



Unified Map Service (UMS)

Integrating all the capabilities of
WMS, WMTS, WFS, WCS, CSW in a single service

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The case for a Unified Map Service

- Current OGC services landscape
 - Different services for different data types (WMS, WMTS, WCS, WFS)
 - Large effort to implement clients & services for imagery, coverage, vector
 - Different semantics for similar concepts
 - Gaps in capabilities (e.g. no vector tiles)
- Unified Map Service
 - Single service for imagery, coverage, vector with shared semantics (layers, tiling schemes, time series, styling...)
 - Request raw features for client-side rendering and analysis, or styled maps rendered server-side
 - Request as entire features or as tiles

UMS Overview

- Simplistic design
- Sub-set of capabilities can be implemented
- Easy to add capabilities to same service
- Easy to build UMS interface around existing WMS, WMTS, WCS, WFS, CSW services
- Not tied to specific object notation (XML discouraged)
- Not tied to any format, tiling grid or data store
- Support for organizing layers (folders for e.g. topics)
- RESTful API option

UMS Requests

Requests	WMS	WMTS	WFS	WCS	CSW
GetCapabilities	✓	✓	✓	✓	✓
GetLayersList	✓	✓	✓	✓	✓
GetLayerInfo	✓	✓	✓	✓	✓
GetMetaData					✓
GetTilingScheme		✓			
GetTileAtPos (<i>debugging / utility</i>)					
GetFeatures	✓		✓	✓	
GetTile		✓			
GetValue	~	~	~	✓	
GetAttributesList			✓		
GetAttributes			✓		
GetStyles					

UMS Prototype

- Hosted at maps.ecere.com (GNOSIS Map Server)
- Offers ECON and JSON (*&on=json*) API
- Current format support:
 - Imagery / Coverage: GNOSIS Map Tiles (<http://ecere.com/gmt.pdf>), PNG
 - Vector: GNOSIS Map Tile, GeoJSON, GeoECON ([TB13VTER#C](#)), GML
- Current tiling scheme support:
 - WMTS Well Known Scale Sets-based:
 - WGS84 CRS: GlobalCRS84Scale, GlobalCRS84Pixel, GoogleCRS84Quad
 - WebMercator CRS: GoogleMapsCompatible
 - GNOSIS Global Grid
 - WGS84 CRS; variable number of columns at different latitudes (Testbed 13 Vector Tiles Engineering Report – [Annex A](#))

GetCapabilities

<http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetCapabilities>
(REST: <http://maps.ecere.com/ums/capabilities.econ>)

```
UMSCapabilities {
  service = { type = "Unified Map Service", version = 0.1 },
  identification = {
    description = "GNOSIS Map Server @ maps.ecere.com",
    organization = { name = "Ecere Corporation", url = "http://ecere.ca" },
    software = { name = "GNOSIS Map Server", version = "0.1",
      url = "http://ecere.ca/", vendor = "Ecere Corporation" }
  },
  requests = [ getCapabilities, getLayersList, getLayerInfo, getMetaData,
    getTile, getFeatures, getValue, getTilingScheme, getTileAtPos,
    getAttributesList, getAttributes, getStyles ],
  tilingSchemes = [ "GNOSISGlobalGrid", "GlobalCRS84Pixel", "GlobalCRS84Scale",
    "GoogleCRS84Quad", "GoogleMapsCompatible" ],
  coordRefSystems = [ "EPSG:4326" ],
  formats = [
    {vector, [ {"gmt", "application/vnd.gnosis-map-tile"},
      {"geoecon", "application/vnd.geo+econ"}, {"geojson", "application/vnd.geo+json"},
      {"gml", "text/xml;subtype=gml/3.1.1"} ]},
    {raster, [ {"gmt", "application/vnd.gnosis-map-tile"}, {"png", "image/png"} ]},
    {coverage, [ {"gmt", "application/vnd.gnosis-map-tile"}, {"png", "image/png"} ]},
    {styles, [ {"sld", "text/xml;subtype=sld"} ]}
  ]
}
```

GetLayersList

<http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetLayersList>
(REST: <http://maps.ecere.com/ums/layers/list.econ>)

```
UMSLayersList {
  layers = [
    UMSLayerCollection { name = "NaturalEarth", title = "NaturalEarth" },
    {
      name = "SRTM_ViewFinderPanorama", title = "ViewFinderPanorama",
      dataType = { coverage }, sourceZoomLevel = 9, availableZoomLevel = 9,
      geoSpatialCoverage = [ {{-90, -180}, {84, 180}} ]
    }, {
      name = "BMNG 2004", title = "Blue Marble Next Generation (2004)",
      dataType = { raster }, sourceZoomLevel = 7, availableZoomLevel = 7,
      geoSpatialCoverage = [ {{-90, -180}, {90, 180}} ],
      temporalCoverage = { monthly = true,
        start = { 2004, january }, end = { 2004, december } }
    },
    UMSLayerCollection { name = "OpenMapLocal", title = "OpenMapLocal" }
  ]
}
```


GetLayersList (collection)

<http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetLayersList&collection=OpenMapLocal>
(REST: <http://maps.ecere.com/ums/layers/OpenMapLocal/list.econ>)

```
UMSLayersList {
  layers = [
    {
      name = "OpenMapLocal/TidalBoundary", title = "TidalBoundary",
      dataType = { vector, lines }, sourceZoomLevel = 15, availableZoomLevel = 15,
      geoSpatialCoverage =
      [ {{49.863142341754, -8.6499244238801}, {60.8608366108112, 1.7635365526004}} ],
    }, {
      name = "OpenMapLocal/ElectricityTransmissionLine",
      title = "ElectricityTransmissionLine",
      dataType = { vector, lines }, sourceZoomLevel = 15, availableZoomLevel = 15,
      geoSpatialCoverage =
      [ {{50.1428702618593, -5.9363164795599}, {58.5765165126101, 1.7215107347768}} ]
    }, {
      name = "OpenMapLocal/Glasshouse", title = "Glasshouse",
      dataType = { vector, areas }, sourceZoomLevel = 15, availableZoomLevel = 15,
      geoSpatialCoverage = [
        {{50.1370962928431, -5.4943649581141}, {57.1324207264252, 1.6145340250534}} ]
    },
    ...
  ]
}
```


