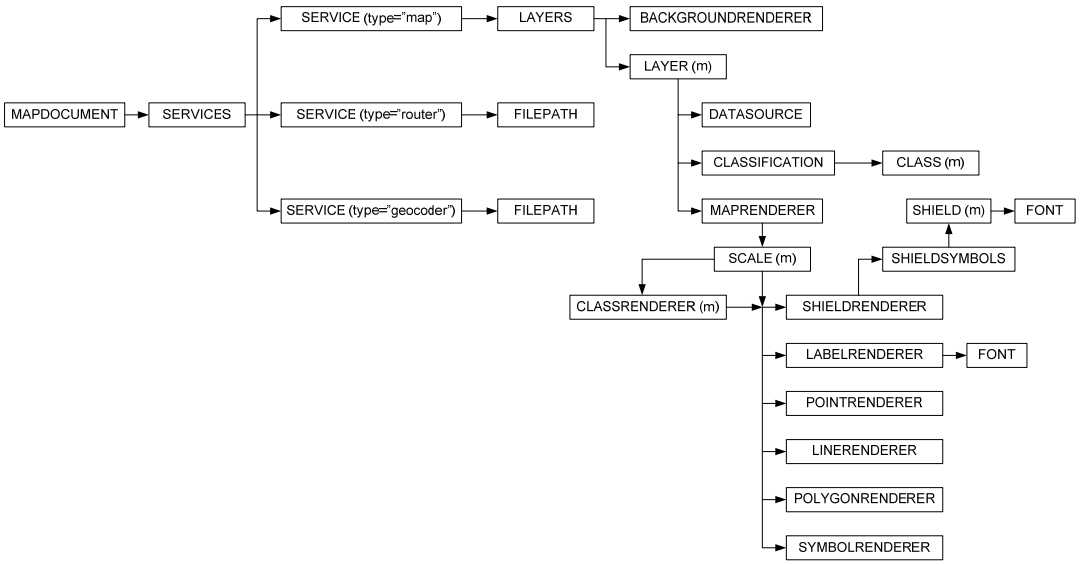
Navigation Map Document Format

The Navmap File

The .Navmap file is the actual document that will opened and used by applications built using the ArcLogistics Navigator SDK, ArcPad, or ArcGIS Mobile. There is a SDC Geoprocessing tool in the Cartography toolset of the SDC Tools toolbox called 'MXD To Navmap'. This tool will convert existing ArcMap .mxd documents into .Navmap format but cannot handle some advanced symbology features that may be implemented in ArcMap. This document serves to illustrate the format of the .Navmap document and how to manually modify it if desired. Please also see the Mxd to Navmap notes document for some additional tips when creating .Navmap files.

NavMap map document schema



Map document conventions

The map document element structure includes the element name and any attributes and child elements. This page outlines the conventions used in documenting map document.

- Elements are always written in uppercase letters.
- Attributes are always written in lowercase letters. Bold means the attribute is required.
- Definitions of attributes are found in the attribute table for the element. If an attribute has a defined list of valid values, all possible values are listed, but note that only one value can be used at a time. Attribute values are always placed inside double quotes (“”), and the text is not case sensitive unless noted. If the attribute has a default value, it is listed in brackets after the attribute list or type. If an attribute does not have a list of known values, the value type is listed, such as double, integer, or string.
- Child elements are always written in uppercase letters. If the child element is required, it is bold. Child elements that can be used multiple are denoted by an m in parenthesis (m). In some cases, special instructions are given in brackets after the element. Special instructions are given in the ‘Restrictions’ section of each element. The most common scenario is when a group of child elements is listed but only one child element can be used.

NavMap Elements and Attributes

MAPDOCUMENT

Used in: SERVICE (all types)
Parent Element: None

<MAPDOCUMENT>
No attributes
<SERVICES... />
</MAPDOCUMENT>

Bold: Attribute or child element is required.

Description:
The root element for all NavMap document statements.

Restrictions:
None

Notes:
All map document statements are required to use a standard prolog that includes the XML version and encoding:
<?xml version="1.0" encoding= "UTF-8"?>

Example for MAPDOCUMENT:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <BACKGROUNDRENDERER color="164,164,255"/>
                    <LAYER name="States" visible="true">
                        <DATASOURCE name="stborders.sdc"/>
                        <MAPRENDERER>
                            <SCALE geometryfield="SHAPE5" upper="1:100000000" lower="1:5850000">
                                <POLYGONRENDERER filled="true" fillcolor="247,239,222" outlined="true"
                                outlinecolor="173,158,140" width="1"/>
                                <LABELRENDERER format="%n&lt;'NAME'&gt;">
                                    <FONT face="Arial" height="14" textcolor="132,130,132" bold="true"
                                    italic="true" underlined="false"/>
                                </LABELRENDERER>
                            </SCALE>
                        </MAPRENDERER>
                    </LAYER>
                </LAYERS>
            </SERVICE>
    </SERVICES>
</MAPDOCUMENT>
```

SERVICES

Used in: SERVICE (all types)
Parent Element: MAPDOCUMENT

<SERVICES>
No attributes
(m) <SERVICE... />
</SERVICES >

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:
Defines collection of map, router and geocoder services.

Restrictions:
At least one service must be defined.

Notes:
- Only one map service can be used in NavMap document.
- Only one router service can be used.
- Multiple of geocoder services can be used.

Example for SERVICES:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <LAYER name="Rivers" visible="true">
                    <DATASOURCE name="rivers.sdc"/>
                    <MAPRENDERER>
                        <SCALE geometryfield="SHAPE2" upper="1:117000" lower="1:45700">
                            <LINERENDERER color="164,164,255" width="1" outlined="false"/>
                        </SCALE>
                    </MAPRENDERER>
                </LAYER>
            </LAYERS>
        </SERVICE>
        <SERVICE type="router">
            <FILEPATH>streets.rs</FILEPATH>
        </SERVICE>
        <SERVICE name="AddressGeocoder" type="geocoder">
            <FILEPATH>rs_streets_street_address.usa.loc</FILEPATH>
        </SERVICE>
        <SERVICE name="AddressReverseGeocoder" type="geocoder">
            <FILEPATH>rs_streets_street_reverse.usa.loc</FILEPATH>
        </SERVICE>
    </SERVICES>
</MAPDOCUMENT>
```

