



DevCon 2025

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Mastering Zebra RFID: Optimizing Reader Performance with Real-Time Health Monitoring and Gen2X Extensions

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Agenda



Agenda

Mastering Zebra RFID

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Reader Device Status

- Fixed Reader
- Sleds

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API Overview

3

Real-Time Health Monitoring

- IoT Connector for Fixed Readers
- IoT Connector for Sleds
- Handheld SDK for Handheld /Sleds
- MDM

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Gen2x Extensions

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Best Practices



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Reader Device Status



Fixed Reader

Device Status

System

- Resource Utilization (CPU, Memory, Flash)
- Current Time, NTP sync status
- Temperature
- Up Time
- GPO / GPI status
- Power (Negotiation, Source)

RFID Radio

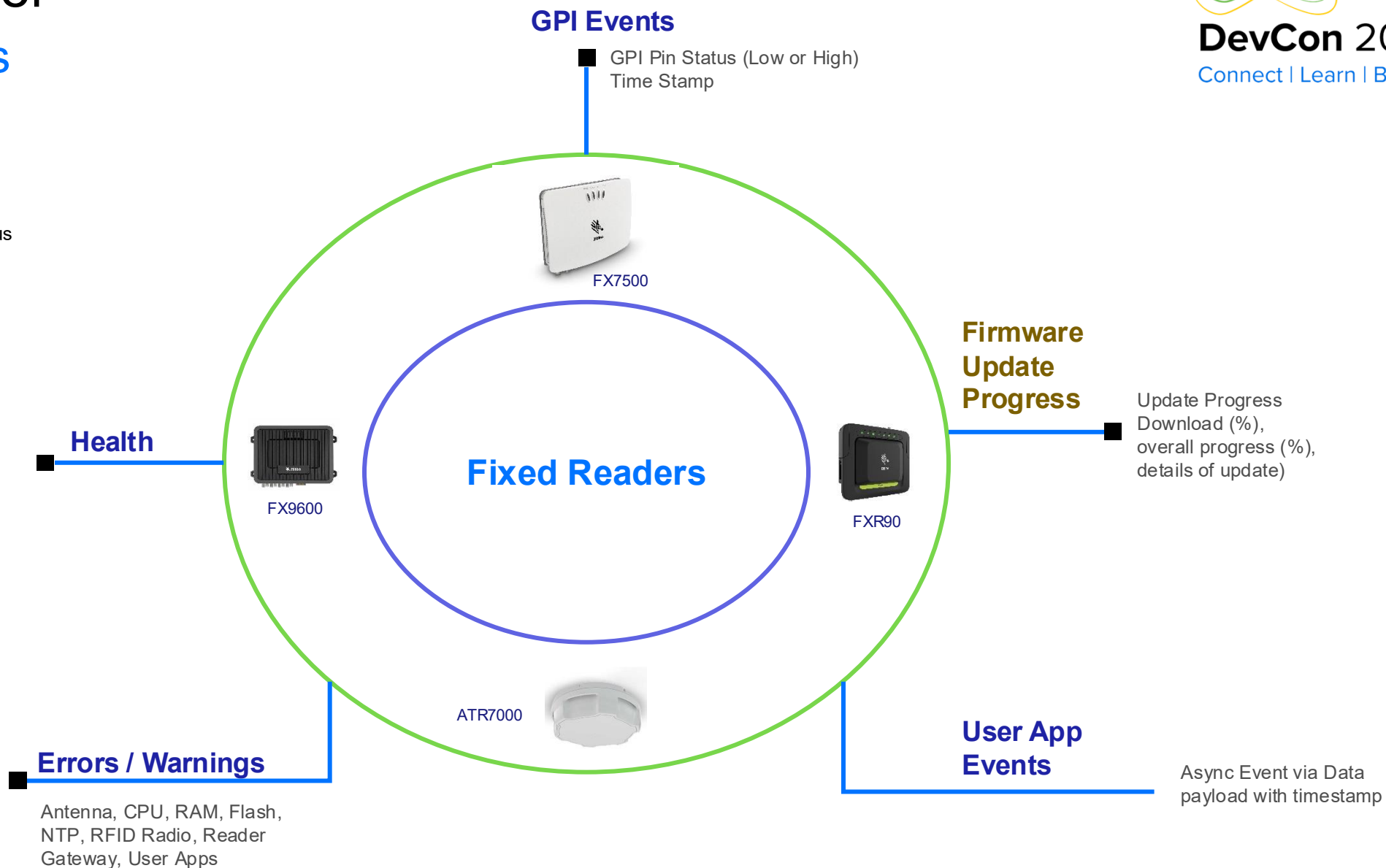
- Antenna Connection
- Active/Inactive
- Stats
- Resource Utilization (CPU/Memory)

