Qualcomm® Snapdragon™ embedded platforms HW and SW Overview

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Qualcomm Snapdragon is a product of Qualcomm Technologies, Inc.

Agenda

1 Chipset overview

2 Hardware sub-systems and typical applications

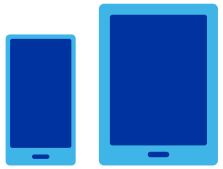
3 Development platforms (DragonBoard)

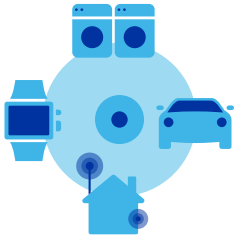
4 Software distributions and features overview

5 Eco system

Bringing Snapdragon platforms to embedded devices

Identifying the challenges





	Mobile OEMs	Embedded Customers
Relationship	○ High touch, 1-1	○ Low-touch, web-based
Primary fulfillment	○ Direct	○ Distribution
Minimum order	○ 10,000s	○ 100
Customers	○ High dependency, few	○ Low dependency, many
Roadmap influence	○ Strong	○ Weak
Engineering capability	○ Strong, large teams	○ Varied, small teams
Primary support	○ Direct	○ Web-based/Contract work
End-product volume	○ High	○ Low
Design type	○ Iterative	○ Clean-slate

Snapdragon 410E and 600E embedded platforms

Drawing from the mobile portfolio for a targeted, tiered offering

Snapdragon 600E

1.5 GHz quad-core Qualcomm® Krait™ 300 CPU

Snapdragon 410E

1.2 GHz quad-core ARM v8 Cortex-A53, 32/64-bit capable

Supported for longevity

- Available through distribution for a minimum of 10 years from Snapdragon 600 and 410 commercial sample in 2015

Available through Arrow Electronics

- 1st time Snapdragon platforms are sold through 3rd party distribution

Qualcomm Krait is a product of Qualcomm Technologies, Inc.

Snapdragon embedded platforms

Snapdragon 410E

Application Processor - APQ8016E
- 12 mm x14 mm non-PoP package size
- LPDDR2/3 533 MHz single channel
- Quad ARM Cortex A53 at 1.2GHz per core

Power module - PM8916
- Power management and codec IC
- 6.2 mm x 6.2 mm

Connectivity - WCN36x0
- WCN3620/3660B - 802.11 b/g/n
- Bluetooth 4.x/LE
- 3.3 mm x 3.5 mm

Location - WGR7640
- Integrated Location (GNSS, GPS) support
- 2.1 mm x 1.5 mm

Snapdragon 600E

Application Processor - APQ8064E
- 23 mm x 23 mm non-PoP package size
- Dual DDR3/DDR3L up to 533MHz
- Quad core Krait 28LP-LVT up to 1.5GHz

Power module - PMM8920AU
- Power Management
- 13.9 mm x 12.3 mm

Connectivity - QCA9377 module
- QCA9377 - 802.11a/b/g/n/ac 1x1 DB 2.4GHz/5GHz
- Bluetooth 4.1
- 18.0 mm x 17.0 mm module, FCC pre-certified

Location - RGR7640AU
- Integrated Location (GNSS, GPS) support

Audio - WCD9311
- Next Gen Audio Codec
- 6.0 mm x 6.0 mm

Ethernet (optional) - AR8151
- Ethernet connectivity

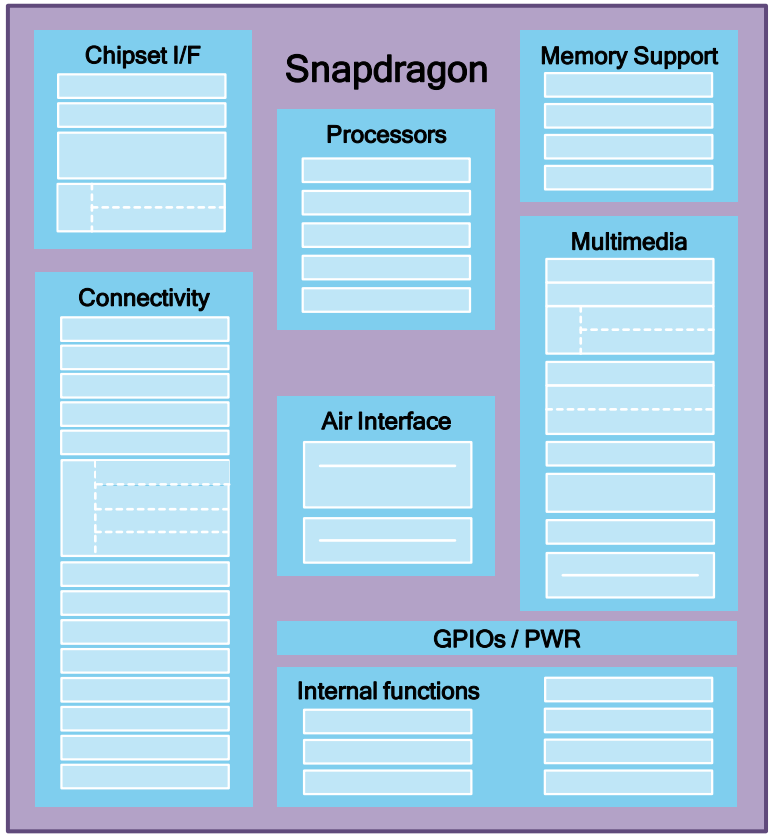
APQ8016E, PM8916, WCN3620/3660B, WGR7640, APQ8064E, PMM8920AU, RGR7640, QCA9377, AR8151 and WCD9311 are products of Qualcomm Technologies, Inc.

