

# GISC Beijing Web services catalogue Project



GISC Beijing / CMA

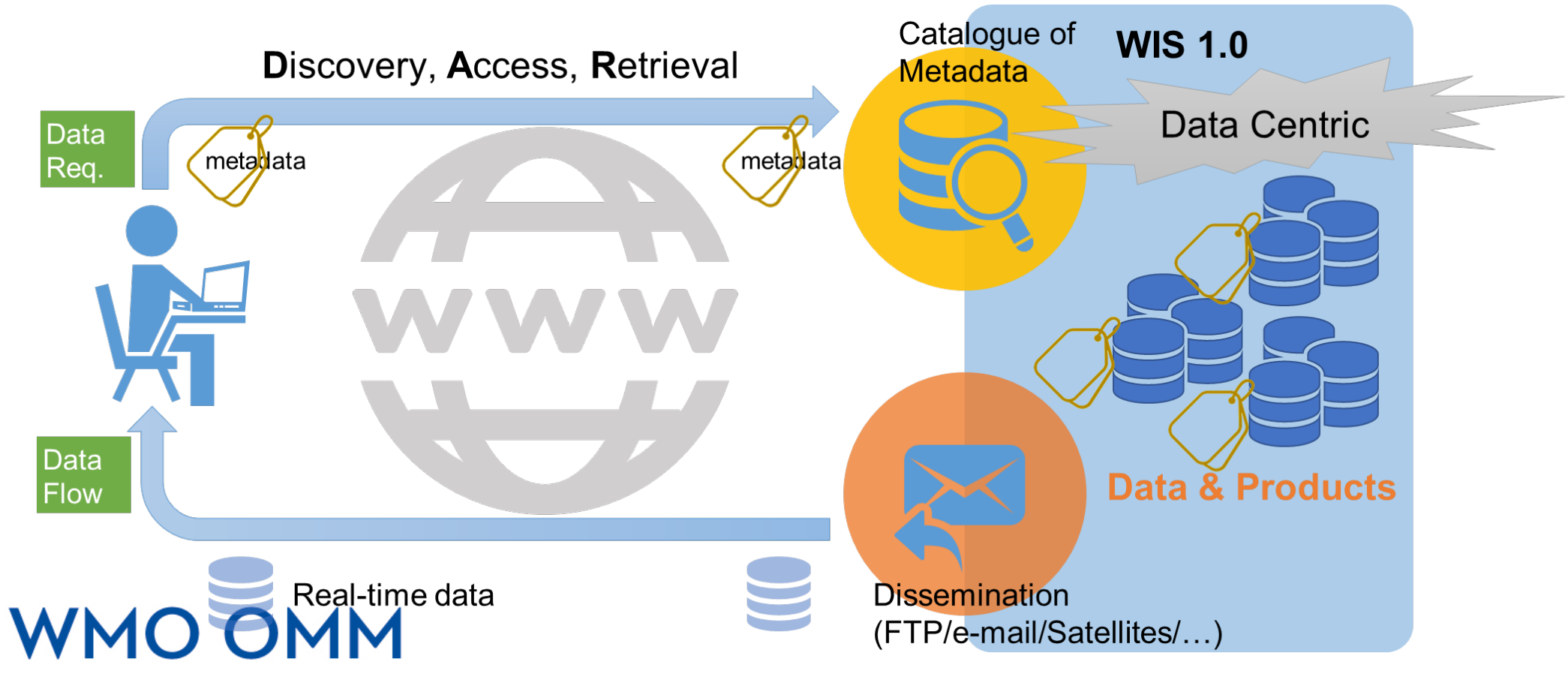
**WMO OMM**

World Meteorological Organization

Organisation météorologique mondiale

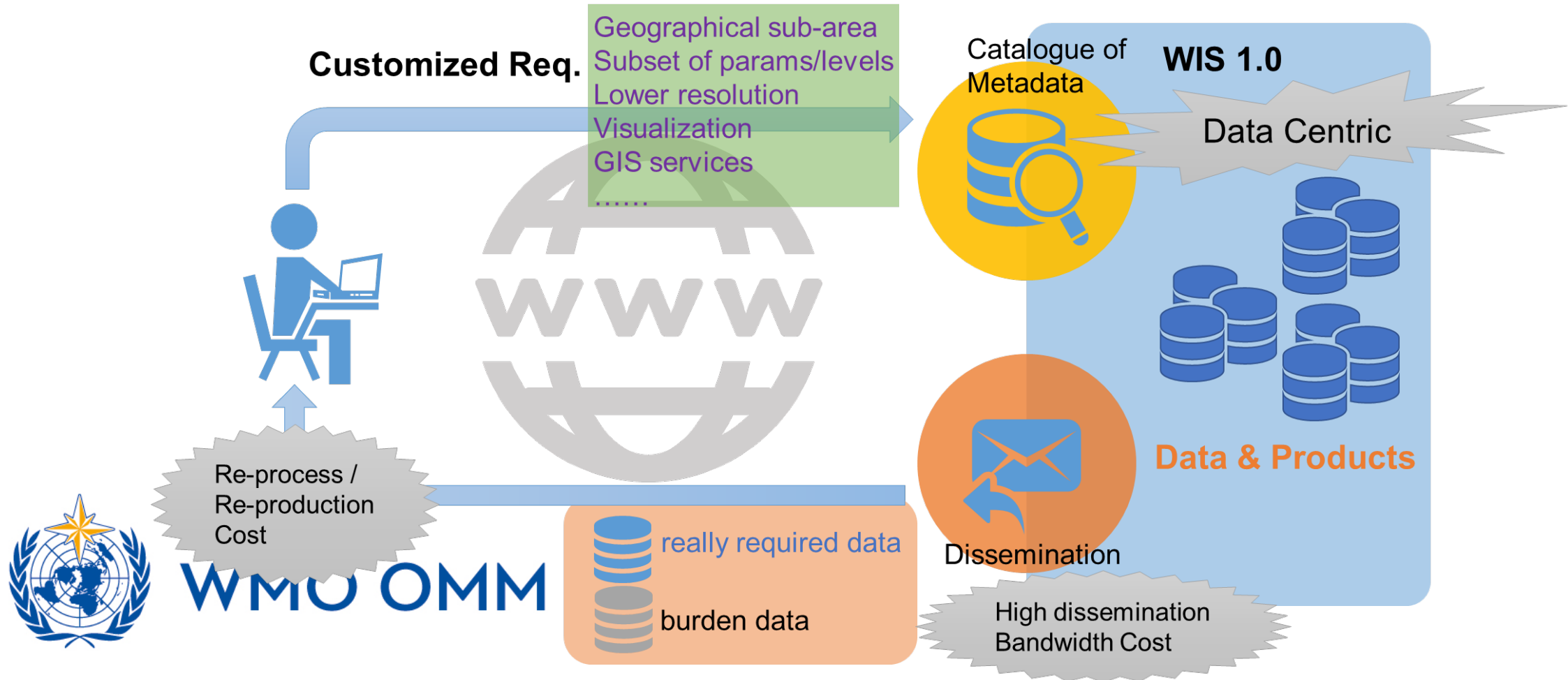
# Background

## Metadata & Catalogue in WIS 1.0 → Data Centric



# Background

## Impractical data exchange volumes in WIS 1.0



# Background

## WIS 2.0 Functional Architecture requires to:

- “Maintain and expose Catalogue of services and information”, containing metadata that describes both data and the services provided to access that data, via APIs, file download, etc.
- “Interoperate with other information systems”, particularly with the World Wide Web, ensuring the Web services can be indexed and discoverable by commercial search engines..



WMO OMM

# Project objectives

- Design metadata for WEB services and APIs and implement a Catalogue of services as a portal website.
- Service providers can publish their services as service metadata records, describing APIs, data and how to access them.
- Each service metadata is published to the Web with accessible URLs. Service users can discover their interested services, either via the Catalogue portal or by commercial search engines.
- Several services covering GISC Beijing AoR members will be implemented and published.



