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# Using Qt 3D Studio to Design Automotive Instrument Cluster Running on i.MX 8QuadMax

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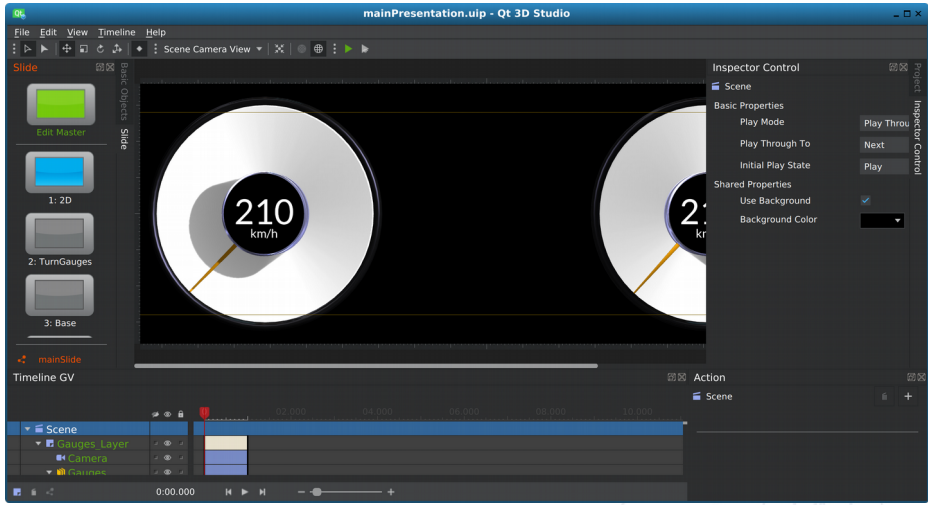
# Overview

- Introduction
  - Qt 3D Studio
  - Instrument Clusters
  - i.MX 8QuadMax System on Chip
- From Qt 3D Studio designing UI to Qt Quick application
- Qt Bring-up on Apalis iMX8QM
- Live Demo

# Qt 3D Studio

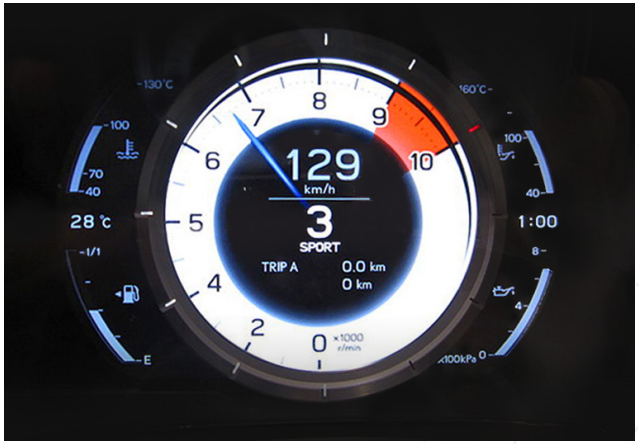



- 3D user interface design tool
- Similar to Qt Quick designer but for 3D UIs
- What You See Is What You Get
- Import FBX or COLLADA assets from 3D authoring tool
- Quickly iterate to match desired user experience
- Viewer running on desktop as well as target hardware

# Qt 3D Studio (cont.)

- 2-Way Qt Quick integration to combine 2D and 3D UIs
  - Use Qt 3D Studio scenes inside Qt Quick applications
  - Render Qt Quick views as textures of 3D elements
- Cross-Platform Support
  - Editor and viewer: Windows, macOS and Linux
  - Runtime: additionally Android, Embedded or RTOS'
- Qt 3D Studio runtime 2.0 now on top of Qt 3D module

