NextGen IT Web Services

Customer Information

NGITWS Design

The NextGen IT Web Services (NGITWS) is a data storage and dissemination system that relies on open source software to aggregate and distribute information in a web-centric, technology-agnostic fashion. It consists of dozens of individual applications in three layers:

- The catalog services and periphery applications, which take in and manage data
- The API platform, which provides raw data for public consumption
- Various web applications that present API data in a browser-friendly format for end users.

NGITWS as BaaS

NGITWS is meant to be a Backend as a Service (BaaS) for NWS data.

> *Backend as a service (BaaS) is service model that serves as the middleware that provides developers with ways to connect their Web and mobile applications to services via application programming interfaces (API).*

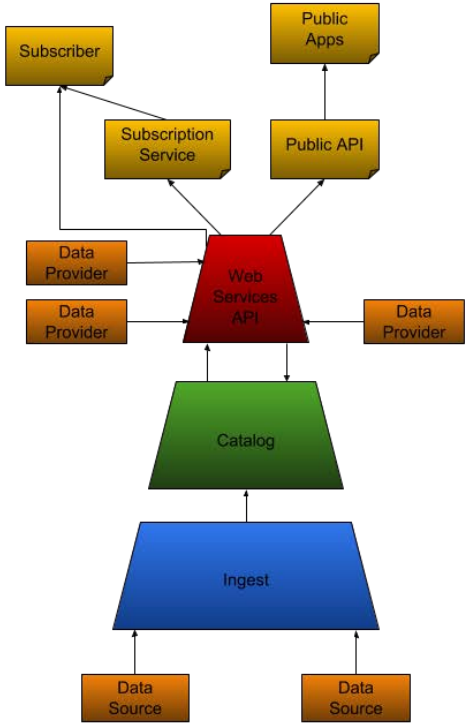
By using NGITWS developers can use serverless architecture concepts in their applications

> *Serverless architectures are application designs that incorporate "Backend as a Service" (BaaS) services. By using these ideas, and related ones like single-page applications, such architectures remove much of the need for a traditional always-on server component. Serverless architectures may benefit from significantly reduced operational cost, complexity, and engineering lead time.*

Leveraging NGITWS

As shown in the diagram, an app (or client application) gains programmatic access to NGITWS services through one or more APIs. The app is at the API's frontend. The integrated NGITWS services are located at the API's backend.

With NGITWS, you can build an API to post or get data with associated and descriptive metadata that makes your data and all data in NGITWS easy to discover for other applications that may also leverage the system.



NIDS Data Services - - NGITWS

- NGITWS uses open technologies and standards driven data outputs
- The NGITWS system
  - Collects Data
    - GRIB2
    - TAC
    - NetCDF
  - Transforms Data
    - XML
    - IWXXM/USWX
    - NetCDF
    - JSON
  - Disseminates Data
    - Pub/Sub
    - FIQL Queries

API - - api.weather.gov

- Designed to be used by customers who are just looking for data for their own uses.
- NIDS IDP developed web services retrieve all data from API
- NIDS IDP developed web services will only return HTML to the user.
- HTTP Accept headers can be used to modify the response returned. Response types include:
  - Geo-JSON
  - JSON-LD
  - DWML
  - OXML
  - CAP
  - ATOM
  - IWXXM/USWX -- Future Release
- Has become popular in a short time by developer community
  - EA Sports
  - BrightSign
  - KagenAir
  - Databridge

Data Services - - Metadata - - The Key That Opens the Door

LDM Metadata

- WMO ID
- PIL
- Issuance Date
- Issuance Time

NGITWS Metadata

- Publish-Date
- Feed-Type
- Wmo-Id
- Issuing-Office
- Issue-Time
- Content-Type
- Product-Category
- Product-Identifier
- Location-Id
- Elevation
- Geometry
- Point
- Product-coordinates
- Product-Format
- Icao-id