SERVICE

Used in: SERVICE (all types)
Parent Element: SERVICES

<SERVICE
type=”map | router | geocoder”
name=”string”>
<LAYERS... /> *[Or]*
<FILEPATH... />
</SERVICE>

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:

Defines map, router or geocoder service. Map service contains list of layers, draw attributes and used for map rendering. Router service is used for finding a path between two or more points. Geocoder service allows using addresses to identify locations on the map.

Restrictions:

- Only one map service can be used in NavMap document.
- Only one router service can be used.
- Multiple of geocoder services can be used.
- Attribute “name” is required only for geocoder service

Notes:

- Map service must contain only one child element - LAYERS.
- Geocoder and Router services must contain only one child element – FILEPATH.

Attribute descriptions for SERVICE:

Attribute	**Usage**
type	Defines the type of service.
name	Name of service.

Example for SERVICE:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <LAYER name="Streets" visible="true">
                    <DATASOURCE name="streets1.sdc"/>
                    <MAPRENDERER>
                        <SCALE geometryfield="SHAPE">
                            <LINERENDERER color="164,164,255" width="1" />
                        </SCALE>
                    </MAPRENDERER>
                </LAYER>
```

```
            </LAYERS>
        </SERVICE>
        <SERVICE type="router">
            <FILEPATH>streets.rs</FILEPATH>
        </SERVICE>
        <SERVICE name="AddressGeocoder" type="geocoder">
            <FILEPATH>rs_streets_street_address.usa.loc</FILEPATH>
        </SERVICE>
        <SERVICE name="AddressReverseGeocoder" type="geocoder">
            <FILEPATH>rs_streets_street_reverse.usa.loc</FILEPATH>
        </SERVICE>
    </SERVICES>
</MAPDOCUMENT>
```

FILEPATH

Used in: SERVICE (router and geocoder types)
Parent Element: SERVICE

<FILEPATH>
path_to_service
</FILEPATH>

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:
Contains reference to RS file or locator for initialization of Router or Geocoder service.

Restrictions:
None

Notes:
Reference can have full or relative pathname.

Example for FILEPATH:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="router">
            <FILEPATH>E:\Dataset\streets.rs</FILEPATH>
        </SERVICE>
        <SERVICE name="AddressGeocoder" type="geocoder">
            <FILEPATH>rs_streets_street_address.usa.loc</FILEPATH>
        </SERVICE>
    </SERVICES>
</MAPDOCUMENT>
```

LAYERS

Used in: SERVICE (map type)
Parent Element: SERVICE

<LAYERS>
<BACKGROUNDRENDERER... />
(m) <LAYER... />
</LAYERS>

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:
Describes map content.

Restrictions:
None

Notes:
Contains layer collection and background color.

Example for LAYERS:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <BACKGROUNDRENDERER color="164,164,255"/>
                    <LAYER name="States" visible="true">
                        <DATASOURCE name="stborders.sdc"/>
                        <MAPRENDERER>
                            <SCALE geometryfield="SHAPE5" upper="1:100000000" lower="1:5850000">
                                <POLYGONRENDERER filled="true" fillcolor="247,239,222" outlined="true"
                                outlinecolor="173,158,140" width="1"/>
                                <LABELRENDERER format="%n&lt;'NAME'&gt;">
                                    <FONT face="Arial" height="14" textcolor="132,130,132" bold="true"
                                    italic="true" underlined="false"/>
                                </LABELRENDERER>
                            </SCALE>
                        </MAPRENDERER>
                    </LAYER>
            </LAYERS>
        </SERVICE>
    </SERVICES>
</MAPDOCUMENT>
```

BACKGROUNDRENDERER

Used in: SERVICE (map type)
Parent Element: LAYERS

<BACKGROUNDRENDERER
color=”0,0,0 – 255,255,255”>
No Child Elements
</BACKGROUNDRENDERER>

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:
Defines color of map’s background.

Restrictions:
None

Notes:

Attribute descriptions for BACKGROUNDRENDERER:

Attribute	**Usage**
color	Background color for map using RGB values

Example for BACKGROUNDRENDERER:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <BACKGROUNDRENDERER color="164,164,255"/>
                    <LAYER name="States" visible="true">
                        <DATASOURCE name="stborders.sdc"/>
                        <MAPRENDERER>
                            <SCALE geometryfield="SHAPE5" upper="1:100000000" lower="1:5850000">
                                <POLYGONRENDERER filled="true" fillcolor="247,239,222" outlined="true"
                                outlinecolor="173,158,140" width="1"/>
                                <LABELRENDERER format="%n&lt;'NAME'&gt;">
                                    <FONT face="Arial" height="14" textcolor="132,130,132" bold="true"
                                    italic="true" underlined="false"/>
                                </LABELRENDERER>
                            </SCALE>
                        </MAPRENDERER>
                    </LAYER>
                </LAYERS>
            </SERVICE>
    </SERVICES>
</MAPDOCUMENT>
```

