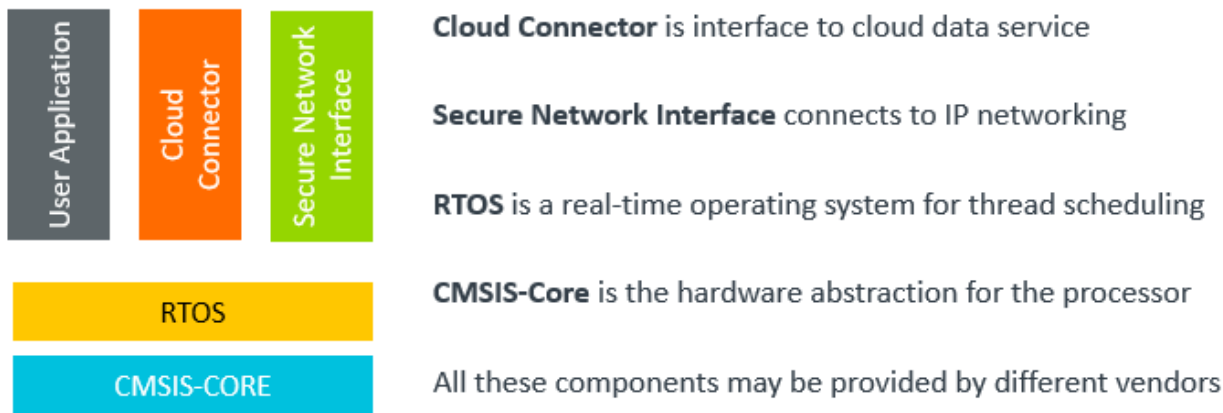


Scalable Software Stack with CMSIS-Pack Technology



Software Component Lists

Cclass Cgroup Csub

Software Component		Sel.	Variant	Version	Description
	ACloud	<input type="checkbox"/>			Cloud connector
	FOTA	<input checked="" type="checkbox"/>			Firmware Update Service
	Communication	<input type="checkbox"/>			Communication protocols
	CoAP	<input type="checkbox"/>			Constraint Application Protocol
	MQTT	<input checked="" type="checkbox"/>			MQTT connectivity

```
<taxonomy>
  <description Cclass="ACloud">Cloud connector</description>
  <description Cclass="ACloud" Cgroup="Communication">Communication protocols</description>
</taxonomy>

<components>
  <component Cclass="ACloud" Cgroup="Communication" Csub="MQTT">
    <description>MQTT connectivity</description>
    <files>
      ...
    </files>
  </component>
```

```

<component Cclass="ACloud" Cgroup="Communication" Csub="CoAP">
  <description>Constraint Application Protocol</description>
  <files>
    ...
  </files>
</component>
<component Cclass="ACloud" Cgroup="FOTA">
  <description>Firmware Update Service</description>
  <files>
    ...
  </files>
</component>
</components>

```

Software Component Variants

Cvariant

Software Component	Sel.	Variant	Version	Description
ACloud	<input type="checkbox"/>			Cloud connector
FOTA	<input checked="" type="checkbox"/>	SPI Flash		Firmware Update Service with external SPI Flash
Communication	<input type="checkbox"/>	On-chip Flash		Communication protocols
CoAP	<input type="checkbox"/>	SPI Flash		Constraint Application Protocol
MQTT	<input type="checkbox"/>			MQTT connectivity

```

<component Cclass="ACloud" Cgroup="FOTA" Cvariant="SPI Flash">
  <description>Firmware Update Service with external SPI Flash</description>
  <files>
    ...
  </files>
</component>
<component Cclass="ACloud" Cgroup="FOTA" Cvariant="On-chip Flash">
  <description>Firmware Update Service with on-chip device Flash</description>
  <files>
    ...
  </files>
</component>

