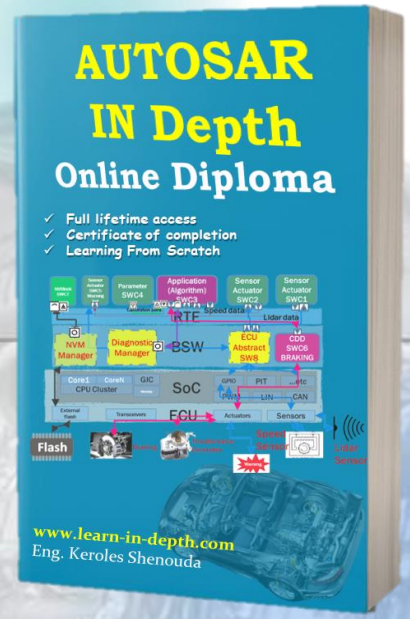
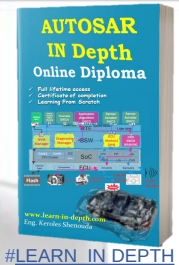
AUTOSAR In Depth

Online Diploma

- ✓ Full lifetime access
- ✓ Access on Android mobile and PC (Windows)
- ✓ Certificate of completion
- ✓ Learning From Scratch





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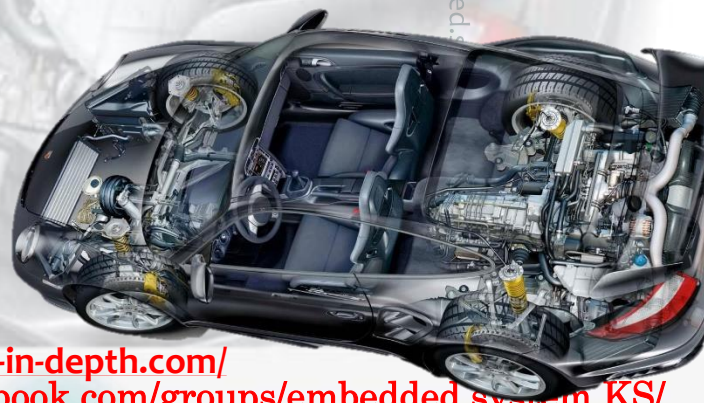
Unit(AUTOSAR Methodology). Session(Understanding ARXML)

- AUTOSAR_MOD_ECUConfiguration Parameters
- PlatformTypes.arxml
- AUTOSAR XML Schema
- Understanding ARXML
  - Attributes
  - Comments
  - Namespace declaration
  - Schema Validation
  - Object Names
  - Packages
  - Referencing Objects
  - Relative References
  - AUTOSAR Elements
  - ECU Configuration Description



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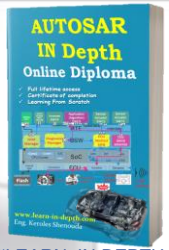

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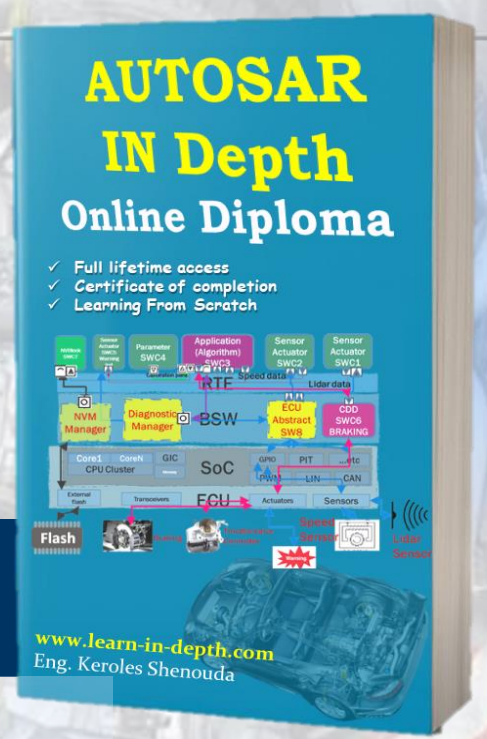
Using UI XML Tool



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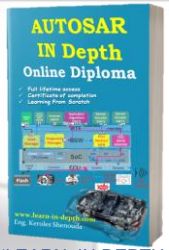
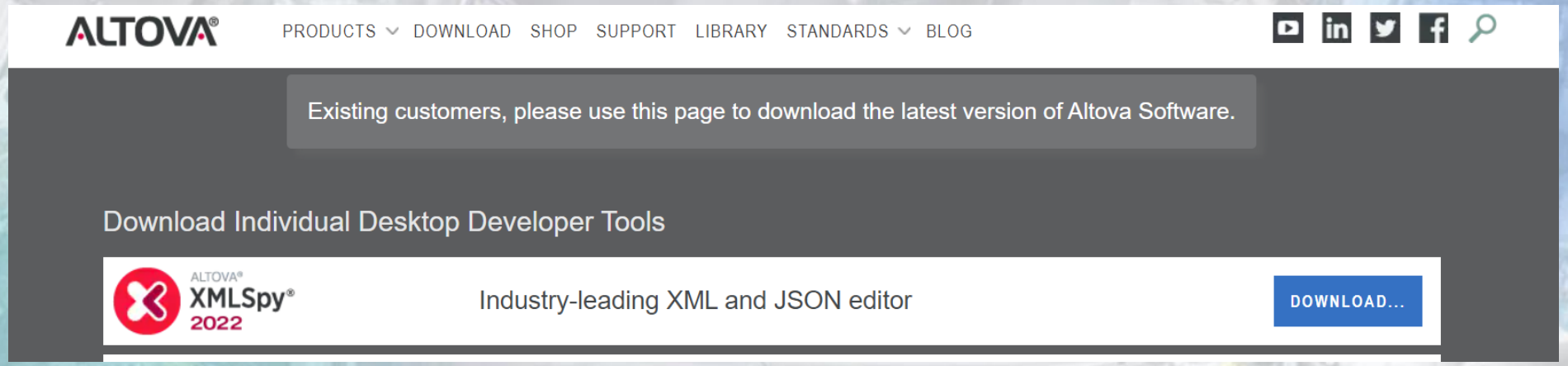


ALTOVA Industry-leading XML and JSON editor



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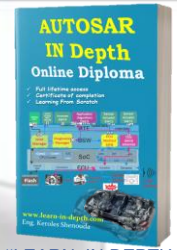

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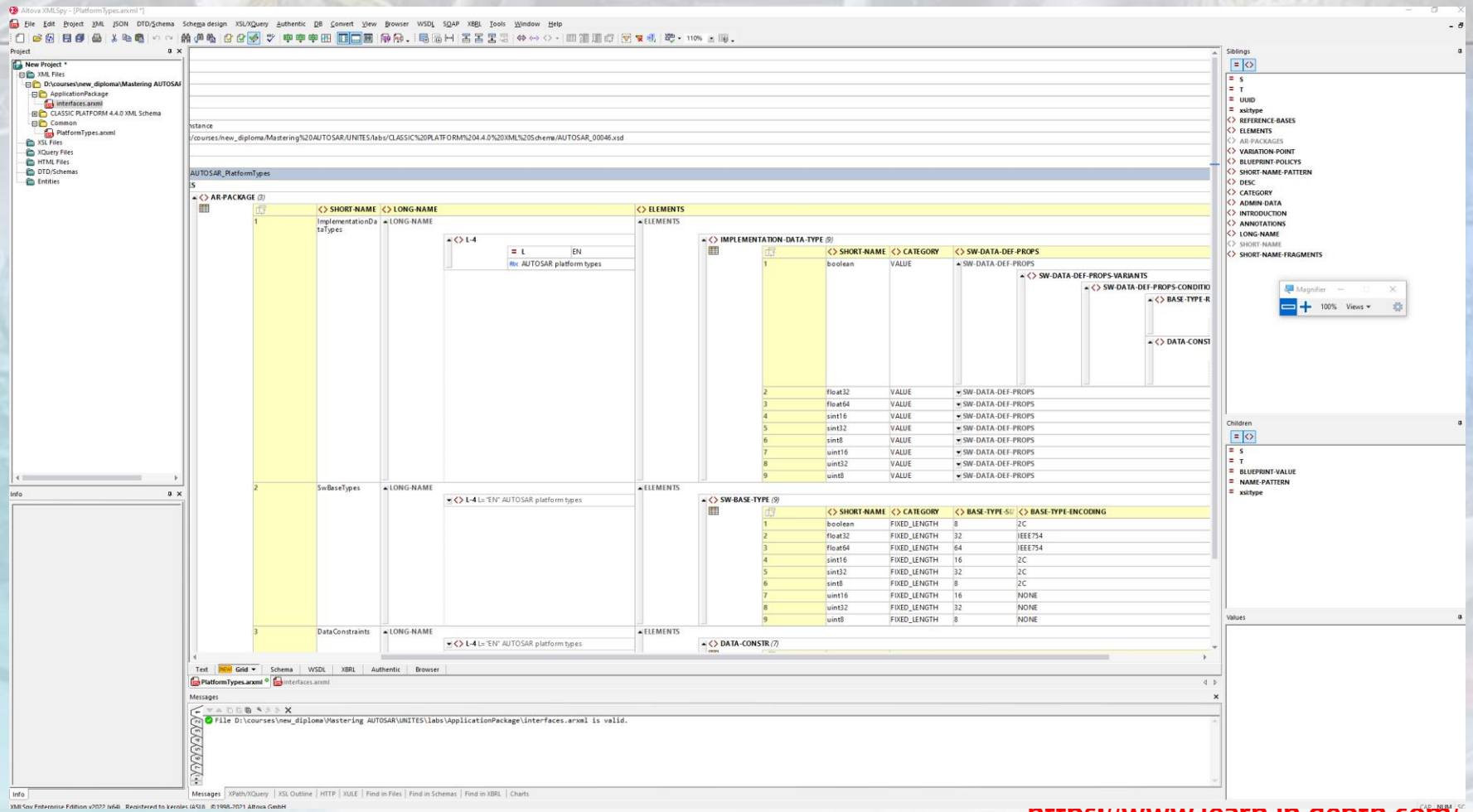

