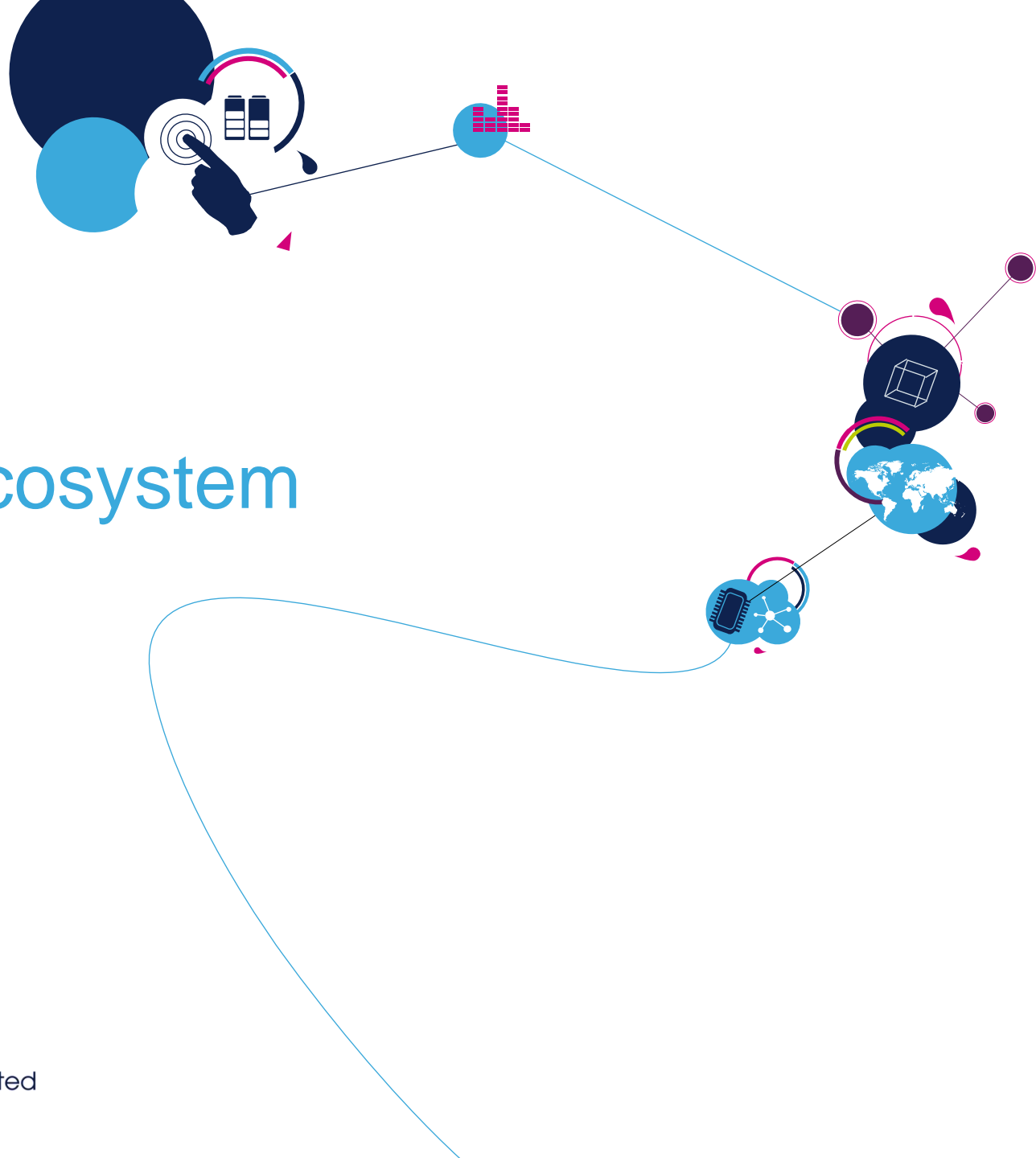# SPC56 Ecosystem

June 2014

SPC56 Ecosystem

Distribution Network

Technical Support / Trainings	Ecosystem / Product Selection	Web Communities	Sales Force/Distribution

Documentation	**Software development Tools**	**Embedded Software**	**Hardware Development Tools**
Products & Ecosystem Documentation	Code Configuration & Generation tools	HAL / Drivers	Evaluation & Promotion boards
	Development & Debugging Tools	RTOS	
		Libraries	Debug probes
		Application Software	Calibration Boards
		AUTOSAR	
	Monitoring Tools	MCAL	Communication bridges
		BSW	
		AUTOSAR OS	

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Embedded Software Solutions at all levels

Application

Automotive

Middleware

RTOS/ KERNEL

Complex Drivers

Device Drivers for Actuators & Sensors

BSW

Development and execution environments

SPC5Studio

Tresos Studio

Da Vinci

Hardware abstraction layer (HAL)

MCAL

vector

AUTOSAR

ETAS

Green Hills SOFTWARE, INC.

intecs the Brainware company

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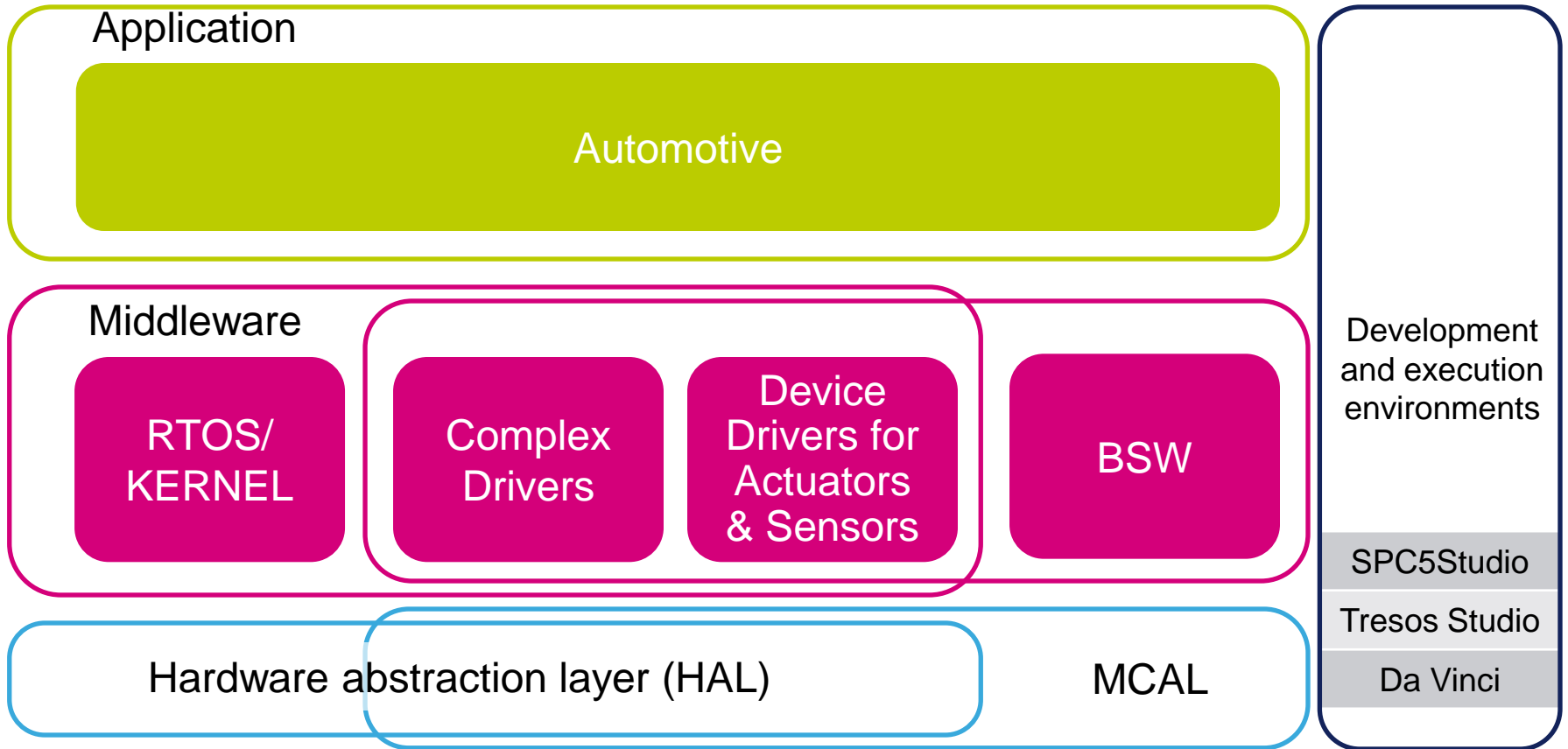
Embedded Software with SPC5Studio

