BeNomad's Server Solution Overview

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Summary

1 Overview

This document is an overview presentation of BeNomad Server solution. BeNomad provides a complete Geographic Information Server over the Internet protocols standard and supports the following Service/Protocols:

1.1 Services supported:

Service name	Description
Mapping	To produces maps of spatially referenced data dynamically from geographic information. Maps are generally rendered in a pictorial format such as PNG, GIF or JPEG formats.
Geocoding	A common need given a physical (mailing) address, find the geographical coordinates in order to display that location on a map.
"Natural" Geocoding	Same like of Geocoding function, but, you can enter you postal address in one line, split by one charter, e.g.: country, city, street
Reverse Geocoding	Is the process of finding an physical addresses (mailing), roads, POIs or an other type of resource for a given latitude / longitude pair.
Routing	High reliability, fast routing, multi-point journey.
Trace route	Performs a road-matching and routing process for a specified type of vehicle. Road-matching consists of correcting uncertainties related to GPS measurements by repositioning a vehicle on most accurate segment of neighboring roads. This service assumes that a input positions correspond to a chronological sequence of positions of a given vehicle driving on road network.
Rebuild Route	Can rebuild the road sheet form existing list of coordinates.
Traffic	Provider the "real-time" Traffic Info.
Geo-fencing	Management and test of geo-fencing.
Geo Server Info	List of available Dataset by name, release date.
Capabilities	List of possibility offer by the Server/Protocol.
Custom Service	You can create with Java language your custom service with the BeNomad SDK Java. And define your input and output protocol.

1.2 Available Tools

Tool name	Description
Geocoding File Analyzer	Geocoding all addresses find in the uploaded file, and add the longitude and latitude into the output file. The output file as the same format of the input.
POI Convertor	Convert the uploaded file into a SVS file contains your POI.

1.3 Advanced Functions supported:

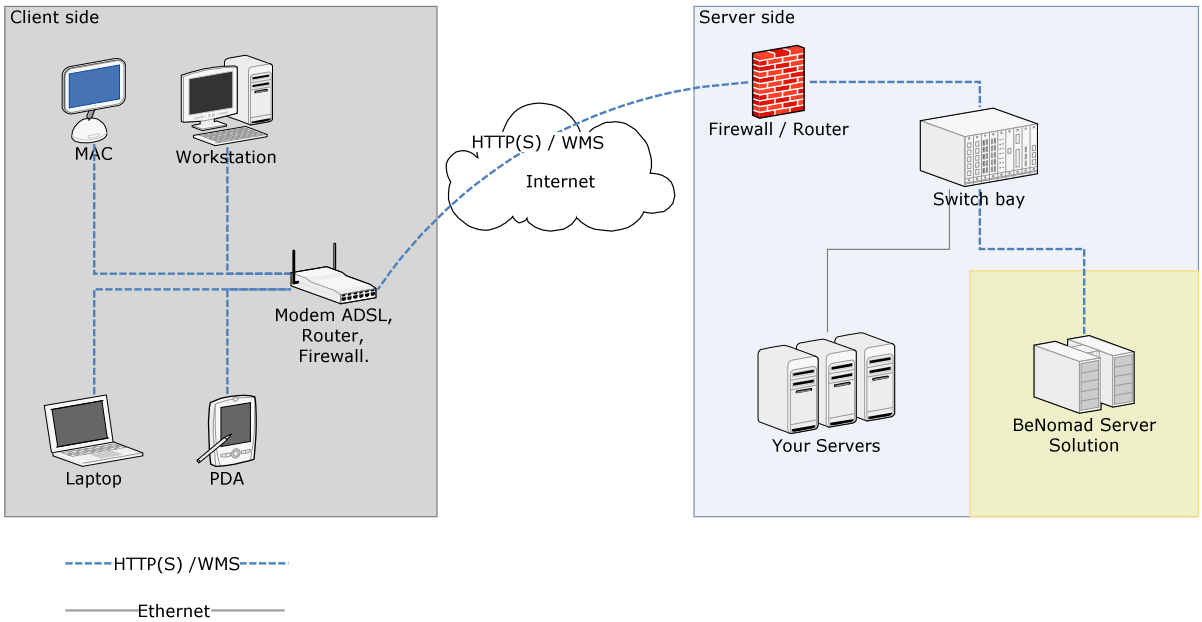
Function name	Description
Mapping Cache Level 2	Components that transparently stores map data so that future requests for that data can be served faster. You can tune by BeMap rules, JSR-94 or Drools rules.
ACL and Back Office	The server can connect to a database (RDMS) for check the

	user access by services.
Watchdog cron script	The watchdog can rest BeMap Server if cannot respond in time.
Cache Builder Tool	Pre-build you Mapping Cache Level 2.
Web Application Demo	Web application with OpenLayers, Javascript and XSLT sample to facilitate your integration time.

1.4 Protocols supported:

Protocol name	Version	Services name	Output format
BND	1.0.0	Mapping	PNG, GIF, JPEG
		Geocoding	XML, JSON
		Natural Geocoding	XML, JSON
		Reverse Geocoding	XML, JSON
		Feature Area	XML, JSON, SVS
		Routing	XML, JSON
		Trace route	XML, JSON
		Rebuild Route	XML, JSON
		Traffic	XML, JSON, BinAC10
		Geo fencing	XML, JSON
		Geo Server Info	XML, JSON
		Custom Service	Your can define
WMS	1.1.1	Mapping	PNG, GIF, JPEG
		Feature info	XML
		Capabilities	XML
WMS	1.3.0	Mapping	PNG, GIF, JPEG
		Feature info	XML
		Capabilities	XML
Web Service	1.4.0	Mapping	Web Service XML-RPC and WDSL
		Geocoding	
		Natural Geocoding	
		Reverse Geocoding	
		Feature Area	
		Routing	
		Trace route	
		Rebuild Route	
		Traffic	
		Geo Fencing	
		Geo Server Info	
		Custom Service	
JSON-RPC			Web Service JSON

1.5 Overview scheme of components



BeNomad Server works on Linux or Windows Operating System (see Supported Operation System chapter for more details). The BeNomad Server can be installing on pre-existing environment like a web server or on a dedicated server.

