Introduction to Zigbee Direct

- **Motivation for Zigbee Direct**
- **Some technical Background**
- **Status of Zigbee Direct**

HOW STANDARDS PROLIFERATE:
(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC)

SITUATION: THERE ARE 14 COMPETING STANDARDS.

14?! RIDICULOUS! WE NEED TO DEVELOP ONE UNIVERSAL STANDARD THAT COVERS EVERYONE'S USE CASES. YEAH!

SOON: SITUATION: THERE ARE 15 COMPETING STANDARDS.

© xkcd, July 20th 2011

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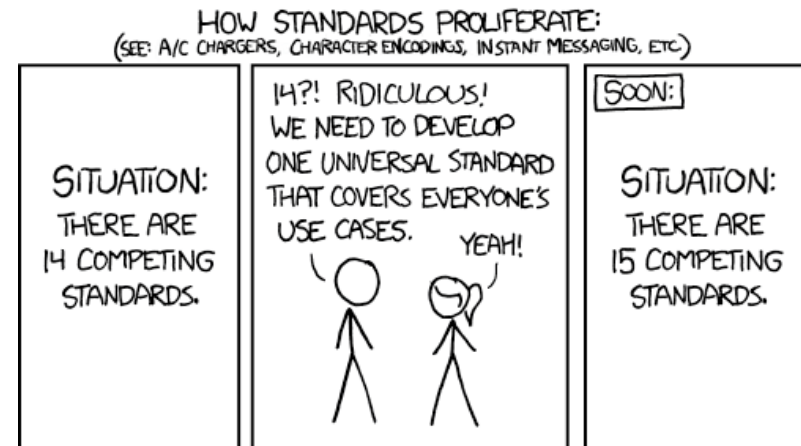
Reasons for Smart Home Devices Getting Returned

Horizontal bar chart titled "Reason for Returning" with the following categories (top to bottom):
- Other — ~24%
- Buyer's remorse — ~6%
- Received as a gift but didn't want — ~10%
- Product didn't fit the space — ~15%
- Difficulty learning to use the device features — ~19%
- Product didn't work with other devices I own — ~21%
- Product was broken or defective — ~22%
- Issues configuring the device settings — ~23%
- Products didn't work as advertised — ~24%
- Difficulty with the physical installation — ~27%

X-axis: 0%, 5%, 10%, 15%, 20%, 25%, 30%

- **The cost to the US economy for returns is $260 Billion a year. According to Deloitte, many technology brands spend 9-15 percent of their revenue handling returns.**

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Protocols vs. Ecosystems

Solution

- **There will be no "one standard to rule them all" in the short to medium term, therefore…**
- **…a given Smart Device needs to work with as many Ecosystems as possible**
- **This is especially true for products already deployed**

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Zigbee Direct High Level Architecture

