S32 Design Studio for Vision 2018.R1 and the S32 Debugger

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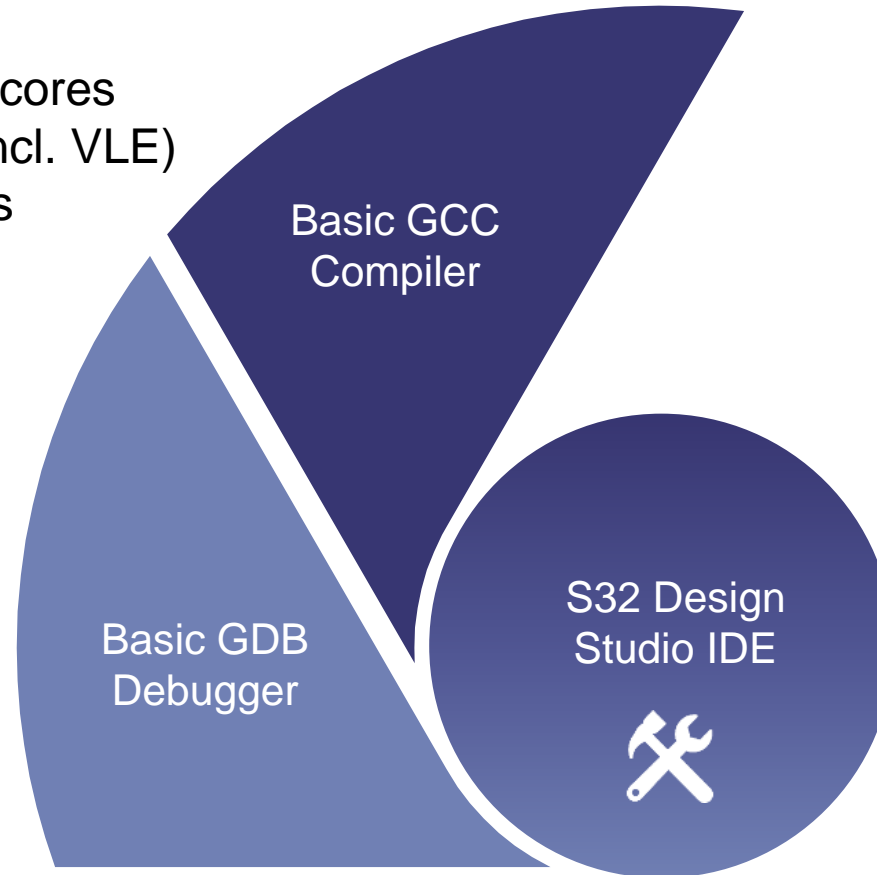
October 2018 | AMF-AUT-T3396

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Agenda

- Overview of S32 Design Studio

- Overview of S32 Design Studio for Vision

- S32 Debugger & Debug Probe

- Demo of S32 Debugger

- Preview of S32 Config Tools from Next Generation S32 Design Studio
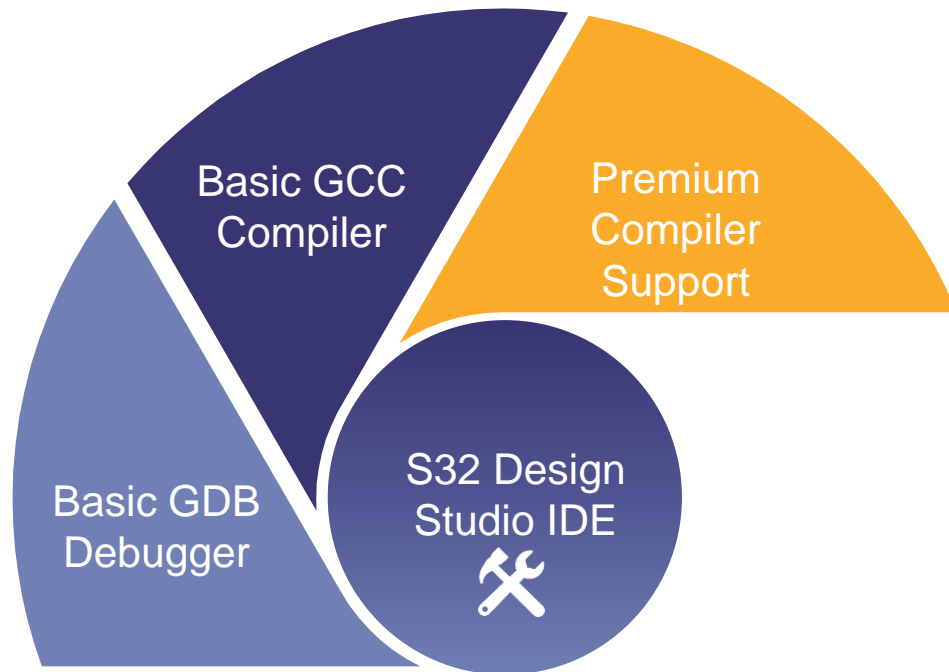
S32 Design Studio – Current Tool Framework

