Managing Field Area Networks with Cisco FND and OpenCSMP

Abitzen Xavier
Senior Product Manager – Wi-SUN,
Z-Wave & Amazon Sidewalk

SILICON LABS

Paul Duffy
Senior Technical Leader - Enterprise
CTO Team/Industrial IoT

CISCO

Agenda

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Device Lifecycle Management for City-Scale FANs

Introduction

- Millions of devices.
- Easy deployment, minimum "touch".
- What devices are on my network?
- Are they properly configured?
- Are they performing?
- Are they behaving normally?
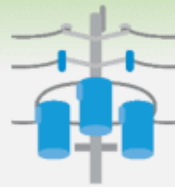- Is the latest SW/FW installed?
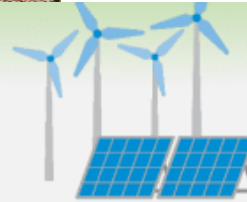

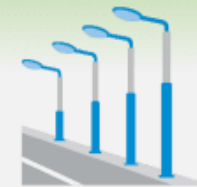AMI Metering   EV Charging   Distribution Automation   Direct Load Control   SCADA   Distributed Generation   Outdoor Lighting   Traffic Management   Parking

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Generic Management for IP Devices.

Network discovery, selection, secure join.

Route formation and IP address acquisition.

Defined by FAN 1.x

Service discovery (manager, time source, etc.).

Register with inventory (capabilities, characteristics).

Obtain configuration.

Report periodic metrics.

Out of Scope FAN 1.x

Report async emergency conditions.

Secure placement of BLOBS

- (Binary Large Objects … FW, config files, FW, certificates).

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Special Challenges of the FAN

Million device scale

Limited bandwidth
- 50 Kbps – 2.4 Mbps.

Per hop latency
- 10s milliseconds.

Lossy links, dynamic routing
- Temporary obstructions, seasonal foliage, etc.

Limited compute / memory resources

All combine to require low footprint management tactic

Re-Introducing CoAP Simple Management Protocol

Originally developed by Cisco (2012)

- 10s mm mesh devices deployed.

Purpose built for low footprint IoT management / lossy networks

- Standards based (CoAP transport + Protocol Buffer payloads).
- RESTful (GET, PUT, POST, DELETE).
- Binary encoded, UDP for efficiency.

Provides all the classic management operations…

- Device registration with inventory.
- Configuration management and placement.
- Metrics reporting.
- Async alarm reporting.
- FW distribution.

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OpenCSMP for FAN 1.x Management

- Cisco has open sourced CSMP.

- Supports Linux and FreeRTOS.

- Multiple silicon vendors adopting.

- Silabs contributes FreeRTOS, EFR32, and Simplicity Studio integration.

- Fully compatible with Cisco Field Network Director (December 2024).

- Get involved here!

