

Matter

Devendra Tewari

August 11, 2022

Matter



Figure 1:

BY



Figure 2:

Objective

- ▶ Why Matter?
- ▶ Core concepts
- ▶ Build and test on Linux
- ▶ Build on macOS and test on ESP32
- ▶ Device commissioning / setup
- ▶ Zigbee Cluster Library Specification
- ▶ Contributing to the project

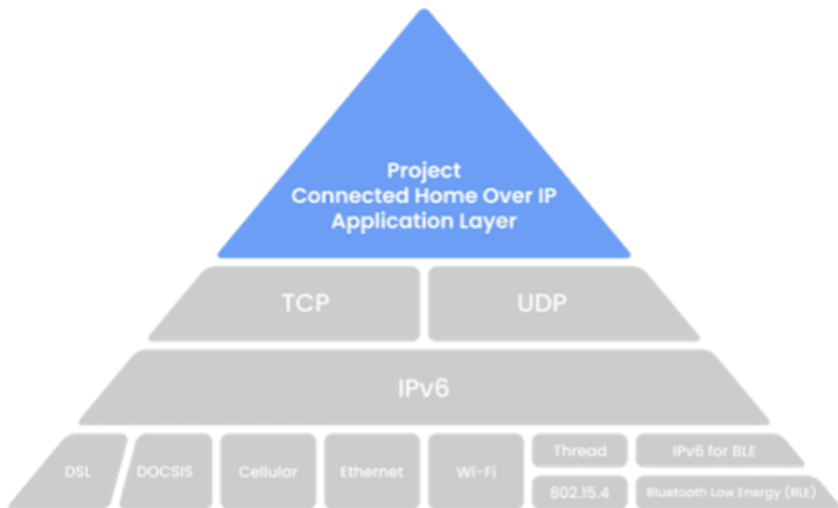
Why Matter?

- ▶ Simple, interoperable, reliable, and secure
- ▶ Promoted by industry leading device manufacturers
- ▶ Open specification and implementation
- ▶ Apache-2 licensed royalty-free source code
- ▶ Devices available sometime in 2022
- ▶ Preliminary support available on Android 12 and iOS 15

Core concepts

Matter	HomeKit	Zigbee
Attribute	Characteristic	Attribute
Binding	Event subscription	Binding
Cluster	Services	Cluster
Commissioning / Rendezvous	Pairing	Association
Controller / Commissioner	Admin	Coordinator
Device or Node	Accessory	Device or Node
Endpoint	Profile	Endpoint
Fabric	Network	Network

Internet Protocols



Architecture



How to use it today?

- ▶ Start by reading the docs at <https://github.com/project-chip/connectedhomeip>
- ▶ Try it out with Linux on a Raspberry Pi
- ▶ Try it out with an embedded device such as ESP32

Code Repository

- ▶ Top level

- BUILD.gn

- CONTRIBUTING.md

- README.md

- build

- docs

- examples

- gn_build.sh

- scripts

- src

- third_party

- zzz_generated

src directory

- ▶ /src
 - BUILD.gn
 - access
 - android
 - app
 - ble
 - controller
 - credentials
 - crypto
 - darwin
 - include
 - inet
 - messaging
 - platform
 - protocols
 - transport

examples directory

- ▶ /examples
 - all-clusters-app
 - all-clusters-common
 - esp32
 - linux
 - bridge-app
 - chip-tool
 - chip-tool-darwin
 - common
 - door-lock-app
 - light-switch-app
 - platform

Supported Platforms

- ▶ ESP32
- ▶ FreeRTOS
- ▶ Linux
- ▶ Mbed OS
- ▶ nRF Connect
- ▶ NXP
- ▶ Tizen
- ▶ Zephyr

