

# Metadata Recommendations Supporting Data Discovery and Use in Data.gov and GeoPlatform.gov

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*This document was updated October 10, 2014 to move references specific to National Geospatial Data Asset (NGDA) Datasets into the [National Geospatial Data Asset \(NGDA\) Metadata Guidelines](#). NGDA resource developers should utilize **both** this document and the [National Geospatial Data Asset \(NGDA\) Metadata Guidelines](#). Additional updates to this document are in progress and **all** Data.gov publishers are encouraged to check for updates on [GeoPlatform Tutorials and Trainings](#) before applying the guidance.*

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## Introduction

Metadata collection has been ongoing for many years in the geospatial field. With the publication of the initial Content Standard for Digital Geospatial Metadata (CSDGM) in 1994 and its [Version 2 in 1998](#), and globally with the international metadata standard including [ISO 19115:2003](#), [ISO 19115-2:2009](#), [ISO 19115-1:2014](#) and its XML form, [ISO TS19139:2007](#), [ISO/TS19139-2:2012](#). The primary objective of these standards is to provide contextual documentation of geospatial resources – data, services, documents, and applications that enable fitness-for-use evaluations, and facilitate direct online access to the described resources.

The documentation of online accessible data and information products, specifically the location of data sets and applications for download and web service URLs for real-time visualization, data access and/or data processing is a priority for Data.gov. This is accomplished by creating and publishing to Data.gov a metadata record or collection of records that describes the resource(s). Data.gov collects metadata describing both non-spatial and geospatial information. This document identifies the best practices of *geospatial* metadata creation and publishing. This will lead to a greater ease of resource discovery and access through cataloguing systems such as [catalog.Data.gov](#) and [GeoPlatform.gov](#) (Geospatial Platform). A separate [Implementation Guide](#) is available for the preparation of metadata associated with the [Federal Open Data Policy](#).

## Provide direct URL to online resources in metadata

Resources (data, services, applications) that are described in either CSDGM or ISO metadata must include URLs that take a user to the online resource. This is a baseline expectation of the Data.gov environment and one that must be followed in the shared catalog to make resources universally available. These URL links provide direct access to the resource wherever possible. Metadata records that only include references to websites or HTML pages where one must re-initiate search are not user-friendly and preclude automated clients from accessing the data. As both metadata standards allow for multiple resource links to be placed in metadata, this should be encouraged to allow users to directly access multiple facets of the data: web service, download, documentation, and browse graphics.

## Use the appropriate metadata structure to describe the download or access URL

In CSDGM metadata, links to resources should be in the Distribution section of the standard using the following XML substructure (CSDGM V 2.0 1998), where Format Name (`formatname`) should describe the specific format being made available in this group. The paired online URL is in the CSDGM Network Resource (`networkr`) element.

Multiple access methods may be described in a metadata document for links to different formats. Online Linkage (`onlink`) is sometimes used to store actionable URLs, but is not recommended for encoding the distribution linkage

```
<digform>
  <digtinfo>
    <formname>shapefile</formname>
  </digtinfo>
  <digtopt>
    <onlinopt>
      <computer>
        <networka>
          <networkr>http://someagency.gov/data/prod_234.zip
        </networkr>
        </networka>
      </computer>
    </onlinopt>
  </digtopt>
</digform>
```

In ISO 19115, the following constructs can be used in the Distribution Section describing the downloadable data resource and its access, format, and function. Where a resource is available through a WMS or WFS, it is more helpful to include two linkages in the distribution section – one (`download`) link for the WMS “GetMap” or WFS “GetFeature” request URL, and the other (`information`) link for the WMS “GetCapabilities” URL. This enables catalog clients to find and bind to exactly the resource being described among many possible layers or feature types in a service.