WMO OMM

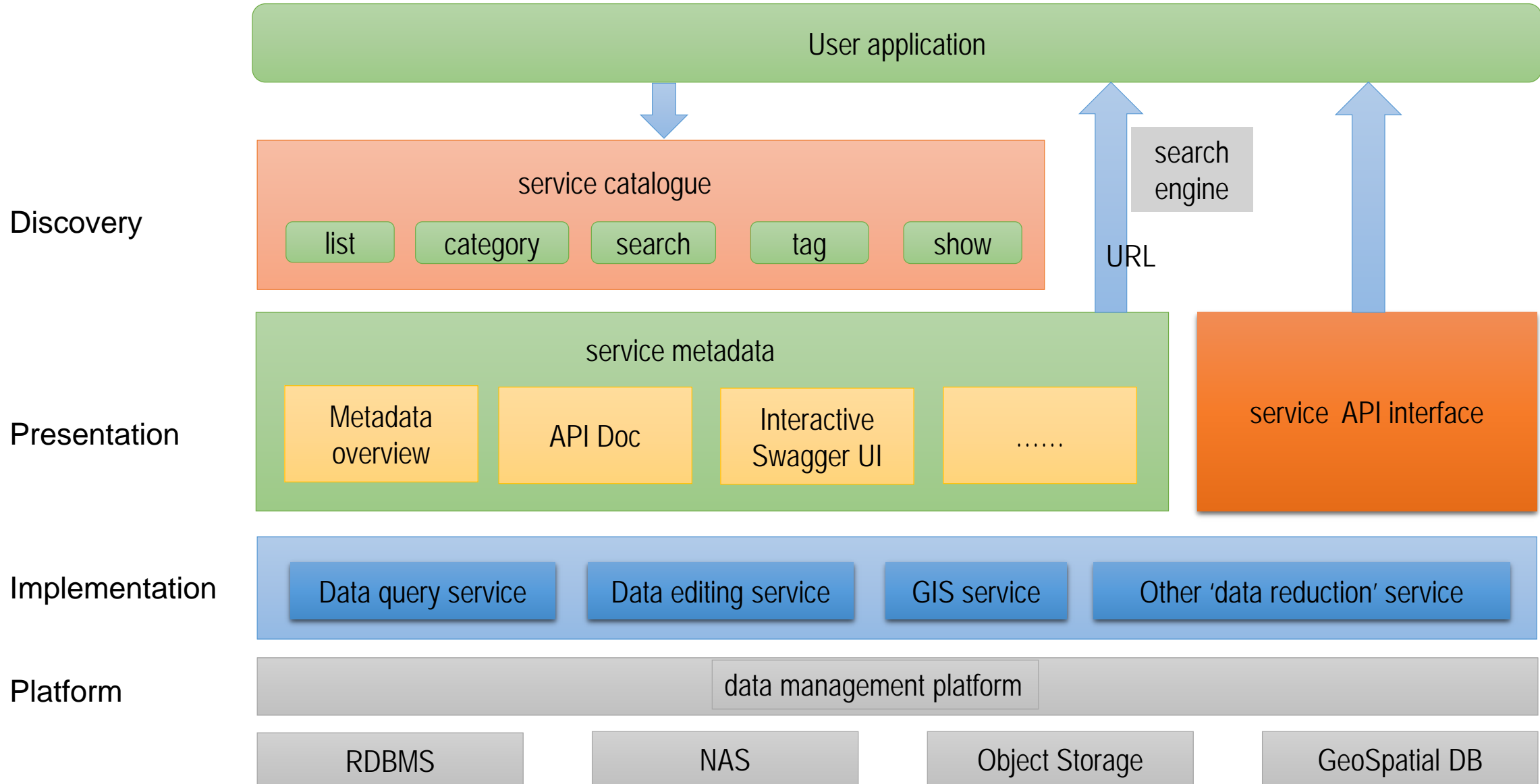
# Project team

- Wang Peng: Web portal design and development
- Han Xinqiang: Service metadata design
  
- GISC Beijing AoR members
  - TBD



WMO OMM

# Project plan



# Project plan

	Task	Item	Status (deliverable date)	WIS 2.0 Principle
1	service metadata design	sample	Finished	10
		schema	In-progress (2021-12)	
2	service metadata catalogue	catalogue navigation: Directory, Category	Finished	10
		records discover: search, tag	In-progress (2021-12)	
		record page display	Finished	
3	OpenAPI service demo	API design, development, publish	Finished	4 (service) 1 (OpenAPI) 5 (data reduction demo)
4	Web GIS service demo	development, publish	Finished	4 (service) 1 (Web GIS)
5	data reduction services publish/application	development	In-progress (2022-4)	5
		test run with operational data	In-progress (2022-5)	
		pre-operational with AoR members	In-progress (2022-8)	
6	“Readable” URL for service and data metadata	development	In-progress (2022-4)	2
7	Metadata indexed by Commercial Search Engine	demo development	In-progress (2022-6)	11
		test run	In-progress (2022-12)	



# WIS 2 Principles in the project (1/2)

	WIS 2 Principles	In Project
1	<b>WIS 2.0: adopts Web technologies and leverages industry best practices and open standards.</b>	✓
2	<b>WIS 2.0: uses Uniform Resource Locators (URL) to identify resources (i.e. Web pages, data, metadata, APIs).</b>	In-progress
3	WIS 2.0: prioritizes use of public telecommunications networks (i.e. the Internet) when publishing digital resources.	
4	<b>WIS 2.0: requires provision of Web service(s) to access or interact with digital resources (e.g. data, information, products) published using WIS.</b>	✓
5	<b>WIS 2.0: encourages NCs and DCPCs to provide 'data reduction' services via WIS that process 'big data' to create results or products that are small enough to be conveniently downloaded and used by those with minimal technical infrastructure.</b>	In-progress
6	WIS 2.0: will add open standard messaging protocols that use the publish-subscribe message pattern to the list of data exchange mechanisms approved for use within WIS and GTS.	



# WIS 2 Principles in the project (2/2)

	WIS 2 Principles	In Project
7	WIS 2.0: will require all services that provide real-time distribution of messages (containing data or notifications about data availability) to cache/store the messages for a minimum of 24-hours, and allow users to request cached messages for download.	
8	WIS 2.0: will adopt direct data-exchange between provider and consumer.	
9	WIS 2.0: will phase out use of routing tables and bulletin headers.	
10	<b>WIS 2.0: will provide a catalogue containing metadata that describes both data and the service(s) provided to access that data.</b>	✓
11	<b>WIS 2.0: encourages data providers to publish metadata describing their data and Web services in a way that can be indexed by commercial search engines.</b>	<b>in plan</b>



WMO OMM

# How the WIS 2 principle is implemented in the project

## Principle 1

WIS 2.0: adopts Web technologies and leverages industry best practices and open standards.

