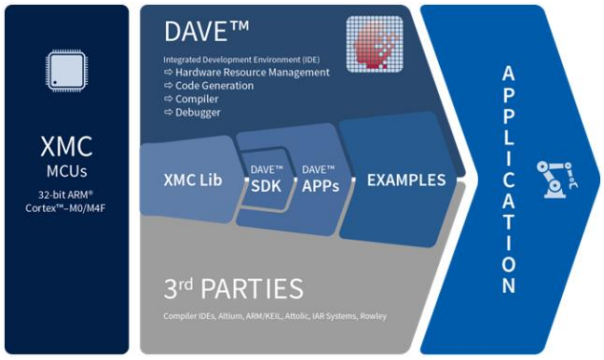
New Release of DAVE™ version 4 and DAVE™ SDK version 4



This document is mainly intended for existing users of DAVE™ version 3. It provides a brief overview of the main user relevant changes from DAVE™ version 3 to DAVE™ version 4 and a very brief introduction to the DAVE™ SDK. It also provides an overview of the concept of the DAVE™ APPs for DAVE™ version 4 and covers the low level peripheral drivers, the XMC lib.

General release information

DAVE™ v4.1.2, DAVE™ SDK v4.1.2 is now released as Productive version. Most of the DAVE™ APPs for DAVE™ v4 are also released as Productive version and some of them are released as Beta version. Beta means that these APPs may have not reached the final design status and should be used for evaluation and test purposes or for adaption in the development flow. A Productive DAVE APP may not be fully compatible to the previous Beta version and may require manual adaptions when upgrading from Beta to Productive release. The DAVE™ APPs released as Beta version are indicated by the last digit in the version number (odd or 0). A separate document is provided that outlines all relevant changes and required steps to migrate projects form DAVE V4.0.0 to this version 4.1.2

Feedback is appreciated, please send feedback to: dave@infineon.com

Sections in this Document

German speaking people may download a recent article of DAVE™ version 4

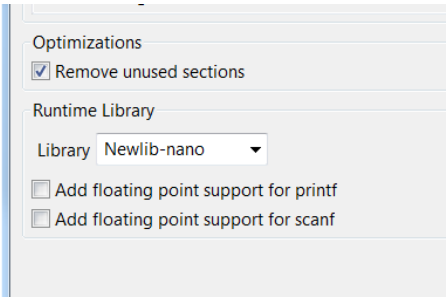
1. Overview of improvements and new features in DAVE™ v4 in comparison to DAVE v3

In a nutshell DAVE™ v4 provides the following main improvements:

- Faster and more robust design: In particular the time for code generation, responses on user interactions in the graphical user interfaces and build time could be improved significantly.
- DAVE APPs are now based on low level peripheral drivers (XMC Lib) which makes generated code more efficient and more readable.
- A DAVE SDK is provided as separate tool: Now everyone can develop own DAVE APPs or modify existing APPs, use cases are not restricted and DAVE SDK can be used to develop a configuration APPs for any library.
- A set of low level peripheral drivers (XMC Lib) is now available and is used by DAVE APPs. The XMC Lib can also be used independent of DAVE or DAVE APPs with any other tool chain that supports XMC (Atollic, Altium, Keil, IAR, Rowley)

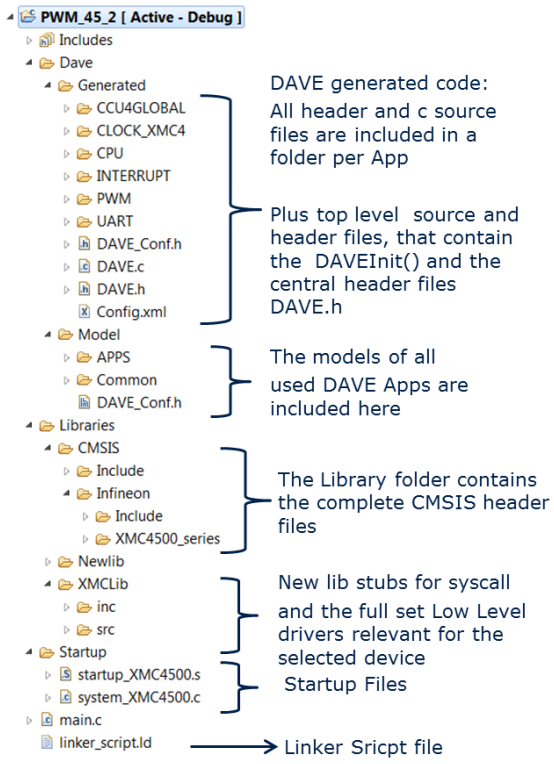
Following a more detailed list of valuable improvements:

1.1 Nano Lib is now included in the gcc toolchain which offers higher code density for microcontroller type of software.



This is reflected in the project settings: DAVE v4 now provides the option to include ‘nano lib’ and to improve default settings to accelerate compilation time.