Multiple instances of distribution information should be included in one metadata record, where available.

```
//gmd:distributionInfo/gmd:MD_Distribution/gmd:distributionFormat/
```

```
<gmd:MD_Format>
  <gmd:name>
    <gco:CharacterString>GeoTIFF</gco:CharacterString>
  </gmd:name>
  <gmd:version gco:nilReason="unknown"/>
</gmd:MD_Format>
```

```
//gmd:distributionInfo/gmd:MD_Distribution/
```

```
<gmd:transferOptions>
  <gmd:MD_DigitalTransferOptions>
    <gmd:onLine>
      <gmd:CI_OnlineResource>
        <gmd:linkage>
          <gmd:URL>http://server.gov/tiffs/bouguer_ok.tif</gmd:URL>
        </gmd:linkage>
        <gmd:function>
          <gmd:CI_OnLineFunctionCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_OnLineFun
ctionCode"codeListValue="download"> download
          </gmd:CI_OnLineFunctionCode>
        </gmd:function>
      </gmd:CI_OnlineResource>
    </gmd:onLine>
  </gmd:MD_DigitalTransferOptions>
</gmd:transferOptions>
<gmd:transferOptions>
  <gmd:MD_DigitalTransferOptions>
    <gmd:onLine>
      <gmd:CI_OnlineResource>
        <gmd:linkage>
```

```

                <gmd:URL>http://catalog.usgin.org/thredds/wms/ok/
ok_bouguergravity.nc?service=WMS&version=1.3.0&request=
GetCapabilities</gmd:URL>
            </gmd:linkage>
            <gmd:protocol>
                <gco:CharacterString>OGC:WMS</gco:CharacterString>
            </gmd:protocol>
            <gmd:function>
                <gmd:CI_OnLineFunctionCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodetlists.xml#CI
_OnLineFunctionCode" codeListValue="information"> information
                </gmd:CI_OnLineFunctionCode>
            </gmd:function>
            </gmd:CI_OnlineResource>
        </gmd:onLine>
    </gmd:MD_DigitalTransferOptions>
</gmd:transferOptions>
<gmd:transferOptions>
    <gmd:MD_DigitalTransferOptions>
        <gmd:onLine>
            <gmd:CI_OnlineResource>
                <gmd:linkage>
                    <gmd:URL>http://catalog.usgin.org/thredds/wms/ok/
ok_bouguergravity.nc?service=WMS&version=1.3.0&request=
GetMap&layers=bouguergravity</gmd:URL>
                </gmd:linkage>
                <gmd:protocol>
                    <gco:CharacterString>OGC:WMS</gco:CharacterString>
                </gmd:protocol>
                <gmd:function>
                    <gmd:CI_OnLineFunctionCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodetlists.xml#CI
_OnLineFunctionCode" codeListValue="download"> download
                    </gmd:CI_OnLineFunctionCode>
                </gmd:function>
            </gmd:CI_OnlineResource>
        </gmd:onLine>
    </gmd:MD_DigitalTransferOptions>
</gmd:transferOptions>

```

Metadata will be indexed and properly classified as to resource type where format and protocol clues are used. This clarifies the information resource payload to be accessed at the link. Data, service, and application resource types can be detected by the proper use of the values described at the end of this document for Format Name – paired with the URL it is describing.

If you are describing only a general Web service endpoint, i.e. WMS, WFS, WPS, then you may wish to describe the service using the ISO SV\_Metadata construct according to the next example.

In general, data and services should be documented using separate metadata records. This approach enables:

- the documentation of characteristics, (abstract, coordinate references systems, geographic and temporal extents, keywords, etc.) that are specific to the data or service
- the application of data management and retrieval practices that are specific to the data or service
- a single service to be associated, via the metadata record, with multiple datasets and a single dataset to be associated with multiple services.

In those cases where a dataset and a service are closely coupled, e.g. a service developed specifically for a dataset or collection, a single metadata record may be in order.

```

<gmd:MD_Metadata>
  <gmd:identificationInfo>
    <srv:SV_ServiceIdentification>
      <gmd:citation/>
      <gmd:abstract/>
      <srv:serviceType>
        <gco:LocalName>ogc:wms</gco:LocalName>
      </srv:serviceType>
      <srv:serviceTypeVersion>
        <gco:CharacterString>1.3.0</gco:CharacterString>
      </srv:serviceTypeVersion>
      <srv:couplingType/>
      <srv:containsOperations>
        <srv:SV_OperationMetadata>
          <srv:operationName>
            <gco:CharacterString>getCapabilities
            </gco:CharacterString>
          </srv:operationName>
          <srv:DCP>
            <srv:DCPList
codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_112"
codeListValue="WebServices">WebServices</srv:DCPList>
            </srv:DCP>
            <srv:connectPoint>
              <gmd:CI_OnlineResource>
                <gmd:linkage>
                  <gmd:URL>http://someagency.org/svc/maps.cgi</gmd:URL>
                  </gmd:linkage>
                </gmd:CI_OnlineResource>
              </srv:connectPoint>
            </srv:SV_OperationMetadata>
          </srv:containsOperations>
        </srv:SV_ServiceIdentification>
      </gmd:identificationInfo>