- GNU C/C++ Compiler
- GCC for ARM Cortex M and A cores
- GCC for Power Architecture (incl. VLE)
- Solid Standard GCC Compilers

- Basic Eclipse Backplane
- C/C++ Development Tools
- Integrated Editor with C/C++ tools
- Managed Make Facility
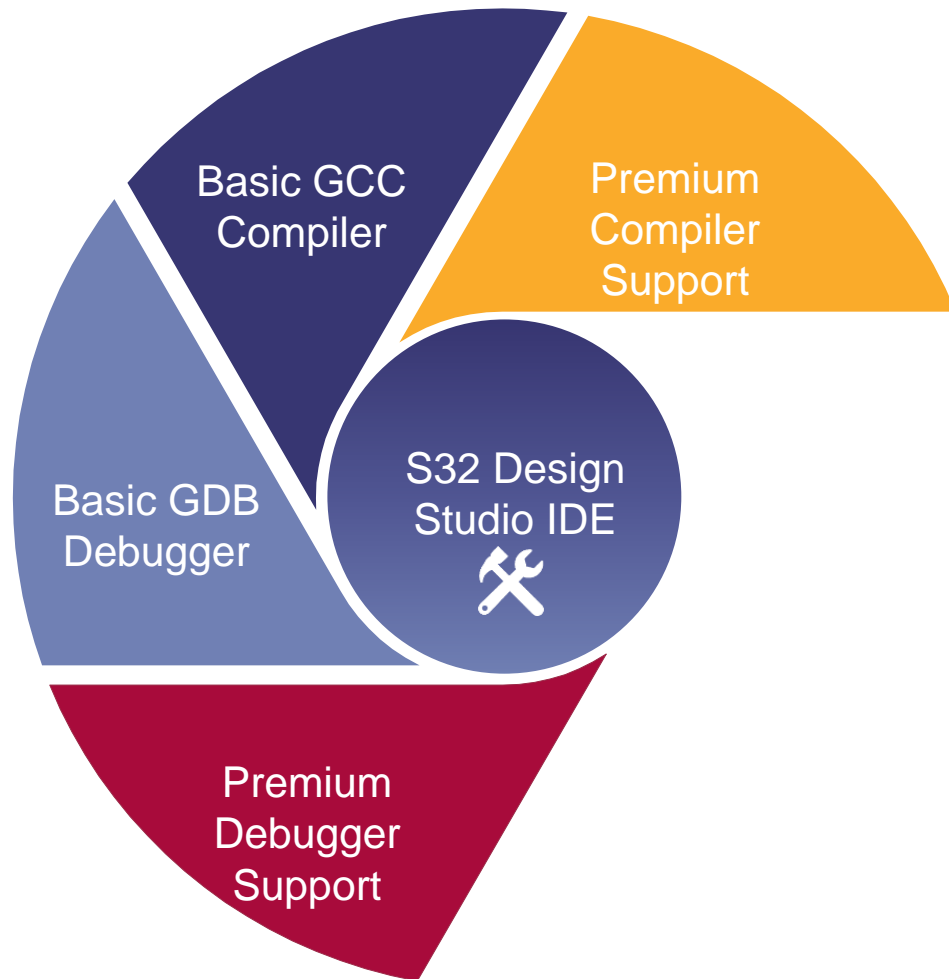- Over 10,000 Eclipse Plug-in Available