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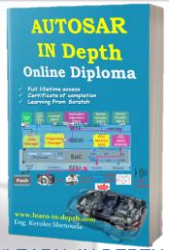


Altova XMLSpy - [interfaces.arxml]

File Edit Project XML JSON DTD/Schema Schema design XSL/XQuery Authentic DB Convert View Browser WSDL SOAP XBRL Tools Window Help

Project

- New Project *
  - XML Files
    - D:\courses\new_diploma\Mastering AUTOSAR
      - ApplicationPackage
        - interfaces.arxml
      - CLASSIC PLATFORM 4.4.0 XML Schema
      - Common
        - PlatformTypes.arxml
  - XSL Files
  - XQuery Files
  - HTML Files
  - DTD/Schemas
  - Entities

```
1  <?xml version="1.0" encoding="UTF-8"?>
2  <AUTOSAR xmlns="http://autosar.org/schema/r4.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="http://autosar.org/schema/r4.0 file:///D:/courses/new_diploma/Mastering%20AUTOSAR/UNITES/labs/
   CLASSIC%20PLATFORM%204.4.0%20XML%20Schema/AUTOSAR_00046.xsd">
3
4      <AR-PACKAGES>
5          <AR-PACKAGE>
6              <SHORT-NAME>interfaces</SHORT-NAME>
7              <ELEMENTS>
8                  <SENDER-RECEIVER-INTERFACE>
9                      <SHORT-NAME>Temp</SHORT-NAME>
10                     <DATA-ELEMENTS>
11                         <VARIABLE-DATA-PROTOTYPE>
12                             <SHORT-NAME>Temprature</SHORT-NAME>
13                         </VARIABLE-DATA-PROTOTYPE>
14
15                     </DATA-ELEMENTS>
16                 </SENDER-RECEIVER-INTERFACE>
17                 <CAN-CLUSTER>
18                     <SHORT-NAME>can0</SHORT-NAME>
19                 </CAN-CLUSTER>
20             </ELEMENTS>
21         </AR-PACKAGE>
22
23     </AR-PACKAGES>
24
25
26 </AUTOSAR>
27
```

Elements

- CAN-CLUSTER-VARIANTS
- VARIATION-POINT
- DESC
- CATEGORY
- ADMIN-DATA
- INTRODUCTION
- ANNOTATIONS
- LONG-NAME
- SHORT-NAME
- SHORT-NAME-FRAGMENTS

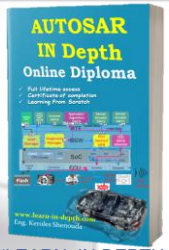
Magnifier 100%

Attributes

Info

Element	CAN-CLUSTER
Model	sequence

https://www.learn-in-depth.com/
https://www.facebook.com/groups/embedded.system.KS/



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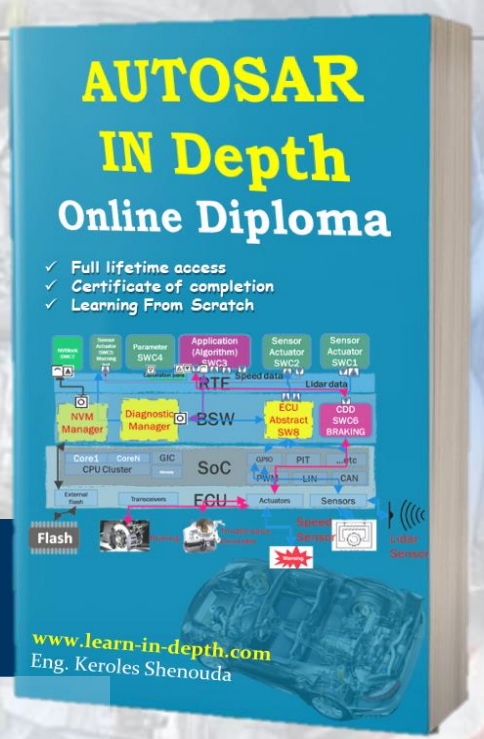
QXMLEdit free tool



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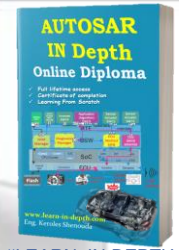
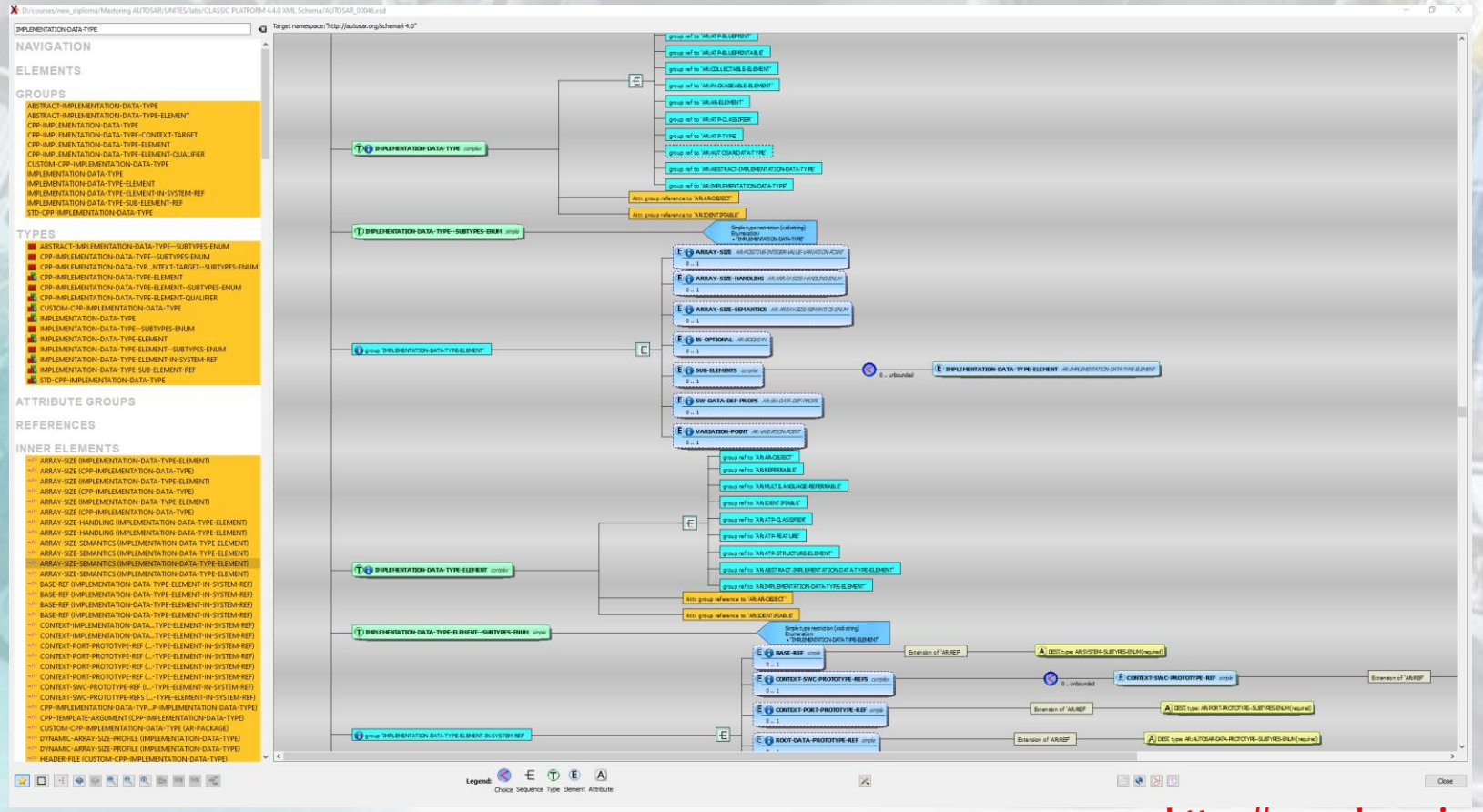


Open AUTOSAR_00046.xsd



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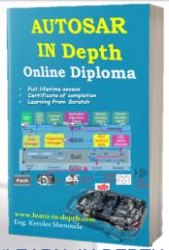

Open XML File platformtypes.xml

QXmlEdit - D:/courses/new_diploma/Mastering AUTOSAR/UNITES/labs/Common/PlatformTypes.arxml

File Edit Preferences Bookmarks XML Special Navigation View Sessions Tools Help

Recent
- PlatformTypes.arxml (1)
- AUTOSAR_00046.xsd (1)
- AUTOSAR_MOD_ECUCo...ameters.arxml (1)

Most used
- AUTOSAR_00046.xsd (1)
- AUTOSAR_MOD_ECUCo...ameters.arxml (1)
- PlatformTypes.arxml (1)

Most recent folders
- D:/courses/new_di...NITES/labs/Common
- D:/courses/new_dip...M 4.4.0 XML Schema
- D:/courses/new_dipl...igurationParameters

```
*Processing Instruction* <?xml   xml(version="1.0" encoding="UTF-8")
<AUTOSAR   xmlns="http://autosar.org/schema/r4.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
           xsi:schemaLocation="http://autosar.org/schema/r4.0 AUTOSAR_00046.xsd"
  1 <AR-PACKAGES
    1 <AR-PACKAGE
      1 <SHORT-NAME   AUTOSAR_PlatformTypes
      2 <AR-PACKAGES
        1 <AR-PACKAGE
          1 <SHORT-NAME   ImplementationDataTypes
          2 <LONG-NAME
            1 <L-4   L="EN"  AUTOSAR platform types
          3 <ELEMENTS
            1 <IMPLEMENTATION-DATA-TYPE
              1 <SHORT-NAME   boolean
              2 <CATEGORY   VALUE
              3 <SW-DATA-DEF-PROPS
            2 <IMPLEMENTATION-DATA-TYPE
            3 <IMPLEMENTATION-DATA-TYPE
            4 <IMPLEMENTATION-DATA-TYPE
            5 <IMPLEMENTATION-DATA-TYPE
            6 <IMPLEMENTATION-DATA-TYPE
            7 <IMPLEMENTATION-DATA-TYPE
            8 <IMPLEMENTATION-DATA-TYPE
            9 <IMPLEMENTATION-DATA-TYPE
        2 <AR-PACKAGE
        3 <AR-PACKAGE
```


