Introduction to XML Schema Document (XSD) visualization

Part I: XSD Diagram

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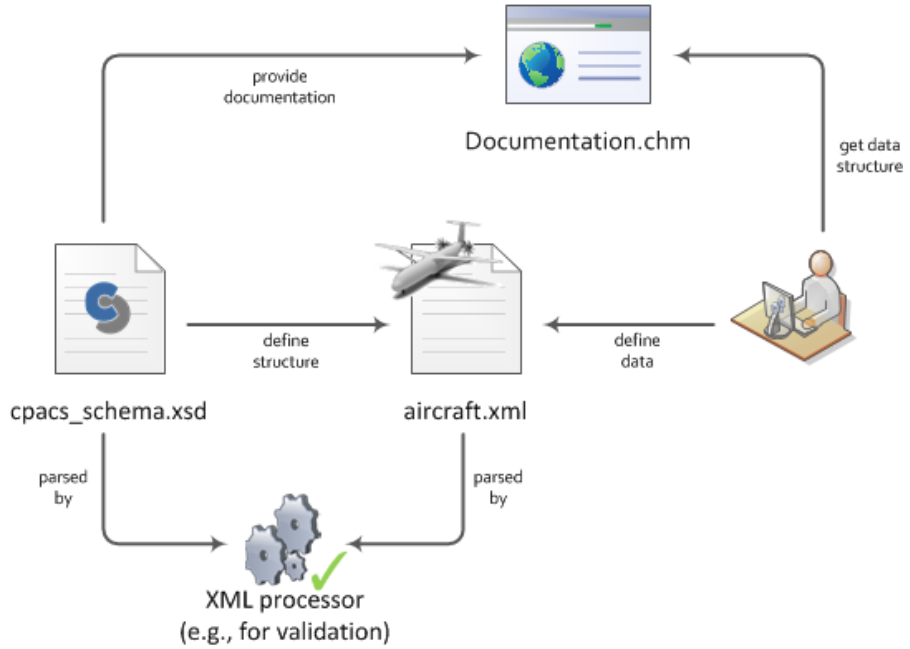
What is a schema?

- A schema* is itself an XML file (**.xsd*), which defines the rules/syntax how a CPACS file (**.xml*) may be structured:
  - how often and in which order may elements appear
  - what is the type of elements (string, double, complex type with sub-elements, etc.)

summarized as *type* of an element

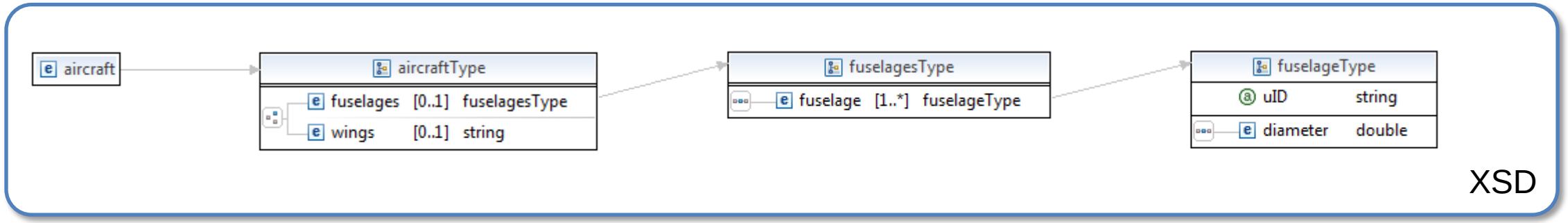


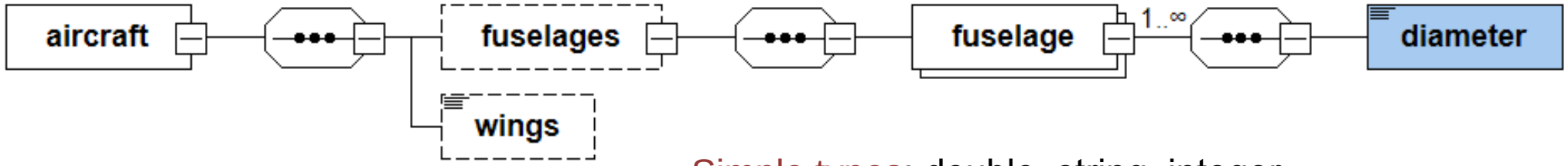

```
- <xsd:complexType name="aircraftType">
  - <xsd:annotation>
    - <xsd:appinfo>
      - <sd:schemaDoc>
        - <ddue:summary>
            <ddue:para>aircraftType</ddue:para>
          </ddue:summary>
        - <ddue:remarks>
            <ddue:para>Aircraft type, containing all the aircraft models</ddue:para>
          </ddue:remarks>
        </sd:schemaDoc>
      </xsd:appinfo>
    </xsd:annotation>
  - <xsd:complexContent>
    - <xsd:extension base="complexBaseType">
      - <xsd:sequence>
          <xsd:element maxOccurs="unbounded" name="model" type="aircraftModelType" />
        </xsd:sequence>
      </xsd:extension>
    </xsd:complexContent>
  </xsd:complexType>
```

*) in IT called *schema* and not *scheme*..

What are elements and types?

Simplified example similar to CPACS





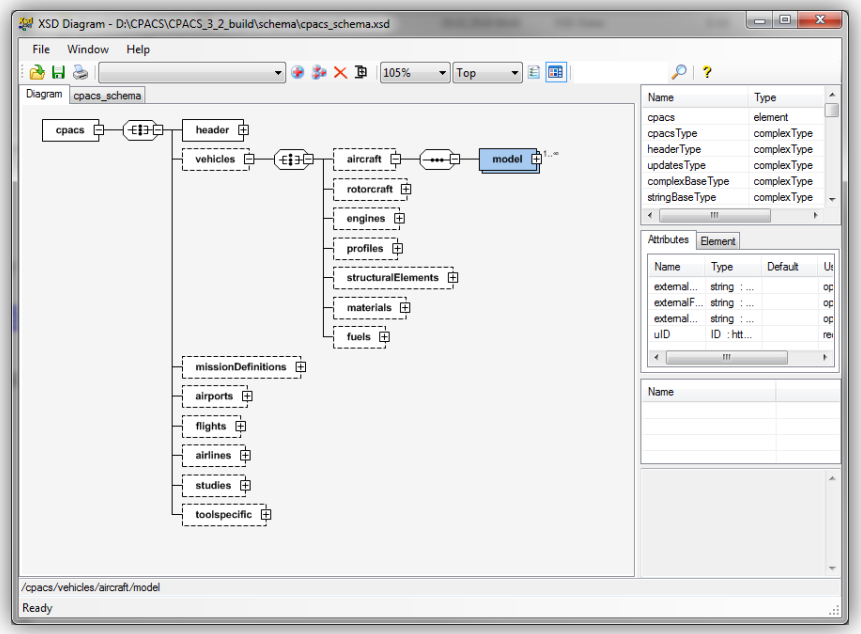
- Simple types: double, string, integer …
- Complex types: specify sub-elements and attributes of elements

