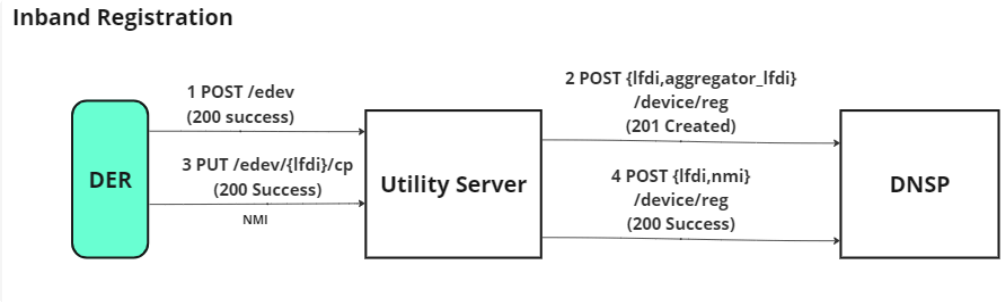
DNSP Interface APIs (DNSP Hosted)

In Band Registration

The below illustrates the flow of registration data through the in band mechanism from DER (client) through the Utility Server to DNSP backend systems.



Key points to highlight from the US-DNSP perspective (with reference to the API specifications below):

1. This is a 2-stage process*, i.e.
   a. LFDI is posted
   b. NMI is posted
2. Completion of successful registration is contingent on receipt of API success ‘200’ codes
3. DNSPs can choose to run backend processes triggered by the receipt of LFDI and NMI (e.g. validation), however SwitchDin’s requirement is simply to receive the success ‘200’ codes

*Note the SwitcDin Utility Server has configuration items for both API calls (LFDI/NMI) however this diagram shows DNSP calls through a single API endpoint (/device/reg). Ideally these might be separated into two separate API endpoints.

In-Band Registration: Device/Aggregator LFDI

HTTP POST

Through in band registration, an OEM Aggregator or Direct client will post LFDI details to the Utility Server, which will then be passed through to the DNSP for record creation and / or validation (as required)

Fields:

- **lfdi :** Required - Device LFDI
- **aggregator**: Optional - [Aggregator LFDI | None | Not present]

```
POST device/reg
```

Request Body

```
[
   {
            "lfdi" : "DeviceLFDI",
            "aggregator" : "AggregatorLFDI"
```

```
    }
]
```

In-Band Registration: Connection Point/NMI

HTTP POST

Subsequent to the post of LFDI details, at the next stage of in band registration, an OEM Aggregator client will post Connection Point (NMI) details to the Utility Server. The NMI will be accompanied by the LFDI and will also be passed through to the DNSP for record creation and / or validation (as required)

Fields:

- **lfdi :** Required - Device LFDI
- **nmi**: Required - Device National Meter Identifier (NMI)

```
POST device/reg
```

Request Body

```
[
   {
            "lfdi" : "DeviceLFDI",
            "nmi" : "DeviceNMI"
   }
]
```

Device Capabilities

HTTP POST

Single device capabilities data can be posted to the DNSP as follows.

Fields:

- **LFDI :** Required
- Other fields all optional

```
POST {{baseUrl}}/device/{{deviceLFDI}}/capabilities
```

```
{
    "LFDI": "45AB31EDFE5B67E343E5E4562E31984E23E5",
    "modesSupported": "0x08100004",
    "rtgMaxVar": 1000,
    "rtgMaxVarNeg": -1000,
    "rtgMaxW": 5000,
    "rtgMaxVA": 5000,
    "rtgMaxChargeRateW": 0,
    "rtgMaxDischargeRateW": 0,
    "type": 4
}
```

Multiple device capabilities data can be posted to the DNSP as follows.

Fields:

- **LFDI :** Required
- Other fields all optional

```
POST {{baseUrl}}/device/capabilities
```

```
{
    "deviceCapability": [
            {
                "LFDI": "45AB31EDFE5B67E343E5E4562E31984E23E5",
                "modesSupported": "0x08100004",
                "rtgMaxVar": 1000,
                "rtgMaxVarNeg": -1000,
                "rtgMaxW": 5000,
                "rtgMaxVA": 5000,
                "rtgMaxChargeRateW": 0,
                "rtgMaxDischargeRateW": 0,
                "type": 4
            },
            {
                "LFDI": "678E31EDFE5BA34B43E5E4562E31984E23E5",
                "modesSupported": "0x08100004",
                "rtgMaxVar": 1000,
                "rtgMaxVarNeg": -1000,
                "rtgMaxW": 5000,
                "rtgMaxVA": 5000,
                "rtgMaxChargeRateW": 0,
                "rtgMaxDischargeRateW": 0,
                "type": 4
            },
            {
                "LFDI": "54BE476AFE5BA34B925DE4562E31984E23E5",
                "modesSupported": "0x08100004",
                "rtgMaxVar": 1000,
                "rtgMaxVarNeg": -1000,
                "rtgMaxW": 5000,
                "rtgMaxVA": 5000,
                "rtgMaxChargeRateW": 0,
                "rtgMaxDischargeRateW": 0,
                "type": 4
            }
        ]
}
```

Device Settings

HTTP POST

Single device settings data can be posted to the DNSP as follows.