GetLayerInfo

<http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetLayerInfo&layer=OpenMapLocal/Road>
(REST: <http://maps.ecere.com/ums/layers/OpenMapLocal/Road/layerInfo.econ>)

```
UMSLayerInfo {  
  title = "Road",  
  dataType = { vector, lines },  
  sourceZoomLevel = 15,  
  availableZoomLevel = 15,  
  geoSpatialCoverage = [  
    {{49.8909115510561, -8.5861795312288}, {60.827676482348, 1.7623105847515}}  
  ],  
  name = "OpenMapLocal/Road"  
}
```

GetLayersList (filtering)

- Filtering options:
 - Data type (vector – points, lines, areas; raster, coverage)
 - Names
 - Keywords
 - Geospatial & temporal extent
 - Scale / Resolution
 - Any metadata fields

GetMetaData

<http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetMetaData&layer=BMNG%202004>
(REST: <http://maps.ecere.com/ums/layers/BMNG%202004/metadata.econ>)

```
MD_MetaData {
  fileIdentifier = "BlueMarbleNG", language = "eng; USA", characterSet = utf8,
  hierarchyLevel = [ dataset ],
  contact = [ { individualName = "Kevin Ward", organisationName = "Science Systems and
Applications, Inc. / NASA Goddard Space Flight Center", positionName = "NEO Architect &
Developer", contactInfo = { phone = { voice = "+1 503 246 1608" }, address =
{ deliveryPoint = "NASA GSFC, Code 613", city = "Greenbelt", administrativeArea = "MD",
postalCode = "20771", country = "USA", electronicMailAddress = "kevin.a.ward@nasa.gov" }
}, role = pointOfContact } ],
  dateStamp = { 2018, january, 6 },
  metadataStandardName = "ISO 19115 Geographic information - Metadata",
  metadataStandardVersion = "ISO 19115:2003(E)",
  spatialRepresentationInfo = [ MD_Georectified { numberOfDimensions = 2,
cellGeometry = area, transformationParameterAvailability = true,
cornerPoints = [ {-90, -180}, {90, 180} ], pointInPixel = center } ],
  referenceSystemInfo = [ { referenceSystemIdentifier = { code =
"urn:ogc:def:crs:EPSG::4326" } } ],
  identificationInfo = [ { citation = { title = "Blue Marble: Next Generation",
date = { dateType = publication, date = { 2018, january, 6 } },
identifier = { code = "BlueMarbleNG" }, presentationForm = mapDigital,
citedResponsibleParty = [ { individualName = "Reto Stöckli", organisationName =
"NASA Earth Observatory (NASA Goddard Space Flight Center)", contactInfo =
...

```

GetMetaData (XML)

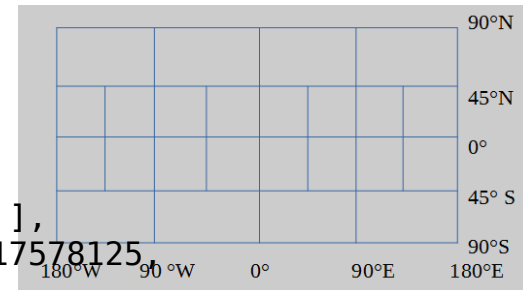
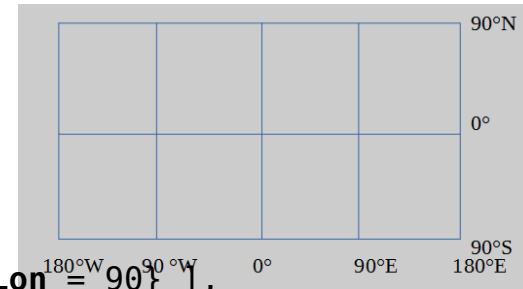
<http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetMetaData&layer=BMNG%202004&on=xml>
(REST: <http://maps.ecere.com/ums/layers/BMNG%202004/metadata.xml>)

```
<gmd:MD_Metadata xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:gco="http://www.isotc211.org/2005/gco" xmlns:gmd="http://www.isotc211.org/2005/gmd"
xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:srv="http://www.isotc211.org/2005/srv"
xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:gsr="http://www.isotc211.org/2005/gsr"
xmlns:gss="http://www.isotc211.org/2005/gss" xmlns:gts="http://www.isotc211.org/2005/gts"
xmlns:gmi="http://www.isotc211.org/2005/gmi" xmlns:gmx="http://www.isotc211.org/2005/gmx"
xsi:schemaLocation="http://www.isotc211.org/2005/gmd/gmd.xsd">
<gmd:fileIdentifier><gco:CharacterString>BlueMarbleNG</gco:CharacterString>\</gmd:fileIdentifier>
<gmd:language><gco:CharacterString>eng; USA</gco:CharacterString></gmd:language>
<gmd:characterSet><gmd:MD_CharacterSetCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodeLists.xml#MD_CharacterSetCode"
codeListValue="utf8"
codeSpace="004">utf8</gmd:MD_CharacterSetCode></gmd:characterSet>
<gmd:hierarchyLevel><gmd:MD_ScopeCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodeLists.xml#MD_ScopeCode"
codeListValue="dataset" codeSpace="005">dataset</gmd:MD_ScopeCode></gmd:hierarchyLevel>
<gmd:contact><gmd:CI_ResponsibleParty><gmd:individualName><gco:CharacterString>Kevin
Ward</gco:CharacterString></gmd:individualName>
<gmd:organisationName><gco:CharacterString>Science Systems and Applications, Inc. / NASA
Goddard Space Flight Center</gco:CharacterString></gmd:organisationName>
...
```

GetTilingScheme

[http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetTilingScheme
&tilingScheme=GNOSISGlobalGrid](http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetTilingScheme&tilingScheme=GNOSISGlobalGrid)
(REST: <http://maps.ecere.com/ums/tilingSchemes/GNOSISGlobalGrid.econ>)

```
UMSTilingScheme {  
  crs = "EPSG:4326",  
  northIsPositive = true,  
  levels = [ {  
    level = 0, scaleDenominator = 139770566.0071794390678,  
    width = 256, height = 256, origin = {-90, -180},  
    numRows = 2, maxCols = 4,  
    rowsSpecs = [ {row = 0, count = 2, numCols = 4, tileDeltaLon = 90} ],  
    metersPerPixel = 39135.758482010242, degreesPerPixel = 0.3515625,  
    tileDeltaLat = 90  
  }, {  
    level = 1, scaleDenominator = 69885283.0035897195339,  
    width = 256, height = 256,  
    origin = {-90, -180},  
    numRows = 4, maxCols = 8,  
    rowsSpecs = [ {0, 1, 4, 90}, {1, 2, 8, 45}, {3, 1, 4, 90} ],  
    metersPerPixel = 19567.879241005121, degreesPerPixel = 0.17578125,  
    tileDeltaLat = 45  
  },  
  ],  
  ...  
}
```



GetTileAtPos

Which tile in the GoogleMapsCompatible scheme level 4 is at 55°N, 120°E ?