Reader Gateway

- Interface Connection (Data)
- Resource utilization (CPU/Memory)
- Stats

User Apps

- App Running status
- Resource utilization (CPU/Memory)
- Stats
- Up Time



RFID Sleds

Device Status

System

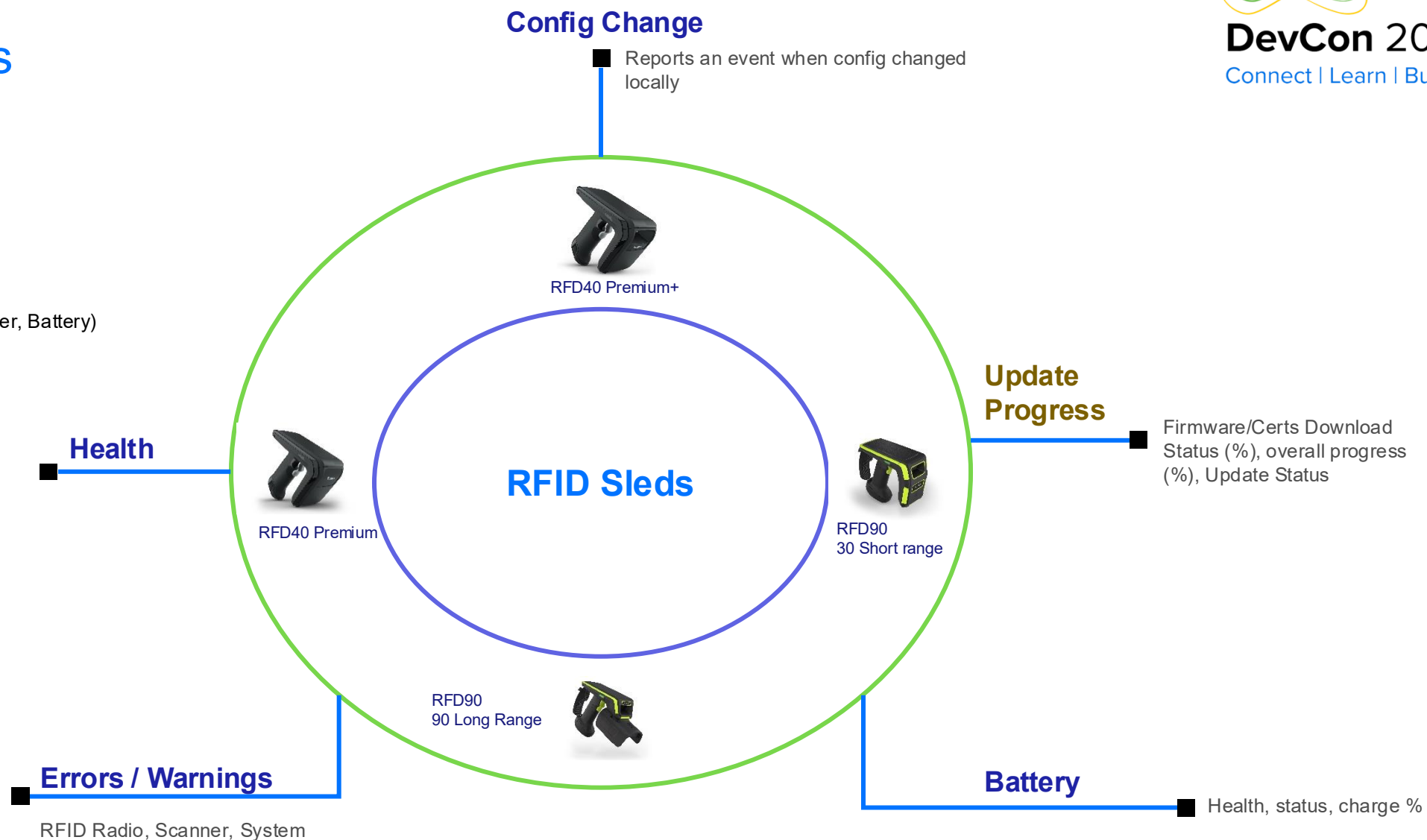
- Current Time
- NTP sync status
- Temperature
- Up Time
- Power
(Source: Cradle, USB, Charger, Battery)
- Model
- API version
- Serial Number
- Network Info
(Wi-Fi, Ethernet)
- Terminal Connection
(Bluetooth, Cradle, eConnex)

RFID Radio

- Active/Inactive
- Stats

MQTT

- MQTT version
- Connection status
- Stats





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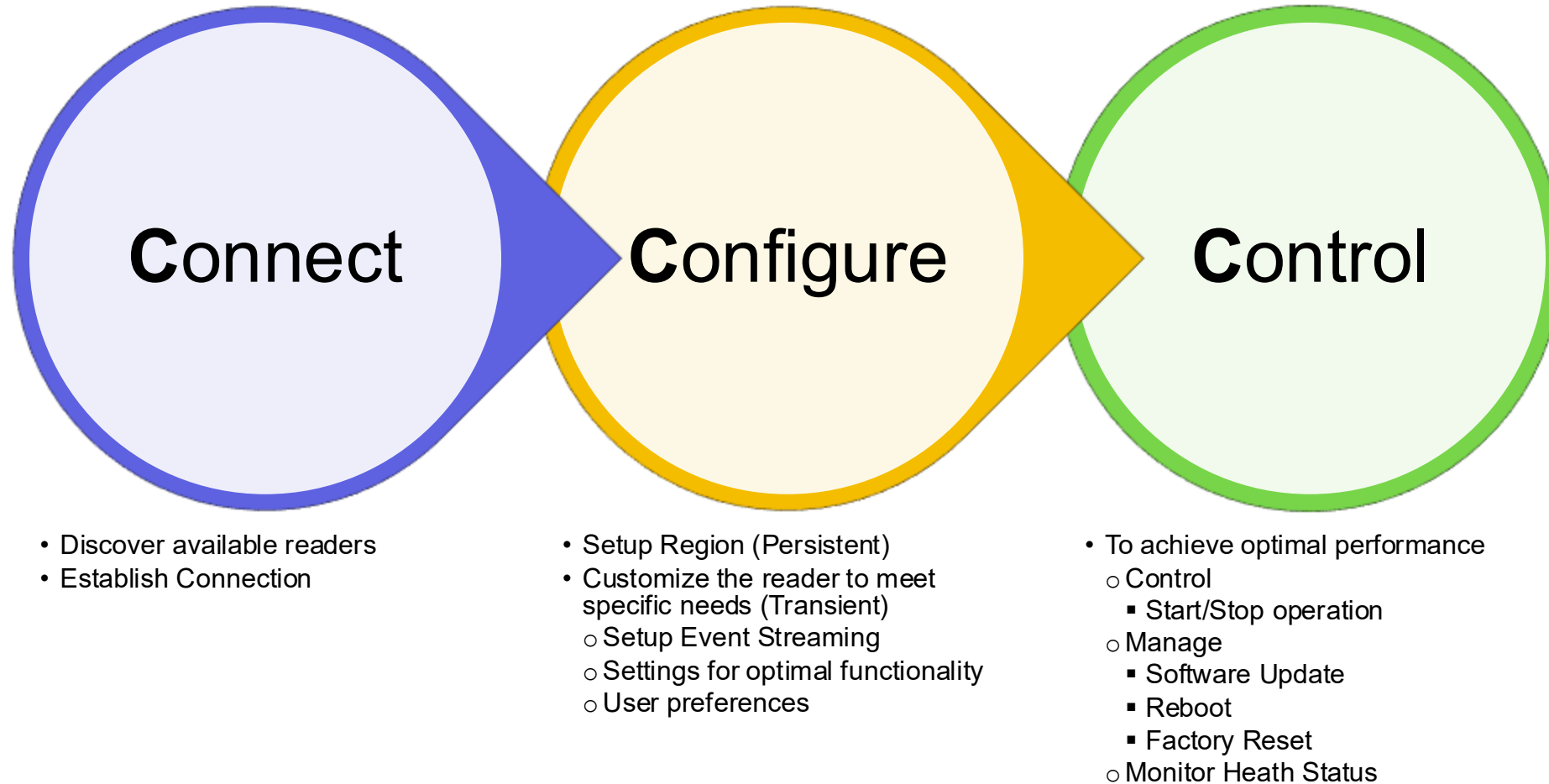
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API Overview



3C Framework

Advance RFID Integration Quickly



RFID API

Structure

Generic Reader

- Reading Tags (Inventory)
- Programming Tags (Tag Access)
 - Read, Write, Lock, Kill

Reader Management

- | | |
|-------------------|-----------------|
| • Managing Reader | • Configuration |
| • Region Setting | • Monitor |
| • Software Update | |
| • Factory Reset | |
| • Reboot | |