Application

Automotive

Middleware

RTOS/ KERNEL

Complex Drivers

Device Drivers for Actuators & Sensors

BSW

Hardware abstraction layer (HAL)

MCAL

Development and execution environments

SPC5Studio

Tresos Studio
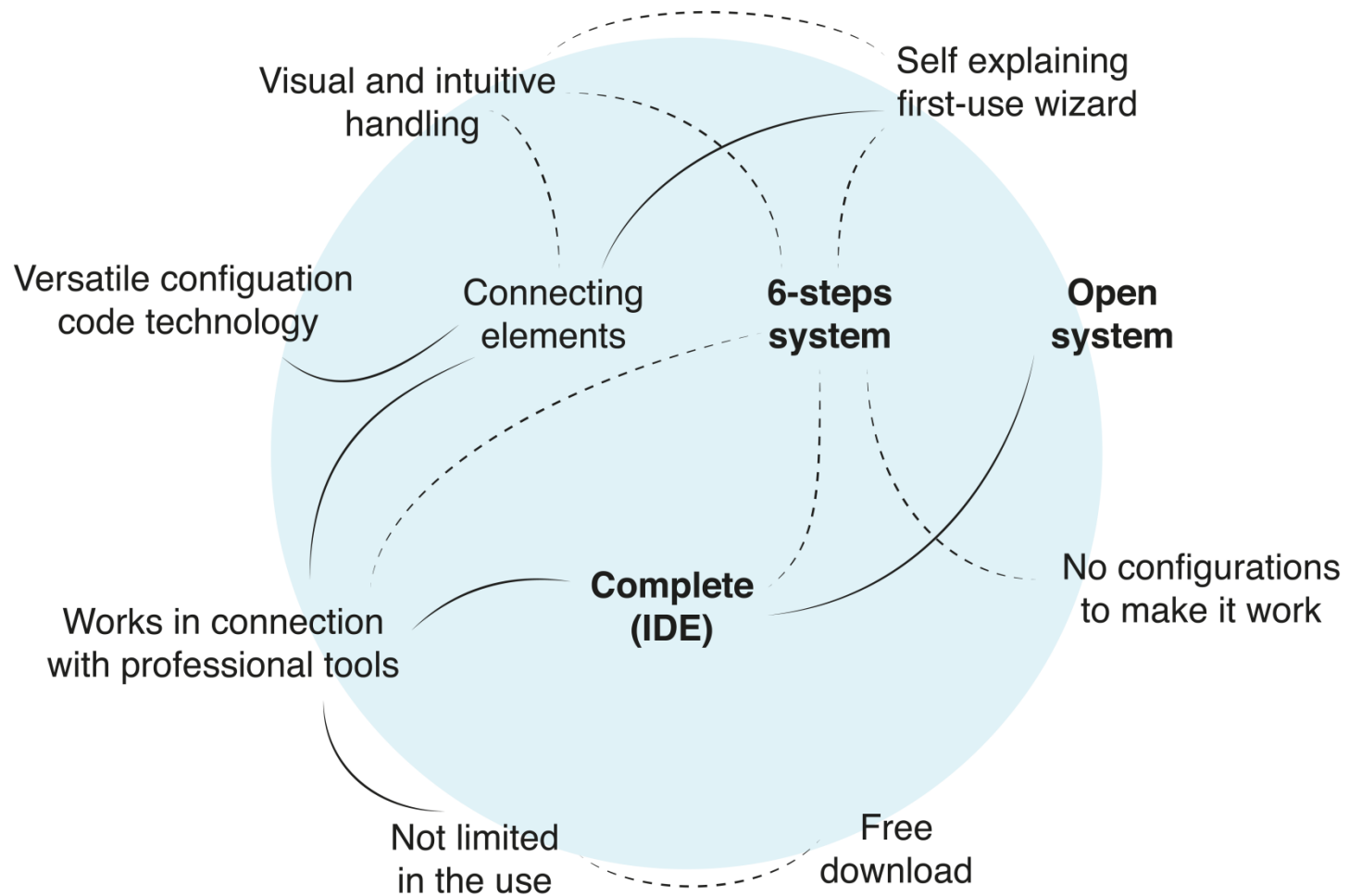
Da Vinci

SPC5Studio

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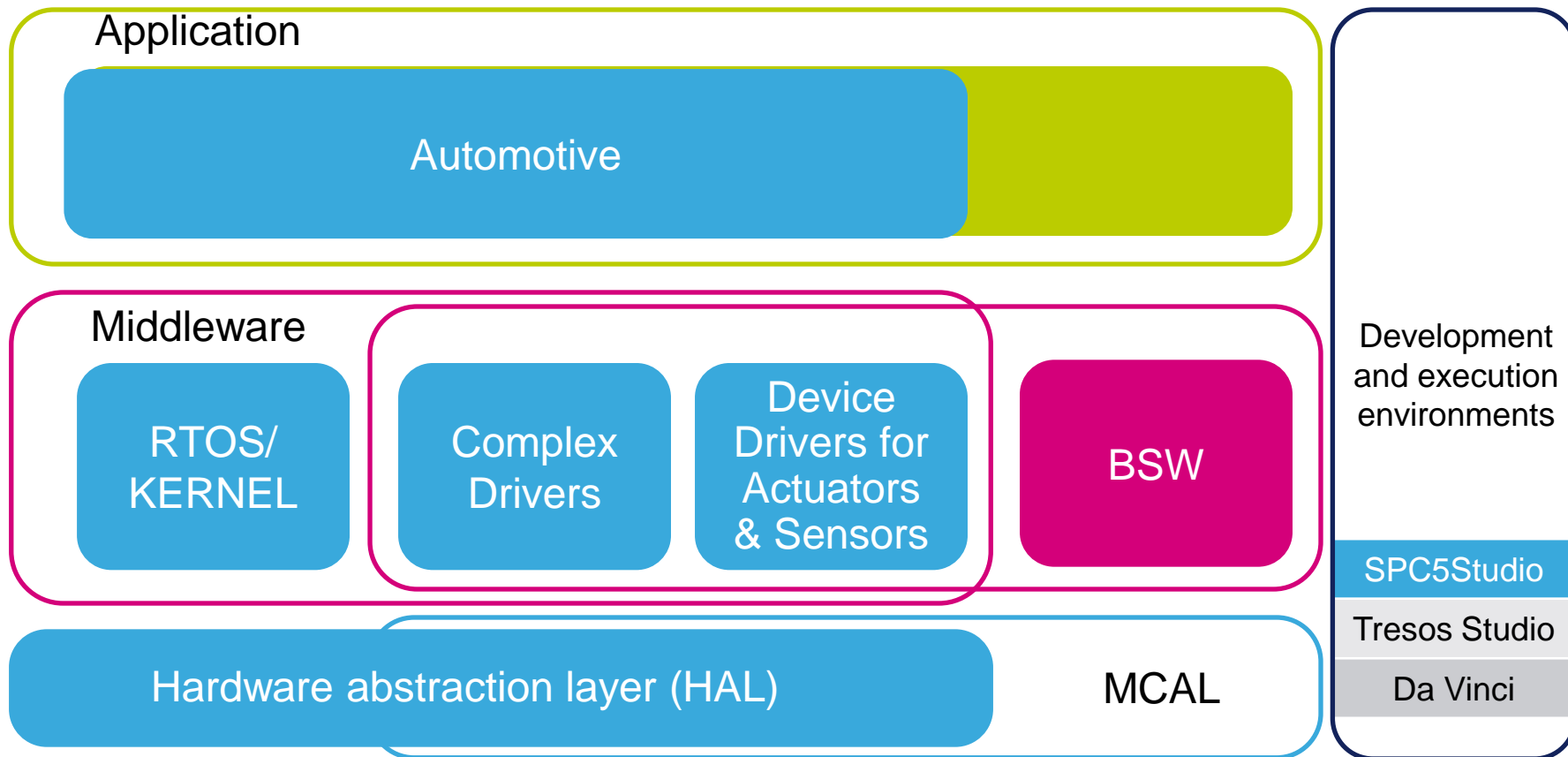
- SPC5Studio is an open framework to host several software packages and functionalities to simplify developers evaluation and application start-up

