



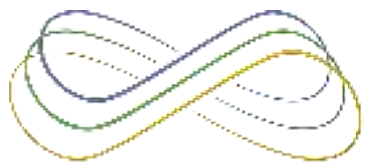
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June 4 - 6, 2025

Amsterdam, Netherlands





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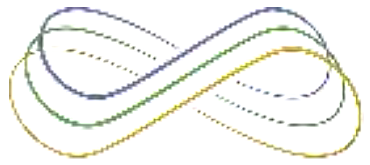
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Mastering Zebra RFID: Optimizing Reader Performance with Real-Time Health Monitoring and Gen2X Extensions

Suresh Ramamoorthy

Senior Manager Software Engineering,
Advanced Location Technologies





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Agenda



Agenda

Mastering Zebra RFID



1

Reader Device Status

- Fixed Reader
- Sleds

2

API Overview

3

Real-Time Health Monitoring

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

4

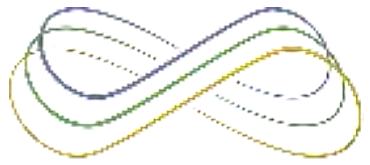
Gen2x Extensions

5

Technical Resources

6

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

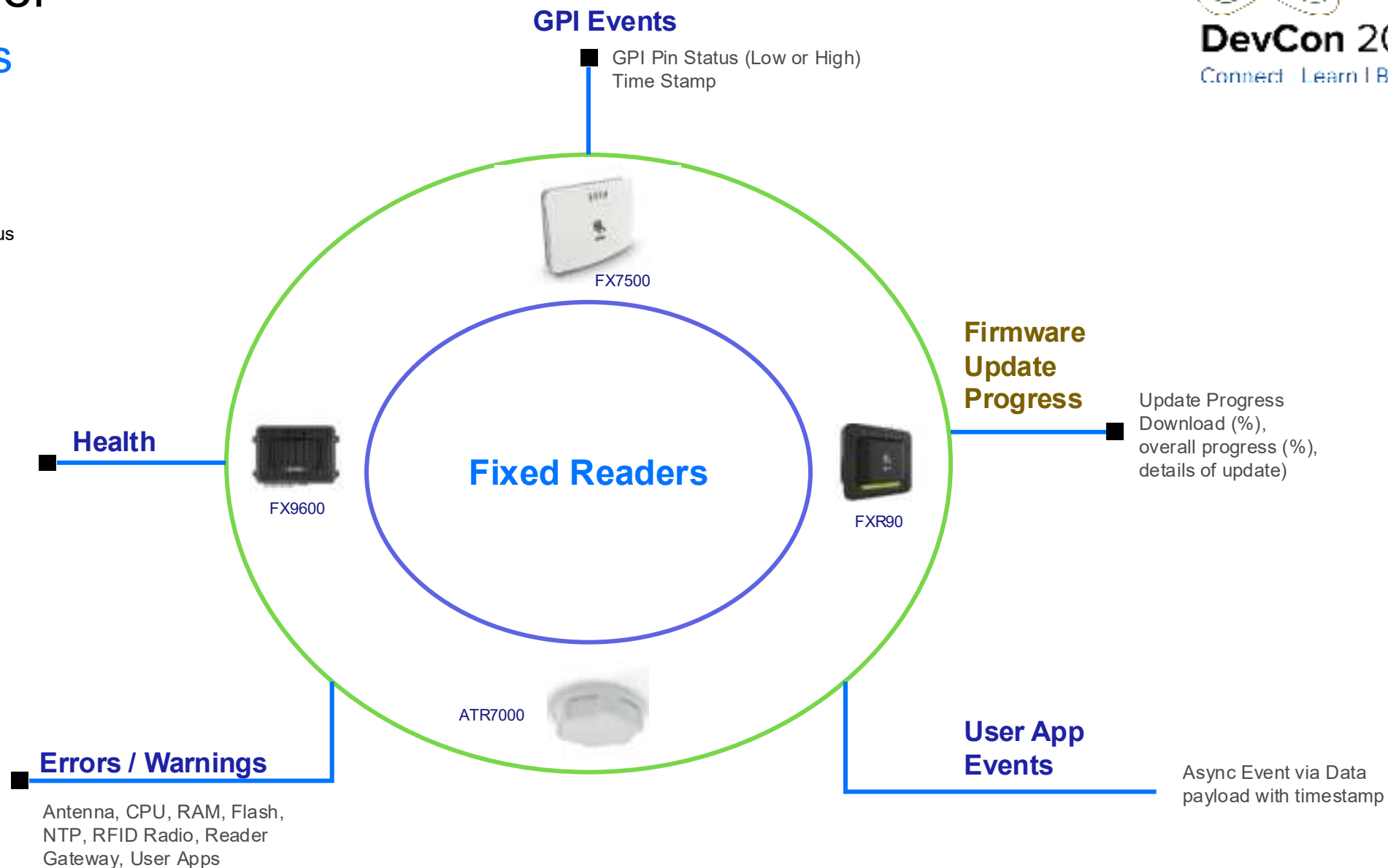
- Antenna Connection
- Active/Inactive
- Stats
- Resource Utilization (CPU/Memory)