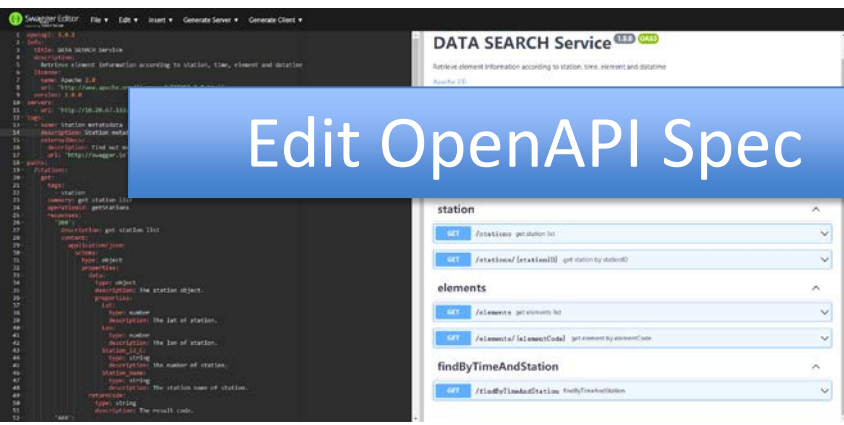
BENEFIT: Use of widely adopted practices and open standards will enable a large population of users to conveniently interact with WIS 2.0 to discover, access, and use authoritative weather, water and climate data.

Particularly open standards from the Internet Engineering Task Force (IETF), World Wide Web Consortium (W3C), the Open Geospatial Consortium (OGC)

OpenAPI v3 is strongly recommended



WMO OMM



Edit OpenAPI Spec

API Spec.  
(source)

Postman Testcase 



Tester

Publish OpenAPI

REST Code Frame



Developer

OpenAPI  
(YAML)

SwaggerUI (interactive)

Service API Doc

API Doc (HTML)

Web page of  
Service API doc

API Doc (Markdown)



WMO OMM

import

Codegen

Codegen

auto tool

export

export

# Why Markdown to present Service Metadata

The image shows a side-by-side comparison of a Markdown document and its rendered HTML output. The left pane displays the source code, including a main heading, a paragraph, a code sample, a license, a sub-heading, and another code sample. The right pane shows the rendered version, where the code is formatted as a web page with a title, a main heading, a paragraph, a license link, a sub-heading, and a code block. A green callout box is overlaid on the code, containing the text: "API Docs from multiple sources (e.g. DCPCs) can be rendered in same style (e.g. GISCs' portal)".

```
<h1 id="data-search-service">DATA SEARCH Service v1.0.0</h1>

> Scroll down for code samples, example requests and responses. Select a language for
code samples from the tabs above or the mobile navigation menu.

Retrieve element information according to station, time, element and datetime

Base URLs:

<a
href="http://
interface/</a>

License: <a href="http://www.apache.org/licenses/LICENSE-2.0.html">Apache
2.0</a>

<h1 id="data-search-service-station">station</h1>

## get station list

<a id="noIdgetStations"></a>

> Code samples

'''ruby
require 'rest-client'
```

DATA SEARCH Service v1.0.0

Scroll down for code samples, example requests and responses. Select a language for code samples from the tabs above or the mobile navigation menu.

License: [Apache 2.0](http://www.apache.org/licenses/LICENSE-2.0.html)

## station

### get station list

Code samples

```
require 'rest-client'
require 'json'

headers = /
```

API Docs from multiple sources (e.g. DCPCs) can be rendered in same style (e.g. GISCs' portal)

Markdown: 10027 bytes 789 words 438 lines Ln 8, Col 12

HTML: 5860 characters 888 words 466 paragraphs



# How the WIS 2 principle is implemented in the project

## Principle 4

WIS 2.0: requires provision of [Web service\(s\)](#) to access or interact with digital resources (e.g. data, information, products) published using WIS.

BENEFIT: Web services support 'machine-actionability' (i.e. the capacity of software systems to access, interoperate, and reuse data with little or no human intervention) because humans increasingly rely on computational support to deal with data as a result of increase in volume, complexity and velocity (i.e. creation speed) of data.

BENEFIT: NMHSs develop their capacity to build and operate Web services, allowing them to extract more value from their data holdings through delivery of higher value services to their users.



WMO OMM

# DEMO Service: Product Dissemination

**GET** /s2simg PNG Service

Parameters

Name	Description
<b>center</b> * required string (query)	center
<b>parameter</b> * required string (query)	parameter
<b>dateTime</b> * required string (query)	dateTime
<b>productType</b> * required string (query)	productType
<b>year</b> * required string (query)	year
<b>ens</b> * required string (query)	ENS member
<b>level</b> * required string (query)	level
<b>recordNo</b> * required string (query)	forecast step
<b>mapType</b> * required string (query)	map projection
<b>startLat</b> * required string (query)	Top Latitude
<b>endLat</b> * required string (query)	Bottom Latitude
<b>startLon</b> * required string (query)	Left Longitude
<b>endLon</b> * required string (query)	Right Longitude