LAYER

Used in: SERVICE (map type)
Parent Element: LAYERS

```
<LAYER
    name=”string”
    visible=”true | false”>
    <DATASOURCE... />
    <MAPRENDERER… />
    <CLASSIFICATION… />
</LAYER>
```

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:
Defines a map layer.

Restrictions:
None

Notes:

Attribute descriptions for LAYER:

Attribute	Usage
name	Name of layer. Name can be any combination of alpha and numeric characters.
visible	Specifies layer visibility.

Example for LAYER:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <BACKGROUNDRENDERER color="164,164,255"/>
                <LAYER name="States" visible="true">
                    <DATASOURCE name="stborders.sdc"/>
                    <MAPRENDERER>
                        <SCALE geometryfield="SHAPE5" upper="1:100000000" lower="1:5850000">
                            <POLYGONRENDERER filled="true" fillcolor="247,239,222" outlined="true"
                        outlinecolor="173,158,140" width="1"/>
                            <LABELRENDERER format="%n&lt;'NAME'&gt;">
                                <FONT face="Arial" height="14" textcolor="132,130,132" bold="true"
                            italic="true" underlined="false"/>
                            </LABELRENDERER>
                        </SCALE>
                    </MAPRENDERER>
```

```
                </LAYER>
            </LAYERS>
        </SERVICE>
    </SERVICES>
</MAPDOCUMENT>
```

DATASOURCE

Used in: SERVICE (map type)
Parent Element: LAYER

<DATASOURCE
name=”string” >
No Child Elements
</DATASOURCE>

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:
Defines the data source used in the layer.

Restrictions:
- SMNavKit supports only the SDC2 data sources.

Notes:
Reference can have full or relative pathname.

Attribute descriptions for DATASOURCE:

Attribute	**Usage**
name	Contains reference to data source file.

Example for DATASOURCE:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <BACKGROUNDRENDERER color="164,164,255"/>
                <LAYER name="States" visible="true">
                    <DATASOURCE name="stborders.sdc"/>
                    <MAPRENDERER>
                        <SCALE geometryfield="SHAPE5" upper="1:100000000" lower="1:5850000">
                            <POLYGONRENDERER filled="true" fillcolor="247,239,222" outlined="true"
                        outlinecolor="173,158,140" width="1"/>
                            <LABELRENDERER format="%n&lt;'NAME'&gt;">
                                <FONT face="Arial" height="14" textcolor="132,130,132" bold="true"
                            italic="true" underlined="false"/>
                            </LABELRENDERER>
                        </SCALE>
                    </MAPRENDERER>
                </LAYER>
            </LAYERS>
        </SERVICE>
    </SERVICES>
</MAPDOCUMENT>
```

CLASSIFICATION

Used in: SERVICE (map type)
Parent Element: LAYER

<CLASSIFICATION
field=”string”>
(m) <CLASS>
</CLASSIFICATION>

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:

Defines a classification of features according to the value in specified field. Based on this field value map can be created to classify data. This is useful when different types of data are stored in the same layer.

Restrictions:

- At least one child CLASS element must be defined.

Notes:

CLASSRENDERER element must be used in MAPRENDERER for defining draw attributes for each defined class.

Attribute descriptions for CLASSIFICATION:

Attribute	**Usage**
field	Name of field used to classification.

Example for CLASSIFICATION:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <BACKGROUNDRENDERER color="164,164,255"/>
                <LAYER name="Cities" visible="true">
                <DATASOURCE name="cities.sdc"/>
                    <CLASSIFICATION field="PCLASS">
                        <CLASS name="Major cities" min="2" max="4"/>
                        <CLASS name="Other cities" min="0" max="1"/>
                    </CLASSIFICATION>
                    <MAPRENDERER>
                        <SCALE geometryfield="Shape" upper="1:100000000" lower="1:317000">
                            <CLASSRENDERER class="Major cities">
                                <POINTRENDERER type="circle" size="5" color="0,0,0" filled="true"
                                fillcolor="200,0,0"/>
                            </CLASSRENDERER>
                        </SCALE>
```