Linux Device Development

- Build and test on a Raspberry Pi 4

More powerful processor

Choice of RAM

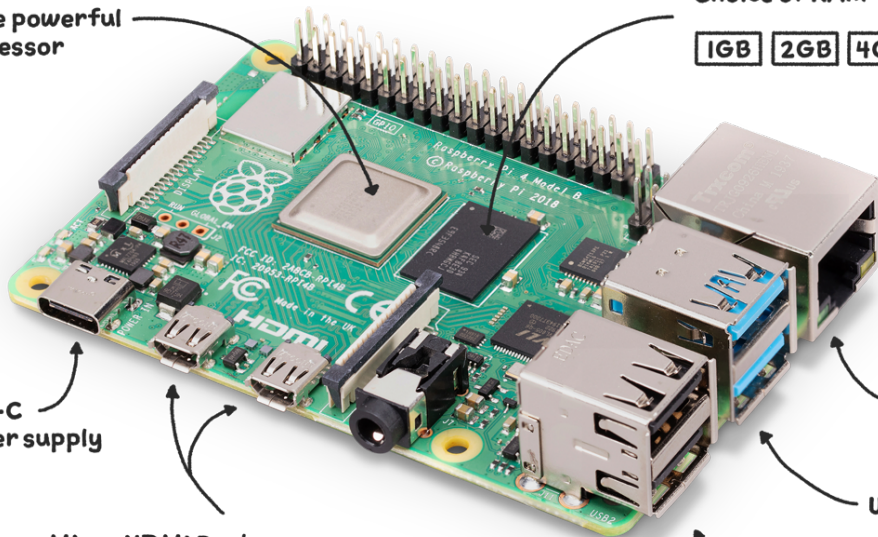
1GB **2GB** **4GB** **8GB**

USB-C Power supply

Micro HDMI Ports Supporting 2 x 4K displays

Gigabit Ethernet

USB 3



Install build toolchain

- ▶ On Raspbian and similar

```
sudo apt install git gcc g++ python pkg-config \  
libssl-dev libdbus-1-dev libglib2.0-dev \  
ninja-build python3-venv python3-dev unzip
```

Build and run all-clusters-app

► Build steps

```
git clone --recurse-submodules \
  https://github.com/project-chip/connectedhomeip
cd connectedhomeip
unalias python
source ./scripts/bootstrap.sh
source ./scripts/activate.sh
cd examples/all-clusters-app/linux
gn gen out/debug
ninja -C out/debug
# Delete network
./out/debug/chip-all-clusters-app --wifi
```


ESP32 Device Development

- ▶ Build on Linux or macOS and test on M5STACK Core 2



Install ESP-IDF

► Installation ESP-IDF SDK

```
git clone https://github.com/espressif/esp-idf.git
cd esp-idf
git checkout v4.4.1
git submodule update --init
./install.sh
source ./export.sh
```

Build and run all-clusters-app on ESP32

- ▶ Assuming you've cloned source code repo

- ▶ Build steps

```
cd connectedhomeip
```

```
unalias python
```

```
source ./scripts/bootstrap.sh
```

```
source ./scripts/activate.sh
```

```
cd examples/all-clusters-app/esp32
```

```
rm sdkconfig
```

```
idf.py -D 'SDKCONFIG_DEFAULTS=sdkconfig_m5stack.defaults' build
```

```
idf.py -p /dev/cu.usbserial-022D45D6 erase_flash flash monitor
```

- ▶ Quit serial monitor using Ctrl+]

chip-tool

- ▶ Command line tool to commission and interact with devices
- ▶ At least five different flavors - Android, iOS, Posix, Darwin, and Python

Install dependencies to build chip-tool on macOS

- Install dependencies using Homebrew

```
brew install openssl pkg-config
```

```
cd /usr/local/lib/pkgconfig
```

```
ln -s ../../Cellar/openssl@1.1/1.1.1n/lib/pkgconfig/* .
```

Build and run chip-tool on macOS

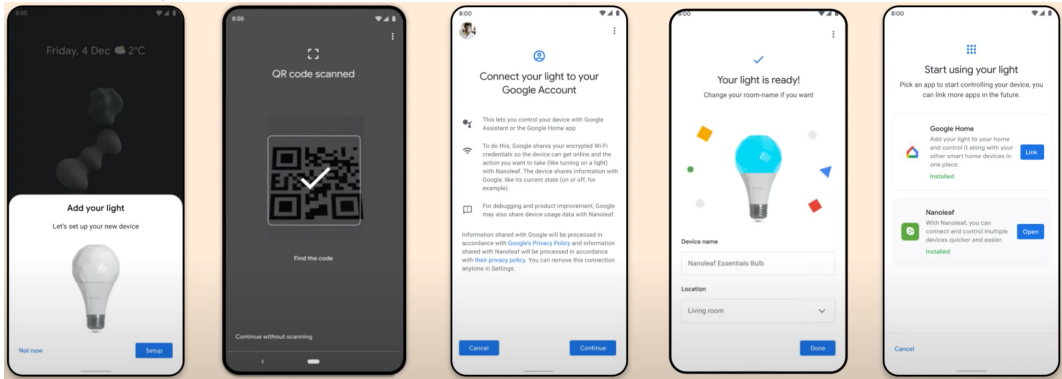
- ▶ Assuming you've cloned source code repo
- ▶ Build steps
 - `cd connectedhomeip`
 - `unalias python`
 - `source ./scripts/bootstrap.sh`
 - `source ./scripts/activate.sh`
 - `cd examples/chip-tool`
 - `gn gen out/debug`
 - `ninja -C out/debug`
 - `./out/debug/chip-tool onoff toggle 1 1`