Cancel

Product API

NetCDF

Server response

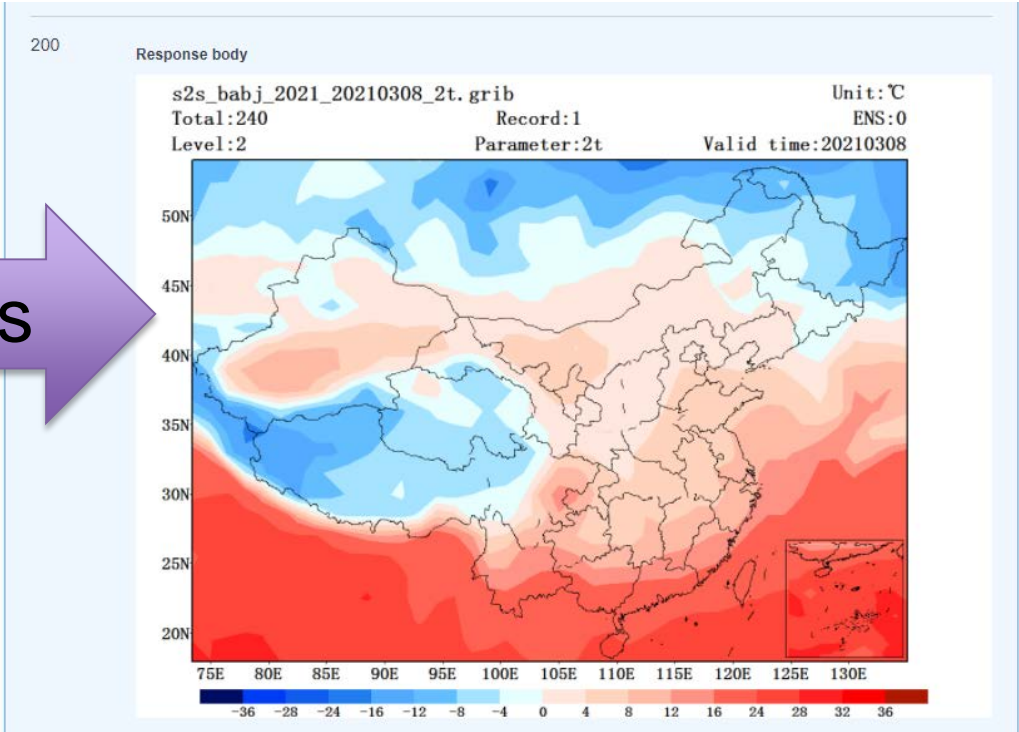
Code	Details
200	Response body

```
{ "returnCode": "0", "data": "http:// /s2s/model0peration/download/3152dd17-6796-4126-8315-2fac7e4062c9_babj_20210308_2t2_lon73.5-135.0_lat18.0-54.0/nc" }
```

Response headers

```
Access-Control-Allow-Headers: *  
Access-Control-Allow-Methods: GET,HEAD,POST,PUT,PATCH,DELETE,OPTIONS  
Access-Control-Allow-Origin: *  
Access-Control-Expose-Headers: *  
Connection: keep-alive  
Content-Length: 159  
Content-Type: text/plain;charset=UTF-8  
Date: Sun, 19 Sep 2021 06:03:21 GMT  
Keep-Alive: timeout=20
```

Images



# DEMO Service: Data Query (RESTful)

GET /stations/ {stationID} get station by stationID

Parameters

Name	Description
stationID * required (path)	stationID of station

54511

Curl

```
curl -X 'GET' \  
  'http://          :8080/cexs/interface/stations/54511' \  
  -H 'accept: application/json'
```

Request URL

```
http://          :8080/cexs/interface/stations/54511
```

Server response

Code	Details
200	Response body

```
{"returnCode": "0", "data": {"Station_Name": "BEIJING", "Lon":          , "Station_Id_C": "54511", "Lat": "  
  "}}
```

Download

Query a collection or an item of collection (RESTful)



WMO O



# How the WIS 2 principle is implemented in the project

## Principle 5

WIS 2.0: encourages NCs and DCPCs to provide 'data reduction' services via WIS that process 'big data' to create results or products that are small enough to be conveniently downloaded and used by those with minimal technical infrastructure.