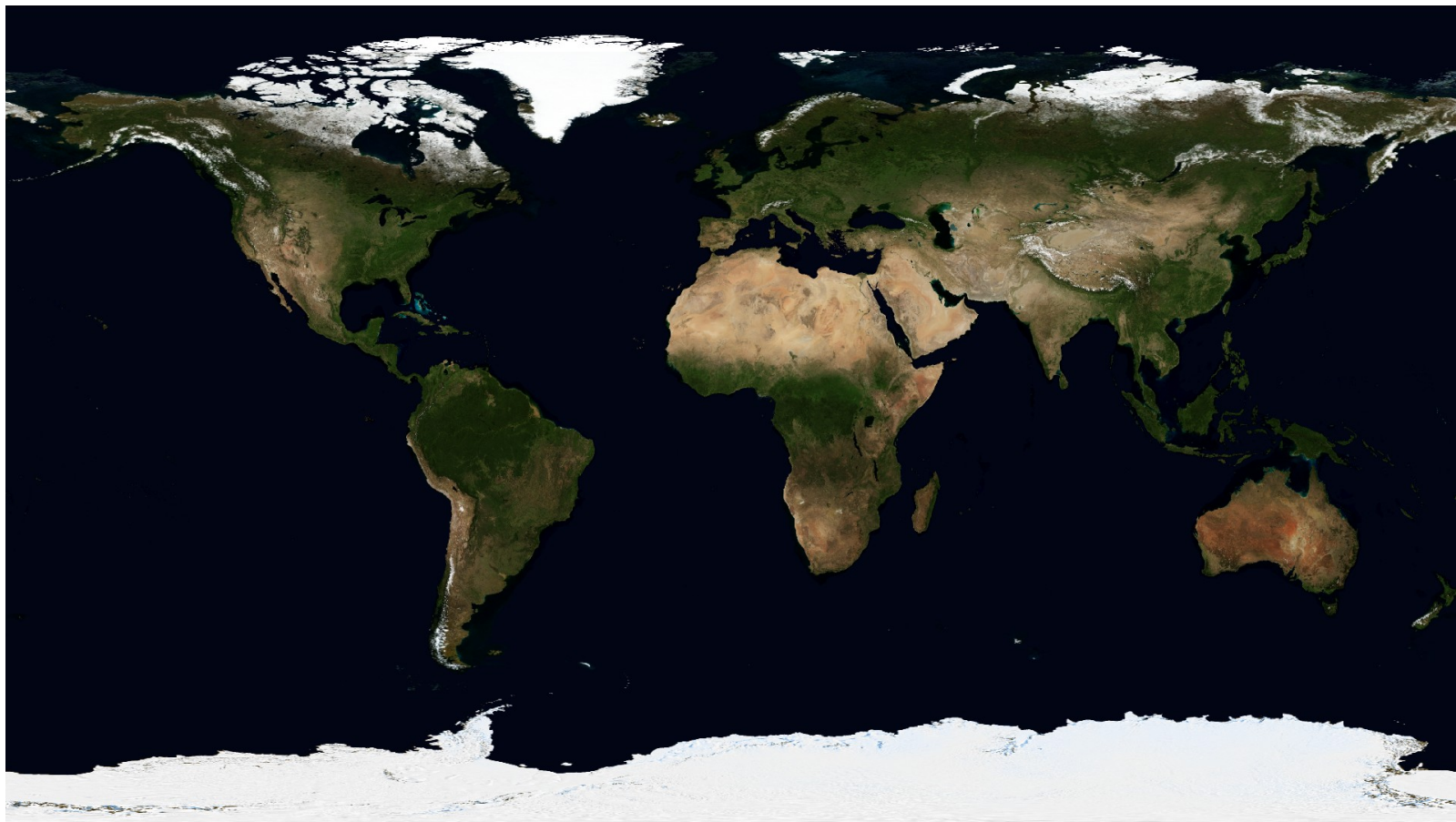
`http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetTileAtPos
&tilingScheme=GoogleMapsCompatible&zoomLevel=4&position={55,120}
(REST: http://maps.ecere.com/ums/tilingSchemes/GNOSISGlobalGrid/tileAtPos/55/120.econ)`

`{ 4, 5, 13 }`

(level 4, tileRow 5, tileCol 13)

GetFeatures (imagery, time, size)

[http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetFeatures
&layer=BMNG%202004&width=1920&height=1080&format=png&time=june](http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetFeatures&layer=BMNG%202004&width=1920&height=1080&format=png&time=june)
(REST: <http://maps.ecere.com/layers/BMNG%202004/time/june/size/1920x1080.png>)



GetFeatures (imagery, time, zoom level, extent)

[http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetFeatures
&layer=BMNG%202004&zoomLevel=3&format=png&time=janeuary&extent=\[{0,-100},{40,-75}\]](http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetFeatures&layer=BMNG%202004&zoomLevel=3&format=png&time=janeuary&extent=[{0,-100},{40,-75}])
(REST: [http://maps.ecere.com/ums/layers/BMNG%202004
/time/janeuary/zoom/3/extent/0,-100/40,-75.png](http://maps.ecere.com/ums/layers/BMNG%202004/time/janeuary/zoom/3/extent/0,-100/40,-75.png))