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

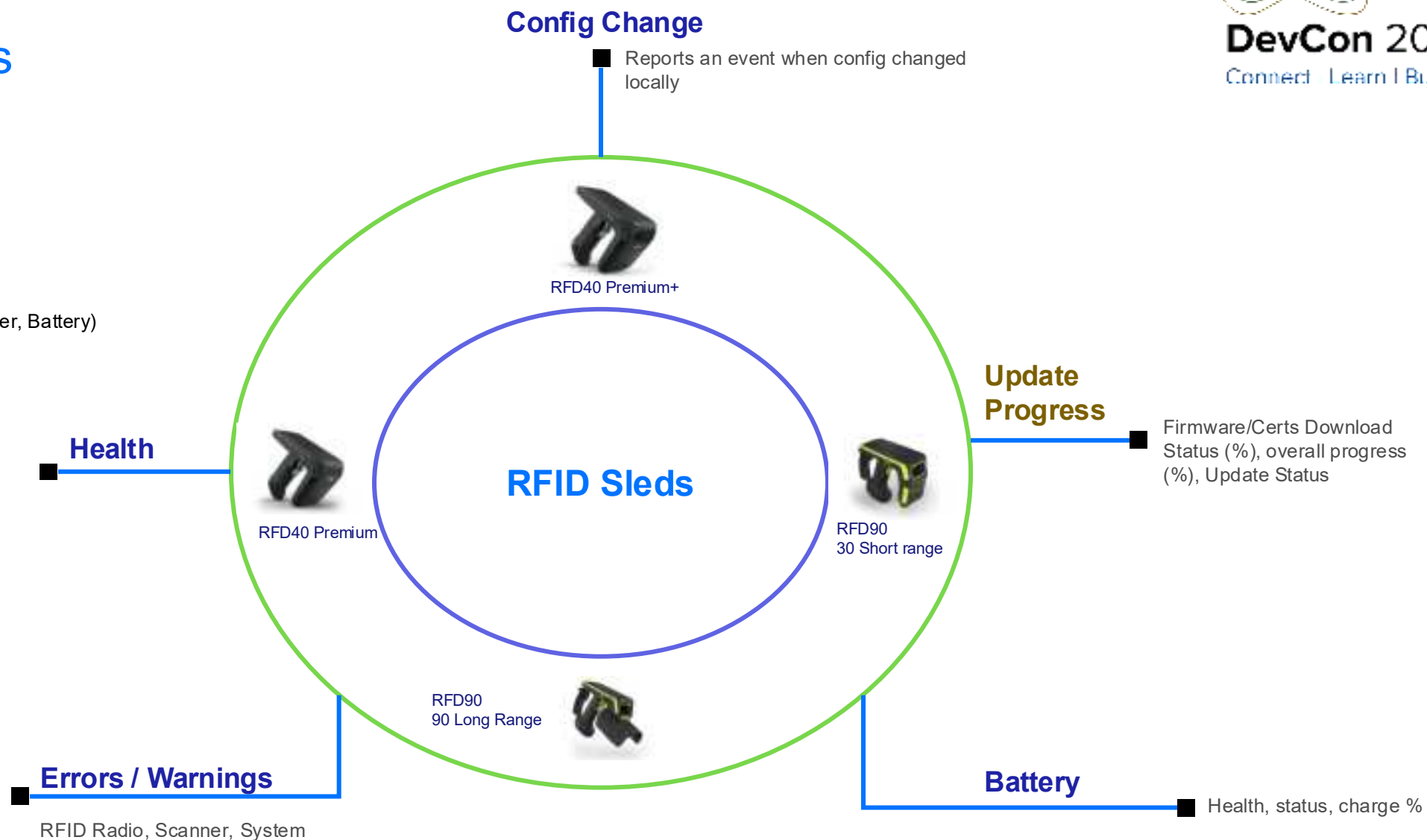
- Current Time
- NTP sync status
- Temperature
- Up Time
- Power
(Source: Cradle, USB, Charger, Battery)
- Model
- API version
- Serial Number
- Network Info
(Wi-Fi, Ethernet)
- Terminal Connection
(Bluetooth, Cradle, eConnex)

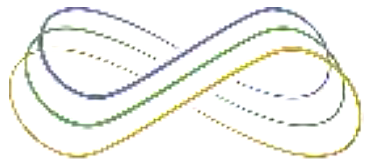
RFID Radio

- Active/Inactive
- Stats

MQTT

- MQTT version
- Connection status
- Stats





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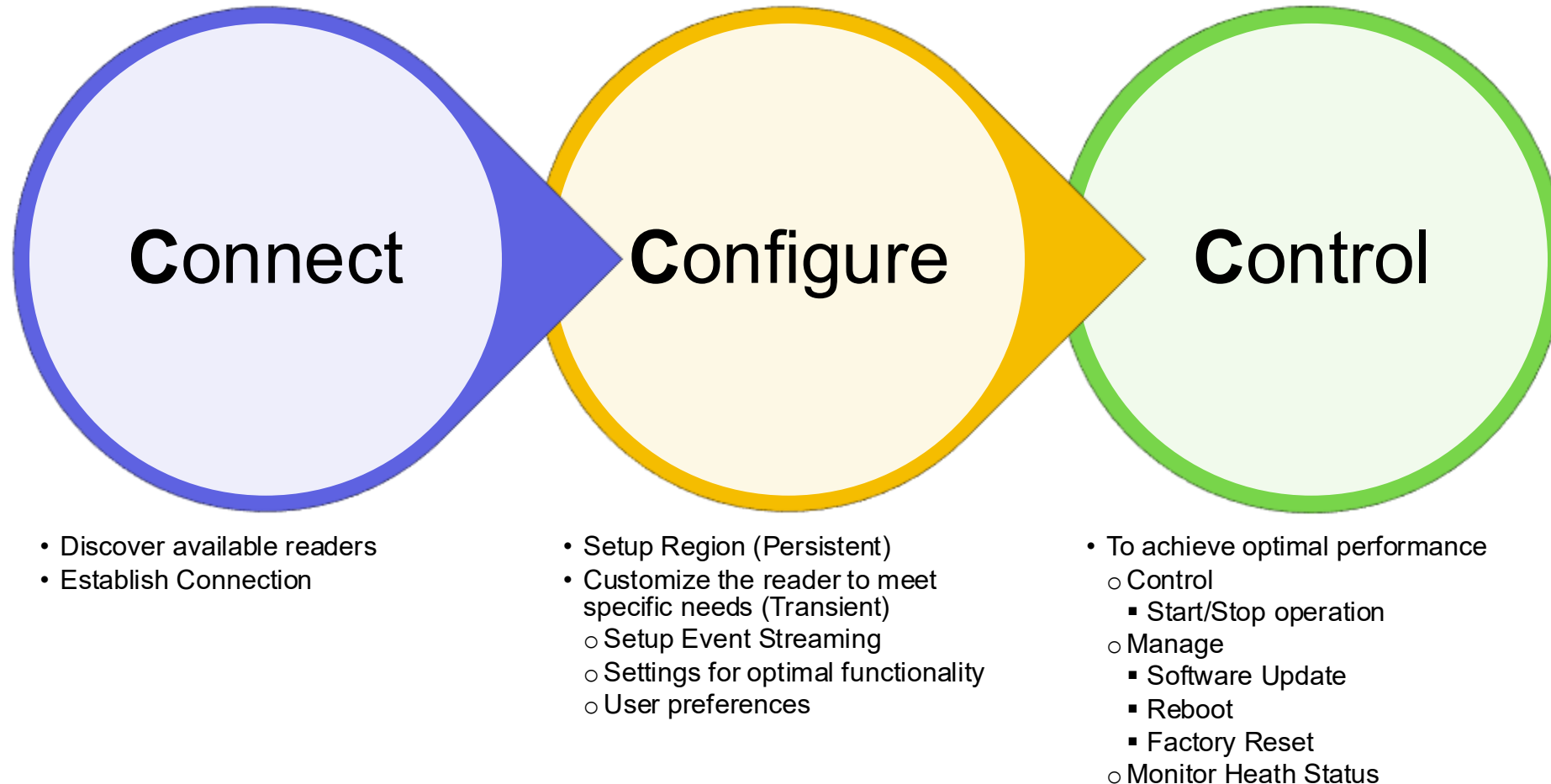
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API Overview