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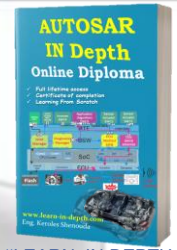
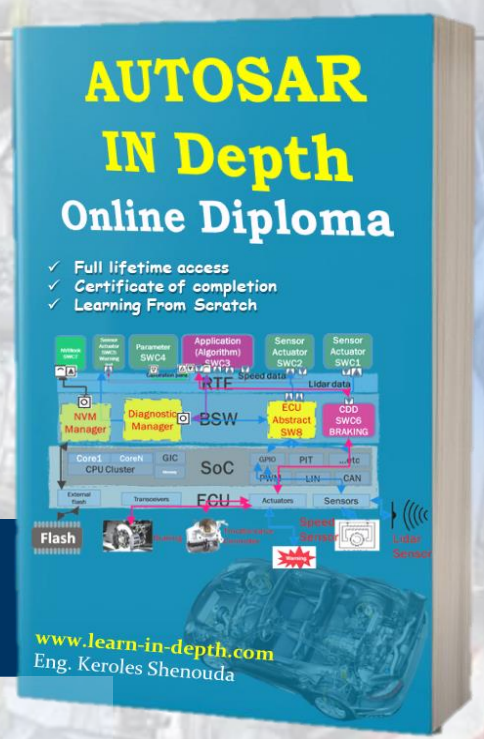
https://www.facebook.com/groups/embedded.system.KS/



AUTOSAR_MOD_ECUConfiguration Parameters



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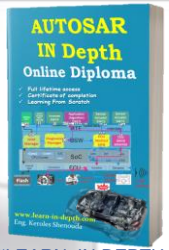
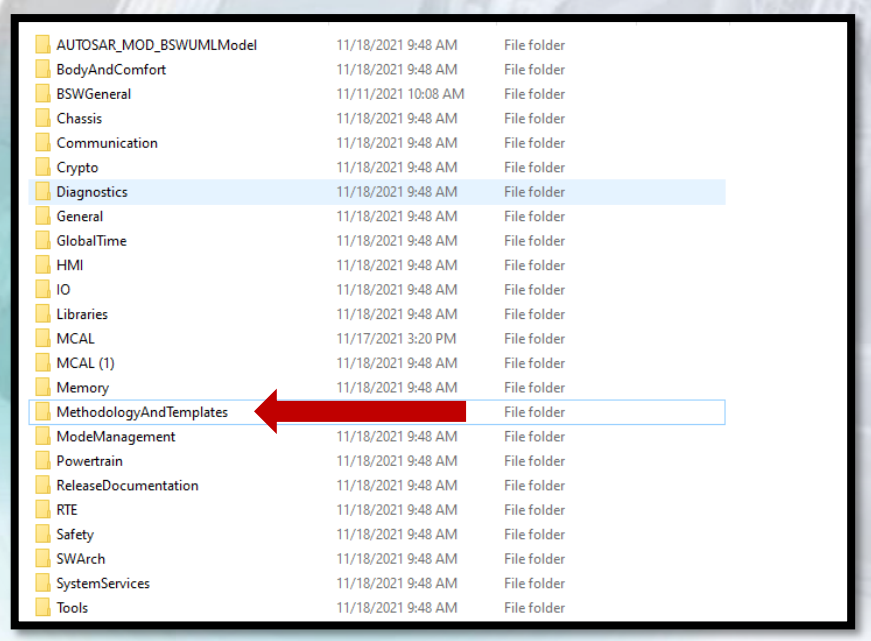


AUTOSAR_MOD_ECUConfiguration Parameters



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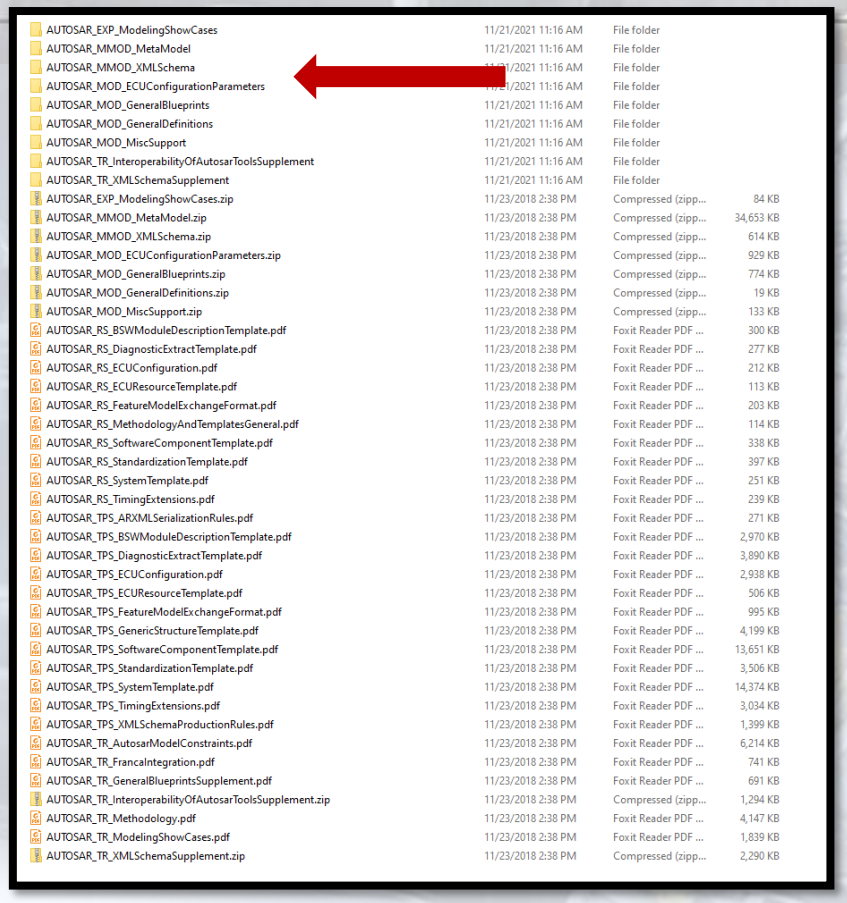
BodyAndComfort	11/18/2021 9:48 AM	File folder
BSWGeneral	11/11/2021 10:08 AM	File folder
Chassis	11/18/2021 9:48 AM	File folder
Communication	11/18/2021 9:48 AM	File folder
Crypto	11/18/2021 9:48 AM	File folder
Diagnostics	11/18/2021 9:48 AM	File folder
General	11/18/2021 9:48 AM	File folder
GlobalTime	11/18/2021 9:48 AM	File folder
HMI	11/18/2021 9:48 AM	File folder
IO	11/18/2021 9:48 AM	File folder
Libraries	11/18/2021 9:48 AM	File folder
MCAL	11/17/2021 3:20 PM	File folder
MCAL (1)	11/18/2021 9:48 AM	File folder
Memory	11/18/2021 9:48 AM	File folder
MethodologyAndTemplates		File folder
ModeManagement	11/18/2021 9:48 AM	File folder
Powertrain	11/18/2021 9:48 AM	File folder
ReleaseDocumentation	11/18/2021 9:48 AM	File folder
RTE	11/18/2021 9:48 AM	File folder
Safety	11/18/2021 9:48 AM	File folder
SWArch	11/18/2021 9:48 AM	File folder
SystemServices	11/18/2021 9:48 AM	File folder
Tools	11/18/2021 9:48 AM	File folder



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AUTOSAR_MMOD_XMLSchema	11/21/2021 11:16 AM	File folder	
AUTOSAR_MOD_ECUConfigurationParameters	11/21/2021 11:16 AM	File folder	
AUTOSAR_MOD_GeneralBlueprints	11/21/2021 11:16 AM	File folder	
AUTOSAR_MOD_GeneralDefinitions	11/21/2021 11:16 AM	File folder	
AUTOSAR_MOD_MiscSupport	11/21/2021 11:16 AM	File folder	
AUTOSAR_TR_InteroperabilityOfAutosarToolsSupplement	11/21/2021 11:16 AM	File folder	
AUTOSAR_TR_XMLSchemaSupplement	11/21/2021 11:16 AM	File folder	
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AUTOSAR_MMOD_MetaModel.zip	11/23/2018 2:38 PM	Compressed (zipp...	34,653 KB
AUTOSAR_MMOD_XMLSchema.zip	11/23/2018 2:38 PM	Compressed (zipp...	614 KB
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AUTOSAR_MOD_GeneralBlueprints.zip	11/23/2018 2:38 PM	Compressed (zipp...	774 KB
AUTOSAR_MOD_GeneralDefinitions.zip	11/23/2018 2:38 PM	Compressed (zipp...	19 KB
AUTOSAR_MOD_MiscSupport.zip	11/23/2018 2:38 PM	Compressed (zipp...	133 KB
AUTOSAR_RS_BSWModuleDescriptionTemplate.pdf	11/23/2018 2:38 PM	Foxit Reader PDF ...	300 KB
AUTOSAR_RS_DiagnosticExtractTemplate.pdf	11/23/2018 2:38 PM	Foxit Reader PDF ...	277 KB
AUTOSAR_RS_ECUConfiguration.pdf	11/23/2018 2:38 PM	Foxit Reader PDF ...	212 KB
AUTOSAR_RS_ECUResourceTemplate.pdf	11/23/2018 2:38 PM	Foxit Reader PDF ...	113 KB
AUTOSAR_RS_FeatureModelExchangeFormat.pdf	11/23/2018 2:38 PM	Foxit Reader PDF ...	203 KB
AUTOSAR_RS_MethodologyAndTemplatesGeneral.pdf	11/23/2018 2:38 PM	Foxit Reader PDF ...	114 KB
AUTOSAR_RS_SoftwareComponentTemplate.pdf	11/23/2018 2:38 PM	Foxit Reader PDF ...	338 KB
AUTOSAR_RS_StandardizationTemplate.pdf	11/23/2018 2:38 PM	Foxit Reader PDF ...	397 KB
AUTOSAR_RS_SystemTemplate.pdf	11/23/2018 2:38 PM	Foxit Reader PDF ...	251 KB
AUTOSAR_RS_TimingExtensions.pdf	11/23/2018 2:38 PM	Foxit Reader PDF ...	239 KB
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AUTOSAR_TPS_ECUResourceTemplate.pdf	11/23/2018 2:38 PM	Foxit Reader PDF ...	506 KB
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AUTOSAR_TR_AutosarModelConstraints.pdf	11/23/2018 2:38 PM	Foxit Reader PDF ...	6,214 KB
AUTOSAR_TR_FrancaIntegration.pdf	11/23/2018 2:38 PM	Foxit Reader PDF ...	741 KB
AUTOSAR_TR_GeneralBlueprintsSupplement.pdf	11/23/2018 2:38 PM	Foxit Reader PDF ...	691 KB
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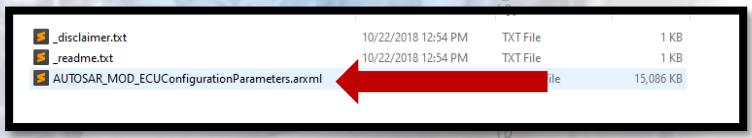