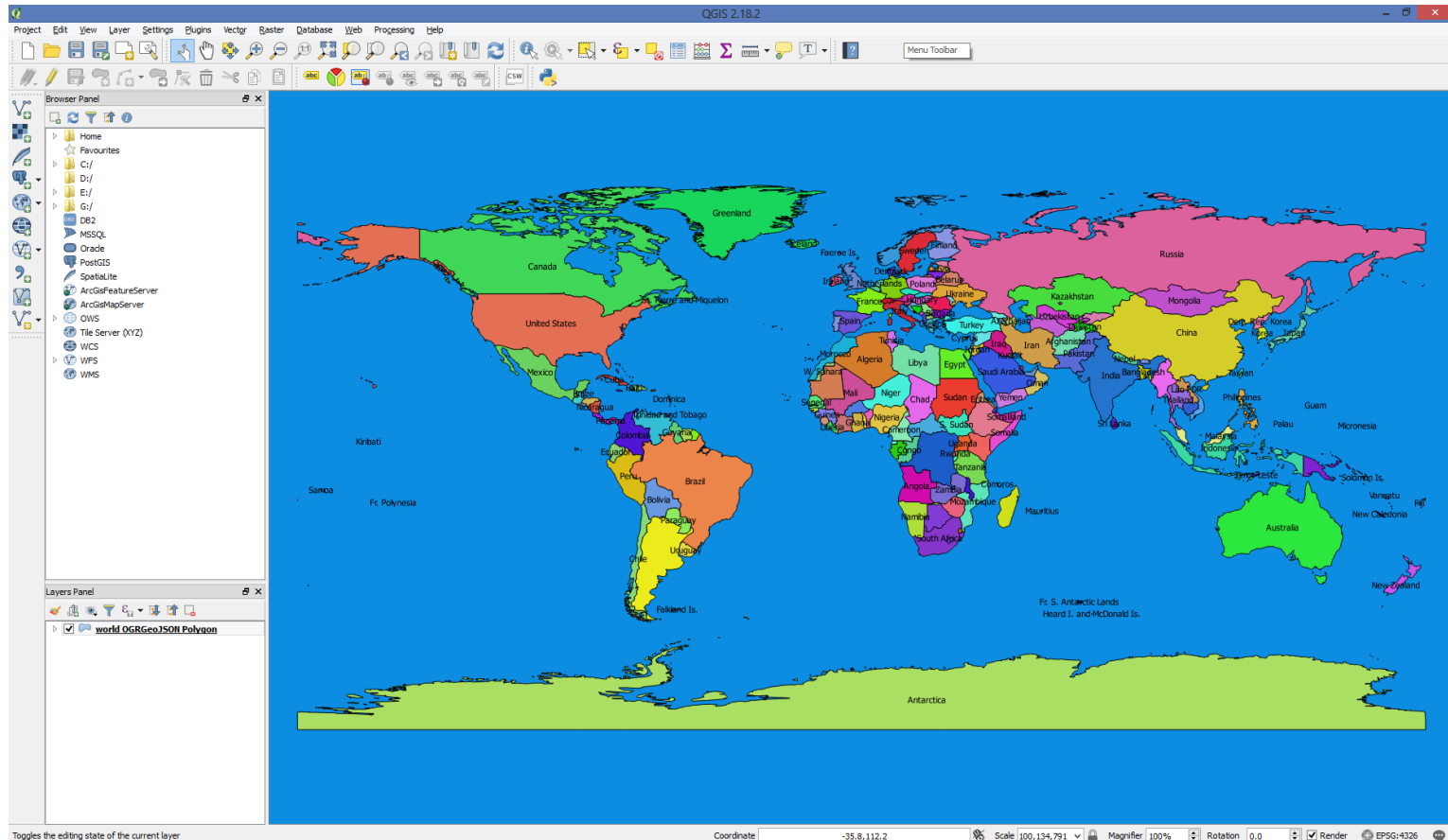
GetFeatures (coverage, zoom level, extent)

`http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetFeatures
&layer=SRTM_ViewFinderPanorama&zoomLevel=3&format=png&extent=[{0, -100},{40, -75}]`
(REST: `http://maps.ecere.com/ums/layers/SRTM_ViewFinderPanorama/
/zoom/3/extent/0, -100/40, -75.png`)



GetFeatures (vector, scale, GeoJSON)

[http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetFeatures](http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetFeatures&layer=NaturalEarth/cultural/ne_10m_admin_0_countries&format=geo+json&scale=100000000)
&layer=NaturalEarth/cultural/ne_10m_admin_0_countries&format=geo+json&scale=100000000
(REST: http://maps.ecere.com/ums/layers/NaturalEarth/cultural/ne_10m_admin_0_countries/scale/100000000.json)



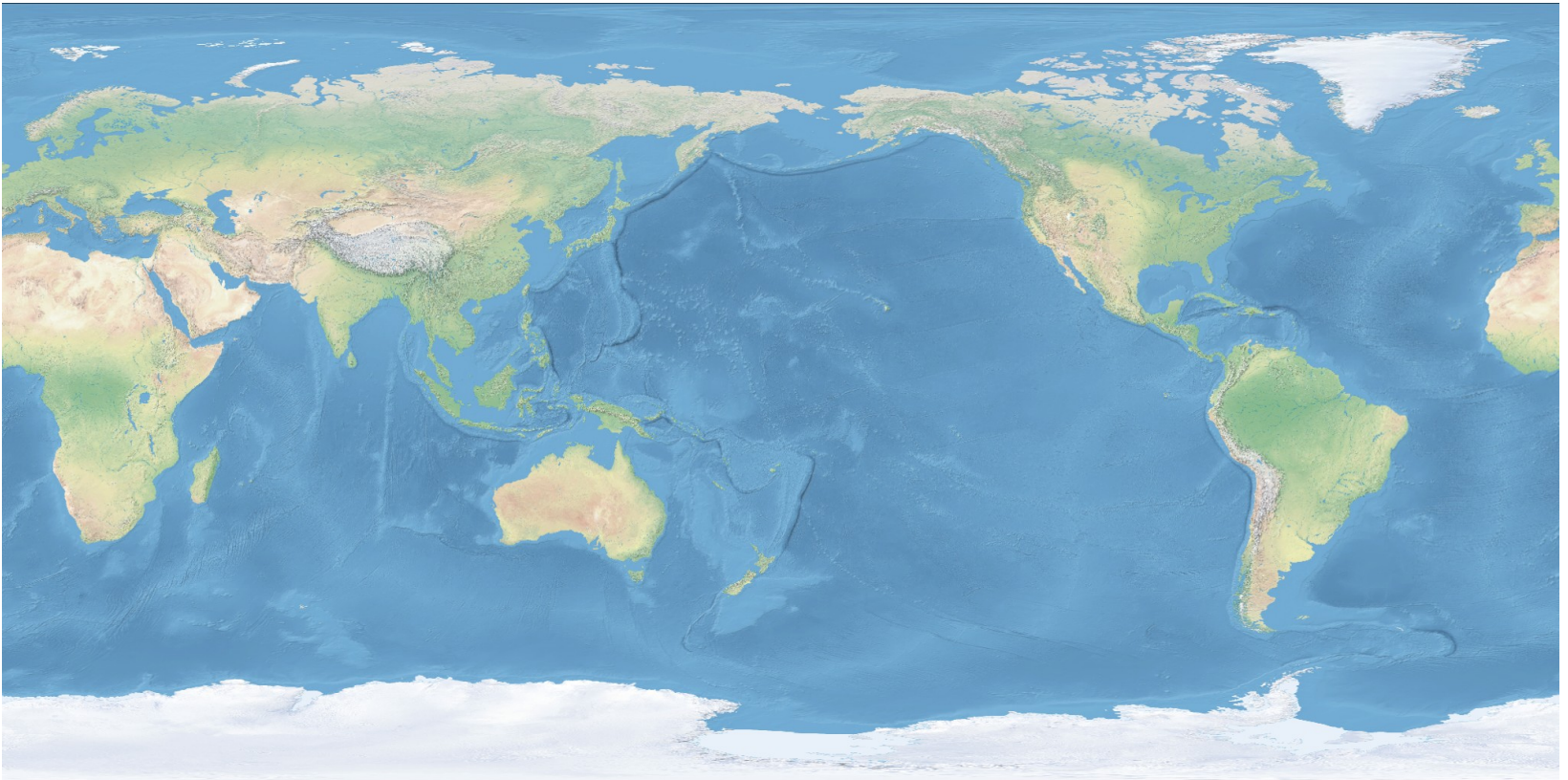
GetFeatures (vector, zoom level, extent)

```
http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetFeatures
&layer=NaturalEarth/cultural/ne_10m_admin_0_countries&zoomLevel=3&format=geo+json
&extent=[{0, -100},{40, -75}]
(REST: http://maps.ecere.com/ums/layers/NaturalEarth/cultural/ne_10m_admin_0_countries/
/zoom/extent/0, -100/40, -75.json)
```



