Data Integrator API Documentation

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1 Overview

This document describes the Data Integrator microservice endpoints used for GNSS planning. The service provides Digital Elevation Model (DEM) data, almanac information, and available constellation details. The following sections detail the request and response formats along with examples derived from recent tests.

2 Endpoints

2.1 `/dem_availability`

Method: POST
Description: Returns available DEM sources for the provided receiver coordinates. The endpoint checks for global or regional availability of DEM sources.

2.1.1 Request Format

The request body must be a JSON object containing a `receivers` field, which is an array of receiver objects. Each receiver must include a `coordinates` object with `latitude` and `longitude`.

Example Request:

```
{
  "receivers": [
    { "coordinates": { "latitude": 59.065219, "longitude": 10.676745 }
       },
    { "coordinates": { "latitude": 45.072841, "longitude": 7.682311 } }
  ]
}
```

2.1.2 Response Format

Success (200 OK): Returns a JSON object containing:

- `available_sources`: A mapping of DEM source IDs to details (name, description, available DEMs, and best resolution).
- `recommended`: A recommended DEM selection (or `null` if none is chosen).

Example Response:


```
{
  "available_sources": {
    "ot": {
      "name": "Open Topography",
      "description": "Global DEM service",
      "dems": [
        { "type": "SRTMGL3", "description": "SRTM GL3 90m", "resolution
           ": 90 },
        { "type": "SRTMGL1", "description": "SRTM GL1 30m", "resolution
           ": 30 },
        { "type": "SRTMGL1_E", "description": "SRTM GL1 Ellipsoidal 30m
           ", "resolution": 30 },
        { "type": "AW3D30", "description": "ALOS World 3D 30m", "
           resolution": 30 },
        { "type": "AW3D30_E", "description": "ALOS World 3D Ellipsoidal
            30m", "resolution": 30 },
        { "type": "SRTM15Plus", "description": "Global Bathymetry
           SRTM15+ V2.1", "resolution": 500 },
        { "type": "NASADEM", "description": "NASADEM Global DEM", "
           resolution": 30 },
        { "type": "COP30", "description": "Copernicus Global DSM 30m",
           "resolution": 30 },
        { "type": "COP90", "description": "Copernicus Global DSM 90m",
           "resolution": 90 },
        { "type": "EU_DTM", "description": "EU DTM 30m", "resolution":
           30 },
        { "type": "GEDI_L3", "description": "GEDI L3 DTM 1000m", "
           resolution": 1000 },
        { "type": "GEBCOIceTopo", "description": "GEBCO Ice Topography
           500m", "resolution": 500 },
        { "type": "GEBCOSubIceTopo", "description": "GEBCO Sub-Ice
           Topography 500m", "resolution": 500 }
      ],
      "best_resolution": 30
    }
  },
  "recommended": null
}
```


Error Responses:

- **400 Bad Request:** When no receivers or coordinates are provided.
- **404 Not Found:** When no DEM sources are available for the given area.
- **500 Internal Server Error:** For unexpected errors.

2.2 `/dem`

Method: POST
Description: Fetches DEM data for given coordinates using the specified DEM source and type.

2.2.1 Request Format

The request body must include:

- `coordinates`: A JSON object with `latitude` and `longitude`.
- `selected_source`: DEM source key.
- `dem_type`: DEM type.

Example Request:

```
{
  "coordinates": {
    "latitude": 37.7749,
    "longitude": -122.4194
  },
  "selected_source": "ot",
  "dem_type": "SRTMGL1"
}
```

2.2.2 Response Format

Success (200 OK): Returns a JSON object containing the DEM data.
Error (500 Internal Server Error): If DEM data is unavailable.

Example Response:

```
{
  "dem_data": {
    ... // DEM data payload
  }
}
```

2.3 `/alm`

Method: GET
Description: Retrieves almanac data containing satellite orbit parameters.

2.3.1 Response Format

Success (200 OK): Returns a JSON object with a `status` of `"success"` and a `data` field (an array of almanac entries).