  → used to build hierarchical structure

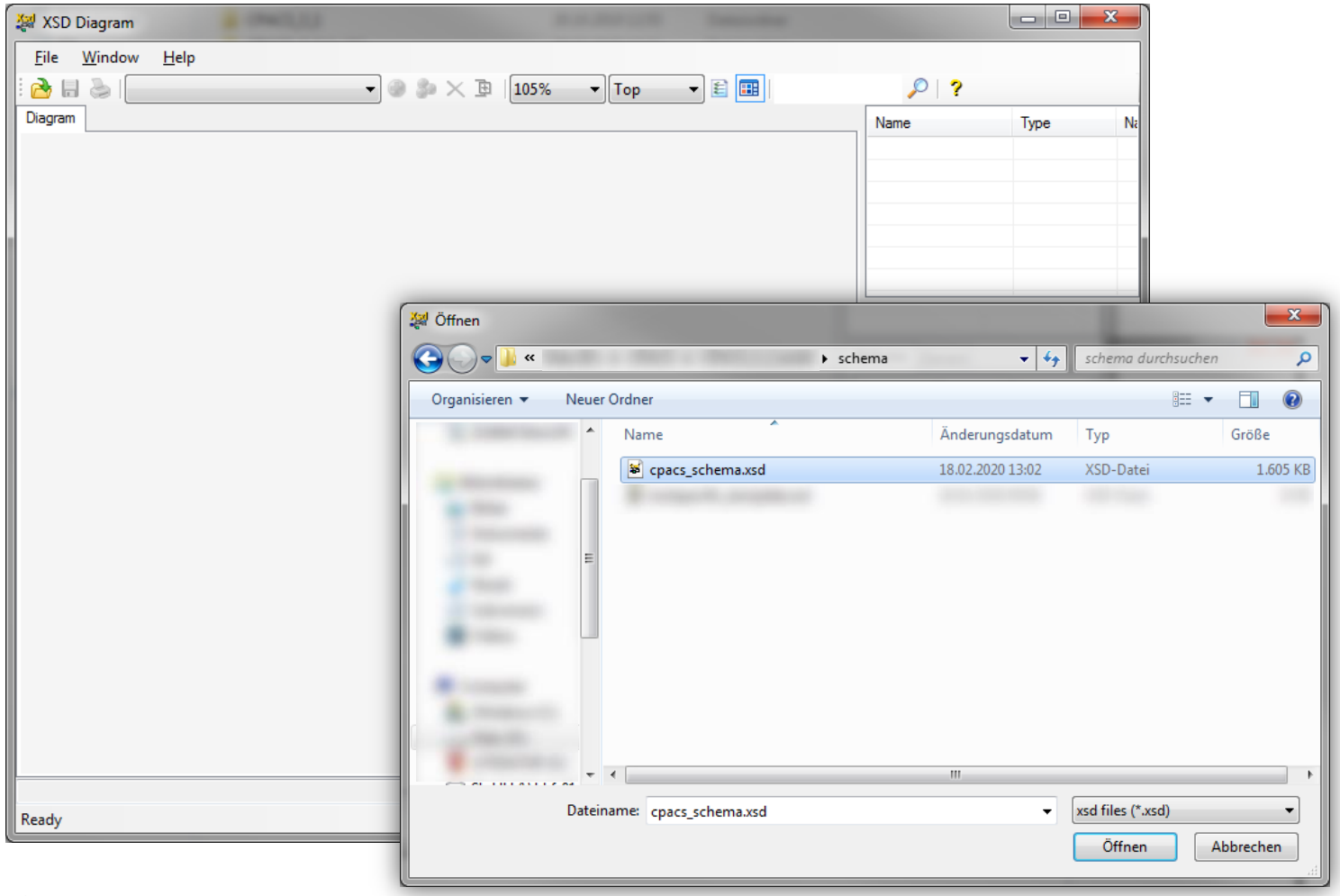
XSDDiagram

- XSD Diagram:
  - A simple tool to visualize a schema quickly and easily
  - It's just a viewer, not an editor (i.e., not possible to modify the schema)

- Download the latest version:
  - http://regis.cosnier.free.fr/?page=XSDDiagram&nomenu
- Download the CPACS schema:
  - https://cpacs.de/pages/download.html
  - e.g.: https://www.cpacs.de/schema/v3_2_0/cpacs_schema.xsd

