

Emergence of DIR-V and VEGA Processor Ecosystem

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C-DAC

DIR-V VEGA Microprocessors

One step towards AatmaNirbhar Bharat

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इलेक्ट्रॉनिक्स एवं
सूचना प्रौद्योगिकी मंत्रालय
MINISTRY OF
ELECTRONICS AND
INFORMATION TECHNOLOGY

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About C-DAC

- Premier R&D organization of the Ministry of Electronics and Information Technology (MeitY) for carrying out R&D in IT, Electronics and associated areas



C-DAC Centres

Bengaluru | Chennai | Delhi | Hyderabad | Kolkata | Mohali | Mumbai | Noida | Patna | Pune | Silchar | Thiruvananthapuram

C-DAC Thrust Areas

Our focus spans key technological areas: High Performance Computing enhances processing capabilities, Health Informatics improves healthcare through data, VLSI & Embedded Systems advances integrated circuit design, Professional Electronics supports specialized applications, Cyber Security protects digital assets, and Software Technologies drives innovation in software development.

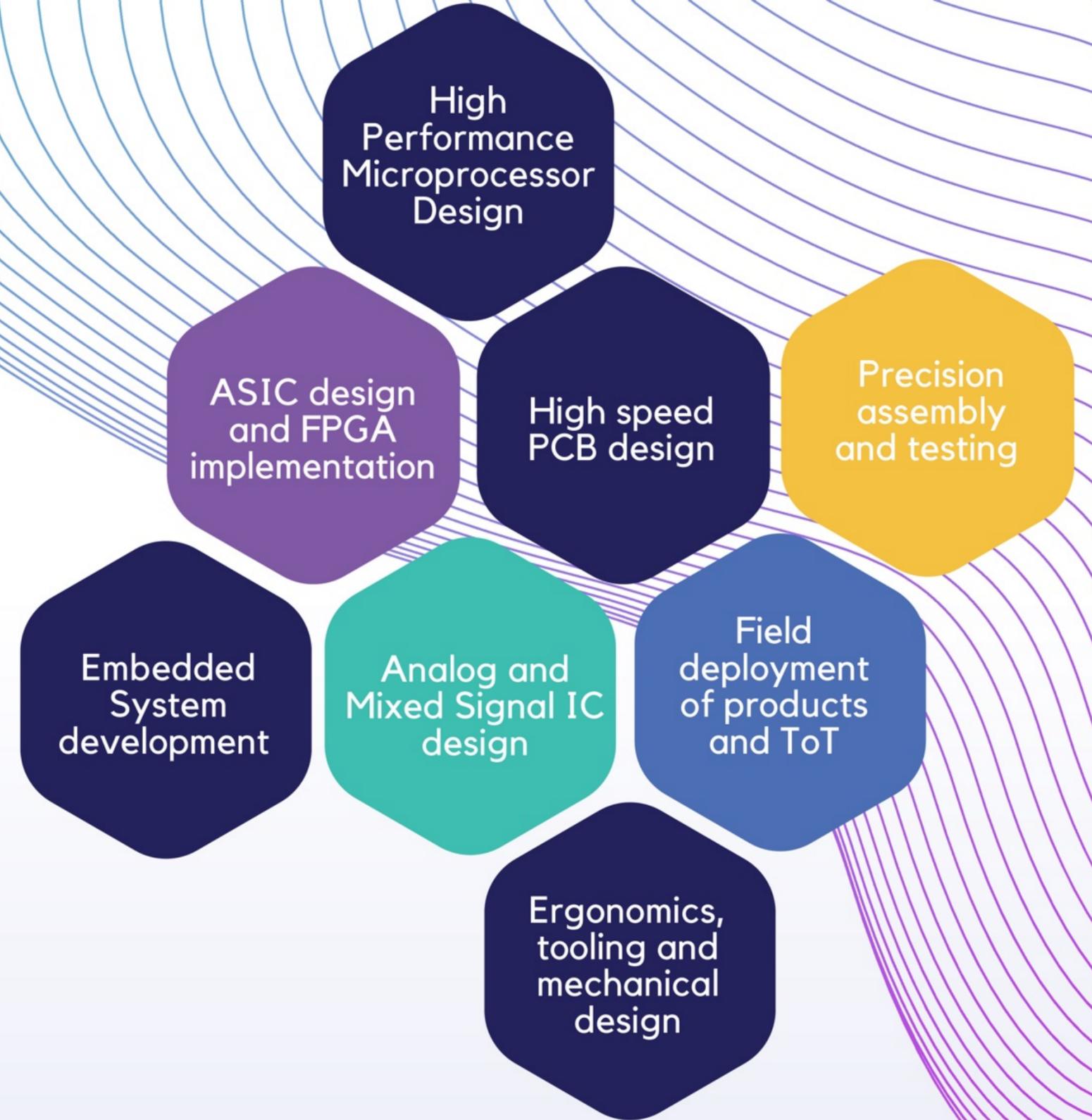


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Expertise Hardware Design Group

Our expertise in cutting-edge microprocessor design, ASIC and FPGA implementations, and high-speed PCB design. We bring together expertise in analog and mixed-signal IC design, embedded systems development, and precision assembly, ensuring top-quality solutions from development to field deployment.



