UAV & Robotics Platform

Overview

Ideally suited for UAV or drone developments, this Xilinx® Zynq® UltraScale+™ MPSoC Unmanned & Robotics Platform (URP) stands out from alternatives because it is fully software programmable while maintaining flexibility to customize unique requirements. The URP is a feature-rich, highly-integrated, small form-factor, off-the-shelf solution. It enables and accelerates developments spanning a breadth of domains including:

- Image processing and compression with two high-res cameras
- Multi-motor drive with high-efficiency high-RPM controller IP
- Inertial measurement with position and environmental sensors
- Autonomous navigation and control, algorithms and autopilot
- High performance low latency deterministic embedded compute
- Algorithm acceleration using Software programing of PL kernels

Embedded software and algorithm developers can quickly get running with this software programmable platform, immediately leveraging Xilinx technology.

Hardware developers and low-level embedded firmware developers can leverage the URP to quickly get running and customizing from on a working foundation.

This URP is equally useful for rapid prototyping and production systems. Documentation is provided, including user guide, board and PL platform design, and embedded drivers with Linux BSP. Topic Dyplo flow and QDesys Motor Control IP licenses are included for use on each purchased board. Topic offers additional platform customization services.

Platform advantages

- Accelerated development, quickly demonstrate tangible results
- Integrate alternative solutions to single URP board, reduce SWAP
- Fully software programmable; no prerequisite for FPGA expertise
- Included Linux BSP, PL IP wrapper, and embedded drivers
- Easy out-of-the-box bring-up of integrated URP solution
- Interact with URP via Wi-Fi connection to embedded GUI
- Enables focused development on Vision, Nav, motors, ML/AI etc.

URP Key features

- SoC-based – Xilinx Zynq UltraScale+ MPSoC XCZU7EV / 5EV
- Communications – WiFi & Bluetooth
- Positioning – GPS chip, Pressure sense, 3-axis accelerometers + gyros
- Motor Control – 4x efficient high-RPM drivers for a power stage supporting BLDC motors up to 30V@15A
- Imaging – 2x MIPI 4k60fps camera sensor, customizable processing/ISP
- Video Codec – H.265/264 w/ 4k60fps
- Autopilot-Capable – support to host PX4 and ROS along-side Linux
- DSP / ML / AI Compute – software-based algorithm development flows
- Battery Management Interface – dedicated SMBus/I2C bus connector
- Expansion and Payload – via Samtec headers with GPIO and 16Gbps GTs
- Reliability and Certification – Xilinx and Topic qualifications, expertise in avionics, auto, industrial, and medical
- Size – 135mm x 68.4mm x 10mm
- Temperature – Ambient -40°C to +85°C

## UAV & Robotics Platform (URP)

<table>
<thead>
<tr>
<th>Technology</th>
<th>URP-EV7I2</th>
<th>URP-EV5I2</th>
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</thead>
<tbody>
<tr>
<td>Logic cells (K)</td>
<td>504</td>
<td>256</td>
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<tr>
<td>CLB LUTs (K)</td>
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<td>117</td>
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<td>Flip Flops (K)</td>
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<td>Block RAM (Mb)</td>
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<td>UltraRAM (Mb)</td>
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<tr>
<td>DSP slices</td>
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<td>1248</td>
</tr>
</tbody>
</table>

### PS MGT transceivers
3 (1x on-board USB 3.0, 2x to extension header)

### PL MGT transceivers (GTH)
12 (4x to expansion connector, 4x to expansion connector #1, 4x to expansion connector #2)

## Processor Units

### Application Processor Core
Quad-core ARM® Cortex™-A53 MPCore™ up to 1.33GHz

### Real-Time Processor Core
Dual-core ARM Cortex-R5 MPCore™ up to 533MHz

### Memory with ECC
- L1 Cache 32KB I / D per core, L2 Cache 1MB, on-chip Memory 256KB
- Tightly Coupled Memory 128KB per core

## Memory resources, Connectivity, Embedded sensors

### Dynamic SRAM memory
4Gbyte DDR4 x72 (including ECC support)

### Flash (NAND and NOR) memory
- On-board: eMMC (8Gbyte), 2x Quad-SPI (64Gbyte), On-connector: SD-card, NVMe (PCIe) M2 SSD
- On-board: 32Kbit I2C for production data, series number, MAC addresses and user parameters

### PS linked High-Speed Connectivity
- PCIe® Gen2 (x2), 1x USB3.0, SATA 3.1, DisplayPort, 2x Tri-mode Gigabit Ethernet
- PCIe® Gen3 (x4), MIPI, HDMI, Aurora (4 lanes), 10/40/50Gbit Ethernet

### PL linked High-Speed Connectivity
- Bosch BMI088 (3-axis accelerometer + 3-axis gyroscope), Bosch BMM150 (geomagnetic), Bosch BME680 (environmental), uBlox ZOE-M8B-0 (GPS)
- Murata LTE5KL1DX (Wi-Fi/BlueTooth), USB 3.0 via micro AB connector

### Connectivity (user interfaces)
- Video connectivity (2x 4Kp60): 2x MIPI video input via 30 pins I-PEX connector (Leopard LI-IMX274-MIPI camera compatible)
- Motor drive connectivity (4x): 4x 20 pin header, 3V3 logic + supply, 14 FPGA controlled signals
- Extension connector (1x): 120 pins Samtec QSH-060 (2xPSGTR, 4xPLGTH, 3x PS + 16x PL IV8 logic signals)
- Expansion connectors (2): 120 pins Samtec QSH-060 (4xPGTH, 3x PS + 16x PL IV8 logic signals)

### Power supply
- Input: 9-16Vdc, max. 4A, via dedicated 5 pins board connector, including PMbus/I2C capabilities

### Important notice!
To drive a motor, a separate supply has to be applied directly to the motor drive stages. The URP does not provide sufficient power to drive motors!

## Software

### Bootloader / BSP
- Vivado board specification file, PCIe boot support option
- Topic Linux BSP including bootloader, PETA Linux
- Dyplo® compatible platform: Yes, license included with the board

## Mechanical and environmental

### Dimensions
135.0mm x 68.4mm x 10mm (length x width x height)

### Temperature grade
Industrial (complete board)

## Qualification tests
- EMC/EMI: EN 55032, IEC 61132, EN 61326, IEC 55024

## Optional add-on boards
- URP-CAMA: Leopard LI-IMX274-MIPI camera pack
- URP-MOCA: Motor driver and motor pack
- URP-DESK: Desktop extension pack
- URP-SDR: 3rd party SDR boards are available; contact Xilinx or Topic for further detail

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