Basic GCC Compiler

Basic GDB Debugger

S32 Design Studio IDE

- GNU GDB Debugger
- Basic Debugger interface

S32 Design Studio – Premium Compiler Support

Basic GCC Compiler

Premium Compiler Support
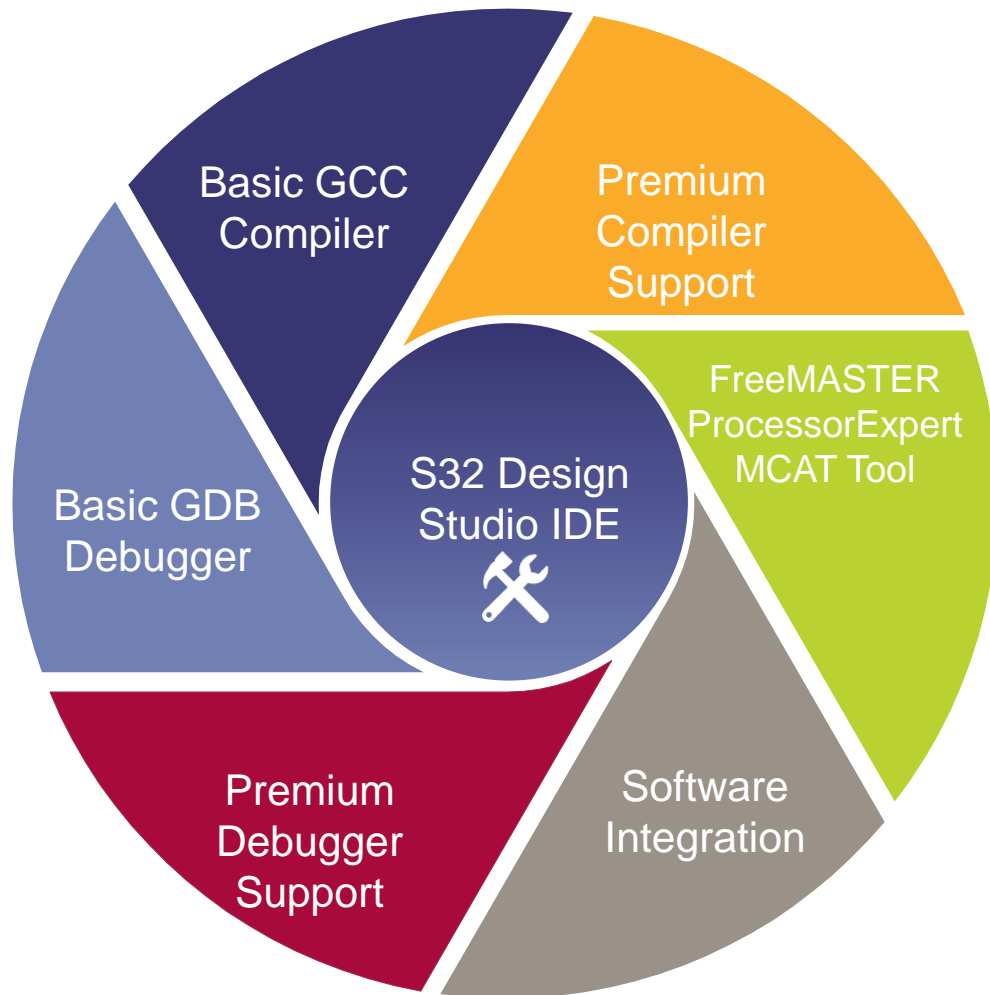
Basic GDB Debugger