3C Framework

Advance RFID Integration Quickly



RFID API

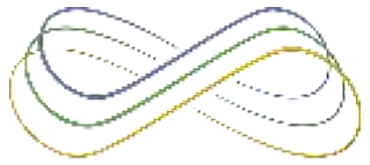
Structure

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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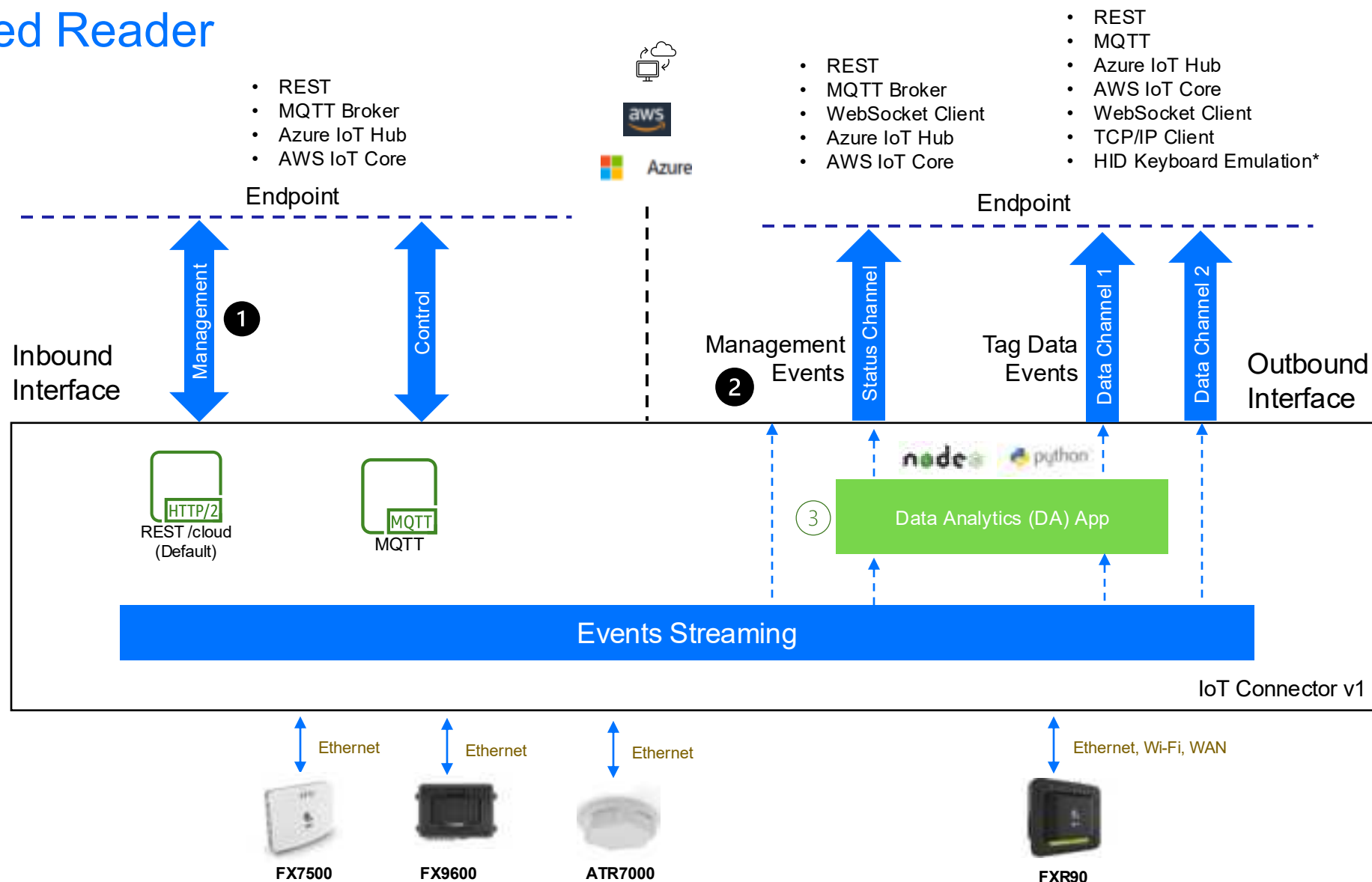
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Real-Time Health Monitoring