  - Dedicated Eclipse plug-ins
    - Combines, configure and solve dependencies among embedded software modules
    - Includes: Application examples selection Wizard, Pin Map Graphic Wizard, New Project Wizard, New Component Wizard.

  - Embedded Software
    - HAL, RTOS, Platform components, Application Example, Libraries are the key enablers

  - Pre-integrated compiler and debugger view

  - On-line help

SPC5Studio offers a free, eclipse based, fully integrated development environment with full flexibility to integrate functional extension

Dedicated eclipse plug-ins inside SPC5Studio wrap software packages and libraries into Solutions

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SPC5Studio concept map

- Visual and intuitive handling
- Self explaining first-use wizard
- Versatile configuation code technology
- Connecting elements
- **6-steps system**
- **Open system**
- **Complete (IDE)**
- No configurations to make it work
- Works in connection with professional tools
- Not limited in the use
- Free download

SPC5Studio associated tools

SPC5Studio

HighTec GNU "C" Compiler is embedded in SPC5Studio

SPC5Studio

- SPC5Studio framework include
  - HighTec GCC Compiler
  - PLS UDE low cost Debugger

To facilitate user in getting started at budget price
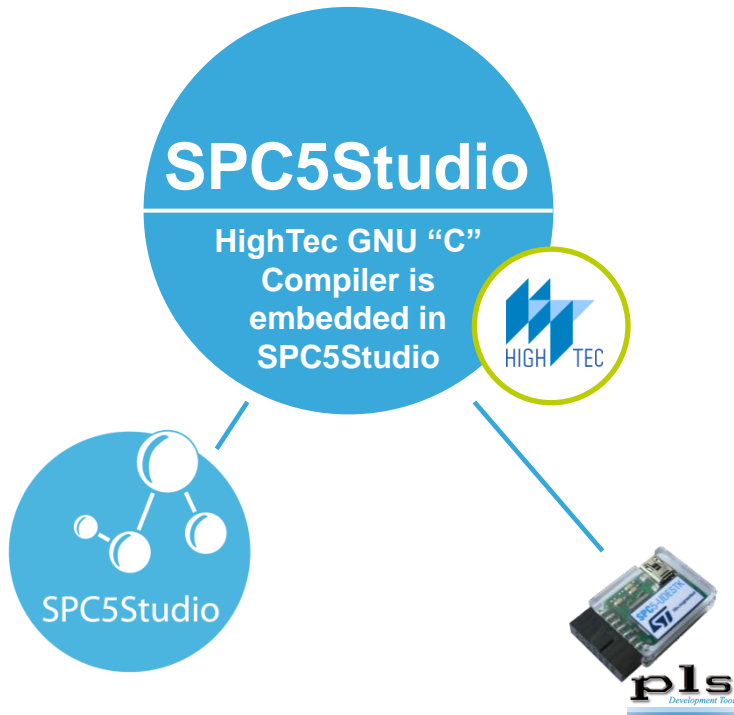
Download: SPC5Studio
www.st.com/spc5studio

Install SPC5Studio and Activate Compiler

Download: Debugging software
www.pls-mc.com/spc5-udestk

Install the UDE SW and add provided keys into UDE License Manager

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Pin Map Wizard

SPC5Studio PinMap editor

STMicroelectronics user-friendly pinout editor for SPC5Studio.