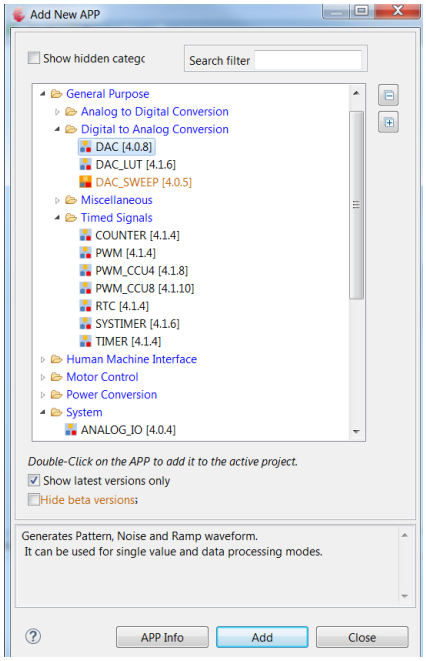
1.2 New project outline



The project in DAVE v4 are now as much self-contained as possible. This means all CMSIS header files, all device specific low level drivers, start-up files and linker script are copied into the project. Also, all DAVE APPs will be fully included. The only remaining references are the standard header files of the compiler tool chain and the device model (Device Descriptions) that is used by the resource solver. With this approach a qualified project can be more easily frozen and archived.

As the project may contain more files and functions than required by the application, the project option “**remove unused section**” should be used to prevent dead code from eating up memory space.

1.3. New DAVE APP Selection View



The APP selection view with improved filter and categorisation is now implemented as a modal view. This should make it easier to find the required DAVE APPs and save screen space when APP selection is not required.

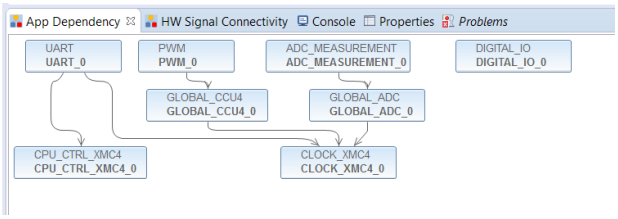
The New APP selection view can be activated from any APP Dependency /Connectivity Views or the tool box bar. It should be closed after the required APPs are selected. It also includes, now, hidden categories for APPs that are normally not explicitly selected; e.g. APPs to configure Global registers.

DAVE APPs released as beta version are highlighted in the colour orange (last digit in version is 0 or odd). It is also possible to hide beta versions.

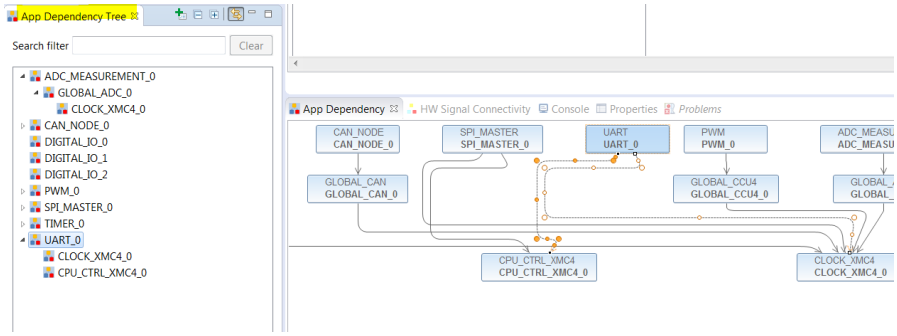
1.4 New DAVE APP Dependency View

To improve the visualization of dependencies between DAVE APPs the APP Dependency view has been reworked in the following manner:

- Layered positioning of DAVE APPs with as many layers as required.
- The top level APP of a dependency tree is positioned at the top, the next dependent DAVE APP on the next lower level and so on. The lowest level APP of a dependency tree is positioned on the lowest level of the view.
- The APPs cannot be moved outside of their assigned layer.
- The APPs can be ordered within the layer by the user, this order will be kept, also after starting the auto layout functionality.
- A new APP is always added from the left.