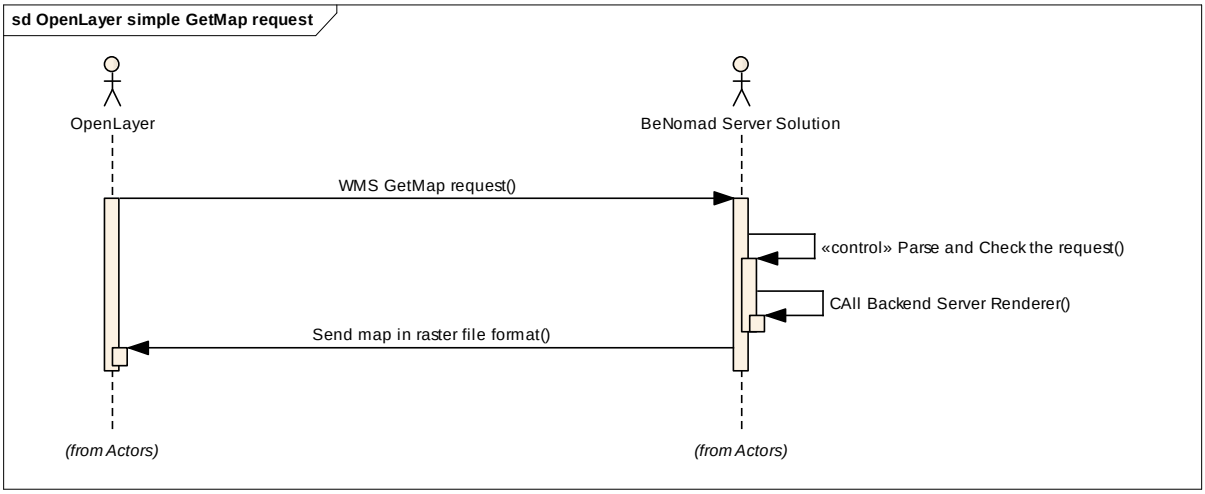
Your existing web server or client can access directly to the BeNomad Server to get geo graphical information and raster map. For the client you can use the Open Source solution like OpenLayers to provide your final user with a graphical map browsing interface. OpenLayers is written in HTML / Javascript and it can work into Internet browser like Mozilla Firefox, Microsoft Internet Explorer or Apple Safari; Under Mac Windows or Linux.

Note: BeNomad recommend installing BeNomad Server on two dedicated servers for best performance and high-availability.

1.6 WMS protocol

The Mapping module of the BeNomad Server Solution uses WMS standard protocol to interact and exchange information or maps with any WMS Client or WMS Server.
With the WMS protocol you can user some open source client like OpenLayers.

1.6.1 Sample of WMS Request to the BeNomad Server



- OpenLayers send a WMS request encapsulated into HTTP / HTTPS protocol to the BeNomad Server Solution.
- BeNomad Server Solution parsing and check the request.
- If the request is good, the server draws the map and sends the response to the OpenLayers client in raster file format (jpeg, png, gif).
- If the request is not right the server writes the response of the found error in WMS Exception XML format (see WMS Exception XML Response).

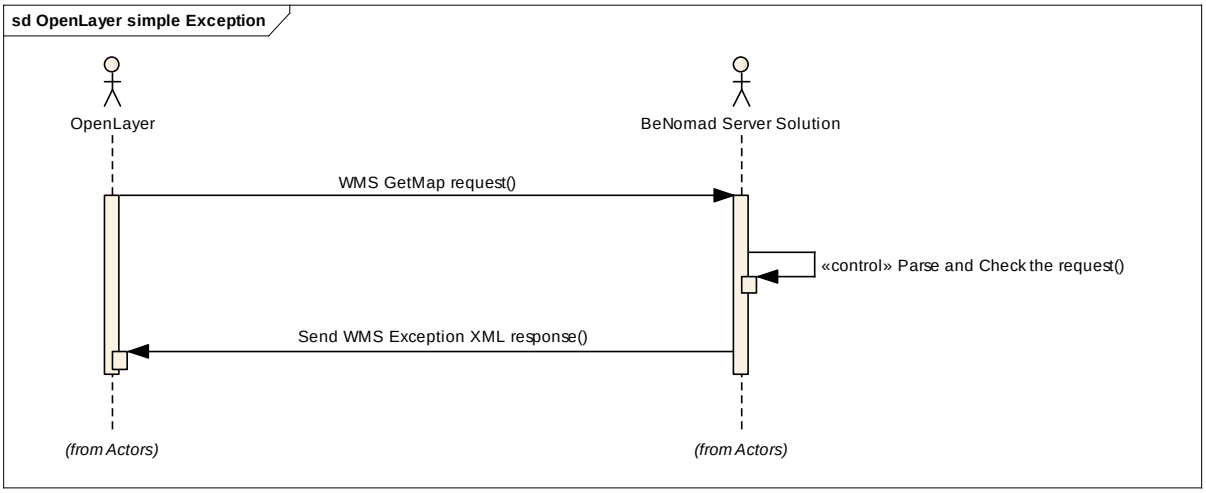
1.6.1.1 Sample of WMS URL for get a map:

Enter this URL into your web browser to see the sample map

```
http://localhost:8080/bgis/wms?LAYERS=&VERSION=1.3.0&FORMAT=image%2Fpng&CRS=EPSG%3A4326&EXCE
PTIONS=INIMAGE&SERVICE=WMS&REQUEST=GetMap&STYLES=&BBOX=1.1334246139713233,40.75561640931422,
6.511232818628431,46.13342461397133&WIDTH=256&HEIGHT=256
```

Note: OpenLayers Client makes dynamically the WMS URL for you and sends it to BeNomad Server.

1.6.2 Sample of WMS Exception XML Response



- OpenLayers sends a WMS request encapsulated into HTTP / HTTPS protocol to the BeNomad Server Solution.
- BeNomad Server Solution parsing and check the request.
- Server writes WMS XML Exception file format.

1.6.2.1 Sample of WMS XML Exception file format:

```
<?xml version='1.0' encoding="UTF-8"?>
<ServiceExceptionReport version="1.3.0"
      xmlns="http://www.opengis.net/ogc" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance"
      xsi:schemaLocation="http://www.opengis.net/ogc
http://schemas.opengis.net/wms/1.3.0/exceptions_1_3_0.xsd">
      <ServiceException code="InvalidUpdateSequence">Another error message, this one with a
service exception code supplied.</ServiceException>
</ServiceExceptionReport>
```

1.6.3 GetMap - Mapping

Request:

```
http://localhost:8080/bgis/wms?LAYERS=&VERSION=1.3.0&FORMAT=image%2Fpng&CRS=EPSG%3A4326&EXCE
PTIONS=INIMAGE&SERVICE=WMS&REQUEST=GetMap&STYLES=&BBOX=1.1334246139713233,40.75561640931422,
6.511232818628431,46.13342461397133&WIDTH=256&HEIGHT=256
```

Reponse:

Request parameters details:

- **BBOX**: The mandatory BBOX parameter allows a Client to request a particular Bounding Box. The value of the BBOX parameter in a GetMap request is a list of comma-separated real numbers in the form "minx,miny,maxx,maxy". These values specify the minimum X, minimum Y, maximum X, and maximum Y values of a region in the Layer CRS of the request. The units, ordering and direction of increment of the X and Y axes are as defined by WGS84. The four bounding box values indicate the outside limits of the region. The relation of the Bounding Box to the map pixel matrix is that the bounding box goes around the "outside" of the pixels of the map rather than through the centers of the map's border pixels. In this context, individual pixels represent an area on the ground. If a request contains an invalid BBOX (e.g., one whose minimum X is greater than or equal to the maximum X, or whose minimum Y is greater than or equal to the maximum Y) the server shall throw a service exception. If a request contains a BBOX whose area does not overlap at all with the "BoundingBox" element in the service metadata for the requested layer, the server shall return empty content (that is, a blank map or an graphic element file with no elements) for that map. Any features that are partly or entirely contained in the Bounding Box shall be returned in the appropriate format.
- **Format**: The mandatory FORMAT parameter states the desired format of the map. Supported values for a GetMap request on a WMS server are listed in one or more "Request" "GetMap" "Format" elements of its service metadata. The entire MIME type string in "Format" is used as the value of the FORMAT parameter. There is no default format. In an HTTP environment, the MIME type shall be set

on the returned object using the Content-type entity header. If the request specifies a format not supported by the server, the server shall issue a service exception (code = InvalidFormat).

- **WIDTH / HEIGHT**: The mandatory WIDTH and HEIGHT parameters specify the size in integer pixels of the map to be produced. If the request is for a picture format, the returned picture, regardless of its MIME type, shall have exactly the specified width and height in pixels. In the case where the aspect ratio of the BBOX and the ratio width/height are different, the WMS shall stretch the returned map so that the resulting pixels could themselves be rendered in the aspect ratio of the BBOX. In other words, it shall be possible using this definition to request a map for a device whose output pixels are the selves non-square, or to stretch a map into an image area of a different aspect ratio. Map distortions will be introduced if the aspect ratio WIDTH/HEIGHT is not commensurate with X, Y and the pixel aspect. Client developers should minimize the possibility that users will inadvertently request or unknowingly receive distorted maps. If a request is for a graphic element format that does not have explicit width and height, the client shall include the WIDTH and HEIGHT values in the request and a server may use them as helpful information in constructing the output map.
- **TRANSPARENT**: The optional TRANSPARENT parameter specifies whether the map background is to be made transparent or not. TRANSPARENT can take on two values, "TRUE" or "FALSE". The default value is FALSE if this parameter is absent from the request. The ability to return pictures drawn with transparent pixels allows results of different Map requests to be overlaid, producing a composite map. It is strongly recommended that every WMS offer a format that provides transparency for layers that could sensibly be overlaid above others. NOTE The image/gif format provides transparency and is properly displayed by common web clients. The image/png format provides a range of transparency options but support in viewing applications is less common. The image/jpeg format does not provide transparency at all. When TRANSPARENT is set to TRUE and the FORMAT parameter contains a Picture format (e.g., image/gif), then a WMS shall return (when permitted by the requested format) a result where all of the pixels not representing features or data values in that Layer are set to a transparent value. For example, a "roads" layer would be transparent wherever no road is shown. If the picture format does not support transparency, then the server shall respond with a non-transparent image (in other words, it is not an error for the client to always request transparent maps regardless of format). When the Layer has been declared "opaque", then significant portions, or the entirety, of the map may not be able to made transparent. Clients may still request TRANSPARENT=true When the FORMAT parameter contains a Graphic Element format, the TRANSPARENT parameter may be included in the request but its value shall be ignored by the WMS.
- **LANGUAGE**: Tells the server to use a preferential language for address lookup. Objects for which defined language code is not available, default language will be used. Values language Code - An US-ASCII string that defines an ISO 639-1 (2-letter) language code. The special "IC" (or "ic") language code allows you to search for a country depending on its ISO-3166 Alpha-3 or Alpha-2 country code. i.e. for French : LANGUAGE=FR
- **Exception**: EXCEPTIONS is an optional parameter. The default value is "XML" if this parameter is absent from the request. A Web Map Service shall offer one or more of the following exception reporting formats by listing them in separate <Format> elements inside the <Exceptions> element of its service metadata. The first of these formats must be offered by every WMS; the others are optional. XML is the default exception format if none is specified in the request. The remaining exception formats are optional. A server may issue a service exception in the default XML format if a request specifies a different exception format not

supported by the server. INIMAGE (optional) If the EXCEPTIONS parameter is set to INIMAGE, the WMS shall, upon detecting an error, return an object of the MIME type specified in the FORMAT parameter whose content includes text describing the nature of the error. In the case of a picture format, the error message shall be drawn on the returned picture. In the case of a graphic element format, the text of the error message shall be rendered in the manner that text is normally represented in that format. BLANK (optional) If the EXCEPTIONS parameter is set to BLANK, the WMS shall, upon detecting an error, return an object of the type specified in FORMAT whose content is uniformly "off". In the case of a picture format, that response shall be an image containing only pixels of one colour (the background colour). In the case of a picture format supporting transparency, if TRANSPARENT=TRUE is specified the pixels shall all be transparent. In the case of a graphic element output format, no visible graphic elements shall be included in the response output.

1.6.4 GetCapabilities – Service Information

Request:

```
http://localhost:8080/bgis/wms?REQUEST=GetCapabilities&VERSION=1.3.0&SERVICE=WMS
```

Response:

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?><WMS_Capabilities
xmlns="http://www.opengis.net/wms" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.3.0"
xsi:schemaLocation="http://www.opengis.net/wms
http://schemas.opengis.net/wms/1.3.0/capabilities_1_3_0.xsd">
      <Service>
            <Name>WMS</Name>
            <Title>BeNomad Server</Title>
            <Abstract>BeNomad Server maintained by BeNomad SARL.  Contact: bgis-
support@benomad.com.</Abstract>
            <KeywordList>
                  <Keyword>benomad</Keyword>
                  <Keyword>server</Keyword>
            </KeywordList>
            <OnlineResource xlink:href="http://localhost:8080/" xlink:type="simple"/>
            <ContactInformation>
                  <ContactPersonPrimary>
                        <ContactPerson>Support</ContactPerson>
                        <ContactOrganization>BeNomad SARL</ContactOrganization>
                  </ContactPersonPrimary>
                  <ContactPosition>Technical Support</ContactPosition>
                  <ContactAddress>
                        <AddressType>postal</AddressType>
                        <Address>8 av de Dr Lefebvre</Address>
                        <City>Villeneuve Loubet</City>
                        <StateOrProvince>06</StateOrProvince>
                        <PostCode>06270</PostCode>
                        <Country>France</Country>
                  </ContactAddress>
                  <ContactVoiceTelephone>+33 (0) 493 730 496</ContactVoiceTelephone>
                  <ContactElectronicMailAddress>bgis-
support@benomad.com</ContactElectronicMailAddress>
            </ContactInformation>
            <Fees>none</Fees>
            <AccessConstraints>none</AccessConstraints>
            <LayerLimit>16</LayerLimit>
            <MaxWidth>800</MaxWidth>
            <MaxHeight>600</MaxHeight>
      </Service>
      <Capability>
            <Request>
                  <GetCapabilities>
                        <DCPType>
                              <HTTP>
                                    <Get>
                                          <OnlineResource
xlink:href="http://localhost:8080/bgis/wms?" xlink:type="simple"/>
                                    </Get>
                                    <Post>
                                          <OnlineResource
xlink:href="http://localhost:8080/bgis/wms?" xlink:type="simple"/>
                                    </Post>
                              </HTTP>
                        </DCPType>
                  <Format>text/xml</Format></GetCapabilities>
                  <GetMap>
                        <DCPType>
                              <HTTP>
                                    <Get>
                                          <OnlineResource
xlink:href="http://localhost:8080/bgis/wms?" xlink:type="simple"/>
                                    </Get>
                              </HTTP>
                        </DCPType>