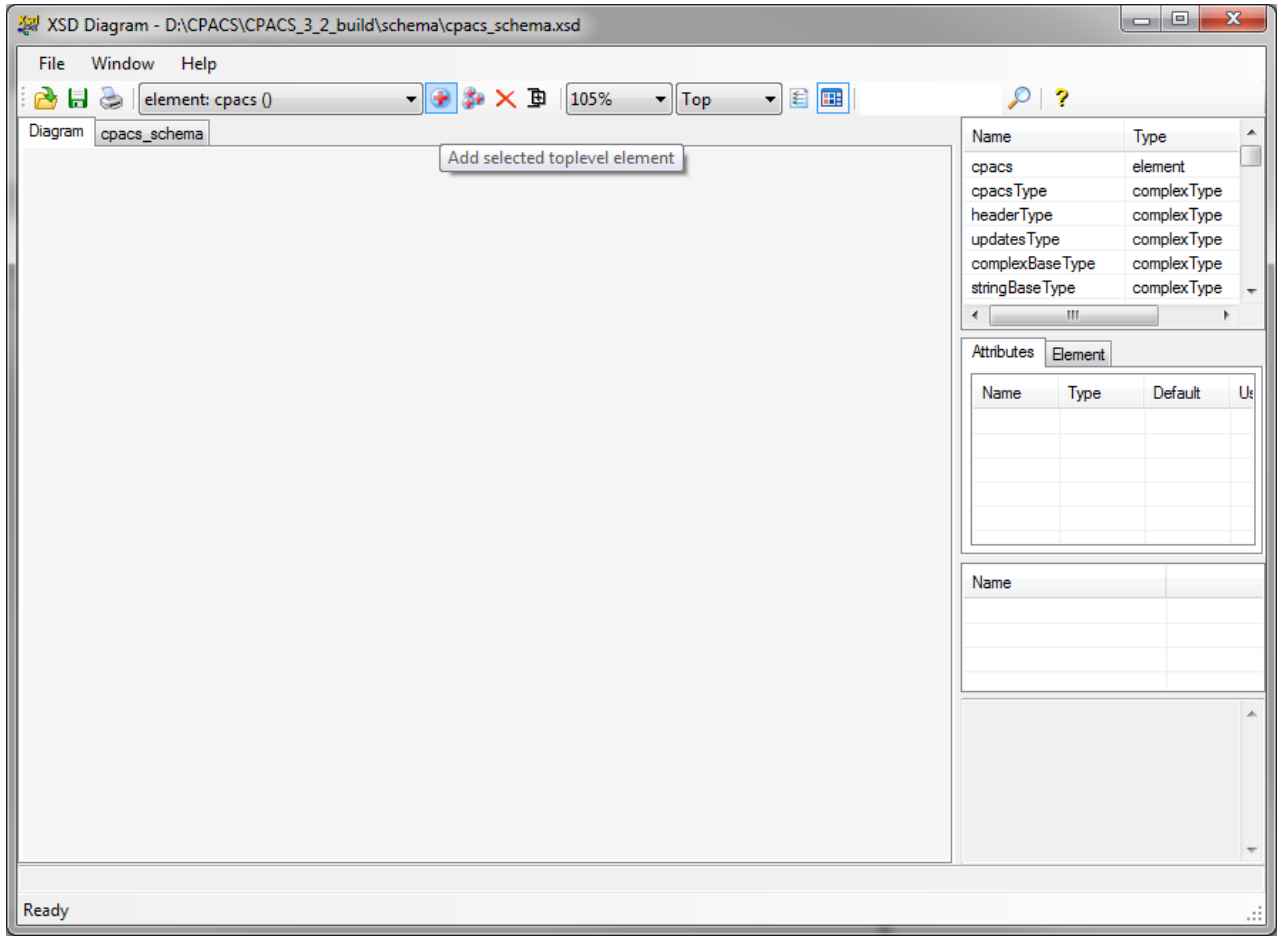


XSDDiagram



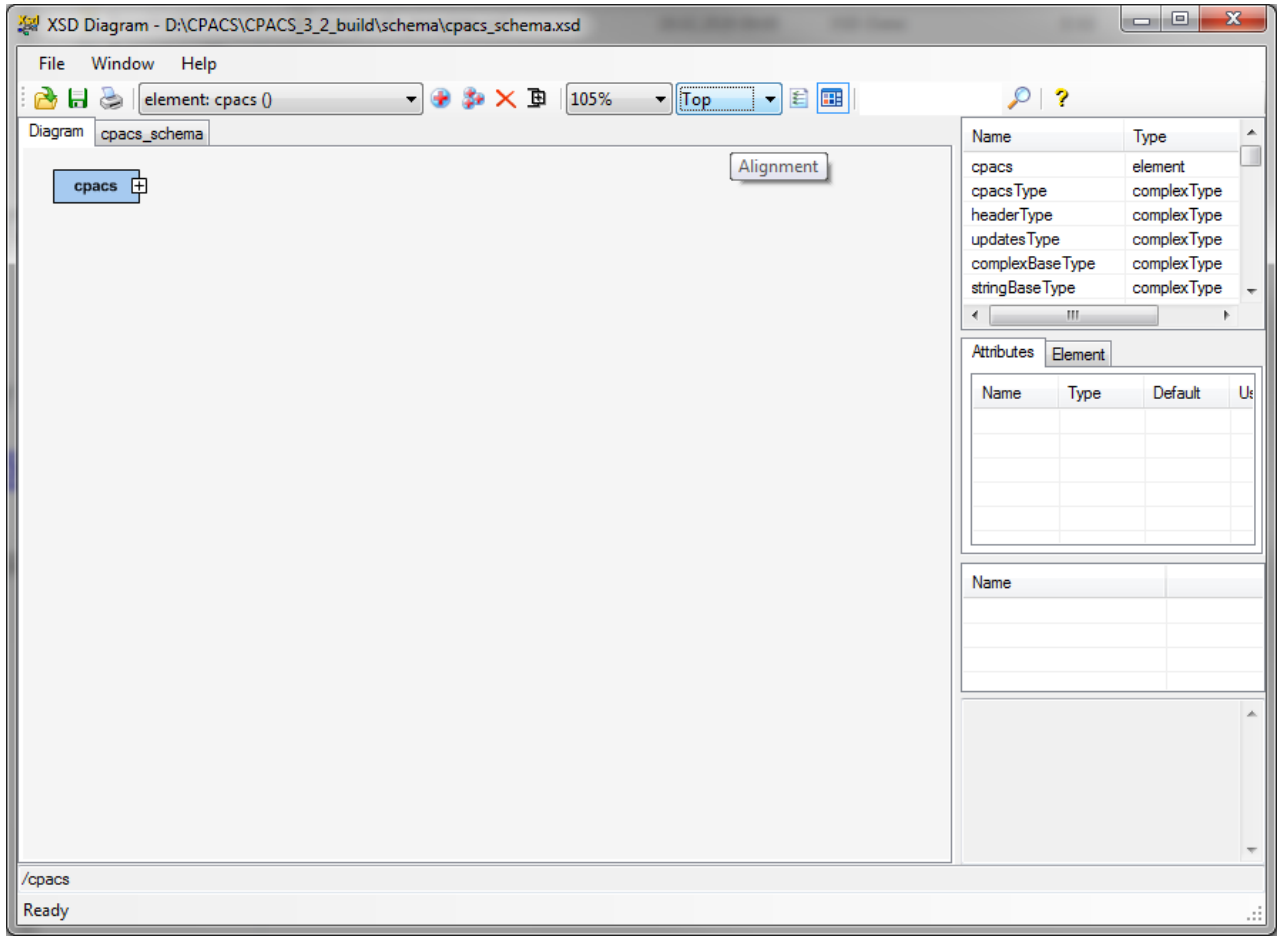
- Run *XSDDiagram.exe*
- Drag & drop or use *File -> Open* the *cpacs_schema.xsd* file