Snapdragon sub-systems

Chipset Interface
- PMIC / WCN / Codec busses
- Analog interfaces (ADCs / DACs)

Air Interface
- Integrated GPS modem
- Integrated WLAN / BT modem

Wired Connectivity
- USB
- PCIe
- GPIOs
- Programmable serial interfaces (I2C / SPI / UART)
- Secure Digital (SD)
- I2S



Memory
- DDR
- eMMC
- Internal memory

Multimedia
- GPU
- VFE
- Display controller
- Camera controller
- ISP
- Audio

Internal Functions
- Security
- Debugging (e.g., JTAG)
- Housekeeping
- Clocks & power

Processors and memory

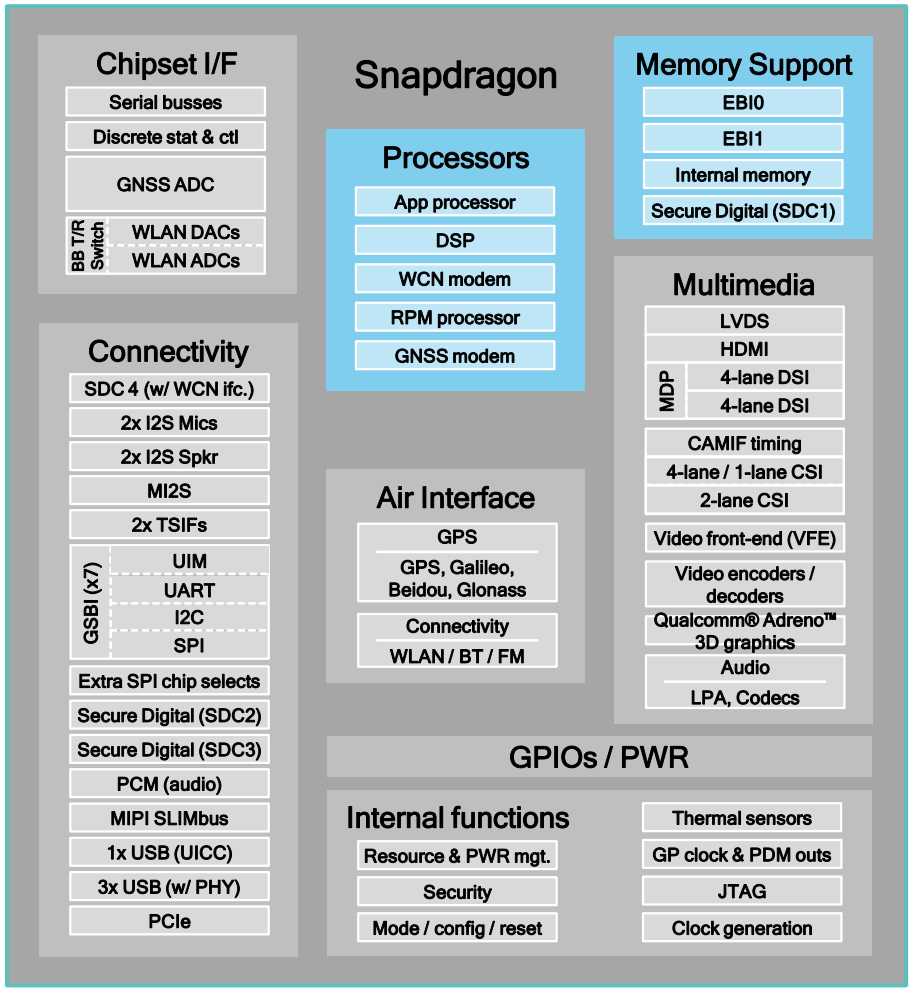
Snapdragon 410E

Application Processor
- Quad core
- 64-bit Cortex A53 (ARM v8) up to 1.2GHz
- 512kB L2 cache

DSP
- Qualcomm® Hexagon™ QDSP6 V5 core up to 691MHz

Supporting processors
- RPM, Cortex M3

Memory
- LPDDR2/3, 32-bit, up to 533MHz
- eMMC v4.5
- iMEM 128kB



Snapdragon 600E

Application Processor
- Quad core
- 32-bit Krait uP (ARM v7 compliant) up to 1.5GHz
- 2MB L2 cache

DSP
- Qualcomm ® Hexagon™ QDSP6 V4 core up to 500MHz

Supporting processors
- RPM, ARM7
- SPSS, ARM7

Memory
- DDR3, 32-bit, dual channel (4 chip-selects), up to 4GB density, up to 533MHz
- eMMC v4.5
- iMEM 256kB LMEM + 192kB MIMEM

Qualcomm Hexagon and Qualcomm Adreno are products of Qualcomm Technologies, Inc.

Multimedia

Snapdragon 410E

Display support
- 1080p external displays supported
- HDMI via converter

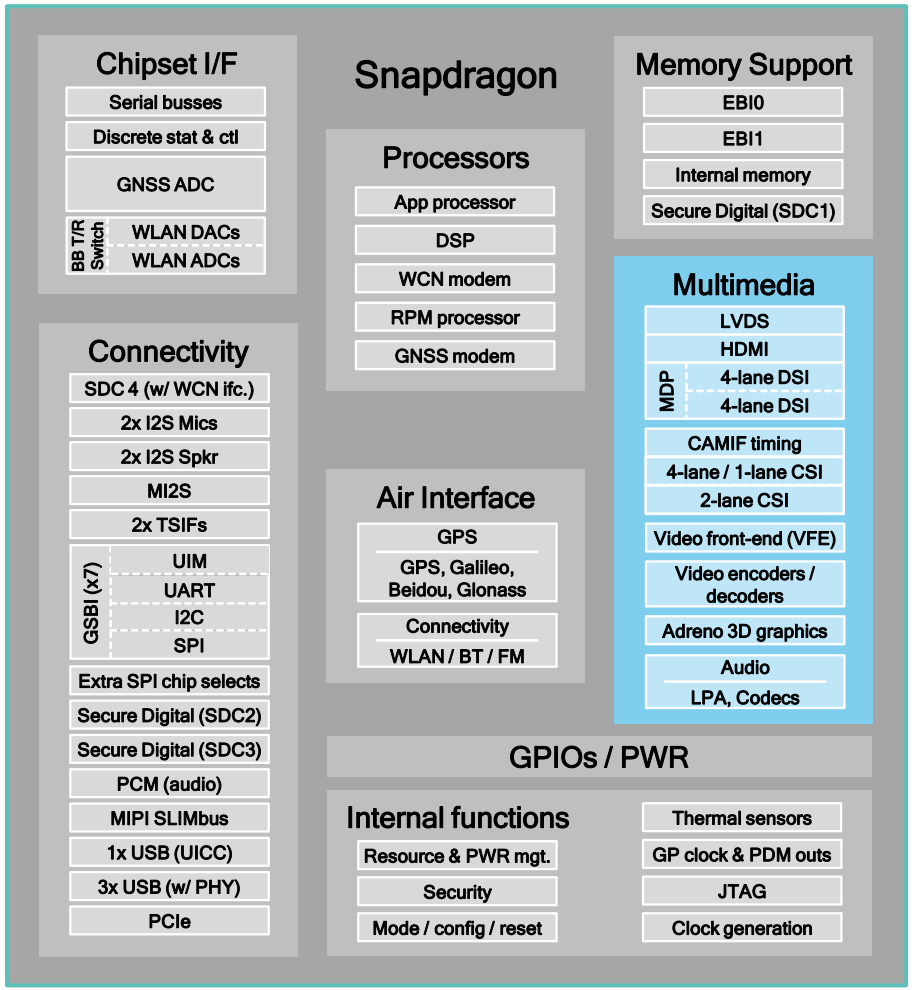
Image processing
- Up to 2x CSIs
- 4-lane CSI up to 13MP
- 2-lane CSI 8MP web cam