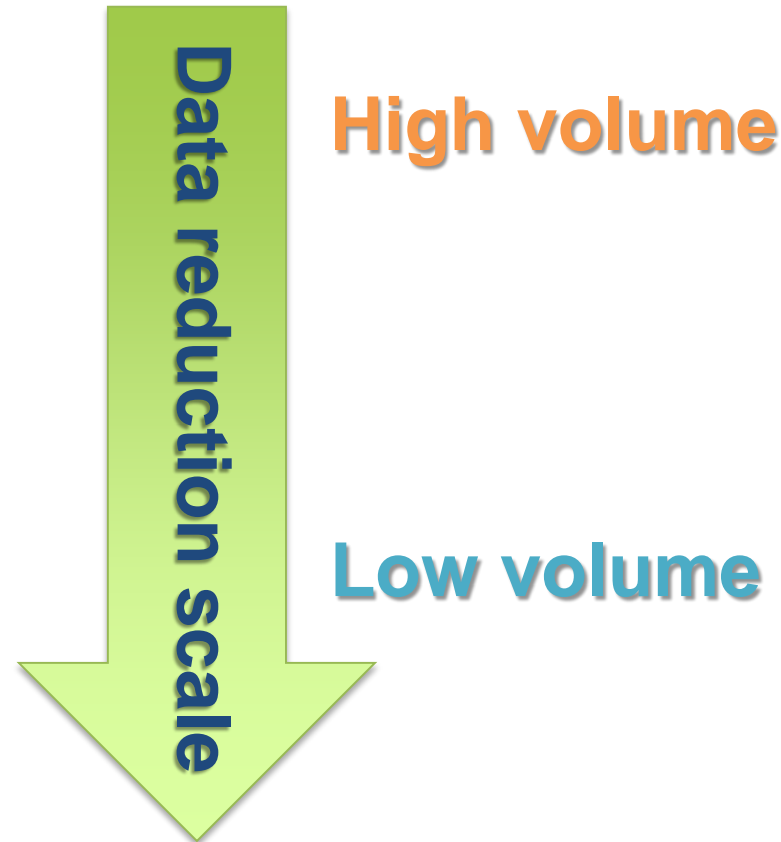
BENEFIT: Using 'data reduction' Web services to process high volume, complex data remotely, Members' agencies and institutions can deliver high-value, high-quality services to their governments and citizens helping them more effectively meet their national mandates without the need to invest in and operate their own data management infrastructure.



WMO OMM

# Data reduction service

- Implements some demo services showing the effectiveness of 'data reduction' Web services
  - Data download
  - Data customization
  - Data product generator (online)
  - Data query API
  - WebGIS/GIS services



**WMO OMM**

# How the WIS 2 principle is implemented in the project

## **Principle 10**

WIS 2.0: will provide a [Catalogue containing metadata](#) that describes both data and the service(s) provided to access that data.

BENEFIT: Users will be able to easily find the data in WIS that interests them, locate the most convenient Web service with which to access that data, and determine how to best use that Web service to meet their needs.



**WMO OMM**

# Catalogue Prototype (service metadata)

service category

Service catalog — data service containing various types of meteorological data

File Download | Product Dissemination | Data Query | GIS

Search

service list

Service catalogue

- service pack A
- S2S Product
- service pack B
- service pack C

Overview | API Doc (Markdown) | API Doc (Html) | Specification

urn:x-wmo:sm:cn.cma.wmc:product-Dissemination

**Title**  
This is a product dissemination sample

**abstract**  
This sample will help you understand how to use the product dissemination service.

**class**  
download

**keywords**  
S2S.product

**servicePermissions**  
public

**userScope**  
Internal members

**executionPermissions**  
read

**geographicBoundingBox**  
west : -30.00  
east : 120.00  
south : 00  
north : 90.00

**metadataStandardVersion**  
0.1

**contact**  
individualName : Zhang San  
organisationName : RTH Beijing - CMA  
address : 46 Zhongguancun Nandajie

Web page based on service metadata



WMO

# Catalogue Prototype (API documents)

Overview API Doc (Markdown) **API Doc (Html)** Specification

## S2S Data Interactive Service

No description provided (generated by Swagger). More information: <https://helloverb.com>. Contact info: [hello@helloverb.com](mailto:hello@helloverb.com). Version: 1.0.0. BasePath: /cexs/interface/. All rights reserved. <http://apache.org/licenses/LICENSE-2.0>

**Access**

**Methods**

[ Jump to Models ]

**Table of Contents**

- S2s
- GET /s2sgrib
- GET /s2snc
- GET /s2simg

**S2s**

**GET /s2sgrib**

GRIB Service (getS2SGrib)

**Query parameters**

- center (required)**  
Query Parameter — center
- parameter (required)**  
Query Parameter — parameter

```
http://10.20.0.133:8080/cexs/interface/s2simg?
GET /s2simg
Parameters</h3>
36 -H 'Accept: image/png'
37
38
39
40 `GET /s2simg`
41
42 <h3 id="png-service-parameters">Parameters</h3>
43
44 |Name|In|Type|Required|Description|
45 |---|---|---|---|---|
46 |center|query|string|true|center|
47 |parameter|query|string|true|parameter|
48 |dateTime|query|string|true|dateTime|
49 |productType|query|string|true|productType|
50 |year|query|string|true|year|
51 |ens|query|string|true|ENS member|
52 |level|query|string|true|level|
53 |recordNo|query|string|true|forecast step|
54 |mapType|query|string|true|map projection|
55 |startLat|query|string|true|Top Latitude|
56 |endLat|query|string|true|Bottom Latitude|
57 |startLon|query|string|true|Left Longitude|
58 |endLon|query|string|true|Right Longitude|
59
60 > Example responses
61
62 > 200 Response
63
64 <h3 id="png-service-responses">Responses</h3>
65
66 |Status|Meaning|Description|Schema|
67 |---|---|---|---|
68 |200|[OK]|
69 (https://tools.ietf.org/html/rfc7231#section-6.3.1)
70 |400|[Bad Request]|
71 (https://tools.ietf.org/html/rfc7231#section-6.5.1)
72 |405|[Method Not Allowed]|
```