XSDDiagram



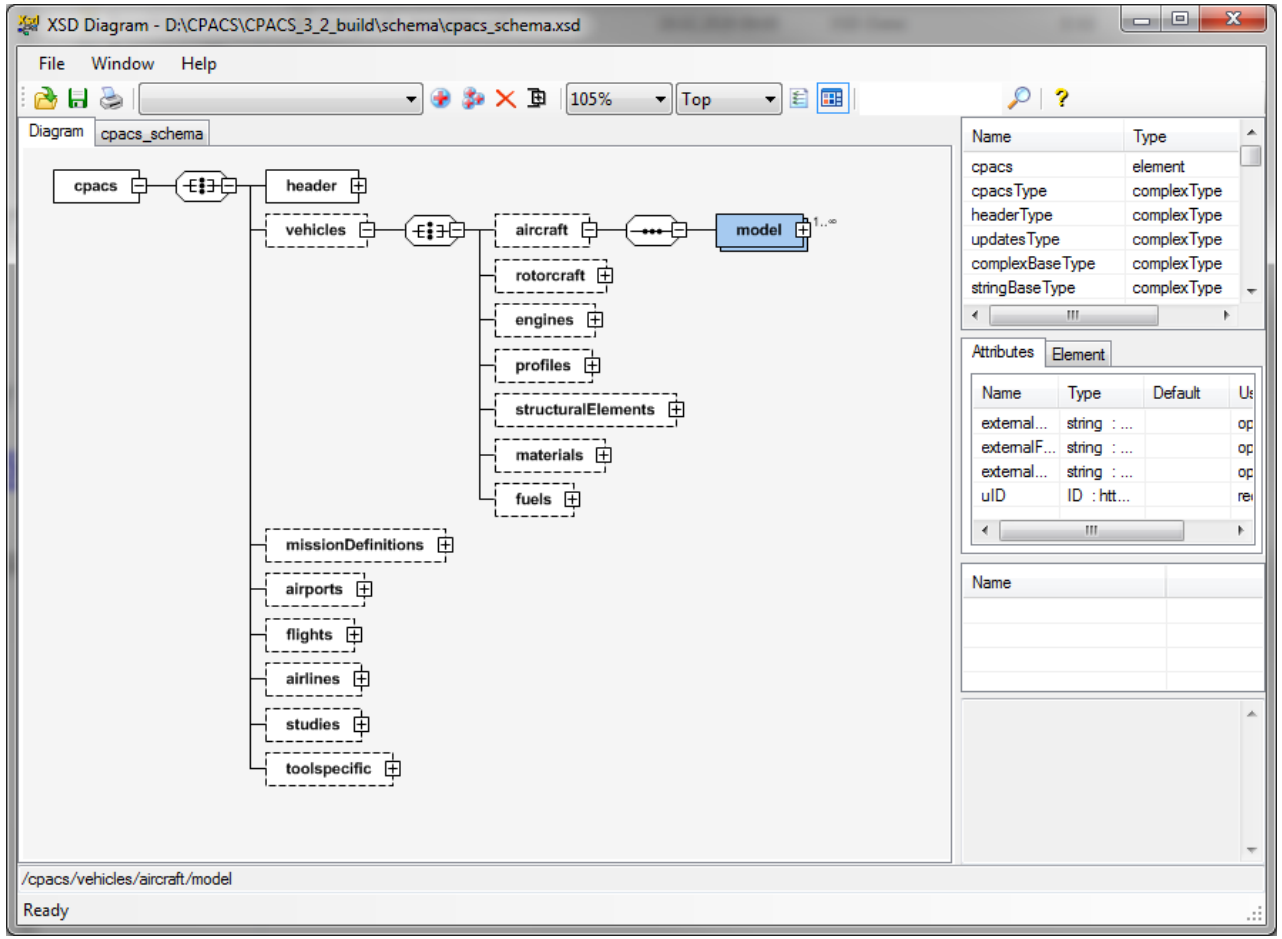
- Click  to open the CPACS root node
- Might be useful:
  - Click on  to display the element description
  - Use  to open all sub-elements

XSDDiagram



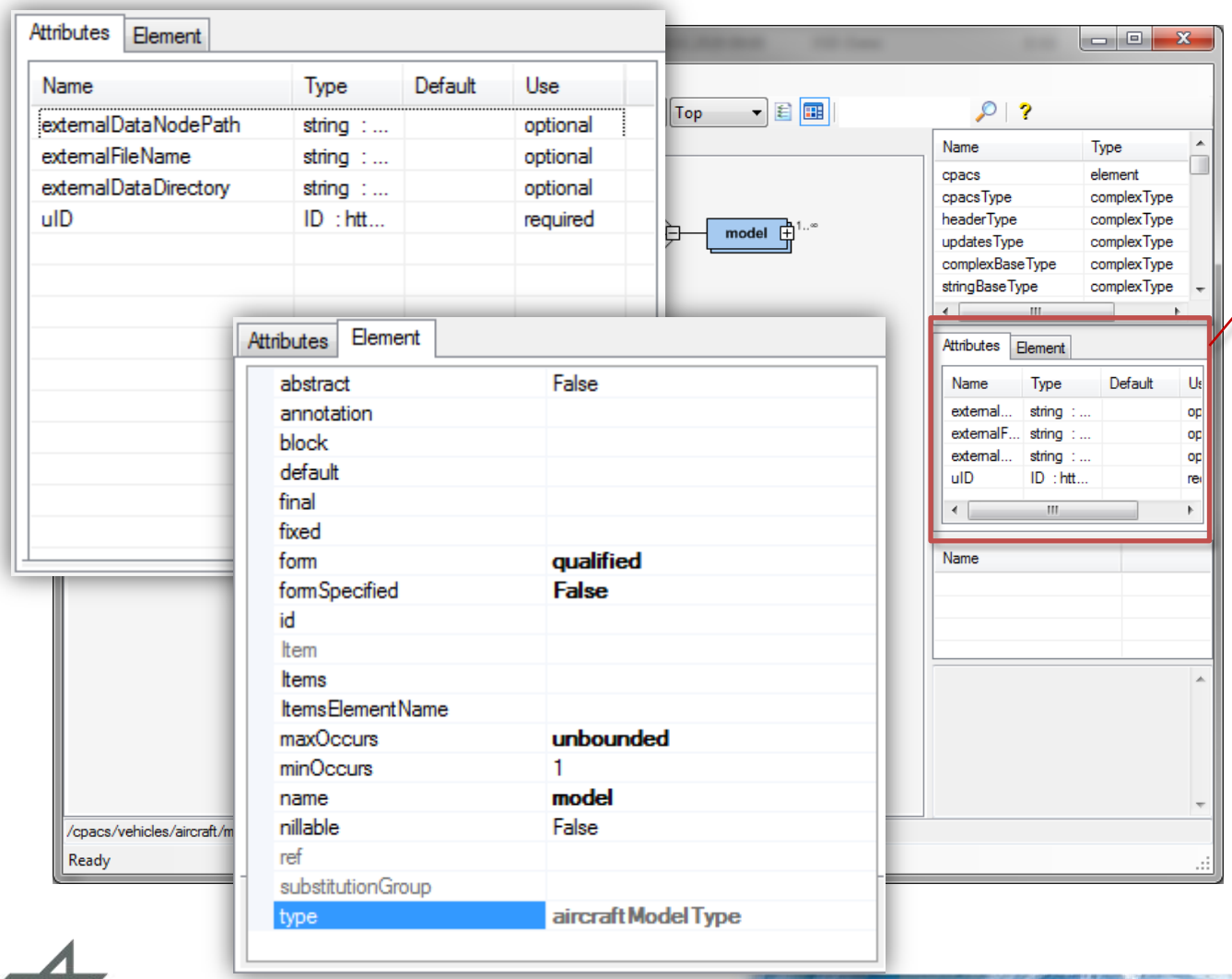
- The *cpacs* root element appears
- Tip: Select *Top* in the dropdown menu to have a more intuitive waterfall structure of the schema