- Visual configuration of I/O alternate functions

- Automatic conflict checker

- Automatic generation of configuration code

- Stand-alone configuration summary in .xls format for customer application's PCB consistency check
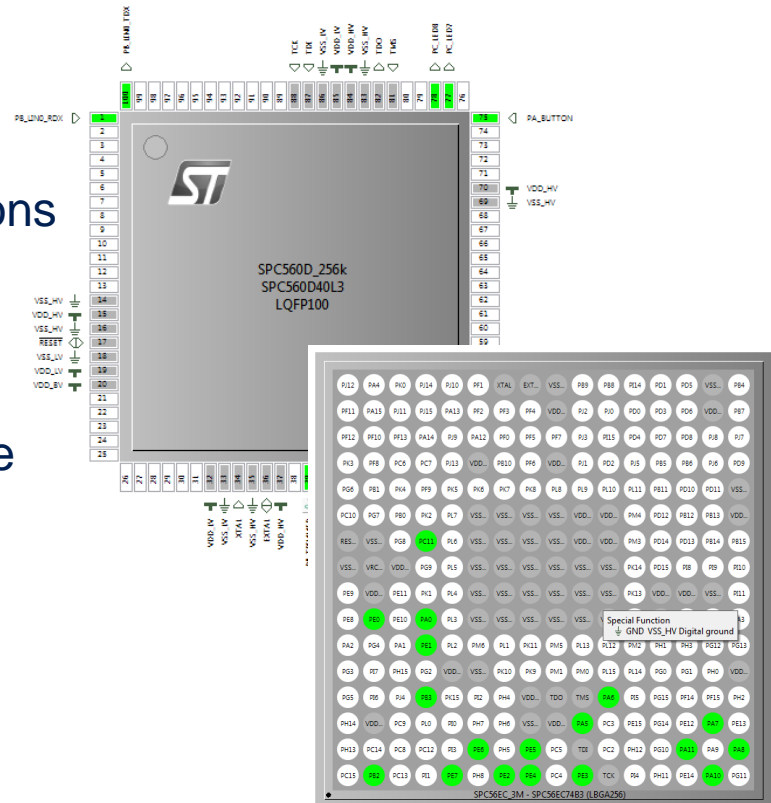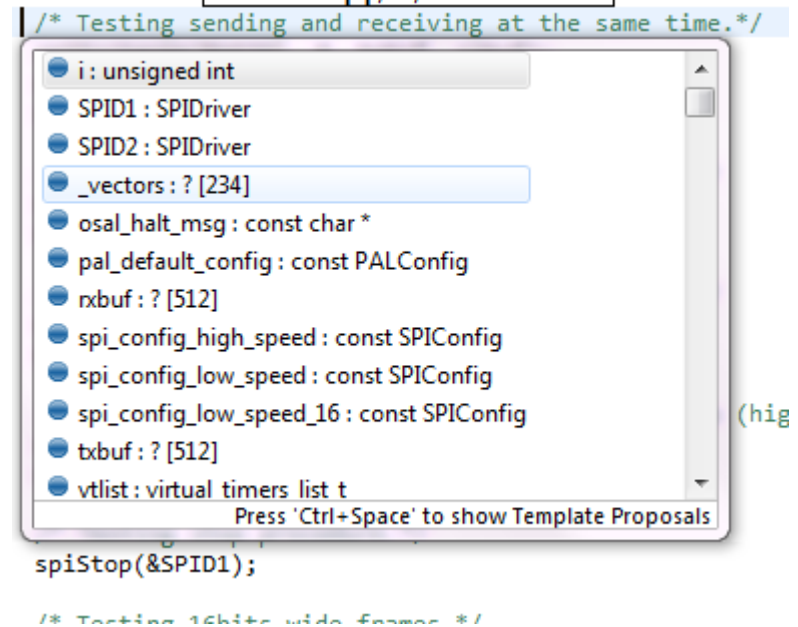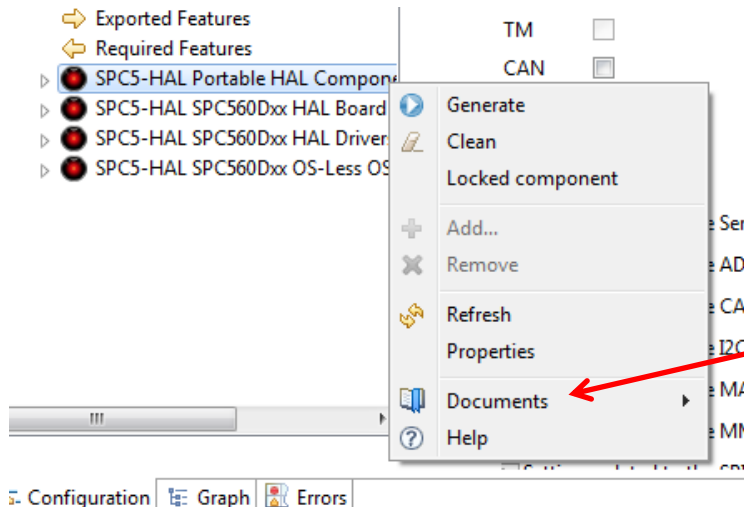

Name	Model	Cost	Availability								KODO READY
			D	0B/0C	4B/EC	P	AP	L	M	A	
PIN MAP	Source	Free	Y	Y	Y	Y	Y				Y

New!

Documentation Wizard

- On line help for
  - SPC5Studio components API
  - Hal drivers API and functionality
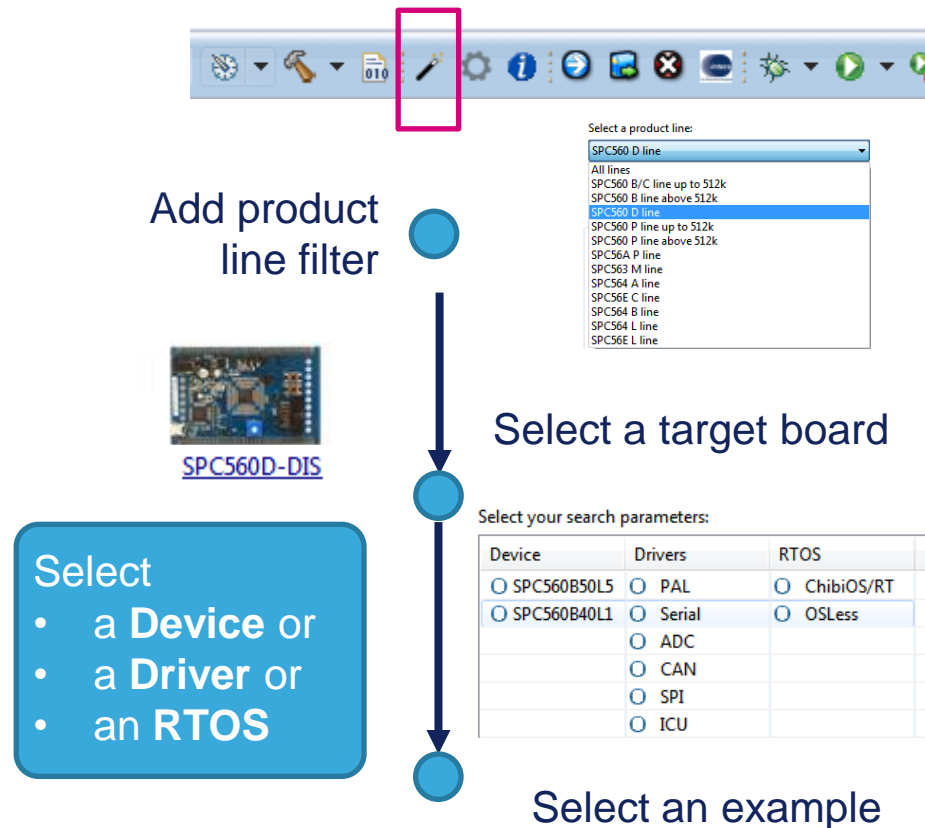
Eclipse built-in Template Proposals

Right click on a component for documentation in chm format side by side with source code

Application examples Wizard

- Facilitate the selection of one or more fully working application examples for Evaluation boards

- More than 50 Application examples to jump-start the project

- Built with HAL drivers

- Added in from 2.0 release onward

Add product line filter

SPC560D-DIS

Select
- a **Device** or
- a **Driver** or
- an **RTOS**

Select a target board

Select a product line:

SPC560 D line

All lines
SPC560 B/C line up to 512k
SPC560 B line above 512k
SPC560 D line
SPC560 P line up to 512k
SPC560 P line above 512k
SPC56A P line
SPC563 M line
SPC564 A line
SPC56E C line
SPC564 B line
SPC564 L line
SPC56E L line

Select your search parameters:

Device	Drivers	RTOS
○ SPC560B50L5	○ PAL	○ ChibiOS/RT
○ SPC560B40L1	○ Serial	○ OSLess
	○ ADC	
	○ CAN	
	○ SPI	
	○ ICU	

Select an example

Application Name	Description	Device	Drivers	RTOS
☐ SPC560BCxx OS-Less Test Application	Test application for the SPC560BCxx created using th...	SPC560B5...	PAL Serial	OSLess
☑ SPC560BCxx OS-Less PWM-ICU Test Ap...	Test application for the SPC560BCxx created using th...	SPC560B5...	PAL ICU P...	OSLess
☐ SPC560BCxx OS-Less DSPI Example App...	Test application for the DSPI unit on the SPC560BCxx.	SPC560B5...	PAL SPI	OSLess
☐ SPC560BCxx OS-Less CAN Test Applicat...	Test application for the SPC560BCxx created using th...	SPC560B5...	PAL CAN ...	OSLess
☐ SPC560BCxx OS-Less ADC Test Applicat...	Test application for the SPC560Bxx created using the...	SPC560B4...	PAL ADC S...	OSLess
☐ ChibiOS-RT SPC560BCxx Test Application	Test application for the SPC560B/Cxx created using t...	SPC560B5...	PAL Serial	ChibiOS/RT

