Web of Things (WoT)

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- **The Web of Things is an emerging concept and technology that extends the Internet of Things (IoT) by making IoT devices and their data accessible and controllable via web standards and protocols.**

- **It aims to create a more standardized and interoperable framework for IoT devices, making it easier for them to work together and be integrated into web applications and services.**

- **Web of Things (WoT) refers to a set of standards formed by the World Wide Web Consortium (W3C) to facilitate the interoperability, fragmentation, and usability of the Internet of Things (IoT).**

- **The Web of Things is an approach to bring the principles of the World Wide Web to the IoT world, aiming to make IoT devices more accessible, interoperable, and secure. It offers a standardized way to interact with IoT devices over the web, which can simplify the development of applications and services that incorporate IoT functionality.**

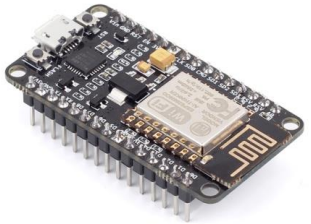
Web of Things (WoT)

Web of Things (WoT): **Applications**

Horizontal application layer for the IoT ***similar*** to the World Wide Web for the Internet

Internet of Things (IoT): **Connectivity**

Ethernet



Wi-Fi

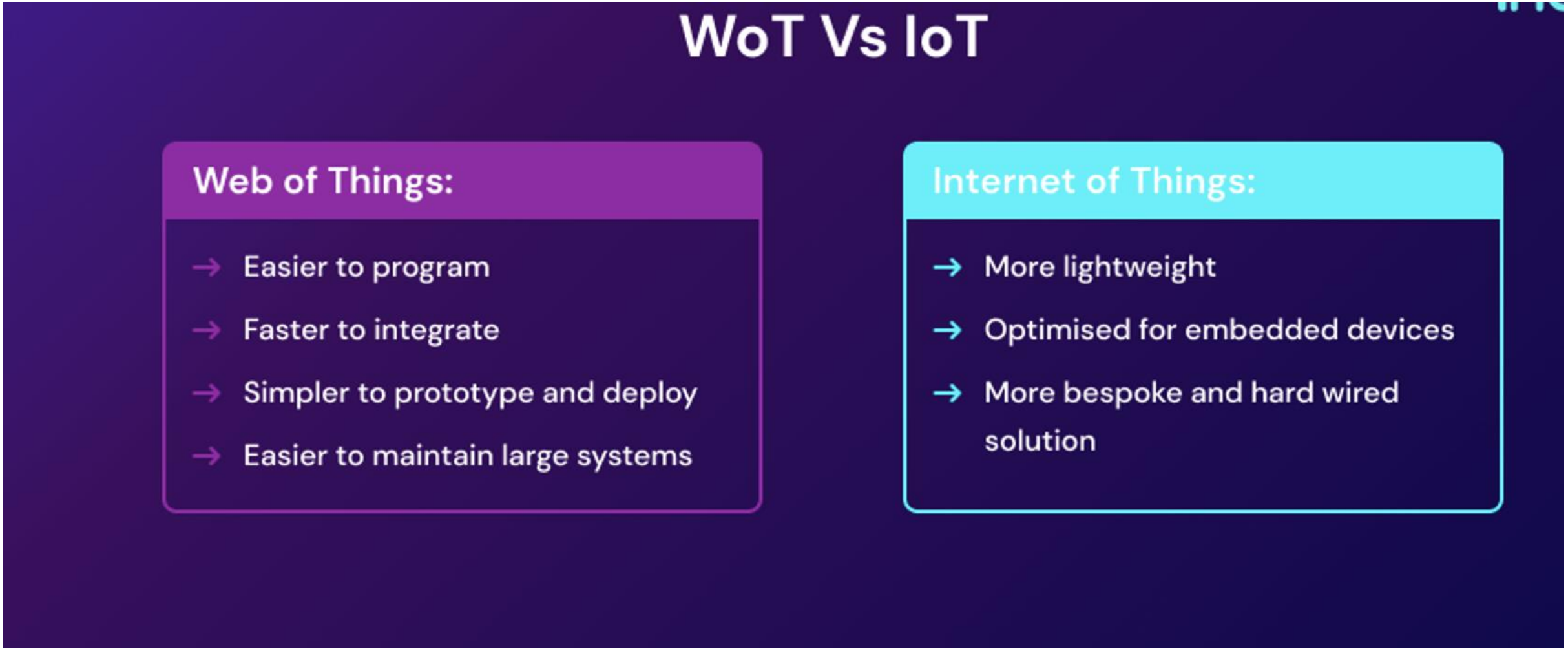
IEEE 802.15.4
(ZigBee/6LoWPAN/Thread)