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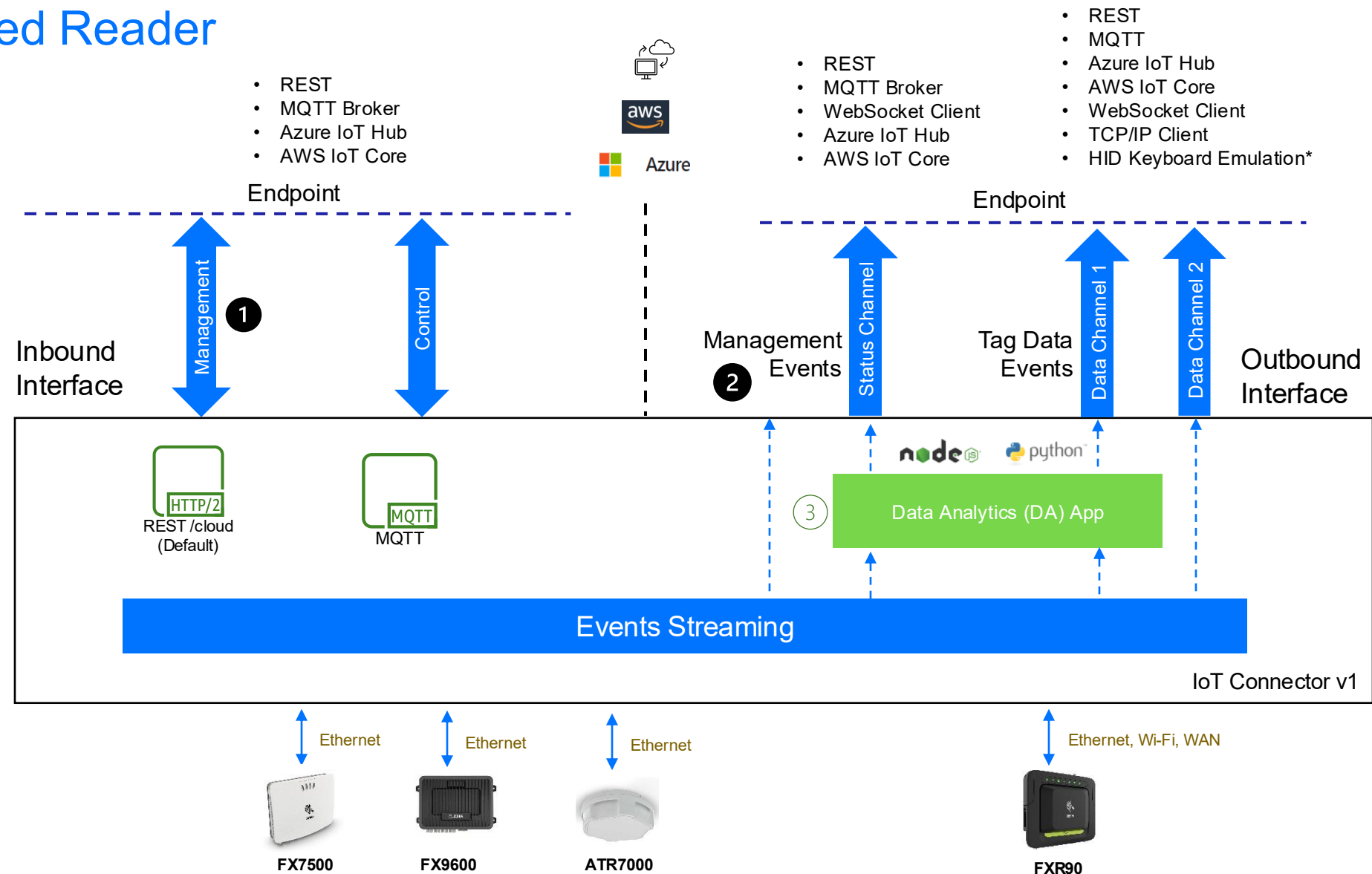
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Real-Time Health Monitoring



IoT Connector

Fixed Reader



- Monitoring**
Configure Endpoint
1. Subscribe
 2. Consume Events
 3. DAApp Events if any

