

# Which Development Path Is Right For You?

## Qt vs CODESYS

---

	Qt	CODESYS
<b>Programming Language(s)</b>	<p><b>C++</b> <b>QML (optional)</b></p> <ul style="list-style-type: none"> <li>• Recommended to have C++ and object oriented programming experience</li> <li>• If you are an experienced programmer, object oriented C++ offers more power and flexibility than CODESYS</li> </ul>	<p><b>Structured Text (ST)</b> <b>Instruction List (IL)</b> <b>Ladder Diagram (LD)</b> <b>Function Block Diagram (FBD)</b> <b>Sequential Function Chart (SFC)</b> <b>Continuous Function Chart (CFC)</b></p> <ul style="list-style-type: none"> <li>• Many different programming languages available - more flexibility.</li> <li>• If you have experience with PLC programming this is a good option.</li> </ul>
<b>Display Portability</b>	<p><b>Yes</b> with exception of the 3.5" VI display</p> <ul style="list-style-type: none"> <li>• Easily portable application from any display to another (besides 3.5" VI display)</li> <li>• Minor User Interface changes will be needed based on screen resolution</li> <li>• Minor hardware function changes may be needed depending on display hardware differences</li> </ul>	<p><b>Yes</b> with exception of the 3.5" VI display</p> <ul style="list-style-type: none"> <li>• Easily portable application from any display to another (besides 3.5" VI display)</li> <li>• Minor User Interface changes will be needed based on screen resolution</li> <li>• Minor hardware function changes may be needed depending on display hardware differences</li> </ul>
<b>Cost</b>	<p><b>Free</b> (and open source)</p> <ul style="list-style-type: none"> <li>• Free and open source tool (with adherence to GPL)</li> <li>• By packaging in a virtual machine, we (CrossControl) have made sure to adhere to license requirements allowing customers to use Qt at no cost and without having to publish source code.</li> </ul>	<p><b>License Fee</b> (and closed source)</p> <ul style="list-style-type: none"> <li>• CODESYS is a closed source development tool created by a company named 3S.</li> <li>• The license fee is assessed per device CODESYS is used on.</li> <li>• The license cost will depend on the version of CODESYS used and the device platform it is installed on.</li> <li>• The IDE or development environment is free to use</li> </ul>
<b>Graphics</b>	<p><b>Yes</b> (Very good graphic support)</p> <ul style="list-style-type: none"> <li>• Qt excels at this.</li> </ul>	<p><b>Yes</b> (Good graphic support)</p> <ul style="list-style-type: none"> <li>• Provides large number of widgets</li> </ul>

	<ul style="list-style-type: none"> <li>• Provides large number of widgets which are easily customizable to user needs.</li> <li>• Allows users to create their own widgets in C++ or QML.</li> <li>• With Qt being open source and cross platform, there are many widgets and projects available online.</li> <li>• Provides control of the user interface and properties from code.</li> </ul>	<p>available in toolbox.</p> <ul style="list-style-type: none"> <li>• Widgets are customizable but customization is limited.</li> <li>• Not able to add in completely customized widgets. You must work with what they provide.</li> <li>• Cannot normally control the user interface from code.</li> </ul>
<b>Hardware Acceleration</b>	<p style="text-align: center;"><b>Yes</b></p> <ul style="list-style-type: none"> <li>• Qt QML is currently hardware accelerated on all displays.</li> <li>• The GPU handles graphics instead of the CPU.</li> <li>• Results in higher graphic performance especially for animations.</li> </ul>	<p style="text-align: center;"><b>Yes (Planned)</b></p> <ul style="list-style-type: none"> <li>• Hardware acceleration will be supported with X-windows windowing system. This will first be available on the XA, XS and XM displays.</li> <li>• Will be extended to V-series displays in the future</li> </ul>
<b>Animations</b>	<p style="text-align: center;"><b>Yes</b></p> <ul style="list-style-type: none"> <li>• Qt Widgets offers pretty good animation support but is limited by the strain on the CPU the animations cause. Due to this you should be careful about the number of animations in Qt Widgets.</li> <li>• Qt QML has excellent animation support due to the hardware acceleration identified above. This means you can have very advanced graphics animations with QML.</li> </ul>	<p style="text-align: center;"><b>No</b></p>
<b>Graphic Performance</b>	<p style="text-align: center;"><b>Very Good</b></p> <ul style="list-style-type: none"> <li>• Graphic performance is very good. Especially QML graphic performance.</li> <li>• Button response and page transitions are fast and responsive.</li> </ul>	<p style="text-align: center;"><b>Good</b></p> <ul style="list-style-type: none"> <li>• Graphic performance is good but doesn't appear as smooth as Qt.</li> <li>• Page transitions and button response are a bit slow at times especially when there are a lot of widgets or other components on a screen.</li> </ul>
<b>Display Hardware Access (IO, Backlight etc)</b>	<p style="text-align: center;"><b>Yes</b></p> <ul style="list-style-type: none"> <li>• Through CCAux shared libraries packaged in Linux OS.</li> </ul>	<p style="text-align: center;"><b>Yes</b></p> <ul style="list-style-type: none"> <li>• Through the CCAux library in CODESYS.</li> <li>• CODESYS CCAux library has access to the most used display hardware components but not all.</li> </ul>