```
                </MAPRENDERER>
            </LAYER>
        </LAYERS>
    </SERVICE>
</SERVICES>
</MAPDOCUMENT>
```

CLASS

Used in: SERVICE (map type)
Parent Element: CLASSIFICATION

<CLASS
name=”string”

value=”string, numeric” *[Or]*

min=”string, numeric”
max=”string, numeric”
>
No Child Elements
</CLASS>

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:
Using with CLASSIFICATION for defining one class in layer classification. Class can be defined by exact value or range of values within a specified field in a layer.

Restrictions:
- *value* attribute is required when class defined by exact value.
- *min, max* attributes are required when class defined by range of values.

Notes:
CLASSRENDERER element with the same *class* attribute as *name* attribute of corresponding CLASS must be used for drawing defined class.

Attribute descriptions for CLASS:

Attribute	**Usage**
name	Name of defined class
value	Value used for matching records in selected classification field. They can be string or numeric.
min	Lower value of range. Can be string or numeric.
max	Upper value of range. Can be string or numeric.

Example for CLASS:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <BACKGROUNDRENDERER color="164,164,255"/>
                <LAYER name="Cities" visible="true">
                <DATASOURCE name="cities.sdc"/>
                    <CLASSIFICATION field="PCLASS">
                        <CLASS name="Major cities" value="2"/>
```

```
                <CLASS name="Other cities" min="0" max="1"/>
            </CLASSIFICATION>
            <MAPRENDERER>
                <SCALE geometryfield="Shape" upper="1:100000000" lower="1:317000">
                    <CLASSRENDERER class="Major cities">
                        <POINTRENDERER type="circle" size="5" color="0,0,0" filled="true"
                        fillcolor="200,0,0"/>
                    </CLASSRENDERER>
                </SCALE>
            </MAPRENDERER>
        </LAYER>
    </LAYERS>
</SERVICE>
</SERVICES>
</MAPDOCUMENT>
```

MAPRENDERER

Used in: SERVICE (map type)
Parent Element: LAYER

<MAPRENDERER>
(m) <SCALE… />
</MAPRENDERER >

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:
Defines rendering settings for layer.

Restrictions:
- At least one SCALE element is required

Notes:
Contains one or more SCALE elements which are contains drawing information on certain scales.

Example for MAPRENDERER:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <BACKGROUNDRENDERER color="164,164,255"/>
                <LAYER name="Cities" visible="true">
                <DATASOURCE name="cities.sdc"/>
                    <CLASSIFICATION field="PCLASS">
                        <CLASS name="Major cities" value="2"/>
                        <CLASS name="Other cities" min="0" max="1"/>
                    </CLASSIFICATION>
                    <MAPRENDERER>
                        <SCALE geometryfield="Shape" upper="1:100000000" lower="1:317000">
                            <CLASSRENDERER class="Major cities">
                                <POINTRENDERER type="circle" size="5" color="0,0,0" filled="true"
                                fillcolor="200,0,0"/>
                            </CLASSRENDERER>
                        </SCALE>
                    </MAPRENDERER>
                </LAYER>
            </LAYERS>
        </SERVICE>
    </SERVICES>
</MAPDOCUMENT>
```

SCALE

Used in: SERVICE (map type)
Parent Element: MAPRENDERER

<SCALE
geometryfield="string"
upper="string" **[100:1]**
lower="string" **[1:1000000000]>**

(m) <CLASSRENDERER… /> *[Or]*

<SHIELDRENDERER… />
<LABELRENDERER… />
<POINTRENDERER… /> *[Or]*
<LINERENDERER… /> *[Or]*
<POLYGONRENDERER… /> *[Or]*
<SYMBOLRENDERER… />
</SCALE >

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:

Display specified rendering information at certain scales. A layer can have different rendering depending on the current scale. For example, when zoomed out, you can draw a street layer one pixel in width. As you zoom farther in, you can draw the street layer eight pixels in width and in a different color.

Restrictions:

- Type of used renderer must correspond to shape type of layer.

Notes:

- Use SCALE for changing symbology at different scales.
- If layer type is point or multipoint, then only POINTRENDERER or SYMBOLRENDERER can be used. If type is line, then only LINERENDERER can be used. If type is polygon, then only POLYGONRENDERER can be used.
- CLASSRENDERER can be used only when layer has defined CLASSIFICATION.
- If CLASSRENDERER is used then other renderers must be defined inside CLASSRENDERER.
- Scales can be set using cartographic (relative) scale. A relative scale represents the scale in a ratio as 1:24000. In this example, 1 meters equals 24000 meters, or 1 inch equals to 24000 inches. Using relative scale, always use a colon (:) between two values.
- Both upper and lower scales are optional. Default values are used when some scale is not defined.
- *geometryfield* attribute defined what shape field from data source is used for rendering layer at certain scales.

Attribute descriptions for SCALE:

Attribute	**Usage**

geometryfield	Name of shape field which is used at certain scales.
lower	Minimum scale to display renderer using a relative scale such as 1:24000. Default value is $1:10^9$
upper	Maximum scale to display renderer using a relative scale such as 1:24000. Default value is 100:1

Example for SCALE:

Example 1: When CLASSRENDERER is used

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <BACKGROUNDRENDERER color="164,164,255"/>
                <LAYER name="Cities" visible="true">
                <DATASOURCE name="cities.sdc"/>
                    <CLASSIFICATION field="PCLASS">
                        <CLASS name="Major cities" value="2"/>
                        <CLASS name="Other cities" min="0" max="1"/>
                    </CLASSIFICATION>
                    <MAPRENDERER>
                        <SCALE geometryfield="Shape" upper="1:100000000" lower="1:317000">
                            <CLASSRENDERER class="Major cities">
                                <POINTRENDERER type="circle" size="5" color="0,0,0" filled="true"
                                fillcolor="200,0,0"/>
                            </CLASSRENDERER>
                        </SCALE>
                    </MAPRENDERER>
                </LAYER>
            </LAYERS>
        </SERVICE>
    </SERVICES>
</MAPDOCUMENT>
```