Name	In	Type	Required	Description
center	query	string	true	center
parameter	query	string	true	parameter
dateTime	query	string	true	dateTime
productType	query	string	true	productType
year	query	string	true	year
ens	query	string	true	ENS member
level	query	string	true	level
recordNo	query	string	true	forecast step
mapType	query	string	true	map projection
startLat	query	string	true	Top Latitude
endLat	query	string	true	Bottom Latitude
startLon	query	string	true	Left Longitude
endLon	query	string	true	Right Longitude

**API Doc (markdown)**

Status	Meaning	Description	Schema
200	[OK]		
400	[Bad Request]		
405	[Method Not Allowed]		

File Download **Product Dissemination** Data Query GIS

Service catalogue

- service pack A
- S2S Product
- service pack B
- service pack C

Swagger  
Supported by SMARTBEAR

/cexs/static/service/yaml/s2s.yaml?ver=1.0.7 **Explore**

## S2S Data Interactive Service

1.0.0 OAS3

Servers

http:// :8080/cexs/interface/

S2S service Season to Sub-season service

s2s

**GET /s2simg** PNG Service

**GET /s2snc** NetCDF Service

Parameters **Try it out**

Name	Description
<b>center</b> * required	center
string (query)	Example : ecmf

ecmf

Interactive API spec



# How the WIS 2 principle is implemented in the project

## Principle 11

WIS 2.0: encourages data providers to publish metadata describing their data and Web services in a way that can be indexed by commercial search engines.

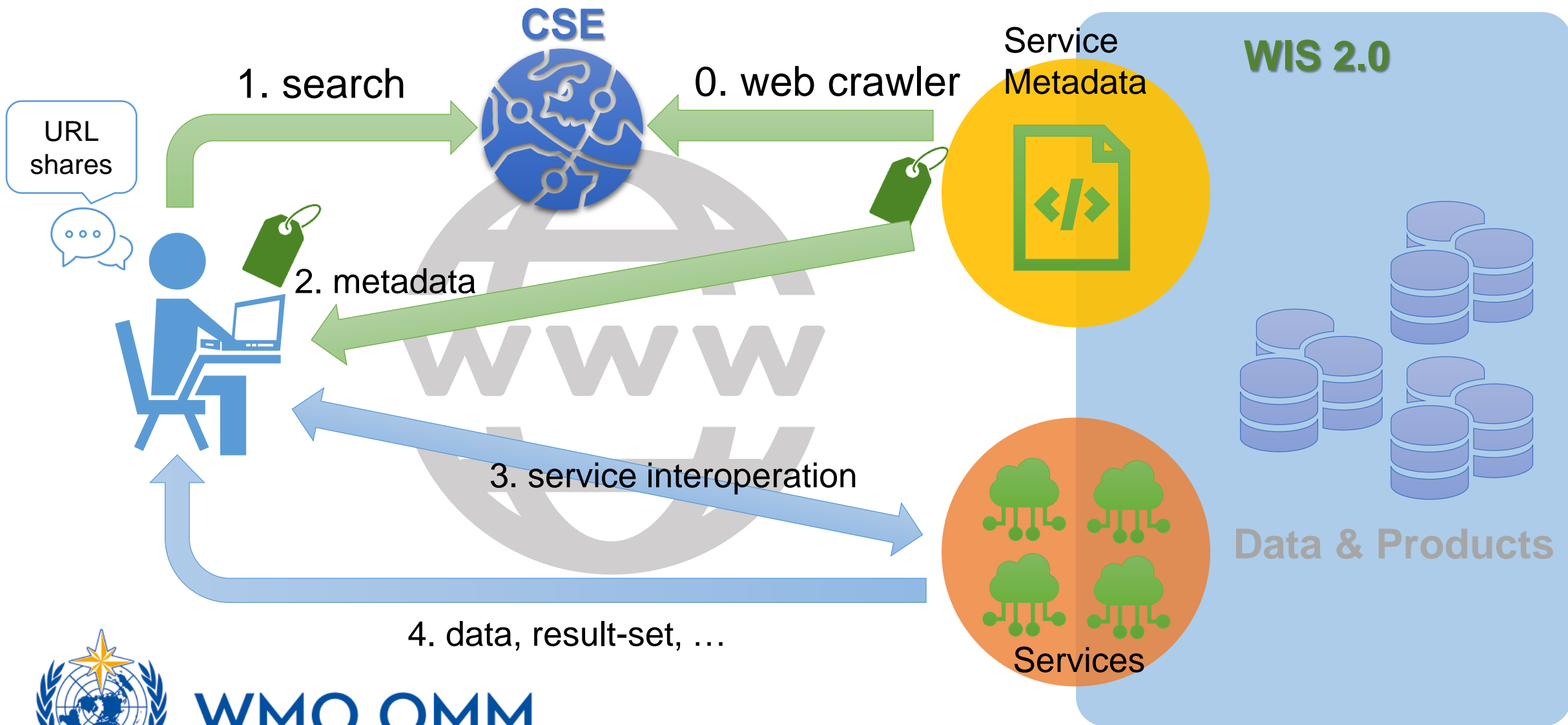
BENEFIT: Indexing by commercial search engines will help users discover data and associated services using their preferred search engine rather than having to find and use a WIS portal.