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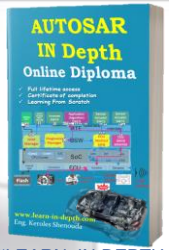
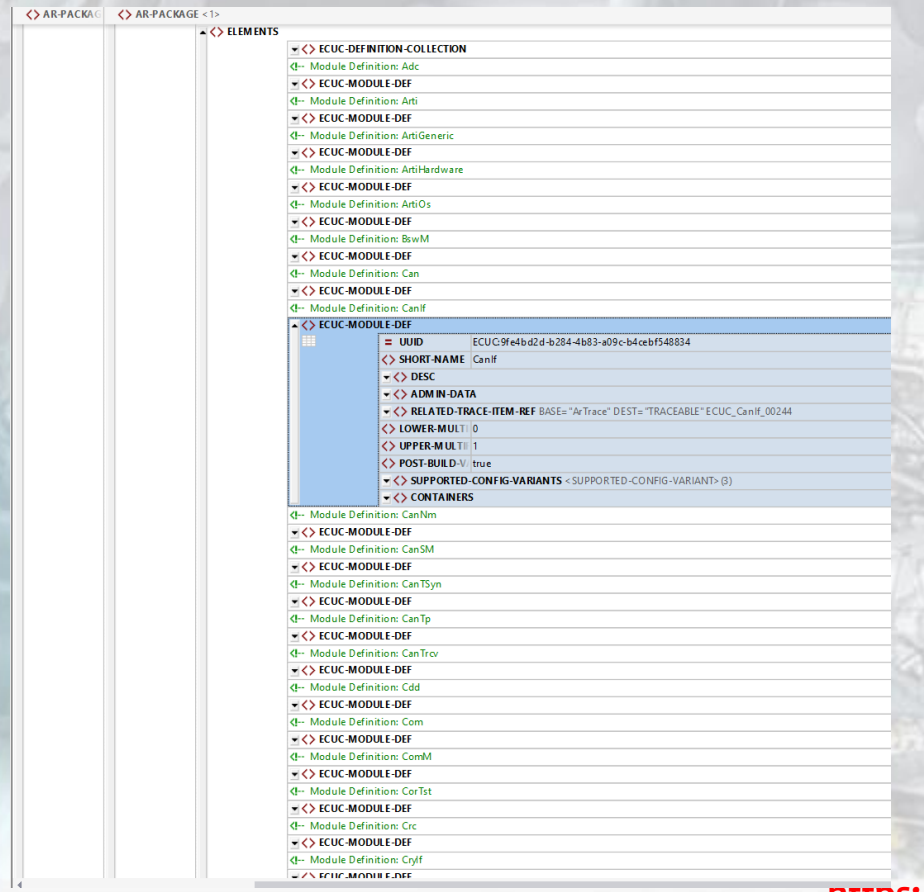
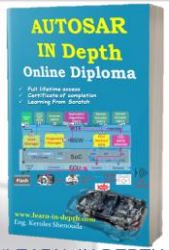
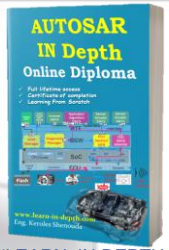






- ECUC-MODULE-DEF
  - UPPER-MULTI 1
  - POST-BUILD-V true
  - SUPPORTED-CONFIG-VARIANTS <SUPPORTED-CONFIG-VARIANT> (3)
  - CONTAINERS
    - Container Definition: CanIfCtrlDrvCfg
    - ECUC-PARAM-CONF-CONTAINER-DEF
    - Container Definition: CanIfDispatchCfg
    - ECUC-PARAM-CONF-CONTAINER-DEF
    - Container Definition: CanIfInitCfg
    - ECUC-PARAM-CONF-CONTAINER-DEF
      - UUID ECUC:5f4506a5-be5f-497c-9349-d69427ba9d24
      - SHORT-NAME CanIfInitCfg
      - DESC
      - RELATED-TRACE-ITEM-REF BASE="ArTrace" DEST="TRACEABLE" ECUC_CanIf_00247
      - LOWER-MULTI 1
      - UPPER-MULTI 1
      - PARAMETERS
        - PARAMETER DEFINITION: CanIfInitCfgSet
        - ECUC-STRING-PARAM-DEF
        - PARAMETER DEFINITION: CanIfMaxBufferSize
        - ECUC-INTEGER-PARAM-DEF
          - UUID ECUC:f1d558d6-5225-4b1d-bd11-5555f8d7193d
          - SHORT-NAME CanIfMaxBufferSize
          - DESC
          - INTRODUCTION
          - RELATED-TRACE-ITEM-REF BASE="ArTrace" DEST="TRACEABLE" ECUC_CanIf_00828
          - LOWER-MULTI 0
          - UPPER-MULTI 1
          - SCOPE LOCAL
          - MULTIPLICITY-CONFIG-CLASSES <ECUC-MULTIPLICITY-CONFIGURATION-CLASS> (3)
          - ORIGIN AUTOSAR_ECUC
          - POST-BUILD-V false
          - POST-BUILD-V false
          - VALUE-CONFIG-CLASSES <ECUC-VALUE-CONFIGURATION-CLASS> (3)
          - SYMBOLIC-NA false
          - MAX 18446744073709551615
          - MIN 0
        - PARAMETER DEFINITION: CanIfMaxRxPduCfg
        - ECUC-INTEGER-PARAM-DEF
        - PARAMETER DEFINITION: CanIfMaxTxPduCfg
        - ECUC-INTEGER-PARAM-DEF
      - SUB-CONTAINERS




```
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  xmlns                 http://autosar.org/schema/r4.0
  xmlns:xsi             http://www.w3.org/2001/XMLSchema-instance
  xsi:schemaLo          http://autosar.org/schema/r4.0 AUTOSAR_00046.xsd
  <!-- AUTOSAR ECU Configuration Parameter Definition
  <!--
       Document Owner:              AUTOSAR
       Document Responsibility:     AUTOSAR
       Document Identification Number: 289
       Document Status:             Final
       Part of AUTOSAR Standard:    Classic Platform
       Part of AUTOSAR Release:     4.4.0
  <!-- Generated on Fri Oct 19 17:24:44 CEST 2018
  <!-- MMT:    3.12.0
  <!-- Meta-Model: D:\Jenkins\jobs\CP_BuildMetamodelArtifacts\ws\01_Sources\MMOD_MetaModel_059\cleaned\AUTOSAR_MMOD_MetaModel.eap
  <!--
       Disclaimer

       This work (specification and/or software implementation) and the material
       contained in it, as released by AUTOSAR, is for the purpose of information
       only. AUTOSAR and the companies that have contributed to it shall not be liable
       for any use of the work.

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  ADMIN-DATA
  AR-PACKAGES
    <!-- AR-Package: AUTOSAR
    AR-PACKAGE
      UUID              ECUC:AUTOSAR
      SHORT-NAME        AUTOSAR
      AR-PACKAGES
        <!-- AR-Package: AUTOSAR
        AR-PACKAGE (2)
          | | UUID | SHORT-NAME | ELEMENTS
          | 1 | ECUC:ECUCDEFS | EcucDefs | ELEMENTS
                ECUC-DEFINITION-COLLECTION
                <!-- Module Definition: Adc
                ECUC-MODULE-DEF
                <!-- Module Definition: Arti
                ECUC-MODULE-DEF
                <!-- Module Definition: ArtiGeneric
                ECUC-MODULE-DEF
                <!-- Module Definition: ArtiHardware
                ECUC-MODULE-DEF
```

