# AIXM (Aeronautical Information Exchange Model) extension for the Aerodrome Surface Route Network concept

**Summary:** This is an attempt to provide an AIXM extension for the Aerodrome Surface Route Networks concept. Extension is provided as an UML model and XML schema, which stand as basis of the AIXM conceptual model. An example AIXM file with the extension features is also provided.

## Contents:

1. How I have created the AIXM ASRN extension

2. How to use these files

3. Explanation of the terms involved in this project

4. About this project

## How I created AIXM ASRN extension

This attempt was done in 5 steps described below:

1. I investigated the ASRN concept, as described in the EUROCAE ED-99D standard, which provides standards about Aerodrome Mapping Databases (AMDB). This document is unfortunately not free for use, but it can be purchased from EUROCAE at <eurocae.net>

2. I investigated the guidelines on how to create an AIXM extension from EUROCONTROL. The draft document can be found here <aixm.aero/document/aixm-511-extensions>

3. I represented the UML model for the ASRN extension in EA Sparx (as described in the guidelines above)

4. I runned the script that generates the XSD (XML schema) from the UML model, which validates the AIXM ASRN extension I have created (scripts are made by EUROCONTROL and can be found in the document for AIXM extension).

5. Finally, I used the extension XSD schema created above, to validate an AIXM extension file that has been created manually by me.

## How to use the files

The folder **ASRN\_documentation** contains the EA Sparx file with the UML model of the extension, as well as documentation about the extension features created, with tables and diagrams, described in a similar way with the AIXM Model documentation provided at the AIXM website: <http://aixm.aero/page/aixm-51-511>

The file **asrn\_validation\_test.xml** contains one example for each of the two features related to the ASRN AIXM extension, these are asrn:RouteSurfaceNetworkEdge and asrn:RouteSurfaceNetworkNode.

The files **asrn\_Features.xsd** and **asrn\_DataTypes.xsd** are the XSD schema files that should be used to validate our test file **asrn\_validation\_test.xml** By using a XML validator program (I use Oxygen XML, for example), one can see if the AIXM ASRN file is valid against the generated XML schema. Attention must be payed, however, at how the namespaces are defined for each of the three files.

For all of these three files, the attributes targetNamespace="D:\Work\AMDB\asrn\_ext", xmlns:asrn="D:\Work\AMDB\asrn\_ext" of the main <schema/> tag define the place where the schema is located. Additionally

* In the **asrn\_Features.xsd** file, there should be a reference to the **asrn\_DataTypes.xsd** at the following tag: <include schemaLocation="D:\Work\AMDB\asrn\_ext\asrn\_DataTypes.xsd"/>.
* In the file to be validated, **asrn\_validation\_test.xml,** there should be a reference to the **asrn\_Features.xsd** at the following attribute of the <message:AIXMBasicMessage/> tag: xsi:schemaLocation="http://www.aixm.aero/schema/5.1/message http://www.aixm.aero/schema/5.1/message/AIXM\_BasicMessage.xsd D:\Work\AMDB\asrn\_ext D:\Work\AMDB\asrn\_ext\asrn\_Features.xsd"

These locations should be changed with the path on the user’s computer where they are downloaded. Currently I am working on a way to host these files on the internet.

This is it! Now you can try to add more ASRN features in the **asrn\_validation\_test.xml** file and validate them!

## Explanation of the terms involved

**Aeronautical Information Exchange Model**, commonly known as AIXM, is a data exchange format developed by EUROCONTROL and FAA to enable the management and distribution of Aeronautical Information Services in digital format. The AIXM Conceptual Model is maintained as a UML (Unified Modelling Language) class model. The **XSD** (**XML Schema Definition)** specifies how to formally describe the elements in an Extensible Markup Language (XML) document. XSD can be used to express a set of rules to which an XML document must conform in order to be considered "valid" according to that schema. The AIXM 5 XML Schema is automatically generated from the AIXM 5 UML Model, by using dedicated scripts.

**Aerodrome Surface Route Networks** represent a new set of features for AMDB. They have the purpose of contructing a graph network over the surface of an airport. A graph consists of **nodes and edges**. Edges represent available navigable paths for aircraft on the aerodrome surface. They are usually considered after the airport taxiway centreline paintings. Nodes are placed at intersection between the edges, and represent points where a decision must be made in order to navigate over a surface path.

The EUROCAE ED-99D standards describes how an ASRN should be implemented for aerodromes. The ASRN is designed to support, at a minimum, the following functions:

* **Creation of an unambiguous taxi route.**
* **Transmission of taxi routes in a format usable by onboard applications.**
* **Display of the taxi route on an aerodrome map.**

Here is a snapshot of how a Aerodrome Surface Network can look like for an example aerodrome (EBBR), according to ED-99D standard (own work):



Here we can see how such features can be useful in calculating a taxi route at an aerodrome (own work):



## About this project

This project has been developed as a part for my bachelor thesis at Politehnica University of Bucharest. In my third year I had the chance to do a traineeship at The European Organization for the Safety of Air Navigation, of EUROCONTROL. There I learned about the Aeronautical Information Exchange Model, or AIXM, under the supervision of Mr. Eduard Porosnicu. Actually, he has provided this project idea to me.

If you would like to contact me about this project, send me a message at my e-mail address: [dragos.borcea@gmail.com](mailto:dragos.borcea@gmail.com)