S32 Design Studio IDE

- 3rd Party Premium Compiler Support
  – Green Hills
  – IAR
  – Wind River

- ISO Certified compilers to support

  Ex: Green Hills and IAR both have ISO26262 certifications and Certification Kits

- Best in Class Compilers for Code Density
- and Code Performance

S32 Design Studio – Premium Debugger Support

- 3rd Party Premium Debugger Support

- Trace of code execution and advanced debugging with industry leading tools
  - Lauterbach
  - iSystems
  - PLS
  - IAR

S32 Design Studio – NXP Software and Tools Integration

- **NXP Tools Support Integrated**
  - ProcessorExpert
  - FreeMASTER

- **NXP Software integrated as part of a single download package**

- **Automotive Math And Motor Control Libraries**
  - Libraries included
  - Drag & drop functionality

- **Software SDK functions available in the environment**
  - Bare Metal Drivers available directly in tool
  - Drag & drop functionality

Current Tools for Vision Application Development

S32 Design Studio for Vision (S32V)

S32 Design Studio Development Environment for S32V234 by Core

ISP/M0+

ISP Graph Tool
ISP Assembler
Compiler
Debugger
Source Editor
New Project Wizard
Vision SDK
Software Examples

APEX 2

NXP APEX C/C++ Compiler
APEX2 Graph Tool
Debugger
Source Editor
New Project Wizard
Vision SDK
ACF Framework
APEX Emulation of Hardware
Example Projects

M4

C/C++ Compiler
Debugger
Source Editor
New Project Wizard

A53

C/C++ Compiler
Multi-Core Debug Support
Task Aware Debug Support
Source Editor
New Project Wizard
Bareboard & Linux App
Support

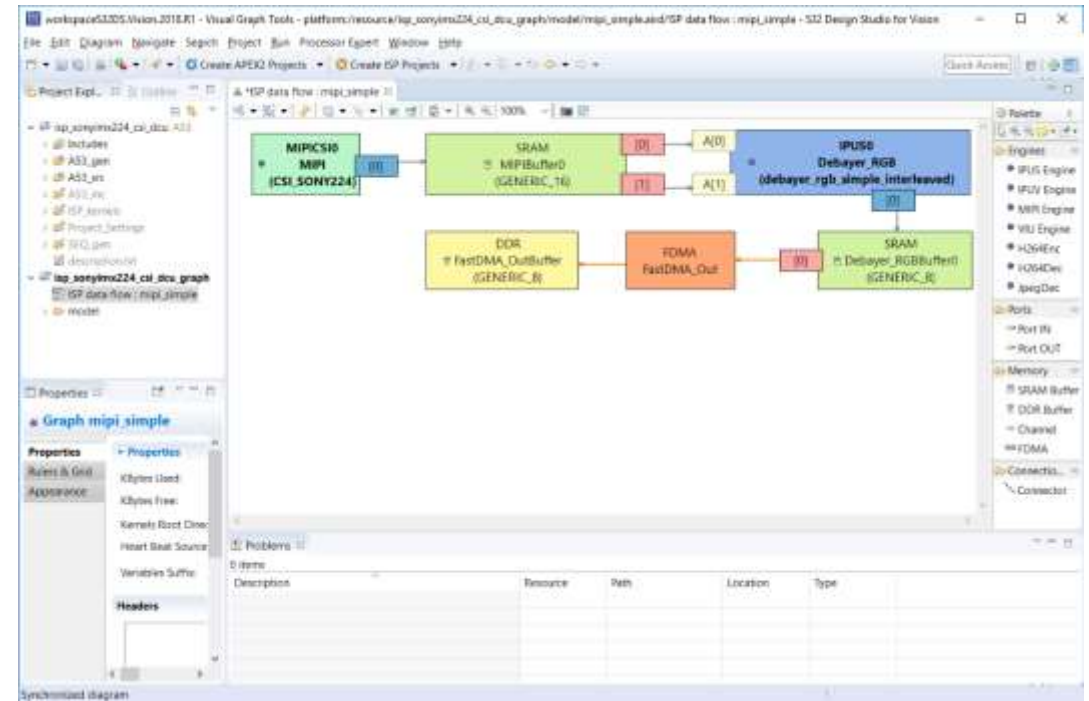Support for both IDE and Command line development on Windows and Linux platforms