Example 2: When feature renderer is used

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <BACKGROUNDRENDERER color="164,164,255"/>
                <LAYER name="Cities" visible="true">
                <DATASOURCE name="cities.sdc"/>
                    <MAPRENDERER>
                        <SCALE geometryfield="Shape" upper="1:100000000" lower="1:317000">
                                <POINTRENDERER type="circle" size="5" color="0,0,0" filled="true"
                                fillcolor="200,0,0"/>
                        </SCALE>
                    </MAPRENDERER>
                </LAYER>
            </LAYERS>
        </SERVICE>
    </SERVICES>
</MAPDOCUMENT>
```

CLASSRENDERER

Used in: SERVICE (map type)
Parent Element: SCALE

<CLASSRENDERER
class="string">
<SHIELDRENDERER… />
<LABELRENDERER… />
<POINTRENDERER… /> *[Or]*
<LINERENDERER… /> *[Or]*
<POLYGONRENDERER… /> *[Or]*
<SYMBOLRENDERER… />
</CLASSRENDERER >

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:
Defines renderer for features according to specified class.

Restrictions:
- CLASSRENDERER can be used when some CLASSIFICATION is defined for this layer.

Notes:
- Available set of *class* values is defined in CLASSIFICATION for this layer.
- For more information on using renderers see SCALE element.
- CLASSRENDERER can be defined not for all classes determined in CLASSIFICATION. If CLASSRENDERER is not defined for some classes, then features from these classes will not be rendered at certain scales.

Attribute descriptions for CLASSRENDERER:

Attribute	**Usage**
class	Name of class

Example for CLASSRENDERER:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <BACKGROUNDRENDERER color="164,164,255"/>
                <LAYER name="Cities" visible="true">
                <DATASOURCE name="cities.sdc"/>
                    <CLASSIFICATION field="PCLASS">
                        <CLASS name="Major cities" value="2"/>
                        <CLASS name="Other cities" min="0" max="1"/>
                    </CLASSIFICATION>
                    <MAPRENDERER>
                        <SCALE geometryfield="Shape" upper="1:100000000" lower="1:317000">
```

```
                    <CLASSRENDERER class="Major cities">
                        <POINTRENDERER type="circle" size="5" color="0,0,0" filled="true"
                        fillcolor="200,0,0"/>
                    </CLASSRENDERER>
                </SCALE>
            </MAPRENDERER>
        </LAYER>
    </LAYERS>
</SERVICE>
</SERVICES>
</MAPDOCUMENT>
```

POINTRENDERER

Used in: SERVICE (map type)
Parent Element: SCALE, CLASSRENDERER

<POINTRENDERER
color="0,0,0 – 255,255,255"
size="numeric"
type="circle | square"
filled="true | false" **[false]**

When filled="true"
fillcolor="0,0,0 – 255,255,255"
>
No Child Elements
</POINTRENDERER >

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:
Symbolizes point features using one of predefined symbols types: circle or square.

Restrictions:
None

Notes:
- POINTRENDERER can be used only for point and multipoint types of layer.
- If *filled* is true then symbol will be outlined.
- *fillcolor* is required when *filled* is true.

Attribute descriptions for POINTRENDERER:

Attribute	**Usage**
color	Symbol color using RGB values.
size	Symbol size in pixels
type	Symbol type.
filled	If TRUE then symbol is filled with *fillcolor*
fillcolor	Fill color

Example for POINTRENDERER:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <BACKGROUNDRENDERER color="164,164,255"/>
                <LAYER name="Cities" visible="true">
                <DATASOURCE name="cities.sdc"/>
                    <MAPRENDERER>
                        <SCALE geometryfield="Shape" upper="1:100000000" lower="1:317000">
```

```
                    <POINTRENDERER type="circle" size="5" color="0,0,0" filled="true"
                    fillcolor="200,0,0"/>
                </SCALE>
            </MAPRENDERER>
        </LAYER>
    </LAYERS>
</SERVICE>
</SERVICES>
</MAPDOCUMENT>
```

SYMBOLRENDERER

Used in: SERVICE (map type)
Parent Element: SCALE, CLASSRENDERER

<SYMBOLRENDERER
size=”numeric”
symbol=”image file”
>
No Child Elements
</SYMBOLRENDERER >

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:
Symbolizes point features using the specified raster image.

Restrictions:
- Only symbols from SYMBOLS folder of SMNavKit can be used for rendering.

Notes:
- SYMBOLRENDERER can be used only for point and multipoint types of layer.
- Acceptable image format is BMP.
- Advanced symbol properties like transparent color and label box are supported and can be defined in INI file which is placed near BMP file. See Appendix A – Symbol Rendering Options for details.

Attribute descriptions for SYMBOLRENDERER:

Attribute	**Usage**
size	Symbol size in pixels
symbol	Name of the symbol (file name without extension).

Example for SYMBOLRENDERER:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <BACKGROUNDRENDERER color="164,164,255"/>
                <LAYER name="Cities" visible="true">
                <DATASOURCE name="cities.sdc"/>
                    <MAPRENDERER>
                        <SCALE geometryfield="Shape" upper="1:100000000" lower="1:317000">
                            <SYMBOLRENDERER symbol="gift" size="16"/>
                        </SCALE>
                    </MAPRENDERER>
                </LAYER>
            </LAYERS>
        </SERVICE>
    </SERVICES>
</MAPDOCUMENT>
```

LINERENDERER

Used in: SERVICE (map type)
Parent Element: SCALE, CLASSRENDERER

<LINERENDERER
color=”0,0,0 – 255,255,255”
width=”numeric”
outlined=”true | false” **[false]**

When outlined=”true”
outlinecolor=”0,0,0 – 255,255,255”
>
No Child Elements
</LINERENDERER >

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:
Symbol for line features.