XSDDiagram



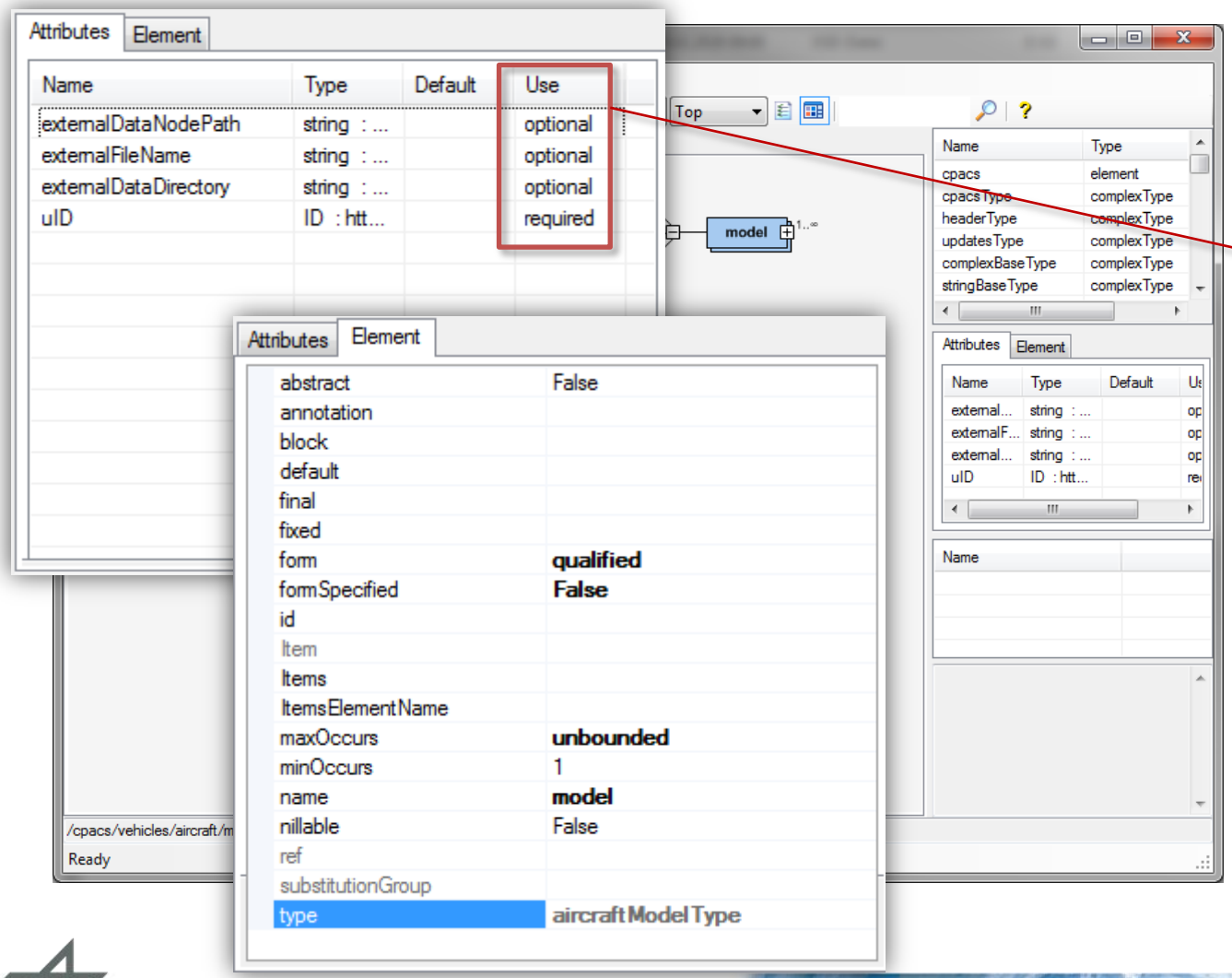
- Use the arrow keys on your keyboard to navigate quickly and easily through the CPACS schema

XSDDiagram



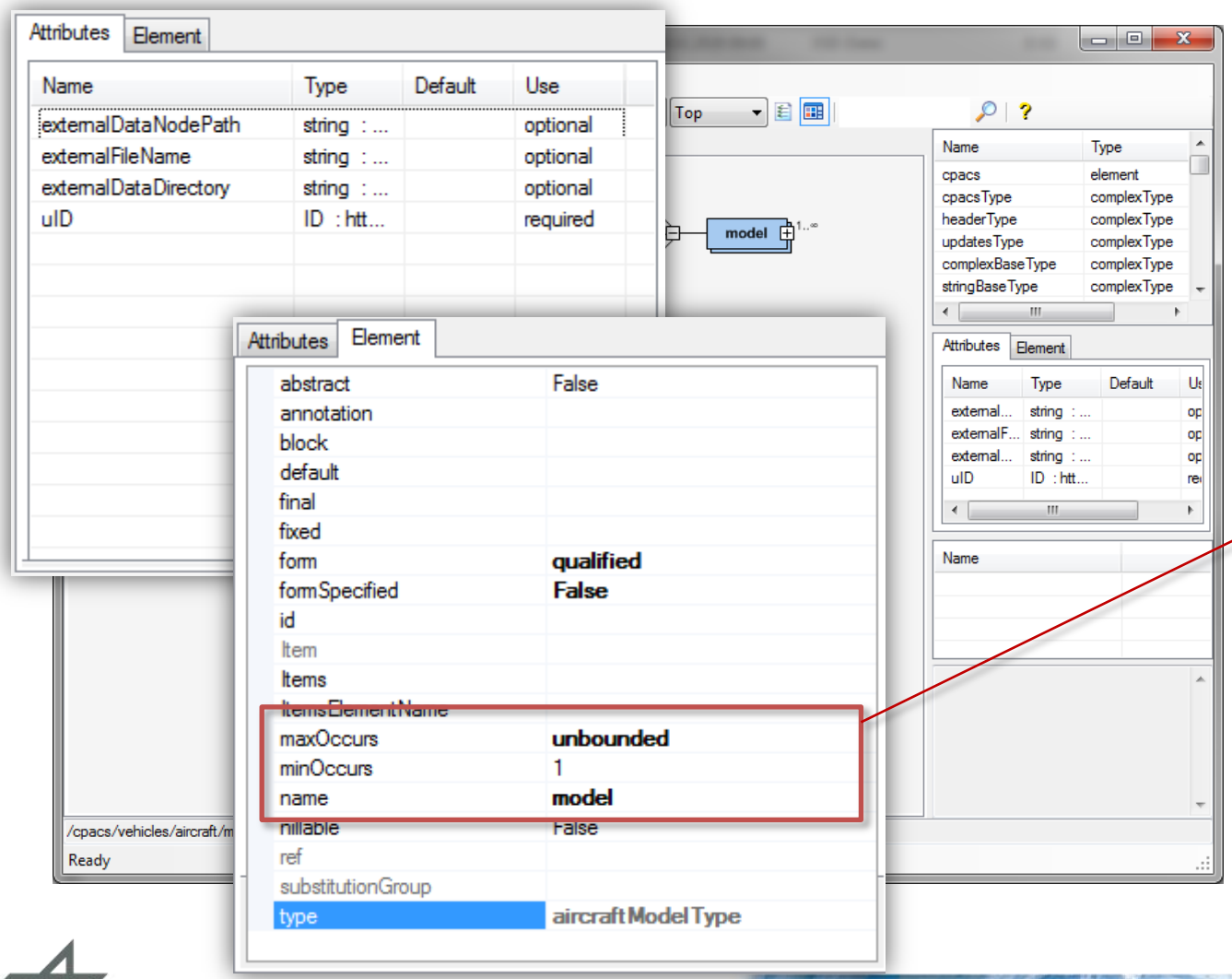
- The right part of the window contains the *attributes* (e.g., *uID*) and *element properties* belonging to the node marked in blue

XSDDiagram



- The right part of the window contains the *attributes* (e.g., *uID*) and *element properties* belonging to the node marked in blue
- Check whether an *attribute* is required or optional