```

ACloud

Cbundle

Software Component	Sel.	Variant	Version	Description
ACloud	<input checked="" type="checkbox"/>	lite	1.0.0	Cloud Stack for ultra constrained MCUs
Communication	<input type="checkbox"/>	full		Communication protocols
MQTT	<input type="checkbox"/>	lite	1.0.0	MQTT Lite connectivity

```

<bundle Cbundle="lite" Cclass="ACloud" Cversion="1.0.0">
  <description>Cloud Stack for ultra-constrained MCUs</description>
  <component Cclass="ACloud" Cgroup="Communication" Csub="MQTT">

```

```

        <description>MQTT Lite connectivity</description>
        <files>
            ...
        </files>
    </component>
</bundle>
<bundle Cbundle ="full" Cclass="ACloud" Cversion="1.0.0">
    <description>Cloud Stack for featured MCUs</description>
    <component Cclass="ACloud" Cgroup="Communication" Csub="MQTT">
        <description>MQTT connectivity</description>
        ...
    </component>
    <component Cclass="ACloud" Cgroup="Communication" Csub="CoAP">
        ...
    </component>
    <component Cclass="ACloud" Cgroup="FOTA" Cvariant="SPI Flash">
        ...
    </component>
    <component Cclass="ACloud" Cgroup="FOTA" Cvariant="On-chip Flash">
        ...
    </component>
</bundle>
</components>

```

Component Selection exported to header file

- [Pre Include Global h](#)
- [Pre Include Local Component h](#)
- [RTE Components.h](#)

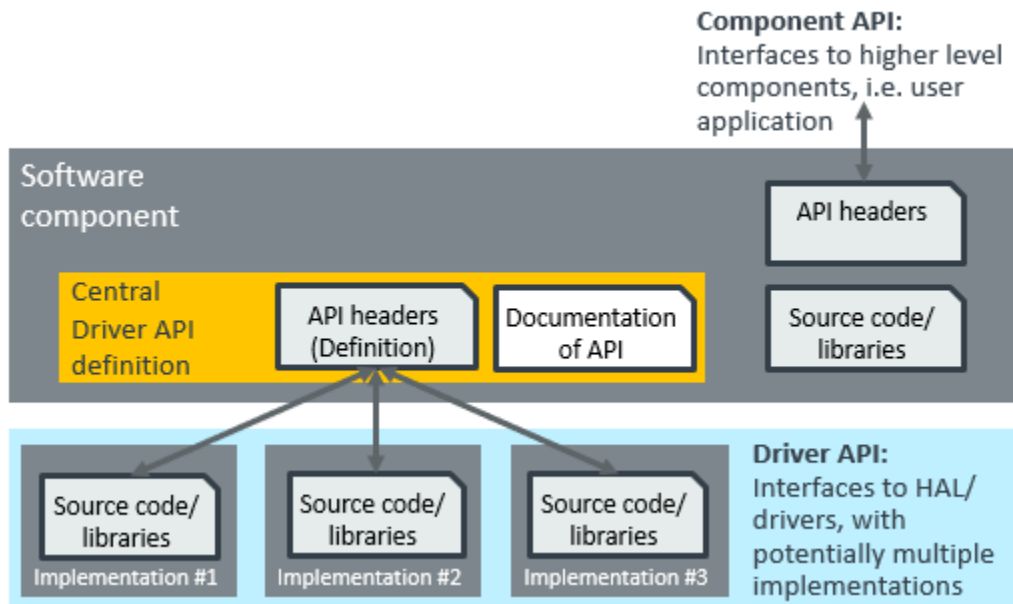
```

<component Cclass="ACloud" Cgroup="Communication" Csub="MQTT">
    <description>MQTT connectivity</description>
    <Pre_Include_Global_h>
        #define ACloud_MQTT 1
    </Pre_Include_Global_h>
    <files>
        ...
    </files>
</component>
<component Cclass="ACloud" Cgroup="Communication" Csub="CoAP">
    <description>Constraint Application Protocol</description>
    <Pre_Include_Global_h>
        #define ACloud_CoAP 1
    </Pre_Include_Global_h>
    <files>
        ...
    </files>
</component>