Restrictions:
None

Notes:

- LINERENDERER can be used only for polyline type of layer.
- If *outlined* is true then line will be outlined.
- *outlinecolor* is required when *outlined* is true.

Attribute descriptions for LINERENDERER:

Attribute	**Usage**
color	Line color using RGB values.
width	Line width in pixels
outlined	If TRUE then line is outlined with *outlinecolor*
outlinecolor	Outline color using RGB values

Example for LINERENDERER:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <BACKGROUNDRENDERER color="164,164,255"/>
                <LAYER name="Streets" visible="true">
                <DATASOURCE name="streets.sdc"/>
                    <MAPRENDERER>
                        <SCALE geometryfield="SHAPE" upper="1:3370" lower="1:1">
                                <LINERENDERER color="255,255,255" width="6" outlined="true"
                                outlinecolor="173,158,140"/>
                        </SCALE>
```

```
                </MAPRENDERER>
            </LAYER>
        </LAYERS>
    </SERVICE>
</SERVICES>
</MAPDOCUMENT>
```

POLYGONRENDERER

Used in: SERVICE (map type)
Parent Element: SCALE, CLASSRENDERER

<POLYGONRENDERER
outlined=”true | false” **[false]**
filled=”true | false” **[false]**

When outlined=”true”
outlinecolor=”0,0,0 – 255,255,255”
width=”numeric”

When filled=”true”
fillcolor=”0,0,0 – 255,255,255”
>
No Child Elements
</POLYGONRENDERER >

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:
Symbol for polygon features.

Restrictions:
None

Notes:

- POLYGONRENDERER can be used only for polygon type of layer.
- If *outlined* is true then polygon will be outlined.
- *outlinecolor* and *width* are required when *outlined* is true.
- If *filled* is true then polygon will be filled.
- *fillcolor* is required when *filled* is true.

Attribute descriptions for POLYGONRENDERER:

Attribute	**Usage**
outlined	If TRUE then polygon is outlined with *outlinecolor* and boundary width = *width*
outlinecolor	Outline color using RGB values
width	Outline width
filled	If TRUE then polygon is filled with *fillcolor*
fillcolor	Fill color using RGB values

Example for POLYGONRENDERER:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
```

```
            <BACKGROUNDRENDERER color="164,164,255"/>
            <LAYER name="States" visible="true">
                <DATASOURCE name="stborders.sdc"/>
             <MAPRENDERER>
             <SCALE geometryfield="SHAPE5" upper="1:100000000" lower="1:5850000">
                    <POLYGONRENDERER filled="true" fillcolor="247,239,222" outlined="true"
               outlinecolor="173,158,140" width="1"/>
               </SCALE>
            </LAYER>
          </LAYERS>
        </SERVICE>
    </SERVICES>
</MAPDOCUMENT>
```

LABELRENDERER

Used in: SERVICE (map type)
Parent Element: SCALE, CLASSRENDERER

<LABELRENDERER
format=”string”
>
<FONT… />
</LABELRENDERER >

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:
Used for labeling features.

Restrictions:
- Only one LABELRENDERER can be used per SCALE or CLASSRENDERER

Notes:
- One or more fields can be used for labeling.
  Examples of format strings:
  %n<'FULLSHIELD'> - features are labeling using FULLSHIELD field;
  %n<'SHIELD'>%n<'HWY_NUM'> - features are labeling using concatenation of two fields SHIELD and HWY_NUM.
  See details about label format string in Appendix B.
- Note that ‘<’ and ‘>’ symbols must be replaced on < and > in XML file.
- Style of label (font face, font size etc.) is defined in child element FONT.

Attribute descriptions for LABELRENDERER:

Attribute	**Usage**
format	Format string for labeling features.

Example for LABELRENDERER:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <BACKGROUNDRENDERER color="164,164,255"/>
                <LAYER name="States" visible="true">
                    <DATASOURCE name="stborders.sdc"/>
                 <MAPRENDERER>
                 <SCALE geometryfield="SHAPE5" upper="1:100000000" lower="1:5850000">
                        <POLYGONRENDERER filled="true" fillcolor="247,239,222" outlined="true"
                   outlinecolor="173,158,140" width="1"/>
                            <LABELRENDERER format="%n&lt;'NAME'&gt;">
                                <FONT face="Arial" height="14" textcolor="132,130,132" bold="true"
                            italic="true" underlined="false"/>
```