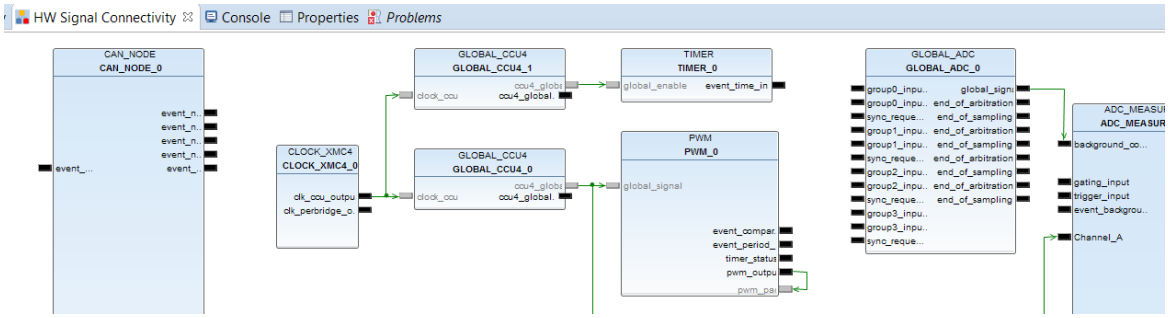


When a large number of DAVE APPs are instantiated, the APP Dependency TreeView can be used to select an APP. Then the Dependency view will focus on the selected APP (dark blue) plus its dependency connections.



1.5. New DAVE APP HW Signal Connectivity View

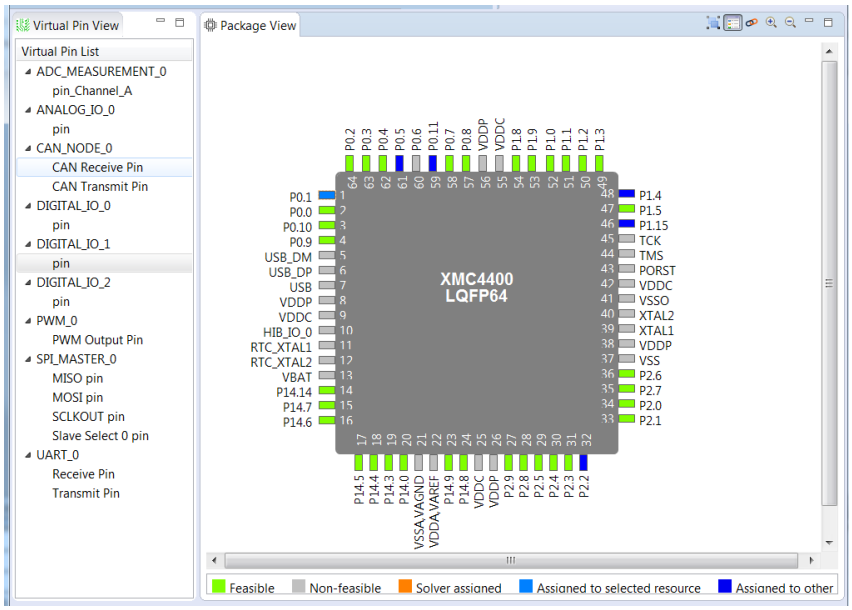
The concept of the HW Connectivity view has been changed to a schematic circuit style. Each APP is now represented as an object with all input and output signals displayed - inputs on the left side, outputs on the right side. The green lines represent connections made by the manifest and cannot be modified by the user; the blue lines are user defined lines. The purposes of this view is to visualize signal and event connections graphically, the user cannot do any changes in this view.