Example Response:

```
{
  "data": [
    {
      "ARG_OF_PERICENTER": 53.9556,
      "BSTAR": 0,
      "CLASSIFICATION_TYPE": "U",
      "ECCENTRICITY": 0.0087302,
      "ELEMENT_SET_NO": 999,
      "EPHEMERIS_TYPE": 0,
      "EPOCH": "2025-03-08T12:38:21.492960",
      "INCLINATION": 55.7641,
      "MEAN_ANOMALY": 306.9171,
      "MEAN_MOTION": 2.00562536,
      "MEAN_MOTION_DDOT": 0,
      "MEAN_MOTION_DOT": -9e-08,
      "NORAD_CAT_ID": 24876,
      "OBJECT_ID": "1997-035A",
```

```
      "OBJECT_NAME": "GPS BIIR-2  (PRN 13)",
      "RA_OF_ASC_NODE": 116.7908,
      "REV_AT_EPOCH": 20261,
      "line1": "1 24876U 97035A   25067.52663765 -.00000009  00000+0
         00000+0 0  9999",
      "line2": "2 24876  55.7641 116.7908 0087302  53.9556 306.9171
         2.00562536202619"
    },
    {
      "ARG_OF_PERICENTER": 231.1729,
      "BSTAR": 0,
      "CLASSIFICATION_TYPE": "U",
      "ECCENTRICITY": 0.0038303,
      "ELEMENT_SET_NO": 999,
      "EPHEMERIS_TYPE": 0,
      "EPOCH": "2025-03-09T09:18:38.628576",
      "INCLINATION": 54.8699,
      "MEAN_ANOMALY": 121.1992,
      "MEAN_MOTION": 2.00558218,
      "MEAN_MOTION_DDOT": 0,
      "MEAN_MOTION_DOT": -6.5e-07,
      "NORAD_CAT_ID": 26360,
      "OBJECT_ID": "2000-025A",
      "OBJECT_NAME": "GPS BIIR-4  (PRN 20)",
      "RA_OF_ASC_NODE": 38.0987,
      "REV_AT_EPOCH": 18194,
      "line1": "1 26360U 00025A   25068.38794709 -.00000065  00000+0
         00000+0 0  9992",
      "line2": "2 26360  54.8699  38.0987 0038303 231.1729 121.1992
         2.00558218181946"
    },
    ... % Additional almanac entries
  ],
  "status": "success"
}
```

Error Response:

```
{
  "error": "Almanac unavailable"
}
```

2.4 /constellations

Method: GET
Description: Returns available satellite constellations and their associated satellites.

2.4.1 Response Format

The response is a JSON object where each key is a constellation code and the value is an object containing a list of satellites under the `sats` field.

Example Response:

```
{
  "BEI": {
    "sats": [
      {
```

```
      "name": "BEIDOU-2 IGSO-1 (C06)",
      "norad_id": 36828,
      "object_id": "2010-036A"
    },
    {
      "name": "BEIDOU-2 G4 (C04)",
      "norad_id": 37210,
      "object_id": "2010-057A"
    },
    {
      "name": "BEIDOU-2 IGSO-2 (C07)",
      "norad_id": 37256,
      "object_id": "2010-068A"
    }
  ]
},
"GAL": {
  "sats": [
    {
      "name": "GSAT0101 (GALILEO-PFM)",
      "norad_id": 37846,
      "object_id": "2011-060A"
    },
    {
      "name": "GSAT0102 (GALILEO-FM2)",
      "norad_id": 37847,
      "object_id": "2011-060B"
    }
  ]
},
"GLO": {
  "sats": [
    {
      "name": "COSMOS 2433 (720)",
      "norad_id": 32275,
      "object_id": "2007-052A"
    },
    {
      "name": "COSMOS 2432 (719)",
      "norad_id": 32276,
      "object_id": "2007-052B"
    }
  ]
},
"GPS": {
  "sats": [
    {
      "name": "GPS BIIR-2  (PRN 13)",
      "norad_id": 24876,
      "object_id": "1997-035A"
    },
    {
      "name": "GPS BIIR-4  (PRN 20)",
      "norad_id": 26360,
      "object_id": "2000-025A"
    }
  ]
}
```

```
}
```

3 Additional Notes

- All endpoints use JSON for both requests and responses.
- Coordinates must fall within valid ranges (latitude: -90 to 90, longitude: -180 to 180).
- The `/dem_availability` endpoint determines DEM source availability based on global or regional coverage.
- The `/alm` and `/constellations` endpoints provide essential auxiliary data for GNSS planning.