```

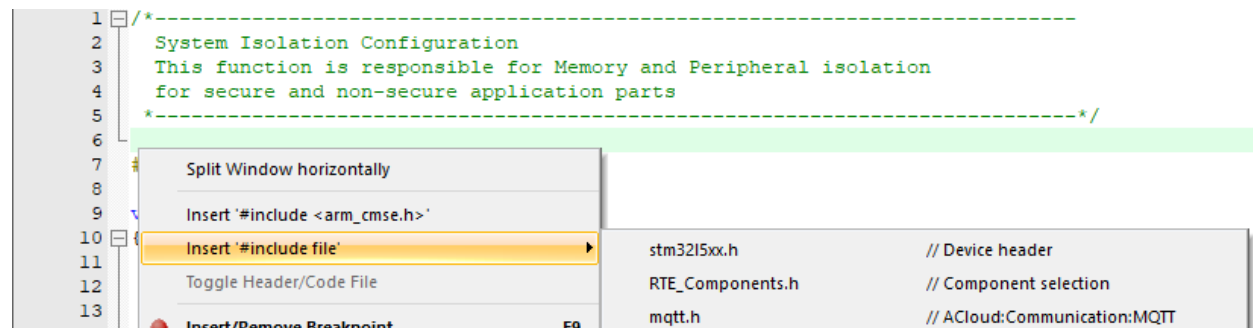
Interfaces

- **Component API**
- **Driver API**



Component API

```
<component Cclass="ACloud" Cgroup="Communication" Csub="MQTT">
  <description>MQTT Lite connectivity</description>
  <files>
    <file category="sourceC" name="mqtt/source/mqtt.c"/>
    <file category="header" name="mqtt/include/mqtt.h"/>
  </files>
</component>
```



Driver API

apis

```
<taxonomy>
...
<description Cclass="ACloud IF">Low-Level Interfaces of ACloud component</description>
</taxonomy>

<apis>
  <api Cclass="ACloud IF" Cgroup="TRNG" Capiversion="1.0.0">
    <description>True Random Number Generator</description>
    <files>
      <file category="header" name="include/trng.h"/>
    </files>
  </api>
</apis>

<conditions>
  <condition id="Requires_RNG">
    <require Cclass="ACloud IF" Cgroup="TRNG"/>
  </condition>
</conditions>

  <component Cclass="ACloud" Cgroup="Communication" Csub="MQTT" condition="Requires_RNG">
    <description>MQTT Lite connectivity</description>
    <files>
      <file category="sourceC" name="mqtt/source/mqtt.c"/>
      <file category="header" name="mqtt/include/mqtt.h"/>
    </files>
  </component>
```

Software Component	Sel.	Variant	Version	Description
ACloud	<input type="checkbox"/>	lite	1.0.0	Cloud Stack for ultra constrained MCUs
Communication	<input type="checkbox"/>			Communication protocols
MQTT	<input checked="" type="checkbox"/>		1.0.0	MQTT Lite connectivity

Validation Output	Description
ARM.lite:ACloud:Communication:MQTT	Additional software components required

-
-
-

ACloud pack:

```
<component Cclass="ACloud IF" Cgroup="TRNG" Csub="Emulation">
  <description>Software simulation of random number generator</description>
  <files>
    <file category="sourceC" name="source/trng_emulation.c"/>
  </files>
</component>
```

Device support pack

```
<conditions>
  <condition id="STM32F7">
    <require Dvendor="STMicroelectronics:13" Dname="STM32F7*" />
  </condition>
</conditions>
...
<component Cclass="ACloud IF" Cgroup="TRNG" Csub="MCU" condition="STM32F7" Capiversion="1.0.0">
  <description>Random number generator driver</description>
  <files>
    <file category="sourceC" name="TRGN_Driver.c"/>
  </files>
</component>
```