Significant Software Integration

- Linux Board Support Package (BSP) Included for SMP A53 Development
  - Support for Linux application build and debug

- Vision Software Development Kit
  - ISP Kernels, ISP Software
  - APEX Kernels, APEX/APU Software
  - APEX CV and APEX CV Pro Libraries

ISP Graph Tool – Example

Vision Algorithm Development on ISP

- New Project Wizard to create starter project
  - including all libraries and SW required

- High Level Graph tools for algorithm formation
  - drag and drop creation of algorithm graphs
  - Graph == Mathematical with Visual Interface

- Vision SDK of Kernels for Vision processing

- Assembler for building executable at a button press

- Debugging Algorithm on ISP Hardware

- Example projects of Vision Processing on ISP

Graph Tools
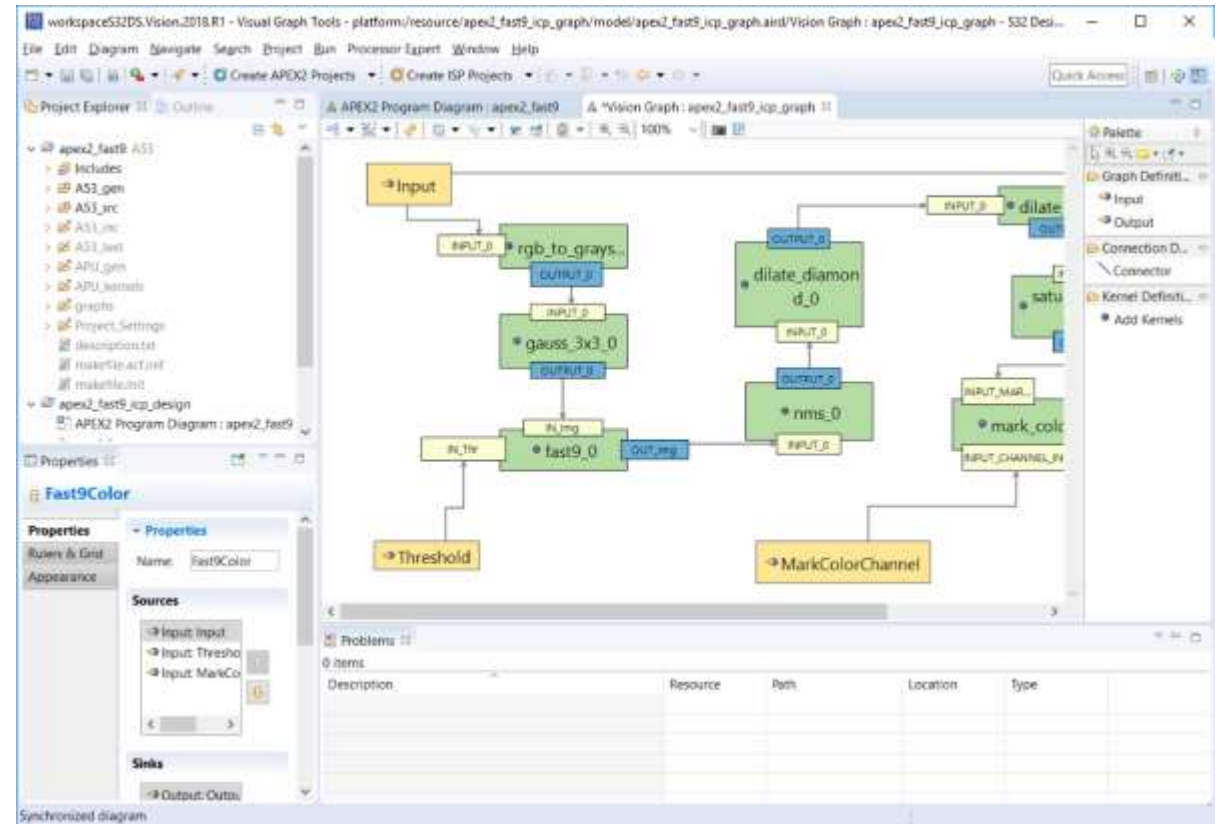## Example: Vision Algorithm Development on APEX2