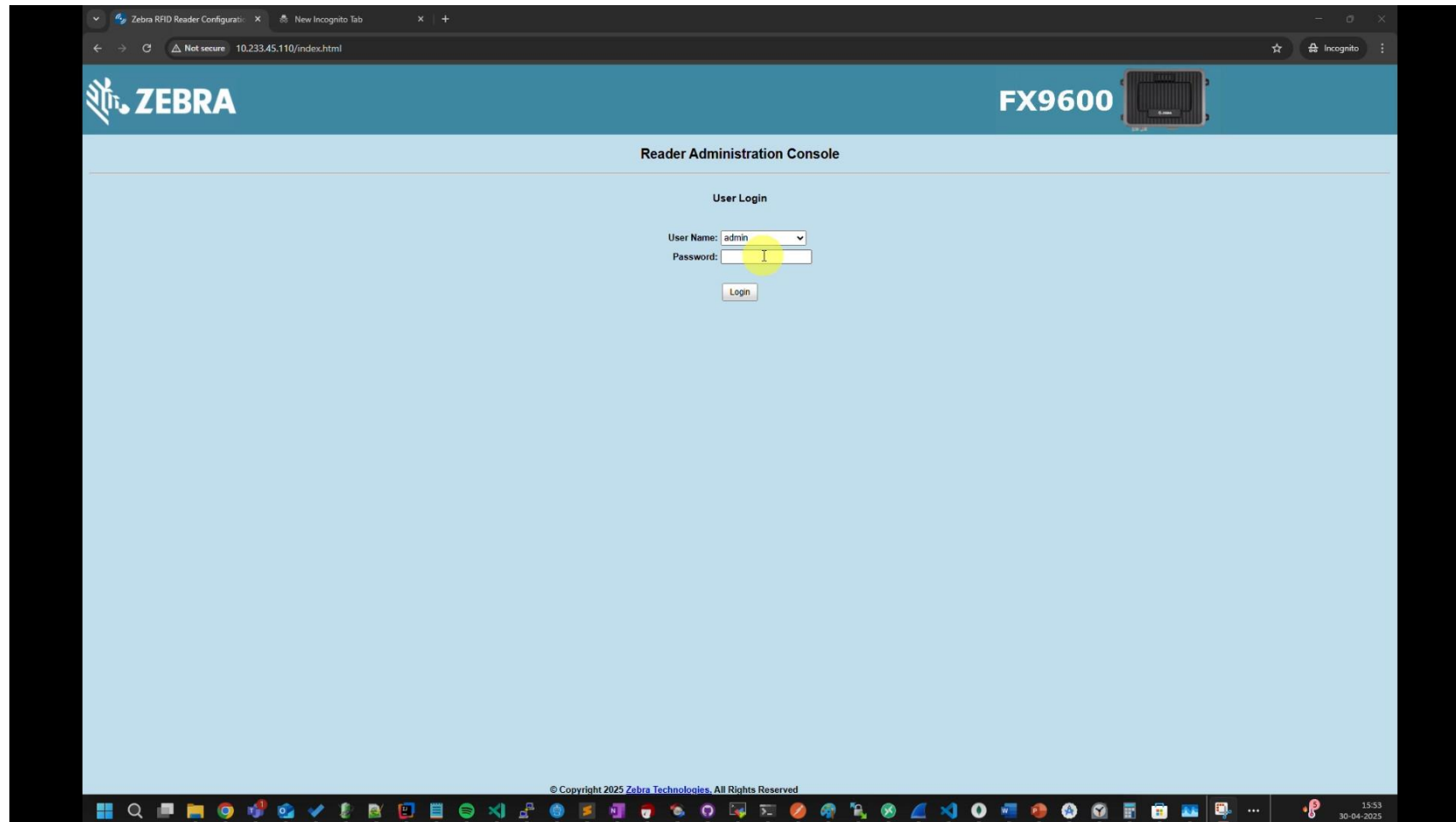
IoT Connector

Monitoring Fixed Readers

Connect	Configure	Control
Device Provisioning - Reader Web UI/ RFID .NET SDK / 123RFID Desktop - End Point Configuration - Management Events - Management Interface Discover & Connect • FX Series: RM Command EnrollToCloud to /Control (POST) • FXR90:Reader automatically connects to IOT Connector Endpoints configured • REST: /Cloud/LocalRestLogin to get JWT Token for session.	Setup Event Streaming • set_config to enable interested status notifications • Heartbeat (Interval: 60 Sec default) • GPI • Firmware Upgrade • Error/Warnings • User App Custom events	Events • Heartbeat • CPU, RAM, FLASH, uptime, NTP sync status, temperature, radio (active), Antennas Connected, Stats, user apps (running, utilization, uptime) • GPI (Port No, High/Low) • Firmware Update progress (Download, overall, details, status) Disconnect - FX Series: RM Command disconnectFromCloud to /Control (POST) - FXR90: - REST: Session Timeout - Others: Retries till max timeout and disconnects