```

### **Include terms found in published taxonomies in your metadata**

In ISO Metadata, there is a structure allowing for the identification of one or more Topic Categories that best characterize your data or application domain. These are very high-level thematic bins, but are excellent for providing a quick triage of available data when indexed in the Data.gov catalog.

The valid values for ISO Topic Category keywords are:

- biota
- boundaries
- climatologyMeteorologyAtmosphere
- economy
- elevation
- environment
- farming
- geoscientificInformation
- health
- imageryBaseMapsEarthCover
- inlandWaters
- intelligenceMilitary
- location
- oceans
- planningCadastre
- society
- structure
- transportation
- utilitiesCommunication

Using CSDGM, include one or more Topic Categories as a Theme Keyword and specify "ISO 19115 Topic Category" as the theme keyword thesaurus.

```
<keywords>
  <theme>
    <themekt>ISO 19115 Topic Category</themekt>
    <themekey>biota</themekey>
    <themekey>environment</themekey>
  </theme>
</keywords>
```

Use the ISO 19115/19139 approach to ISO Topic Category per the following example structure when using ISO metadata:

```
<gmd:topicCategory>
  <gmd:MD_TopicCategoryCode>biota</gmd:MD_TopicCategoryCode>
</gmd:topicCategory>
<gmd:topicCategory>
  <gmd:MD_TopicCategoryCode>environment</gmd:MD_TopicCategoryCode>
</gmd:topicCategory>
```

Other vocabularies or taxonomies can be referenced. For example, if your community uses the Global Change Master Directory Science Keywords be sure to reference the source in the Theme Keyword Thesaurus field (themekt = GCMD Science Keywords) in your metadata with a valid string (value) found in the following file: <http://gcmdservices.gsfc.nasa.gov/static/kms/sciencekeywords/sciencekeywords.csv>

CSDGM and ISO metadata have a means to distinguish between "place" and "theme" keywords so that they do not share the same search index. This allows publishers to enter locations by name and controlled terms from published vocabularies similar to the keywords used in CSDGM. Do not enter place names in the "theme" keywords entries.

The following example shows the ISO structure for "theme" and "place" keywords:

```
<gmd:descriptiveKeywords>
  <gmd:MD_Keywords>
    <gmd:keyword><gco:CharacterString>EARTH SCIENCE &gt; Oceans &gt; Ocean
    Circulation &gt; Ocean Currents</gco:CharacterString></gmd:keyword>
    <gmd:keyword><gco:CharacterString>EARTH SCIENCE &gt; Oceans &gt; Ocean
    Temperature &gt; Water Temperature</gco:CharacterString></gmd:keyword>
    <gmd:type>
      <gmd:MD_KeywordTypeCode
        codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodeLists.xml#MD
        _KeywordTypeCode"
        codeListValue="theme">theme</gmd:MD_KeywordTypeCode>
      </gmd:type>
    <gmd:thesaurusName>
      <gmd:CI_Citation>
        <gmd:title><gco:CharacterString>GCMD Science Keywords
          </gco:CharacterString></gmd:title>
        <gmd:date gco:nilReason="unknown"/>
      </gmd:CI_Citation>
    </gmd:thesaurusName>
  </gmd:MD_Keywords>
</gmd:descriptiveKeywords>
<gmd:descriptiveKeywords>
  <gmd:MD_Keywords>
    <gmd:keyword><gco:CharacterString>Pacific Ocean</gco:CharacterString>
    </gmd:keyword>
    <gmd:type>
      <gmd:MD_KeywordTypeCode
        codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodeLists.xml#MD
```

```

 KeywordTypeCode" codeListValue="place">place</gmd:MD_KeywordTypeCode>
 </gmd:type>
 <gmd:thesaurusName>
 <gmd:CI_Citation>
 <gmd:title><gco:CharacterString>None</gco:CharacterString>
 </gmd:title>
 <gmd:date gco:nilReason="unknown"/>
 </gmd:CI_Citation>
 </gmd:thesaurusName>
 </gmd:MD_Keywords>
 </gmd:descriptiveKeywords>