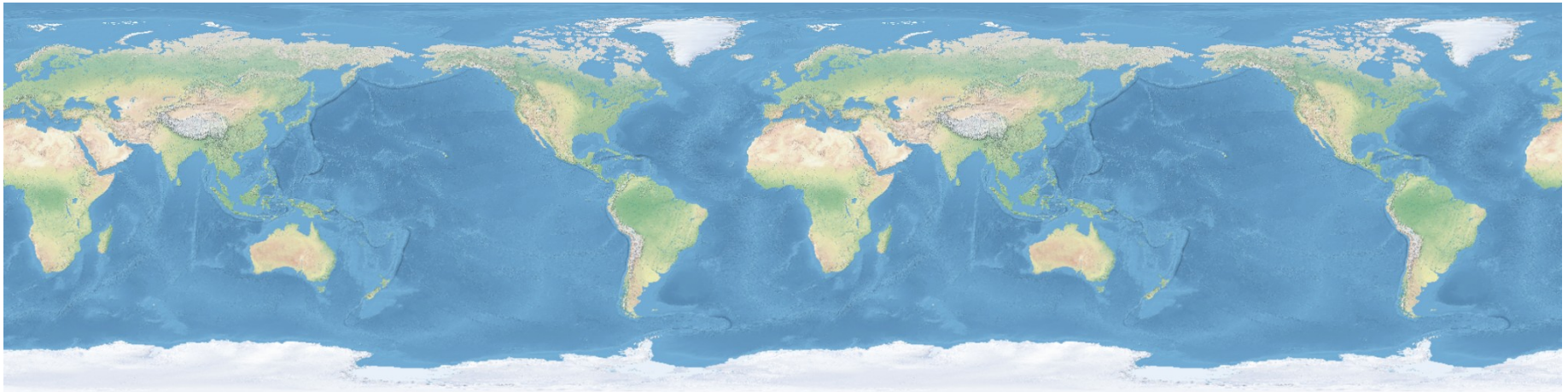
GetFeatures (imagery, extent crossing dateline)

```
http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetFeatures  
&layer=NaturalEarth/raster/NE2_HR_LC_SR_W_DR&zoomLevel=1&extent={{-90,0},{90,360}}  
(REST: http://maps.ecere.com/ums/layers/NaturalEarth/raster/NE2\_HR\_LC\_SR\_W\_DR  
/zoom/1/extent/-90,0/90,360.png)
```



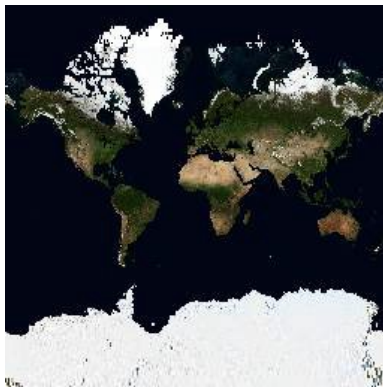
GetFeatures (imagery, globe wrapping)

```
http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetFeatures  
&layer=NaturalEarth/raster/NE2_HR_LC_SR_W_DR&zoomLevel=0&extent={{-90,-360},{90,360}}  
(REST: http://maps.ecere.com/ums/layers/NaturalEarth/raster/NE2_HR_LC_SR_W_DR  
/zoom/0/extent/-90,-360/90,360.png
```

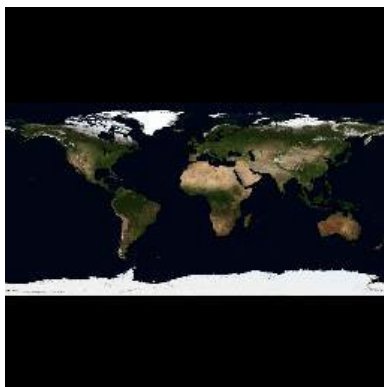


GetTile (imagery, well-known scale sets level 0)

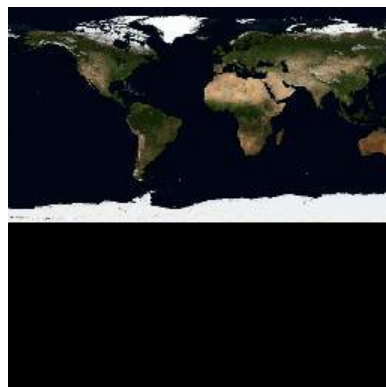
[http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetTile&layer=BMNG%202004&time=june
&tilingScheme=GoogleMapsCompatible&tileKey={0,0,0}&format=png](http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetTile&layer=BMNG%202004&time=june&tilingScheme=GoogleMapsCompatible&tileKey={0,0,0}&format=png)
(REST: <http://maps.ecere.com/ums/layers/BMNG%202004/tiles/GoogleMapsCompatible/0/0/0.png>)