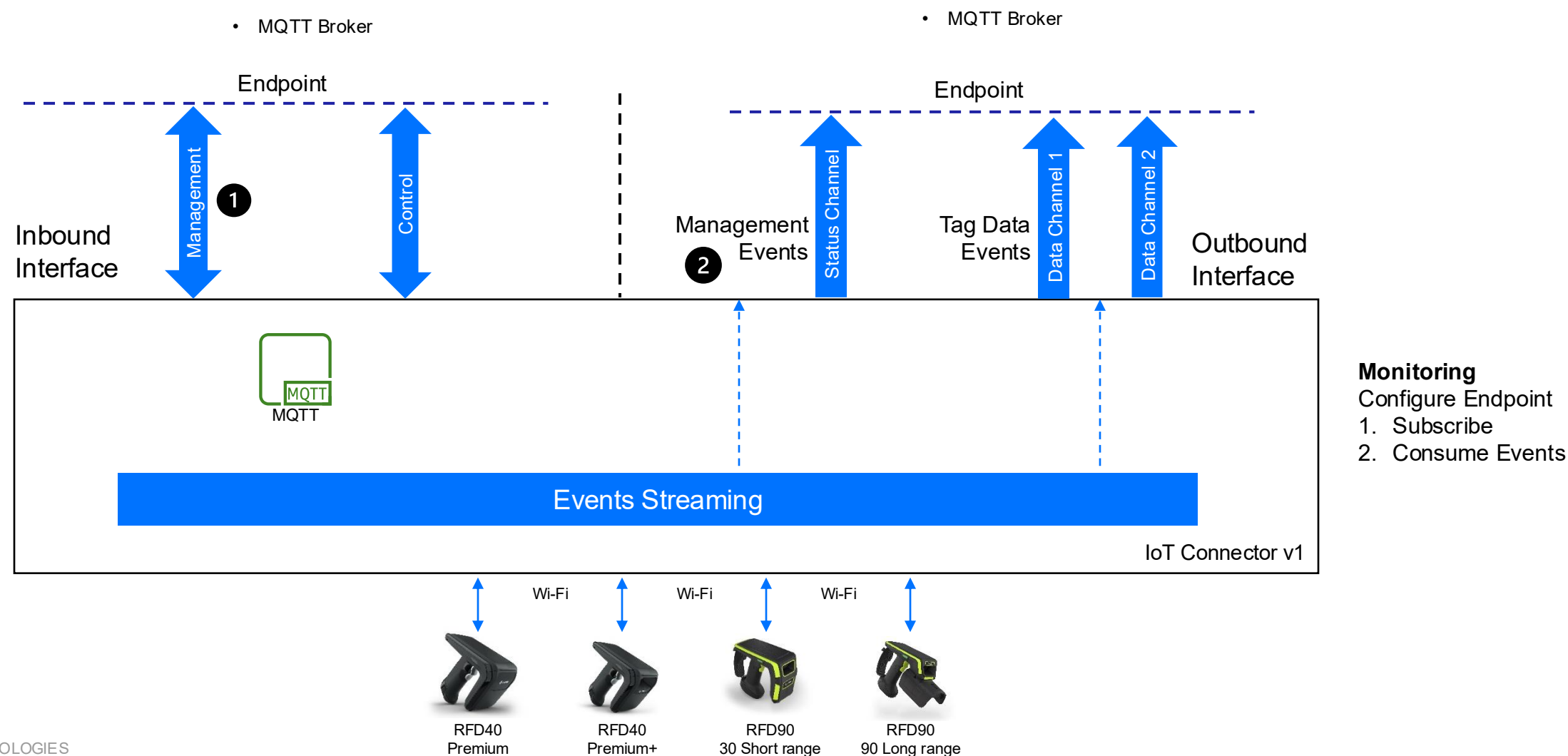
IoT Connector – MQTT

Demo for fixed readers



IoT Connector

RFID Sleds



IoT Connector

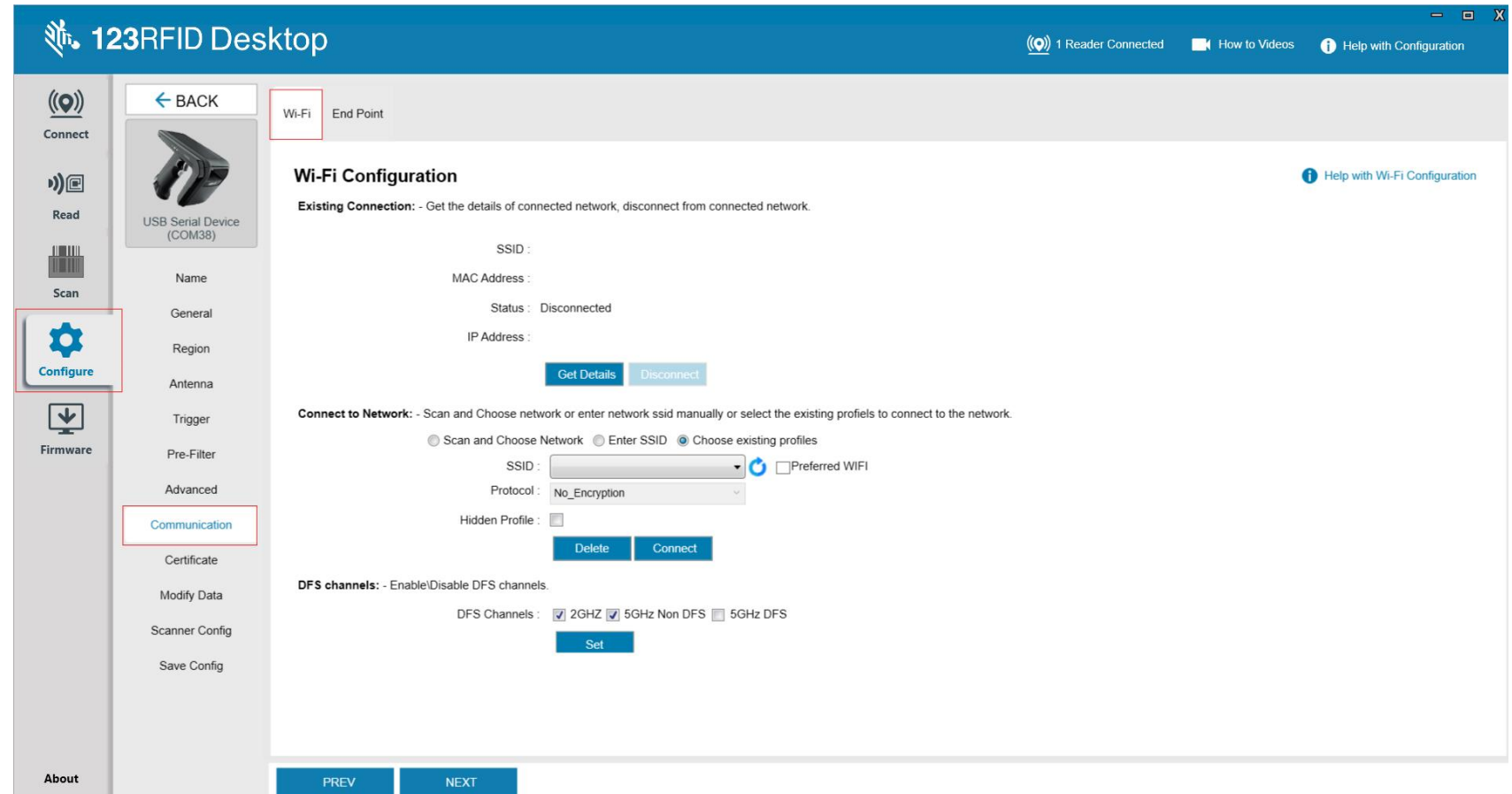
Monitoring Sleds

Connect	Configure	Control
Device Provisioning (Staging) - RFID SDK / 123RFID Desktop / Mobile - End Point Configuration - Management, Events Discover & Connect • Reader automatically connects to IOT Endpoint (MQTT broker)	Setup Event Streaming • config_events to enable interested status notifications • Alerts • Exception • Periodic: Heartbeat (Interval: 60 Sec default)	Events • Alerts • Firmware update • Download Info (Firmware, Certs) • Power source (USB, Wall charger, Cradle) • Temperature Info (RFID PA, Ambient) • Network Status (Interface, network info) • System Exceptions • Battery • Exception (RFID, System, Scanner) • Heartbeat (Inventory, Battery) Disconnect - Retries till max timeout and disconnects

Device Provisioning

Configure Wi-Fi Profile

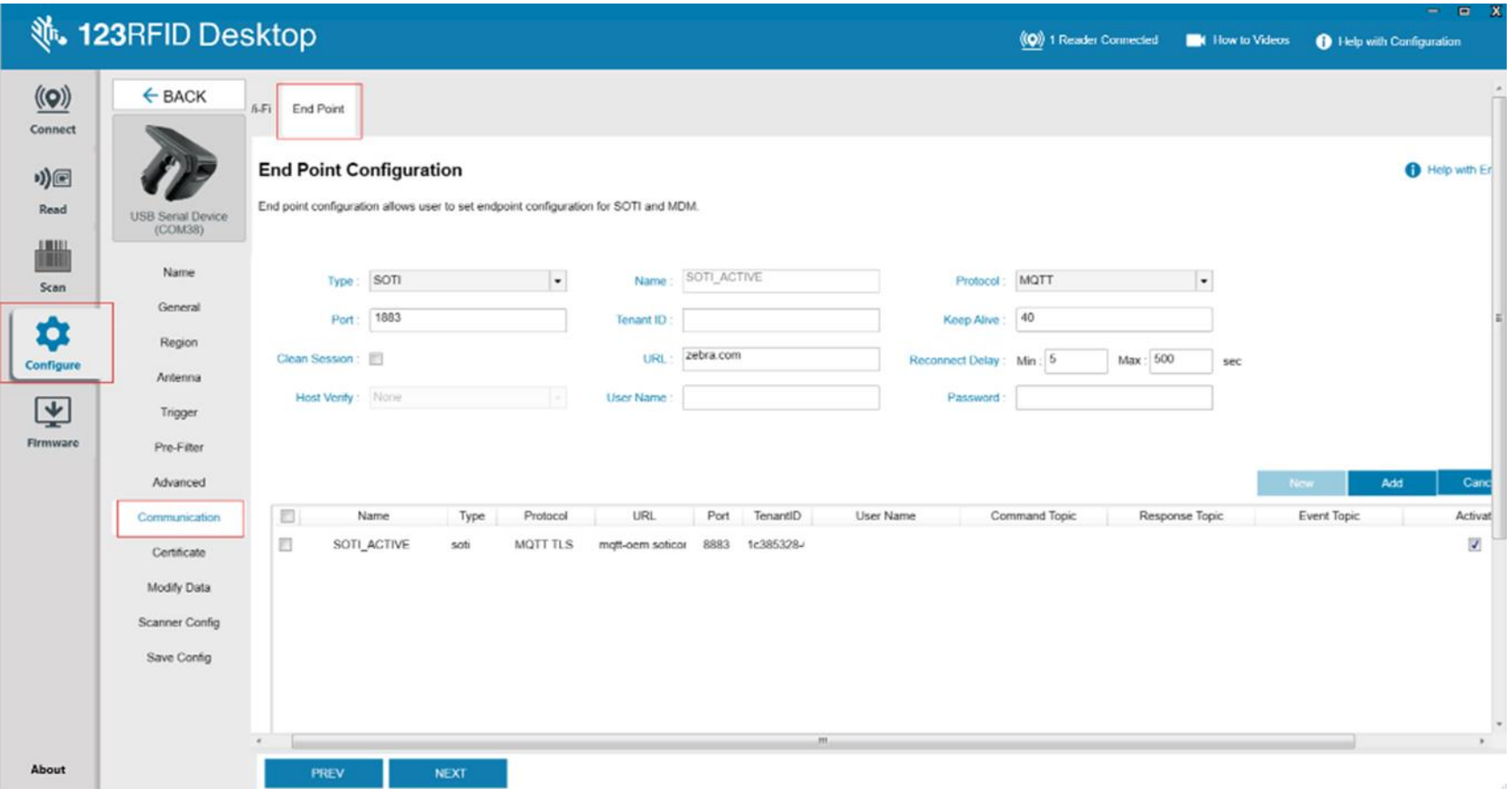
- Open the 123RFID Desktop Application and connect your RFD40/90 device.
- Navigate to the Configuration section and select the Communication option.
- Click on the WiFi tab to access WiFi settings.