```
                    </LABELRENDERER>
                </SCALE>
            </LAYER>
        </LAYERS>
    </SERVICE>
</SERVICES>
</MAPDOCUMENT>
```

FONT

Used in: SERVICE (map type)
Parent Element: LABELRENDERER, SHIELD

<FONT
face=”Any system font”
height=”numeric”
textcolor=”0,0,0 – 255,255,255”
bold=”true | false” [false]
italic=”true | false” [false]
underlined=”true | false” [false]
>
No Child Elements
</FONT >

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:
Symbol used to label features.

Restrictions:
None

Notes:
- FONT is used to defining style of labels or text on shield.

Attribute descriptions for FONT:

Attribute	**Usage**
face	Font name. The name is case sensitive. If font name uses “&”, use “&” instead.
height	Font size.
textcolor	Font color using RGB values.
bold	Bold style of font.
italic	Italic style of font.
underlined	Underlined style of font.

Example for FONT:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <BACKGROUNDRENDERER color="164,164,255"/>
                <LAYER name="States" visible="true">
                    <DATASOURCE name="stborders.sdc"/>
                  <MAPRENDERER>
                  <SCALE geometryfield="SHAPE5" upper="1:100000000" lower="1:5850000">
                        <POLYGONRENDERER filled="true" fillcolor="247,239,222" outlined="true"
                    outlinecolor="173,158,140" width="1"/>
```

```
                    <LABELRENDERER format="%n&lt;'NAME'&gt;">
                        <FONT face="Arial" height="14" textcolor="132,130,132" bold="true"
                    italic="true" underlined="false"/>
                    </LABELRENDERER>
                </SCALE>
            </LAYER>
        </LAYERS>
    </SERVICE>
</SERVICES>
</MAPDOCUMENT>
```

SHIELDRENDERER

Used in: SERVICE (map type)
Parent Element: SCALE, CLASSRENDERER

<SHIELDRENDERER
format=”string”
>
<SHIELDSYMBOLS… />
</SHIELDRENDERER >

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:
Defines rendering of shields.

Restrictions:

- Only one SHIELDRENDERER can be used per SCALE or CLASSRENDERER

Notes:

- SHIELDRENDERER has higher priority than LABELRENDERER. If both shield and label renderers are defined, then feature will be labeled only when nothing shield symbol is matched for it.
- One or more fields can be used for shield label.
  Examples of format strings:
  %n<'FULLSHIELD'> - shields are labeling using FULLSHIELD field;
  %n<'SHIELD'>%n<'HWY_NUM'> - shields are labeling using concatenation of two fields SHIELD and HWY_NUM.
  See details about label format string in Appendix B.
- Note that ‘<’ and ‘>’ symbols must be replaced on < and > in XML file.

Attribute descriptions for SHIELDRENDERER:

Attribute	**Usage**
format	Format string for labeling shields.

Example for SHIELDRENDERER:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <BACKGROUNDRENDERER color="164,164,255"/>
                <LAYER name="InterstateHighways" visible="true">
                    <DATASOURCE name="interstates.sdc"/>
                    <MAPRENDERER>
                        <SCALE geometryfield="SHAPE5" upper="1:100000000" lower="1:5850000">
                            <LINERENDERER color="251,180,115" width="1" outlined="false"/>
                            <SHIELDRENDERER format="%n&amp;lt;'FULLSHIELD'&amp;gt;">
                                <SHIELDSYMBOLS>
```

```
                        <SHIELD prefix="I" symbol="inhwy1">
                            <FONT face="Arial" height="12" textcolor="255,255,255" bold="false"
                        italic="false" underlined="false"/>
                            </SHIELD>
                            <SHIELD prefix="U" symbol="ushwy1">
                                <FONT face="Arial" height="12" textcolor="0,0,0" bold="false"
                            italic="false" underlined="false"/>
                            </SHIELD>
                            <SHIELD prefix="S" symbol="sthwy1">
                                <FONT face="Arial" height="12" textcolor="0,0,0" bold="false"
                            italic="false" underlined="false"/>
                            </SHIELD>
                        </SHIELDSYMBOLS>
                    </SHIELDRENDERER>
                </SCALE>
            </MAPRENDERER>
        </LAYER>
    </LAYERS>
</SERVICE>
</SERVICES>
</MAPDOCUMENT>
```

SHIELDSYMBOLS

Used in: SERVICE (map type)
Parent Element: SHIELDRENDERER

<SHIELDSYMBOLS>
(m)<SHIELD… />
</SHIELDSYMBOLS>

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:
Defines collection of shield symbols.

Restrictions:
None

Notes:
- One or more shields symbols can be defined.

Example for SHIELDSYMBOLS:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <BACKGROUNDRENDERER color="164,164,255"/>
                <LAYER name="InterstateHighways" visible="true">
                    <DATASOURCE name="interstates.sdc"/>
                    <MAPRENDERER>
                        <SCALE geometryfield="SHAPE5" upper="1:100000000" lower="1:5850000">
                            <LINERENDERER color="251,180,115" width="1" outlined="false"/>
                            <SHIELDRENDERER format="%n&lt;'FULLSHIELD'&gt;">
                                <SHIELDSYMBOLS>
                                    <SHIELD prefix="I" symbol="inhwy1">
                                        <FONT face="Arial" height="12" textcolor="255,255,255" bold="false"
                                    italic="false" underlined="false"/>
                                        </SHIELD>
                                        <SHIELD prefix="U" symbol="ushwy1">
                                            <FONT face="Arial" height="12" textcolor="0,0,0" bold="false"
                                        italic="false" underlined="false"/>
                                        </SHIELD>
                                        <SHIELD prefix="S" symbol="sthwy1">
                                            <FONT face="Arial" height="12" textcolor="0,0,0" bold="false"
                                        italic="false" underlined="false"/>
                                        </SHIELD>
                                    </SHIELDSYMBOLS>
                                </SHIELDRENDERER>
                            </SCALE>
                        </MAPRENDERER>
                </LAYER>
```

```
            </LAYERS>
        </SERVICE>
    </SERVICES>
</MAPDOCUMENT>
```

SHIELD

Used in: SERVICE (map type)
Parent Element: SHIELDSYMBOLS

```
<SHIELD
    prefix=”string”
    symbol=”image file” >
    <FONT… />
</SHIELD>
```

Bold: Attribute or child element is required.
(m): Child element can be used multiple times.