IoT Connector

Fixed Reader



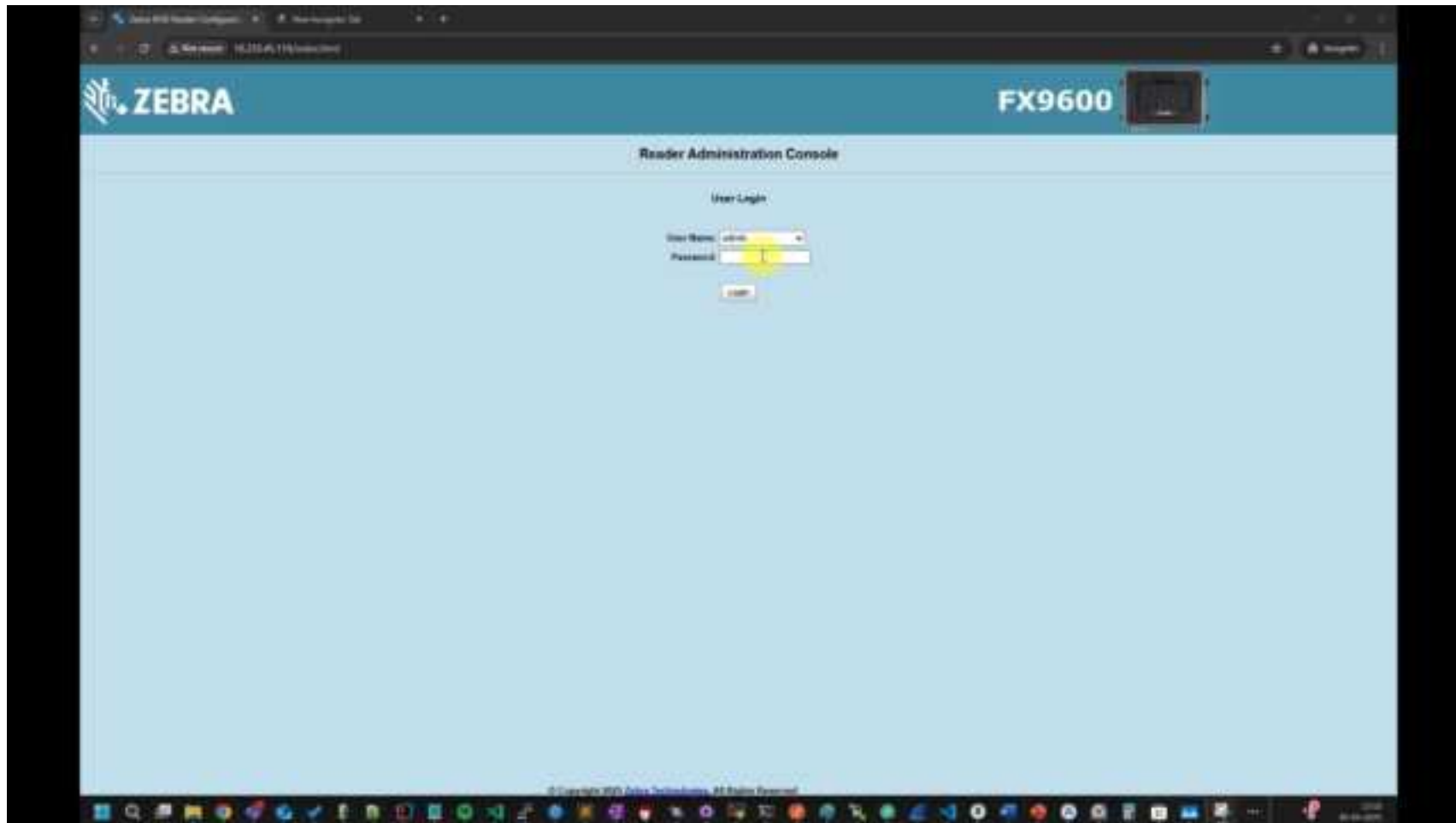
IoT Connector

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

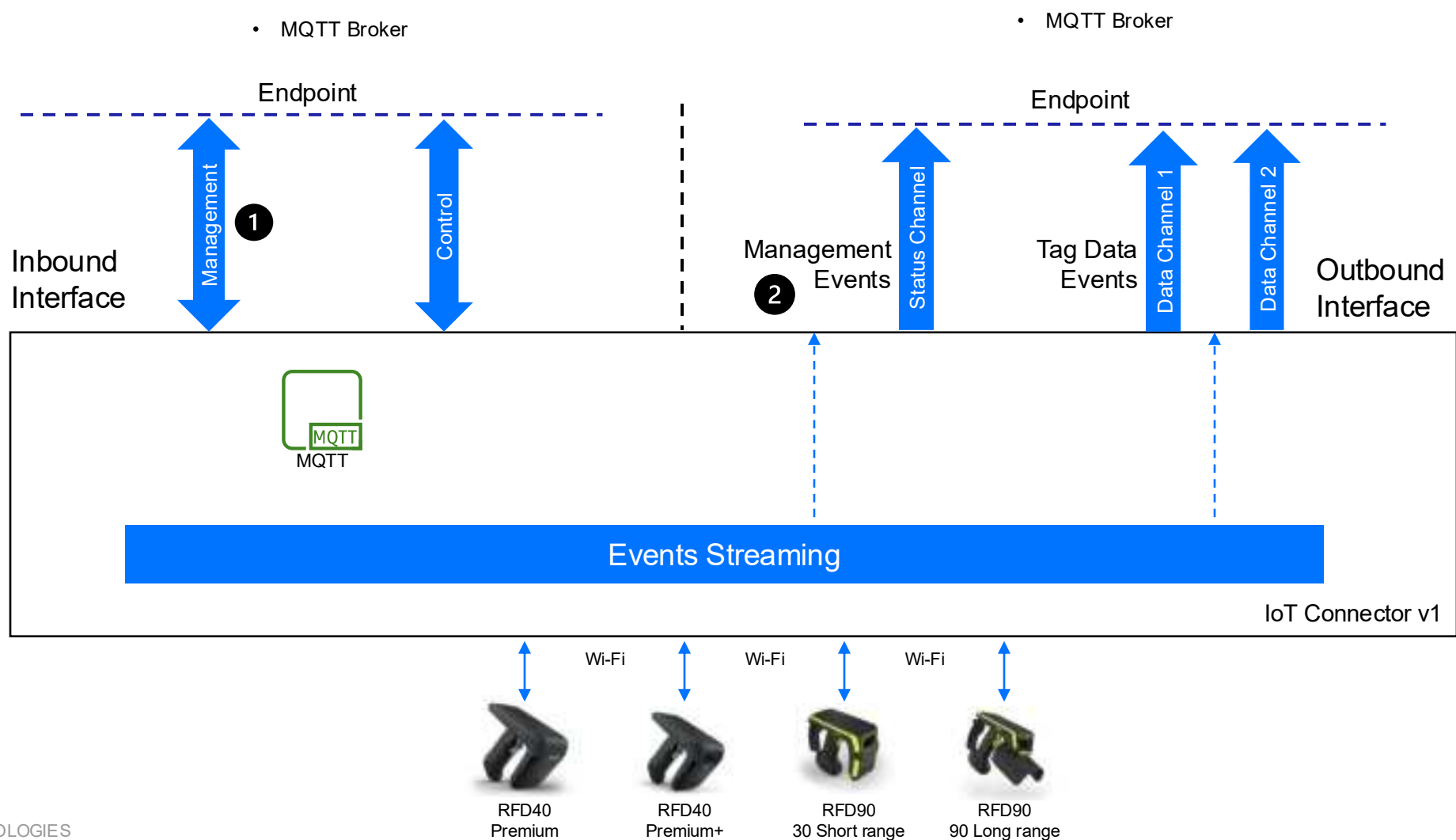
IoT Connector – MQTT

Demo for fixed readers



IoT Connector

RFID Sleds



IoT Connector

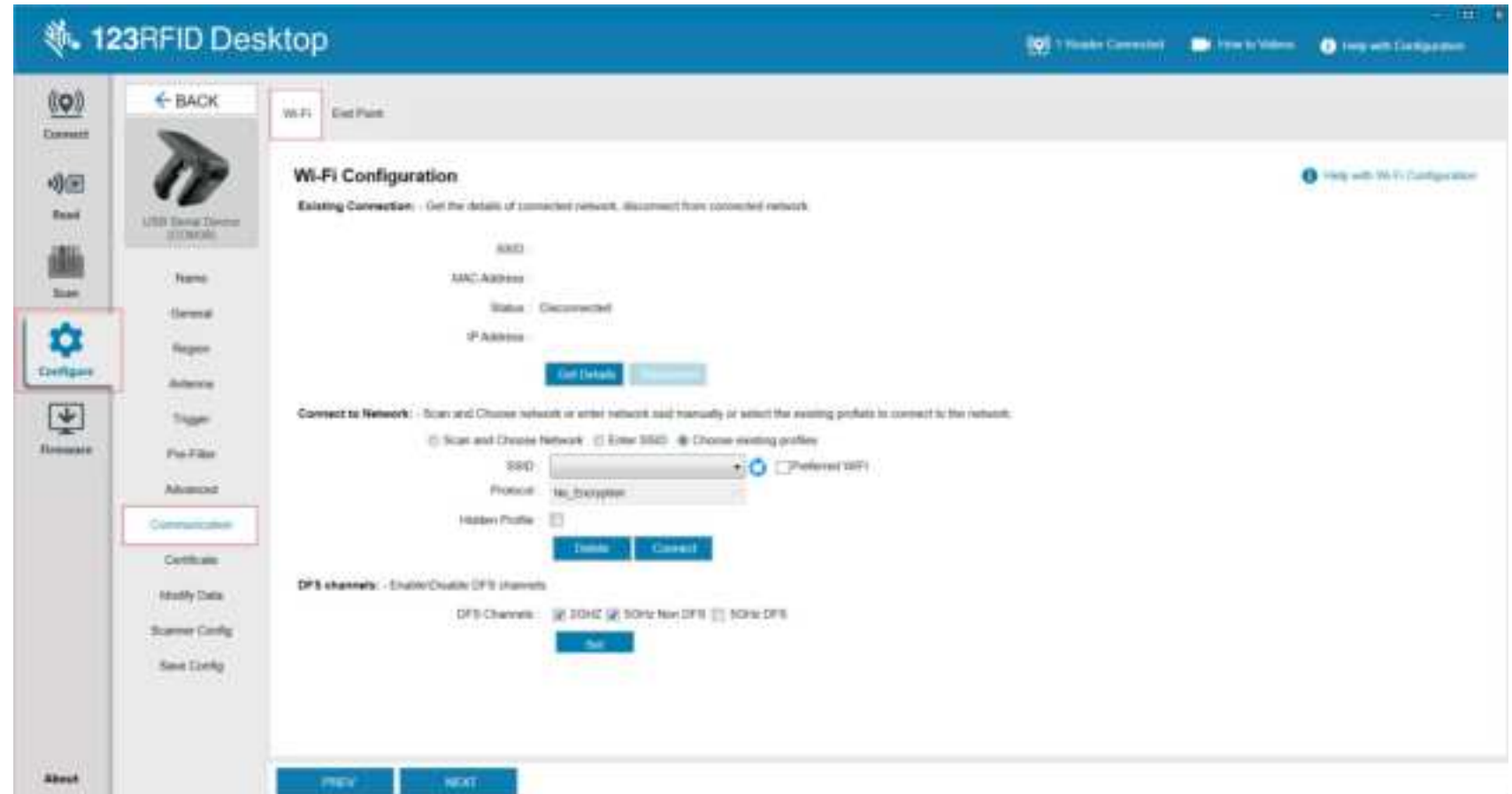