TFM pack

```
<component Cclass="ACloud IF" Cgroup="TRNG" Csub="TFM" Capiversion="1.0.0" Cversion="1.2.0">
  <description>Random number service from Trusted Firmware-M</description>
  <files>
    <file category="sourceC" name="TRGN_TFM_Interface.c"/>
  </files>
</component>
```

include/trng.h

Software Component	Sel.	Variant	Version	Description
ACloud	<input type="checkbox"/>	lite	1.0.0	Cloud Stack for ultra constrained MCUs
Communication	<input type="checkbox"/>			Communication protocols
MQTT	<input checked="" type="checkbox"/>		1.0.0	MQTT Lite connectivity
ACloud IF	<input type="checkbox"/>			Low-Level Interfaces of ACloud component
TRNG (API)	<input type="checkbox"/>		1.0.0	True Random Number Generator
Emulation	<input type="checkbox"/>			Software simulation of random number generator
MCU	<input type="checkbox"/>			Random number generator driver
TFM	<input type="checkbox"/>			Random number service from Trusted Firmware-M

Validation Output

- ARM.lite::ACloud:Communication:MQTT
 - require ACloud IF:TRNG
 - ARM::ACloud IF:TRNG:TFM
 - ARM::ACloud IF:TRNG:Emulation
 - ARM::ACloud IF:TRNG:MCU

Description
Additional software components required
Select component from list
Random number service from Trusted Firmware-M
Software simulation of random number generator
Random number generator driver

ACloud:IF:TRNG:MCU

condition

ACloud:IF:TRNG:MCU

ACloud:IF:TRNG:MCU

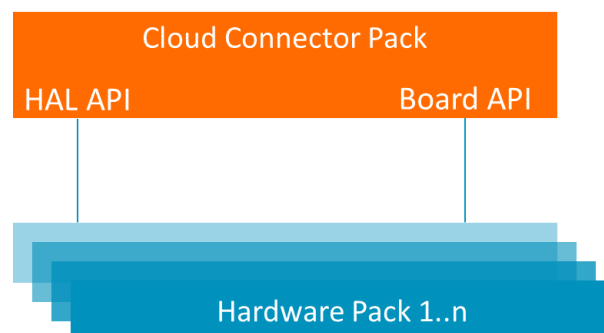
Using API Versions

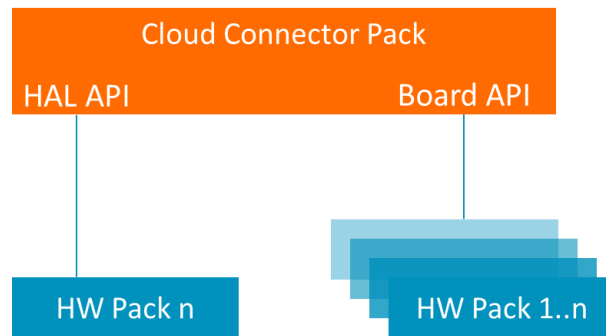
```
<component Cclass="ACloud IF" Cgroup="TRNG" Csub="MCU" condition="STM32F7" Capiversion="1.1.0">  
  <description>Random number generator driver</description>  
  <files>  
    <file category="sourceC" name="TRGN_Driver.c"/>  
  </files>  
</component>
```

```
<apis>  
  <api Cclass="ACloud IF" Cgroup="TRNG" Capiversion="1.2.0">
```

