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FLY AI Forum

Data acquisition using AI for AIXM 5.1.1

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1.1 - FROM AIS to AIM

Aeronautical Information Service (AIS) was historically based on provision of HTML or PDF documents (AIP and Charts) and conventional NOTAM.

Documents established with help of database. Complete enough to generate docs but not enough to provide added value services based on data.

Provision of added value services to stakeholders requires to enlarge the scope and volume of data. CP1 regulation gives a regulatory frame and European AIS Database a recipient

COMMISSION IMPLEMENTING REGULATION (EU) 2021/116

of 1 February 2021

on the establishment of the Common Project One supporting the implementation of the European Air Traffic Management Master Plan provided for in Regulation (EC) No 550/2004 of the European Parliament and of the Council, amending Commission Implementing Regulation (EU) No 409/2013 and repealing Commission Implementing Regulation (EU) No 716/2014

- (i) Centralised aeronautical information services ('AIS') systems, such as the European AIS Database ('EAD'), must provide environment data for European FRA and for flexible airspace structures to all involved operational stakeholders in a timely manner – with the exception of ad hoc structures due to short-term requests/reservations – enabling planning based on accurate information relevant to the time of the planned operations. The information must be made available using available SWIM services set out in point 5.1.3.

1.2 - FRENCH AIS DATA GAP

Present French database exported to EAD embedded in AIXM (Aeronautical Information Exchange Model) 4.5 contains a volume of approximately **22 000** data.

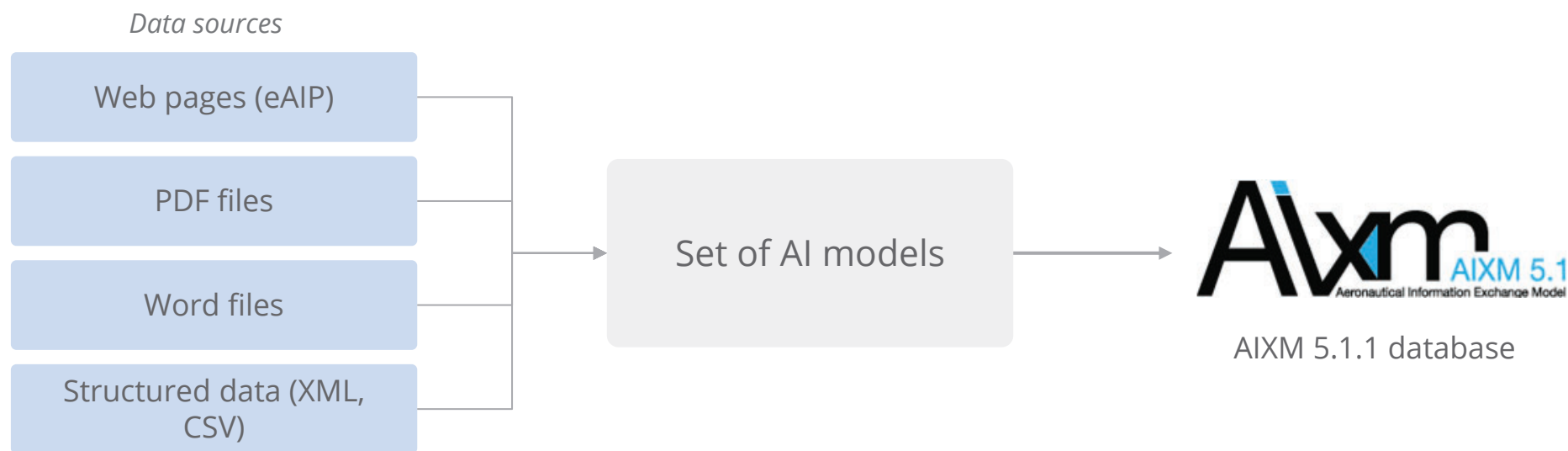
Goal of data completeness to comply CP1 requirements would raise this volume to **1 000 000** data (multiplied by 50).

Time and HR to reach this goal by the end of 2025 enormous.

May AI help us ?

2.1 - Overview of our methodology

In order to best support the SIA in this project, the solution we are developing aims to build a set of software scripts that can **recognize the information contained in different data sources** and encode it in the AIXM 5.1 format.