Device Provisioning

Configure IoT Endpoint

- Use 123 Desktop/Mobile application to create IOT endpoints in RFD40/90 devices
- Below is an example shows how to add IOT endpoint for SOTI MDM
- For generic IOT solution select type MDM
- Configure parameters like URL, Protocol, Port, Verification type, MQTT publish & subscription topics



123RFID Desktop

1 Reader Connected | How to Videos | Help with Configuration

Connect | Read | Scan | **Configure** | Firmware | About

USB Serial Device (COM38)

← BACK | End Point

End Point Configuration

End point configuration allows user to set endpoint configuration for SOTI and MDM.

Type: SOTI | Name: SOTI_ACTIVE | Protocol: MQTT

Port: 1883 | Tenant ID: | Keep Alive: 40

Clean Session: ☐ | URL: zebra.com | Reconnect Delay: Min: 5 Max: 500 sec

Host Verify: None | User Name: | Password:

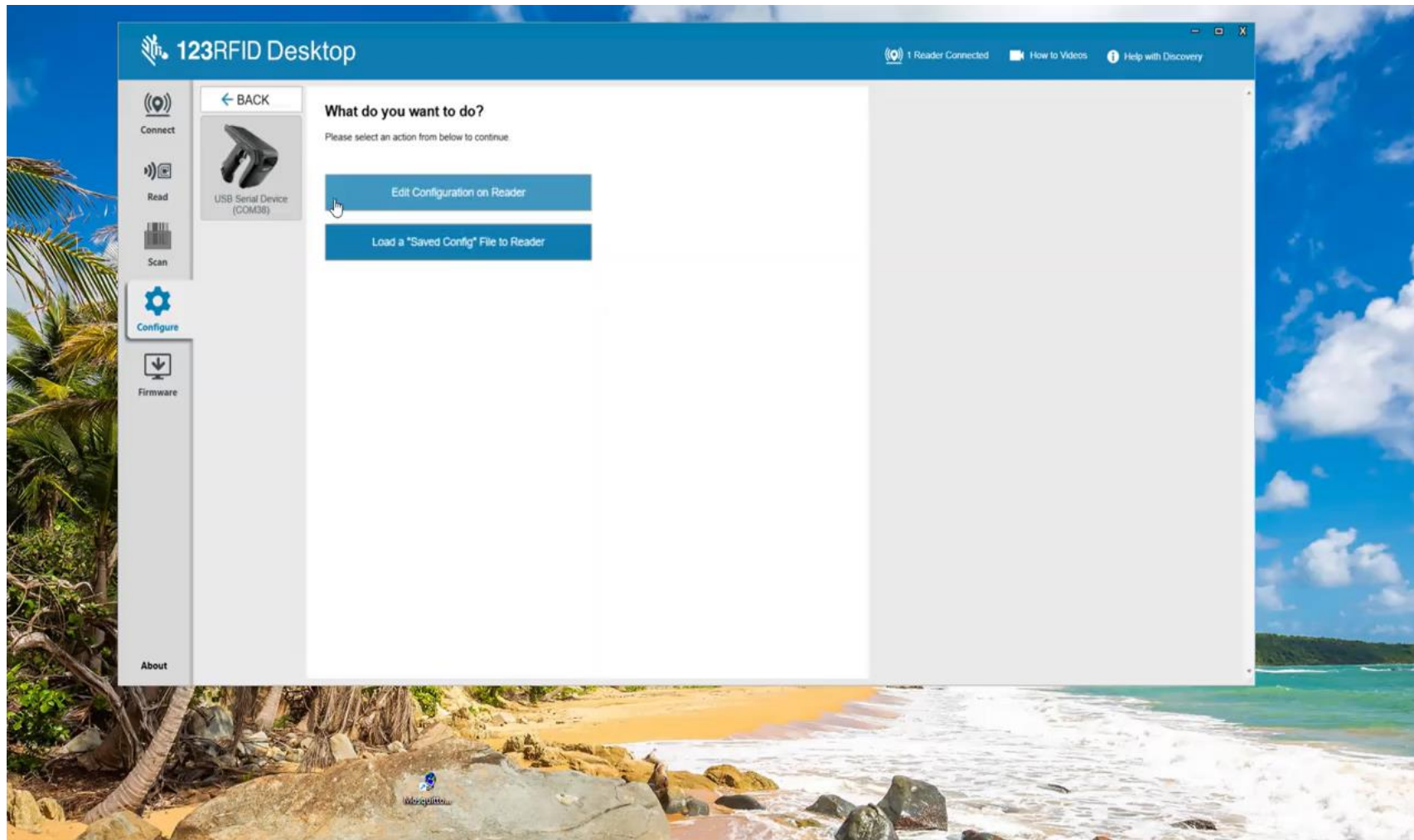
Now Add Cancel

	Name	Type	Protocol	URL	Port	TenantID	User Name	Command Topic	Response Topic	Event Topic	Activated
☒	SOTI_ACTIVE	soti	MQTT TLS	mqtt-oem soticor	8883	1c385328					☒

PREV NEXT

Device Monitoring

Demo using MQTT client



Handheld SDK

Monitoring Handhelds / Sleds

Connect	Configure	Control
Discover & Connect • Transport: USB / Bluetooth • Discover - Readers.GetAvailableRFIDReaderList() • Connect Connect()	Setup Event Streaming • Status Notifications - addEventsListener - setReaderDisconnectEvent - eventStatusNotify - BATTERY_EVENT	API Battery Statistics • Asset Info, Charge Cycles consumed, Status, state of Health • Config.getBatteryStats() Events • Battery – Cause, Level, Charging status Disconnect - disconnect() - Dispose()