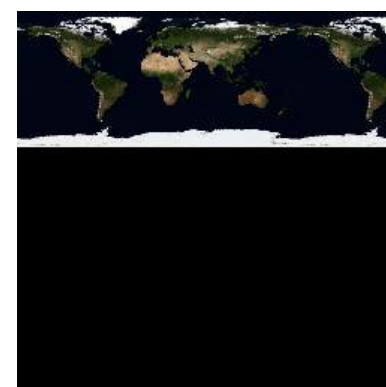
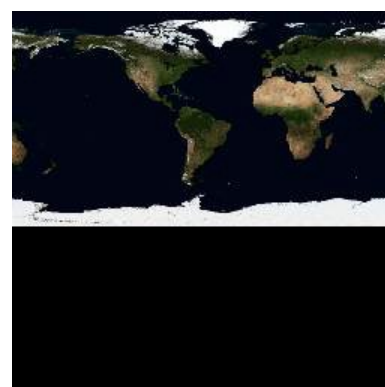
Other WMTS Well Known Scale Sets tiling schemes 0,0,0 tiles:



GoogleCRS84Quad



GlobalCRS84Scale (columns 0 & 1)



GlobalCRS84Pixel

GetTile (imagery, GNOSIS Global Grid)

<http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetTile&layer=BMNG%202004&time=june&tilingScheme=GNOSISGlobalGrid&tileKey={0,0,0}&format=png>
(REST: <http://maps.ecere.com/ums/layers/BMNG%202004/tiles/GNOSISGlobalGrid/0/0/0.png>)



{ 1, 1, 0 }



{ 1, 1, 1 }



{ 1, 1, 2 }



{ 1, 1, 3 }



{ 0, 1, 0 }



{ 0, 1, 1 }



{ 0, 1, 2 }



{ 0, 1, 3 }

GetTile (imagery, coverage, vector)

<http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetTile&layer=BMNG%202004&time=janyary&tilingScheme=GoogleMapsCompatible&tileKey={4,6,11}&format=png>

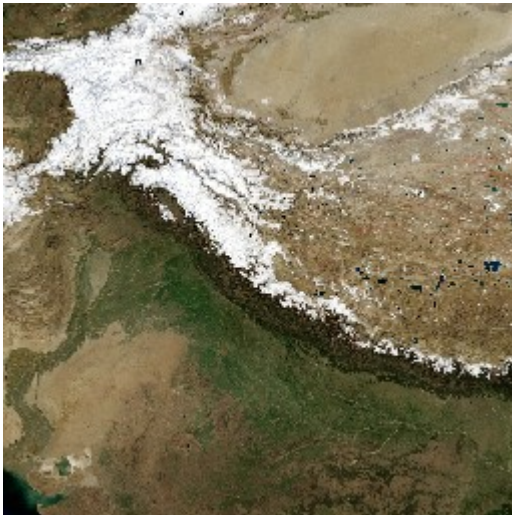
http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetTile&layer=SRTM_ViewFinderPanorama&tilingScheme=GoogleMapsCompatible&tileKey={4,6,11}&format=png

http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetTile&layer=NaturalEarth/physical/ne_10m_geography_regions_polys&tilingScheme=GoogleMapsCompatible&tileKey={4,6,11}&format=geo+json

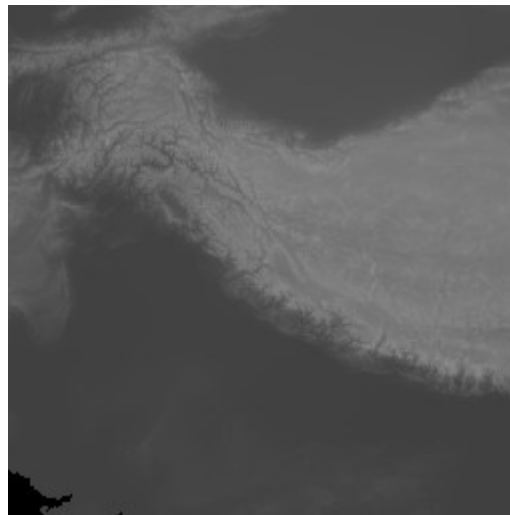
(REST: <http://maps.ecere.com/ums/layers/BMNG%202004/time/june/tiles/GoogleMapsCompatible/4/6/11.png>

http://maps.ecere.com/ums/layers/SRTM_ViewFinderPanorama/tiles/GoogleMapsCompatible/4/6/11.png

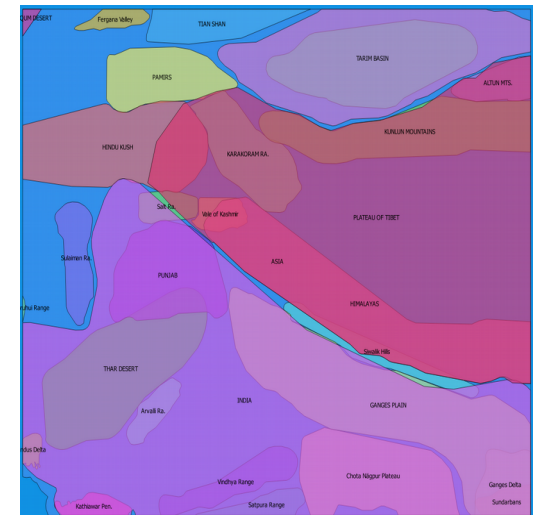
http://maps.ecere.com/ums/layers/NaturalEarth/physical/ne_10m_geography_regions_polys/tiles/GoogleMapsCompatible/4/6/11.json)



Blue Marble (janyary)



SRTM (ViewFinderPanorama)



Geography Regions

GetValue (coverage, imagery, vector)

[http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetValue&layer=SRTM_ViewFinderPanorama
&position={43,-79}](http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetValue&layer=SRTM_ViewFinderPanorama&position={43,-79})
(REST: http://maps.ecere.com/ums/layers/SRTM_ViewFinderPanorama/value/43/-79)

