**Jayanth Rangaraju,**
*Business Development Manager,*
*Automotive Infotainment Processors*

**Matthew Watson,**
*Product Line Manager,*
*Automotive Infotainment Processors*

Texas Instruments

**TEXAS INSTRUMENTS**

# *Today's high-end infotainment soon becoming mainstream*

## Introduction

*The global demand for automotive infotainment systems is growing at a rapid pace and is expected to reach nearly 130 million units by 2020. Car manufacturers are noticing a growing trend that more and more consumers are factoring in the car's infotainment features and performance in their car buying decisions. Over the last few years, rich multimedia and connected car experiences (e.g., Pandora, Tune-in, etc.) have become standard in luxury and high-end car segments. Now vehicle OEMs are facing growing pressure to offer infotainment systems with immersive interfaces such as touchscreens with rich graphical user interface, streaming audio, seamless connections between the infotainment system and a host of bring your own devices (BYOD) as standard offerings in entry- to mid-level vehicles.*
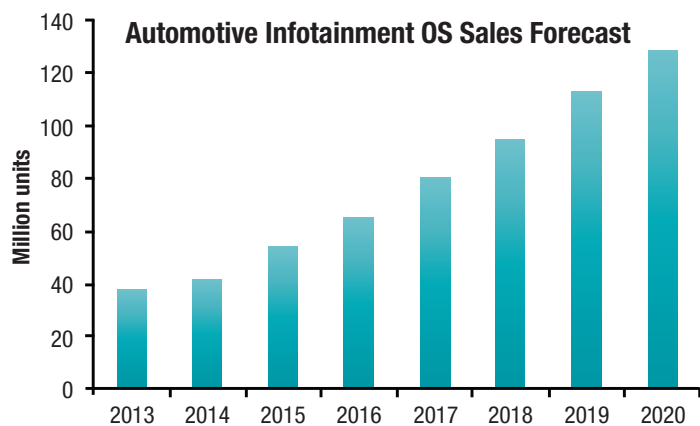


**Figure 1: Automotive Infotainment OS Sales Forecast**
*Source: IHS Automotive, November 2013*

Texas Instruments' new DRA72x "Jacinto 6 Eco" processor, a member of the "Jacinto" family of infotainment processors, is designed to meet the needs of value-oriented, cost-optimized in-vehicle infotainment for entry- to mid-level automobile segments. Developed on the same architecture as TI's other "Jacinto 6" devices, the new DRA72x enables manufacturers to scale their investments and deliver a diverse portfolio of products with both hardware and software compatibility.

To meet the needs of a mainstream infotainment system, the DRA72x processor includes a main ARM® Cortex®-A15 CPU to support highly concurrent applications along with auxiliary cores consisting of dual ARM Cortex-M4 CPUs for support of real-time, interrupt-intensive tasks. The graphics required for feature-rich HMI applications are enabled by 3D graphics support from Imagination Technologies' POWERVR™ SGX544 graphics core and 2D graphics from Vivante Corporation's GC320 core. This device family also includes a Texas Instruments C66x VLIW digital signal processor (DSP) that supports a variety of different functionalities including software-defined radio, enhanced audio and speech-processing algorithms. The display sub-system offers concurrent support for up to three 1080p displays and the IVA-HD hardware accelerator supports 1080p60 decode as well as concurrent high-definition video encode and decode operations.
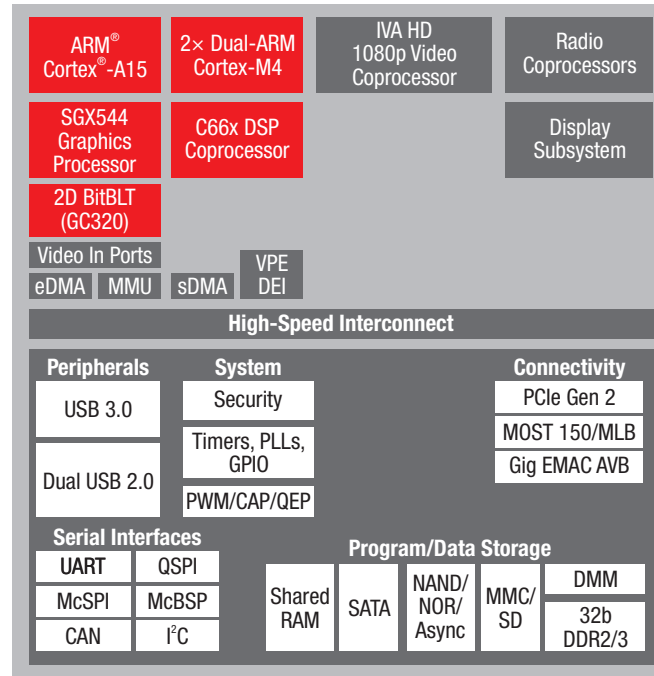
**Figure 2: TI's Jacinto 6 Eco processor diagram**