Monitoring Sleds

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

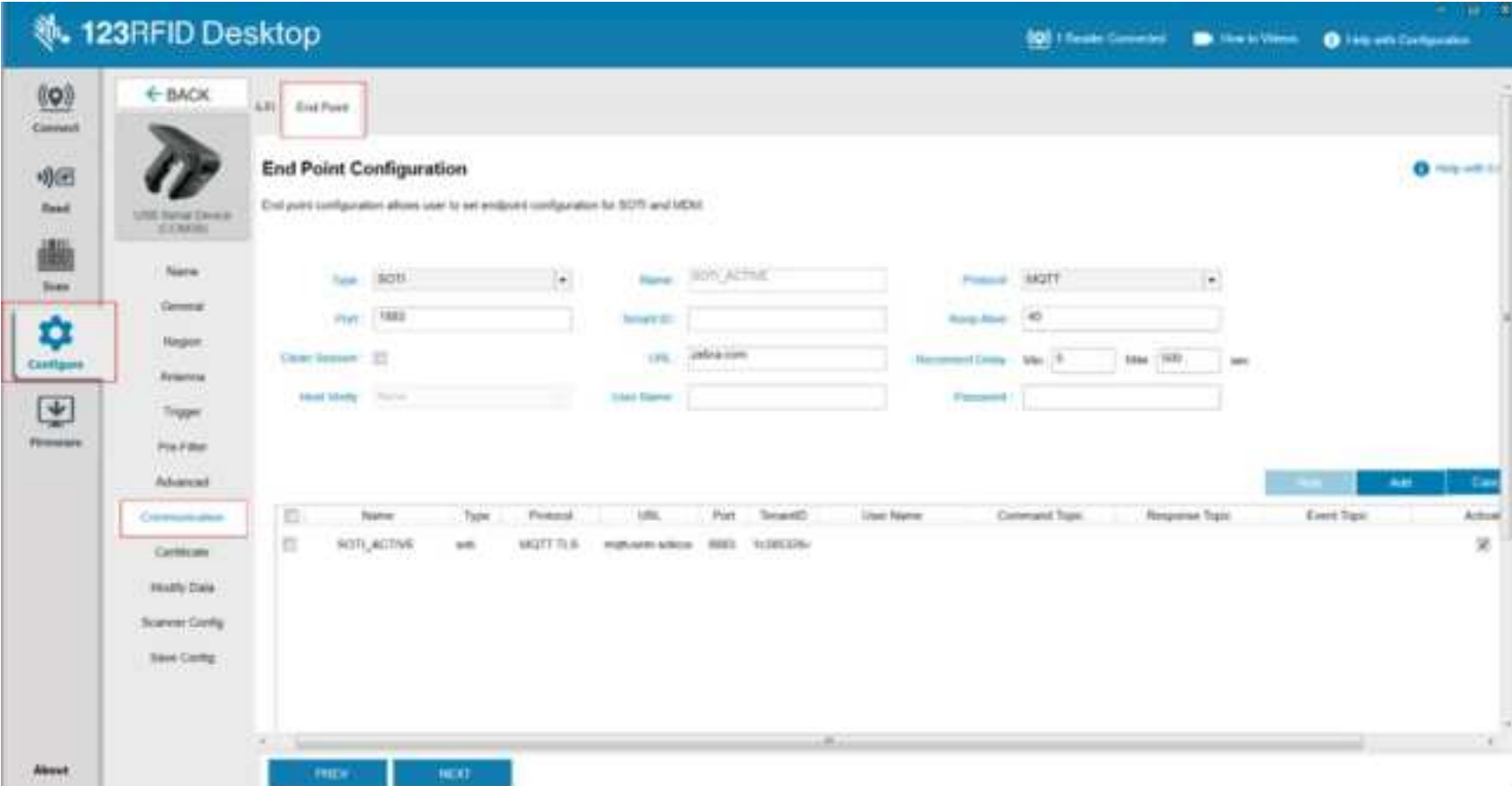
- Open the 123RFID Desktop Application and connect your RFD40/90 device.
- Navigate to the Configuration section and select the Communication option.
- Click on the WiFi tab to access WiFi settings.