Commissioning

- ▶ Configures device into a Matter fabric
- ▶ Pair device with multiple controllers / admins
- ▶ Commissioning over BLE/Wi-Fi using chip-tool

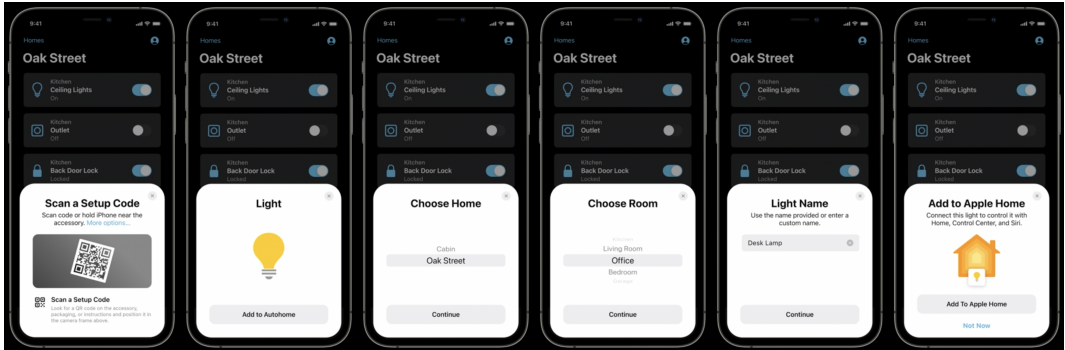
```
./out/debug/chip-tool pairing ble-wifi \  
1 ssid "password" \  
20202021 3840
```

Device Setup Flow on Android 12



Device Commissioning on iOS 15

- ▶ A hub device such as Apple TV 4K is needed
- ▶ A Matter profile needs to be installed on iOS and hub



Pair device with another controller

- ▶ Open commissioning window on device
`./out/debug/chip-tool pairing \`
`open-commissioning-window \`
`1 1 400 2000 3840`
- ▶ Use onnetwork pairing to discover devices and pair with first device found
`./out/debug/chip-tool pairing onnetwork 0 20202021`
- ▶ Android and iOS enable similar functionality

Read attributes using chip-tool

► Try

```
./out/debug/chip-tool onoff read on-off 1 1
```

```
./out/debug/chip-tool pressuremeasurement read measured-value 1 1
```

```
./out/debug/chip-tool relativehumiditymeasurement read measured-value 1 1
```

```
./out/debug/chip-tool temperaturemeasurement read measured-value 1 1
```

```
CHIP: [DMG] }
```

```
CHIP: [DMG]
```

```
CHIP: [DMG] Data = -32768,
```

```
CHIP: [DMG] DataVersion = 0x0,
```

```
CHIP: [DMG] },
```

Write attributes using chip-tool

► Try

```
./out/debug/chip-tool onoff write on-time 5 1 1
```

```
./out/debug/chip-tool onoff read on-time 1 1
```

```
CHIP: [DMG] }
```

```
CHIP: [DMG]
```

```
CHIP: [DMG] Data = 5,
```

```
CHIP: [DMG] DataVersion = 0x0,
```

```
CHIP: [DMG] },
```

Send commands using chip-tool

► Try

```
./out/debug/chip-tool onoff toggle 1 1
./out/debug/chip-tool onoff read on-off 1 1
CHIP: [DMG]                                }
CHIP: [DMG]
CHIP: [DMG]                                Data = true,
CHIP: [DMG]                                DataVersion = 0x0,
CHIP: [DMG]                                },
```

Configure Device Model using ZAP Tool

- ▶ Endpoints are defined in a .zap file which then generates code and static structures for the data model
- ▶ Run Zigbee Cluster Configurator

```
brew install nvm
```

```
nvm use stable
```

```
cd connectedhomeip
```

```
cd third-party/zap/repo
```

```
npm i
```

```
npm run zap
```

- ▶ See Zigbee Cluster Library Specification

Contributing to Matter

- ▶ Submit bugs and features to
<https://github.com/project-chip/connectedhomeip/issues>
- ▶ Run automated test suite using act
`brew install act`
`act -j test_suites_linux`
- ▶ Run tests on device using chip-tool
`./out/debug/chip-tool tests TestCluster --nodeId 1`
- ▶ Submit pull request via GitHub for maintainers to review and merge

Wrap-up

- ▶ Questions?
- ▶ Thanks!