Data Services - - Discovery

NGITWS Catalogs -- Metadata

- NGITWS provides 30 metadata catalogs which applications can use to discover data relevant for their use. Some of these catalogs include:
  - CAP-Metadata
  - LDM-Metadata
  - Metar-Metadata
  - IWXXM-Metadata
- There is a “catalog of catalogs” which shows information on all other catalogs
- Metadata allows discovery of data with minimal knowledge about NWS data or products

Data Discovery

http://nids-metaws.cp.ncep.noaa.gov:8080/catalogs/


```
...
{
   "Collection-Name": "NGITWS_SIGMET_IWXXM_METADATA",
   "Catalog-Identifier": "NGITWS_SIGMET_IWXXM_METADATA",
   "Indexes": [],
   "Schema": null,
   "Catalog-Type": "metadata",
   "Retention-Policy": null,
   "Num-Records": 0,
   "Size": 0
  },
  {
   "Collection-Name": "NGITWS_MADIS_IWXXM_METADATA",
   "Catalog-Identifier": "NGITWS_MADIS_IWXXM_METADATA",
   "Indexes": [],
   "Schema": null,
   "Catalog-Type": "metadata",
   "Retention-Policy": [
     {
       "retentionPeriodInDays": 7,
       "retentionDateKey": "Storage.Publish-Date",
       "retentionFilter": null
     }
   ],
   "Num-Records": 0,
   "Size": 0
  },
...
```

Data Discovery

http://nids-metaws.cp.ncep.noaa.gov:8080/catalogs/NGITWS_METAR_METADATA/records?sort=Storage.Publish-Date%20DESC&limit=1


```
[
  {
    "Storage": {
      "Publisher": "ngitws",
      "Publish-Date": "2020-06-09T15:40:28Z",
      "Object-Identities": [
        {
          "Catalog-Identifier": "NGITWS_OBJECTS",
          "Record-Identifier": "32791736-ee78-40cc-9e22-47d33a786852",
          "@id": "http://nids-objws.cp.ncep.noaa.gov:8080/objws/v1/catalogs/NGITWS_OBJECTS/objects/32791736-ee78-40cc-9e22-47d33a786852"
        }
      ],
      "Record-Identifier": "9b03754e-a89d-4a18-aba4-fe054583e133",
      "@id": "http://nids-metaws.cp.ncep.noaa.gov:8080/metaws/v1/catalogs/NGITWS_METAR_METADATA/records/9b03754e-a89d-4a18-aba4-fe054583e133"
    },
    "Doc": {
      "Feed-Type": "WMO",
      "Elevation": 820,
      "geometry": {
        "type": "Point",
        "coordinates": [
          -105.83333,
          59.25
        ]
      },
      "Product-Format": "XML",
      "Icao-Id": "CYSF",
      "Collective-Issue-Time": "2020-06-09T15:40:00Z",
      "Wmo-Id": "SPZZ40",
      "Issuing-Office": "KAWN",
      "Product-Identifier": "SPECI",
      "Issue-Time": "2020-06-09T15:38:00Z",
      "Content-Type": "text/xml",
      "IWXXM-Schema": "IWXXM"
    }
  }
]
```

Data Discovery -- Refining Results

http://nids-metaws.cp.ncep.noaa.gov:8080/catalogs/NGITWS_METAR_METADATA/records?&s=Doc.Icao-Id=like=%5EK&sort=Storage.Publish-Date%20DESC&limit=1

[{"Storage":{"Publisher":"ngitws","Publish-Date":"2017-06-03T14:45:10Z","Object-Identities":[{"Catalog-Identifier":"NGITWS_OBJECTS","Record-Identifier":"9d85da2b-715b-41b0-afd7-e00f56b949fe"}],"Record-Identifier":"9a844560-26f0-4e2d-9132-d08b399960f8"},"Doc":{"Feed-Type":"WMO","Elevation":1788,"geometry":{"type":"Point","coordinates":[-99.68167,32.41028]},"Product-Format":"IWXXM","Icao-Id":"KABI","Collective-Issue-Time":"2017-06-03T14:45:00Z","Wmo-Id":"SPUS81","Issuing-Office":"KWBC","Product-Identifier":"SPECI","Issue-Time":"2017-06-03T14:41:00Z","Content-Type":"text/xml","IWXXM-Schema":"IWXXMUS"}}]

