



Application Note

IMPINJ M775 TAG AUTHENTICATION

RETRIEVING TAG AUTHENTICATION
INFORMATION USING IMPINJ R700
READERS

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OVERVIEW

This document outlines the steps to retrieve an authentication response from tags built with Impinj M775 tag chips (M775) using the Impinj IoT Device Interface for the Impinj R700 RAIN RFID Reader (R700) with firmware version 8.0.1.240 or later. The firmware is available on the [Impinj Support Site](#).

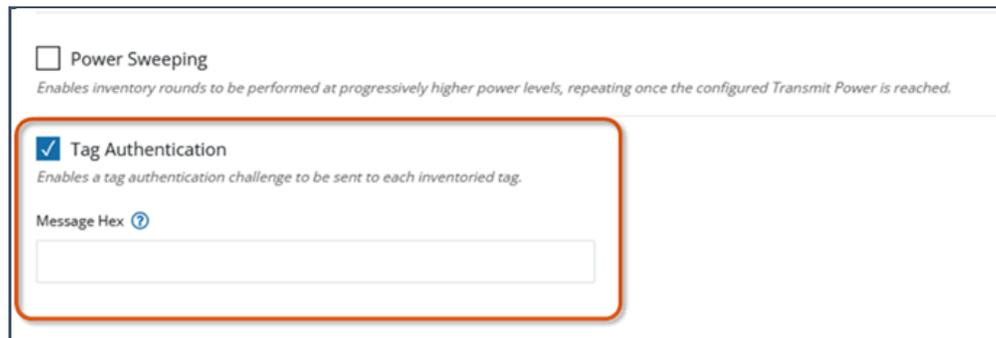
TAG AUTHENTICATION

Impinj provisions each M775 during manufacturing with a unique cryptographic key. The key is used when the R700 challenges an M775 using the *Authenticate* command defined by the GS1 EPC UHF Gen2 Air Interface Protocol. The M775 responds as defined by ISO/IEC 29167-11.

R700 INVENTORY PRESETS

The Inventory Preset feature of the R700 IoT Device Interface allows sending a Tag Authentication challenge to each inventoried tag. To enable this feature using the WebUI, check the **Tag Authentication** checkbox for the preset.

Figure 1: Inventory Preset – Enable Tag Authentication



The screenshot shows a configuration panel with two main sections. The top section has an unchecked checkbox for 'Power Sweeping' with a descriptive text below it. The bottom section has a checked checkbox for 'Tag Authentication' with a descriptive text below it. Below the 'Tag Authentication' section is a text input field labeled 'Message Hex' with a help icon to its right. An orange rectangular box highlights the 'Tag Authentication' section and the 'Message Hex' field.

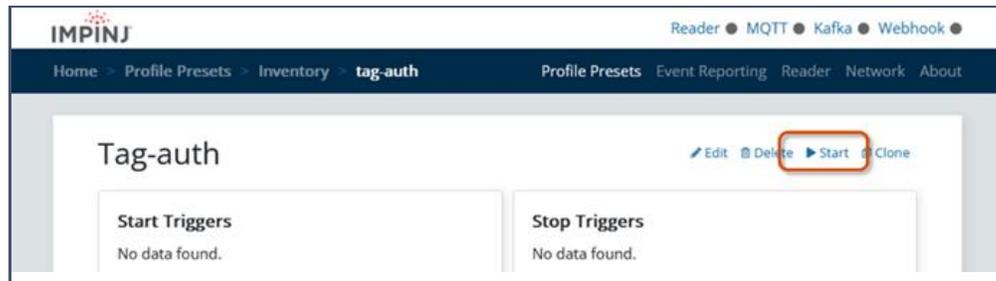
Enabling Tag Authentication for an Inventory Preset

Once checked, the **Message Hex** field will appear. This field expects a 12-character hex string representing a 48-bit payload to the *Authenticate* command. The first 5 bits of the command must be 0. If the sixth bit is 1, then a compact representation of the TID is included in the tag's response. The remaining 42 bits make up the challenge sent to the M775. Otherwise, if this field is left blank, the reader will automatically generate a random challenge message, including a 1 in the sixth bit, instructing the tag to return the compact TID in its response.

The compact TID is 64 bits in length and consists of words 1, 3, 4, and 5 of the full TID.

Once the preset is configured and saved, click the preset's **Start** button to begin the inventory, sending the Authentication challenge as part of the inventory operations.

Figure 2: Inventory Preset – Start Inventory Operations



Starting a Tag Authentication session for an Inventory Preset

Alternatively, the IoT REST API `PUT /profiles/inventory/presets/{presetId}` method can enable the Tag Authentication feature for Inventory Presets by specifying `"tagAuthentication": {"messageHex": "<Message>"}` inside an antenna configuration within the **body** message of the request. Refer to the IoT Device Interface's [API Reference](#) for more information on REST API methods.

Like the WebUI, use a blank **messageHex** to have the reader generate a random tag authentication challenge message. Below is a cURL example that will create (or modify) a profile named 'tag-auth':

Figure 3: cURL – Creating an Inventory Preset

```
curl -u root:impinj -X PUT 'https://192.168.0.101/api/v1/profiles/inventory/presets/tag-auth' -H 'Content-Type: application/json' -H 'Accept: application/json' --data-raw '{"antennaConfigs": [{"antennaPort": 1, "transmitPowerCdbm": 3000, "inventorySession": 2, "inventorySearchMode": "dual-target", "estimatedTagPopulation": 2, "rfMode": 4, "tagAuthentication": {"messageHex": ""}}, {"eventConfig": {"tagInventory": {"epcHex": "enabled"}}}]'}
```

Create Inventory Preset

Use the `POST /profiles/inventory/presets/{presetId}/start` REST API method to start the Inventory preset.

Figure 4: cURL – Starting an Inventory Preset

```
curl -u root:impinj -X POST 'https://192.168.0.101/api/v1/profiles/inventory/presets/tag-auth/start' -H 'Accept: application/json'
```

Start Inventory Preset

AUTHENTICATION RESPONSE

Use any event reporting method supported by the reader's firmware to view the tag response information. For example, the following cURL command reads the data from the reader's *HTTP Stream* event reporting method:

Figure 5: cURL – Listening to the HTTP Stream

```
curl -u root:impinj 'https://192.168.0.101/api/v1/data/stream'
```

HTTP Stream Data

The response from the Impinj M775 tag will contain a **tagAuthenticationResponse** that has the **messageHex**, **responseHex**, and **tidHex** (if requested).

Figure 6: Tag Authentication Response

```
{
  "timestamp": "2022-05-19T20:01:30.461684205Z",
  "eventType": "tagInventory",
  "tagInventoryEvent": {
    "epcHex": "E2C011A2A5001FA0098050BC",
    "tagAuthenticationResponse": {
      "messageHex": "0535443E2AA7",
      "responseHex": "071305DC7779E91A",
      "tidHex": "11A210BC4C02FD00"
    }
  }
}
```

HTTP Stream Data

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