

IoT Virtual Bootcamp

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IoT Properties, Jobs, Methods and TWINS

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IoT Device Management is different

- Scale
- Different Sensors
- Different Hardware
- Different OS
- Different SKU
- No Person to Device Map
- Limited Physical Access
- Connectivity
- Criticality
- SLA
- Firmware Updates
- Configuration Update

Introducing:

- Device TWINs
 - Desired Properties
 - Reported Properties
 - TAGs
- Device Methods
- Jobs
 - Queries
 - Change Properties
 - Execute Methods

Deep Dive with Code: <https://tinyurl.com/ybbj5uxr>

TWINS

- JSON in language
- Include:
 - tags
 - Properties.Desired
 - Properties.Reported
- Can be queried



The screenshot shows the 'Device Twin' window in the Azure IoT Hub portal. The 'Refresh' button is active, and the dropdown menu shows 'IoTCore'. The 'Entire Twin' tab is selected, displaying the following JSON:

```
{
  "deviceId": "IoTCore",
  "etag": "AAAAAAAAAAM=",
  "tags": {
    "location": "3rd Floor",
    "OS": "WindowsIoTCore"
  },
  "properties": {
    "desired": {
      "interval": 60,
      "$metadata": {
        "$lastUpdated": "2017-11-28T16:25:22.0100239Z",
        "$lastUpdatedVersion": 2,
        "interval": {
          "$lastUpdated": "2017-11-28T16:25:22.0100239Z",
          "$lastUpdatedVersion": 2
        }
      }
    },
    "$version": 2
  },
  "reported": {
    "interval": 500.0,
    "$metadata": {
      "$lastUpdated": "2017-11-28T19:11:12.9696792Z",
      "interval": {
        "$lastUpdated": "2017-11-28T19:11:12.9696792Z"
      }
    }
  },
  "$version": 9
}
```

Methods

- Registered in code on the device
- Callable from the Cloud
- Can expire
- Supported in and out of the SDK

```
83 private async void connectToIoTHub()
84 {
85     deviceClient = DeviceClient.CreateFromConnectionString(IoTDeviceConnectionString, TransportTy
86     await deviceClient.OpenAsync();
87     await deviceClient.SetMethodHandlerAsync("changeInterval", changeInterval, null);
88 }
89
90 private async Task<MethodResponse> changeInterval(MethodRequest methodRequest, object userContext)
91 {
92     if (methodRequest.DataAsJson != null)
93     {
94         await dispatcher.RunAsync(Windows.UI.Core.CoreDispatcherPriority.Normal, () => {
95             // Do something amazing
96             timer.Stop();
97             timer.Interval = TimeSpan.FromMilliseconds(Convert.ToDouble(methodRequest.DataAsJson));
98             DelayText.Text = methodRequest.DataAsJson + "ms";
99             timer.Start();
100         });
101     };
102
103     await UpdateTwin("interval", Convert.ToDouble(methodRequest.DataAsJson.ToString()));
104     return null;
105 }
```

Jobs

- Cloud Side: SDK or REST
- Can Update Property
- Can be based on Query
- Can expire
- Can call Method
- Have quotas

```
0 references | 0 changes | 0 authors, 0 changes
164 void dosomething() {
165     updateTwinsDesiredProperty("STARTSWITH(deviceId,'loadTest1') AND tags.location = 'Las Colinas' AND tags.floor = '3rd'", "heartbeat", "16").Wait();
166 }
1 reference | Kevin Saye, 162 days ago | 1 author, 1 change
167 static async Task updateTwinsDesiredProperty(string query, string property, string value)
168 {
169     jobClient = JobClient.CreateFromConnectionString(iotHubConnectionString);
170     var twin = new Twin();
171     twin.Properties.Desired[property] = value;
172     JobResponse result = await jobClient.ScheduleTwinUpdateAsync(Guid.NewGuid().ToString(),
173                                                                query,
174                                                                twin,
175                                                                DateTime.Now,
176                                                                100);
177     Console.WriteLine("Started Twin Update Job for devices = '" + query + "' result = " + result.Status);
178     // close the connection
179     jobClient.CloseAsync().Wait();
180 }
181
```

Quotas <https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-devguide-quotas-throttling>

| Throttle | Free and S1 hubs | S2 hubs | S3 hubs |
|---|---|--|--|
| Identity registry operations (create, retrieve, list, update, delete) | 1.67/sec/unit (100/min/unit) | 1.67/sec/unit (100/min/unit) | 83.33/sec/unit (5000/min/unit) |
| Device connections | Higher of 100/sec or 12/sec/unit For example, two S1 units are $2 \times 12 = 24$ /sec, but you have at least 100/sec across your units. With nine S1 units, you have 108/sec (9×12) across your units. | 120/sec/unit | 6000/sec/unit |
| Device-to-cloud sends | Higher of 100/sec or 12/sec/unit For example, two S1 units are $2 \times 12 = 24$ /sec, but you have at least 100/sec across your units. With nine S1 units, you have 108/sec (9×12) across your units. | 120/sec/unit | 6000/sec/unit |
| Cloud-to-device sends | 1.67/sec/unit (100/min/unit) | 1.67/sec/unit (100/min/unit) | 83.33/sec/unit (5000/min/unit) |
| Cloud-to-device receives (only when device uses HTTPS) | 16.67/sec/unit (1000/min/unit) | 16.67/sec/unit (1000/min/unit) | 833.33/sec/unit (50000/min/unit) |
| File upload | 1.67 file upload notifications/sec/unit (100/min/unit) | 1.67 file upload notifications/sec/unit (100/min/unit) | 83.33 file upload notifications/sec/unit (5000/min/unit) |
| Direct methods | 20/sec/unit | 60/sec/unit | 3000/sec/unit |
| Device twin reads | 10/sec | Higher of 10/sec or 1/sec/unit | 50/sec/unit |
| Device twin updates | 10/sec | Higher of 10/sec or 1/sec/unit | 50/sec/unit |
| Jobs operations (create, update, list, delete) | 1.67/sec/unit (100/min/unit) | 1.67/sec/unit (100/min/unit) | 83.33/sec/unit (5000/min/unit) |
| Jobs per-device operation throughput | 10/sec | Higher of 10/sec or 1/sec/unit | 50/sec/unit |

Demonstrate

- Show Device Explorer
- C# Demo

Additional References:

- www.InternetofYourThings.com
- <https://blogs.microsoft.com/iot/>
- <https://azure.microsoft.com/en-us/services/iot-hub/>
- <https://docs.microsoft.com/en-us/azure/iot-hub/>

Summary:

Device management in IoT is not like desktop, server or mobile device management

4 key components for IoT device management:

- Properties -- what the device settings are
- TWINS -- what the device settings should be
- Methods -- how to take action on a device
- Jobs -- scheduled change to make

Device Management is a key component in IoT Hub



www.InternetofYourThings.com

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