Zigbee Virtual Device (ZVD)
BLE Only

Zigbee Direct Device (ZDD)
802.15.4 & BLE

Zigbee PRO stack

BLE
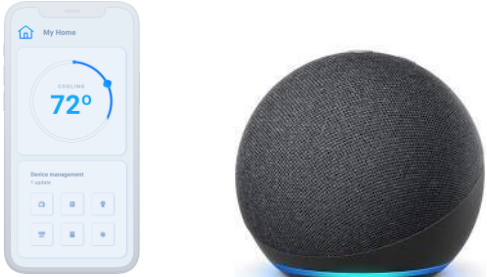
Zigbee PRO stack

BLE

802.15.4
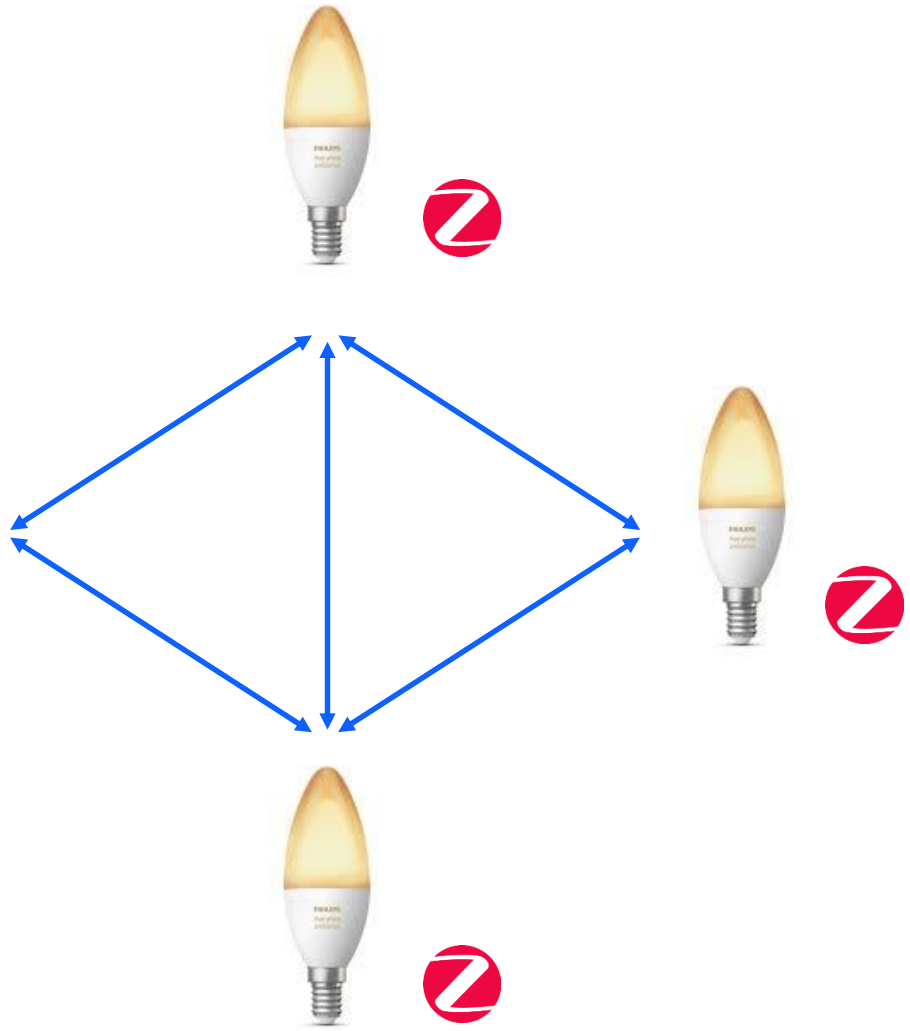
Zigbee Direct – Connecting Standards and Ecosystems