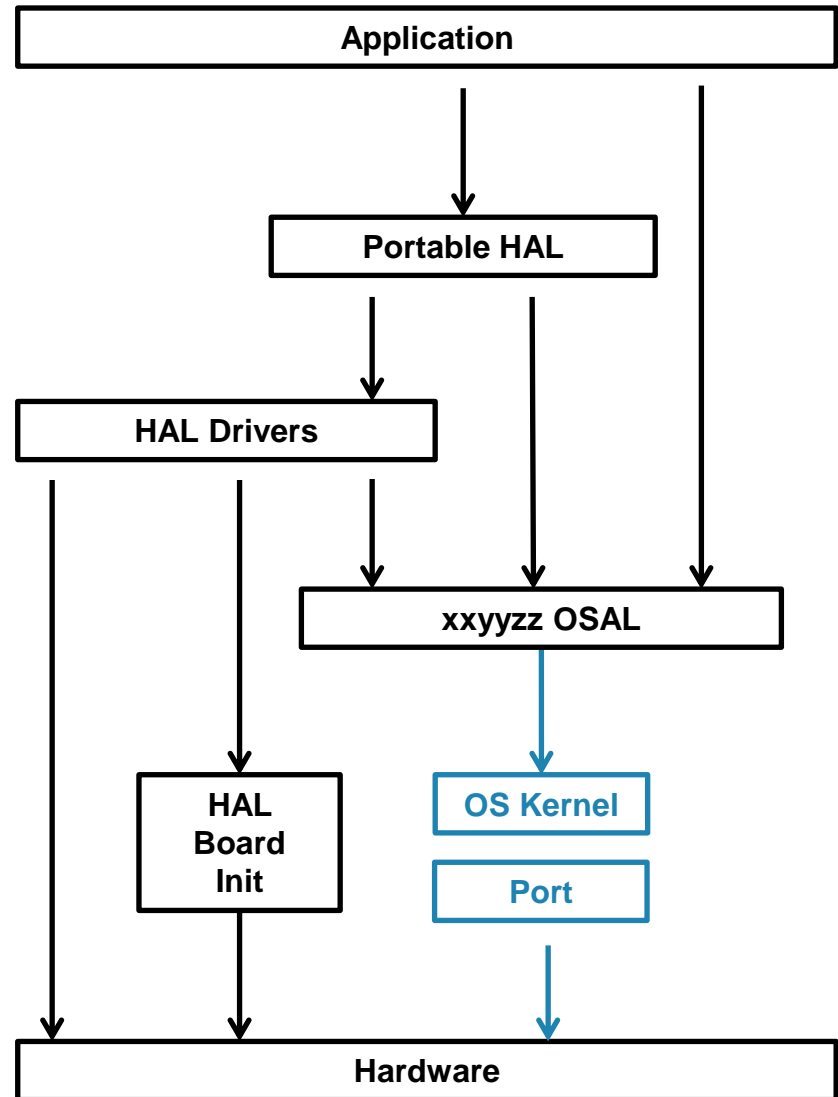# Embedded Software inside SPC5Studio framework

- ## HAL Drivers

  - ### Consistent programming interface across product lines
    - **Consistency**: Unique set of Application programming Interfaces (API) to abstract hardware dependent functionalities
    - **Portability**: no customer application changes with every SPC5 family microcontroller

  - ### Key peripherals supported
    - General Purpose timer, ADC,ICU/PWM, SPI, Timers, CAN, Serial Interface

  - ### Delivered inside SPC5Studio:
    - Drivers configuration & code generation enabled by SPC5Studio plug-in's
    - Code Portable to Professional tool chains

  - ### On line help for API and functionality description

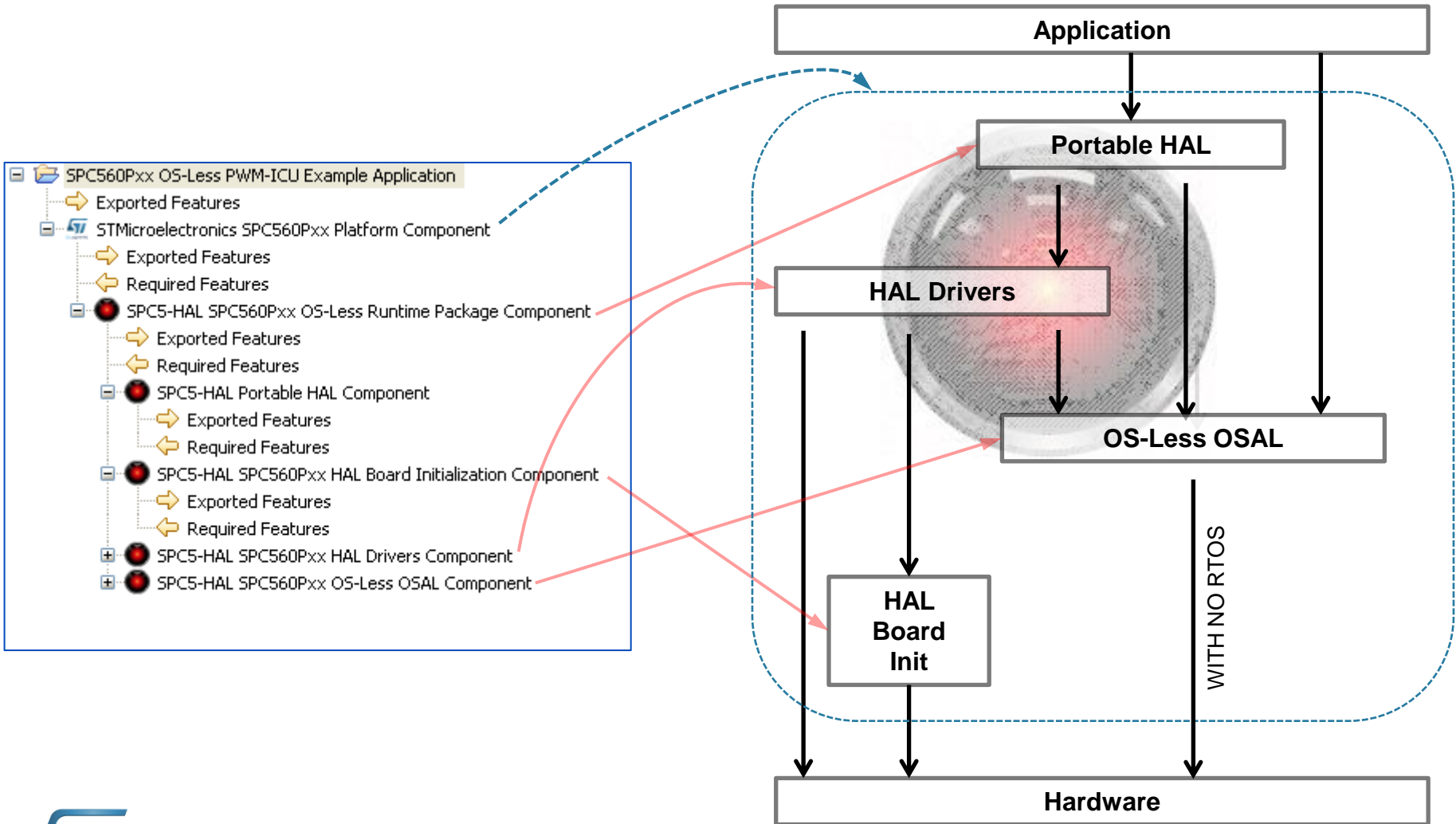 - ### Operating system independent / can be used without any operating system