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OpenCSMP Application for FAN Stack
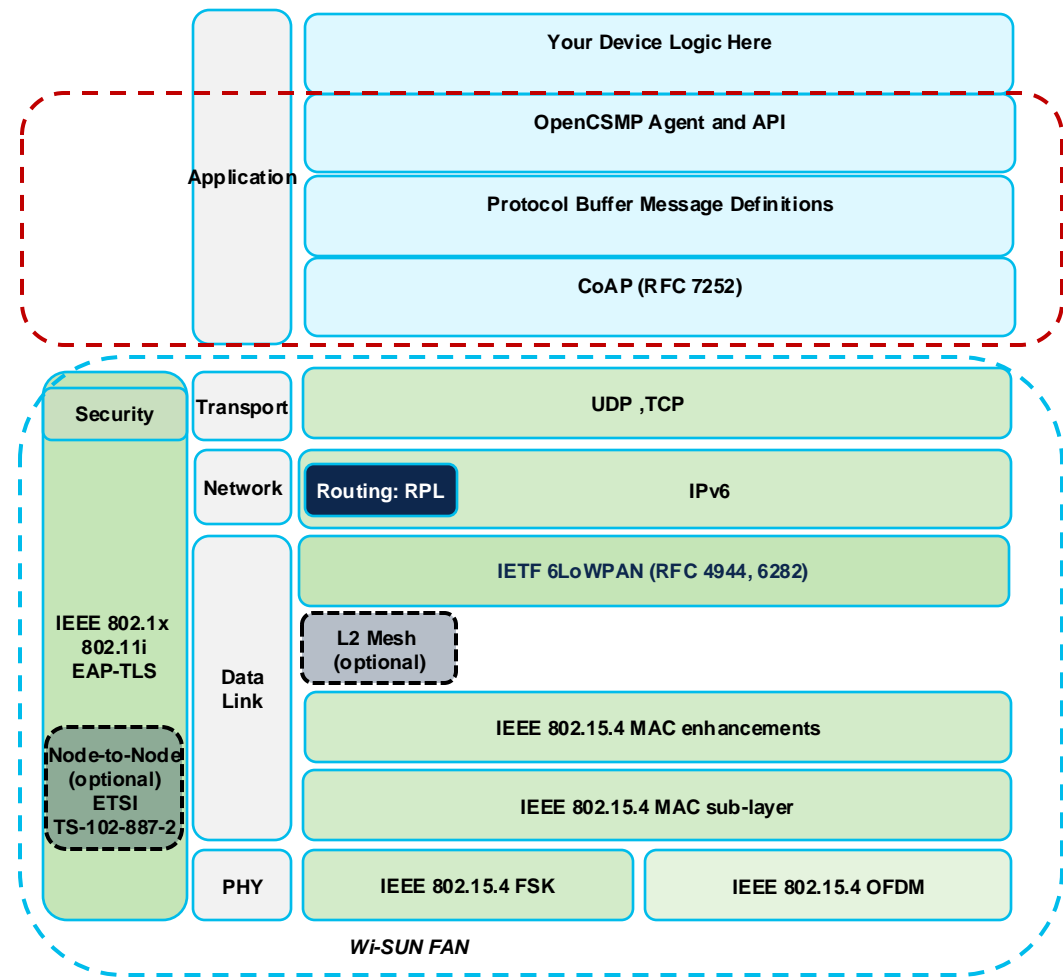
IPv6 protocol
- 6LoWPAN adaptation.
- Routing using RPL
- Unicast and Multicast forwarding.
- DHCPv6 address management.

Security
- 802.1X/EAP-TLS/PKI Authentication.
- 802.11i Key Management
- Optional ETSI Node 2 Node Key Management

Your Device Logic Here

OpenCSMP Agent and API

Protocol Buffer Message Definitions

CoAP (RFC 7252)

OpenCSMP

Application

Security

IEEE 802.1x 802.11i EAP-TLS

Node-to-Node (optional) ETSI TS-102-887-2

Transport — UDP ,TCP

Network — Routing: RPL   IPv6

Data Link

IETF 6LoWPAN (RFC 4944, 6282)

L2 Mesh (optional)