Fields:

- **LFDI :** Required
- Other fields all optional

```
POST {{baseUrl}}/device/{{deviceLFDI}}/settings
```

```
{
    "LFDI": "45AB31EDFE5B67E343E5E4562E31984E23E5",
    "modesEnabled": "0x08000000",
    "setMaxVar": 1000,
    "setMaxVarNeg": -1000,
    "setMaxW": 5000,
    "setMaxVA": 5000,
    "setMaxChargeRateW": 0,
    "setMaxDischargeRateW": 0
}
```

Multiple device settings data can be posted to the DNSP as follows.

Fields:

- **LFDI :** Required
- Other fields all optional

```
POST {{baseUrl}}/device/settings
```

```
{
    "deviceSettings": [
            {
                "LFDI": "45AB31EDFE5B67E343E5E4562E31984E23E5",
                "modesEnabled": "0x08000000",
                "setMaxVar": 1000,
                "setMaxVarNeg": -1000,
                "setMaxW": 5000,
                "setMaxVA": 5000,
                "setMaxChargeRateW": 0,
                "setMaxDischargeRateW": 0
            }
        ]
}
```

Control Responses

HTTP POST

- Control schedules posted by a DNSP, that are received by the Utility Server and passed onto devices result in control responses from devices being sent back to the DNSP, via the UtilityServer.

Fields:

- **LFDI :** Required

- **controlId**: Required
- **timestamp**: Required
- **response**: Required - Enumeration, refer to Table 27 of IEEE 2030.5 Standard 2018

```
{{baseUrl}}/controls
```

Request Body

```
[{
    "controlId": "97699b177ff912f536cbe5935e0d56c9",
    "LFDI": "45AB31EDFE5B67E343E5E4562E31984E23E5",
    "timestamp": 1612978663,
    "response": 1
}]
```

Device Readings

HTTPS POST

Device readings can be posted to the DNSP via HTTPS as follows.

Fields:

- **LFDI:** Required
- **DeviceID:** Required | May be Aggregated DER LFDI or Aggregator LFDI (for direct clients these are the same)
- Other fields all optional

```
POST devices/777F9911604A55D6F84F75053EE700052956_UTSRV/messages/events/?api-version=2018-06-30
```

Request Body

```
{
  "DeviceID": "1A01777F9911604A55D6F84F75053EE700052956",
  "MirrorMeterReading": [
    {
      "DataName": 3,
      "DataQualifier": 2,
      "UoM": 29,
      "Phase": 129,
      "RoleFlag": "0x3",
      "Reading": [
        {
          "Value": 241.287,
          "Duration": 300,
          "End": 1694247023
        }
      ]
    }
  ]
}
```

MQTT PUBLISH

Device readings can be published to the DNSP MQTT broker as follows.

Fields:

- **LFDI:** Required
- **DeviceID:** Required | May be Aggregated DER LFDI or Aggregator LFDI (for direct clients these are the same)
- Other fields all optional

```
PUBLISH devices/777F9911604A55D6F84F75053EE700052956_UTSRV/messages/events/ username: [dnsp url]/1A01777F9911604A
```

Request Body


```
{
  "DeviceID": "1A01777F9911604A55D6F84F75053EE700052956",
  "MirrorMeterReading": [
    {
      "DataName": 3,
      "DataQualifier": 2,
      "UoM": 29,
      "Phase": 129,
      "RoleFlag": "0x3",
      "Reading": [
        {
          "Value": 241.287,
          "Duration": 300,
          "End": 1694247023
        }
      ]
    }
  ]
}
```


Device Status

HTTPS POST

Device status data can be posted to the DNSP via HTTPS as follows.

Fields:

- **LFDI :** Required
- Other fields all optional

```
POST devices/ED0B0CE302A288FBCDF1D8442C94AD4C633F82AF_UTSRV/messages/events/?api-version=2018-06-30
```

Request Body


```
{
  "LFDI": "ED0B0CE302A288FBCDF1D8442C94AD4C633F82AF",
  "DERStatus": [
    {
      "alarmStatus": [
        {
          "value": "00",
          "timestamp": 1694391031
```

```
        }
      ],
      "inverterStatus": [
        {
          "value": 8,
          "timestamp": 1694391031
        }
      ],
      "genConnectStatus": [
        {
          "value": "00",
          "timestamp": 1694391031
        }
      ]
    }
  ]
}
```

MQTT PUBLISH

Device status data can be published to the DNSP MQTT broker as follows.

Fields:

- **LFDI :** Required
- Other fields all optional

```
PUBLISH devices/ED0B0CE302A288FBCDF1D8442C94AD4C633F82AF_UTSRV/messages/events/ username: [dnsp url]/ED0B0CE302A2
```

Request Body

```
{
  "LFDI": "ED0B0CE302A288FBCDF1D8442C94AD4C633F82AF",
  "DERStatus": [
    {
      "alarmStatus": [
        {
          "value": "00",
          "timestamp": 1694391031
        }
      ],
      "inverterStatus": [
        {
          "value": 8,
          "timestamp": 1694391031
        }
      ],
      "genConnectStatus": [
        {
          "value": "00",
          "timestamp": 1694391031
        }
      ]
    }
  ]
}
```