Qualcomm® Adreno™ 306 GPU (400 MHz)
- 3D graphics accelerator
- On-chip graphics memory (128 kB unified SRAM)

Video Decode
30 fps 1080p (MPEG-4/H.264/H.263/DivX/MPEG2/VC1/Soreson/VP8)

Video Encode
30 fps 1080p (MPEG-4/H.264/VP8/H.263)

Audio
- 5.1 surround sound with Dolby and DTS
- Low Power Audio Core
- DSP Post-Proc programmability



Snapdragon 600E

Display support
- 2560x1600 via 2xDSI
or
- 2048x1560 via 1xDSI
- 2048x1536 via LVDS
- 1080p HDMI port

Image processing
- Up to 3x CSIs
- 4-lane CSI:
- Up to 20MP in-line JPEG encode at 15 fps
- 60 fps WXGA viewfinder frame rate
- 2-lane CSI 8MP web cam
- 1-lane CSI 3D cam support

Qualcomm® Adreno™ 320 GPU (400+ MHz)
- 200 M peak triangles/sec; 6.4 B vector shader instructions/sec; 3.2 BP/sec; 3.2 B texel/sec
- On-chip graphics memory 512 KB for fast Z, color, and stencil rendering

Video Decode
30fps 1080p (MPEG-4 / MPEG-2 / H.264 / H.263 / DivX / VC-1 / WMV-9)
30fps D1 @ FWVGA (H.263)

Video Encode
30fps @1080p (MP4/H.264)
30fps @ D1 (H.263)

Audio
- Dolby 7.1 surround sound with Digital Plus audio
- Low Power Audio Core
- DSP Programmability

Qualcomm Adreno is a product of Qualcomm Technologies, Inc.

Wired Connectivity

Snapdragon 410E

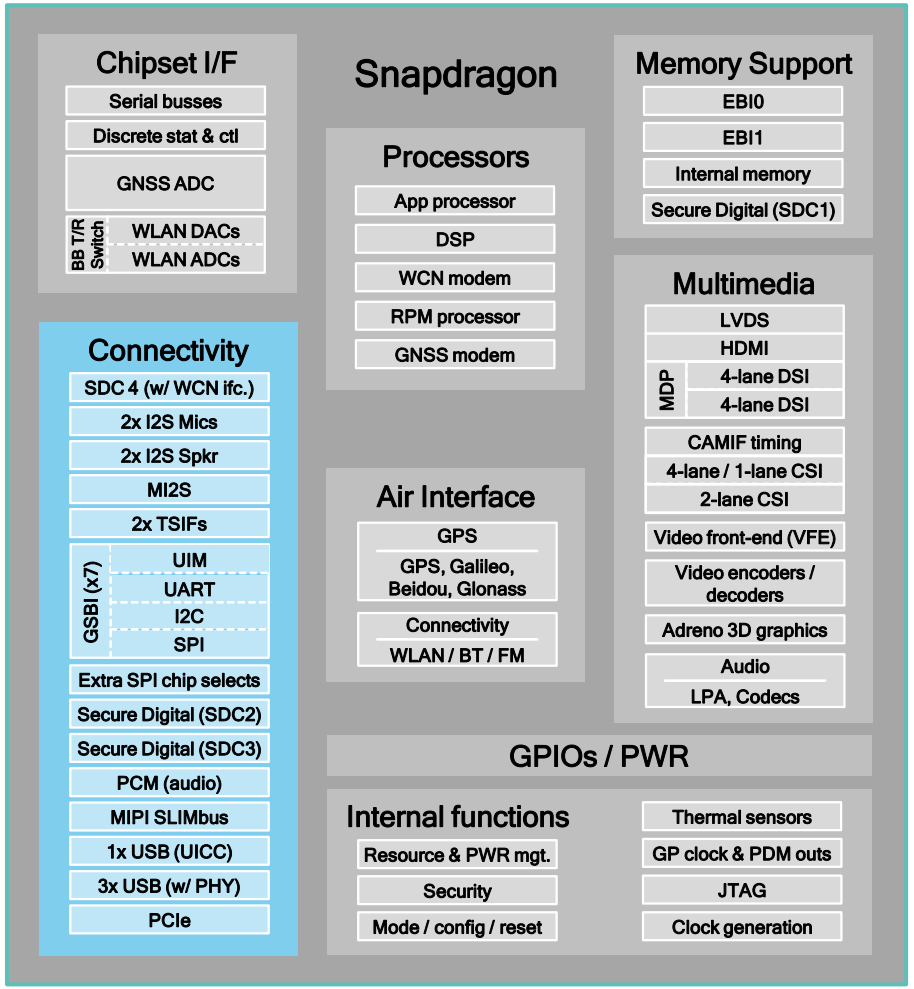
USB
- 1x USB 2.0 HS ports (w/ build-in PHY)

Secure Digital
- 2x ports
- Supports SD3.0 and MMC, eMMC4.5 NAND flash, SD/eMMC boot
- Different operating voltages

BLSP
- 6x 4-bit wide ports
- Multiplexed serial interfaces
- UART, I2C, SPI (master), GPIO

GPIOs
- 122x GPIOs
- Top-level mode multiplexer
- Input config: pullup, pulldown, keeper, no-pull
- Output config: drive strength

Audio
- DMIC
- 2x MI2S (2-bit)
- CDC PDM port



Snapdragon 600E

USB
- 3x USB 2.0 HS ports (w/ build-in PHY)
- 1x USB 2.0 FS port
- 1x HSIC

Secure Digital
- 4x ports
- Supports SD3.0 and MMC, eMMC4.5 NAND flash, SD/eMMC boot