180.99951171875

[http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetValue&layer=SRTM_ViewFinderPanorama
&position={63,-90}](http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetValue&layer=SRTM_ViewFinderPanorama&position={63,-90})
(REST: http://maps.ecere.com/ums/layers/SRTM_ViewFinderPanorama/value/63/-90)

NODATA

[http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetValue&layer=BMNG%202004
&position={53,-90}](http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetValue&layer=BMNG%202004&position={53,-90})
(REST: <http://maps.ecere.com/ums/layers/BMNG%202004/value/53/-90>)

0xFF20270F

[http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetValue
&layer=NaturalEarth/cultural/ne_10m_admin_0_countries&position={53,-90}](http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetValue&layer=NaturalEarth/cultural/ne_10m_admin_0_countries&position={53,-90})
(REST: [http://maps.ecere.com/ums/layers/NaturalEarth/cultural/ne_10m_admin_0_countries
/value/53/-90](http://maps.ecere.com/ums/layers/NaturalEarth/cultural/ne_10m_admin_0_countries/value/53/-90))

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(Canada)

GetAttributesList (vector)

[http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetAttributesList
&layer=NaturalEarth/cultural/ne_10m_admin_0_countries](http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetAttributesList&layer=NaturalEarth/cultural/ne_10m_admin_0_countries)
(REST: [http://maps.ecere.com/ums/layers/NaturalEarth/cultural/ne_10m_admin_0_countries
/attributesList.econ](http://maps.ecere.com/ums/layers/NaturalEarth/cultural/ne_10m_admin_0_countries/attributesList.econ))

```
UMSAttributesList {  
  attributes = [  
    { name = "scalerank", type = integer },  
    { name = "featurecla", type = text },  
    { name = "labelrank", type = integer },  
    { name = "sovereignty", type = text },  
    { name = "sov_a3", type = text },  
    { name = "adm0_dif", type = integer },  
    { name = "level1", type = integer },  
    { name = "type", type = text },  
    { name = "admin", type = text },  
    { name = "adm0_a3", type = text },  
    { name = "geou_dif", type = integer },  
    { name = "geounit", type = text },  
    { name = "gu_a3", type = text },  
    { name = "su_dif", type = integer },  
    { name = "subunit", type = text },  
    { name = "su_a3", type = text },  
    { name = "brk_diff", type = integer },  
    { name = "name", type = text },  
    { name = "name_long", type = text },  
    { name = "brk_a3", type = text },  
    ...  
  ]  
}
```

GetAttributes (specific attributes & IDs)

```
http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetAttributes
  &layer=NaturalEarth/cultural/ne_10m_admin_0_countries
  &attributes=["name", "pop_est"]
  &features=[1,2,3,4,5]
(REST: http://maps.ecere.com/ums/layers/NaturalEarth/cultural/ne_10m_admin_0_countries
  /attributes.econ – all attributes)
```

```
UMSAttributes {
  values = [
    {"name", [
      {1, "American Samoa"},
      {2, "Antarctica"},
      {3, "Chile"},
      {4, "Cook Is."},
      {5, "Ecuador"},
    ]},
    {"pop_est", [
      {1, 65628},
      {2, 3802},
      {3, 16601707},
      {4, 11870},
      {5, 14573101},
    ]}
  ]
}
```

GetAttributes (specific attribute & extent)

```
http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetAttributes
  &layer=NaturalEarth/cultural/ne_10m_admin_0_countries
  &attributes=["name"]&extent={{-90,-180},{-50,180}}
(REST: http://maps.ecere.com/ums/layers/NaturalEarth/cultural/ne_10m_admin_0_countries
  /attributes.econ – all attributes)
```

```
UMSAttributes {
  values = [
    {"name", [
      {2, "Antarctica"},
      {3, "Chile"},
      {9, "New Zealand"},
      {16, "Argentina"},
      {20, "Falkland Is."},
      {22, "Norway"},
      {25, "S. Geo. and S. Sandw. Is."},
      {37, "Heard I. and McDonald Is."},
      {56, "Australia"}
    ]}
  ]
}
```

GetAttributes (specific attribute & extent, GML)

```
http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetAttributes
&layer=NaturalEarth/cultural/ne_10m_admin_0_countries
&attributes=["name"]&extent={{-90,-180},{-50,180}}&on=xml
(REST: http://maps.ecere.com/ums/layers/NaturalEarth/cultural/ne_10m_admin_0_countries
/attributes.xml – all attributes)
```

```
<wfs:FeatureCollection xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:gms="http://maps.ecere.com/gms" xmlns:wfs="http://www.opengis.net/wfs"
xmlns:gml="http://www.opengis.net/gml" xsi:schemaLocation="http://www.opengis.net/wfs
http://schemas.opengis.net/wfs/2.0.2/wfs.xsd">
<gml:boundedBy><gml:Envelope srsName="urn:ogc:def:crs:EPSG:4326">
<gml:lowerCorner>-90 -180</gml:lowerCorner><gml:upperCorner>90.0002058236639
180</gml:upperCorner></gml:Envelope></gml:boundedBy>
<gml:featureMember><gms:NaturalEarth_cultural_ne_10m_admin_0_countries gml:id="2">
<gms:id>2</gms:id><name>Antarctica</name><gms:area>3.6856116579582</gms:area>
</gms:NaturalEarth_cultural_ne_10m_admin_0_countries></gml:featureMember>
<gml:featureMember><gms:NaturalEarth_cultural_ne_10m_admin_0_countries
gml:id="3"><gms:id>3</gms:id><name>Chile</name><gms:area>0.046765976518</gms:area>
</gms:NaturalEarth_cultural_ne_10m_admin_0_countries></gml:featureMember>
<gml:featureMember><gms:NaturalEarth_cultural_ne_10m_admin_0_countries gml:id="9">
<gms:id>9</gms:id><name>New Zealand</name><gms:area>0.0177052985583</gms:area>
</gms:NaturalEarth_cultural_ne_10m_admin_0_countries></gml:featureMember>
<gml:featureMember><gms:NaturalEarth_cultural_ne_10m_admin_0_countries gml:id="16">
<gms:id>16</gms:id><name>Argentina</name><gms:area>0.169782213391</gms:area>
</gms:NaturalEarth_cultural_ne_10m_admin_0_countries></gml:featureMember>
...