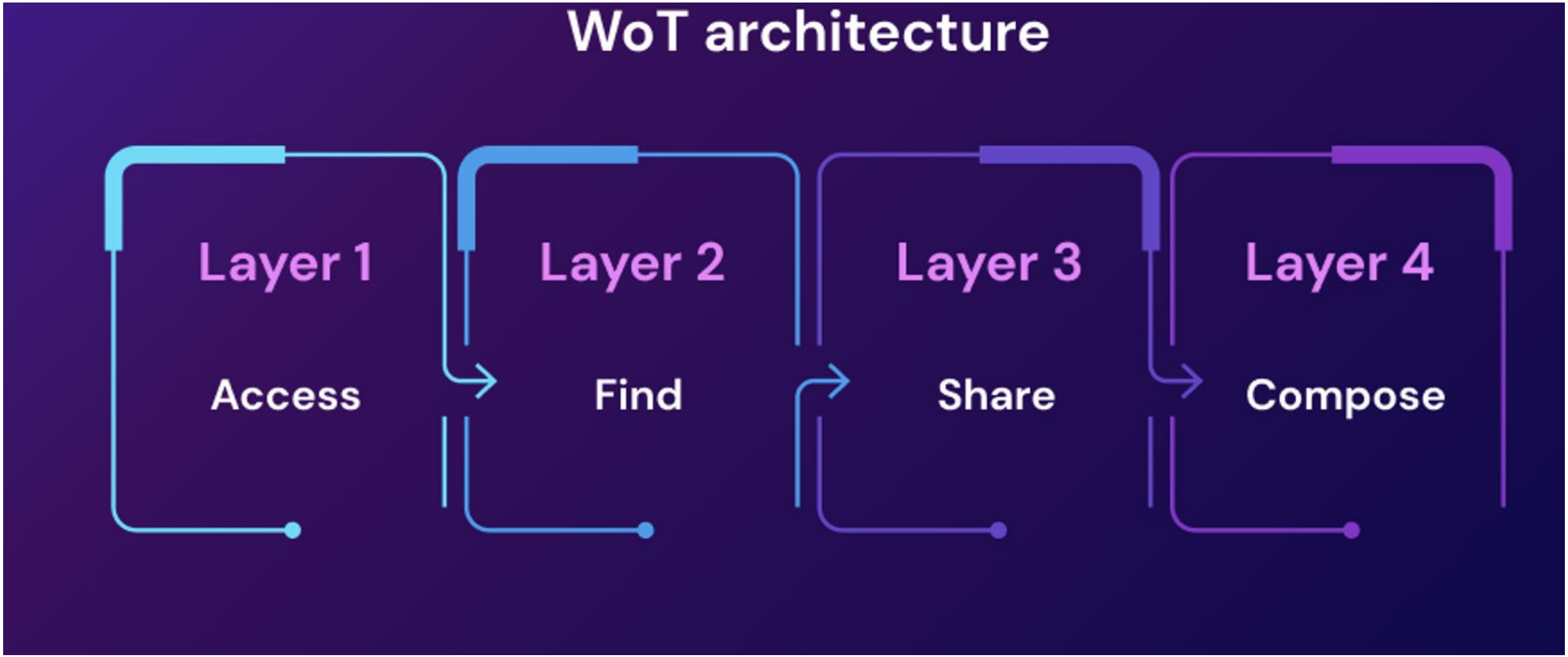
Bluetooth

LPWAN
(LoRa, Sigfox, NB-IoT, …)