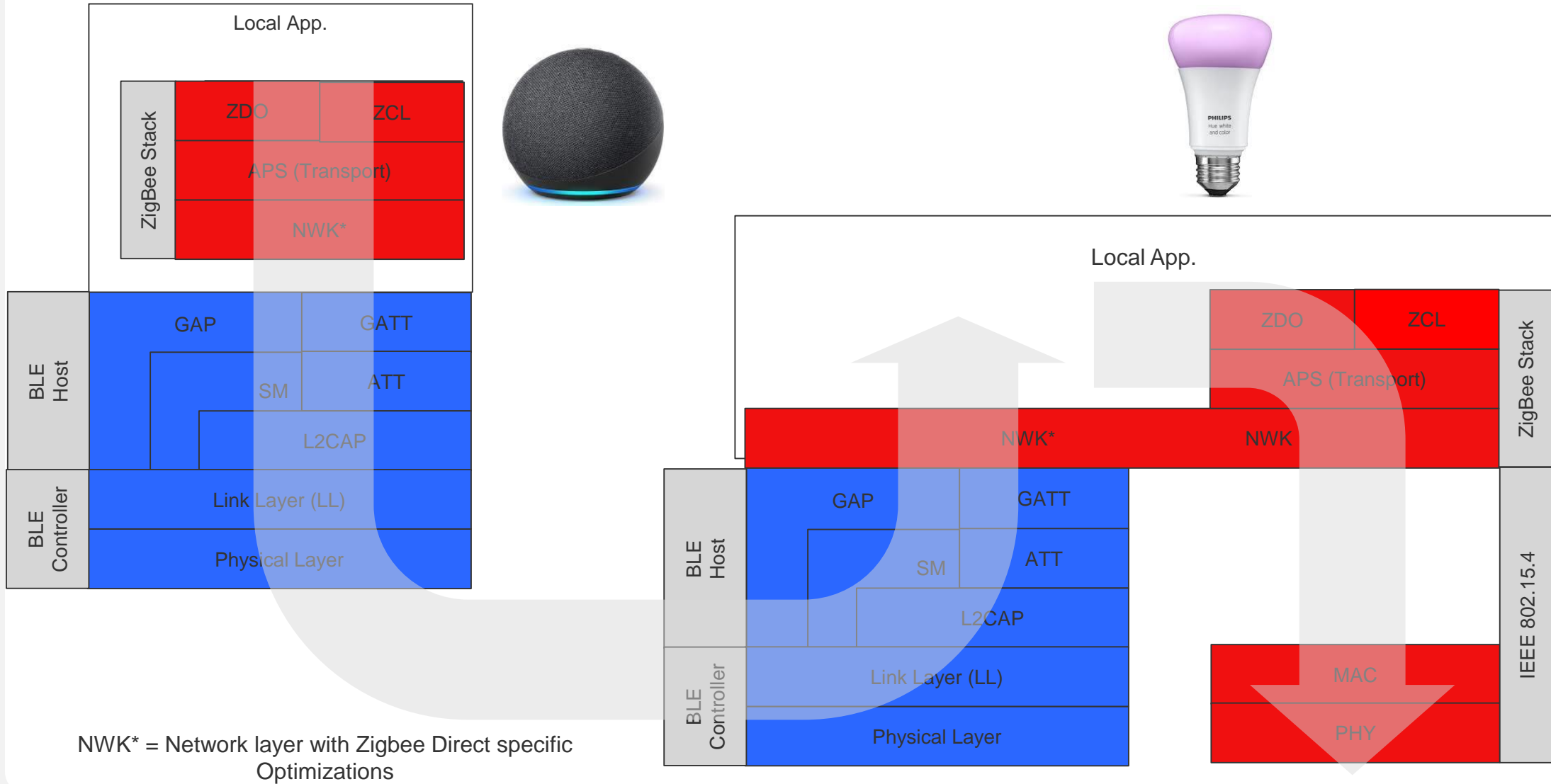|	ZVD (Phone, Tablet, Speaker, Hub)	ZDD (Light Bulb, Switch, etc)
Zigbee HW	✗	✓
Zigbee Stack	✓	✓
BLE HW	✓	✓
BLE Stack	✓	✓

PROBLEM →

- **Helps to bridge the gap caused by incompatible radio hardware, which is ultimately bridging the gap between ecosystems.**

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Connecting Standards and Ecosystems - Example