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

← 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 Smart ID: Resp. Topic: 40

Clear Session: ☐ URL: zebra.com Recv. Topic: 40 Max: 1000

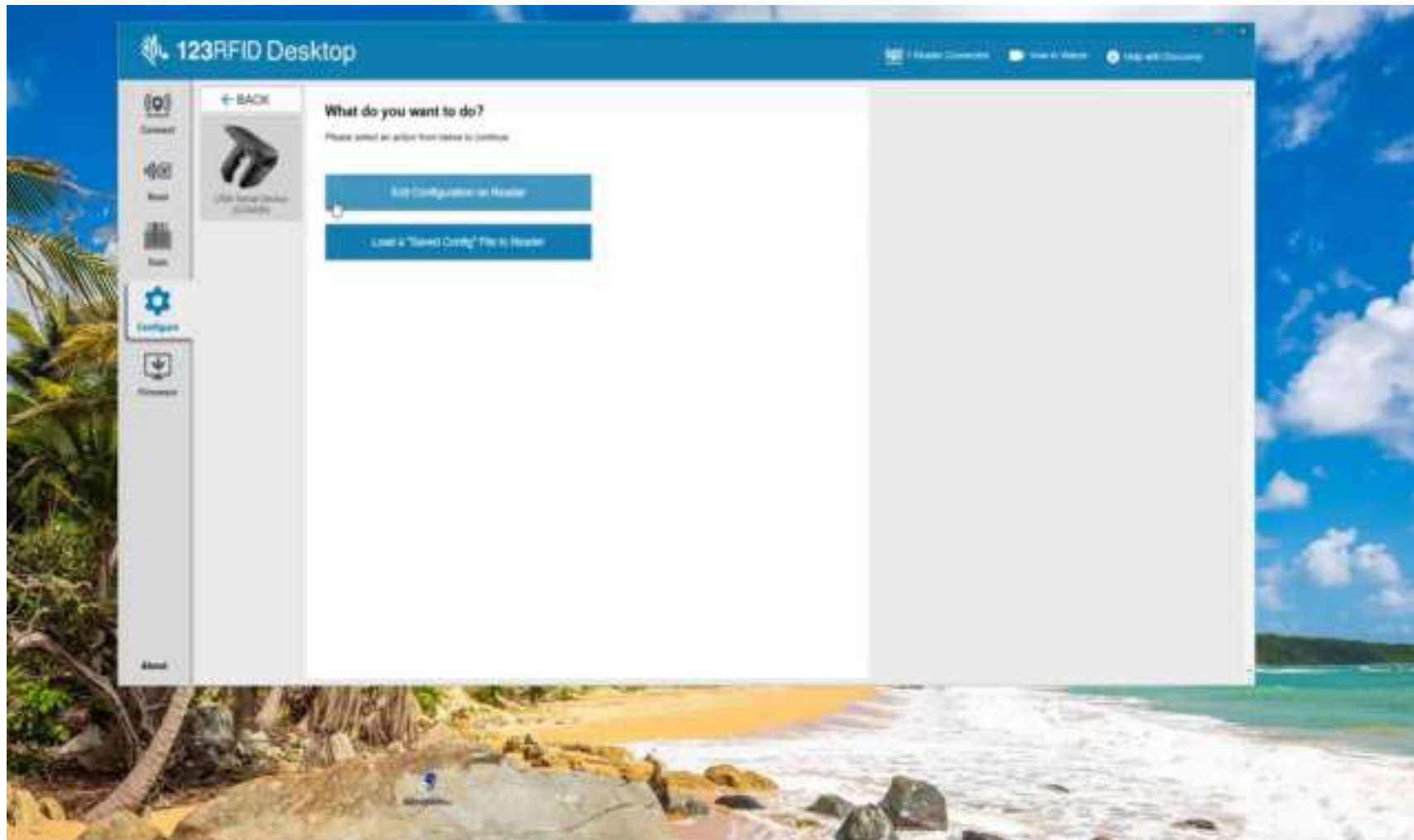
Host Identity: User: User Name: Password: Password:

Name	Type	Protocol	URL	Port	SmartID	User Name	Command Topic	Response Topic	Event Topic	Action
SOTI_ACTIVE	web	MQTT TLS	zebra.com	1883	1c3832b6					

PREV NEXT

Device Monitoring

Demo using MQTT client

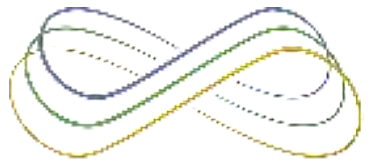


Handheld SDK

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

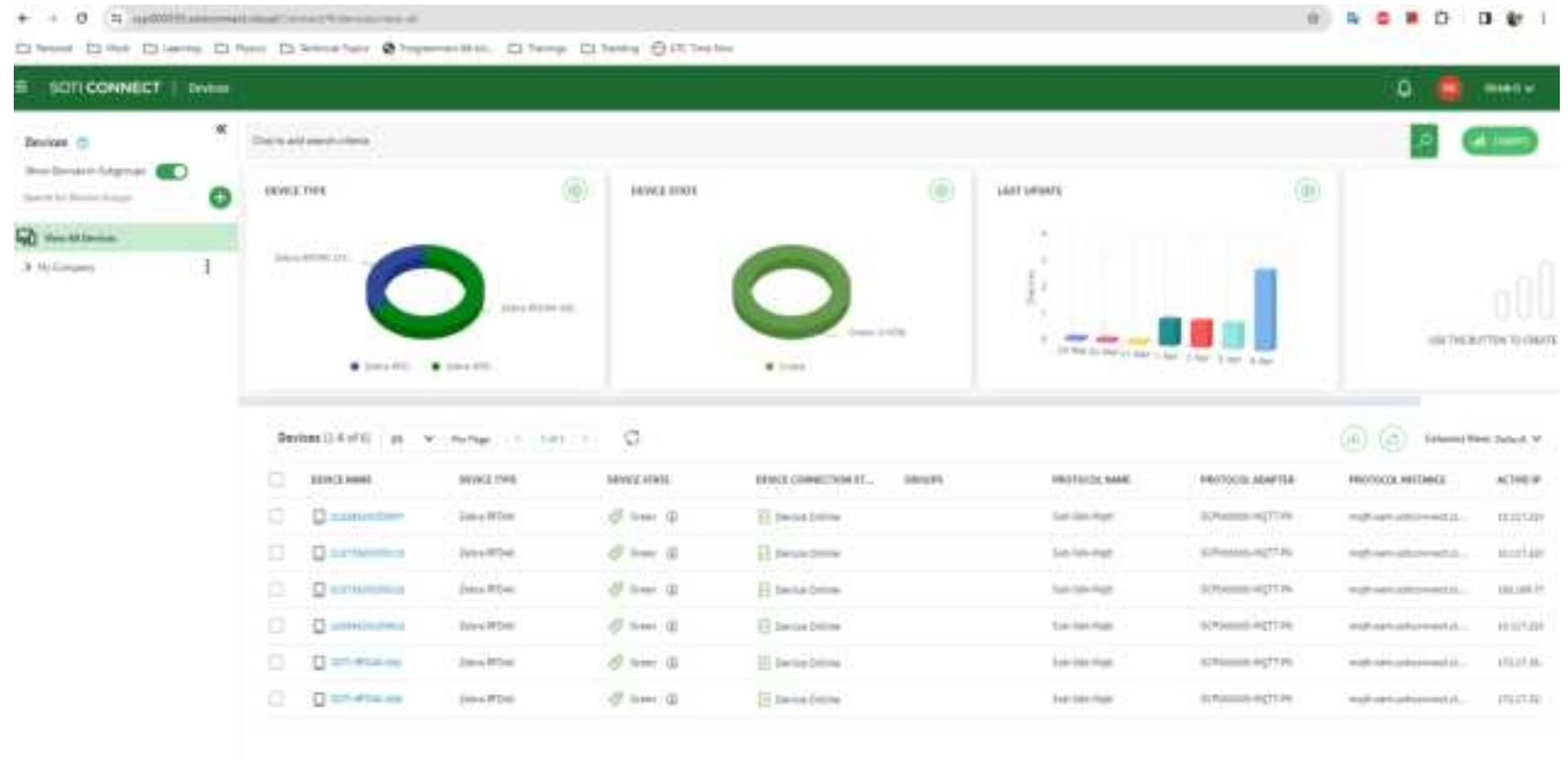


SOTI Connect

RFD40/90

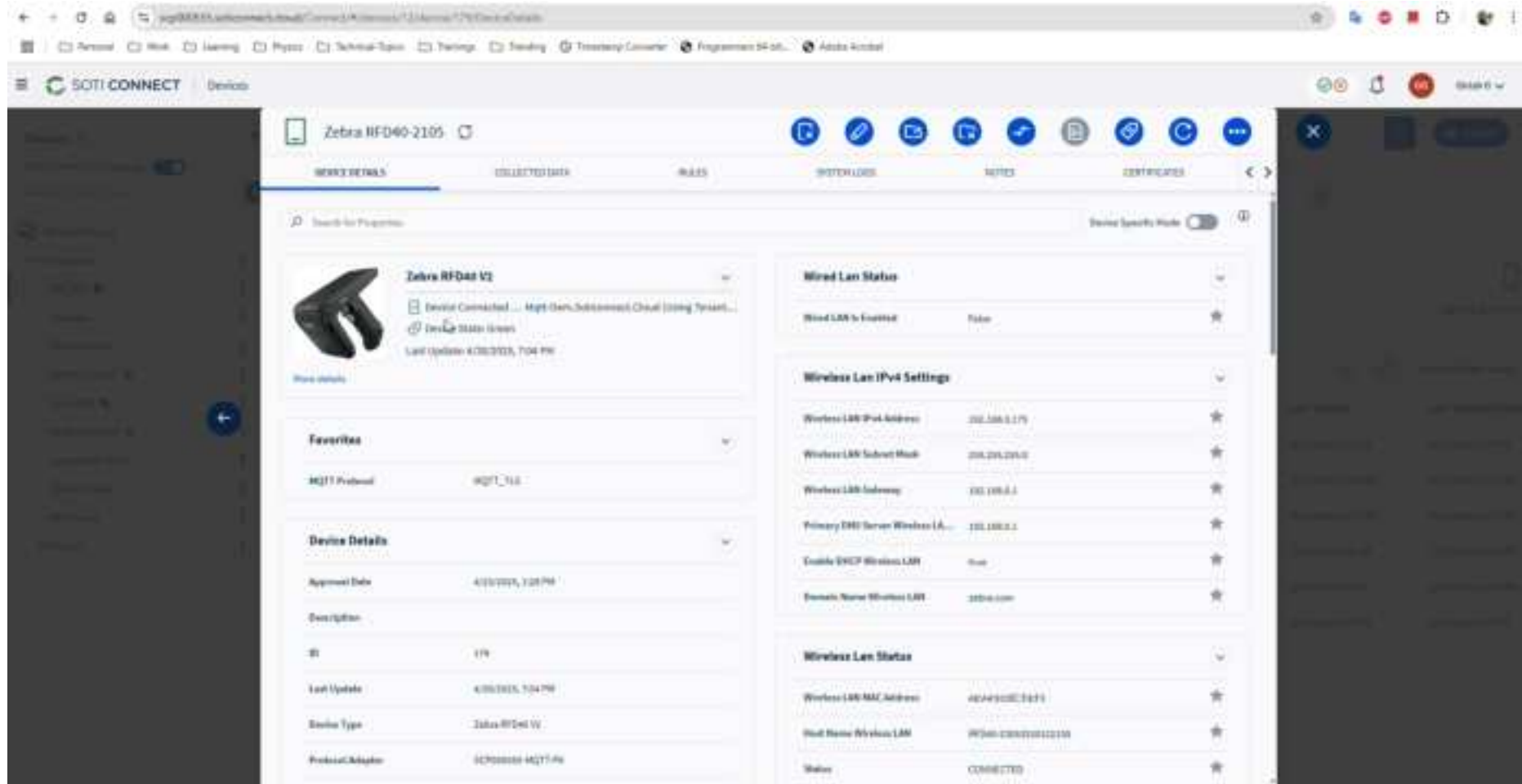


- SOTI connect is Mobile Device Management (MDM) provider
- Manage multiple device types easily



SOTI Connect

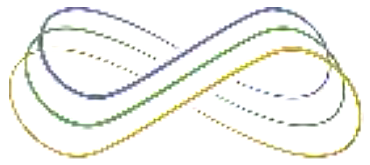
Demo



The screenshot displays the SOTI Connect web application interface. The top navigation bar includes the SOTI Connect logo and a 'Devices' tab. The main content area is titled 'Zebra RF040-2105' and features a sidebar with navigation options like 'Overview', 'Device Details', 'Device Settings', 'Device History', 'Device Groups', 'Device Tags', 'Device Alerts', 'Device Reports', and 'Device Actions'. The main panel shows the 'Device Details' tab, which includes a search bar, a device status card, and several sections for device information and settings.

Device Details

- Device Status:** Zebra RF040-2105. Status: Device Connected. Last Update: 4/10/2025, 7:04 PM.