…

WoT vs. IoT


WoT Vs IoT
Web of Things:
→ Easier to program
→ Faster to integrate
→ Simpler to prototype and deploy
→ Easier to maintain large systems
Internet of Things:
→ More lightweight
→ Optimised for embedded devices
→ More bespoke and hard wired solution


WoT architecture
Layer 1
Access
Layer 2
Find
Layer 3
Share
Layer 4
Compose

Layer 1- Accessibility:

This layer converts anything into a web thing. This will enable us to interact with the converted web thing with HTTP requests. To put it more simply, a web thing is a REST API that permits us to communicate with anything in the actual world.

1.HTML

2.REST API

3.URL / URI

4.Gateway

5.HTTP

Layer 2 - Findability:

It is one thing to make the data more accessible, but it is wholly different that the applications can understand what the data is or its purpose. For this purpose, the second layer comes into action.

It ensures that other HTTP users can use your device, and it is easily discoverable and workable by different WoT applications. It is done by resing the semantic web standards to explain the things and their purpose of existing.

1. Linked Data
2. Link Header
3. Search Engines
4. JSON

Layer 3 - Sharing:

This layer's job is to find a safe way to transfer the data across services securely. Different protocols are used at this level, such as TLS, OAuth, etc.

1. Social Networks
2. Encryption
3. Authentication

Layer 4 - Composition

The fourth step is to find a way and tools to build an application for the web of things. At the Composition layer, web tools span from web toolkits (JavaScript) that provide a higher-level abstraction to dashboards with programmable widgets, and lastly, physical mashup tools like Node-RED.

1. Systems Integration
2. Node-RED
3. Automated UI generation
4. Web Application

Web of Things (WoT)

Key components and principles of the Web of Things include:

1.Semantic Interoperability: WoT promotes the use of standardized data formats and ontologies, making it possible for IoT devices to semantically describe their capabilities and data. This helps different devices understand each other and work together more seamlessly.

2.RESTful APIs: Similar to how websites use Representational State Transfer (REST) APIs to interact with each other, WoT devices expose RESTful APIs that can be accessed via HTTP. This makes it easy to access and control IoT devices using standard web tools.

3.Web of Things Description Language (WoT Thing Description): This is a standardized way of describing the metadata and capabilities of WoT devices, making it easier for clients to discover and interact with devices. These descriptions include information about data properties, actions, events, and security requirements.