Provider	Name	Model	Cost	Availability								KODO READY
				D	0B/0C	4B/EC	P	AP	L	M	A	
ST	GPIO	Source	Free	Y	Y	Y	Y	Y	Y	Y	Y	Y
ST	ADC	Source	Free	Y		Y	Y	Y	Y	Y	Y	Y
ST	ICU/PWM	Source	Free	Y	Y	Y	Y	Y	Y	Y	Y	Y
ST	SPI	Source	Free	Y	Y	Y	Y	Y	Y	Y	Y	Y
ST	TM	Source	Free			Y			Y	Y	Y	Y
ST	Can	Source	Free	Y	Y	Y	Y	Y	Y	Y	Y	Y
ST	SCI	Source	Free	Y	Y	Y	Y	Y	Y	Y	Y	Y

SW architecture overview

- **Application**: High level application code abstracted from hardware details

- **Portable HAL**: High level, <u>cross platform</u>, drivers API layer

- **OSAL**: Operating system Abstraction Layer

- **HAL Drivers**: Low level, <u>platform-specific</u>, drivers layer

- **OS Kernel**: Portable RTOS kernel layer

- **Port**: Kernel port layer for a specific Architecture

- **Board**: Board-specific description and initialization code

- **Hardware**: The HW platform

= **Present ONLY if RTOS component added**

Component based Approach

SPC560Pxx OS-Less PWM-ICU Example Application
- Exported Features
- STMicroelectronics SPC560Pxx Platform Component
  - Exported Features
  - Required Features
  - SPC5-HAL SPC560Pxx OS-Less Runtime Package Component
    - Exported Features
    - Required Features
    - SPC5-HAL Portable HAL Component
      - Exported Features
      - Required Features
    - SPC5-HAL SPC560Pxx HAL Board Initialization Component
      - Exported Features
      - Required Features
    - SPC5-HAL SPC560Pxx HAL Drivers Component
    - SPC5-HAL SPC560Pxx OS-Less OSAL Component

Application

Portable HAL

HAL Drivers

OS-Less OSAL

HAL Board Init

WITH NO RTOS

Hardware

Component based Approach

- # Platform Components

  - include startup code, interrupt handling framework I/O configuration and drivers required for debug (TIMER, UART, DMA, I/O)

  - All SPC56 product line supported

- # Libraries

  - Flash drivers

  - Lin Drivers (RPN: STSW-SPC56002FW)

  - Cryptography library for SPC5 MCU's (RPN: SPC5-CRYP-LIB)

- # RTOS

  - ChibiOS: Portable, open source, compact and extremely fast RTOS. Designed for deeply embedded real time applications, where timings and code size are key factors. Is available for all platforms.

  - mOSEK: Real-Time and networked Operating System compliant to the Osek/Vdx standard and suitable for the development of embedded real-time applications. Available for Monaco platform

Compiler and Debugger

Compiler

- GNU "C" compiler for SPC56 MCU's

- Book E, VLE and SPE Instruction set with GPL3 open source libraries

- 30 days free trial, full feature

- Integrated inside SPC5Studio

- Designed by HighTec, Distributed by ST or ST franchised distributors

Order code	
SPC5-HTCOMP-NLTL	1 year node-locked support

Debugger

- JTAG Debugger for SPC56 MCU's

- Compliant with IEEE1149.1 specification

- Designed by PLS, Distributed by ST or ST franchised distributors

- Free software download: http://www.pls-mc.com/spc5-udestk

Order code	Description
SPC5-UDESTK-EVAL	PLS USB/JTAG adapter and time unlimited software license up to 128 KB code
SPC5-UDESTK-FULL	Include PLS USB/JTAG adapter and 1-year license with full memory access
SPC5-UDEDEBG-TL	1-year license with full memory access

Compiler Options

HighTec GCC *for* ST	HighTec Professional

Make file compatibility

Distributed by ST node locked option only	Distributed by HighTec Multiple licensing options
Inside SPC5Studio	Part of HighTec development environment
GCC compiler + GPL3 libraries	Commercial compiler and libraries, no open source
	ISO 26262 certified
With support from ST and bug fixing support	Professional support from HighTec
Ultra low cost	Lower cost compared to other professional products

Evaluation / Development

Production

SPC5 studio suite use cases

- Low cost / Features rich development suite

Key functionalities

- Use SPC5Studio wizards to leverage on all plug-ins, embedded software content and embedded compiler

- Use SPC5Studio just as eclipse project Editor and build environment to leverage on GCC compiler

- Productivity tool **adding** features to your professional development environment

Key functionalities

- Explore quickly microcontroller features.

- Reuse code of application examples

- Manage I/O configuration

- Configure Software libraries with SPC5studion plug-in before importing them in your project

- Compiler activation not required

If compiler is HighTec Pro

- Share code and projects with SPC5Studio with Full make file and build settings compatibility

- Optimized costs having a mix of Pro IDE and low cost (SPC5studio) IDE

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- STMicroelectronics develops off the shelf software products in accordance with CMMI and AUTOMOTIVE SPICE Level 3 quality standards.

Provider	Name	STATUS	Model	Cost	Availability							
					D	B/C	B/C	P	AP	L	M	A
ST	MCAL ASR 3.0	RTM	Source	License(*)	Y	Y	Y	Y	Y	Y	Y	Y
ST	MCAL ASR 3.2	RTM	Source	License(*)	Y	Y	Y					
ST	MCAL ASR 4.x	BETA	Source	License(*)	Y	Y	Y	Y	Y	Y		Y
ST	AUTOSAR OS ASR 3.x	RTM	Source	License(*)	Y	Y	Y	Y	Y	Y	Y	Y
ST	AUTOSAR OS ASR 4.0	RTM	Source	License(*)	Y	Y	Y	Y	Y	Y		Y
Elektrobit	AUTOSAR OS ASR 4.0 ISO 26262	RTM	Source	License(*)						Y		
Elektrobit	BSW (ASR3.x)	RTM	Source	License(**)	Y	Y	Y	Y	Y	Y	Y	Y
VECTOR	BSW (ASR3.x)	RTM	Source	License(**)	Y	Y	Y	Y	Y	Y	Y	Y
Elektrobit	BSW (ASR4.x)	RTM	Source	License(**)	Y	Y	Y	Y	Y	Y		Y

Solution for BAC 3.1 release are available from Elektrobit and got SLP10 from Vector
RTM: release to market

(*) contact ST or authorized distributors
(**) contact 3rd party

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Promotion and Evaluation Boards

- ## Two level of boards to satisfy all needs

  - ### Premium Evaluation boards

    - Access all peripherals, change MCU using socket and mini-modules
    - Port for JTAG and Nexus trace debuggers

  - ### Discovery/Discovery+ Boards

    - IC soldered on PCB with customer option to change it
    - Embedded debugger(*)
    - Legacy Automotive connector (**)
    - Connectivity Ports (Can / LIN)
    - Arduino-Compatible (Pictus Discovery+ only)

  Promote the solution enabling immediate user operation
  Connect to other system in automotive environment
  Debug your application
  Connect extension modules with ST smart power devices
  Connect ARDUINO World

(*) Not available on L, M & A Discovery/+
(**) Not Available on B & D line Discoveries

