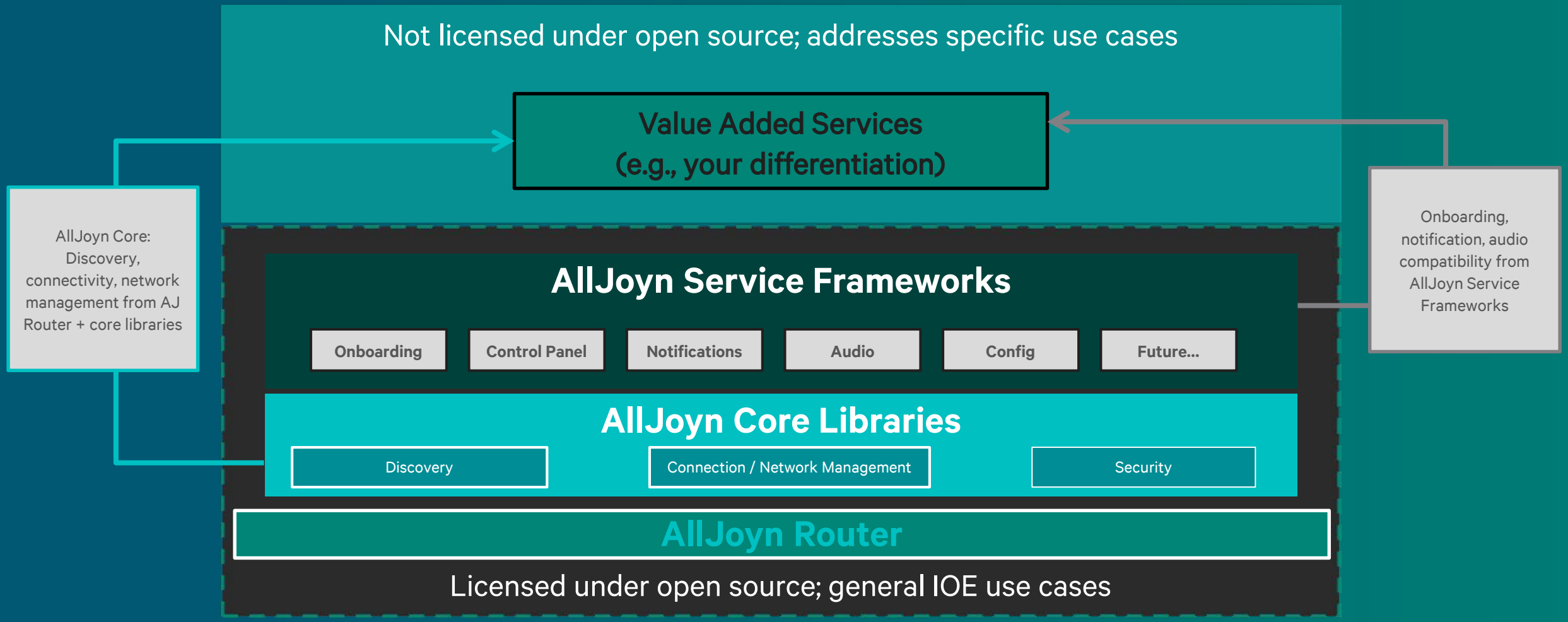
- OEM writes this

Thin Core Libraries

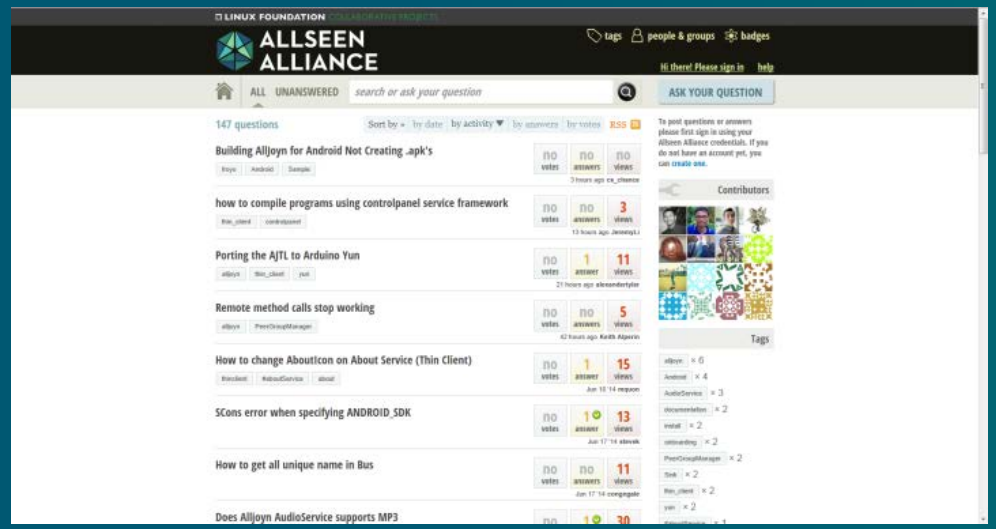
- C bindings, runs on RTOS
- Thin Apps using Thin Core requires an AllJoyn Router in the network

Open source building blocks for value added services

Use AllJoyn Core Library and Service Frameworks to create differentiated offerings



For More Information



- Alliance Wiki: https://wiki.allseenalliance.org
  - Documents, downloads, and developer tools
  - Source Code, release overviews, roadmaps
  - Training & Service Framework details
  - Working Groups, New Proposals & meeting minutes
- Forums: https://ask.allseenalliance.org/questions
- Certification: https://allseenalliance.org/certification
- Releases & Roadmaps: https://wiki.allseenalliance.org/release/overview
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