Schematic operation of our solution

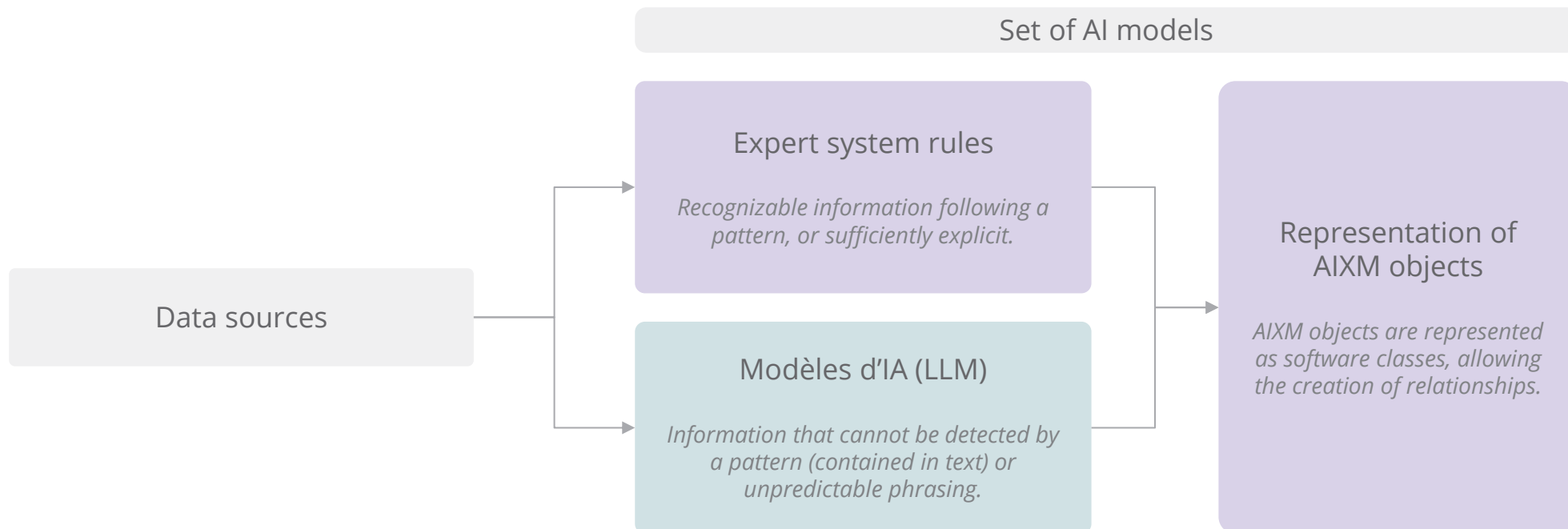
The main benefit of this methodology is its **reusability**, allowing encoding to be triggered again when the raw data is updated.

2.2 - Identification of information through Artificial Intelligence

One of the most important aspects of implementing the functional solution is the **recognition and identification of information contained in unstructured data** (particularly text) through AI.

This implementation will enable the recognition of information **for which business rules may be difficult** or even impossible to define.

In order to represent all AIXM objects, the set of scripts will include **two engines** for recognizing and identifying information: **expert system rules** and **AI models** (LLMs). Both engines produce logs and deliver metrics, providing explainability for the results obtained.



3.1 - Focusing on airspace activations

When certain information cannot be identified by expert system rules, we will use an AI model, specifically a **large language model (LLM)**, in order to easily extract information contained in unstructured data sources.

Example of using a language model for identifying service hours

The language model used allows for extracting the different **availability hours (activation)** of an airspace, as defined from raw text (below) into structured data.

```
MON-FRI 0800-1600, SAT-SUN 0800-1300 (SUM: -1HR) .  
Except on holidays.
```

The language model recognizes, based on numerous examples provided to it beforehand, the different **Timesheets** mentioned in the raw text, extracting the associated attributes (day, activation hours, events, etc.) as **structured data**.

A script is then used to convert this structured data into XML format, adhering to the **schema imposed by AIXM 5.1.1** (example on the right).

```
<aixm:timeInterval>  
  <aixm:Timesheet>  
    <aixm:timeReference>UTC</aixm:timeReference>  
    <aixm:day>WORK_DAY</aixm:day>  
    <aixm:startTime>08:00</aixm:startTime>  
    <aixm:endTime>16:00</aixm:endTime>  
    <aixm:daylightSavingAdjust>YES</aixm:daylightSavingAdjust>  
  </aixm:Timesheet>  
</aixm:timeInterval>  
<aixm:timeInterval>  
  <aixm:Timesheet>  
    <aixm:timeReference>UTC</aixm:timeReference>  
    <aixm:day>SAT</aixm:day>  
    <aixm:startTime>08:00</aixm:startTime>  
    <aixm:endTime>13:00</aixm:endTime>  
    <aixm:daylightSavingAdjust>YES</aixm:daylightSavingAdjust>  
  </aixm:Timesheet>  
</aixm:timeInterval>  
<aixm:timeInterval>  
  <aixm:Timesheet>  
    <aixm:timeReference>UTC</aixm:timeReference>  
    <aixm:day>SUN</aixm:day>  
    <aixm:startTime>08:00</aixm:startTime>  
    <aixm:endTime>13:00</aixm:endTime>  
    <aixm:daylightSavingAdjust>YES</aixm:daylightSavingAdjust>  
  </aixm:Timesheet>  
</aixm:timeInterval>  
<aixm:timeInterval>  
  <aixm:Timesheet>  
    <aixm:timeReference>UTC</aixm:timeReference>  
    <aixm:day>HOL</aixm:day>  
    <aixm:excluded>YES</aixm:startTime>  
  </aixm:Timesheet>  
</aixm:timeInterval>
```