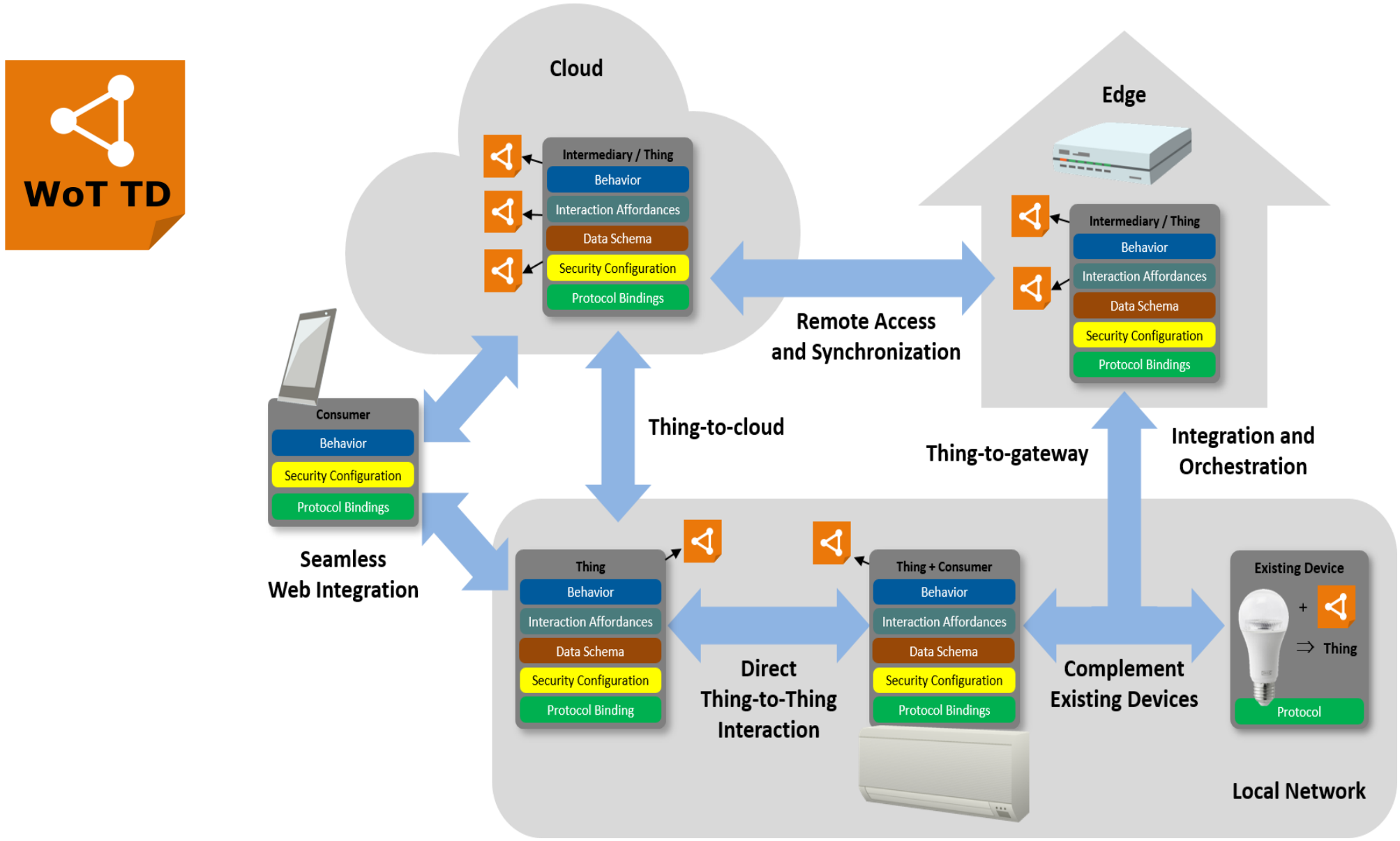
Web of Things (WoT)

Key components and principles of the Web of Things include:

4. Accessibility and Usability: WoT emphasizes the user experience by making IoT devices easily accessible and controllable via web interfaces. This can include web applications, mobile apps, or voice assistants.

5. Scalability: As the number of IoT devices continues to grow, WoT is built to scale. It can accommodate a wide range of devices and services, making it a suitable framework for both small-scale and large-scale IoT deployments.

Abstract WoT Architecture



Why the Web – User- and Developer-friendly

- Internet of Things
  - Domain expertise
  - Embedded developers
  - Optimized protocols and formats
    - Silos with high integration costs

Profiles 30,308

- World Wide Web
  - Interoperability and usability
  - Web developer community
  - HTTP, JSON, scripting
    - Easy with high productivity

Open source culture

Profiles 873,202

- Web of Things
  - Take patterns that worked for the Web
  - Adapt and apply them to the IoT

Roadmap / Next steps

- Proposed RECOMMENDATION Publication of Architecture and Thing Description: expected in Sep 2019

- New charter of the WoT Working Group currently being defined
  - Charter Period: November 2019 – October 2021 (Still under discussion)
  - 1st WoT Working Group face-to-face meeting under the new charter expected in Singapore
- Please participate and contribute to the evolution of the Web of Things