SPC56 Discoveries World
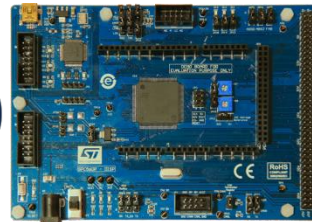
SPC56D-Discovery with SPC560D40L1
- **order code: SPC560D-DIS**

- Embedded debugger
  (up to 128Kbyte free)
- Optocoupler for USB isolation,
- All I/O accessible on connectors
- Standard connector (type B)

SPC56L-Discovery with SPC56EL60L5
- **order code: SPC56EL70-DISP**

- Can, Lin Connectivity on board
  (included transceivers)
- Standard connector (type A)

SPC56M-Discovery with SPC563M64L5
- **order code: SPC560M-DISP**

- Can, Lin Connectivity on board
 (included transceivers)
- Standard connector (type A)

SPC56B-Discovery with SPC560B54L5
- **order code: SPC560B-DIS**

- Embedded debugger
  (up to 128Kbyte free)
- Optocoupler for USB isolation,
- All I/O accessible on connectors
- Standard connector (type B)

SPC56P-Discovery with SPC560P50L5:
- **order code: SPC560P-DISP**

- Embedded detachable on board JTAG
  debugger (up to 128Kbyte free)
- Can, Lin Connectivity on board (included
  transceivers)
- Connector Arduino-Compatible
- Standard connector (type A)

SPC56A-Discovery with SPC563A70L5
- **order code: SPC564A-DISP**

- Can, Lin Connectivity on board
  (included transceivers)
- Standard connector (type A)

New!: Shipping from mid may

Functionality Extension boards

- ## Connector Type A: 4x37 Pins

MCU Boards	
SPC56EL70-DISP	SPC563M-DISP
SPC560P-DISP	SPC564A-DISP
Extension Boards	
EVAL-L9942	EVAL-L9907
EVAL-L9907-H	EVAL-L9958
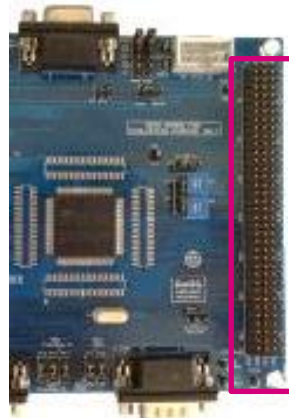
- ## Arduino-Compatible

MCU Boards
SPC560P-DISP
Extension Boards
EVAL-VNH5019-P2
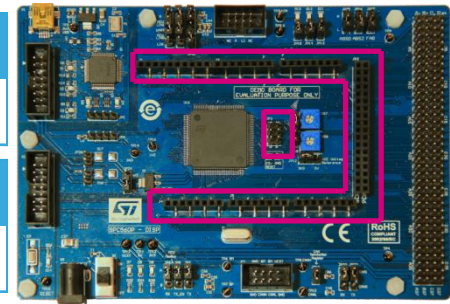
- ## Connector Type B: 2x2x36 Pins

MCU Boards	
SPC560D-DIS	SPC560B-DIS
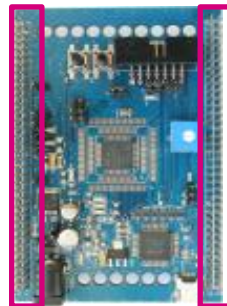
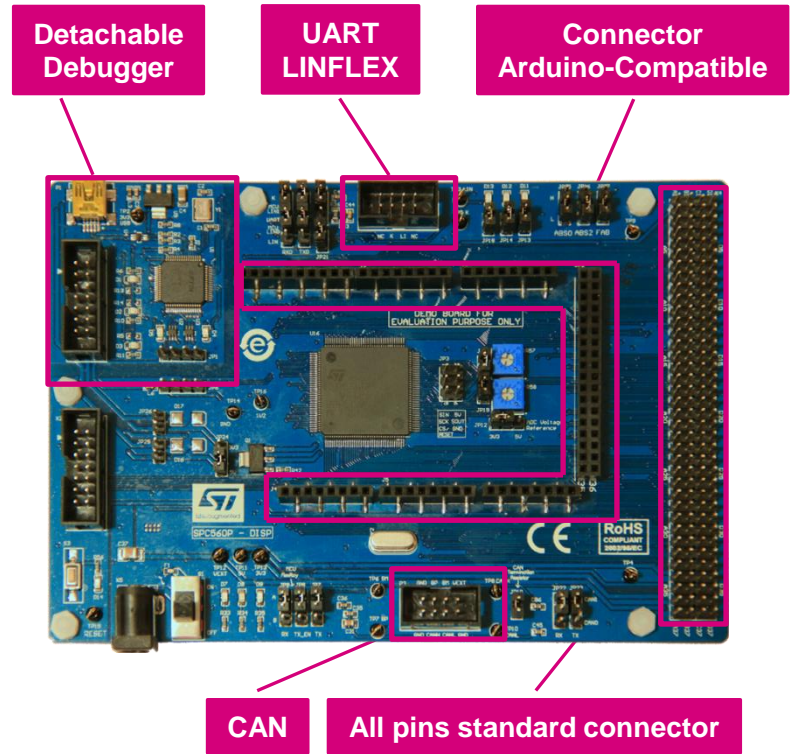Several solutions in design to extend the microcontroller board functionality

The addition of a connector Arduino-Compatible multiply the number of options
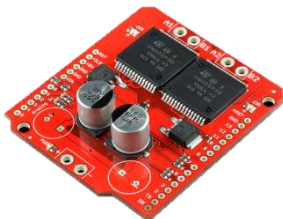
All ST Nucleo expansion boards will fit as well

Available   In design

Discovery Boards: Special Innovation

- ## SPC560P-DISP Arduino-Compatible
  - Leverage on Arduino Community functional modules such as:
    - Arduino Proto Shield
    - Display Modules
    - Communication Modules
    - Motor drivers modules (with ST VNH H-Bridges)
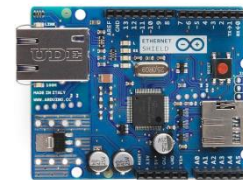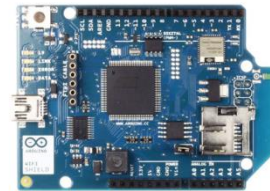
Detachable Debugger