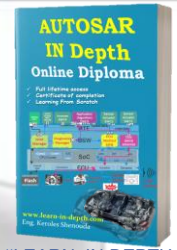

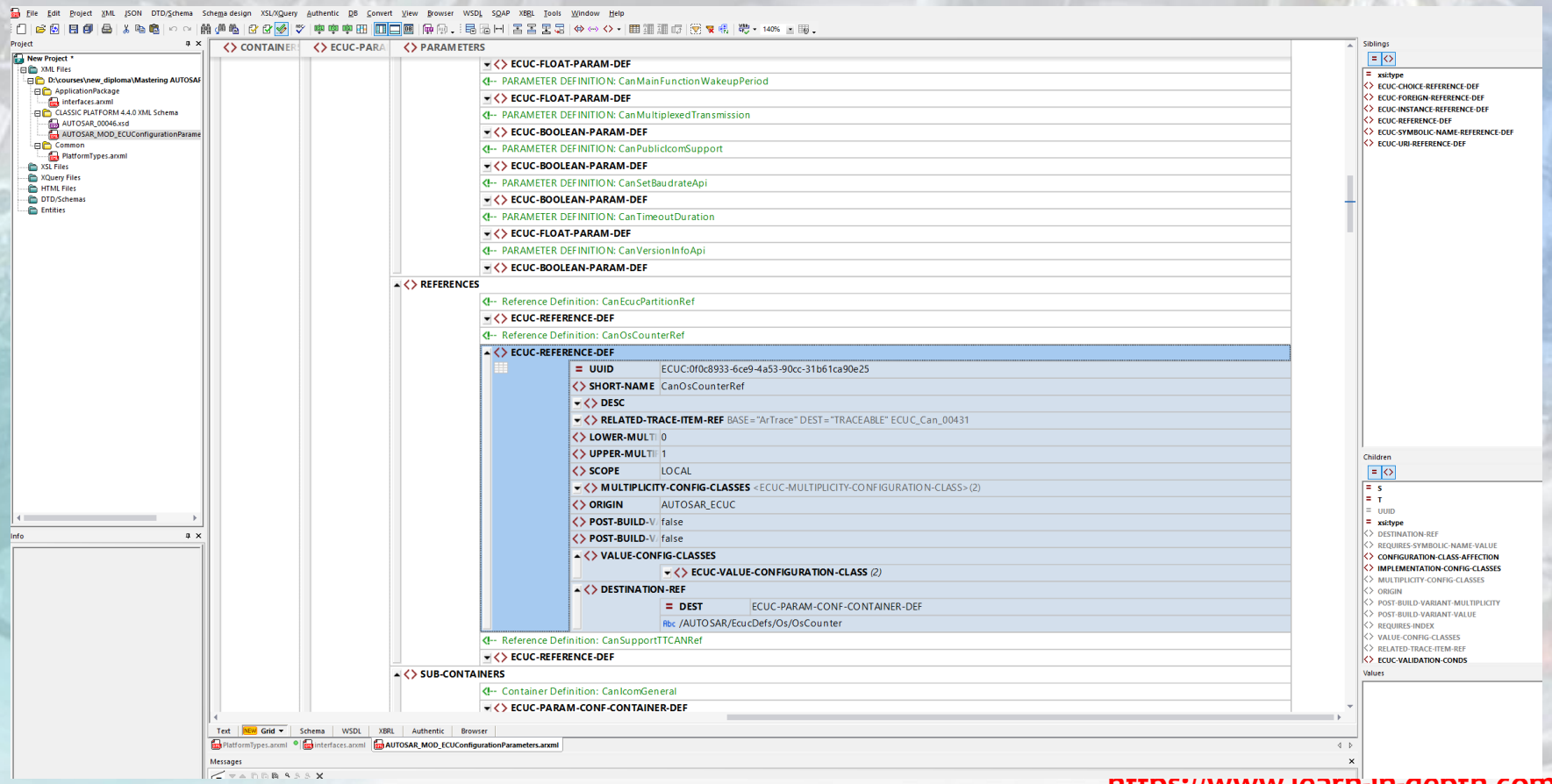

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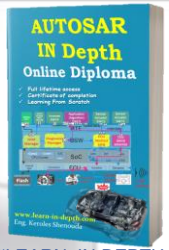
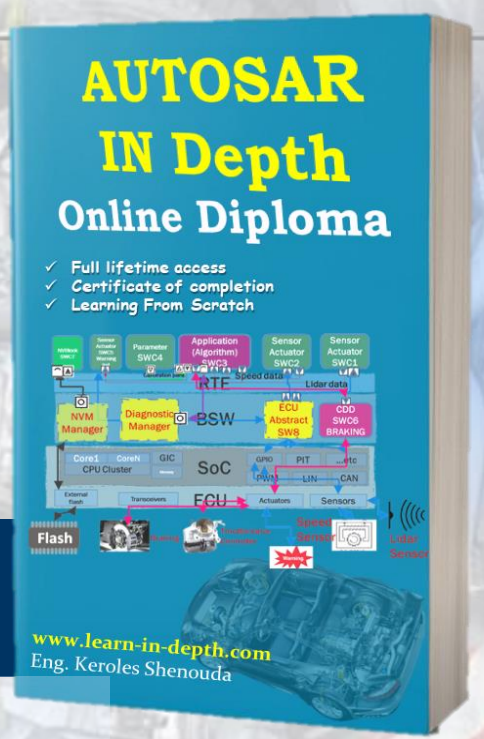


PlatformTypes.arxml



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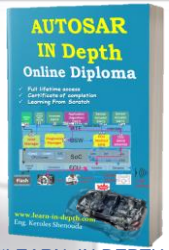
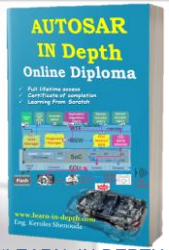


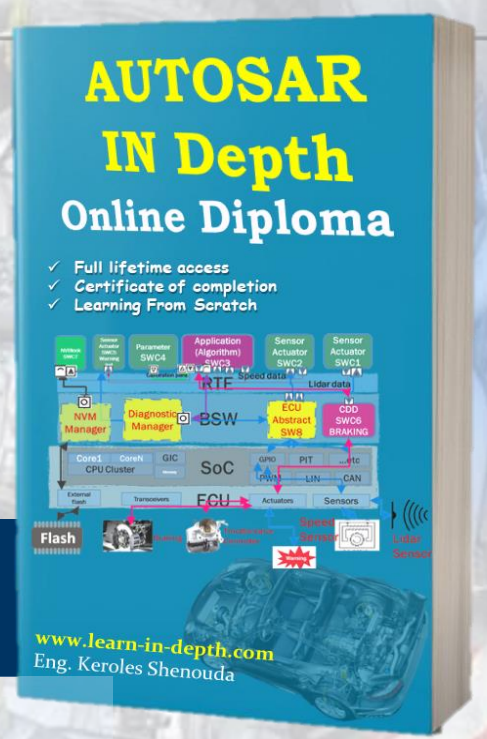
Platform types

CLASSIC_PLATFORM4.4.0\MethodologyAndTemplates\MethodologyAndTemplates\AUTOSAR_EXP_ModelingShowCases\AUTOSAR_EXP_ModelingShowCases\30_MeasurementCalibration\10_Introductory\model

ApplicationDataTypes.arxml	10/9/2018 12:03 PM	ARXML File	9 KB
CompuMethods.arxml	10/9/2018 12:03 PM	ARXML File	3 KB
DataTypeMappings.arxml	10/9/2018 12:03 PM	ARXML File	5 KB
EcucConf.arxml	10/9/2018 12:03 PM	ARXML File	15 KB
FlatMap.arxml	10/9/2018 12:03 PM	ARXML File	9 KB
PlatformTypes.arxml	10/9/2018 12:03 PM	ARXML File	14 KB
PortInterfaces.arxml	10/9/2018 12:03 PM	ARXML File	13 KB
SwAddrMethods.arxml	10/9/2018 12:03 PM	ARXML File	2 KB
SwcComposition.arxml	10/9/2018 12:03 PM	ARXML File	10 KB
SwcController.arxml	10/9/2018 12:03 PM	ARXML File	12 KB
SwcEnvironment.arxml	10/9/2018 12:03 PM	ARXML File	13 KB
SwcParameters.arxml	10/9/2018 12:03 PM	ARXML File	10 KB
SwcPlant.arxml	10/9/2018 12:03 PM	ARXML File	14 KB
System.arxml	10/9/2018 12:03 PM	ARXML File	4 KB
UnitsAndPhysicalDimensions.arxml	10/9/2018 12:03 PM	ARXML File	8 KB