Data Discovery -- Refining by Location

http://nids-metaws.cp.ncep.noaa.gov:8080/catalogs/NGITWS_METAR_METADATA/records?&geoNear=(-94.4781,39.2721,102500)&sort=Storage.Publish-Date%20DESC&limit=1

[{"Storage":{"Publisher":"ngitws","Publish-Date":"2017-05-31T12:42:21Z","Object-Identities":[{"Catalog-Identifier":"NGITWS_OBJECTS","Record-Identifier":"ddd26a9f-0c03-4f59-981c-1e7d245b4bdf"}],"Record-Identifier":"2dc4ebdd-2db8-46f7-a56c-06d34929815c"},"metaDoc":{"distanceFromQueryPoint":15996.299726415307},"Doc":{"Feed-Type":"WMO","Elevation":777,"geometry":{"type":"Point","coordinates":[-94.3096,39.3325]},"Product-Format":"IWXXM","Icao-Id":"KGPH","Collective-Issue-Time":"2017-05-31T12:42:00Z","Wmo-Id":"SAUS70","Issuing-Office":"KWBC","Product-Identifier":"METAR","Issue-Time":"2017-05-31T12:35:00Z","Content-Type":"text/xml","IWXXM-Schema":"IWXXMUS"}}]

Results

http://nids-objws.cp.ncep.noaa.gov:8080/objws/v1/catalogs/NGITWS_OBJECTS/objects/ddd26a9f-0c03-4f59-981c-1e7d245b4bdf


```
<iwxxm-us:METAR xmlns:gco="http://www.isotc211.org/2005/gco" xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:iwxxm="http://icao.int/iwxxm/1.1" xmlns:iwxxm-us="http://nws.weather.gov/schemas/IWXXM-US/1.0/Release" xmlns:metce="http://def.wmo.int/metce/2013" xmlns:om="http://www.opengis.net/om/2.0" xmlns:saf="http://icao.int/saf/1.1" xmlns:sams="http://www.opengis.net/samplingSpatial/2.0" xmlns:sf="http://www.opengis.net/sampling/2.0" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" automatedStation="true" gml:id="METAR-KGPH-201705311235Z" status="NORMAL" xsi:schemaLocation="http://nws.weather.gov/schemas/IWXXM-US/1.0/Release http://nws.weather.gov/schemas/IWXXM-US/1.0/Release/schemas/usMetarSpeci.xsd" slick-uniqueid="3">

    <div>
        <a id="slick_uniqueid"/>
    </div>
    <iwxxm:observation>
        <om:OM_Observation gml:id="obs-KGPH-20170531T123500Z">
            <om:type xlink:href="http://codes.wmo.int/49-2/observation-type/IWXXM/1.0/MeterologicalAerodromeObservation"/>
            <om:phenomenonTime>
                <gml:TimeInstant gml:id="metar-KGPH-201705311235Z">
                    <gml:timePosition>2017-05-31T12:35:00Z</gml:timePosition>
                </gml:TimeInstant>

                ...

                </iwxxm-us:MeteorologicalAerodromeObservationRecord>
            </om:result>
        </om:OM_Observation>
    </iwxxm:observation>
    <iwxxm-us:observingSystemType xlink:href="http://nws.weather.gov/codes/FMH-1/2005/ObservingSystemType/AUTOMATED_WITH_PRESENT_WEATHER"/>
</iwxxm-us:METAR>
```

Data Services - - Customer Posting Data

Approved customers may post data directly into NGITWS in a two step process:

Post Metadata to the appropriate catalog

```
POST http://server/metaws/v1/catalogs/NGITWS_METAR_METADATA/records
Authorization: Basic a2V2aW4ub2ZmOk15UGFzc3dvcmQ=
Realm: public
Tags: banana,strawberry,cherry
Content-Type: application/json
Object-Identities: NGITWS_OBJECTS;18c6cc37-52aa-4187-baff-3ed27cdf1385

{
   "Product-Type" : "Observation",
   "Product-Name" : "METAR",
   "Site-Id" : "OPKC",
   "Icao-Id" : "OPKC",
   "Obs-Time" : "2016-06-10T19:25:00Z",
   "Wmo-Header" : "SAAW34 KWBC 101915 RRA",
   "Elevation" : 22,
   "geometry" : {
         "type" : "Point",
         "coordinates" : [
               -92.1,
               24.53
         ]
}
```

Example: curl -X POST -d @metadata.json -H "Content-Type: application/json" "http://user:password@nids-metaws-dev.bldr.ncep.noaa.gov:8080/catalogs/NGITWS_MODEL_NETCDF/records"

System response: {"id":"9f3b9d1a-2b0b-4f0f-88e6-c5e68f0ebd3f"}

Post data to the service

```
POST http://server.gov/objws/v1/catalogs/NGITWS_OBJECTS/objects
Realm: PublicData
Tags: observation,us,conus
Authorization: Basic a2V2aW4ub2ZmOk15UGFzc3dvcmQ=
Content-Length: 69
Content-MD5: 0hacxg0g9Hg6QEGiOF4BZw==
Metadata-Identities: NGITWS_METAR_METADATA;18c6cc37-52aa-4187-baff-
3ed27cdf1385
Content-Type: text/plain
METAR KEAX 191700Z AUTO 30008KT 12/10 RMK AO1 SLP180 T01180095 53011=
```

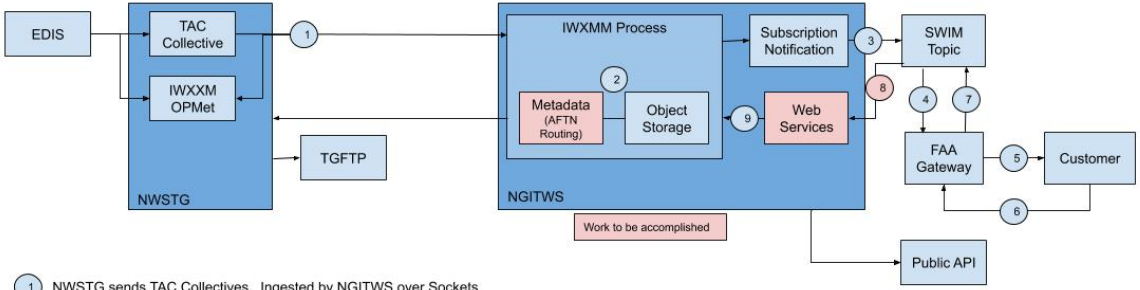
Subscription Services

- Consumers can subscribe to any data that can be described by NGITWS metadata queries.
- Notifications are sent to the consumer in very small payloads which include information on the data location for retrieval by the consumer

Example subscription notification:


```
{
  "Notification-Identifier": "fea29771-cc12-4939-b5ea-3283296de407",
  "Object-Identity": {
    "Catalog-Identifier": "NGITWS_OBJECTS",
    "Record-Identifier": "5aa2e6f6-2479-4307-9aff-520dc69f111c"
  },
  "Metadata-Identity": {
    "Catalog-Identifier": "NGITWS_MADIS_CSV_METADATA",
    "Record-Identifier": "6e6d1c59-36d2-4927-8f86-a87e1b5d318d"
  }
}
```

AMHS Communication



1. NWSTG sends TAC Collectives. Ingested by NGITWS over Sockets
2. NGITWS creates individual IWXXM 3.0 documents, adds AFTN Routing, and sends IWXXM back to NWSTG
3. NGITWS creates JMS notification, JMS notification is "pushed" into swim
4. FAA Gateway receives via SWIM, adds additional FTBP info.
5. Profit
6. Customer sends to FAA with FTBP, FAA removes FTBP info
7. FAA Gateway inserts into SWIM
8. NGITWS ingests data via SWIM
9. NGITWS inserts data into IWXXM Process, flow goes back to (2)