Digital India RISC-V Program(DIR-V)

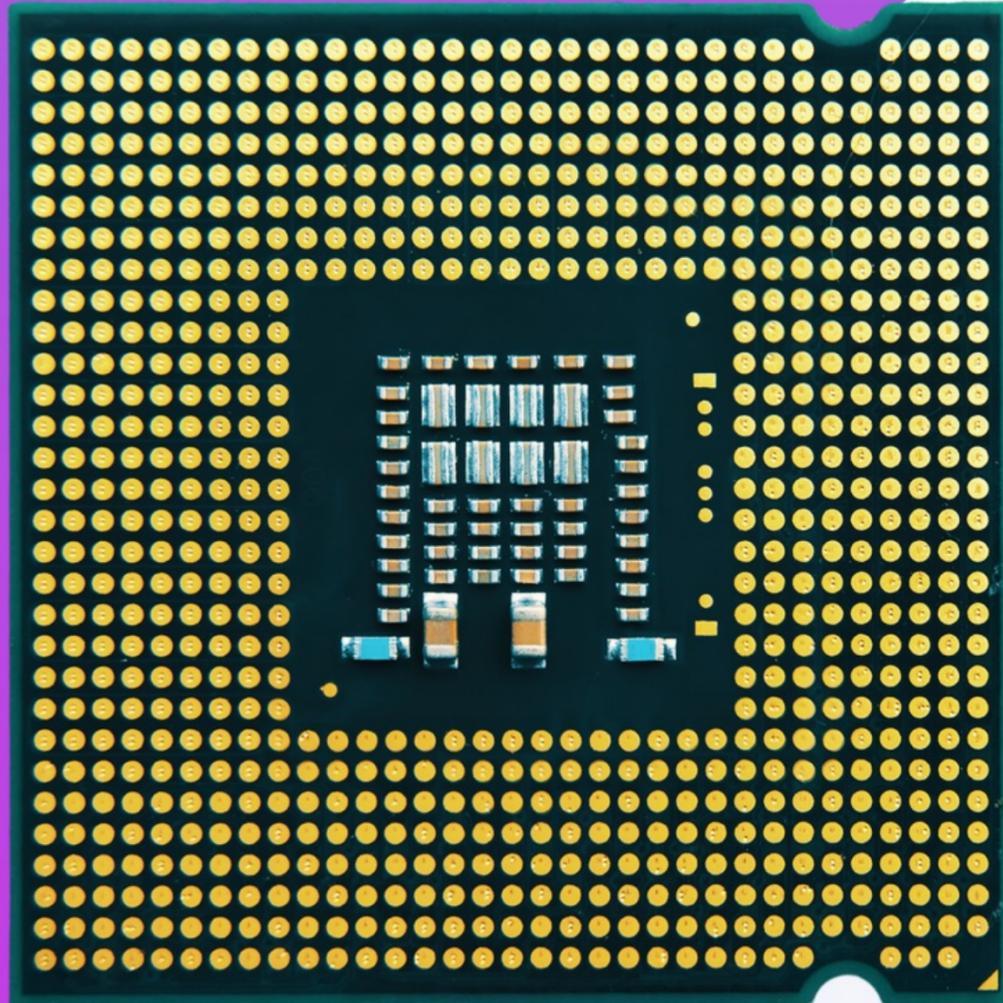
As one of the concrete steps towards realizing the ambition of “Atmanirbhar Bharat”, MeitY launched Digital India RISC-V Microprocessor (DIR-V) Program with an overall aim to enable creation of Microprocessors for the future, in India, for the world and achieve industry-grade Silicon.

RISC-V (DIR-V) Program will offer opportunities to students, startups & entrepreneurs, further catalysing the semiconductor ecosystem in India

This program will make India not only a RISC-V Talent Hub for the World but also supplier of RISC-V SoC (System on Chips) for Servers, Mobile devices, Automotive, IoT & Microcontrollers across the globe.