Zigbee Virtual Device (ZVD) BLE Only

Zigbee Direct Device (ZDD) 802.15.4 & BLE

Zigbee PRO stack

BLE

Zigbee PRO stack

BLE   802.15.4
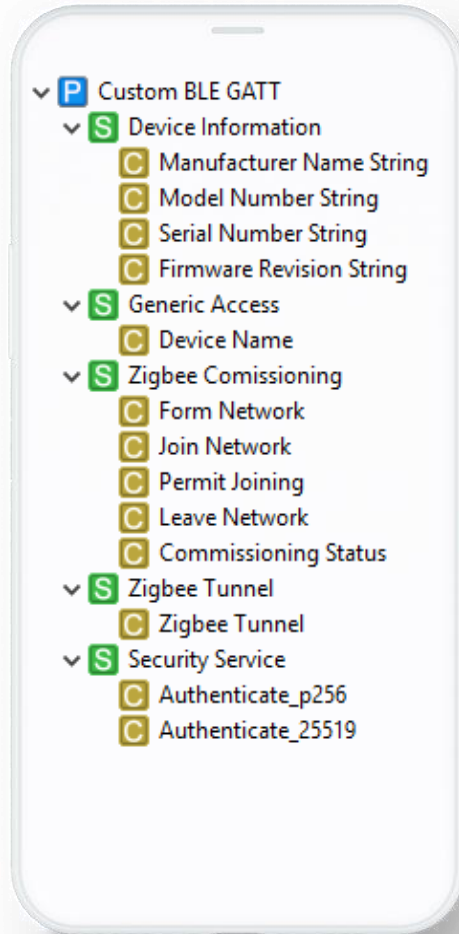
The ZVD could act as a bridge to allow existing Zigbee devices to interact with Matter products using Zigbee Direct

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Zigbee Direct Detailed Architecture

NWK* = Network layer with Zigbee Direct specific Optimizations

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BLE Messaging


```
v P Custom BLE GATT
  v S Device Information
      C Manufacturer Name String
      C Model Number String
      C Serial Number String
      C Firmware Revision String
  v S Generic Access
      C Device Name
  v S Zigbee Comissioning
      C Form Network
      C Join Network
      C Permit Joining
      C Leave Network
      C Commissioning Status
  v S Zigbee Tunnel
      C Zigbee Tunnel
  v S Security Service
      C Authenticate_p256
      C Authenticate_25519
```
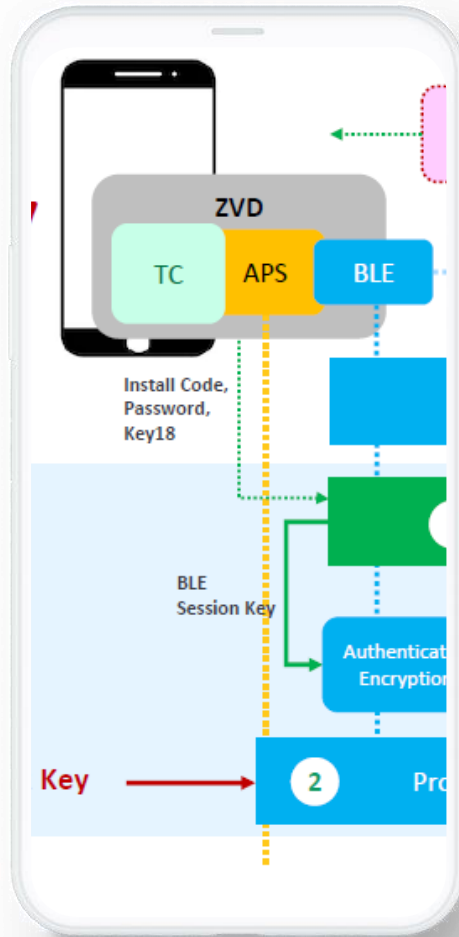
1. **Zigbee Direct is making use of BLE's generic attribute profile (GATT)**

2. **The Zigbee Virtual Device (ZVD) acts as a central device and the Zigbee Direct Device (ZDD) as a peripheral**
   - Security Service (Mandatory)
   - Comissioning Service (Mandatory)
   - Tunneling Service (Optional)

3. **ZDD sends connectable advertisement if it is ready to connect to one or more ZVDs**

4. **On conection (and authentication) ZVD gets added to ZDD's neighbor or child table and is treated by the local stack as yet another Zigbee device (with a different MAC identifier)**

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Zigbee Direct – Is it Secure

1. **Zigbee Direct is making use of state-of-the-art security features like Ellyptic Curve Cryptography**

2. **Zigbee Direct is <u>not</u> using standard Zigbee Network Security**
   - Network and Link key is not shared with the ZVD
   - Only exception is when the ZVD is a Coordinator