```

## Referencing browse graphics or thumbnails

In both metadata standards there is a provision to reference a thumbnail 'browse' graphic. This will be rendered in your metadata if the URL is placed in the CSDGM Browse Graphic structure, field: browsen, or the MD\_BrowseGraphic structure in ISO.

## Publish only your original metadata/data

Many legacy collections of metadata exist where entries from partner agencies are included within the catalog. This may have been done to collate available resources into a community catalog. When harvested into a common index, this practice may lead to duplication of metadata. Worse, it may imply ownership or authorship of data from other sources.

Data.gov takes a focused view that resources being published should be 'original' to the publishing agency. When committing data to Data.gov, a publisher is asserting that the data conform to the data quality guidelines of the publishing organization and that they are authors of such data. If an agency participated in the development of the data set (sponsorship, co-development, collection, modification, re-processing) then the metadata may be published by the agency to catalog.Data.gov with clear attribution to the source and participating organizations as a co-authored or derivative product. Metadata for data not originating in an agency should not be registered with the Data.gov catalog.

## Publish your metadata only once

Geospatial and 'raw' data metadata are now to be harvested into catalog.Data.gov. In most agencies one entity would identify and approve raw entries, while another would share their geospatial catalogs with geo.Data.gov. Since there is only one catalog now, be sure that data resources are published to the catalog – if tabular through the 'raw' data metadata feed, if geospatial through the catalog Web Accessible Folder (WAF) or CSW. It is recommended that you coordinate your publication efforts within the agency to provide a consistent view of agency metadata holdings.

## Write descriptive titles and abstracts

Following good library and publications practice, titles of metadata documents should be declarative so that when reviewed, the user has a good sense of the information context being promoted. Titles must also be unique – having a dozen results with the identical title is not very helpful to the end user and there are features within the results that should be elevated to the title to distinguish them. Good titles will include the topic, and where relevant, the range of dates and geography associated with the data product being documented – What? Where? When? Where resources have local, regional, national, or global coverage, it should be apparent in the title. If the metadata describes a modification of data from another source, that also should be noted in the title. Never use a filename as the title of a metadata record! Although titles should not try to replace an Abstract or more lengthy description, they should not be terse. You may also wish to review the titles of your metadata records relative to those already in the catalog to assure distinction between the various entries.

A rich abstract provides additional information and enables users to better assess the data resource's fitness for use. The abstract should include:

- a general description of the data resource content and features
- form of the data resource, e.g. GIS, imagery, database, service, application, etc.
- relevant place names and references
- the time period of the data resource content
- information about special data characteristics or limitations, e.g. data access limitations, excluded geographies or content, etc

### **Collections or series of homogeneous data need collection-level and member-level metadata records**

Homogeneous series data are all of the same content, share most of the same metadata values, and might only vary in terms of content date and geographic extent. Examples include satellite imagery repositories, or data product series individually available for download. This type of collection management is not applicable to most heterogeneous collections where every record should be indexed and is unique relative to its peers within the collection.

To support homogeneous collections, the catalog.Data.gov solution supports the ability to distinguish a 'parent' metadata record that contains the basic information common to the full series. The first resource description link (under the distribution section) should be a URL to the WAF or CSW GetRecords URL containing the series metadata records. These 'child' records are separately indexed and made discoverable to the user after finding the parent record in general search. The parent record should not be located with the children in the folder or its subfolders.