- Device Settings:** Mired Lan Status (Mired LAN is Enabled), Wireless Lan IPv4 Settings (Wireless LAN IPv4 Address: 192.168.1.179, Wireless LAN Subnet Mask: 255.255.255.0, Wireless LAN Subnet: 192.168.1.1, Primary DNS Server Wireless LAN: 192.168.1.1, Enable DHCP Wireless LAN: True, Primary Name Wireless LAN: soti.com).
- Device Information:** Device Name: Zebra RF040-2105, Device Type: Zebra RF040 W, Product Adapter: SC7000000-40211-00.



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Technical Resources

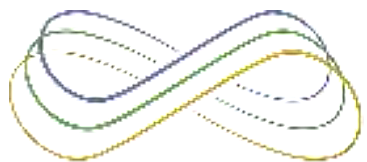


Resources

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

Gen2 Compatible Feature



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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

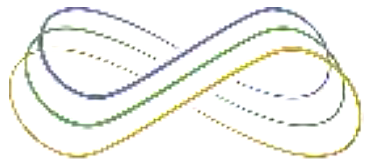
- IOT Connector
 - Data Usage / Cost control
 - Subscribe for required notifications (status, data)
 - Enable the required data payloads (management / tag data).
 - Restrict the interval of reporting heart beats / alerts or tag events based on the use case
 - Use tag filtering (interval, tag matching 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



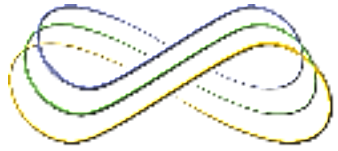


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Questions?





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Thank You



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