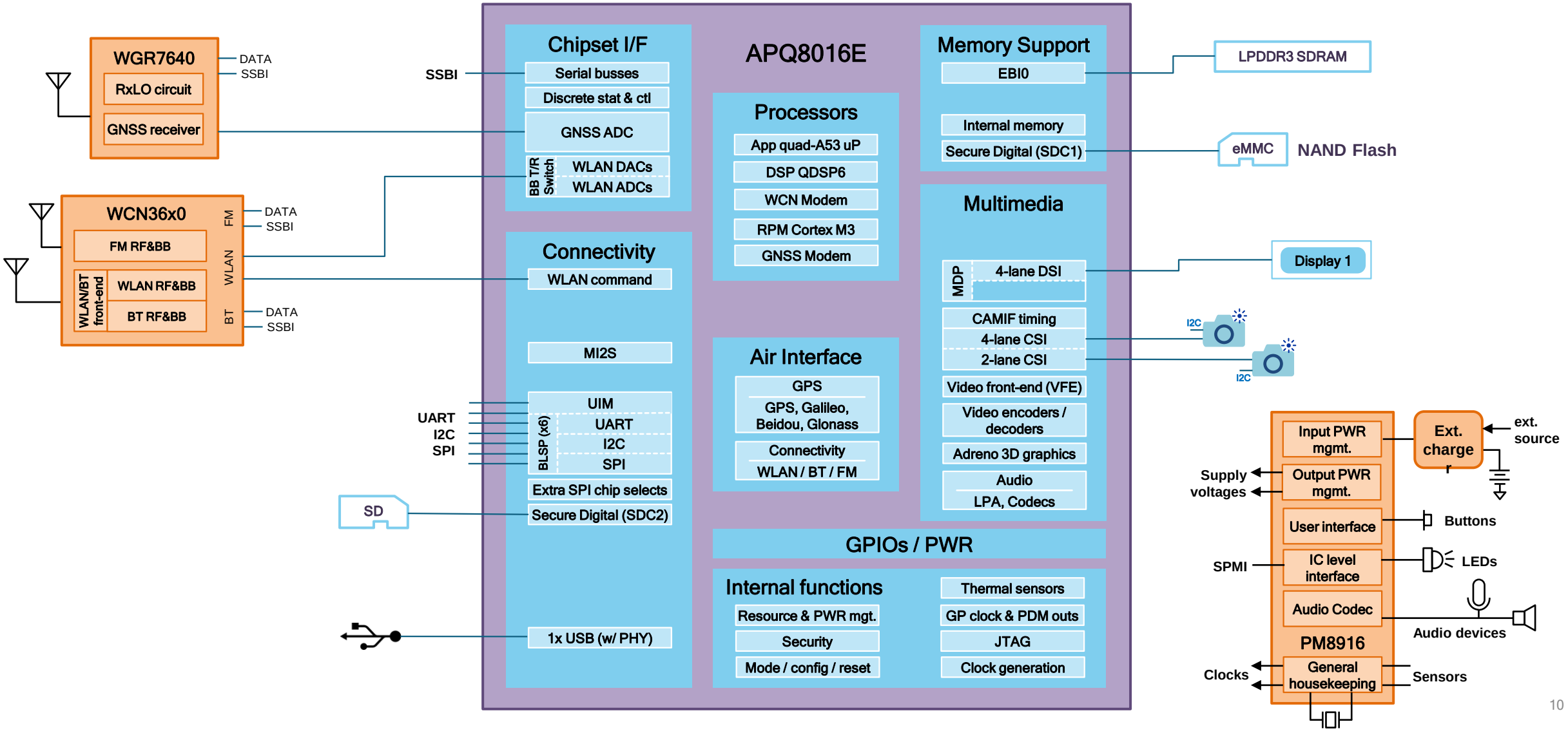
PCIe
- 1-lane PCIe 2.0

GSBI
- 7x 4-bit wide ports
- Multiplexed serial interfaces
- UART, UIM, I2C, SPI (master), GPIO

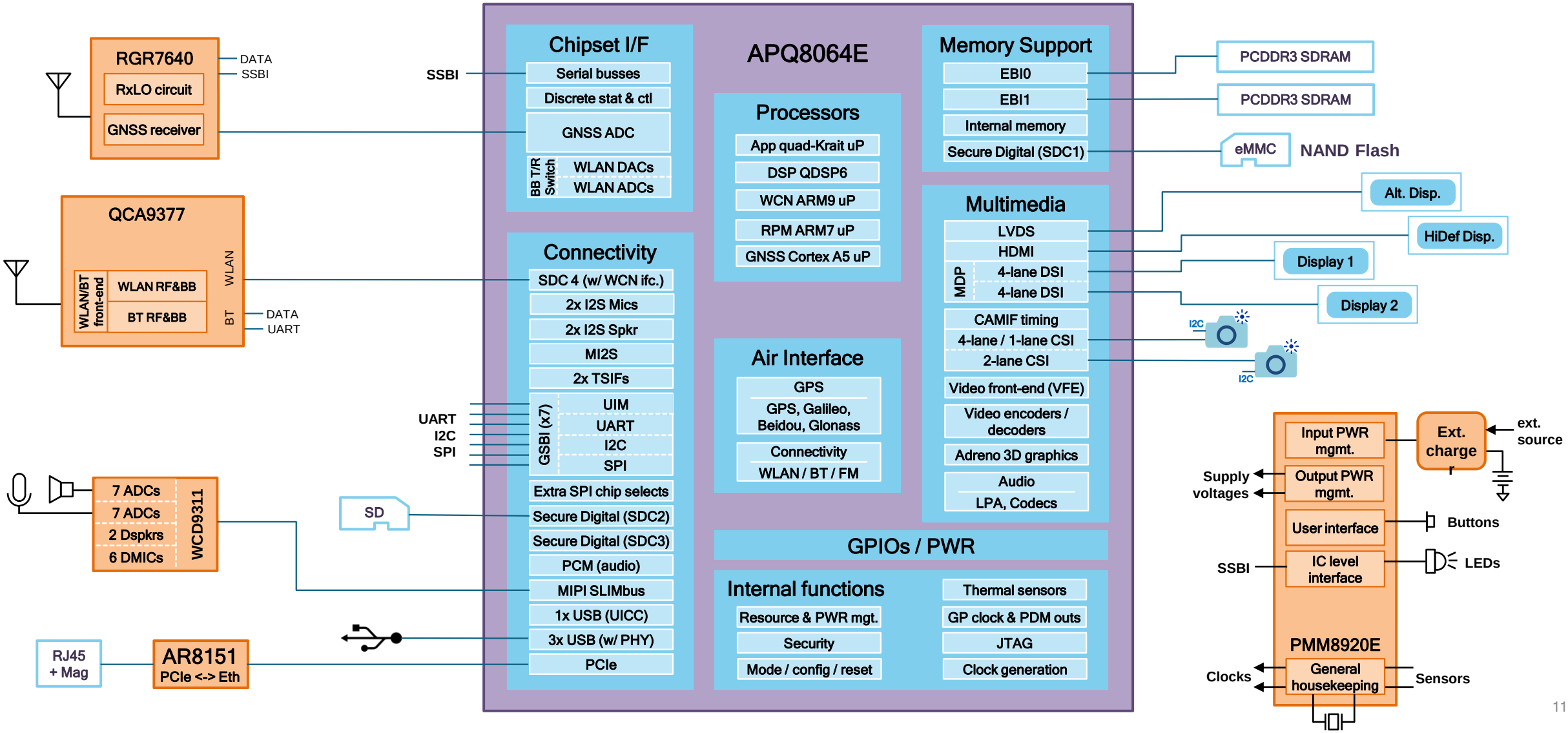
GPIOs
- 90x GPIOs
- Top-level mode multiplexer
- Input config: pullup, pulldown, keeper, no-pull
- Output config: drive strength