# Instrument Clusters

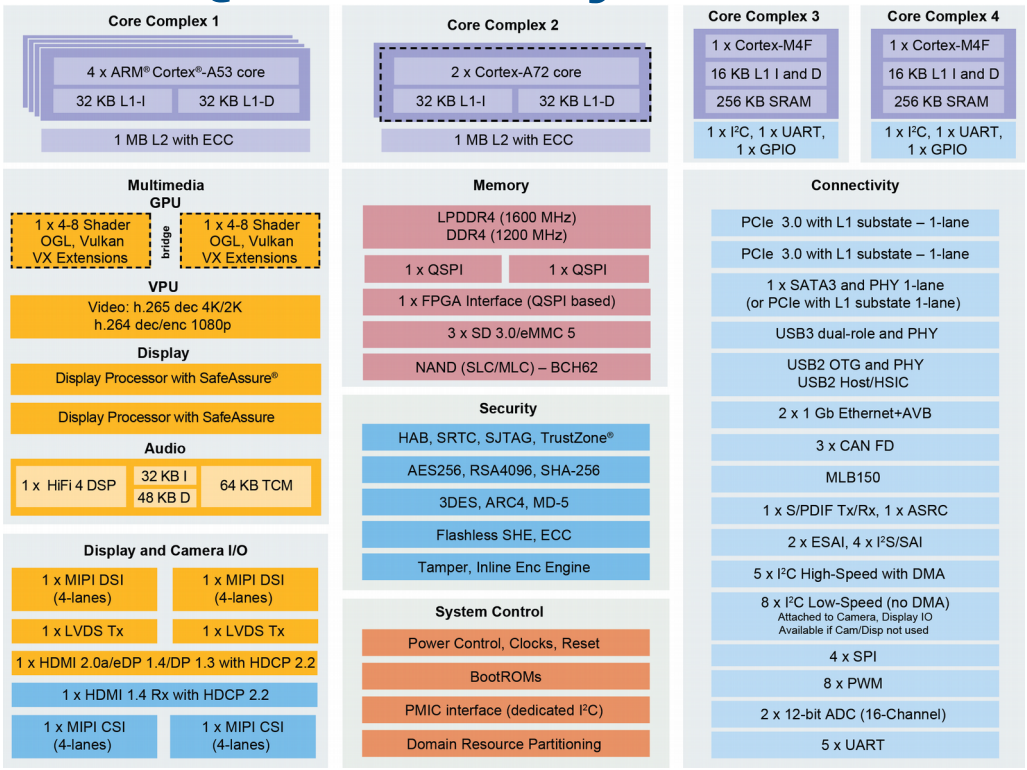



- Evolved from mechanical gauges to fully digital displays
- Integrate trip computer
- Visualise information from various sensors
- Allow for more immersive driver notification
- Qt based 2D instrument clusters widely deployed
- 3D instrument clusters even more appealing

# Instrument Clusters (cont.)

- Safety critical aspects gain traction
- Qt Safe Renderer
- Have a look at the Qt Blog:
  *Functional Safety with the Qt Safe Renderer*
- Future work targeting i.MX 8QM SafeAssure Features

# NXP i.MX 8QuadMax System on Chip



# NXP i.MX 8QuadMax System on Chip (cont.)

- 4 Core Complex':
  - Dual Cortex-A72 @ 1.6GHz
  - Quad Cortex-A53 @ 1.26GHz
  - 2 x Cortex-M4 @ 266MHz
- GPU:
  - Vivante GC7000
  - Quad Independent Display Controller with SafeAssure
  - HDMI V2.0a, eDP 1.4, DP 1.3 with 2160p 4K UHD

# NXP i.MX 8QuadMax System on Chip (cont.)

- 3 x CAN FD
- Dual Quad Lane MIPI CSI
- Dual Gigabit with AVB
- Dual PCIe GEN3
- USB 3.0 SuperSpeed Host
- VPU 4K h.265 Capable

# From Qt 3D Studio Designing UI to Qt Quick Application

- First how to get Qt 3D Studio
  - Both editor as well as runtime required
  - Editor available in tools section of Qt Online installer
  - So far only binaries for Windows and macOS
  - I’m on Linux so let’s build it ourselves

# Building Qt 3D Studio on Linux

http://code.qt.io/cgit/qt3dstudio/qt3dstudio.git/tree/build_instructions

- Pretty straight forward build instructions
- Dependency on Autodesk FBX SDK
- Careful requires later Qt version then listed!
- Qt 3D Studio 2.0 actually requires Qt 5.11!

# Building Qt 3D Studio on Linux (cont.)

- Open qt3dstudio.pro in Qt Creator
- Build (and get a big cup of coffee…) and run it as usual
- While 2.0 beta worked fine on my Fedora with Wayland
- Released 2.0 causes issues so back to Xorg

# Building Qt 3D Studio Runtime

http://code.qt.io/cgit/qt3dstudio/qt3d-runtime.git

- Built as part of editor for desktop
- Dependency on Qt 3D module
- Required for your target hardware
- Build and deploy it as usual

# Getting Started With Qt 3D Studio

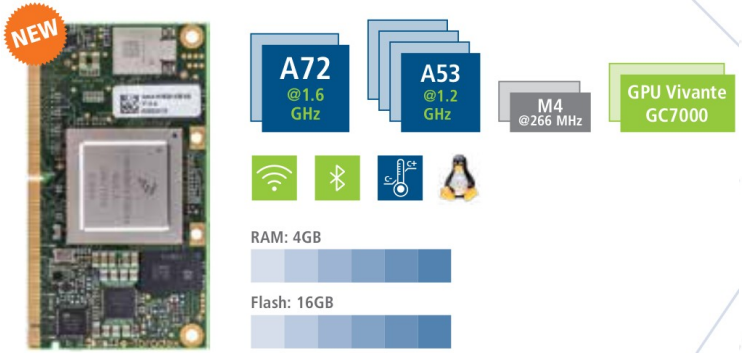
https://www.qt.io/3d-studio

- Find two introductory videos
- Webinar recording showing more in-depth usage

# 3D Instrument Cluster Demo

https://git.qt.io/public-demos/qt3dstudio/tree/master/kria-cluster-3d-demo

# Qt Bring-up on Apalis iMX8QM




- NXP plans i.MX 8QuadMax launch later this year
- Toradex is early launch partner
- Alpha silicon with certain limitations already available
- PMIC configuration unclear: pre-programmed for now
- No information on fusing therefore strapped for now
- Booting off SD card rather than on-module eMMC