3. **Zigbee Direct is <u>not</u> using standard Bluetooth Security**
   - Allows ZVDs to roam between ZDDs
   - In a central security NWK ZVDs are authenticated via the Zigbee TC

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Status and Roadmap

- **The completed Zigbee Direct Specification is expected in January 2022**
- **Silicon Labs is active participant in the standardization process**
- **The ZVD concept has fuelled the discussion on App and Component Certification within the Zigbee Alliance**

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# Silicon Labs Well Positioned to Help You Design in Zigbee Direct

ZDD

1. **Dynamic Multi Protocol (DMP) Hardware, Software and Development Tools**
   ‣ Radio scheduler/arbiter with customizable priorities
2. **DMP Sample Applications and Application Notes**
3. **Zigbee Direct Sample Application & Documentation will be available closer to completion of the Zigbee Direct Specification**
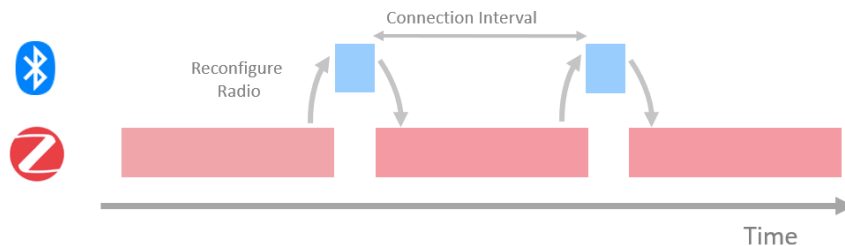
ZVD

1. **Based on either a complete (Type 1) implementation on a given host, or based on dependent Zigbee certified Software components**

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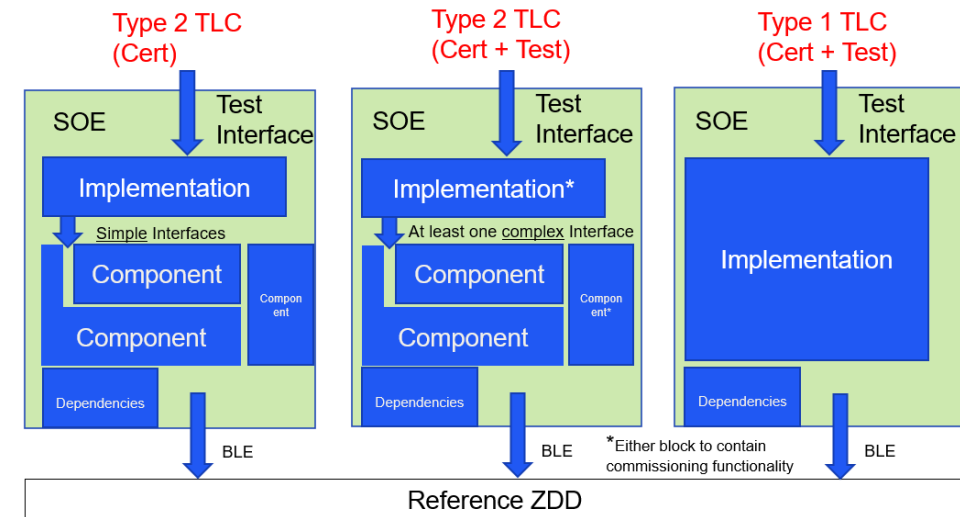
Zigbee Direct – ZDD Use Case Demo

- **See Video Storyborad**
  - Limited due to Alpha stage
  - Will have to use Alpha of GSDK3.3

Zigbee Direct – Video (OUTLINE)

- Get Signify to partner for the demo
- Show a ZVD on a smartphone
- Controlling a ZDD on ~~WSTK as well as~~ 1-2 "real" legacy Zigbee Devices from ~~(different?)~~ vendors
  - Could be luminaire to be brand agnostic

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Thank you