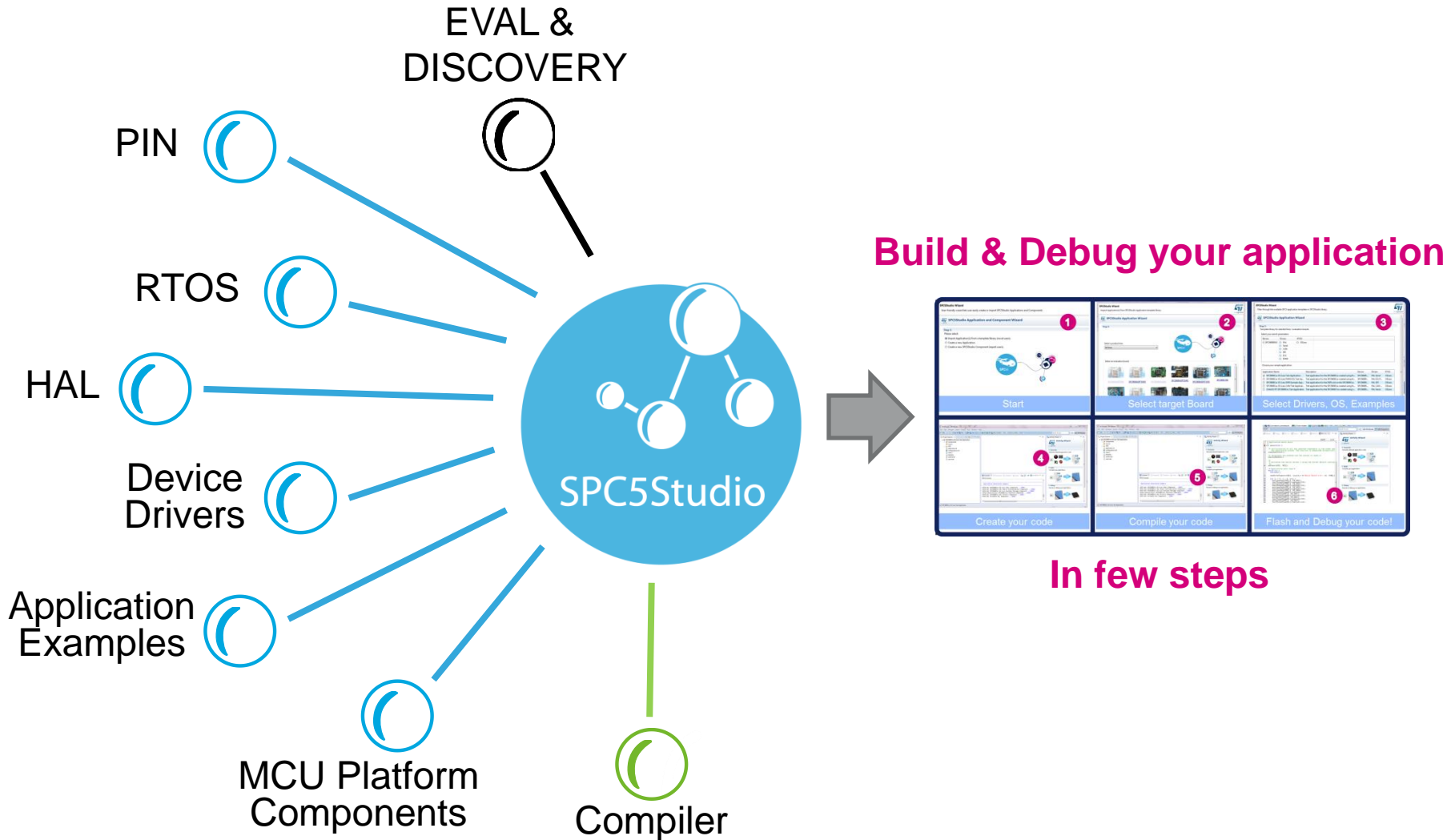**UART LINFLEX**

Connector Arduino-Compatible

CAN

All pins standard connector

Available in ST e-store
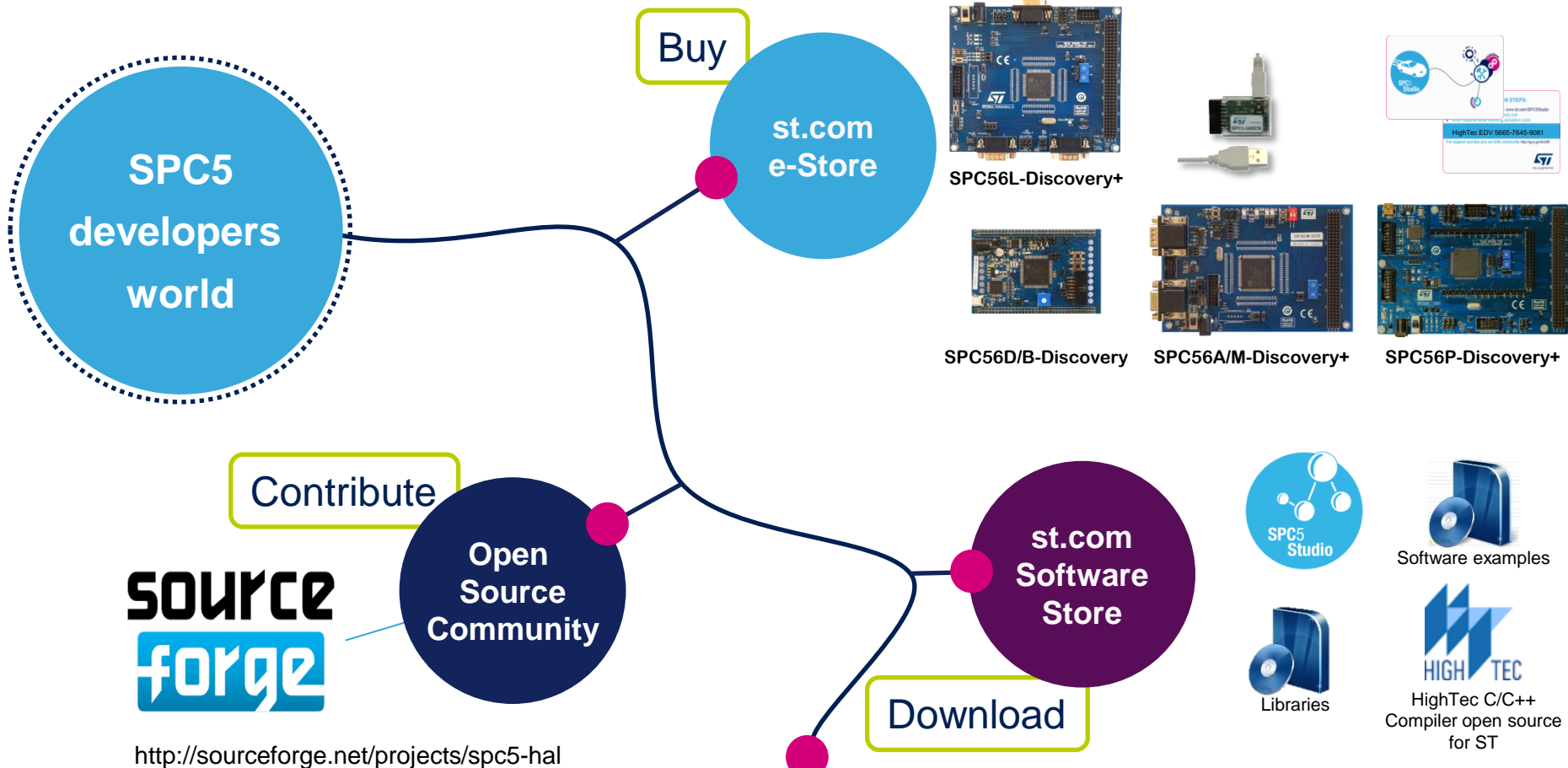
CAN

VNH2SP30

VNH5019

LCD Button Shield

Ethernet

WIFI

Note: expansion boards could be purchased in web from 3rd parties

A feature and software rich environment

EVAL & DISCOVERY

PIN

RTOS

HAL

Device Drivers

Application Examples

MCU Platform Components

Compiler

SPC5Studio

Build & Debug your application

In few steps

SPC56 New Getting Package
it's available

SPC5 developers world

Buy

st.com e-Store

SPC56L-Discovery+

SPC56D/B-Discovery   SPC56A/M-Discovery+   SPC56P-Discovery+

Contribute

Open Source Community

SOURCE forge

http://sourceforge.net/projects/spc5-hal

st.com Software Store

SPC5 Studio   Software examples

Libraries   HighTec C/C++ Compiler open source for ST

Download

Support   e2e

Video /e-learning on   Follow

You Tube   st.com   @st_world

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Thank You!

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