Why Digital India RISC-V Program ?



Microprocessor essential component in a gamut of key applications



Essential for Space, Public Utilities, Commodities, and Communication



Crucial for Public safety and Critical Communication



Critical Strategic and National Importance



Essential Component of India's ascent to Technological Supremacy



Country to have control to change, proliferate, implement and guarantee availability



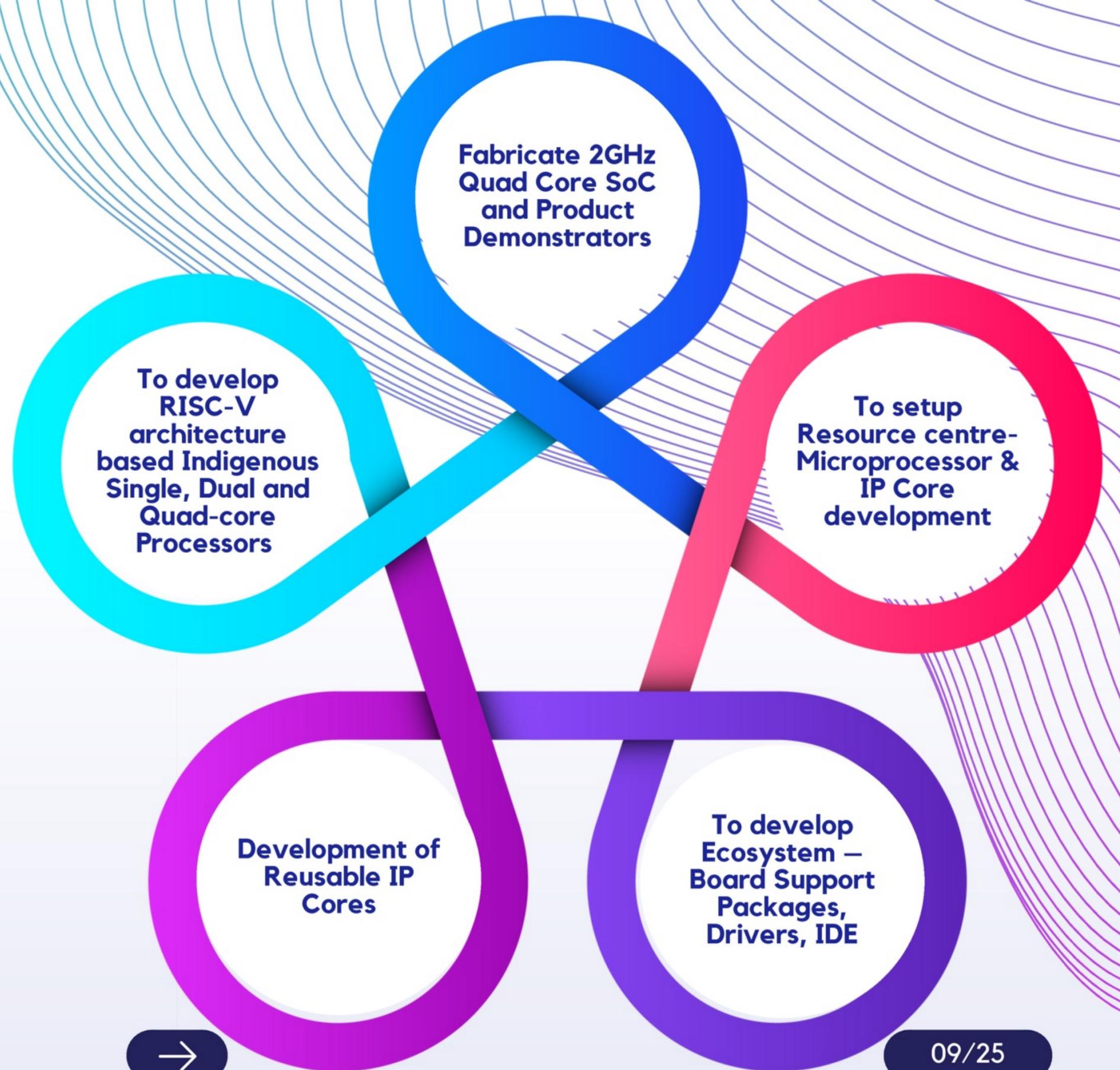
Exploiting commercially without sacrificing the transparency & trust worthiness