*Differentiate with the Jacinto 6 family*

The DRA72x "Jacinto 6 Eco" processors were designed to enable automotive Tier 1s and car manufacturers to provide a feature-rich infotainment system at reduced overall cost to the end customers. Various hardware accelerators allow manufacturers to offload the main CPU and the graphics cores, freeing them to focus on other differentiated HMI and application-based features.

**Digital Signal Processor (DSP):** The DSP C66x core on the DRA72x (and other "Jacinto 6" processors) allows for value-added features such as rear- or surround-view stitched video from high-definition cameras mounted to the vehicle. The TI DSP in the "Jacinto" family has been used for several generations to support software-defined radio for HD Radio™ and DAB/DMB Audio standards. Additionally, the DSP can support advanced speech-processing algorithms, active noise cancellation and advanced multi-zone and multi-rate audio processing algorithms.

**Dual ARM Cortex-M4 cluster:** The presence of auxiliary M4 cores allows for a number of different interesting capabilities, including offloading the main CPU of real-time, interrupt-intensive tasks. Additionally, these cores can be used to implement fast boot functions (CAN and camera) and lower power book-keeping applications such as communication to CAN, Ethernet and modem gateways.

**Video coprocessor:** The TI IVA-HD video accelerator provides hardware acceleration for video decode and encode for multimedia streams supporting various formats including H.264. Additionally, the IVA-HD also enables BYOD connectivity allowing end customers to use the touch and voice features for their smartphone applications from the car's center infotainment console.

**Automotive peripheral:** Similar to other devices in the "Jacinto 6" family, the DRA72x processor integrates automotive interfaces such as CAN, Media Local Bus (MLB), USB 2.0, USB 3.0, PCIe and Ethernet

AVB. Integration of these automotive interfaces directly translates to a cost-optimized BOM for automotive Tier 1s and car manufacturers.

**Accelerate
time to market**

Since DRA72x processors are built on the "Jacinto 6" family architecture, manufacturers can leverage a single investment in hardware and software throughout the family. The broad, existing ecosystem for the "Jacinto 6" family of devices are compatible with "Jacinto 6 Eco" DRA72x processors allowing rapid prototyping and reduced time to market for automotive Tier 1s and car manufacturers.