Audio
- 4x I2S / 1x MI2S (4-bit)
- SLIMbus
- PCM

Snapdragon 410E typical application



Snapdragon 600E typical application



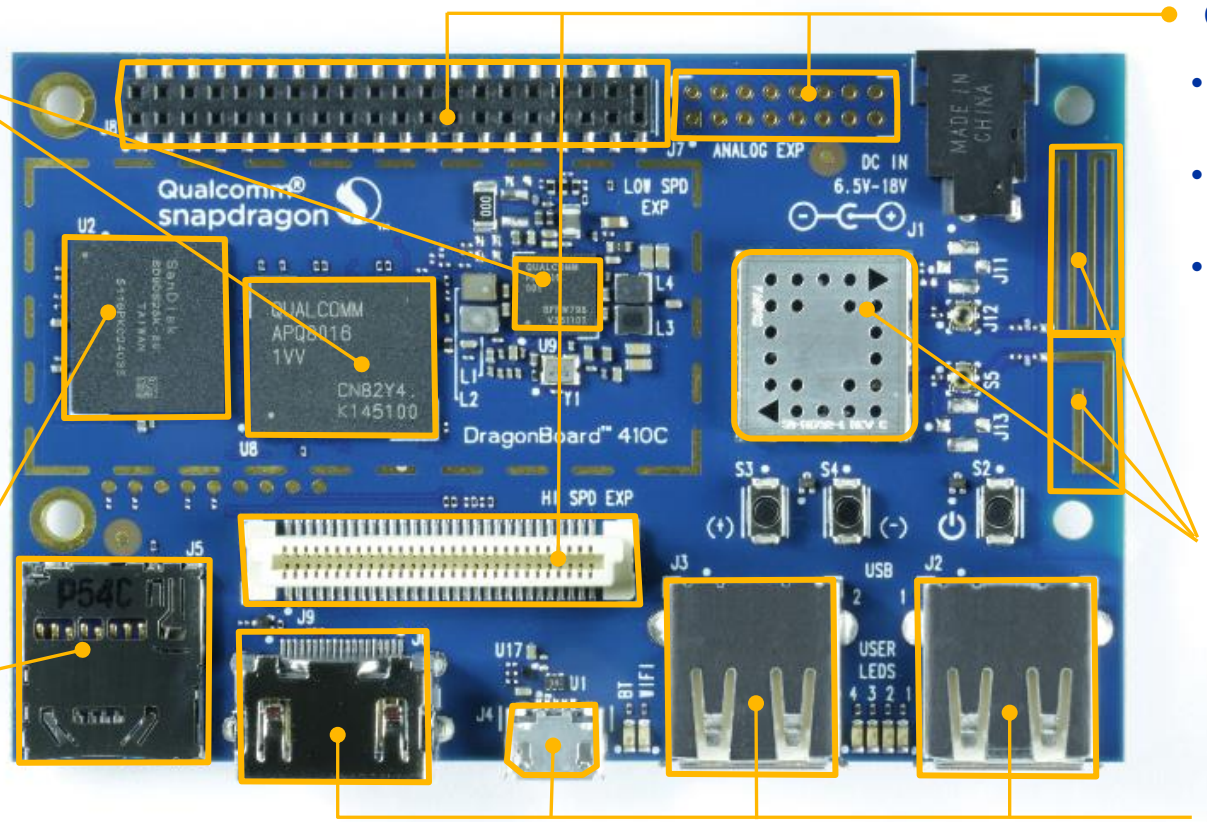
DragonBoard™ 410c development board overview

Powerful processing and multimedia capabilities

- Snapdragon 410E Processor
- Quad-core ARM Cortex A53
- Adreno 400MHz PC-class graphics
- Power management and audio codec

Memory and storage

- 1GB LPDDR3
- 8GB eMMC 4.5
- Micro SD card slot



A wide array of expansion capability

- One 40-pin low-speed (LS) expansion connector
- One 60-pin high-speed (HS) expansion connector
- Footprint for one optional 16-pin analog expansion connector
  - e.g. Stereo headset/line-out, speaker and analog line-in