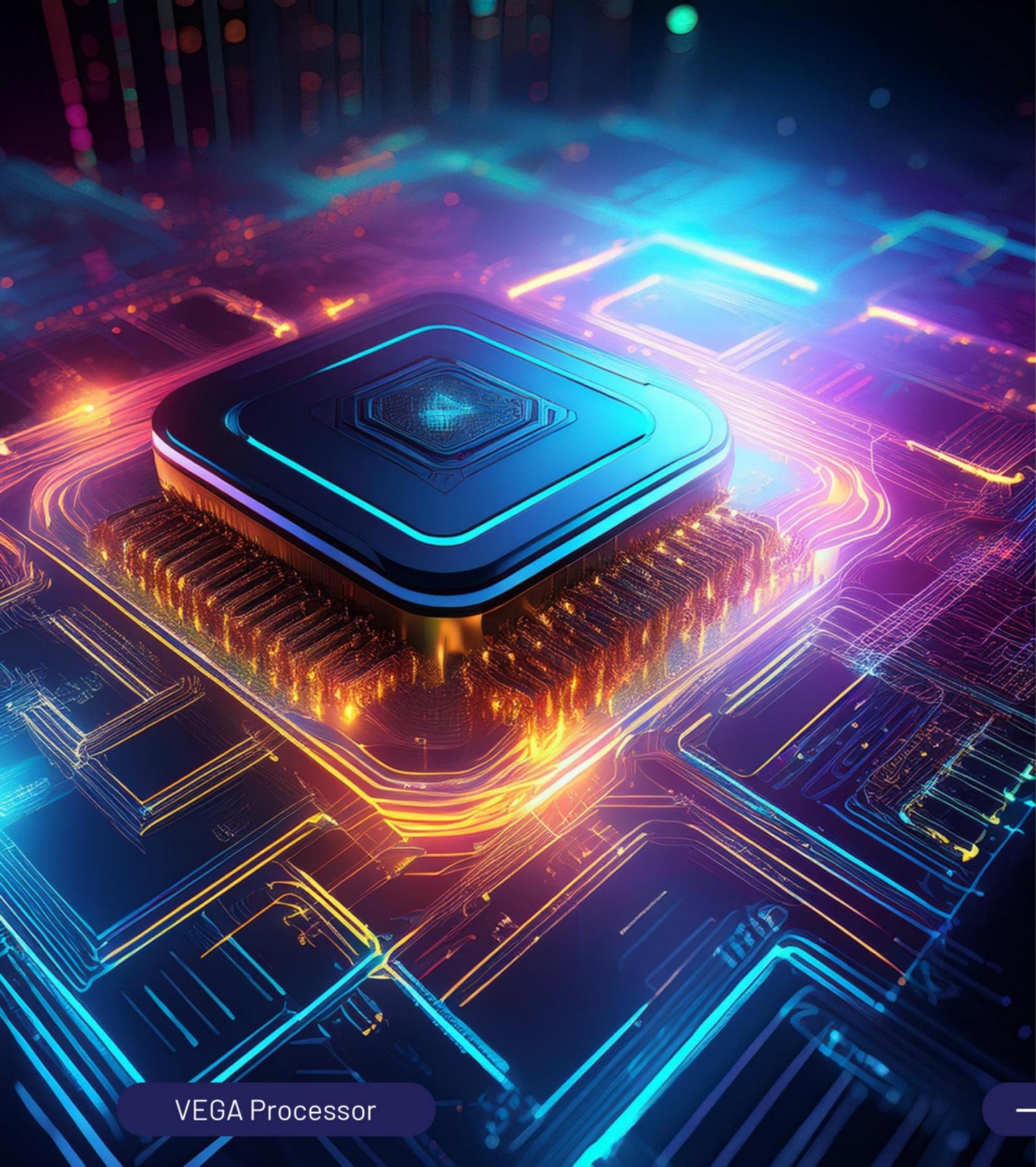


Command Over manufacturing Process

Mission Goals

Our Mission is to make India Self-reliant in Microprocessor Development using Indigenous Design, Advanced Technologies & Components, with the requisite Hardware/Software products with special emphasis on Strategic Sector.





DIR-V VEGA Processors

The VEGA series is India's first indigenous family of RISC-V-based microprocessors, designed by the Centre for Development of Advanced Computing (C-DAC). It is part of the DIR-V Program funded by the Ministry of Electronics and Information Technology (MeitY).