Description:

Defines symbol and text style for drawing shield.

Restrictions:

- Only symbols from SYMBOLS folder of SMNavKit can be used for rendering.

Notes:

- *prefix* is filter for matching a values within a string specified in *format* attribute of SHIELDRENDERER.
  Filter expression is:
  format LIKE ‘*prefix*%’
  When a match occurs, the defined *symbol* is drawn.
- If nothing SHIELD in SHIELDSYMBOLS are matched, then label defined in LABELRENDERER is drawn.
- Acceptable image format is BMP.
- Advanced symbol properties like transparent color and label box are supported and can be defined in INI file which is placed near BMP file. See Appendix A – Symbol Rendering Options for details.

Attribute descriptions for SHIELD:

Attribute	**Usage**
prefix	Value using for matching shields symbol.
symbol	Name of the symbol (file name without extension).

Example for SHIELD:

```
<?xml version="1.0" encoding="utf-8"?>
<MAPDOCUMENT>
    <SERVICES>
        <SERVICE type="map">
            <LAYERS>
                <BACKGROUNDRENDERER color="164,164,255"/>
                <LAYER name="InterstateHighways" visible="true">
                    <DATASOURCE name="interstates.sdc"/>
                    <MAPRENDERER>
                        <SCALE geometryfield="SHAPE5" upper="1:100000000" lower="1:5850000">
```

```
                    <LINERENDERER color="251,180,115" width="1" outlined="false"/>
                    <SHIELDRENDERER format="%n&lt;'FULLSHIELD'&gt;">
                        <SHIELDSYMBOLS>
                            <SHIELD prefix="I" symbol="inhwy1">
                                <FONT face="Arial" height="12" textcolor="255,255,255" bold="false"
                            italic="false" underlined="false"/>
                                </SHIELD>
                                <SHIELD prefix="U" symbol="ushwy1">
                                    <FONT face="Arial" height="12" textcolor="0,0,0" bold="false"
                                italic="false" underlined="false"/>
                                </SHIELD>
                                <SHIELD prefix="S" symbol="sthwy1">
                                    <FONT face="Arial" height="12" textcolor="0,0,0" bold="false"
                                italic="false" underlined="false"/>
                                </SHIELD>
                            </SHIELDSYMBOLS>
                        </SHIELDRENDERER>
                    </SCALE>
                </MAPRENDERER>
            </LAYER>
        </LAYERS>
    </SERVICE>
</SERVICES>
</MAPDOCUMENT>
```

Appendix A. Symbol Rendering Options

A symbol can have advanced rendering options. These options are stored in INI file with the same name as symbol and *.ini extension. This INI file must be placed near symbol file.

Symbol rendering options file format

This file defines rendering options for corresponding symbol. This file is optional.
If it is missed then symbol will be rendered with default options.

Possible options:
TransparentColor - The color that will be treated as transparent. The color format is "R, G, B" where R,G, and B are numbers and correspond to Red, Green and Blue color components.
If this parameter is omitted, then symbol will be rendered without transparency.

LabelBox - Specifies the region of the symbol in which text label will be drawn (e.g. highway number for shield symbol. The region is set by four numbers - "left, top, right, bottom" coordinates. If this option is not set then text is rendered in center of symbol. Top-left corner of symbol has 0,0 coordinates.

Example:

```
[Symbol]
TransparentColor = 255,255,255
LabelBox = 2,2,10,10
```

Appendix B. Label Format String

Label format allows defining composite feature labels for a map layer. Composite feature label may consist of values from multiple fields.

Format string uses for drawing labels. Formatting string must be presented in following format:

"%s<0>: %n<[ ]'FIELD_NAME1'>%n<'FIELD_NAME2'|" Default text">%s<1>."

Supported tokens:
%s<n> - constant string
%S<[text]'n1'|'n2'|'Default text'[text]> - smart constant string
%n<[text]'Field_Name1'|'Field_Name2'|"Default text"[text]> - field data from record by field name
Field_Name1,..,Field_NameN - field names in data source,
[text] - text added to string if field data not empty,
|"Default text" - default text, added if field data empty([text] ignored in this case).

Expression token:
%b<<'FieldName'EQ"value(text)">?<FormatString1>:<FormatString2>>
%b<<'FieldName'EQ'FieldName'>?<FormatString1>:<FormatString2>>

FieldName - field name,
EQ - comparison operator equal(==), also supported:
NE - not equal(!=),
LS - less(<),
GR - greater(>),
LE - less equal(<=),
GE - greater equal(>=);
value(text) - data to compare,

If token part /EQ"value(text)"/ or /EQ'FieldName'/ does not exist, field data compared with empty string through operator NE;

FormatString1 - used for formating if expression is TRUE,
FormatString2 - used for formating if expression is FALSE (optional).

In FormatString1 and 2 may be used any other tokens and this one (recursion supported)
"value(text)" and FormatString(s) must be valid string (not empty).