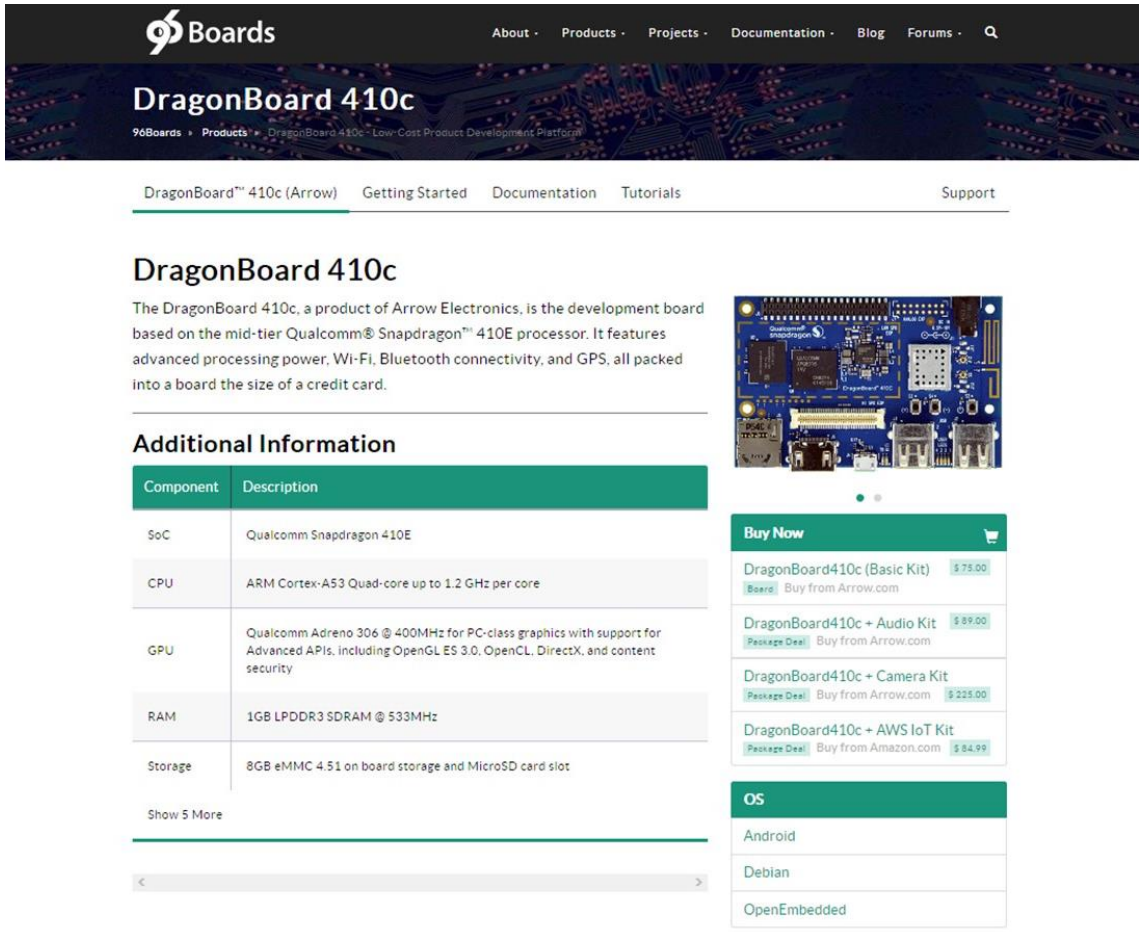
Integrated connectivity

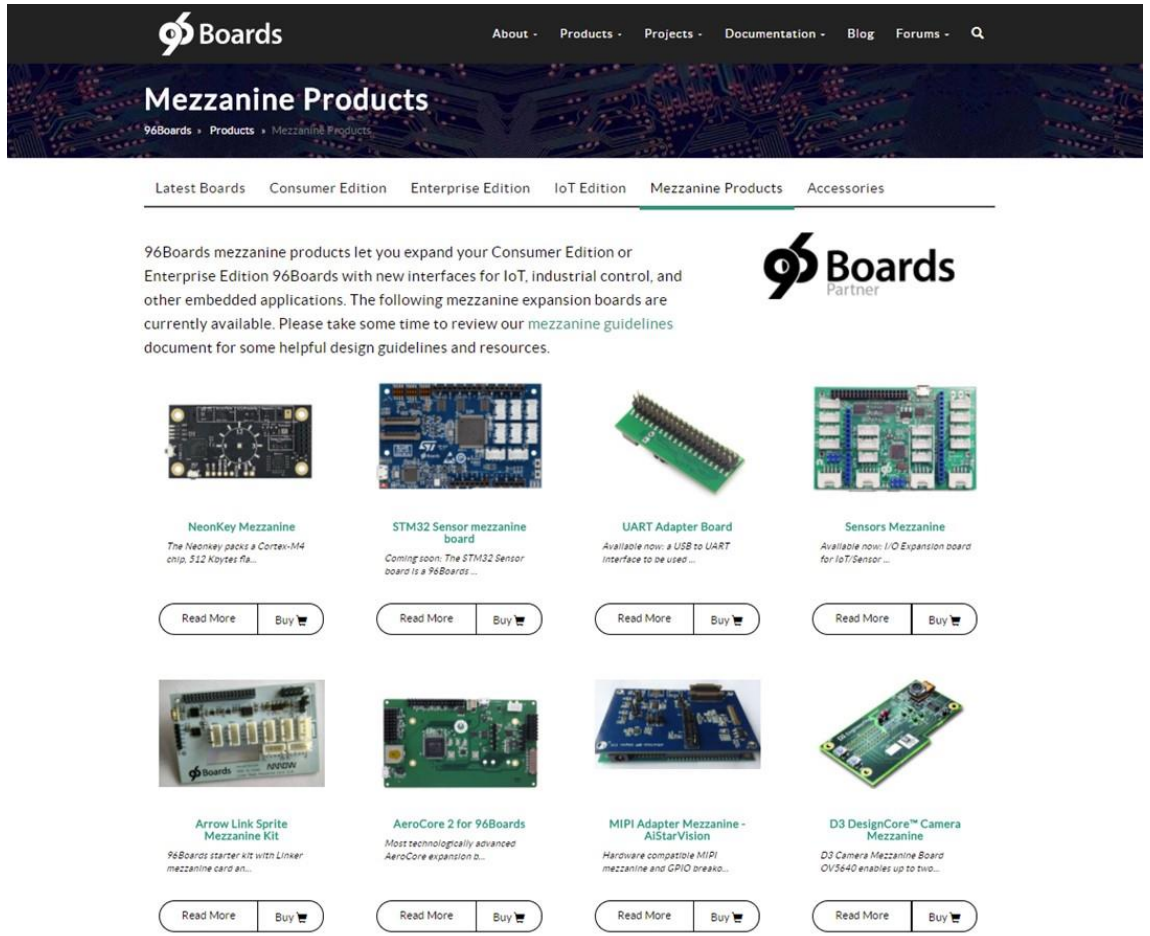
- Wi-Fi, Bluetooth, GPS
- On-board Wi-Fi & GPS antennas

I/O Interfaces

- HDMI full-size
- USB

DragonBoard™ 410c – an evaluation and enablement tool





https://www.96boards.org/product/dragonboard410c/

https://www.96boards.org/products/mezzanine/

QUALCOMM®

Software Overview

HLOS supported for community and commercial use

Commercial Distributions

Linux Open Embedded/Yocto from Qualcomm Technologies

- Recommended for commercial customers
- Tested and packaged by Qualcomm Technologies
- Highly flexible and customizable
- Upstream LTS kernels
- Variety of 3rd parties providing support services

Ubuntu Core

- Recommended for commercial customers
- Supported on Snapdragon 410E embedded platform
- Support via 3rd parties

Windows 10 IOT Core

- Recommended for commercial customers
- Supported on Snapdragon 410E embedded platform
- Support via 3rd parties

Community Distributions

Linux Debian from Linaro

- Developed for community by Linaro
- Out of the box Desktop experience for evaluation and fast prototyping
- Upstream LTS kernels
- Community support through 96boards.org forums