XSDDiagram



- The right part of the window contains the *attributes* (e.g., *uID*) and *element properties* belonging to the node marked in blue
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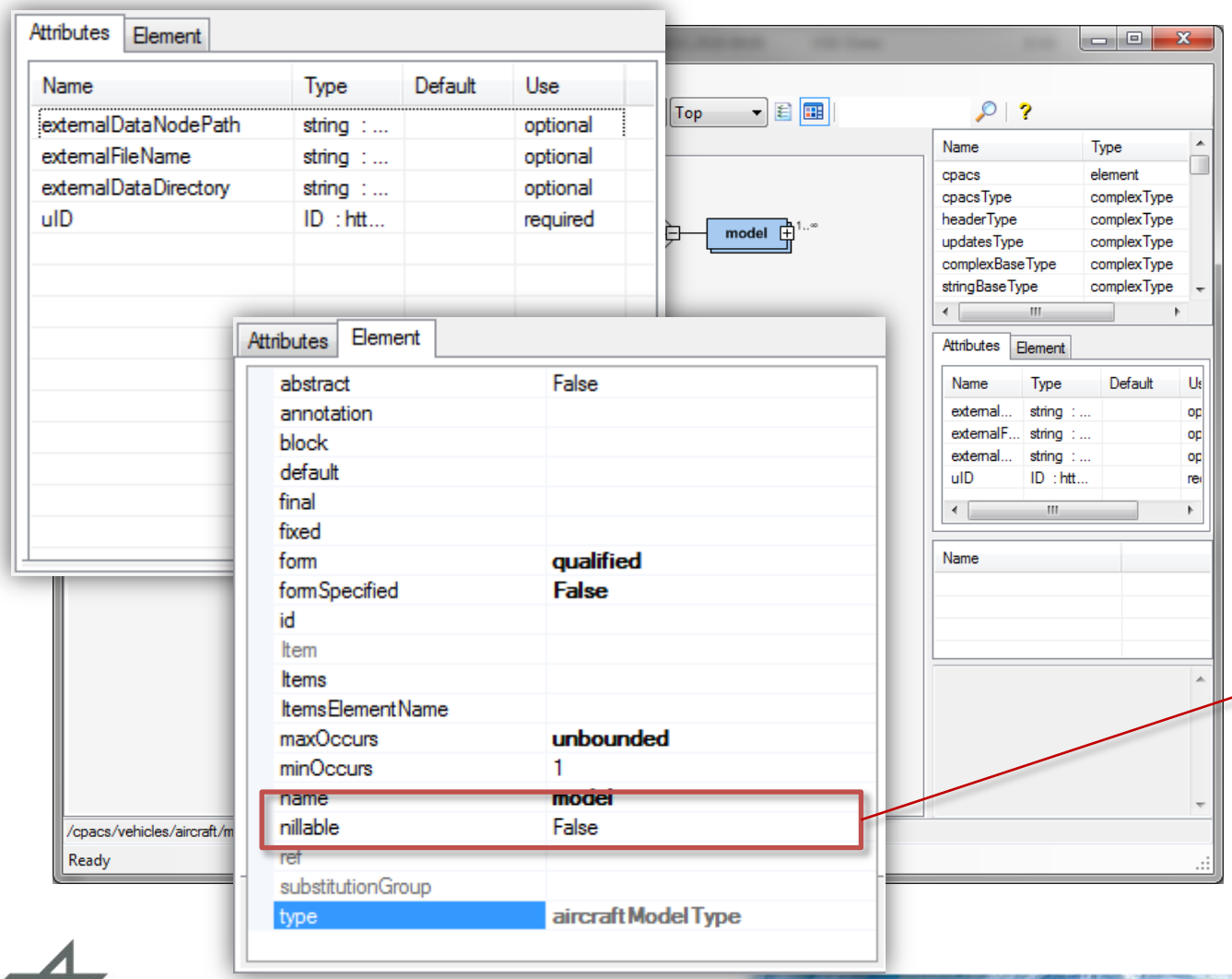
XSDDiagram