The "Jacinto 6" ecosystem includes support for major High-Level Operating Systems such as QNX®, Linux™ and Android™, Real-time Operating Systems such as Integrity™, software-defined terrestrial radio solutions, audio processing solutions and middleware, as well as applications with HMI capabilities developed along with ecosystem partners.
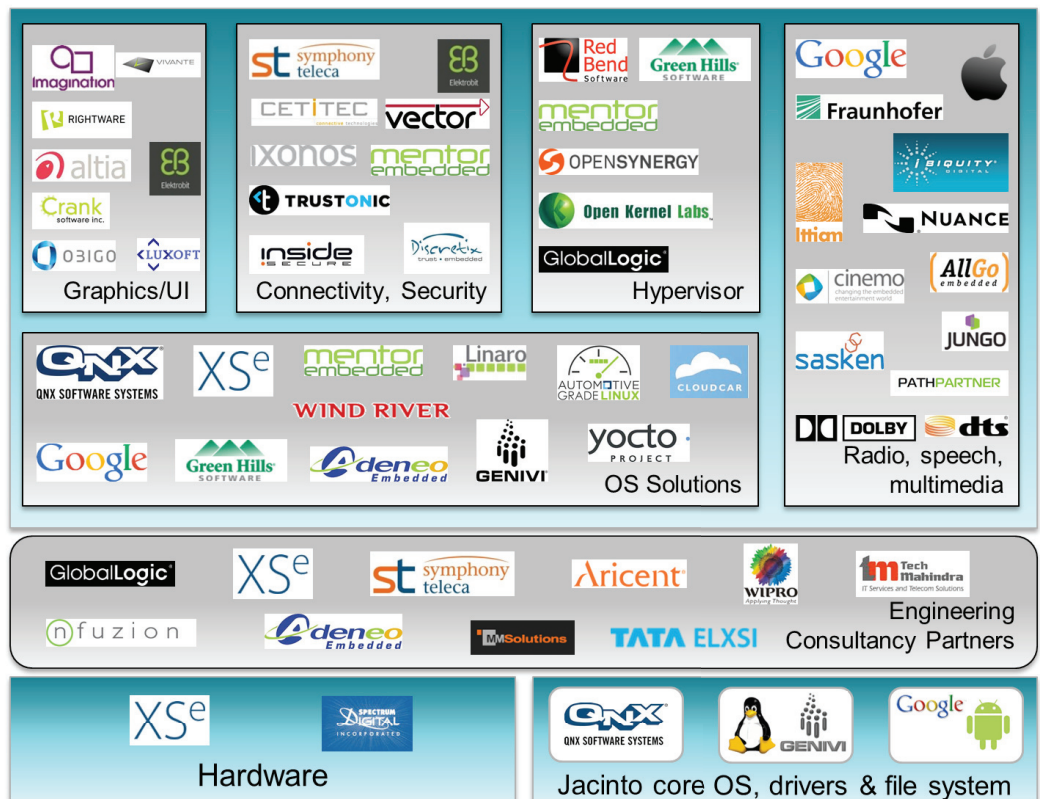


*Figure 3: TI's Automotive Software and Hardware Ecosystem partners*

TI has the most mature ARM Cortex-A15 solutions in the automotive market space. The "Jacinto 6" hardware ecosystem has evolved to include support for various hardware platforms such as "Jacinto 6" and "Jacinto 6 Eco" evaluation module (EVMs) and reference development kit (RDK) platforms. For example, automotive-ready hardware reference platforms such as the AXSB from XSe (visit **http://www.axsb.org** for

more details) provide a comprehensive single-DIN reference board with standard and extensible automotive interfaces to develop advanced automotive proof-of-concept demonstrations and to accelerate production projects. The AXSB platform allows a higher level of differentiation at the product level without having to focus on the foundation level.