C-DAC has successfully developed VEGA series of microprocessors and related IPs and the complete ecosystem to enable fully indigenous product development that meets various requirements in the strategic, industrial and commercial sectors

These high performance processors are based on the open source RISC-V Instruction Set Architecture

VEGA Processors

VEGA ET1031

- 32-bit Single Core
- RV32IM
- 3-Stage Pipeline
- In-Order

VEGA AS1061

- 64-bit Single Core
- RV64IMAFDC
- 6-Stage Pipeline
- In-Order

VEGA AT1051

- 32-bit Single Core
- RV32IMAFDC
- 5-Stage Pipeline
- In-Order

VEGA AS1161

- 64-bit Single Core
- RV64IMAFD
- 16 Stage Pipeline
- Out-of-Order Superscalar

VEGA AS2161

- 64-bit Dual Core
- RV64IMAFD
- 16 Stage Pipeline
- Out-of-Order Superscalar

VEGA AS4161

- 64-bit Quad Core
- RV64IMAFD
- 16 Stage Pipeline
- Out-of-Order Superscalar

VEGA SoC Roadmap

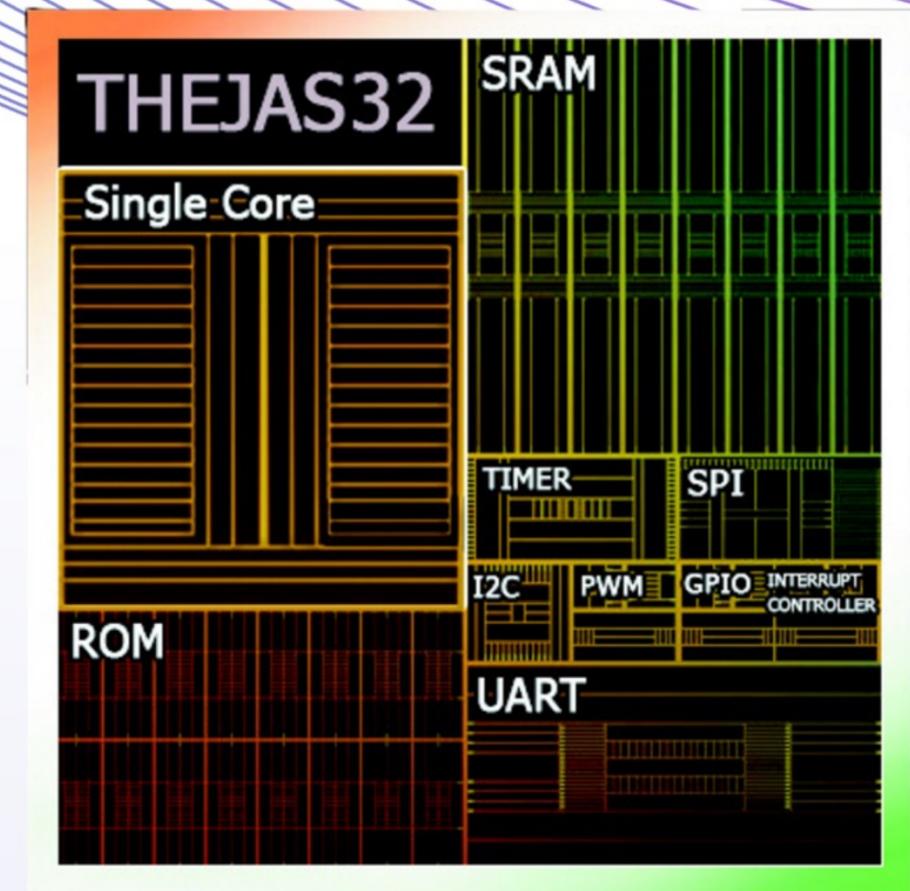


THEJAS32 SoC



Single Core SoC

Upto
100 MHz
CPU Performance
Low powered embedded & IoT

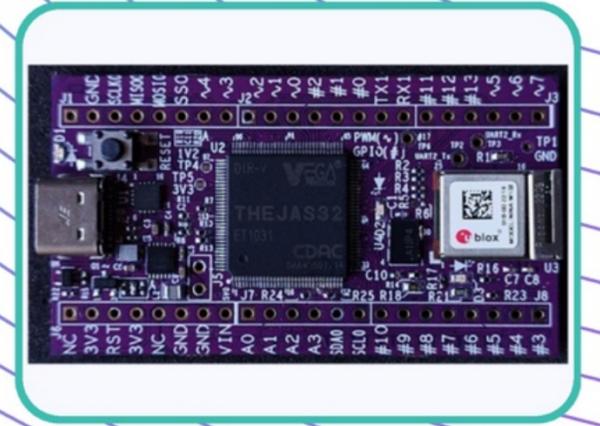


ARIES Boards

ARIES Eco



ARIES Nova



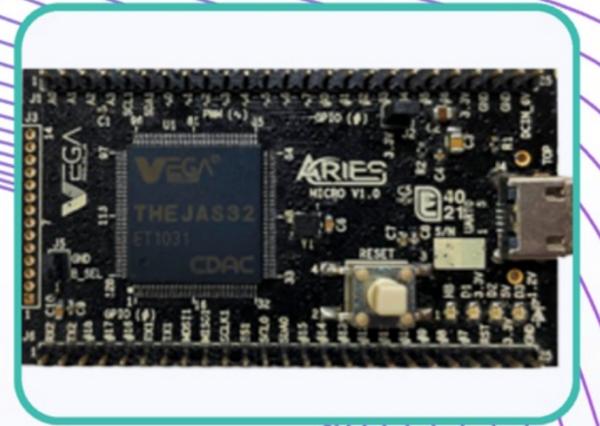
ARIES V3



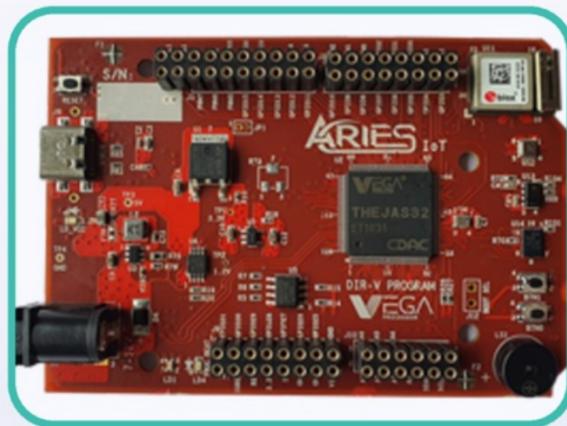
ARIES V2



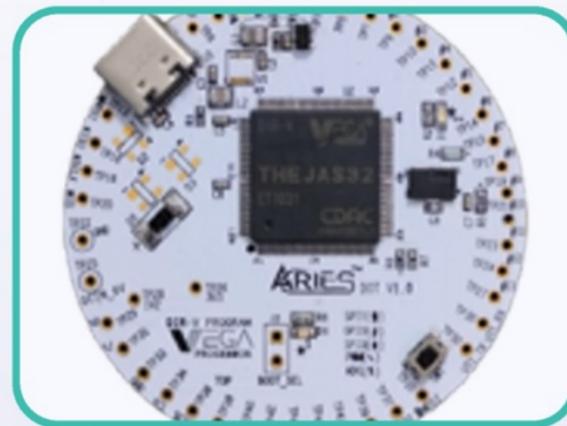
ARIES Micro



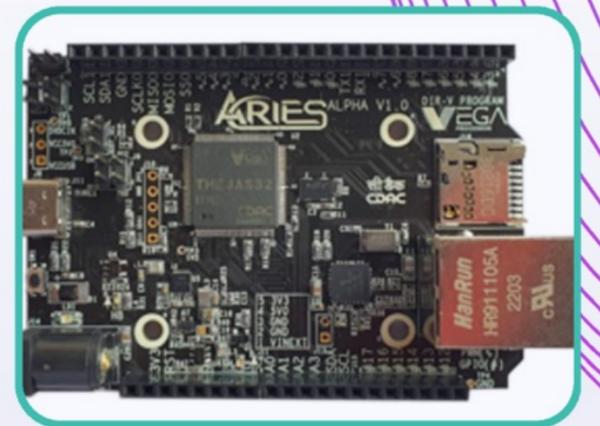
ARIES IoT



ARIES Dot



ARIES Alpha



THEJAS32 SoC ASIC

Key features

| | |
|--------------|---------------|
| Processor | : VEGA ET1031 |
| RAM | : 256KB |
| UART | : 3 nos |
| SPI | : 4 nos |
| Timer | : 3 nos |
| PWM | : 8 nos |
| I2C | : 3 nos |
| GPIO | : 32 nos |
| Core voltage | : 1.2V |
| IO voltage | : 3.3V |
| Frequency | : upto 125MHz |

Applications:

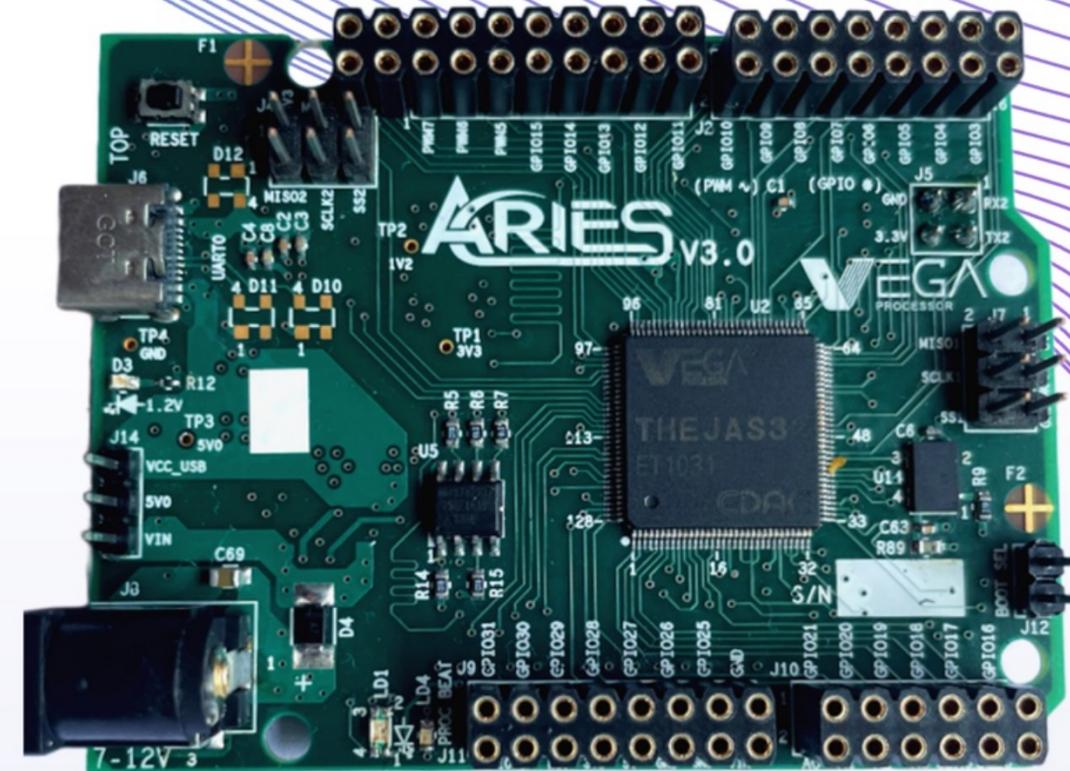
Sensor fusion
Smart Meter
System supervisors
Remote sensors
Small IoT devices
Wearable devices
Toy and electronic education equipment
Legacy 8/16-bit applications
Industrial networking and many more.



ARIES v3 Development Platform

Key features

| | |
|----------------|---------------|
| Processor | : VEGA ET1031 |
| RAM | : 256 KB |
| Flash | : 2 MB |
| UART | : 3 nos |
| SPI | : 3 nos |
| Timer | : 3 nos |
| PWM | : 8 nos |
| I2C | : 2 nos |
| ADC | : 4 channel |
| GPIO | : 32 nos |
| IO voltage | : 3.3V |
| Supply Voltage | : 7-12 V |
| Frequency | : 100 MHz |