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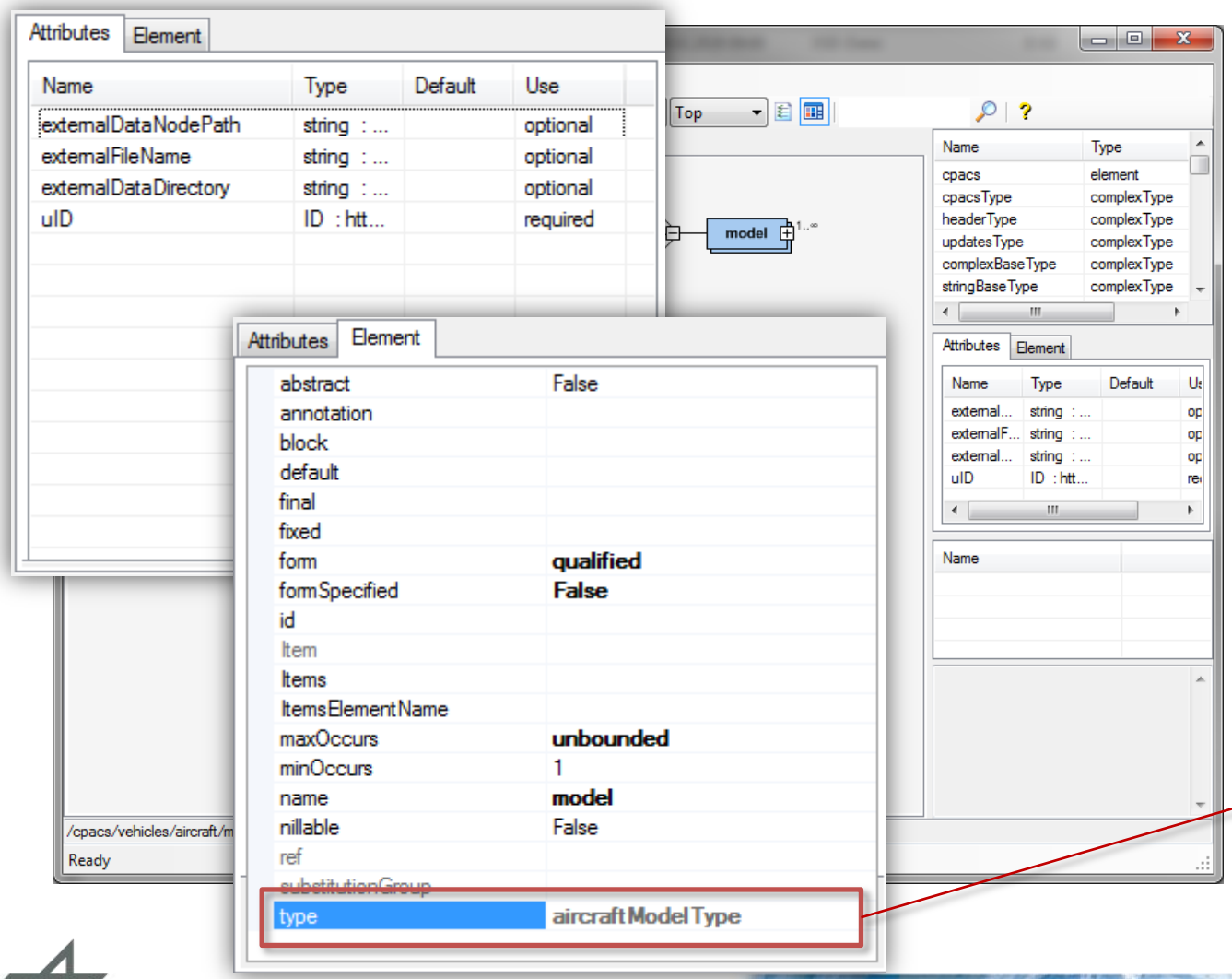
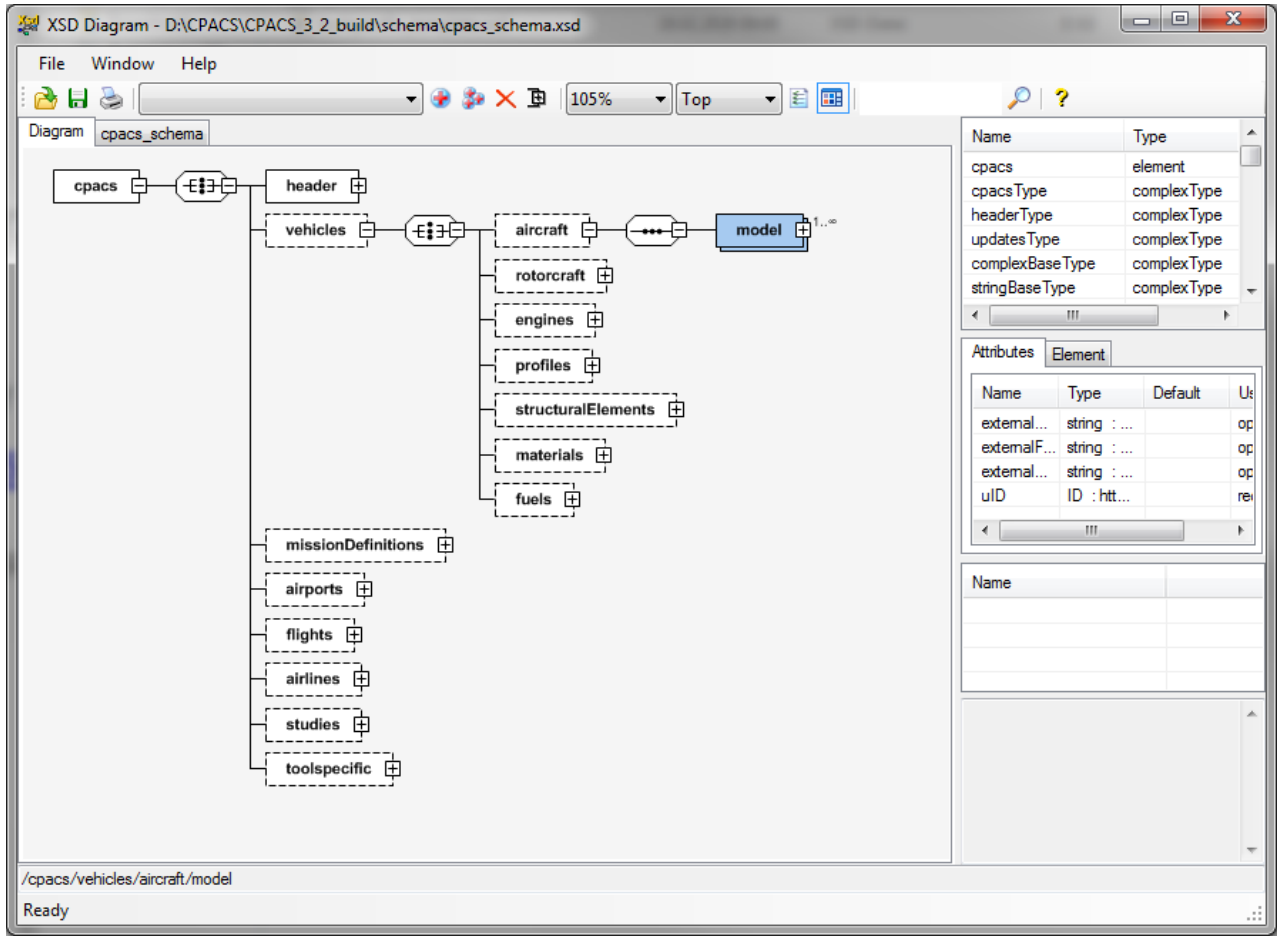
- The above node is not *nillable*, i.e. *<model/>* is not allowed

XSDDiagram



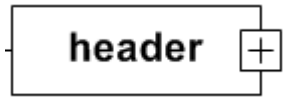
- The right part of the window contains the *attributes* (e.g., *uID*) and *element properties* belonging to the node marked in blue
- Check whether an *attribute* is required or optional
- The *aircraft/model* node, for example, can occur any number of times, but must be specified at least once
- The above node is not *nillable*, i.e. *<model/>* is not allowed
- The type of *model* is *aircraftModelType*

XSDDiagram

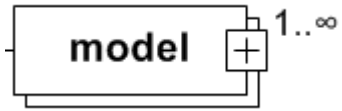


- How often may nodes appear in CPACS? (=*occurrence*):
  - Optional node [0..1]:

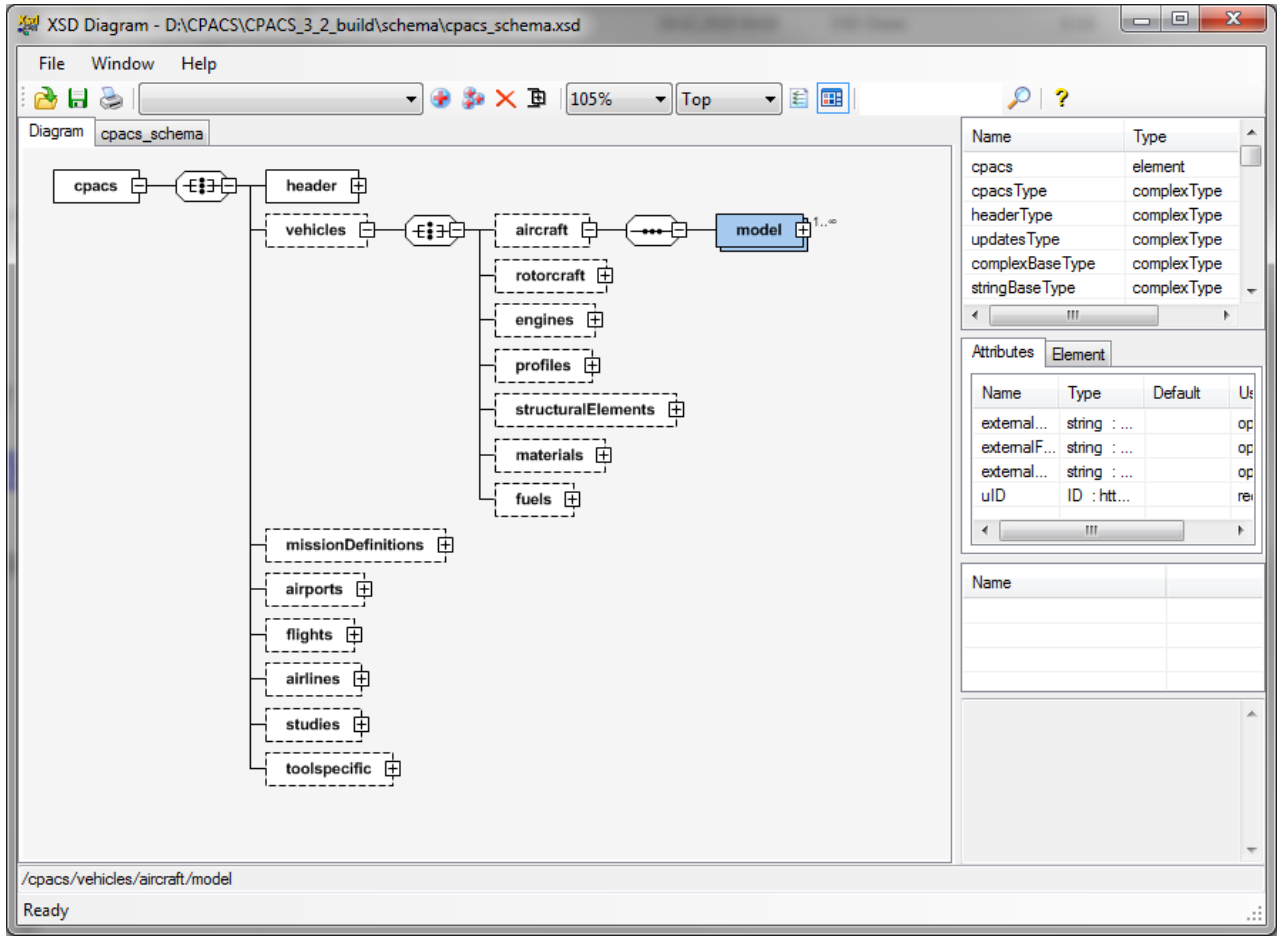
  - Mandatory node [1..1]:



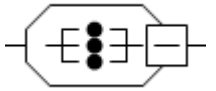
  - Mandatory sequence [1..*]:



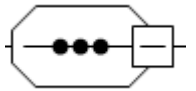
XSDDiagram



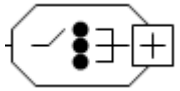
- In what order may the elements appear?:
  - Sequence is arbitrary (i.e. it does not matter whether *aircraft* is specified first and then *engines* or vice versa)



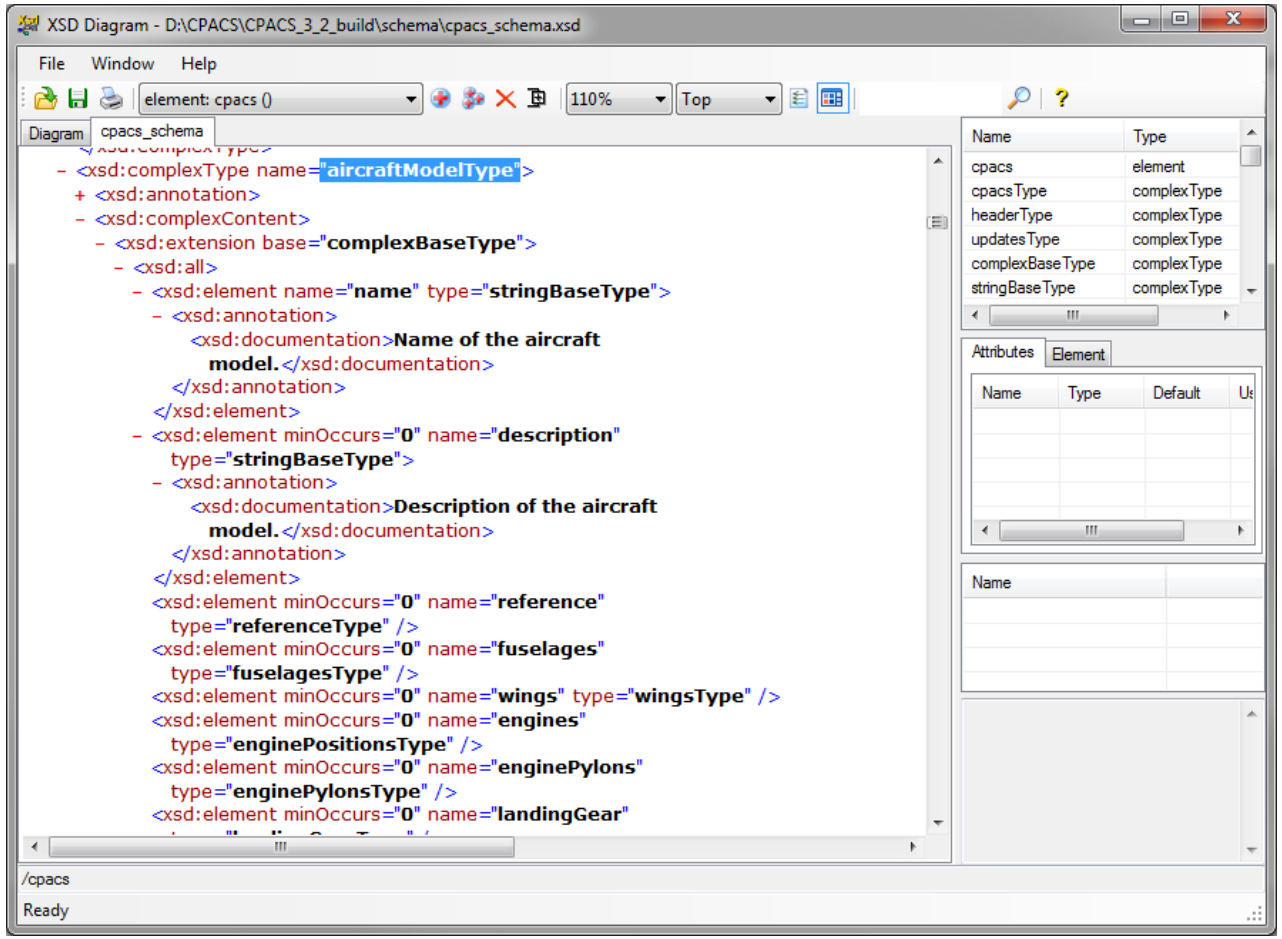
  - Sequence must correspond to the representation in the XSD diagram



  - Only one of the nodes may be specified (=*choice element*):



XSDDiagram



- For the advanced user:
  - The complete XML code of the schema
- Note:
  - (In the current version) XSDDiagram is not the most suitable tool to analyze the XML code of a schema
  - Notepad++, Eclipse or RCE is recommended instead