*Scale your investment*

With the introduction of the DRA72x "Jacinto 6 Eco" processors, TI now provides the widest range in the industry of Cortex-A15, SGX-544 3D graphic cores and C66x DSP cores at various clock speeds along with scalable external memory interfaces, multi-display and multi-camera support along with automotive peripherals.
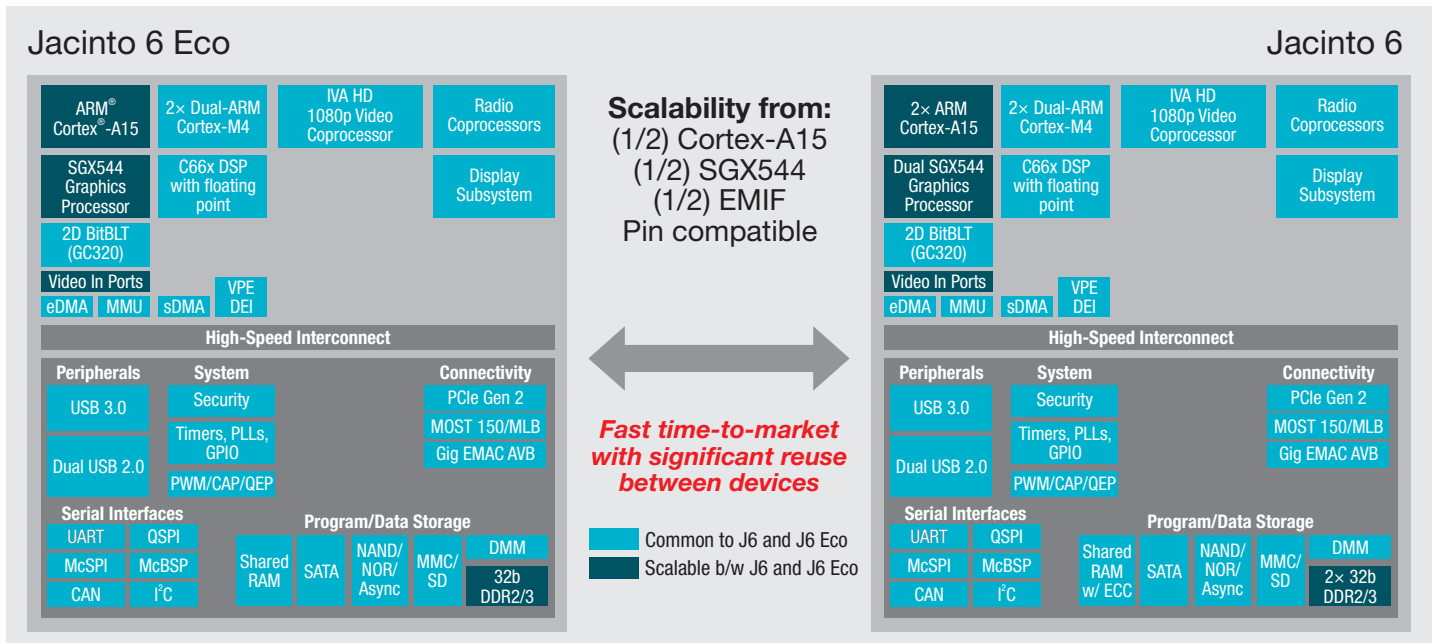


*Figure 4: Scalability across Jacinto 6 and Jacinto 6 Eco families*

As shown in Table 1 on the following page, the DRA72x processor offers upward scalability to DRA74x devices, while being pin-compatible across the family, allowing Tier 1s and car manufacturers to address a wide range of products with the same family.

**Table 1. Jacinto 6 Family Features and Capability Summary**

|  | Jacinto 6 Eco<br>DRA72x | Jacinto 6<br>DRA74x |
|---|---|---|
| Main CPU | 1× A15 | 2× A15 |
| Aux CPU | 2× Dual M4 | 2× Dual M4 |
| 3D GPU | SGX544MP1 | SGX544MP2 |
| 2D GPU | GC320 | GC320 |
| DSP | 1× C66x DSP | 1× C66x DSP |
| DDR | 1× 32b DDR3 | 2× 32b DDR3 |
| Display | 1080p Display Sub-System<br>HDMI 1.4 + DPI | 1080p Display Sub-System<br>HDMI 1.4 + DPI |
| Video | 1080p60<br>1080p30 | 1080p60<br>1080p30 |
| Capture | CSI2 +<br>Parallel 24b | Parallel 24b |
| Boot Flash | QSPI<br>eMMC 4.5 | QSPI<br>eMMC 4.5 |

***Summary***      Consumers are demanding an accelerated evolution of the in-vehicle experience. The infotainment offering has become a greater factor in the car buyer's decision making, as well calling for seamless interaction with smartphones. There is mounting pressure on manufacturers and developers to equip entry- to mid-level cars with feature-rich infotainment systems as a standard offering.

The Texas Instruments DRA72x processor enables Tier 1s to address cost-effective, value-oriented infotainment offerings in low- and mid-segment cars. The DRA72x also leverages the mature hardware and software ecosystem provided by the foundational technology in "Jacinto 6" and OMAP™5 family of devices, further shortening time to market. The DRA72x "Jacinto 6 Eco" along with the rest of the "Jacinto 6" family of devices offers a highly scalable automotive infotainment platform allowing OEMs to address infotainment systems across all segments of the automotive markets with the same family of devices.

TI is currently defining the next generation of infotainment SoC solutions and will continue on this path of enabling automobiles to leverage highly innovative, automotive-centric and optimized infotainment offerings in the years to come.

OMAP is a trademark of Texas Instruments. All other trademarks are the property of their respective owners.

# IMPORTANT NOTICE AND DISCLAIMER