### **Specify content dates**

Both CSDGM and ISO metadata include metadata fields to store dates related to the metadata and the information content itself. In CSDGM, the Source Time Period of Content structure carries single date or the beginning and ending date of the data, expressed using ISO 8601 Dates in the form of YYYYMMDD or YYYY-MM-DD. The word 'present' may also be used in lieu of an end-date for continuously collected data.

In ISO metadata, the following structure should be used, by example, using the same date format:

```
<gmd:temporalElement>
  <gmd:EX_TemporalExtent>
    <gmd:extent>
      <gml:TimePeriod gml:id="boundingTemporalExtent">
        <gml:description>ground condition</gml:description>
        <gml:beginPosition>1999-11-03</gml:beginPosition>
        <gml:endPosition>2012-12-30</gml:endPosition>
      </gml:TimePeriod>
    </gmd:extent>
  </gmd:EX_TemporalExtent>
</gmd:temporalElement>
```

The indeterminatePosition attribute can be used in time positions. This attribute is often used to document unknown and present dates. The valid values for indeterminatePosition are "unknown", "after", "before", and "now".

The following example shows how an unknown date is represented in ISO:

```
<gmd:temporalElement>
  <gmd:EX_TemporalExtent>
    <gmd:extent>
      <gml:TimePeriod gml:id="boundingTemporalExtent">
        <gml:description>ground condition</gml:description>
        <gml:beginPosition>2012-08-15T20:00:00</gml:beginPosition>
        <gml:endPosition indeterminatePosition="unknown"/>
      </gml:TimePeriod>
    </gmd:extent>
  </gmd:EX_TemporalExtent>
</gmd:temporalElement>
```

The use of “now” is equivalent to the use of “present” in CSDGM:

```
<gml:endPosition indeterminatePosition="now"/>
```

Publication date can also be encoded in the ISO Identification Section as a useful date for search on information products, as per the following example:

```
<gmd:date>
  <gmd:CI_Date>
    <gmd:date>
      <gco>Date>2010-06-04</gco>Date>
    </gmd:date>
    <gmd:dateType>
      <gmd:CI_DateTypeCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodetlists
.xml#CI_DateTypeCode" codeListValue="publication"
codeSpace="002">publication</gmd:CI_DateTypeCode>
    </gmd:dateType>
  </gmd:CI_Date>
</gmd:date>
```



**Supplement: Recommended format and protocol codes to be used in the 'Format Name' field for proper type classification in Data.gov**

Known raster geospatial data formats (resource type: data) include the following:

Description	'Format Name' Value
<a href="#">Arc/Info ASCII Grid</a>	AAIGrid
<a href="#">ADRG/ARC Digitized Raster Graphics (.gen/.thf)</a>	ADRG
<a href="#">Arc/Info Binary Grid (.adf)</a>	AIG
<a href="#">Magellan BLX Topo (.blx, .xlb)</a>	BLX
<a href="#">Bathymetry Attributed Grid (.bag)</a>	BAG
<a href="#">Microsoft Windows Device Independent Bitmap (.bmp)</a>	BMP
<a href="#">VTP Binary Terrain Format (.bt)</a>	BT
<a href="#">USGS LULC Composite Theme Grid</a>	CTG
<a href="#">Spot DIMAP (metadata.dim)</a>	DIMAP
<a href="#">DODS / OPeNDAP</a>	OPeNDAP
<a href="#">USGS DOQ</a>	DOQ
<a href="#">Military Elevation Data (.dt0, .dt1, .dt2)</a>	DTED
<a href="#">Arc/Info Export E00 GRID</a>	E00GRID
<a href="#">ERDAS Compressed Wavelets (.ecw)</a>	ECW
<a href="#">Erdas Imagine Raw</a>	EIR
<a href="#">ENVI .hdr Labelled Raster</a>	ENVI
<a href="#">Epsilon - Wavelet compressed images</a>	EPSILON
<a href="#">ERMapper (.ers)</a>	ERS
<a href="#">Envisat Image Product (.n1)</a>	ESAT
<a href="#">EOSAT FAST Format</a>	FAST
<a href="#">Graphics Interchange Format (.gif)</a>	GIF
<a href="#">WMO GRIB1/GRIB2 (.grb)</a>	GRIB
<a href="#">GRASS Rasters</a>	GRASS
<a href="#">GRASS ASCII Grid</a>	GRASSASCIIGrid
<a href="#">Golden Software Surfer 7 Binary Grid</a>	GS7BG
<a href="#">TIFF / BigTIFF / GeoTIFF (.tif)</a>	GeoTiff
<a href="#">Tag Image File Format / Electronic Photography (TIFF/EP)</a>	TIFF/EP
<a href="#">GXF - Grid eXchange File</a>	GXF
<a href="#">Hierarchical Data Format Release 4 (HDF4)</a>	HDF4
<a href="#">Hierarchical Data Format Release 5 (HDF5)</a>	HDF5
<a href="#">Erdas Imagine (.img)</a>	HFA
<a href="#">Image Display and Analysis (WinDisp)</a>	IDA
<a href="#">ILWIS Raster Map (.mpr, .mpl)</a>	ILWIS