Linux Open Embedded/Yocto from Linaro

- Developed for community by Linaro
- Highly flexible and customizable
- Upstream LTS kernels
- Community support through 96boards.org forums

Android

- For hobbyist projects
- Supported on DragonBoard 410c

Software Features (Snapdragon 410E)

OS
Linux Open Embedded/Yocto Morty, Kernel 4.9 -> 4.14

Wireless Connectivity
WiFi STA and HostAP (supplicant and network manager layers)
Bluetooth via BlueZ Stack
GPS via GPSD

Wired Connectivity
Flash Memory, SD Card (storage and boot)
USB - storage, HID, Camera, Ethernet, Audio, 3G/4G modem
GPIOs, I2C, SPI, UART (96board compliant)

Display/Video/Graphics
HDMI/DSI, Xorg and Wayland, OpenGL, Accelerated Video decoding and encoding (H.264 via V4L2)

Audio
Analog, HDMI, USB, BT via ALSA or pulseaudio

Camera
MIPI CSI YUV, USB

Security
Secure Boot

Other
Chromium Browser (not accelerated)
Fastboot
Qualcomm Technologies tools (QPST, QRCT, QXDM)

Software Features (Snapdragon 600E)

OS
Linux Debian Sid, Kernel 4.14

Wireless Connectivity
WiFi STA and HostAP (supplicant and network manager layers)
Bluetooth via BlueZ Stack

Wired Connectivity
Flash Memory, SD Card
USB - storage, HID, Camera, Ethernet, Audio, 3G/4G modem
GPIOs, I2C, SPI, UART (96board compliant)

Display/Video/Graphics
HDMI, Xorg, OpenGL

Audio
HDMI, USB, BT via ALSA or pulseaudio

Other
Chromium Browser (not accelerated)
Fastboot

Upstream and Software Updates

“Upstream First” Paradigm

- Features are developed and upstreamed as early as possible

Open Source

Easy to work with

Enables generic Linux developers to work with our products

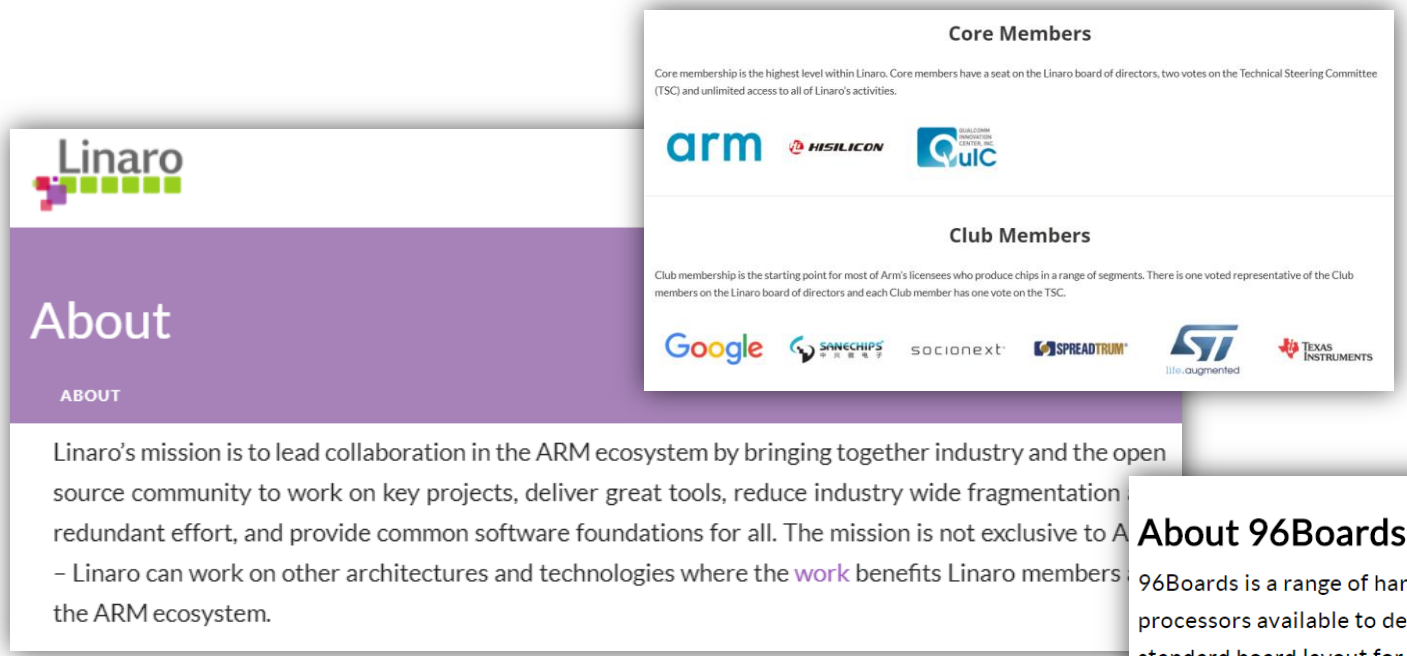
Major Annual Updates (~March)

- Long Term Support (LTS) Kernels
- Open Embedded / Yocto Upgrades

Minor Quarterly Feature and Fixes Updates

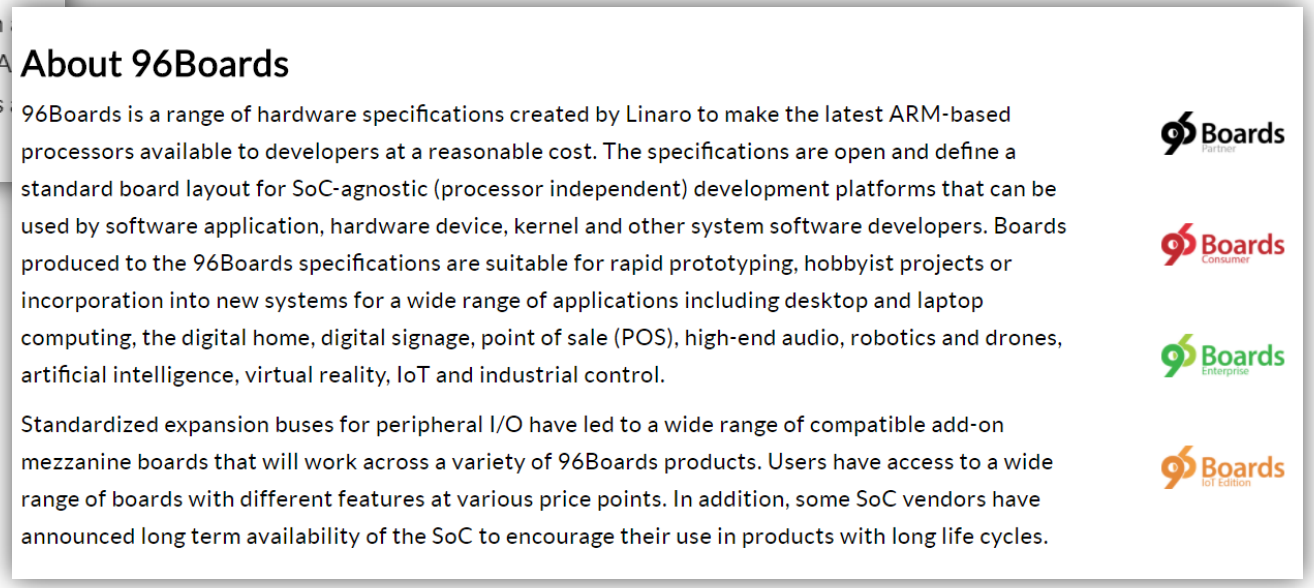
- Cadence may be reduced in later stages of the product life