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MDM



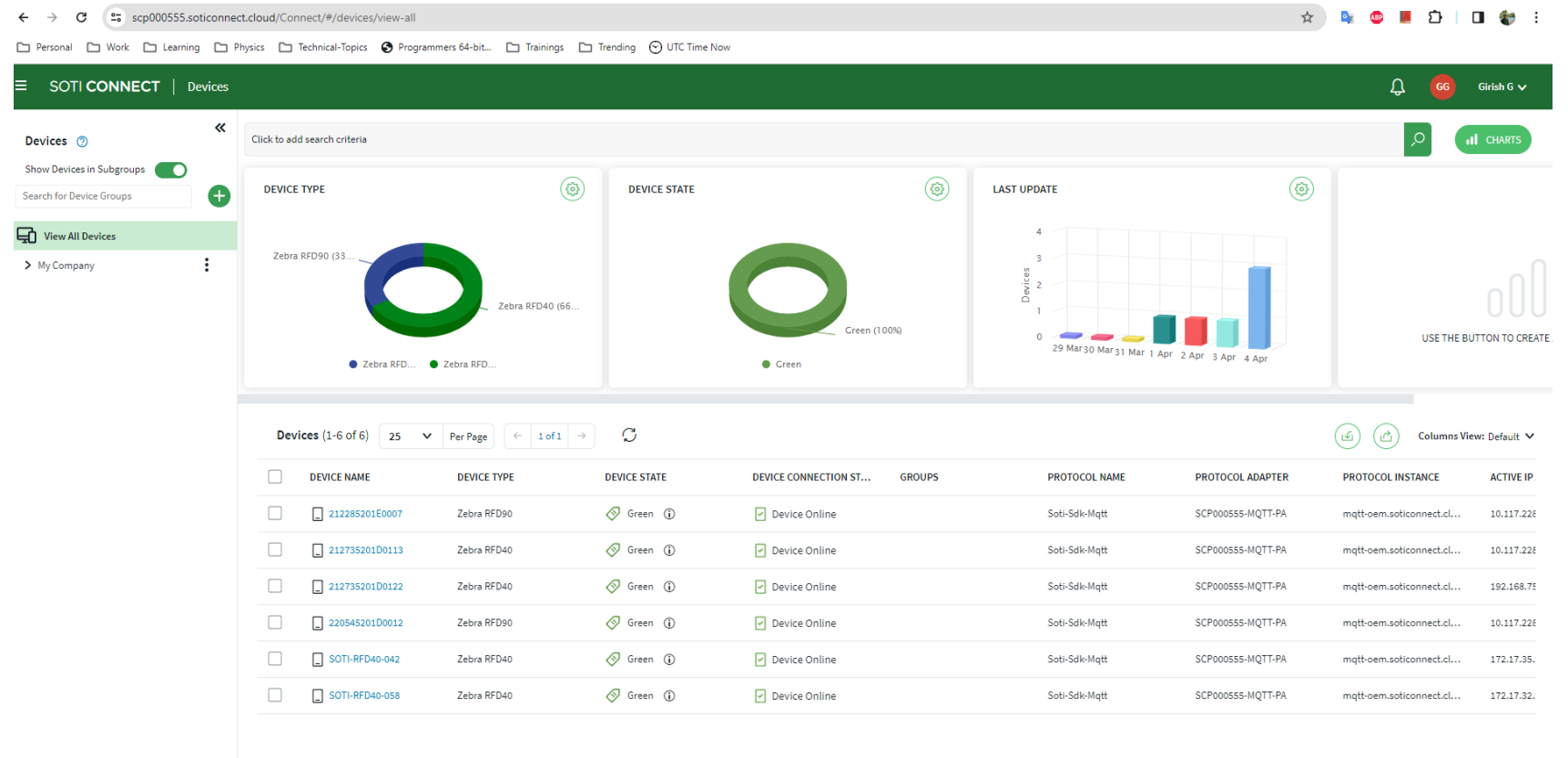
ZEBRA TECHNOLOGIES



SOTI Connect

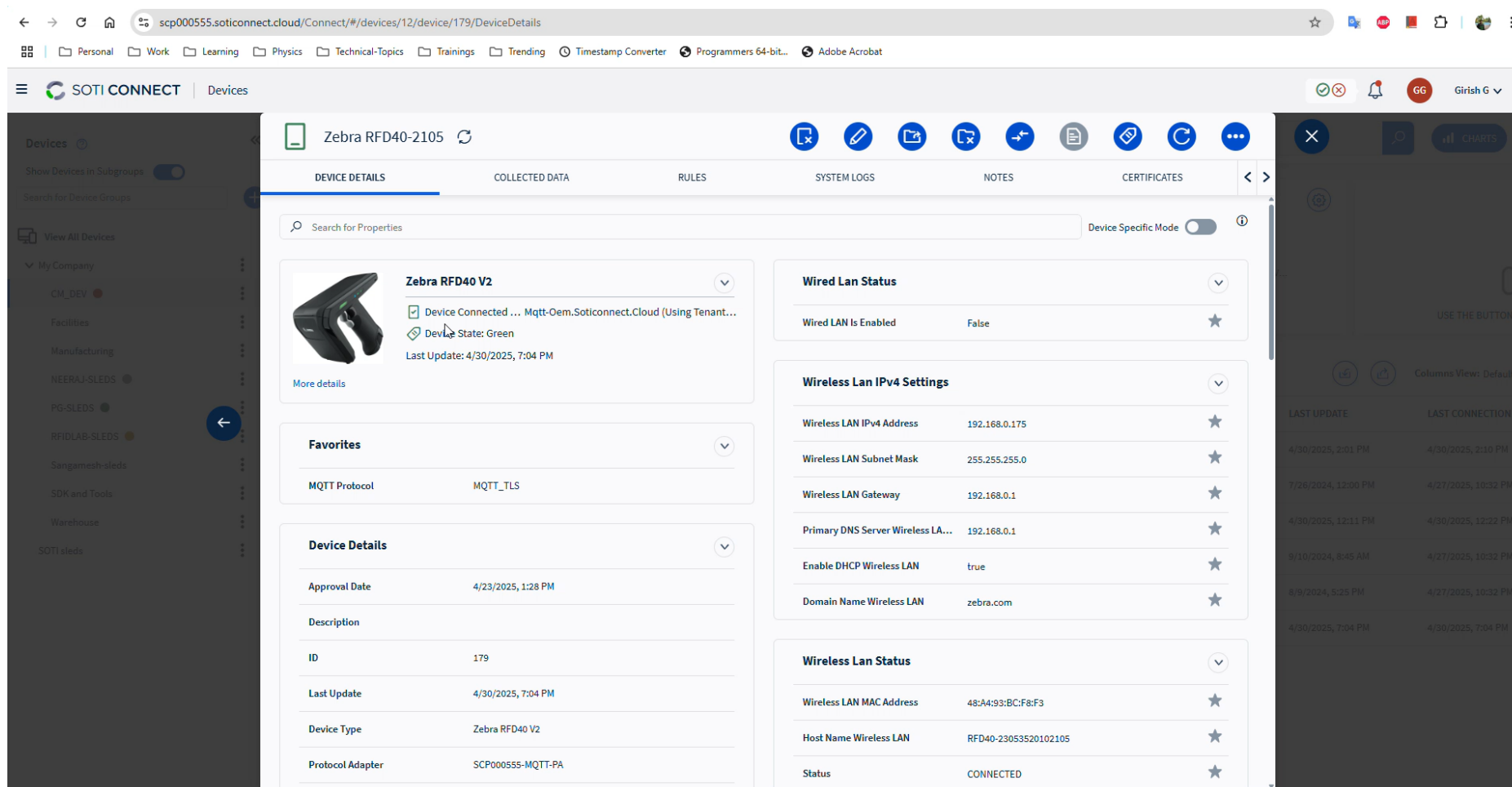
RFD40/90

- SOTI connect is Mobile Device Management (MDM) provider
- Manage multiple device types easily



SOTI Connect

Demo



The screenshot displays the SOTI Connect web interface in a browser. The address bar shows the URL: `scp000555.soticonnect.cloud/Connect/#/devices/12/device/179/DeviceDetails`. The interface includes a sidebar with navigation options like 'Devices', 'Show Devices in Subgroups', and a list of device groups. The main content area is titled 'Zebra RFD40-2105' and features several tabs: 'DEVICE DETAILS', 'COLLECTED DATA', 'RULES', 'SYSTEM LOGS', 'NOTES', and 'CERTIFICATES'. The 'DEVICE DETAILS' tab is active, showing a search bar, a device status card for 'Zebra RFD40 V2' (status: Green, last update: 4/30/2025, 7:04 PM), a 'Favorites' section with 'MQTT Protocol' set to 'MQTT_TLS', and a 'Device Details' table. The table lists the following information:

Property	Value
Approval Date	4/23/2025, 1:28 PM
Description	
ID	179
Last Update	4/30/2025, 7:04 PM
Device Type	Zebra RFD40 V2
Protocol Adapter	SCP000555-MQTT-PA

On the right side of the 'DEVICE DETAILS' tab, there are two expandable sections: 'Wired Lan Status' (Wired LAN Is Enabled: False) and 'Wireless Lan IPv4 Settings' (Wireless LAN IPv4 Address: 192.168.0.175, Wireless LAN Subnet Mask: 255.255.255.0, Wireless LAN Gateway: 192.168.0.1, Primary DNS Server Wireless LAN: 192.168.0.1, Enable DHCP Wireless LAN: true, Domain Name Wireless LAN: zebra.com). Below these is another 'Wireless Lan Status' section showing 'Wireless LAN MAC Address: 48:A4:93:BC:F8:F3', 'Host Name Wireless LAN: RFD40-23053520102105', and 'Status: CONNECTED'. A right-hand sidebar shows a 'LAST UPDATE' and 'LAST CONNECTION STATUS' table with a list of recent updates and connection events.



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Technical Resources



Resources

IOT Connector, SDK

- IoT Connector for Fixed Reader
 - IOT Connector: <https://zebradevs.github.io/rfid-ziotc-docs/index.html>
 - Alerts/Events: https://zebradevs.github.io/rfid-ziotc-docs/best_practices/configure_mgmtEvents.html#
 - JSON Schema: https://zebradevs.github.io/rfid-ziotc-docs/schemas/async_event_schema/index.html
 - Postman Collections for REST: https://zebradevs.github.io/rfid-ziotc-docs/best_practices/resources/index.html
- IoT Connector for Handheld Reader
- SDK/Tool
 - RFID Reader Tech Docs
 - <https://techdocs.zebra.com/dcs/rfid/>
 - RFID Reader SDK for Windows (.NET) – includes Demo App (Exe, Source), SDK
 - <https://www.zebra.com/us/en/support-downloads/software/rfid-software/zebra-rfid-sdk-for-windows.html>
 - 123RFID Desktop v3.0.0.33 or above
 - <https://www.zebra.com/us/en/support-downloads/software/rfid-software/123rfid.html>