1.6 New graphical pin mapping functionality

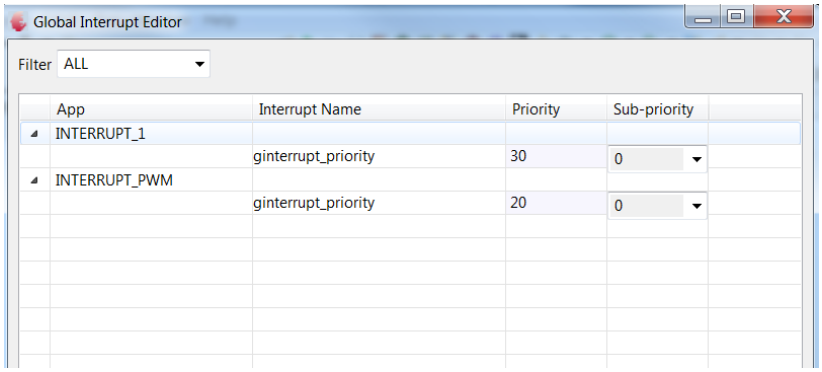
In addition to the existing table view, for manual pin assignments a graphical pin mapping functionality for manual pin assignments has been implemented within its own dedicated perspective called PinMapping. This perspective can be opened by selecting:
->Window ->Open Perspective ->PinMapping
Or by pressing the pin mapping tool box button in the tool box bar.

The resource list on the left shows all APPs and signals than can be mapped to a pin.
When selecting a signal in the resource list all possible pins are marked in green in the graphical view, assignment can be done by right mouse click on a green pin. When the pin is selected it is highlighted in light blue; it can be unassigned by right mouse click on the pin. All pins manually assigned to other signals are indicated as dark blue.
There is a specific visualization options that shows all pins that are assigned by the solver (orange) these pins have not been manually assigned by the user but have been assigned by the solver and user may check whether this fits to the board constraints.



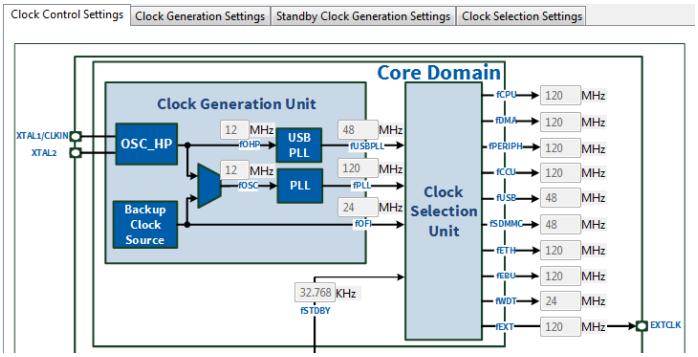
1.7 New Global Interrupt Editor

A new view has been introduced to show all defined interrupts at one glance. This Global Interrupt Editor allows changing the priority of all defined interrupts in one global UI.



1.8 New widgets in the Configuration UI

The new APP SDK allows modelling of advanced widgets for the configuration UI including rich text information and bit map graphic. This leads to more appealing graphical interfaces of the DAVE APPs.



Example: the combination of pictures and entry widgets like in the configuration of the clock settings makes the configuration more intuitive and user friendly.

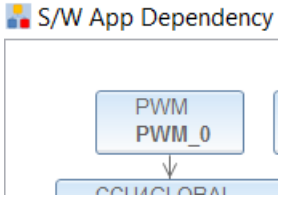
1.9 Copy and paste of APP Configurations

The existing configuration of any APP can be copied to another instance of this APP in the same project by using the new “Copy and paste” functionality which is accessible upon right mouse click on an APP. The configuration of an APP can also be exported to a file (XML) and imported from there to another instance of this APP in any project.

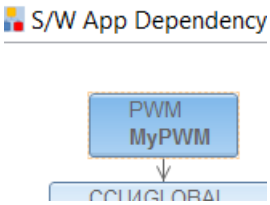
1.10 New instance label of APPs

DAVE v4 provides the option to change the default instance label to a user defined symbol. This symbol can then be used in the APIs of the APP to refer to the respective APP instance.

With this user code can easily ported to other projects that use a certain set of APPs. It is just required that both projects use the same user defined instance label.



DAVE APP with the default user label that is derived from the APP name plus instance suffix.



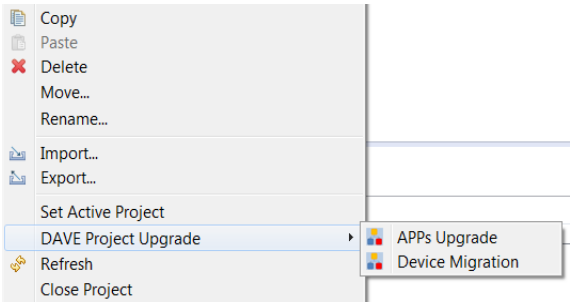
Via a right mouse click option the instance label can be redefined to a user defined label, here "MyPWM"

This user defined label can then be used in the code to reference the used API to the used instance:
`PWM_SetDutyCycle(&MyPWM, <integer value>);`

1.11 Better management of resource conflicts

In DAVE v4 the resources solver is now executed on each action that is relevant to the required chip resources. With that it is easy to identify potential conflicts and allow to user to take appropriate actions to avoid such conflicts.