```

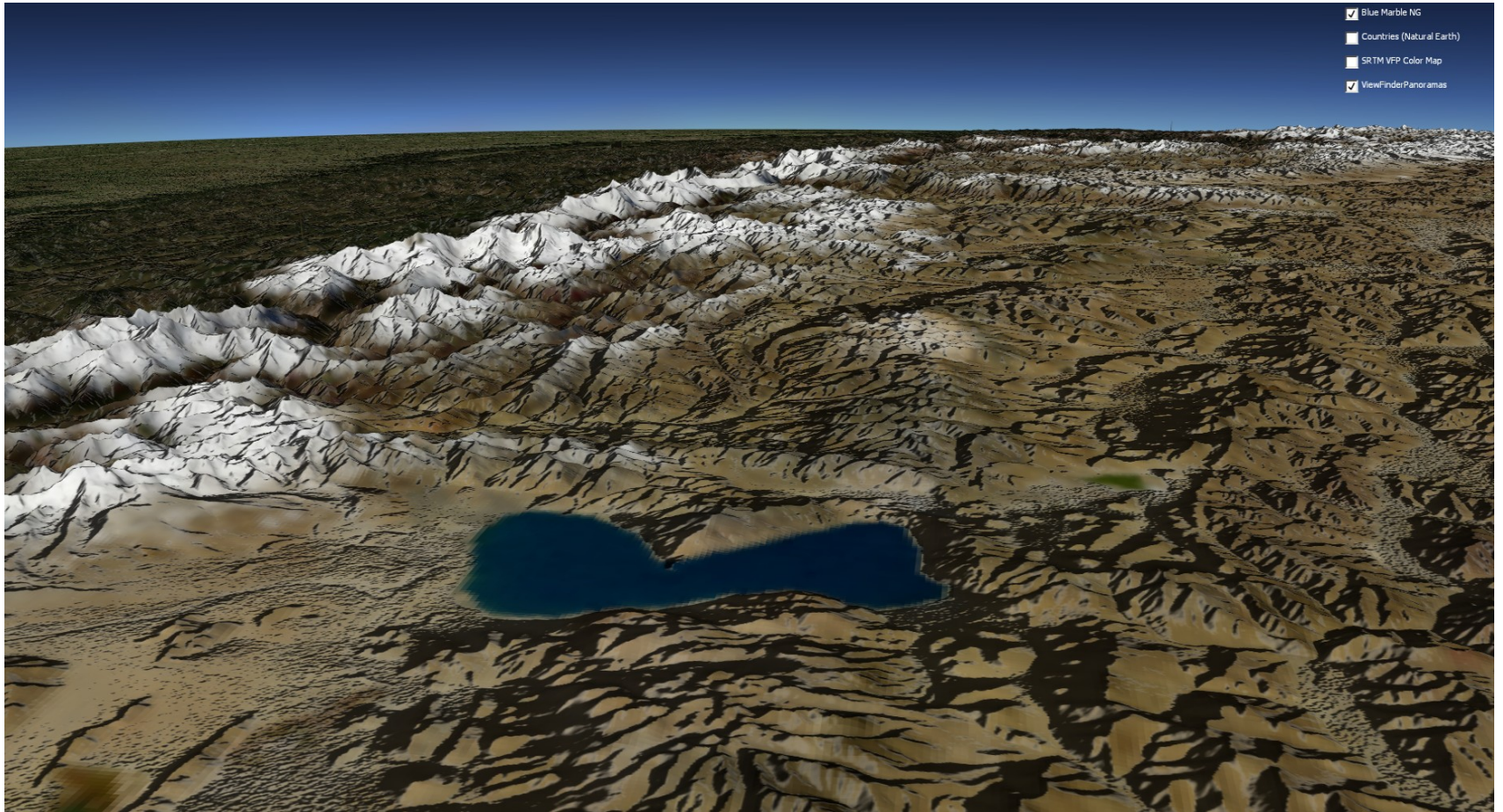

GetStyles

<http://maps.ecere.com/ums?SERVICE=UMS&REQUEST=GetStyles&layer=OpenMapLocal/Road&format=sld> (REST: <http://maps.ecere.com/ums/layers/OpenMapLocal/Road/styles.sld>)

```
<StyledLayerDescriptor xmlns="http://www.opengis.net/sld"
xmlns:ogc="http://www.opengis.net/ogc" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.0.0"
xsi:schemaLocation="http://www.opengis.net/sld
http://schemas.opengis.net/sld/1.0.0/StyledLayerDescriptor.xsd">
<NamedLayer>
<Name>OS Open Map - Local® Roads (Full colour style)</Name>
<UserStyle>
<Title>Product SLD - November 2016</Title>
<Abstract>OS Open Map - Local® Local. Ordnance Survey.
© Crown copyright and database rights 2016.</Abstract>
<!-- Road Casing (motorway,primary,A,B and minor roads) -->
<FeatureTypeStyle><Rule><Name>Road Case</Name>
<ogc:Filter><ogc:Or>
<ogc:PropertyIsEqualTo><ogc:PropertyName>FEATCODE</ogc:PropertyName>
<ogc:Literal>15750</ogc:Literal></ogc:PropertyIsEqualTo>
<ogc:PropertyIsEqualTo><ogc:PropertyName>FEATCODE</ogc:PropertyName>
<ogc:Literal>15759</ogc:Literal></ogc:PropertyIsEqualTo>
<ogc:PropertyIsEqualTo><ogc:PropertyName>FEATCODE</ogc:PropertyName>
<ogc:Literal>15743</ogc:Literal></ogc:PropertyIsEqualTo>
<ogc:PropertyIsEqualTo><ogc:PropertyName>FEATCODE</ogc:PropertyName>
<ogc:Literal>15749</ogc:Literal></ogc:PropertyIsEqualTo>
<ogc:PropertyIsEqualTo><ogc:PropertyName>FEATCODE</ogc:PropertyName>
<ogc:Literal>15729</ogc:Literal></ogc:PropertyIsEqualTo>
<ogc:PropertyIsEqualTo><ogc:PropertyName>FEATCODE</ogc:PropertyName>
```

...

Web Client



Future direction

- UMS Prototype: Complex server-side rendering
- Vectorization of raster (e.g. contours, classification)
- Vector: filter & queries, transactions (create, update, delete)
- WFS 3.0 – Similar objectives
 - Possibility to achieve same capabilities from single service
 - Discussions at OGC Stuttgart TC
 - OGC Vector Tiles Pilot
- UMS implementation in other projects?
 - Guidance and contributions
 - Code Sprint!
- Feedback: jerome@ecere.com