# Qt Bring-up on Apalis iMX8QM (cont.)

- Initial bring-up Linux L4.9.51 for i.MX 8QuadMax Alpha
  - No HDMI integration yet
  - VPU not supported
  - Luckily OpenGL running quite nicely
- Required System Controller Firmware (SCFW) integration
  - Clocking
  - Power Gating

# Qt Bring-up on Apalis iMX8QM (cont.)

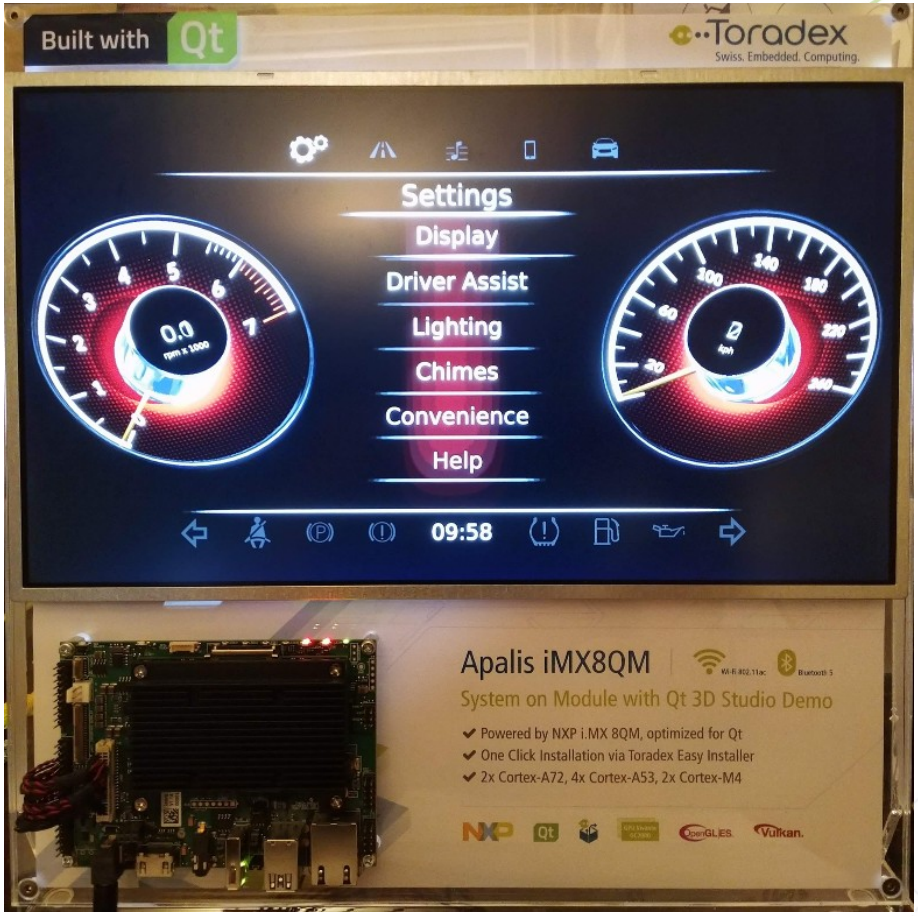
- Migrating Linux L4.9.51 for i.MX 8QuadMax Beta1/Beta2
  - Integrated HDMI firmware
  - Broke PCIe (trying to convince NXP about it)
  - SCFW ever changing target
  - Tricky for open-sourcing to mainline

# Qt Bring-up on Apalis iMX8QM (cont.)

- Qt For Device Creation aka Boot2Qt since 5.11.0 rc2
  - Initial Qt 3D module bug related to Vivante drivers fixed thanks to Qt Company engineers
- Custom Yocto Project Boot2Qt image build
  - Early Apalis iMX8QM BSP available on our github
  - Integrating Qt 3D Studio Runtime
  - Integrating Cluster Demo

# Live Demo

- Toradex Apalis iMX8QM early sample
- Toradex Ixora carrier board
- Dual channel full HD LVDS display without touch
- Automotive Instrument Cluster


Built with Qt
Toradex
Swiss. Embedded. Computing.
Settings
Display
Driver Assist
Lighting
Chimes
Convenience
Help
09:58
Apalis iMX8QM
System on Module with Qt 3D Studio Demo
Powered by NXP i.MX 8QM, optimized for Qt
One Click Installation via Toradex Easy Installer
2x Cortex-A72, 4x Cortex-A53, 2x Cortex-M4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