1.12 Migration to a different device and Upgrade of DAVE APPs



Both functionalities can be activated by a right mouse click on the project and then selection of the DAVE Project Upgraded functionality.

The functionality to migrate the project to a different is similar as in DAVE v3. The current supported device migration functionality allows a migration to other devices within the same XMC series. Extensions to migrate across series within a family or across families are planned.

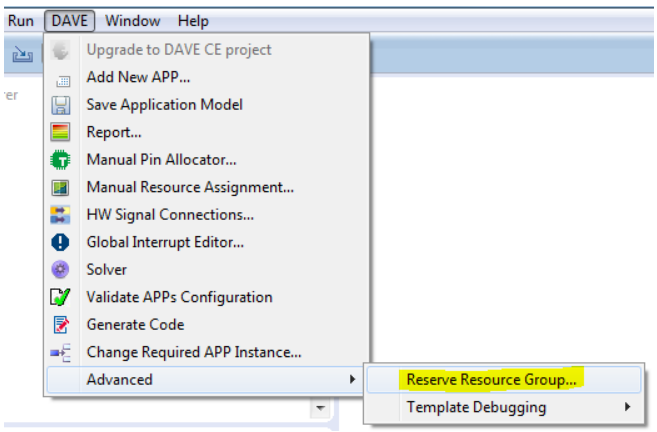
The functionality to upgrade DAVE APPs of an existing project to the latest DAVE APPs version available in the local library store has been implemented according to a new more mature concept. When starting this functionality a new project will be created with the latest version startup files, header and linker script files. The old project remains unchanged. The DAVE APPs existing in old projects will be added as newest version that can be found in the local library store . The adding sequence goes from top to down considering differences in required APPs. After all required APPs are added the configurations, signal connections and pin assignments are copied from the old project to the new project. As consequence of this concept, all DAVE APPs of the old project must be already installed in the local library store; otherwise the missing APP will not be added in the new project.
A detailed migration report will be provided after the migration is completed.

1.13 Reservation of Resource Groups

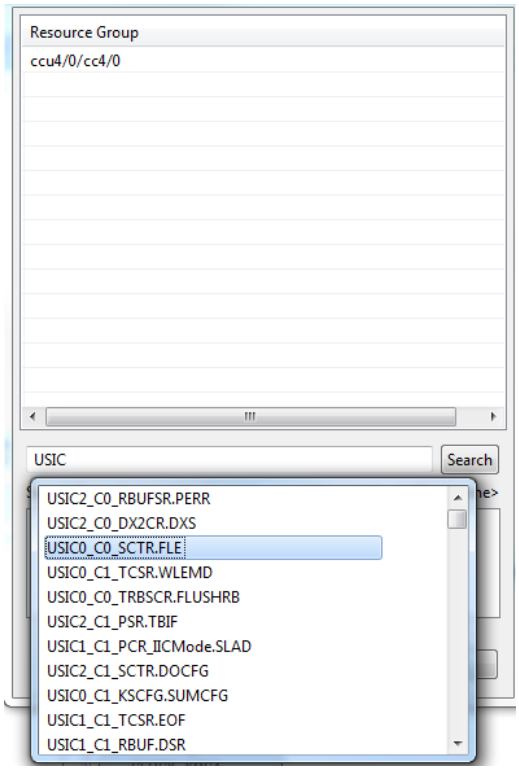
When working with DAVE APPs to create a library for the selected use cases, the resource solver in DAVE takes care that the required resources of the used microcontroller (bit-fields / registers of the peripherals grouped in so called resource groups) are assigned properly to the APPs considering connectivity and other constraints. And the resource solver takes care that that there are no resource conflicts. Sometimes it is required to combine DAVE APPS with other SW components that require HW resources, e.g.

- If the use case of a DAVE APP does not meet the requirements and the user wants to use directly the peripheral drivers of the XMC Lib.
- If the user wants to use SW solution from third party, e.g. communication stacks that requires chip resources.

In such a case the resource solver in DAVE needs to be informed about the HW resources of the microcontroller that are used by these software components in order not to assign them to the DAVE APPs.
For this purposes an improved functionality to reserve resource groups have been implemented.