IEEE 802.15.4 MAC enhancements

IEEE 802.15.4 MAC sub-layer

PHY — IEEE 802.15.4 FSK   IEEE 802.15.4 OFDM
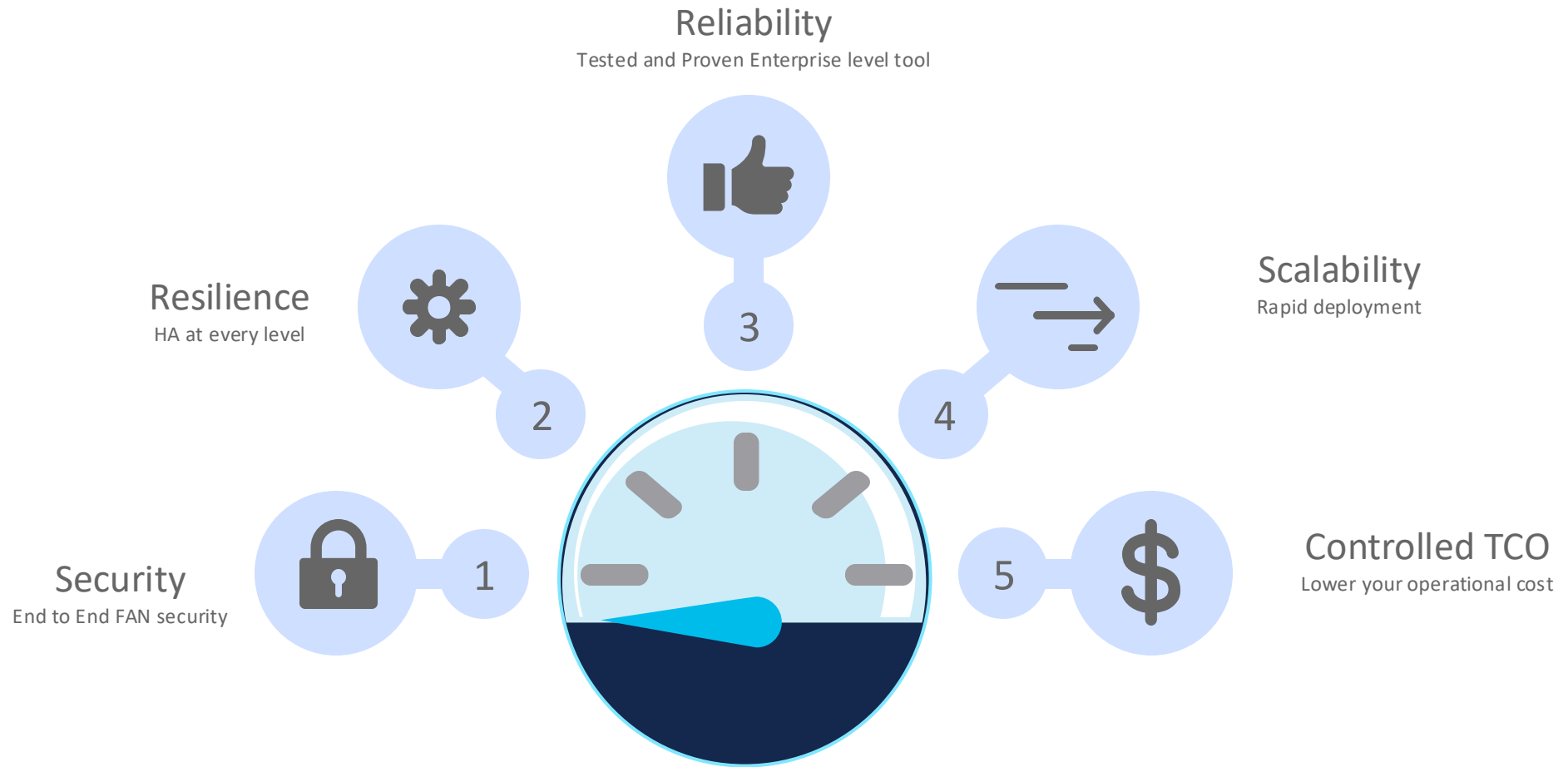
Wi-SUN FAN