- New Project Wizard to create starter project
  - including all libraries and SW required

- High Level Graph tools for algorithm formation
  - drag and drop creation of algorithm graphs
  - Graph == Mathematical with Visual Interface

- Vision SDK of Kernels and ACF for Vision processing development on APEX2

- Compiler for building executable at a button press

- Debugging Algorithm on Emulator without Hardware

- Debugging Algorithm on APEX2 Hardware

- Example projects of Vision Processing on APEX2

- 70+ Vision Kernels shipping with tools
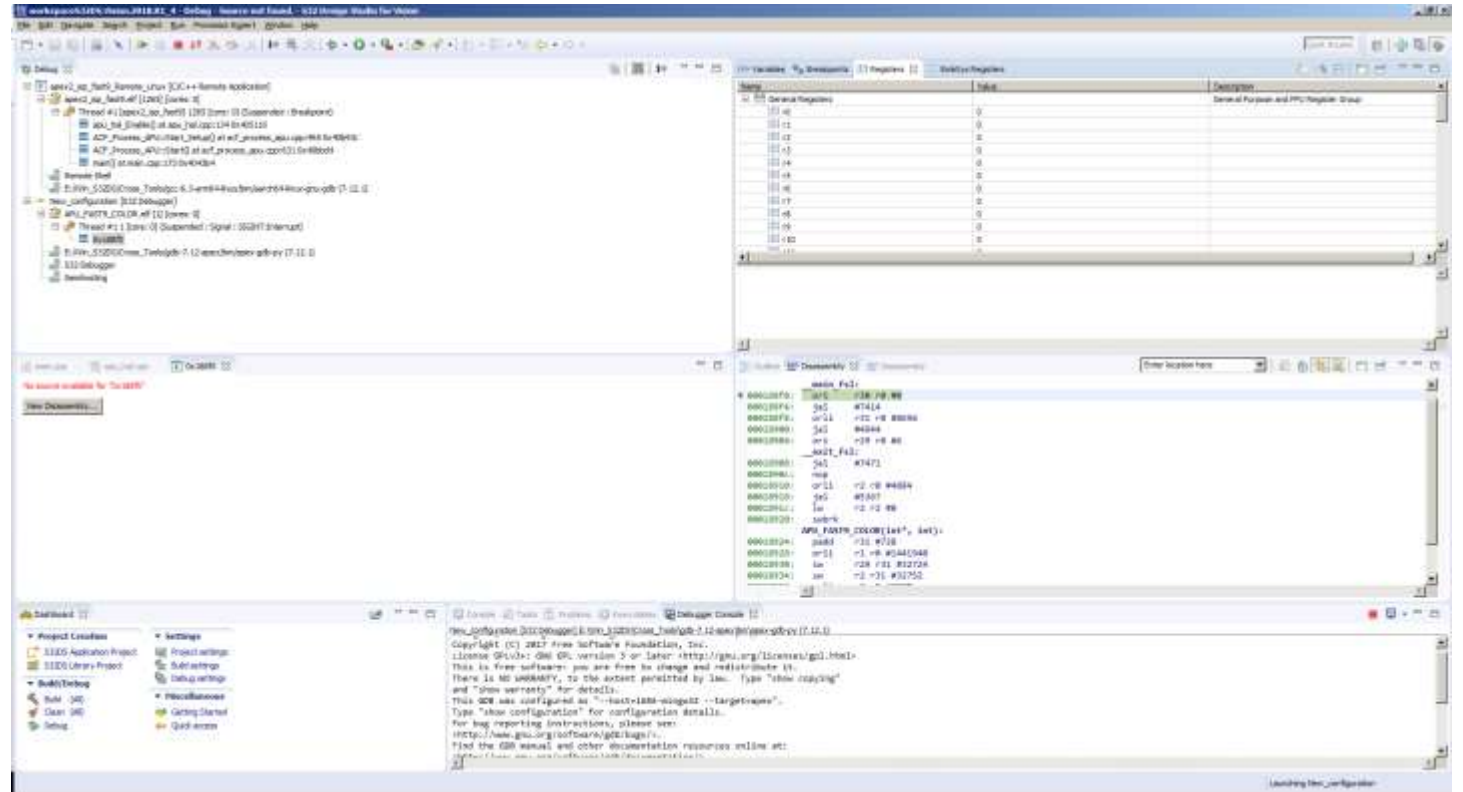
S32 Design Studio for Vision (S32V)