      <Format>image/png</Format><Format>image/png</Format><Format>image/gif</Format><Format
>image/jpeg</Format></GetMap>
                  <GetFeatureInfo>
                        <DCPType>
                              <HTTP>
                                    <Get>
                                          <OnlineResource
xlink:href="http://localhost:8080/bgis/wms?" xlink:type="simple"/>
                                    </Get>
                              </HTTP>
                        </DCPType>
                  <Format>text/xml</Format></GetFeatureInfo>
            </Request>
            <Exception>
            <Format>XML</Format><Format>INIMAGE</Format><Format>BLANK</Format></Exception>
            <Layer>
            <Layer opaque="1" queryable="1"><Name>road</Name><Title>All
roads</Title><EX_GeographicBoundingBox><westBoundLongitude>-
30.0</westBoundLongitude><eastBoundLongitude>25.0</eastBoundLongitude><southBoundLatitude>71
.0</southBoundLatitude><northBoundLatitude>86.0</northBoundLatitude></EX_GeographicBoundingB
ox><BoundingBox CRS="WGS84" maxx="71.0" maxy="86.0" minx="-30.0"
miny="25.0"/></Layer></Layer>
      </Capability>
</WMS_Capabilities>
```

Request parameters details:

- **FORMAT**: The optional FORMAT parameter states the desired format of the service metadata. Supported values for a GetCapabilities request on a WMS server are listed in one or more <Request><GetCapabilities><Format> elements of its service metadata. Every server shall support the default text/xml format defined in Annex A. Support for other formats is optional. The entire MIME type string in <Format> is used as the value of the FORMAT parameter. In an HTTP environment, the MIME type shall be set on the returned object using the HTTP Content-type entity header. If the request specifies a format not supported by the server, the server shall respond with the default text/xml format.
- **LANGUAGE**: Tells the server to use a preferential language for address lookup. Objects for which defined language code is not available, default language will be used. Values language Code - An US-ASCII string that defines an ISO 639-1 (2-letter) language code. The special "IC" (or "ic") language code allows you to search for a country depending on its ISO-3166 Alpha-3 or Alpha-2 country code. i.e. for French : LANGUAGE=FR

1.6.5 GetFeatureInfo – Cartography Information

Request:

```
http://192.168.1.23:8080/bgis/wms?LAYERS=&VERSION=1.3.0&FORMAT=text%2Fxml&CRS=EPSG%3A4326&EX
CEPTIONS=XML&SERVICE=WMS&REQUEST=GetFeatureInfo&STYLES=&BBOX=7.2660000000000045,43.702,7.268
000000000004,43.704&WIDTH=256&HEIGHT=256&I=25&J=25
```

Response:

```
<?xml version="1.0" encoding="utf-8"?>
<WmsGetFeatureInfo version="1.3.0"
xmlns="http://www.opengis.net/gml"
xmlns:gml="http://www.opengis.net/gml"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xlink="http://www.w3.org/1999/xlink"
xsi:schemaLocation="http://www.opengis.net/gml
../crsSchemas/base/coordinateReferenceSystems.xsd">
  <gml:boundedBy>
    <gml:Envelope>
      <gml:coordinates>7.2660000000000045,43.702 .268000000000004,43.704</gml:coordinates>
    </gml:Envelope>
  </gml:boundedBy>
  <gml:featureMember>
    <gml:CodeType>18759</gml:CodeType>
    <gml:name>FRA</gml:name>
  </gml:featureMember>
  <gml:featureMember>
    <gml:CodeType>18759</gml:CodeType>
    <gml:name>FR</gml:name>
  </gml:featureMember>
  <gml:featureMember>
    <gml:CodeType>20306</gml:CodeType>
    <gml:name>France</gml:name>
  </gml:featureMember>
```

.....