<a href="#">Intergraph Raster</a>	INGR
<a href="#">IRIS</a>	IRIS
<a href="#">USGS Astrogeology ISIS cube (Version 2)</a>	ISIS2
<a href="#">USGS Astrogeology ISIS cube (Version 3)</a>	ISIS3
<a href="#">JAXA PALSAR Product Reader (Level 1.1/1.5)</a>	JAXAPALSAR
<a href="#">Japanese DEM (.mem)</a>	JDEM
<a href="#">JPEG JFIF (.jpg)</a>	JPEG
<a href="#">JPEG-LS</a>	JPEGLS
<a href="#">JPEG2000 (.jp2, .j2k)</a>	JPEG2000
<a href="#">JPIP (based on Kakadu)</a>	JPIPKAK
<a href="#">KMLSUPEROVERLAY</a>	KMLSUPEROVERLAY
<a href="#">NOAA Polar Orbiter Level 1b Data Set (AVHRR)</a>	L1B
<a href="#">Erdas 7.x .LAN and .GIS</a>	LAN
<a href="#">FARSITE v.4 LCP Format</a>	LCP
<a href="#">Daylon Leveller Heightfield</a>	Leveller
<a href="#">MBTiles</a>	MBTiles
<a href="#">OziExplorer .MAP</a>	OZIMAP
<a href="#">Vexcel MFF</a>	MFF
<a href="#">Vexcel MFF2 (HKV)</a>	MFF2
<a href="#">MG4 Encoded Lidar</a>	MG4Lidar
<a href="#">Multi-resolution Seamless Image Database</a>	MrSID
<a href="#">Meteosat Second Generation</a>	MSG
<a href="#">EUMETSAT Archive native (.nat)</a>	MSGN
<a href="#">NLAPS Data Format</a>	NDF
<a href="#">NOAA NGS Geoid Height Grids</a>	NGSGEOID
<a href="#">NITF (.ntf, .nsf, .gn?, .hr?, .ja?, .jg?, .jn?, .lf?, .on?, .tl?, .tp?, etc.)</a>	NITF
<a href="#">NetCDF</a>	netCDF
<a href="#">PCI .aux Labelled</a>	PAux
<a href="#">PCI Geomatics Database File</a>	PCIDSK
<a href="#">Geospatial PDF</a>	PDF
<a href="#">NASA Planetary Data System</a>	PDS
<a href="#">Portable Network Graphics (.png)</a>	PNG
<a href="#">PostGIS Raster (previously WKTRaster)</a>	PostGISRaster
<a href="#">Rasterlite - Rasters in SQLite DB</a>	Rasterlite
<a href="#">Raster Matrix Format (*.rsw, .mtw)</a>	RMF
<a href="#">Raster Product Format/RPF (CADRG, CIB)</a>	RPFTOC
<a href="#">RadarSat2 XML (product.xml)</a>	RS2
<a href="#">Idrisi Raster</a>	RST
<a href="#">SAGA GIS Binary format</a>	SAGA