- Contact Zebra for the best and quickest way to get support for any questions or issues:
 - <https://www.zebra.com/us/en/about-zebra/contact-zebra/contact-tech-support.html>



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Gen2x Extensions



Gen2x

Gen2 Compatible Feature

- Impinj TagFocus™
 - Enables capturing of more unique tags by giving ability to control persistent time of session 1 flag
- Tag Quieting
 - Further ability to control Gen2 Session Flags
- Impinj Protected Mode
 - Enables customer privacy by making tag invisible to readers
- Impinj FastID™
 - Ability to read EPC and TID together
- Short-range reading
 - Limits range of tag
- Impinj Integra™
 - Ensure tag memory is written properly and ability to confirm how well bits are written
- Impinj Authentication
 - Enables tag authentication

Gen2x

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} Q2: Android

Gen2x

Practical Use cases

- Impinj TagFocus™
 - Cycle Count
 - To read harder to read tags in the range
 - Useful for reading large tag populations
- Tag Quieting
 - Package Loading Use case
 - Every cycle the reader only need to read the tags coming into the truck
 - Number of reads per box during truck loading operations
 - Much higher and constant during loading operation
- Impinj Protected Mode
 - Retail Application Example
 - Item Sale
 - Consumer buys an item,
 - customer loyalty number associated with tag's PIN
 - On completion of purchase, the reader makes invisible for the purchased item
 - Item Return
 - Consumer loyalty number provided upon return
 - Loyalty number used to look up the PIN from the backend
 - On completion of return, the reader uses PIN to make visible

RFID

Best Practices

- IOT Connector
 - Data Usage / Cost control
 - Subscribe for required notifications (status, data)
 - Enable the required data payloads (management / tag data).
 - Restrict the interval of reporting heart beats / alerts or tag events based on the use case
 - Use tag filtering (interval, tag matching pattern) & batching
 - Connection management
 - REST allows one connection (Management, Control and Events)
- Security
 - Use secured connection to protect data
 - Certificates can be used to establish secure connection
 - Latest software updates (subscribe for Zebra Notifications)

RFID

Best Practices

- Optimal Performance
 - MQTT
 - QoS 0 Fire and Forget
 - QoS 1 At least Once
 - QoS 2 Exactly Once
 - Web Socket – Reconnect after timeout
 - Monitor events for thresholds and antenna status
 - Read Memory banks (TID, User) only if needed
 - Set the appropriate RF Settings (Operating Environment)
 - Batching and Retention can be used for managing network conditions
 - DA Apps to make decisions inside the reader before data flowing out of the reader





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Questions?





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