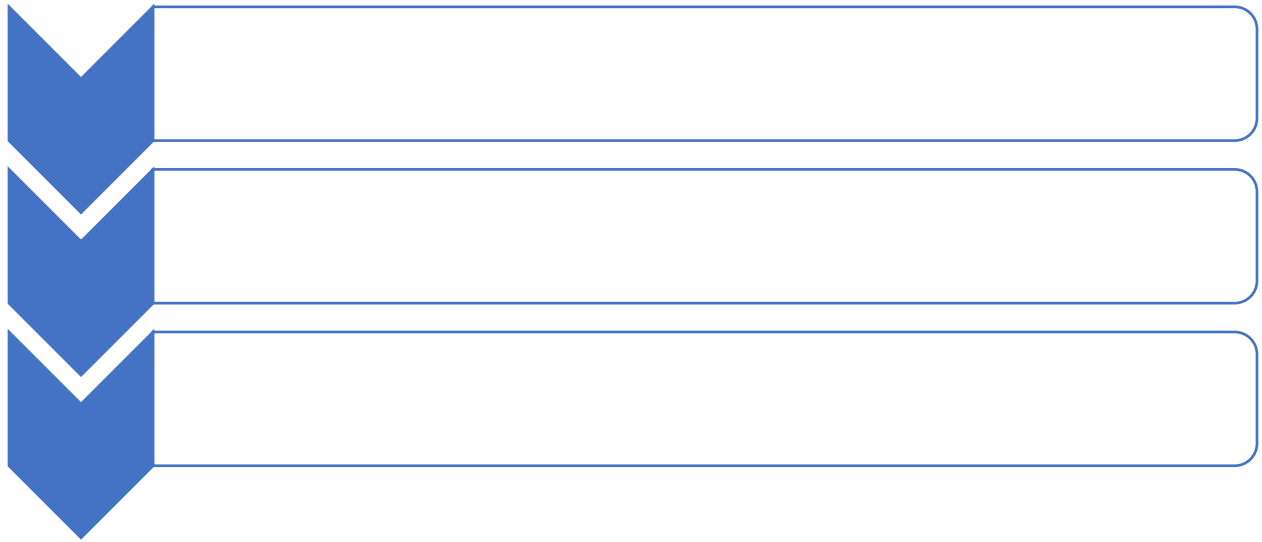
```
<apis>  
  <api Cclass="ACloud IF" Cgroup="TRNG" Capiversion="1.0.0">
```