This functionality can be activated by selecting DAVE in the tool bar ->Advanced ->Reserve Resource Group

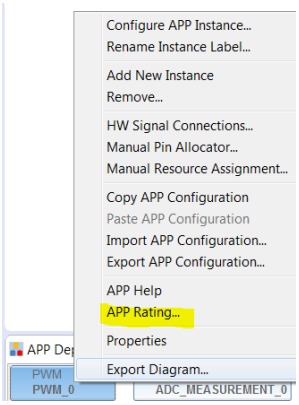


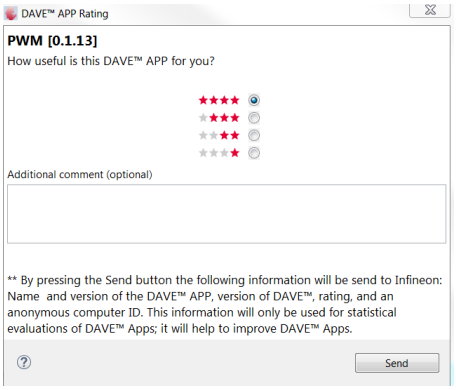
Then the control to select and reserve resources groups show up.
This is operated as follows:

- Enter the name of the peripheral (as defined in the XMC user manual) then a window appear that gives all registers / bit-fields associated to the search string.
- Select (double click) the register / bit-field that should be reserved
- Press the search button.
- Then the resources group in URI format appears.
- Double click on this resource group will move it to the list of reserved resource groups.

1.14 APP rating and feedback

Upon right mouse on a DAVE APP there is an APP rating implemented. It allows rating the value of DAVE APPs and providing the options to add comment, e.g. what is not good or what should be improved.
We appreciate such feedback very much because it will help us to further optimize the DAVE APPs and to define new DAVE APPs driven by such inputs.





1.15 New Debugger

The TASKING debugger has been replaced by a CDT debugger from gnuarmeclipse. This debugger uses the Segger GDB server and requires a J-Link debug probe to connect to a XMC target. Almost all XMC kits include a J-Link on board debugger. The Infineon DAP miniWiggler is not supported any more.
There is also the option to install the free System debugger, winIDAE open a respective tutorial is in preparation and can be downloaded from the DAVE web site (www.infinone.com/dave) once available.

2. Concept and guidelines of DAVE™ APPs for DAVE™ v4

DAVE APPs are application components that abstract a certain use case. There is no change in the general philosophy of DAVE v4 APPs in comparison to DAVE v3.

However, there are some major changes in the implementation concept of DAVE v4 APPs.

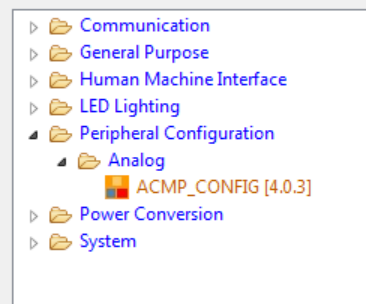
2.1 DAVE v4 APPs are built on top of the newly introduced peripheral specific low level drivers (XMC Lib), see also picture of the XMC Lib section below.
With this, DAVE v4 APPs generally do not directly access registers of the MCU but use the API of the XMC Lib to initialize HW. Hence DAVE v4 APPs essentially generate the configuration data structure based on the selected configuration options and call the appropriate 'Init' functions. Depending on the use case of the DAVE v4 APPs, higher level API functions are created to implement the defined use cases, by using the APIs provided by the LLDs. With this, code generation becomes more transparent and robust and generated code can easily be qualified to be used in production.

2.2. New Domain Specific Language (DSL) to define the GUI, GUI actions, instantiation actions, and code generation actions.
Groovy has been chosen as the DSL to define DAVE v4 APPs, related control functions and code generation templates. With this, the GUI design to configure DAVE APPs is more flexible and the APP design is more robust.

2.3 Consumption of resources
DAVE APPs for DAVEv4 should include / consume all resources and functionalities that are essentially belong to the use case of the APP. Separation to various application components should only be done if there is a good re-uses benefit. This leads to less number of APPs that are required in a project, visible by the fact that now I/O functionality and interrupt nodes included in the APP whenever I/O functionality and an interrupt node is required to fulfill the uses case. Although, in most of such cases flexibility to do an own respective composition is still possible.