Extended IEEE 802.15.4 MAC.
- Discovery / Join
- Frequency hopping
- Several Frame Exchange patterns
- Protocol Dispatch (IEEE 802.15.9)
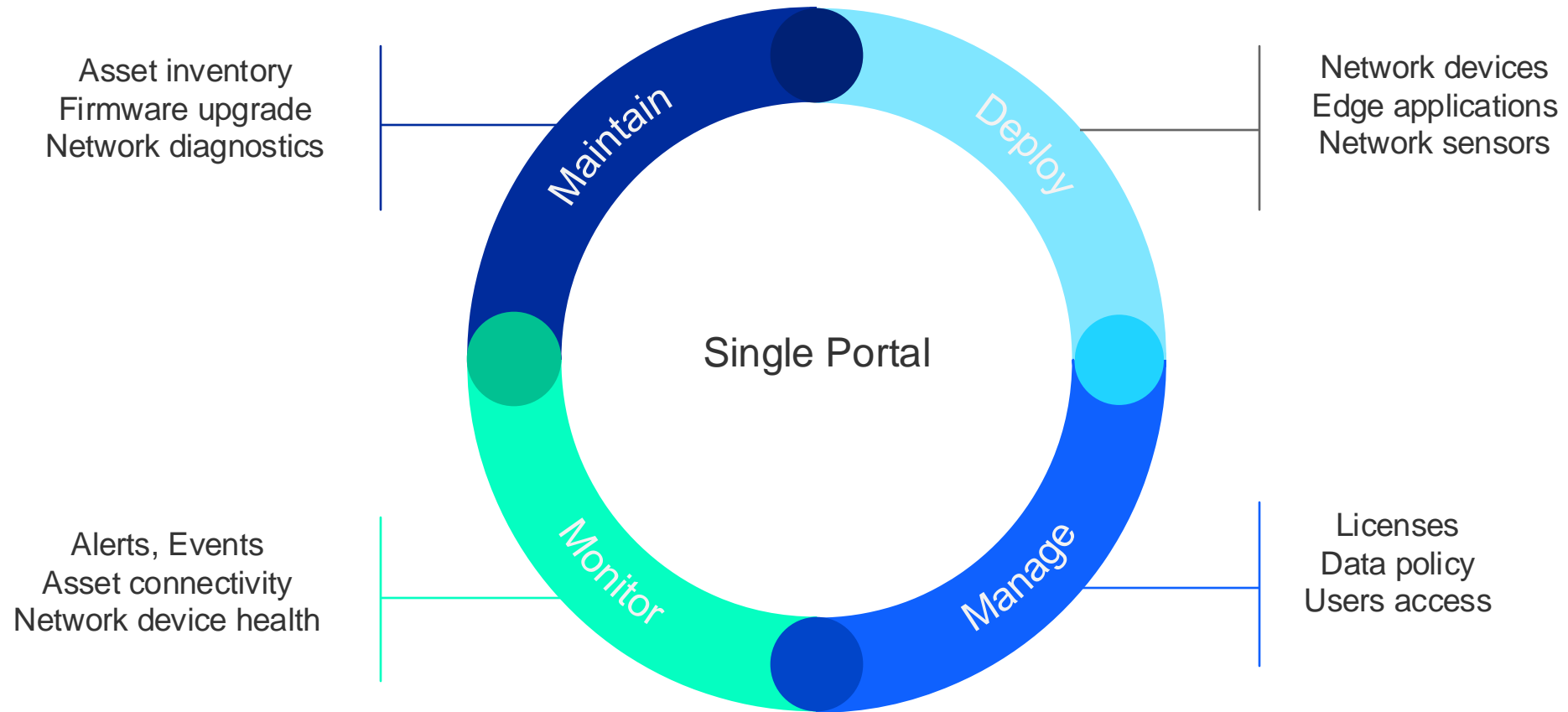- Optional Mesh Under routing.

IEEE 802.15.4 PHY
- OFDM + FSK modulations, data rates, and regional support.
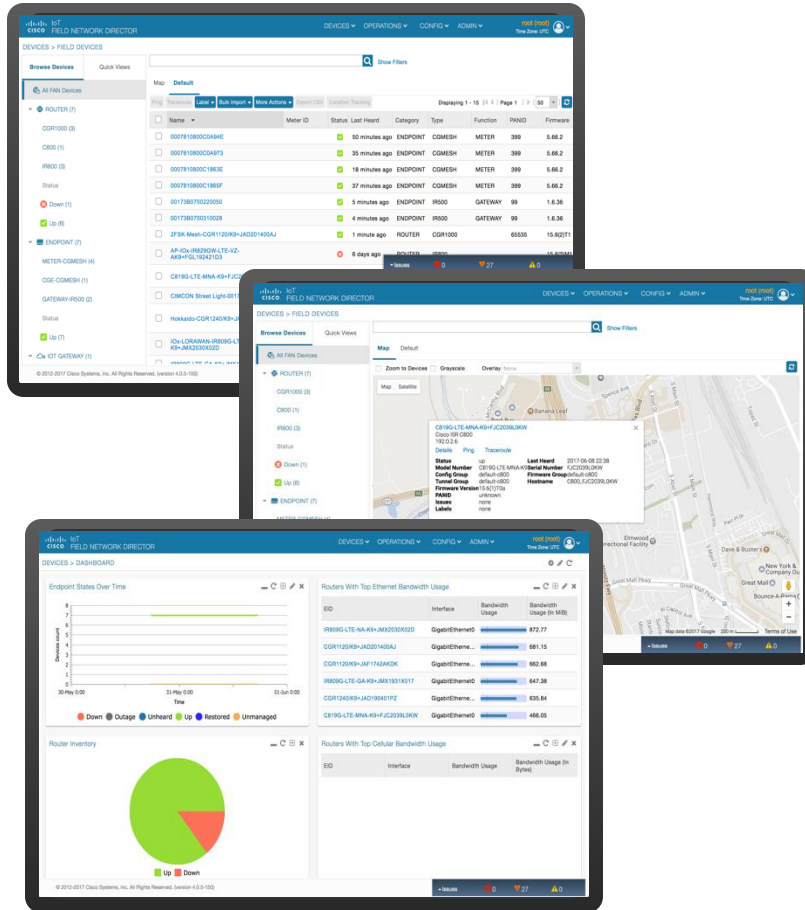
Cisco Field Network Director (FND)