```
  <gml:featureMember>
    <gml:CodeType>20567</gml:CodeType>
    <gml:name>06000</gml:name>
  </gml:featureMember>
</WmsGetFeatureInfo>
```

Request parameters details:

- **BBOX**: The mandatory BBOX parameter allows a Client to request a particular Bounding Box. The value of the BBOX parameter in a GetMap request is a list of

comma-separated real numbers in the form "minx,miny,maxx,maxy". These values specify the minimum X, minimum Y, maximum X, and maximum Y values of a region in the Layer CRS of the request. The units, ordering and direction of increment of the X and Y axes are as defined by WGS84. The four bounding box values indicate the outside limits of the region. The relation of the Bounding Box to the map pixel matrix is that the bounding box goes around the "outside" of the pixels of the map rather than through the centers of the map's border pixels. In this context, individual pixels represent an area on the ground. If a request contains an invalid BBOX (e.g., one whose minimum X is greater than or equal to the maximum X, or whose minimum Y is greater than or equal to the maximum Y) the server shall throw a service exception. If a request contains a BBOX whose area does not overlap at all with the "BoundingBox" element in the service metadata for the requested layer, the server shall return empty content (that is, a blank map or an graphic element file with no elements) for that map. Any features that are partly or entirely contained in the Bounding Box shall be returned in the appropriate format.

- **WIDTH / HEIGHT**: The mandatory WIDTH and HEIGHT parameters specify the size in integer pixels of the map to be produced. If the request is for a picture format, the returned picture, regardless of its MIME type, shall have exactly the specified width and height in pixels. In the case where the aspect ratio of the BBOX and the ratio width/height are different, the WMS shall stretch the returned map so that the resulting pixels could themselves be rendered in the aspect ratio of the BBOX. In other words, it shall be possible using this definition to request a map for a device whose output pixels are the selves non-square, or to stretch a map into an image area of a different aspect ratio. Map distortions will be introduced if the aspect ratio WIDTH/HEIGHT is not commensurate with X, Y and the pixel aspect. Client developers should minimize the possibility that users will inadvertently request or unknowingly receive distorted maps. If a request is for a graphic element format that does not have explicit width and height, the client shall include the WIDTH and HEIGHT values in the request and a server may use them as helpful information in constructing the output map.
- **INFO_FORMAT**:The mandatory INFO_FORMAT parameter indicates what format to use when returning the feature information. Supported values for a GetFeatureInfo request on a WMS server are listed as MIME types in one or more <Request><FeatureInfo><Format> elements of its service metadata. The entire MIME type string in <Format> is used as the value of the INFO_FORMAT parameter. In an HTTP environment, the MIME type shall be set on the returned object using the Content-type entity header. If the request specifies a format not supported by the server, the server shall issue a service exception (code = InvalidFormat). EXAMPLE The parameter INFO_FORMAT=text/xml requests that the feature information be formatted in XML.
- **I / J**: mandatory I and J request parameters are integers that indicate a point of interest on the map that was produced by the embedded GetMap request (the "map request part". Therefore: the value of I shall be between 0 and the maximum value of the i axis; the value of J shall be between 0 and the maximum value of the j axis; the point I=0, J=0 indicates the pixel at the upper left corner of the map; I increases to the right and J increases downward. The point (I,J) represents the center of the indicated pixel. If the value of I or of J is invalid, the server shall issue a service exception (code = InvalidPoint).
- **FEATURE_COUNT**: The optional FEATURE_COUNT parameter states the maximum number of features per layer for which feature information shall be returned. Its value is a positive integer. The default value is 1 if this parameter is omitted or is other than a positive integer.
- **LANGUAGE**: Tells the server to use a preferential language for address lookup. Objects for which defined language code is not available, default language will be

used. Values language Code - An US-ASCII string that defines an ISO 639-1 (2-letter) language code. The special "IC" (or "ic") language code allows you to search for a country depending on its ISO-3166 Alpha-3 or Alpha-2 country code. i.e. for French : LANGUAGE=FR

- **ANGLE**: Orientation angle of vehicle. Use it to have more precision during the research. Use it with "speed" parameter.
- **SPEED**: Speed of vehicle. Use it to have more precision during the research. Use it with "angle" parameter.
- **Exception**: EXCEPTIONS is an optional parameter. The default value is "XML" if this parameter is absent from the request. A Web Map Service shall offer one or more of the following exception reporting formats by listing them in separate <Format> elements inside the <Exceptions> element of its service metadata. The first of these formats must be offered by every WMS; the others are optional. XML is the default exception format if none is specified in the request. The remaining exception formats are optional. A server may issue a service exception in the default XML format if a request specifies a different exception format not supported by the server. INIMAGE (optional) If the EXCEPTIONS parameter is set to INIMAGE, the WMS shall, upon detecting an error, return an object of the MIME type specified in the FORMAT parameter whose content includes text describing the nature of the error. In the case of a picture format, the error message shall be drawn on the returned picture. In the case of a graphic element format, the text of the error message shall be rendered in the manner that text is normally represented in that format. BLANK (optional) If the EXCEPTIONS parameter is set to BLANK, the WMS shall, upon detecting an error, return an object of the type specified in FORMAT whose content is uniformly "off". In the case of a picture format, that response shall be an image containing only pixels of one colour (the background colour). In the case of a picture format supporting transparency, if TRANSPARENT=TRUE is specified the pixels shall all be transparent. In the case of a graphic element output format, no visible graphic elements shall be included in the response output.

1.7 Bnd protocol

1.7.1 Mapping

Request:

```
http://localhost:8080/bgis/bnd?version=1.0.0&action=mapping&bbox=1.13342,40.75561,6.51123,46.13342&width=256&height=256&format=png
```

-

Reponse:

Request parameters details:

- **bbox**: The mandatory bbox parameter allows a Client define an area of map. The value of the bbox parameter is a list of comma-separated real numbers in the form "minx,miny,maxx,maxy". These values specify the minimum X, minimum Y, maximum X, and maximum Y values of a region. The units, ordering and direction of increment of the X and Y axes are as defined by WGS84.
- **Width**: The mandatory width parameter is use to define the width of map in pixels. This value is an integer.
- **Height**: The mandatory height parameter is use to define the height of map in pixels. This value is an integer.
- **Format**: The optional parameter format is use to define the file format used for the map. By default the format is png. Possible value is: png, png24, gif, jpeg.
- **Transparent**: The optional transparent parameter specifies whether the map background is to be made transparent or not. Transparent can take on two values, "true" or "false". The default value is false if this parameter is absent from the request. The ability to return pictures drawn with transparent pixels allows results of different Map requests to be overlaid, producing a composite map. The jpeg format does not provide transparency at all. When transparent is set to true and the format parameter contains a picture format (e.g., gif).
- **Language**: Tells the server to use a preferential language for address lookup. Objects for which defined language code is not available, default language will be used. Values language Code - An US-ASCII string that defines an ISO 639-1 (2-letter) language code. The special "IC" (or "ic") language code allows you to search for a country depending on its ISO-3166 Alpha-3 or Alpha-2 country code. i.e. for French : LANGUAGE=FR
- **Icon**: The optional parameter is use to draw some overlay icon on the map. The value of the bbox parameter is a list of comma-separated real numbers in the form "x,y,icon number". The icon bitmap is defined in the graphical chart file.This parameter can be used several times. E.g: &icon=7.13426,43.65279,100000000&icon=7.14426,43.65279,100000000

1.7.2 Geocoding

Request:

```
http://localhost:8080/bgis/bnd?version=1.0.0&action=geocoding&country=FR&city=paris&street=pyr%E9n%E9es&language=fr&maxresult=2
```

Response:

```
<?xml version="1.0" encoding="UTF-8"?>
<Geocoding version="1.0.0">
      <Elements count="2">
            <Element>
                  <Coordinate x="2.395975" y="48.860675" />
                  <PostalAddress>
                        <Country>France</Country>
                        <State>Ile-de-France</State>
                        <County>Paris</County>
                        <City>Paris</City>
                        <District>Paris 20ème Arrondissement</District>
                        <PostalCode></PostalCode>
                        <Street>Rue des Pyrénées</Street>
                        <StreetNumber></StreetNumber>
                  </PostalAddress>
                  <SpeedLimit>0.0</SpeedLimit>
            </Element>
            <Element>
                  <Coordinate x="2.405515" y="48.853435" />
                  <PostalAddress>
                        <Country>France</Country>
                        <State>Ile-de-France</State>
                        <County>Paris</County>
                        <City>Paris</City>
                        <District>Paris 20ème Arrondissement</District>
                        <PostalCode></PostalCode>
                        <Street>Villa des Pyrénées</Street>
                        <StreetNumber></StreetNumber>
                  </PostalAddress>
                  <SpeedLimit>0.0</SpeedLimit>
            </Element>
      </Elements>
</Geocoding>
```

Request parameters details:

- **CountryCode / Country**: The mandatory parameters countryCode or Country is use to define the research in specific country. Use countryCode parameter with 3 digits ISO country code. Use country parameter with full name of country. If you use the countryCode parameter the country parameter is optional and if you use the country parameter the countryCode is optional.
- **State**: The optional parameter state is use to define a filter on State name.
- **County**: The optional parameter county is use to define a filter on County name.
- **City**: The optional parameter city is use to define a filter on City name.
- **District**: The optional parameter district is use to define a filter on District name.
- **PostalCode**: The optional parameter postalCode is use to define a filter on postal code value.
- **Street**: The optional parameter street is use to define a filter on Road name.
- **StreetNumber**: The optional parameter streetNumber is use to define a filter on House number in a street.
- **MaxResult**: The optional parameter is use to define the maximum of result return, by default is set to 1.
- **Language**: Tells the server to use a preferential language for address lookup. Objects for which defined language code is not available, default language will be used. Values language Code - An US-ASCII string that defines an ISO 639-1 (2-letter) language code. The special "IC" (or "ic") language code allows you to search for a country depending on its ISO-3166 Alpha-3 or Alpha-2 country code. i.e. for French : LANGUAGE=FR

1.7.3 Reverse geocoding

Reverse Geocoding is the process of translating a (Longitude / Latitude) location back to an address, place, city, state or identifying other attributes about or near the location.

Request:

```
http://localhost:8080/bgis/bnd?version=1.0.0&action=revgeocoding&xy=2.39478,48.86957&radius=5&language=fr
```

Response:

```
<?xml version="1.0" encoding="UTF-8"?>
<ReverseGeocoding version="1.0.0">
	<Elements count="1">
		<Element>
			<Coordinate x="2.39479" y="48.86958" />
			<PostalAddress>
				<Country>France</Country>
				<State>Ile-de-France</State>
				<County>Paris</County>
				<City>Paris</City>
				<District></District>
				<PostalCode>75020</PostalCode>
				<Street>Rue des Pyrénées</Street>
				<StreetNumber>295</StreetNumber>
			</PostalAddress>
			<SpeedLimit>0.0</SpeedLimit>
			<Types>
				<Type>DISTRICT</Type>
				<Type>CITY</Type>
				<Type>COUNTY</Type>
				<Type>STATE</Type>
				<Type>COUNTRY</Type>
			</Types>
		</Element>
	</Elements>
</ReverseGeocoding>
```

Request parameters details:

- **Xy**: The mandatory XY parameter allows a Client to request a particular Point. The value of the XY parameter in a Reverse-Geocoding request is a list of comma-separated real numbers in the form "x,y". These values specify the X, Y, values of a point in the Layer of the request. The units, ordering and direction of increment of the X and Y axes are as defined by WGS84. X of longitude and Y for latitude coordinate.
- **Radius**: Maximum search radius around the given point.
- **MaxResult**: The optional parameter is use to define the maximum of result return, by default is set to 1.
- **Angle**: Orientation angle of vehicle. Use it to have more precision during the research. Use it with "speed" parameter.
- **Speed**: Speed of vehicle. Use it to have more precision during the research. Use it with "angle" parameter.
- **Language**: Tells the server to use a preferential language for address lookup. Objects for which defined language code is not available, default language will be used. Values language Code - An US-ASCII string that defines an ISO 639-1 (2-letter) language code. The special "IC" (or "ic") language code allows you to search for a country depending on its ISO-3166 Alpha-3 or Alpha-2 country code. i.e. for French : LANGUAGE=FR

1.7.4 Routing

Request:

```
http://bgisdev.int.benomad.com/bgis/bnd?version=1.0.0&action=routing&language=fr&options=ROUTESHEET,POLYLINE&format=xml&xy=7.41891,43.73255&xy=7.15376,43.72189&xy=7.15092,43.66244&xy=7.12901,43.62986
```

1.7.4.1 Eco-tax

BeMap provide you with the tools needed to calculate the cost of eco-tax for your route.

Request:

```
http://bgisdev.int.benomad.com/bgis/bnd?version=1.0.0&action=routing&language=fr&options=ROU
TESHEET,POLYLINE&format=xml&ecoTaxCategory=CATA&xy=2.40236,48.91315&xy=2.22938,48.82397
```

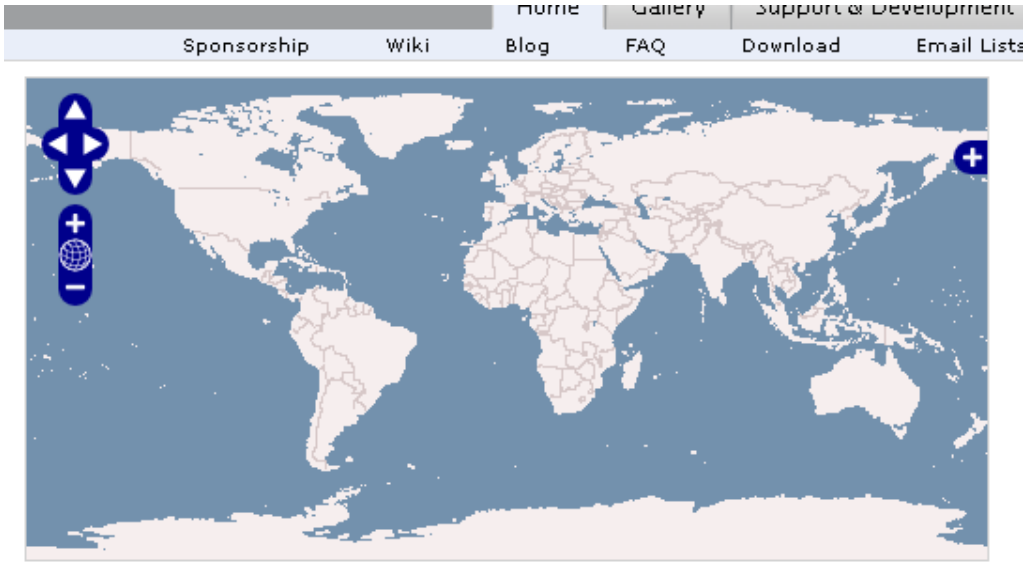
Part of response:

```
. . .
<Length unity="m">19158</Length>
<Duration unity="second">1591</Duration>
<AverageSpeed>43.34934003771213</AverageSpeed>
<EcoTax unity="euro">1.224</EcoTax>
. . .
```

1.8 OpenLayers

OpenLayers makes it easy to put a dynamic map in any web page. It can display map tiles and markers loaded from any source. OpenLayers is completely free, Open Source JavaScript, released under a BSD-style License.

1.8.1 OpenLayers screenshots

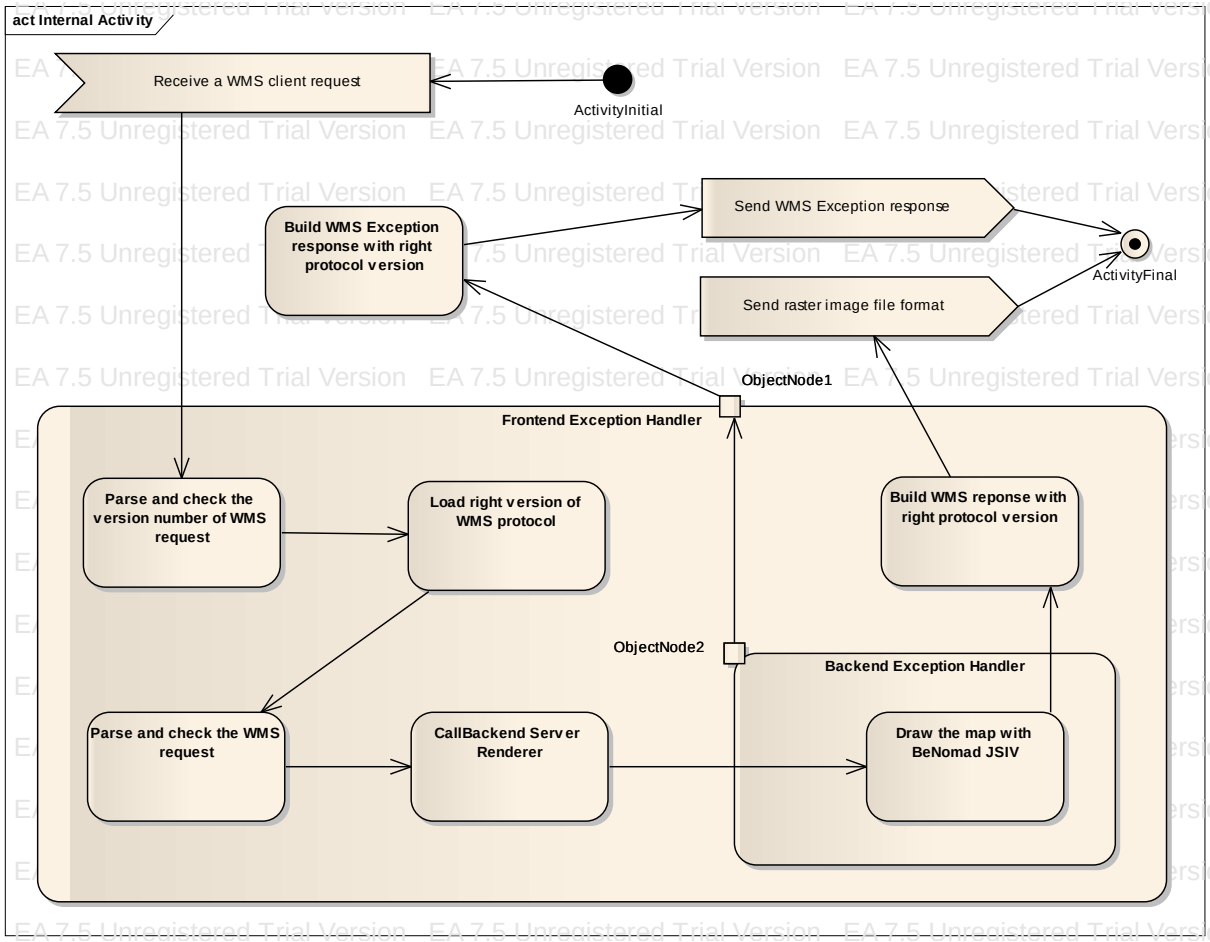


OpenLayers inside a HTML Web site page

You can see other screenshots at this URL: http://gallery.OpenLayerss.org/

OpenLayers integration is easily to your website. See some sample of OpenLayers integration at http://OpenLayers.org/dev/examples/

1.9 Internal activity of BeNomad Server



2 Supported Operation System

BeNomad Server Solution is compatible with the following x86-32bit and x64 platforms:

- Windows 2000 / XP / Vista / Seven,
- Linux platforms including
  - gcc-3.4.6 - glibc 2.3.4 (E.g. Centos 4.6)
  - gcc-4.1.2 - glibc 2.5.0 (E.g. Centos 5.2)

3 Linux Server Deployment (is subject to change)

These followed command lines are executed into root user:

3.1 Add a BeNomad user and group

Command line for RedHat Enterprise Linux 5.x or CentOS 5.x:

```
groupadd benomad
adduser -g benomad -d /opt/benomad -M benomad
```

Command line for Debian Linux:

```
addgroup --system benomad
adduser –gid <LAST GROUP ID OF BENOMAD> --system --no-create-home --home
/opt/benomad --shell /bin/sh benomad
```

3.2 Install msttcorefonts for TrueType fonts support (optional)

For RedHat Enterprise Linux 5.x or CentOS 5.x:

```
yum install ttmkfdir
yum install rpm-build

# x86-32
wget http://packages.sw.be/cabextract/cabextract-1.2-1.el5.rf.i386.rpm
rpm -Uvh ./cabextract-1.2-1.el5.rf.i386.rpm

# x86-64
wget http://packages.sw.be/cabextract/cabextract-1.2-1.el5.rf.x86_64.rpm
rpm -Uvh ./cabextract-1.2-1.el5.rf.x86_64.rpm

wget http://corefonts.sourceforge.net/msttcorefonts-2.0-1.spec
rpmbuild -ba msttcorefonts-2.0-1.spec
yum install chkfontpath
rpm -ivh /usr/src/redhat/RPMS/noarch/msttcorefonts-2.0-1.noarch.rpm
```

3.3 Unpack

Extract the archive files at the root of your file system.

Command lines:

```
cd /
tar -xvzpf bgis-x.x.xfinal-linux_x86_64bits-server.tar.gz
tar -xvzpf bgis-x.x.xfinal-linux_x86_64bits-config.tar.gz
```

3.4 Default installation directories

- Base folder: /opt/benomad/bgis/stable
  The default patch of BeNomad Server Solution for Linux Operating System.
- Configuration: <Base folder>/etc
  In this directory you can find the configuration of Server and graphical chart.
- Binary: <Base folder>/bin
  This directory contains the JVM, Tomcat and Server Core of BeNomad Server Solution.
- Log: <Base folder>/var/log
  You can find in it all log files write by the Server process.

3.5 Adjust configuration files

Dataset:

- Into <Base folder>/etc/configuration.properties
  - Set your SVS files directory for "bgis.dataset.path" key.
  - Set your SVS key for "bgis.dataset.svskey" key.
  - Set the Copyright of dataset for "bgis.dataset.forcecopyright" key, Set to blank for automatic recognition.
- Into <Base folder>/etc/wmsCapabilities_x_x_x.xml
  - Replace all http://bgis.benomad.com:80/ by your server host name.
  - Adjust Title, Abstract, KeywordList and ContactInformation sections.

Chart (optional, required by msttcorefonts):

- Into /opt/benomad/bgis/data/chart/LinuxFontMapping.cfg
  - Uncomment the "FONT_PATH" parameter.

3.6 Operating system configuration (optional)

Firewall:

RedHat Enterprise Linux 5.x or CentOS 5.x:
Edit /etc/sysconfig/iptables and add this RED line:

```
# Firewall configuration written by system-config-securitylevel
# Manual customization of this file is not recommended.
*filter
:INPUT ACCEPT [0:0]
:FORWARD ACCEPT [0:0]
:OUTPUT ACCEPT [0:0]
:RH-Firewall-1-INPUT - [0:0]
-A INPUT -j RH-Firewall-1-INPUT
-A FORWARD -j RH-Firewall-1-INPUT
-A RH-Firewall-1-INPUT -i lo -j ACCEPT
-A RH-Firewall-1-INPUT -p icmp --icmp-type any -j ACCEPT
-A RH-Firewall-1-INPUT -p 50 -j ACCEPT
-A RH-Firewall-1-INPUT -p 51 -j ACCEPT
-A RH-Firewall-1-INPUT -p udp --dport 5353 -d 224.0.0.251 -j ACCEPT
-A RH-Firewall-1-INPUT -p udp -m udp --dport 631 -j ACCEPT
-A RH-Firewall-1-INPUT -p tcp -m tcp --dport 631 -j ACCEPT
-A RH-Firewall-1-INPUT -p tcp -m tcp --dport 8080 -j ACCEPT
-A RH-Firewall-1-INPUT -m state --state ESTABLISHED,RELATED -j ACCEPT
-A RH-Firewall-1-INPUT -m state --state NEW -m tcp -p tcp --dport 22 -j ACCEPT
-A RH-Firewall-1-INPUT -j REJECT --reject-with icmp-host-prohibited
COMMIT
```

And after edition you can execute:

```
iptables-restore /etc/sysconfig/iptables
```

3.7 Apache 2.x configuration for compression support (optional)

Require Apache 2.x with mod_deflate.
Configuration sample:

```
LoadModule deflate_module modules/mod_deflate.so

<IfModule mod_deflate.c>
    AddOutputFilterByType DEFLATE text/plain text/html text/xml text/css application/xml
application/xhtml+xml application/rss+xml application/javascript application/x-javascript
    DeflateCompressionLevel 9
    BrowserMatch ^Mozilla/4 gzip-only-text/html
    BrowserMatch ^Mozilla/4\.0[678] no-gzip
    BrowserMatch \bMSIE !no-gzip !gzip-only-text/html
    SetOutputFilter DEFLATE
</IfModule>
```

3.8 Install you data-sets (SVS files)

Put your data-sets into the <Base folder>/../data/svs/current

3.9 Start and Stop the BeNomad Server Solution

3.9.1 Under RedHat Enterprise Linux or CentOS

Commands lines:

```
service benomad start
service benomad stop
```

3.9.2 Under Debian Linux

Commands lines:

```
/etc/init.d/benomad start
/etc/init.d/benomad stop
```

3.10 Test your server

- http://localhost:8080/bgis/
- or adjust with IP/Domain name of your server: http://<server ip>:8080/bgis/

4 Microsoft Windows Deployment (is subject to change)

4.1 Unpack

Extract the archive bgis-x.x.xfinal_win-x64-server_delivery.zip into C:\Program Files folder, to obtain the C:\Program Files\ bgis-x.x.xfinal_win-x64-server_delivery folder.

4.2 Default installation directories

- Base folder: C:\Program Files\ bgis-x.x.xfinal_win-x64-server_delivery
  The default patch of BeNomad Server Solution for Linux Operating System.
- Configuration : <Base folder>\usr\tomcat-x.x.x\webapps\bgis\WEB-INF\
  In this directory you can find the configuration of Server and graphical chart.
- Binary : <Base folder>\usr
  This directory contains the JVM, Tomcat and Server Core of BeNomad Server Solution.
- Log : <Base folder>\usr\tomcat-x.x.x\logs
  You can find in it all log files write by the Server process.

4.3 Adjust configuration files

Dataset:

- Into <Configuration folder>/configuration.properties
  - Set your SVS files directory for "bgis.dataset.path" key (the default configuration is generic for this install, you do not change this).
  - Set your SVS key for "bgis.dataset.svskey" key.
  - Set the Copyright of dataset for "bgis.dataset.forcecopyright" key, Set to blank for automatic recognition.
- Into <Base folder>/etc/wmsCapabilities_x_x_x.xml

- Replace all http://bgis.benomad.com:80/ by your server host name.
- Adjust Title, Abstract, KeywordList and ContactInformation sections.

4.4 Install you data-sets (SVS files)

Put your data-sets into the <Base folder>\data\svs

4.5 Start the BeNomad Server Solution

Go to the "base folder" and execute start.bat bash script

Commands lines:

```
start.bat
```

4.6 Test your server

- http://localhost:8080/bgis/
- or adjust with IP/Domain name of your server: http://<server ip>:8080/bgis/

5 Internet Links

CentOS http://www.centos.org/

Debian http://www.debian.org/

OpenLayers: http://openlayers.org/

RedHat http://www.redhat.com/

WMS: http://www.opengeospatial.org/standards/wms

6 Abbreviated Terms

DTD Document Type Definition

HTTP Hypertext Transfer Protocol

MIME Multipurpose Internet Mail Extensions

OGC Open GIS Consortium

OS Operating System

OWS OGC Web Service

RDBMS A relational database management system is a database management system that is based on the relational model. Most popular commercial and open source databases currently in use are based on the relational model.

RFC Request for Comments

SLD Styled Layer Descriptor

SOA In computing, a service-oriented architecture (SOA) is a flexible set of design principles used during the phases of systems development and

integration. A deployed SOA-based architecture will provide a loosely-integrated suite of services that can be used within multiple business domains.

SOAP	Simple Object Access Protocol
URL	Uniform Resource Locator
WMS	Web Map Service
XML	Extensible Markup Language

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