AUTOSAR XML Schema



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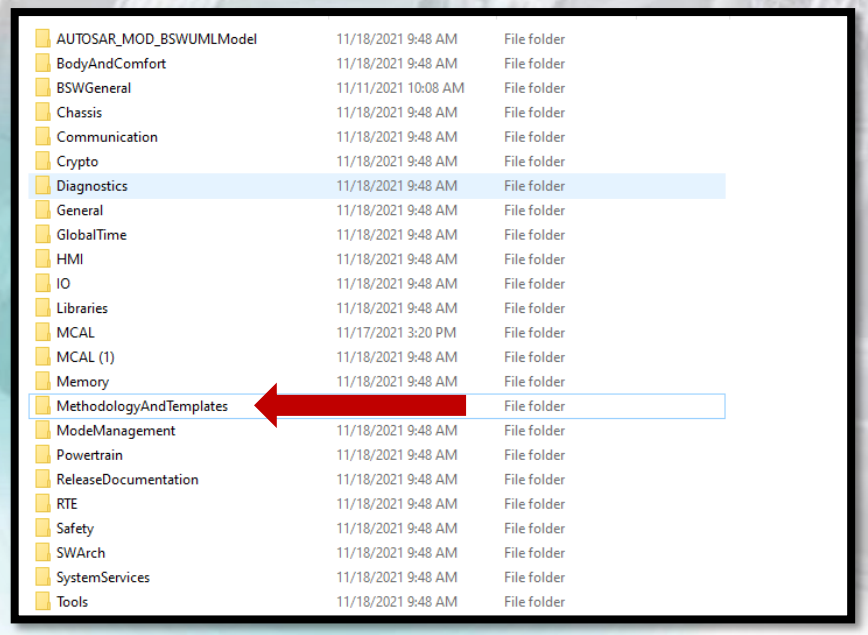
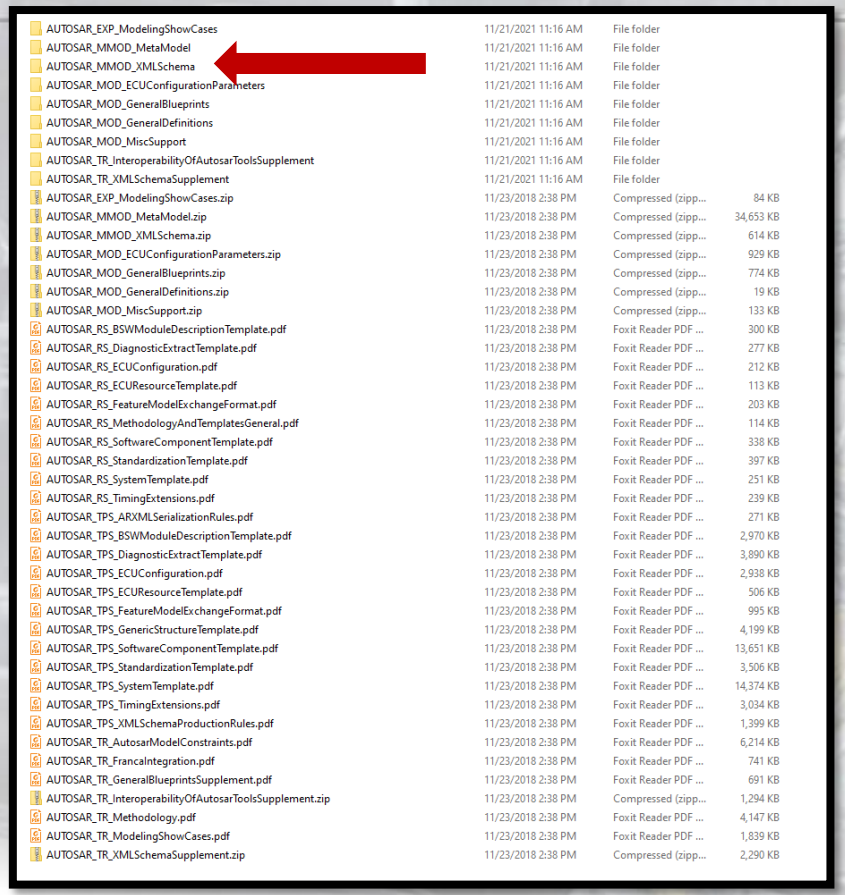
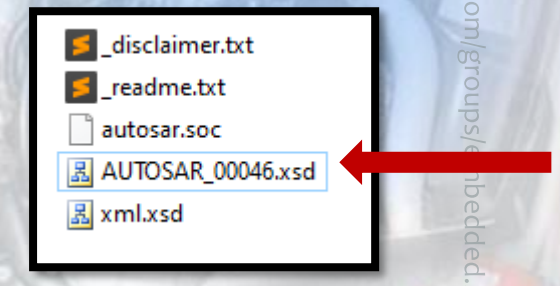
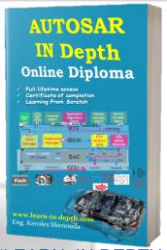
Get Autosar Schema file .xsd









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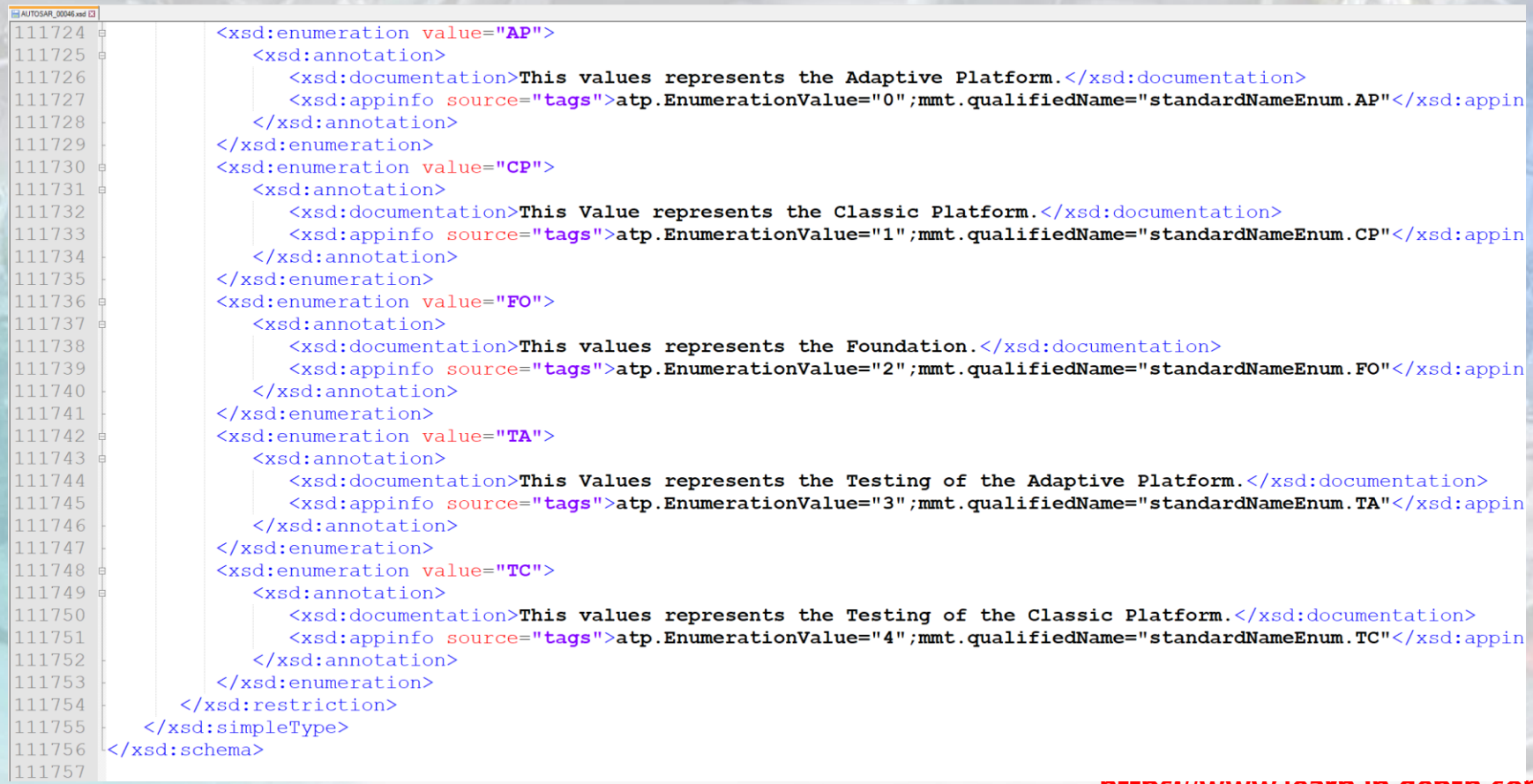
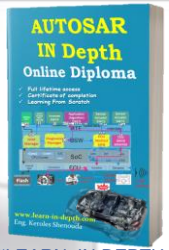
AUTOSAR_00046.xsd

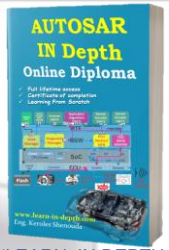


```
111724          <xsd:enumeration value="AP">
111725             <xsd:annotation>
111726                <xsd:documentation>This values represents the Adaptive Platform.</xsd:documentation>
111727                <xsd:appinfo source="tags">atp.EnumerationValue="0";mmt.qualifiedName="standardNameEnum.AP"</xsd:appin
111728             </xsd:annotation>
111729          </xsd:enumeration>
111730          <xsd:enumeration value="CP">
111731             <xsd:annotation>
111732                <xsd:documentation>This Value represents the Classic Platform.</xsd:documentation>
111733                <xsd:appinfo source="tags">atp.EnumerationValue="1";mmt.qualifiedName="standardNameEnum.CP"</xsd:appin
111734             </xsd:annotation>
111735          </xsd:enumeration>
111736          <xsd:enumeration value="FO">
111737             <xsd:annotation>
111738                <xsd:documentation>This values represents the Foundation.</xsd:documentation>
111739                <xsd:appinfo source="tags">atp.EnumerationValue="2";mmt.qualifiedName="standardNameEnum.FO"</xsd:appin
111740             </xsd:annotation>
111741          </xsd:enumeration>
111742          <xsd:enumeration value="TA">
111743             <xsd:annotation>
111744                <xsd:documentation>This Values represents the Testing of the Adaptive Platform.</xsd:documentation>
111745                <xsd:appinfo source="tags">atp.EnumerationValue="3";mmt.qualifiedName="standardNameEnum.TA"</xsd:appin
111746             </xsd:annotation>
111747          </xsd:enumeration>
111748          <xsd:enumeration value="TC">
111749             <xsd:annotation>
111750                <xsd:documentation>This values represents the Testing of the Classic Platform.</xsd:documentation>
111751                <xsd:appinfo source="tags">atp.EnumerationValue="4";mmt.qualifiedName="standardNameEnum.TC"</xsd:appin
111752             </xsd:annotation>
111753          </xsd:enumeration>
111754       </xsd:restriction>
111755    </xsd:simpleType>
111756 </xsd:schema>
111757
```



Understanding XML

- XML is a mark-up language for documents that uses a series of tags to convey structured information.
- XML does not define either the name of the tags or the semantics of the data enclosed by the tags. Instead, the names and structure of the tags is defined in by an XML schema.
- Each XML document you write needs to specify the schema that is used for processing the remaining file content.
- With schema definitions it is possible to define a namespace for the tags which allows you to create a single XML file that references configuration from multiple schemas.
- There are basically three types of mark-up that you need to understand to work with AUTOSAR configuration:
  - Elements
  - Attributes
  - Comments



Elements

- An element is delimited using angle brackets and is the most common construct you will see.
- For elements that contain content, including sub-elements, the general structure is:

<ELEMENT-TAG>

...