<a href="#">SAR CEOS</a>	SAR_CEOS
<a href="#">ArcSDE Raster</a>	SDERASTER
<a href="#">USGS SDTS DEM (*CATD.DDF)</a>	SDTS
<a href="#">SGI Image Format</a>	SGI
<a href="#">Snow Data Assimilation System</a>	SNODAS
<a href="#">Standard Raster Product (ASRP/USRP)</a>	SRP
<a href="#">SRTM HGT Format</a>	SRTMHGT
<a href="#">Terragen Heightfield (.ter)</a>	TERRAGEN
EarthWatch/DigitalGlobe .TIL	TIL
TerraSAR-X Product	TSX
<a href="#">USGS ASCII DEM / CDED (.dem)</a>	USGSDEM
<a href="#">ASCII Gridded XYZ</a>	XYZ
<a href="#">ZMap Plus Grid</a>	ZMap

**Known GIS Vector data formats (resource type: data) include the following:**

<b>Description</b>	<b>'Format Name' Value</b>
<a href="#">Aeronav FAA files</a>	AeronavFAA
<a href="#">Arc/Info .E00 (ASCII) Coverage</a>	E00
<a href="#">Arc/Info Generate</a>	ARCGEN
<a href="#">AutoCAD DWG</a>	DWG
<a href="#">AutoCAD DXF</a>	DXF
<a href="#">CouchDB / GeoCouch</a>	CouchDB
<a href="#">ElasticSearch</a>	ElasticSearch
<a href="#">ESRI FileGDB</a>	FileGDB
<a href="#">ESRI Personal GeoDatabase</a>	PGDB
<a href="#">ESRI Shapefile</a>	Shapefile
<a href="#">GeoJSON</a>	GeoJSON
<a href="#">Geomedia .mdb</a>	Geomedia
<a href="#">GeoRSS</a>	GeoRSS
<a href="#">GML</a>	GML
<a href="#">GMT</a>	GMT
GPS Exchange Format <a href="#">GPX</a>	GPX
OGC <a href="#">KML</a> (.kml, .kmz)	KML
<a href="#">LASer (LAS) File Format for Lidar</a>	LASF
<a href="#">Mapinfo File</a> (.mif, .tab)	MapInfo
<a href="#">Microstation DGN</a>	DGN
<a href="#">Vector Product Format</a>	VPF
<a href="#">OpenStreetMap XML and PBF</a>	OSM PCI
Geomatics Database File	PCIDSK
<a href="#">Geospatial PDF</a>	PDF
<a href="#">PostgreSQL SQL dump</a>	PGDump
<a href="#">S-57 (ENC)</a>	S57
<a href="#">SDTS</a>	SDTS

<a href="#">SEG-P1 / UKOOA P1/90</a>	SEGUKOOA
<a href="#">SEG-Y</a>	SEGY
<a href="#">SQLite/SpatialLite</a>	SQLite
<a href="#">SUA</a>	SUA
<a href="#">SVG</a>	SVG
<a href="#">U.S. Census TIGER/Line</a> (non-shapefile)	TIGER
<a href="#">X-Plane/Flightgear aeronautical data</a>	XPLANE

**Known tabular data formats (resource type: Dataset) that may contain spatial columns:**

Description	'Format Name' Value
<a href="#">Comma Separated Value (.csv)</a>	CSV
<a href="#">Google Fusion Tables</a>	GFT
<a href="#">Open Document Spreadsheet</a>	ODS
<a href="#">MS Excel format</a>	XLS
<a href="#">MS Office Open XML spreadsheet</a>	XLSX

**Known service protocols (resource type: Service) that can be encoded in Service if describing a service and not a data set-specific endpoint:**

Description	'ServiceType' or protocol Value
OGC Web Feature Service	OGC:WFS
OGC Web Coverage Service	OGC:WCS
OGC Web Map Service	OGC:WMS
OGC Web Processing Service	OGC:WPS
OGC Catalog Service for the Web	OGC:CSW
Open-source Project for a Network Data Access Protocol (OPeNDAP, THREDDS)	OPeNDAP
ArcGIS REST Service API	ArcREST

**Identified formats for applications include the following:**

Mobile application – iOS (iPad, iPhone, iTouch)	iOS
Mobile application – Android	APK
Mobile application – jQuery	jQuery
Web application – general HTML5	HTML5
Web application – Flash	Flash
Web application – Flex	Flex
Windows application	EXE