<b>CAN Support</b>	<p><b>Yes (Raw, J1939)</b></p> <ul style="list-style-type: none"> <li>• Fieldbus Access tool developed which offers easy configuration and use of J1939 messages and stack.</li> <li>• Currently, FieldBus Access only has support for J1939 but CANopen support will be added in future releases.</li> <li>• Raw can messages can be configured and used through the SocketCAN interface.</li> </ul>	<p><b>Yes (Raw, J1939, CANopen)</b></p> <ul style="list-style-type: none"> <li>• Both J1939 and CANopen (Master and Slave) are supported in an easy to use configuration tool in CODESYS.</li> <li>• Raw messages can be configured and handled through 3S libraries in CODESYS.</li> </ul>
<b>Video</b>	<b>Yes</b>	<b>Yes</b>
<b>Ethernet</b>	<b>Yes</b>	<b>Yes</b>
<b>Serial</b>	<b>Yes</b>	<b>Yes</b>
<b>Add On Components</b>	<p><b>Yes</b></p> <ul style="list-style-type: none"> <li>• Has access to many additional libraries providing support for a large range of use cases.</li> <li>• Examples: WIFI, Bluetooth, XML, JSON, File IO, Debugging, Serial Communication, Persistent and Retain variables</li> </ul>	<p><b>Yes</b></p> <ul style="list-style-type: none"> <li>• Has access to some additional libraries provided by 3S</li> <li>• Examples: File IO, Persistent and Retain Variables</li> <li>• Provides some useful components such as Warning Tables, Access Control and others. Many of these come with pre-developed User Interface components which is very nice.</li> <li>• Allows users to create and add their own libraries into CODESYS if desired</li> </ul>
<b>Documentation and Help</b>	<p><b>Very Good</b></p> <ul style="list-style-type: none"> <li>• Qt has very good support and very detailed documentation for all libraries, classes and functions. It is easily found online.</li> <li>• Because Qt is open source and cross platform it is widely used in embedded, mobile and PC development. There is a lot of help and support available in online forums covering all topics.</li> </ul>	<p><b>Not Great</b></p> <ul style="list-style-type: none"> <li>• CODESYS has an in tool Help system that provides some basic support and documentation</li> <li>• It can sometimes be difficult to find support or examples when needed</li> <li>• There is some support that can be found in online forums and the CODESYS Store (<a href="https://store.codesys.com/">https://store.codesys.com/</a>)</li> </ul>

# Summary

---

## Qt

- Ideal for software developers with experience using Object Oriented Programming and C++
- Potentially higher learning curve and development time but offers superior graphics and performance
- Good for OEM customers with dedicated software resources potentially developing larger applications and looking to achieve a high quality application with superior performance.
- Good if you need to achieve advanced functionality such as WIFI file transfers, over the air software updates and video overlays.

## CODESYS

- Ideal for PLC or electronics programmers that have experience with PLC programming languages such as Ladder Logic or Function Block Diagrams but have limited to no experience with object oriented languages and C++.
- Strong integrated fieldbus support. Good to use if you need J1939, CANopen Master or Slave support.
- Good for system integrators that have quick application development cycles.
- Good for smaller projects that may not require advanced graphics, animations and performance
- Good if you need pre-developed and easy to use additions such as User Access control or Alarm tables and don't want to spend time developing the functionality yourself.
- Good if you want to create a first application or a quick proof of concept. You can then extend functionality by combining Qt and CODESYS as described below to improve graphics or performance.

## CODESYS + Qt

- Qt and CODESYS can be used simultaneously on a display by communicating data between the applications using the Data Engine included on the displays.
- Ideal for customers that are more comfortable programming in PLC programming languages but want the advanced graphics functionality Qt offers.
- Ideal for customers that want to use CANopen Master and Slave functionality but otherwise want to use Qt