</ELEMENT-TAG>

- An element can be empty which means that it has no content, this is represented using the following shorthand:

<EMPTY-ELEMENT-TAG/

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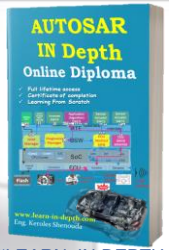
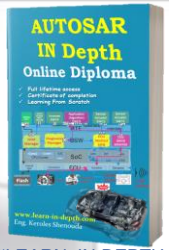


Attributes

- An attribute is a name-value pair that occurs inside start-tags after the element name.
- For example,

```
<ELEMENT-TAG SOME-ATTRIBUTE="some value">
```

- All attribute values must be quoted.



Comments

- Sometimes you will need to add comments to your XML document. Comments begin with <!-- and end with --> and can contain any data except the literal string "--".'
- You can place comments between mark-up anywhere in your document.

  <!-- This is a comment in XML -->
- Comments are not part of the textual content of an XML document and are ignored by the XML processor

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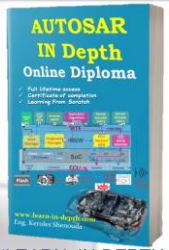
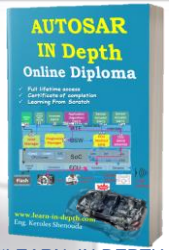


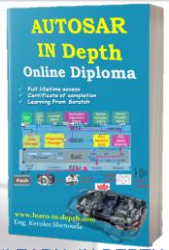
Understanding AUTOSAR XML

- AUTOSAR defines the tags and their semantics using an XML schema definition
- Namespace declaration
  - AUTOSAR XML descriptions (XML files describing all or part of an AUTOSAR configuration) must declare the AUTOSAR namespace as the default namespace.
  - A namespace is declared using an xmlns attribute on the root element of an XML file.
  - The AUTOSAR namespace for all AUTOSAR releases in the 4.x series is http://autosar.org/schema/r4.0



Schema Validation

- AnyTool validates each XML input file that declares the AUTOSAR 4.x namespace against an AUTOSAR XML schema.
- Each 4.x schema from AUTOSAR is a superset of all previous 4.x schemas, allowing all instance documents to be validated against the latest schema.
- Due to the relaxation of some constraints, configurations that would have been rejected when validated against earlier AUTOSAR schema versions may be accepted when validated against a later version.



Object Names

- All objects are named using the <SHORT-NAME> tag:

  <SHORT-NAME>ThisIsMyNamedObject</SHORT-NAME>

- The names allocated in the configuration for software component prototypes, ports, runnable entities, interfaces etc.
- are used by the RTE generator to generate object handles and customized API calls for use at runtime.
- This means that names you give objects in the RTE configuration must be valid C identifiers

Packages

- The <AUTOSAR> element is a container for exactly one top level packages <AR-PACKAGES> element.
- The top-level packages element represents the root of an XML object tree from which all objects in all configuration files can be accessed.
- The top-level packages itself then contains one or more packages each defined with the <AR-PACKAGE> element.
- Each <AR-PACKAGE> defines a group of AUTOSAR elements.

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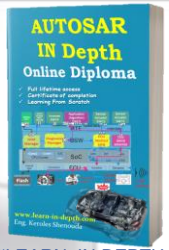

Packages

- A package definition is named using the <SHORT-NAME> element. Each package should have a unique name so that the elements contained within the package can be referenced by other packages, for example:

```
<AUTOSAR>
  <AR-PACKAGES>
    <AR-PACKAGE>
          <SHORT-NAME>MyPackage</SHORT-NAME>
          <DESC>This is one of my packages</DESC>
    </AR-PACKAGE>
...
    <AR-PACKAGE>
          <SHORT-NAME>MyOtherPackage</SHORT-NAME>
          <DESC>This is another</DESC>
    </AR-PACKAGE>
  </AR-PACKAGES>
</AUTOSAR>
```

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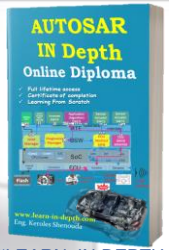
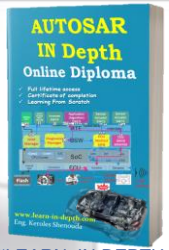


Packages

- The <AR-PACKAGE> element is used to define the package name as well as acting as a container for the <ELEMENTS> descriptions.
- <ELEMENTS> is a container for the components of an AUTOSAR configuration including:

- The definition of atomic software component types
- The description of component internal behavior
- The composition descriptions including software component prototype instantiation
- The definition of ECU types
- The system description including ECU instantiation



Packages

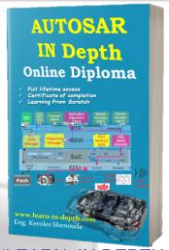
- The <SUB-PACKAGES> element permits a hierarchical arrangement of packages to be formed:

```
<AUTOSAR>
<AR-PACKAGES>

<AR-PACKAGE>
  <SHORT-NAME>MyPackage</SHORT-NAME>
  <DESC>This is one of my packages</DESC>
  <SUB-PACKAGES>
<AR-PACKAGE>

  <SHORT-NAME>SWCs</SHORT-NAME>
…
</AR-PACKAGE>

<AR-PACKAGE>
  <SHORT-NAME>Interfaces</SHORT-NAME>
…
</AR-PACKAGE>
…
```



Packages

- AUTOSAR does not permit an arbitrary split of XML definitions between files.
- Instead,files can only be split at the top-level packages level.
- When you need to work with
- multiple XML files you must therefore split them at the top-level packages level.
- In the previous example, we might have decided to split this file into two different files, in which case in File 1 we would have:

```
<?xml version="1.0" encoding="UTF-8"?>
<AUTOSAR>
<AR-PACKAGES>
<AR-PACKAGE>
<SHORT-NAME>MyPackage</SHORT-NAME>
<DESC>This is one of my packages</DESC>
</AR-PACKAGE>
</AR-PACKAGES>
</AUTOSAR>
```

In File 2 we would have the second AR-PACKAGE

```
<?xml version="1.0" encoding="UTF-8"?>
<AUTOSAR>
<AR-PACKAGES>
<AR-PACKAGE>
<SHORT-NAME>MyOtherPackage</SHORT-NAME>
<DESC>This is another</DESC>
...
</AR-PACKAGE>
</AR-PACKAGES>
</AUTOSAR>
```

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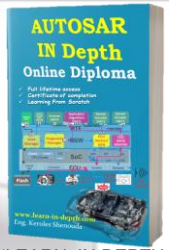
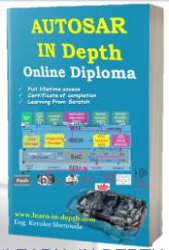


Referencing Objects

- The elements in AUTOSAR XML define a hierarchical structure that is rooted at the toplevel packages element. Each <SHORT-NAME> named object within this structure can be referenced.
- The AUTOSAR XML makes extensive use of this referencing concept – objects are created using a set of elements and then referenced from other objects. For example, when defining the ports of a software component you will need to reference interface descriptions.
- All references are indicated by XML elements with a tag ending *REF



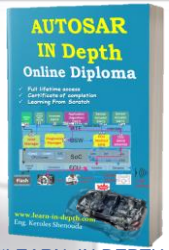
Referencing Objects

- AUTOSAR XML allows references to be made using either absolute or relative paths.
  An absolute path references an object from top of the XML tree and must start with a
  forward-slash. For example:
  <*REF>/MySystem/MyComponent/MyObject</*REF>

  The following example shows the use of absolute referencing:

```
<AR-PACKAGE>
<SHORT-NAME>PackageA</SHORT-NAME>
<ELEMENTS>
        <ELEMENT>
                <SHORT-NAME>X</SHORT-NAME>
                ...
        </ELEMENT>
...
</ELEMENTS>
</AR-PACKAGE>
```

```
<AR-PACKAGE>
<SHORT-NAME>PackageB</SHORT-NAME>
<ELEMENTS>
                <ANOTHER-ELEMENT>
                                <SHORT-NAME>X</SHORT-NAME>
                                <!-- Absolute reference to X in PackageA -->
                                <ELEMENT-REF>/PackageA/X</ELEMENT-REF>
.                               ..
                                </ANOTHER-ELEMENT>
                <YET-ANOTHER-ELEMENT>
                                <SHORT-NAME>Y</SHORT-NAME>
                                <!-- Absolute reference to X in PackageB -->
                                <ANOTHER-ELEMENT-REF>/PackageB/X</ANOTHER-ELEMENT-REF>
                                ...
                                </YET-ANOTHER-ELEMENT>
</ELEMENTS>
</AR-PACKAGE>
```



Relative References

- The relative reference mechanism defines optional reference bases for each AUTOSAR package.
- Each reference base defines the prefix to be used for relative references that are associated with the reference base. For example, assume a package defines the following reference base:

```
<REFERENCE-BASE>
    <SHORT-LABEL>types</SHORT-LABEL>
    <IS-DEFAULT>false</IS-DEFAULT>
    <PACKAGE-REF DEST='AR-PACKAGE'>/autosar_types</PACKAGE-REF>
</REFERENCE-BASE>
```

- Subsequently, within the package, relative references can be used that are associated with base "types".
- For example, the relative reference within the package that defines reference base "types" above:

```
<TYPE-TREF BASE='types'>my_type</TYPE-TREF>
```

- Is equivalent to the absolute reference:

```
<TYPE-TREF>/autosar_types/my_type</TYPE-TREF>
```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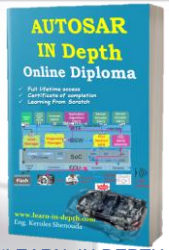
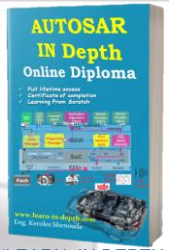


Relative References

- At most one reference base can be marked as the default for the package. The default reference base is used when a relative reference does not explicitly define the associated base, e.g.:
  <TYPE-TREF>my_type</TYPE-TREF>
- for example they might include a reference to a component prototype, a port prototype and a data element prototype.
  When resolving an instance reference, RTA-RTE indirects through each context reference in turn to complete the reference. For example, the following instance reference:
  <DATA-IREF>
  <R-PORT-PROTOTYPE-REF>
  /system/SWC/InputPort
  </R-PORT-PROTOTYPE-REF>
  <DATA-ELEMENT-PROTOTYPE-REF>
  /interfaces/SR/InputValue
  </DATA-ELEMENT-PROTOTYPE-REF>
  </DATA-IREF>



AUTOSAR Elements

- The <ELEMENTS> element provides the encapsulating element used to assemble all AUTOSAR definitions within an <AR-PACKAGE> definition.
- The <ELEMENTS> element is not named since it is merely a container for other, named, elements. There are essentially six sets of <ELEMENTS> definitions:

1. Those that define basic types for the system.
2. Those that define the software components.
3. Those that define a logical software architecture built from the components independently of any hardware.
4. Those that define the physical hardware including the types of ECUs and how they are connected to busses.
5. Those that define the network communication frames and protocols on busses between ECUs
6. Those that define how software components from the logical software architecture are mapped to ECUs and how logical communication is mapped into network communication.