3.2 - Realtime encoding of airspace activations

Deploy ⋮

Timesheets converter - Blent.ai

[Text to Timesheets](#) [Timesheets to Text](#) [Airspaces](#)

This converter allows you to transform human-readable text into a valid AIXM 5.1.1 Timesheets format.

Raw text

```
MON : 0500-2359
TUE : 0000 to FRI 2359
SAT : 0000-2200
SUN, HOL : 0700-2200
SUM-1HR
```

Timesheets AIXM 5.1.1

Convert

- Generate random identifiers (UUID)
- Deconstruct `WORK_DAY` timesheets
- Remove timeSlice attributes

3.3 - Extracting annotations with HOR encoded separately from remarks

NT D 12	FAAONE UTUOFAI			
cercle de 1.5 NM de rayon centré sur 17°40'00"S , 149°20'06"W	4000ft AMSL ----- SFC	SR-1000 (sauf DIM et JF/except SUN and public HOL).	Tirs sol - sol Vols au service de l'État d'aéronefs sans équipage à bord. Live firing ground-ground unmanned aircraft flights on State service.	RIMAP-P : TEL (00 689) 40 46 31 78. IFR/VFR : l'attention des navigateurs aériens est attirée sur le caractère particulièrement dangereux pour la vie humaine des activités s'y déroulant. IFR/VFR : pilot's attention is drawn to particularly dangerous activity in this area for human life.

HOR are encoded in a separate column from the remarks. We can then add HOR content as annotation to the `AirspaceActivation` object, while the airspace's remarks are appended to the `Airspace` annotations.