Linaro and 96boards



https://www.linaro.org

https://www.96boards.org



Ecosystem

96boards.org Forums

- https://discuss.96boards.org/c/products/dragonboard410c

3rd party Software Providers

eInfochips

HW and SW
consulting and support

Intrinsyc

HW and SW
consulting and support

Inforce Computing

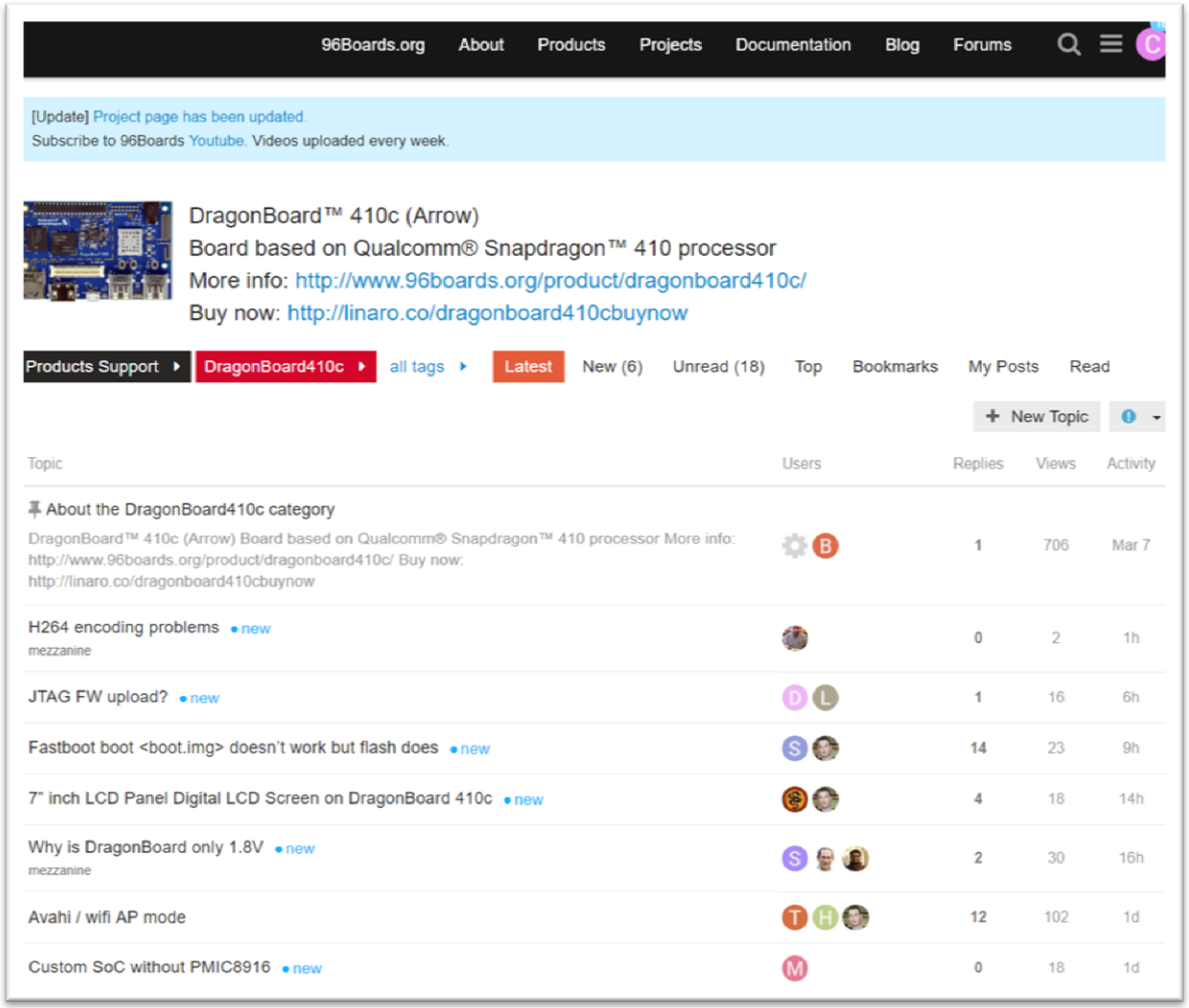
HW and SW
consulting and support

MM Solutions

Camera tuning,
features and support

Forums @96boards.org

https://discuss.96boards.org/c/products/dragonboard410c



Online Resources

Webpage Name	URLs	Content / Used for
Qualcomm Developer Network	• https://developer.qualcomm.com/hardware/snapdragon-410e • https://developer.qualcomm.com/hardware/snapdragon-410/tools	Snapdragon 410E documentation
	• https://developer.qualcomm.com/hardware/snapdragon-600e • https://developer.qualcomm.com/hardware/snapdragon-600/tools	Snapdragon 600E documentation
	• https://developer.qualcomm.com/hardware/dragonboard-410c • https://developer.qualcomm.com/hardware/dragonboard-410c/software	DragonBoard 410c documentation, access to public proprietary blobs (FW) for SW build reproduction
96boards.org	• http://www.96boards.org/product/dragonboard410c/	DragonBoard 410c Product Page
	• https://discuss.96boards.org/c/products/dragonboard410c/	Community Forums
	• https://www.96boards.org/documentation/ConsumerEdition/DragonBoard-410c/	Getting started and installation guides
Code Aurora	• https://www.codeaurora.org/openembedded-mass-market-and-ioe-qualcomm-snapdragon	OpenEmbedded for Snapdragon Embedded project code repository

Thank you

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