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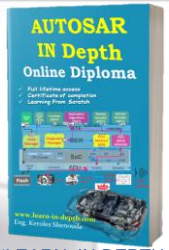
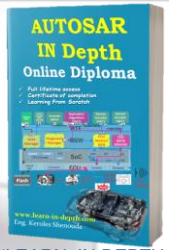


AUTOSAR Elements

```
<AR-PACKAGE>
<SHORT-NAME>MyPackage</SHORT-NAME>
<DESC>My AUTOSAR Test</DESC>
<ELEMENTS>
<!-- Type definitions -->
<!-- Software component elements -->
<!-- Communication Interfaces -->
<!-- Software Components -->
<!-- Mode -->
<!-- Software (Logical) System Topology -->
<!-- Hardware (Physical) System Topology -->
<!-- Network Communication -->
<!-- Software/Hardware/Network Mapping -->
</ELEMENTS>
</AR-PACKAGE>
```



AUTOSAR Elements

- The definition of **AUTOSAR primitive and complex types**
- The <*SENDER-RECEIVER-INTERFACE*> and <*CLIENT-SERVER-INTERFACE*> elements are used to define **AUTOSAR interface types**.
- The application SWC-type <*APPLICATION-SW-COMPONENT-TYPE*> and <*SENSOR-ACTUATOR-COMPONENT-TYPE*> elements describe **software components**.
- The <*INTERNAL-BEHAVIOR*> of the components, which includes which **runnable entities** exist, how they are triggered with **RTE events**, how they define **exclusive areas** etc.
- The **software component types** defined using the SWC-type element are **instantiated** when a <*COMPOSITION-TYPE*> element is defined
- The <ECU> and <ECU-INSTANCE> combine to define the hardware components that are used to build a vehicle network.
- The <**SYSTEM**> element maps the software component instances on the composition onto the **hardware topology instance**.
- When **a mapping** is such that **communication between software components occurs between** ECUs (inter-ECU communication) you need to provide additional configuration to tell the RTE how to achieve this using AUTOSAR COM

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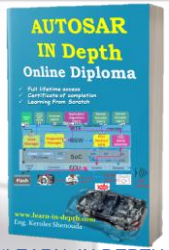
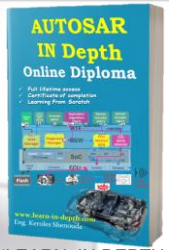


ECU Configuration Description

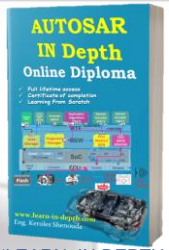
- RTE makes use of AUTOSAR OS for executing threads of control, providing timeouts, signaling events etc., and AUTOSAR COM for communication between ECUs.
- For the RTE to be generated, RTE needs to know a small set of configuration data for these AUTOSAR basic software modules.
- AUTOSAR basic software uses a different configuration concept from the rest of AUTOSAR that is held in the ECU configuration description file. This file is also an XML file, but the use of XML is significantly different from the rest of AUTOSAR configuration



ECU Configuration Description

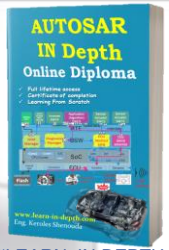
- Rather than define a dedicated configuration for each basic software module, the ECU configuration description defines how to structure a ECUC module configuration with containers that hold configuration data.
- An ECUC Container element can hold subcontainers and thus a hierarchy of configuration containers is formed.

```
<ELEMENTS>
  <ECUC-MODULE-CONFIGURATION-VALUES>
    <SHORT-NAME>...</SHORT-NAME>
    <DEFINITION-REF>
      <!-- Reference to module config description -->
      ...
    </DEFINITION-REF>
    <CONTAINERS>
      <ECUC-CONTAINER-VALUE>
      <CONTAINER>
        <!-- Some configurable item -->
        <SUB-CONTAINERS>
          <ECUC-CONTAINER-VALUE>
          <!-- Some nested configurable item -->
          </ECUC-CONTAINER-VALUE>
        </SUB-CONTAINERS>
      </ECUC-CONTAINER-VALUE>
    </CONTAINERS>
  </ECUC-MODULE-CONFIGURATION-VALUES>
</ELEMENTS>
```



ECU Configuration Description

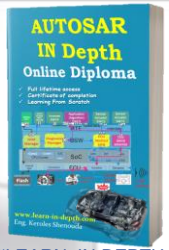
- Each ECUC Module Configutation container contains a **<DEFINITION-REF>** that defines what containers there are and how many of each type are needed for the referenced basic software module.
- All definition references have the form /AUTOSAR/<ModuleName>. For the RTE configuration you will use:
  - /AUTOSAR/Com
  - /AUTOSAR/Os
  - /AUTOSAR/Rte



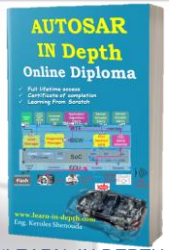
ECU Configuration Description

- ECU configuration descriptions are verbose, so for clarity this user guide will describe ECU configuration description in terms of which parameters referenced by the <DEFINITION-REF> are needed,
- for example: "An /AUTOSAR/Os/OsTask must be created for each RTE task you require.
  - " /AUTOSAR/Os tells you the module for which configuration is needed and OsTask tells you that an OS task needs to be created.
  - This is equivalent to the following configuration:

```
<ELEMENTS>
  <ECUC-MODULE-CONFIGURATION-VALUES>
    <SHORT-NAME>Os</SHORT-NAME>
    <DEFINITION-REF>/AUTOSAR/Os</DEFINITION-REF>
    <CONTAINERS>
    ...
      <ECUC-CONTAINER-VALUE>
        <SHORT-NAME>RTE_Task1</SHORT-NAME>
        <DEFINITION-REF>/AUTOSAR/Os/OsTask</DEFINITION-REF>
        <PARAMETER-VALUES>
          ...
        </PARAMETER-VALUES>
      </ECUC-CONTAINER-VALUE>
    </CONTAINERS>
  </ECUC-MODULE-CONFIGURATION-VALUES>
</ELEMENTS>
```



Source: www.autosar.org



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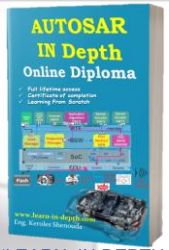

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Jean-Luc Béchennec1;2, **Sébastien Faucou**1;3

1IRCCyN (Institute of Research in Communications and Cybernetics of Nantes)

2CNRS (National Center for Scientific Research) / 3University of Nantes

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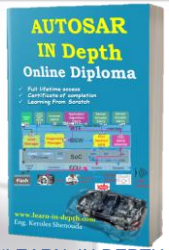

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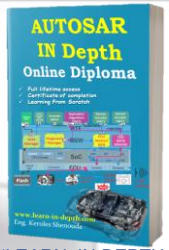

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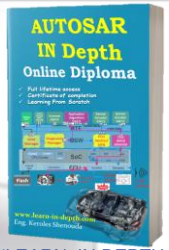

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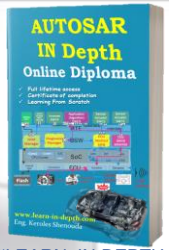

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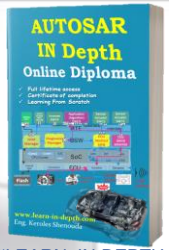

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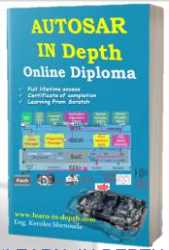

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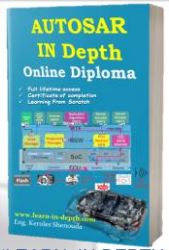

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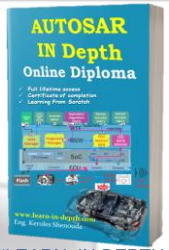

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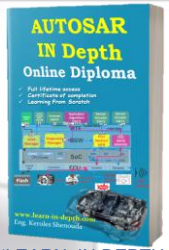

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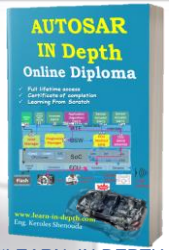

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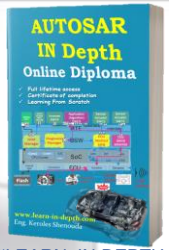

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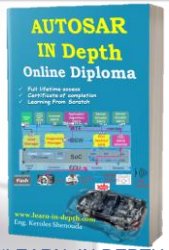

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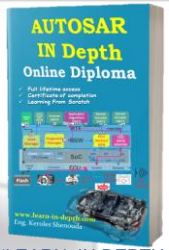

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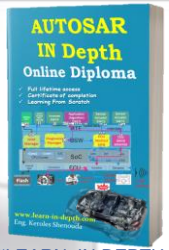

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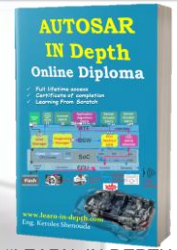

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https://www.learn-in-depth.com/
https://www.facebook.com/groups/embedded.system.KS/