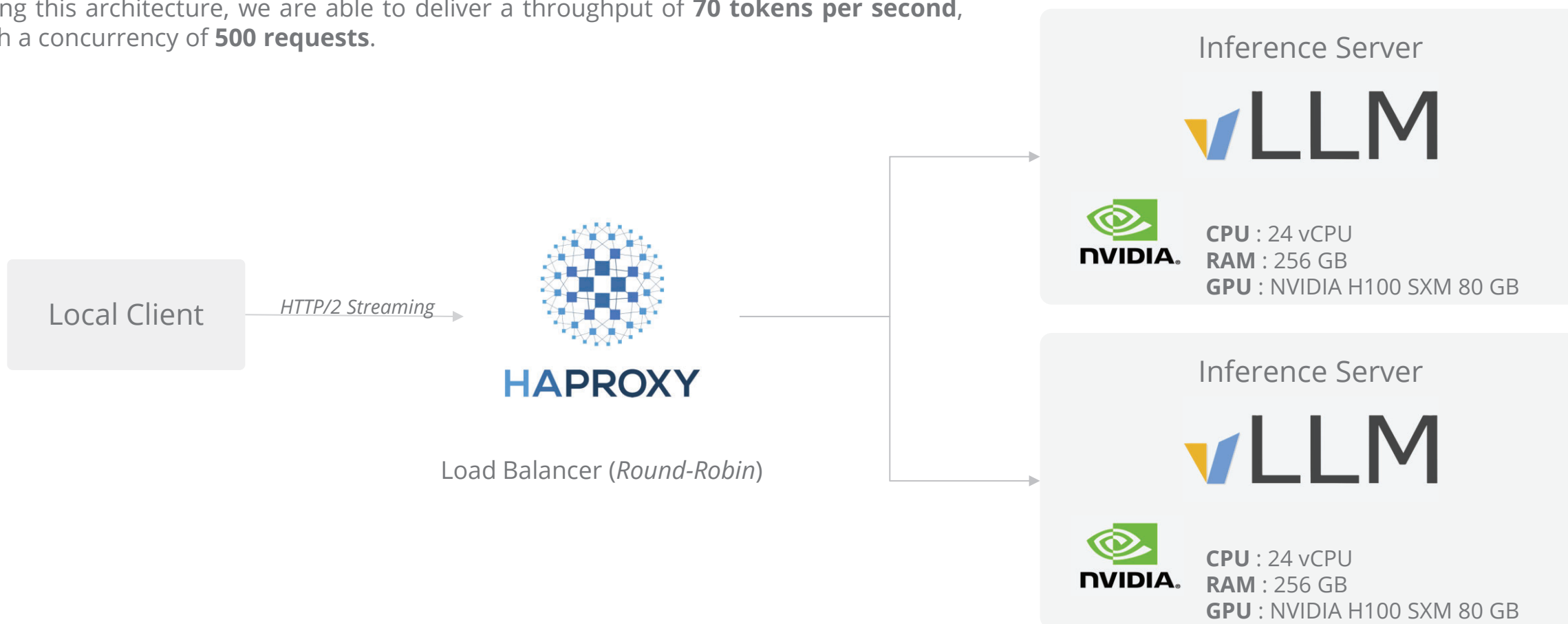
```
<aixm:annotation>
  <aixm:Note gml:id="id.90a132be-d0d0-4f22-9b6a-0ba6a3be5609">
    <aixm:purpose>REMARK</aixm:purpose>
    <aixm:translatedNote>
      <aixm:LinguisticNote gml:id="id.57d1544a-53a9-481a-93eb-b8d3f5566317">
        <aixm:note lang="fr">RIMAP-P : TEL (00 689) 40 46 31 78. IFR/VFR : l'attention des
navigateurs aériens est attirée sur le caractère particulièrement dangereux pour la vie humaine des
activités s'y déroulant.</aixm:note>
      </aixm:LinguisticNote>
    </aixm:translatedNote>
  </aixm:Note>
</aixm:annotation>
<aixm:annotation>
  <aixm:Note gml:id="id.bdfef2f8-1cd8-4519-83c0-9c267f027c75">
    <aixm:purpose>REMARK</aixm:purpose>
    <aixm:translatedNote>
      <aixm:LinguisticNote gml:id="id.16429b99-a99f-4c21-9c75-ff04ae572ed5">
        <aixm:note lang="en">RIMAP-P : TEL (00 689) 40 46 31 78. IFR/VFR : pilot's attention is drawn
to particularly dangerous activity in this area for human life.</aixm:note>
      </aixm:LinguisticNote>
    </aixm:translatedNote>
  </aixm:Note>
</aixm:annotation>
```

```
<aixm:activation>
  <aixm:AirspaceActivation gml:id="id.05a89071-0c74-40db-94f4-8013916b826d">
    <aixm:annotation>
      <aixm:Note gml:id="id.c5ba07fa-c542-41ab-b69e-523d83f45cd2">
        <aixm:purpose>DESCRIPTION</aixm:purpose>
        <aixm:translatedNote>
          <aixm:LinguisticNote gml:id="id.5c864de8-ba11-4535-96a4-2af1626afe0f">
            <aixm:note lang="fr">SR-1000 (sauf DIM et JF).</aixm:note>
          </aixm:LinguisticNote>
        </aixm:translatedNote>
      </aixm:Note>
    </aixm:annotation>
    <aixm:annotation>
      <aixm:Note gml:id="id.d9c87f8e-7b2b-463b-963e-89287749ce63">
        <aixm:purpose>DESCRIPTION</aixm:purpose>
        <aixm:translatedNote>
          <aixm:LinguisticNote gml:id="id.a35ebed5-97c0-4859-9bdb-394a89f4e93e">
            <aixm:note lang="en">SR-1000 (except SUN and public HOL).</aixm:note>
          </aixm:LinguisticNote>
        </aixm:translatedNote>
      </aixm:Note>
    </aixm:annotation>
  </aixm:AirspaceActivation>
</aixm:activation>
```


3.4 - Running at scale

In order to maximize the computation speed for extracting the activation times of airspace sectors, we have built an LLM inference architecture based on vLLM to support as many concurrent queries as possible.

Using this architecture, we are able to deliver a throughput of **70 tokens per second**, with a concurrency of **500 requests**.



4.1 - Extending on others use cases

Our work on encoding the activation schedules of airspaces allows us to apply this same approach to other use cases.

- Operational hours of **air traffic control** (ATS) services and **ground services**.
- Activation hours of **routes** and **communication means**.
- Activation hours of **navigation aids** (lighting, nav aids).

April 23, 2025

Thank you for your attention !