- ## What is New in these tools for 2018.R1 Release – Mid November
  - New S32 Debugger
    - Supports all cores and accelerators on S32V234
  - New S32 Debug Probe
    - $500 USD Probe (Medium Cost Probe)
    - Very Good Performance Probe
  - Updated Vision SDK RTM V1.2
  - Updated BSP Package BSP18
  - Updated Features in ISP/APEX2 Graph Tools

S32 Debugger: GDB Debugger in Eclipse

- Standard GNU Debug Views
- Multi-Core Support
- Accelerator Core Support
- Source Code Debug
- Assembly Code Debug
- Specialized Register View
- Register Views
- Trace Configuration*
- Trace Visualization Support*

* Coming in future release TBD

S32 Debugger: S32 Debug Probe

- USB and Ethernet connections

- Supports Remote access to target system, allowing to interactive debug with target system over the network

- Mid-range ~ $500 (Includes 10 pin and 20 pin JTAG probe tips)

- 400 MHz, 16MB DDR

- Debug features

  - Read Write access to registers and memory

  - Automatic core recognition

  - Scripting and logging

  - GDB, command line

  - Asymmetric multicore debug with cross trigger support

    - Start/Stop cores simultaneously or individually

    - Step through 1 core while others are running or stopped

    - BP on 1 core stops execution on all cores

    - BP on core A with conditions on core B

  - Semi-hosting support for single and multicore devices

  - Flash programming (QuadSPI and on-board flash)

  - Target Reset Supported

  - Debug through Reset and Low Power*

  - Hot connect

  - Debug and Trace* support for accelerators

    - *To be enabled through S32 Debugger in future release TBD

Demo

Summary

What Does S32 Design Studio for Vision Provide…

Industry Standard Toolchain

- Single integrated development environment

- Standard GCC Compilers

- Low Cost Debugger (S32 Debugger) available for all products

- Premium Debugger (Lauterbach) that is seamless plug-in to the toolchain.

Software and Tools in an Integrated Environment

- Operating Systems provided at no cost, Linux integrated into the tool chain

- Tool Interface Drivers integrated into the tool chain

- Vision Software Development Kit with OS and Application Specific functions.