Deploy a Software Stack to Various Hardware Platforms

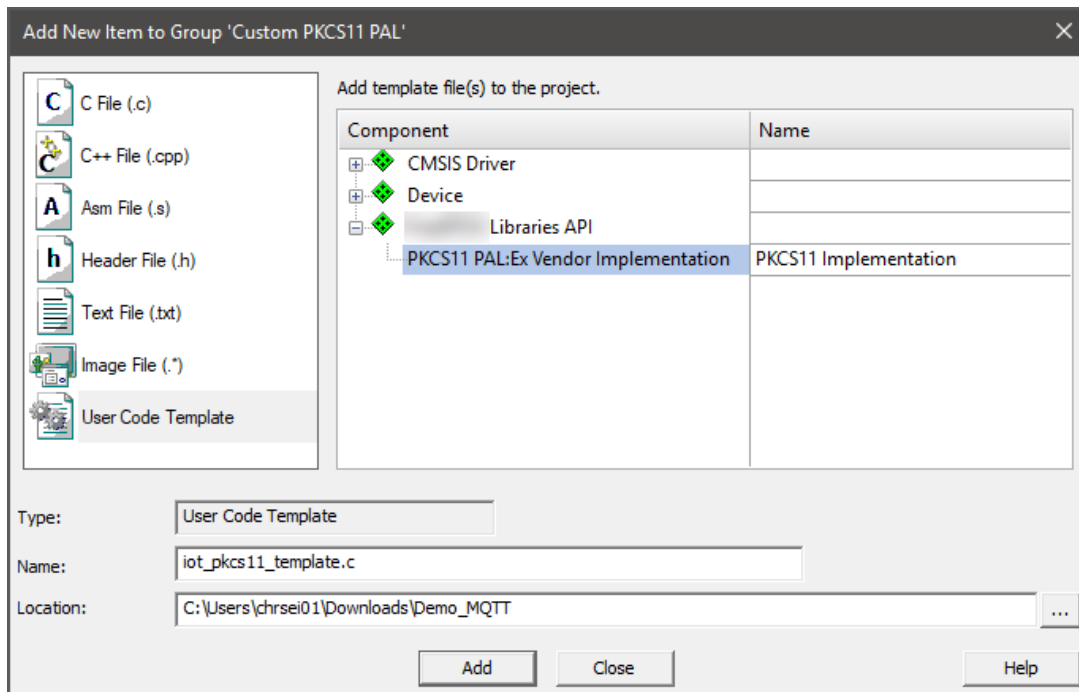




Implement a custom interface component



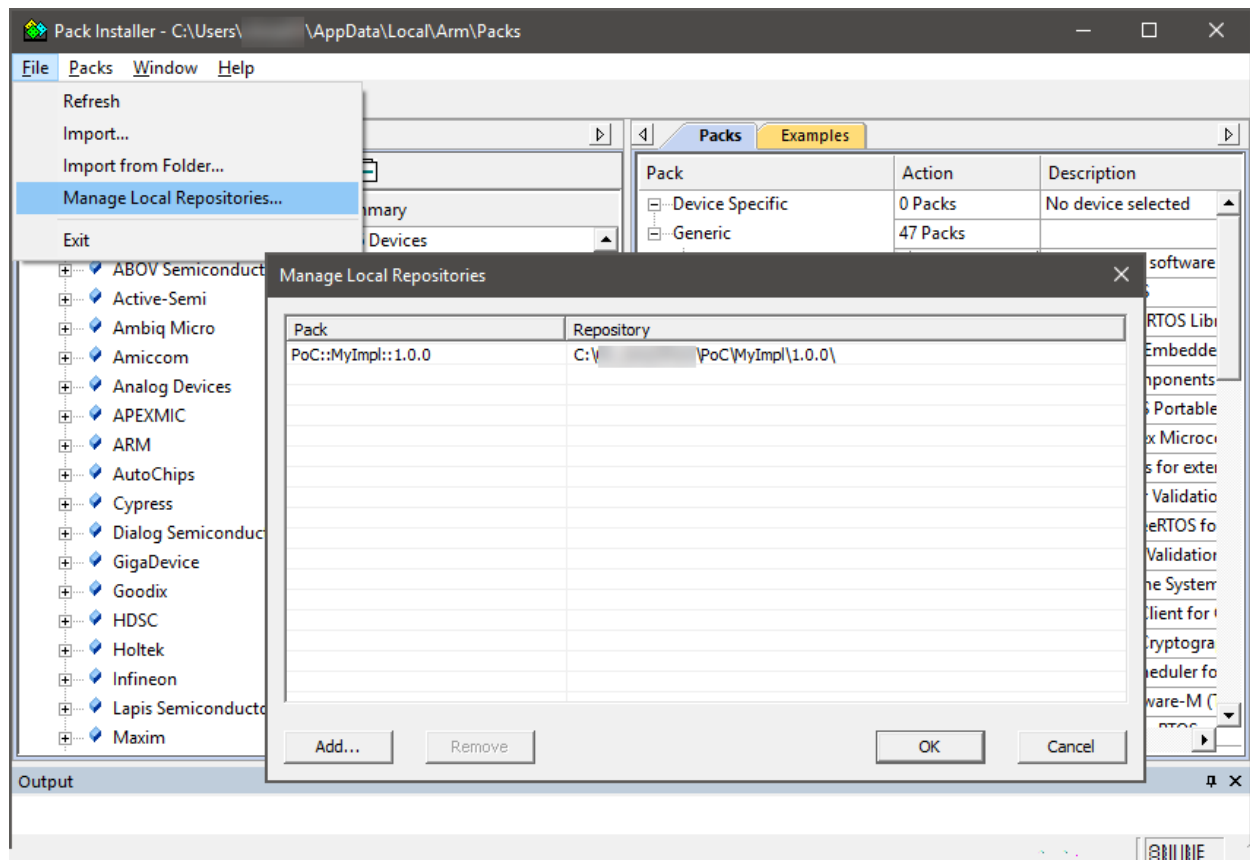
Selecting the custom component



Creating a custom pack

```
<components>
  <component Cvendor="Add vendor name here if not same as pack vendor" Cclass="
Enter Cclass name of API" Cgroup="Add if available" Csub="Add if available" Capiv
ersion="0.0.0" Cversion="0.0.0" condition="Add if required">
    <!-- Enter a short description below -->
    <description>Describe implementation details here</description>
    <files>
      <!-- Add source file(s) below -->
      <file category="sourceC" name="source/custom_implementation.c"/>
      <!-- Add configuration file (usually header files) below -->
      <file category="header" name="config/custom_impl.h" attr="config"/>
      <!-- Add link to further information/documentation below -->
      <file category="doc" name="Documentation/documentation.html"/>
    </files>
  </component>
</components>
```

Adding the pack as a local repository



Testing the component in the IDE

Publishing the custom pack