As an example of how Google use [schema.org](https://schema.org) structured markup to enable users to find datasets, please see the following article from Nature: "Google unveils search engine for open data" <https://www.nature.com/articles/d41586-018-06201-x>



WMO OMM

# Service Discovery via Commercial Search Engines [in Plan]



WMO OMM

# [Existing Practice] Service Discovery via Commercial Search Engines

## Step 1: Search

Google nws weather api stations

https://www.weather.gov/documentation/services-w...  
API Web Service - National Weather Service

The National Weather Service (NWS) API allows developers access to critical forecasts, alerts, and observations, along with other weather data. The API was ...

People also search for  
accuweather api national weather service  
free weather api noaa api example  
noaa api python open weather api

### People also ask

- Does NWS have an API?
- Is NOAA Weather API free?
- How can I get a free weather API?
- What is the best weather API?

### API Web Service

Weather.gov > Documentation > API Web Service

Documentation National Headquarters

Services Technical Bulletins

Overview Examples Updates Specification

#### Specification

**Important!** Only the following endpoints are considered operational. Changes to operational endpoints are subject to [PNS and SCN notices](#). All other endpoints are subject to change without notice.

- /alerts/\*

**Note:** All times generated by the API are in [ISO-8601 format](#).

## Step 2: Browse API list

Filter by tag

GET	/alerts
GET	/alerts/active
GET	/alerts/types
GET	/alerts/{id}
GET	/alerts/active/count
GET	/alerts/active/zone/{zoneId}
GET	/alerts/active/area/{area}
GET	/alerts/active/region/{region}

## Step 3: Read API metadata

### GET /stations/{stationId}

Returns metadata about a given observation station

Parameters Try it out

Name	Description
stationId * required	
string (path)	

Responses

Code	Description	Links
200	<b>success</b>	No links
	<input type="text" value="application/geo+json"/>	
	Controls Accept header:	
default	<b>An error response</b>	No links
	<input type="text" value="application/problem+json"/>	

Example Value | Schema

```
{
  "title": "Unexpected Problem",
  "type": "https://api.weather.gov/problems/UnexpectedProblem",
  "status": 500,
  "detail": "An unexpected problem has occurred.",
  "instance": "https://api.weather.gov/requests/493c3a1d-f87e-407f-ae2c-24483f5aab63",
  "correlationId": "493c3a1d-f87e-407f-ae2c-24483f5aab63"
}
```

## Step 4: Develop code to use API





# Project data standards (in current status)

- Data source: GRIB data in data management platform
- Data service:
  - Data customization: GRIB, NetCDF
  - Data product: PNG
  - Data query: JSON
  - WebGIS: WMTS (tiles)



WMO OMM

# Project metadata standards

- Based on WMO Core Metadata profile v1.3
  - extending / updating key elements
- Add [hyperlinks](#) to API specification (e.g. OpenAPI)
- JSON/YAML format

	Name / Role name	Definition	Obligation / Condition	Maximum occurrence	Data type
1	MD_Metadata	root entity which defines metadata about a resource or resources	M	1	Class
2	fileIdentifier	unique identifier for this metadata file	M	1	CharacterString
6	hierarchyLevel	scope to which the metadata applies	O	1	Class
8	contact	party responsible for the metadata	M	N	Class
9	dateStamp	date that the metadata was created or revised	M	1	Class
10	metadataStandardName	name of the metadata standard (including profile name) used	O	1	CharacterString
11	metadataStandardVersion	version of the metadata standard (version of the profile) used	O	1	CharacterString
15	Role name: identificationInfo	basic information about the resource(s) to which the metadata applies	M	N	Association



WMO OMM

# Data discovery

Data & service discovery:

- via **Catalogue**: directory, search, tag
- via **Search-Engine**: metadata indexed by commercial search engine
- via **Readable URL**: URL share (e.g. email, IM), search engine, .....



WMO OMM



# Input to WIS2 (1/2)

## Contribution

- Proposals on schema of service metadata, defining:
  - key elements: extending, updating
  - metadata format: JSON
- Service catalogue (prototype) and demo services
- Data reduction services, providing operational data
  - Data customization
  - Data visualization
  - WebGIS
- .....

# Input to WIS2 (2/2)

## Recommended practice

- OpenAPI v3 as API specification
- Use OpenAPI v3 tools (edit/codegen/...) for rapid development based on OpenAPI spec (text)
- Use Markdown format to present service API documents

WEATHER CLIMATE WATER

TEMPS CLIMAT EAU



Thank you  
Merci

WMO OMM

World Meteorological Organization

Organisation météorologique mondiale