- Tools for Graphical development of Vision processing algorithms
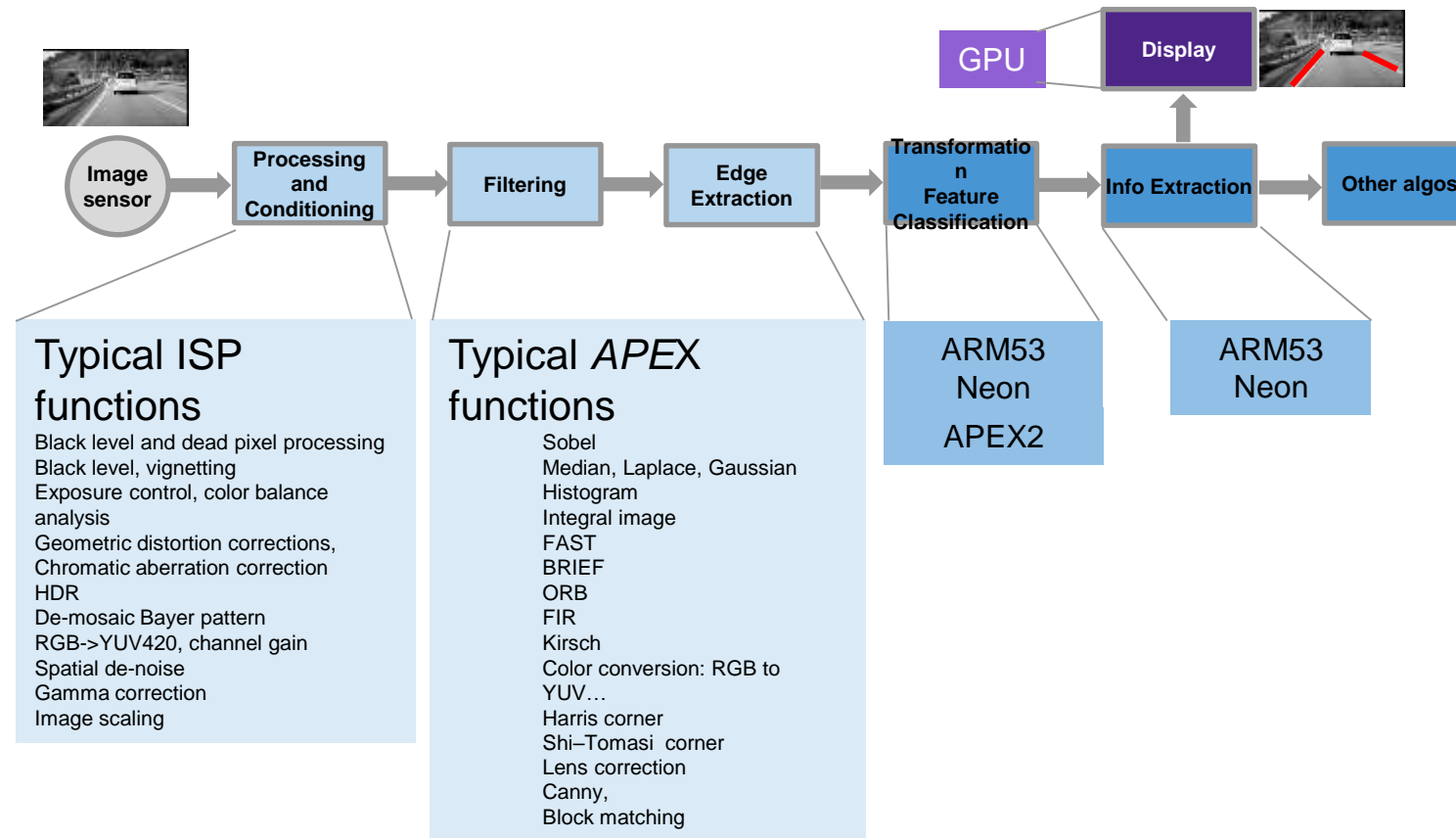
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Backup Slides

S32V234 The Vision Pipeline

Each engine offers the best efficiency for certain type of functions. To let the complete system work at highest efficiency, each engine needs to work in parallel in pipeline mode.

Image sensor → **Processing and Conditioning** → **Filtering** → **Edge Extraction** → **Transformation Feature Classification** → **Info Extraction** → **Other algos**

GPU → Display

Typical ISP functions

Black level and dead pixel processing
Black level, vignetting
Exposure control, color balance analysis
Geometric distortion corrections,
Chromatic aberration correction
HDR
De-mosaic Bayer pattern
RGB->YUV420, channel gain
Spatial de-noise
Gamma correction
Image scaling

Typical *APEX* functions

Sobel
Median, Laplace, Gaussian
Histogram
Integral image
FAST
BRIEF
ORB
FIR
Kirsch
Color conversion: RGB to YUV…
Harris corner
Shi–Tomasi corner
Lens correction
Canny,
Block matching

ARM53 Neon
APEX2

ARM53 Neon

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