2.4 Improved Concept of DAVE APPs.
Most of The new DAVE APPs are also conceptually redesigned to improve ease of use but also to improve their usability in productive code.

2.5 New category of peripheral configuration APPs (Config APPs)
We have defined a preliminary concept of APPs with the use case to configure a peripheral and use the APIs of the XMC lib to operate the peripheral.
Such an APP essentially provides the GUI to configure a peripheral module or a functional block of a peripheral module and provides related virtual signals or events that can be connected to other APPs. Based on the graphical configuration and the connections an initialization method for the peripheral will be provided. No other methods will be provided. The user can use the APIs of the peripheral driver of the respective peripheral to operate the peripheral.



The current release includes one Peripheral Configuration APP for the analog comparator module (ACMP) included in the XMC1000 family. This is ACMP_CONFIG APP. As the concept is not yet finalized this APP is released as Beta version (only visible in the APP selection view if the option “Hide beta version” is not checked).

The code generated by the DAVE APPs is fully compliant and tested with these compiler tools: GCC (Atollic, Rowley), ARM, IAR, TASKING. Tutorials that show how to uses the DAVE generated coded in these tools are available from the DAVE web site.

3. Compatibility between DAVE™ v3 and DAVE™ v4

Because of the concept changes of DAVE APPs describe in section 7 and the changes in the data model of DAVE APPs to improve speed and robustness projects that includes DAVE APPs are not compatible between DAVE v4 and DAVE v4. However, it is possible to manually migrate projects from DAVE v3 to DAVE v4, more details are described in the DAVE user manual that can be found in help content in DAVE and in a dedicated Application Note. On the other hand there is no real need to migrate old projects because DAVE v3 and DAVE APPs for DAVE v3 will still be available and maintained for a sufficient period of time.

4. Quick Start tutorial for DAVE™ v4

Those people who have already worked with DAVE v3 may realize the working with DAVE v4 follows the same philosophy, but the described changes should improve the user experience significantly and should bring more fun in embedded software engineering. To gain some first own experience we have developed a quick start tutorial that creates the famous blinky of a LED using any XMC kit.
The tutorial is a separate document and can be downloaded from here.

5. DAVE™ SDK Overview and Quick Start

It is now possible to offer an SDK for DAVE APPs that makes developing or changing of DAVE APPs much simpler than before.

A DAVE APP essentially consists of 2 elements:

- The Manifest that contains the properties, the GUI design, GUI functions, Instantiation actions and code generation actions , the manifest language is grove with domain specific extensions
- Code templates for script based code generation and/ or static files, the code templates are also based on groovy script.

Writing the Manifest is supported by offering:

- GUI designers with drag and drop functionality for widgets and wysiwyg preview of the designed GUI
- Professional SW editors with syntax highlighting and completion functions for efficient coding
- Comprehensive checks for types and other errors
- Debugging features

Writing the code templates is supported by offering:

- Convenient APIs to get GUI and device data
- Debugging features

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The DAVE APP SDK is open to be used for any use case. One valuable use case would be to develop DAVE APPs to create the configuration code for any static library based on an easy to use graphical user interface, or to create configuration files to customize software.

Tutorials are included in the DAVE SDK user manual the can be found in the DAVE SDK help content. Or download a tutorial as separate pdf file.

The DAVE APPs projects will be provided from a Git repository in a time frame mid-2015. They can be also obtained earlier by sending a specific request to dave@infineon.com.

6. Overview of XMC Peripheral Drivers, XMC Lib

In addition to the application components DAVE APPs we will also offer a set of XMC peripheral drivers. The libraries of the XMC Lib are peripheral IP oriented not specific to individual devices. Device specific deviation of a IP is handled by conditional compilation.

Three possible usage models exist along with DAVE:

- Used by DAVE APPs to improve robustness and transparency of code generation
- Standalone (independent of DAVE APPs) to simplify the usage of the XMC microcontrollers in case DAVE APPs are not adequate
- Mixed use of DAVE APPs and LLD, e.g. if there is no APP for the required Application use case the LLD can be used. With the APIs of the LLDs the full flexibility of peripherals and connectivity can be used instead of accessing the registers directly

The XMC Lib can also be used independent of DAVE, along with all compiler tools supporting the XMC family which is Keil MDK, IAR, Atollic, TASKING, Rowley or other GCC based tool chains. The LLDs are integrated in the latest CMSIS PACK for Keil and in the getting started of IAR.

Download LLDs as separate package