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Cisco FND – Addressing Key Requirements

Reliability
Tested and Proven Enterprise level tool

3

Resilience
HA at every level

2

Scalability
Rapid deployment

4

Security
End to End FAN security

1

Controlled TCO
Lower your operational cost

5

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Cisco FND – High-level Overview

Asset inventory
Firmware upgrade
Network diagnostics

Network devices
Edge applications
Network sensors

Alerts, Events
Asset connectivity
Network device health

Licenses
Data policy
Users access

Maintain

Deploy

Monitor

Manage

Single Portal

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Cisco Field Network Director (FND)

- On-Premise Network Management System for the IoT Field Area Network

- Secure zero touch deployment (ZTD) at scale

- Real-time critical infrastructure monitoring

- Enterprise-class visibility for gateways and endpoints

- Geographical visualization of all network assets

- Field device lifecycle management

- Robust configuration, troubleshooting, and tunnel provisioning

- Edge Application management

- Multi-tenancy and RBAC support

- Focused solution for DA use cases

- API for 3rd party integration

- Low backhaul bandwidth usage

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Demo Setup Overview

Cisco FND OVA Virtual Machine

Silicon Labs Linux Border Router

CSMP Agent Sample Application
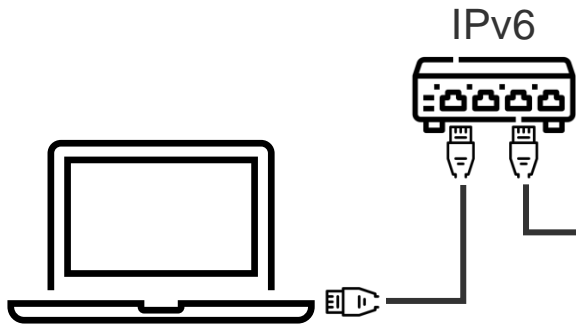
IPv6

- ▪ **VMware Workstation**
- ▪ **FND OVA Virtual machine**
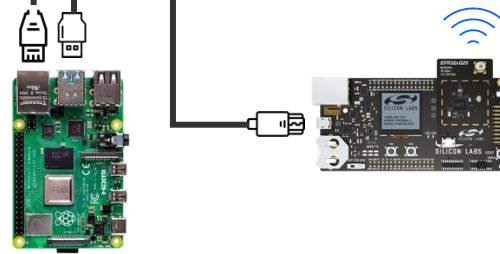
- ▪ **Silicon labs Linux BR**
- ▪ **IPv6 Transparent Proxy**
- ▪ **NTP Server**

- ▪ **CSMP Agent Sample app**

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Silicon Labs FG25/FG28 Open CSMP/Cisco FND Demo

Demo step-by-step guide

- Clone the *csmp-agent-lib* repository

- Refer to *CSMP Developer Tutorial* sections 2 and 3 to get the FND virtual machine and install it.

- Setup Silicon Labs *Linux Border Router*

- Follow the instructions to configure the *IPv6 Transparent Proxy*

- Setup the *NTP Server*

- Create the *Wi-SUN - SoC CSMP Agent Skeleton*

- *Copy the project* to the CSMP repository and complete *the project configuration*

- *Build the project and flash it* on the board

- *Connect To FND*

Note - *All the instructions are documented and detailed under Silabs Wi-SUN CSMP Agent Project Readme*

Thank You

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