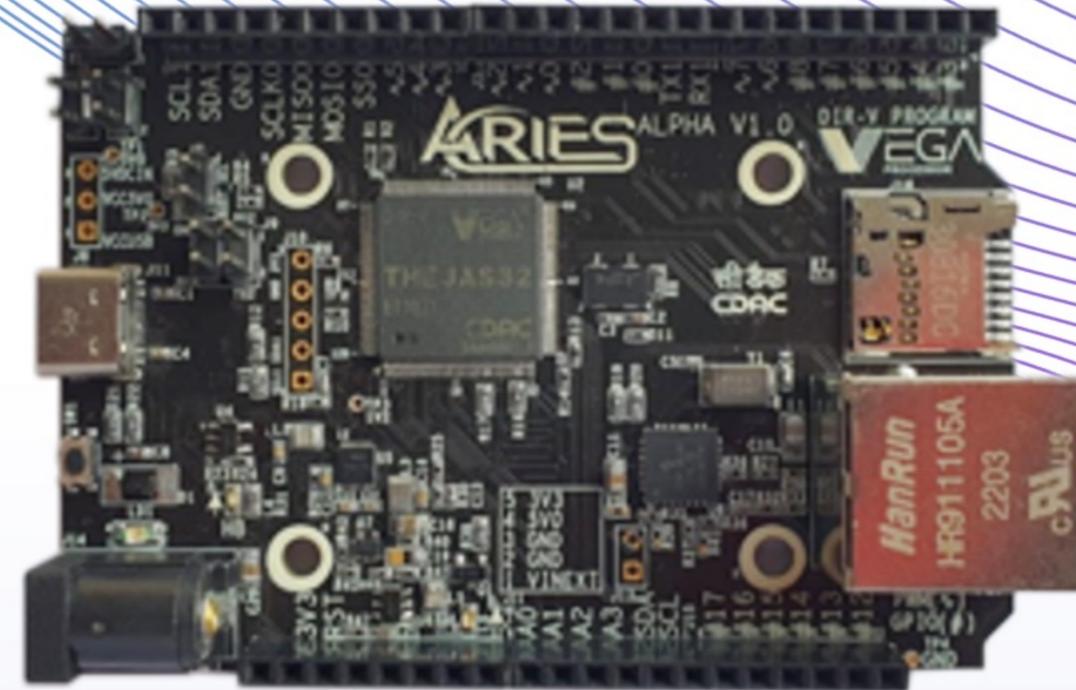


ARIES ALPHA

Development Platform

Key features

| | |
|----------------|--|
| Processor | : VEGA ET1031 |
| RAM | : 256 KB |
| Flash | : 2 MB |
| UART | : 2 nos (1x CAN,1x ETHERNET,1x SD -Card) |
| SPI | : 3 nos |
| Timer | : 3 nos |
| PWM | : 8 nos |
| I2C | : 2 nos |
| ADC | : 4 channel |
| GPIO | : 32 nos |
| IO voltage | : 3.3V |
| Supply Voltage | : 7-12 V |
| Frequency | : 100 MHz |



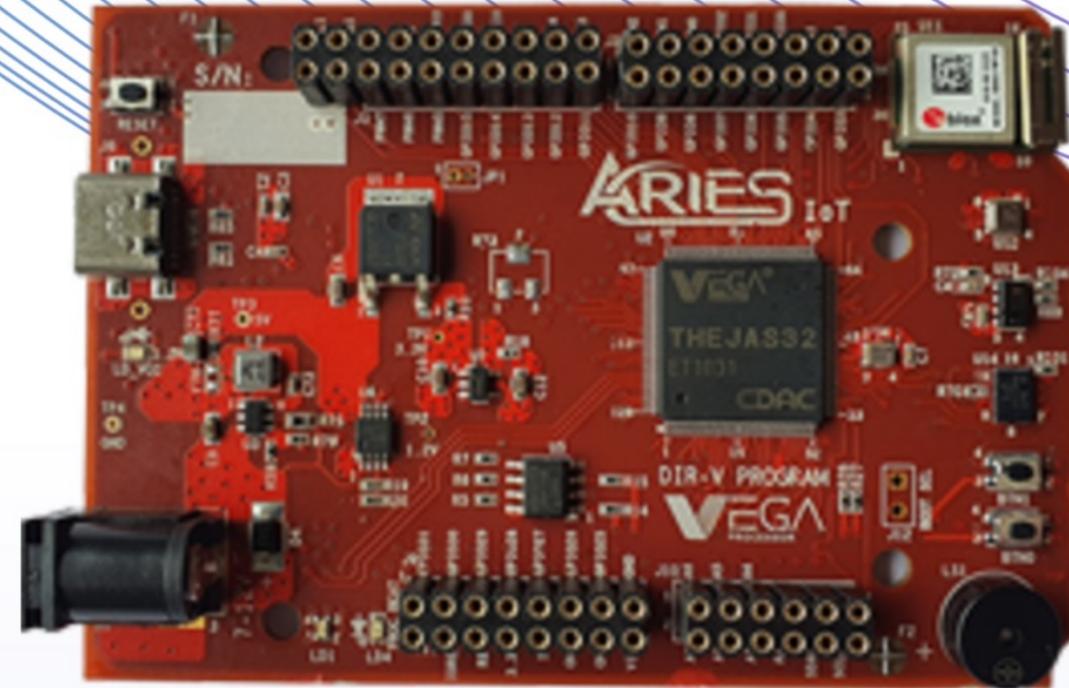
On board interfaces:

- SD- card Reader
- Stand-Alone Ethernet Controller (IEEE 802.3™
Compatible and Fully Compatible with
10/100/1000Base-T Networks)
- Stand-Alone CAN Controller (CAN V2.0B at 1 Mb/s)

ARIES IoT Development Platform

Key features

| | |
|----------------|---------------|
| Processor | : VEGA ET1031 |
| RAM | : 256 KB |
| Flash | : 2 MB |
| UART | : 3 nos |
| SPI | : 2 nos |
| Timer | : 3 nos |
| PWM | : 8 nos |
| I2C | : 1 nos |
| ADC | : 4 channel |
| GPIO | : 25 nos |
| IO voltage | : 3.3V |
| Supply Voltage | : 7-12 V |
| Frequency | : 100 MHz |

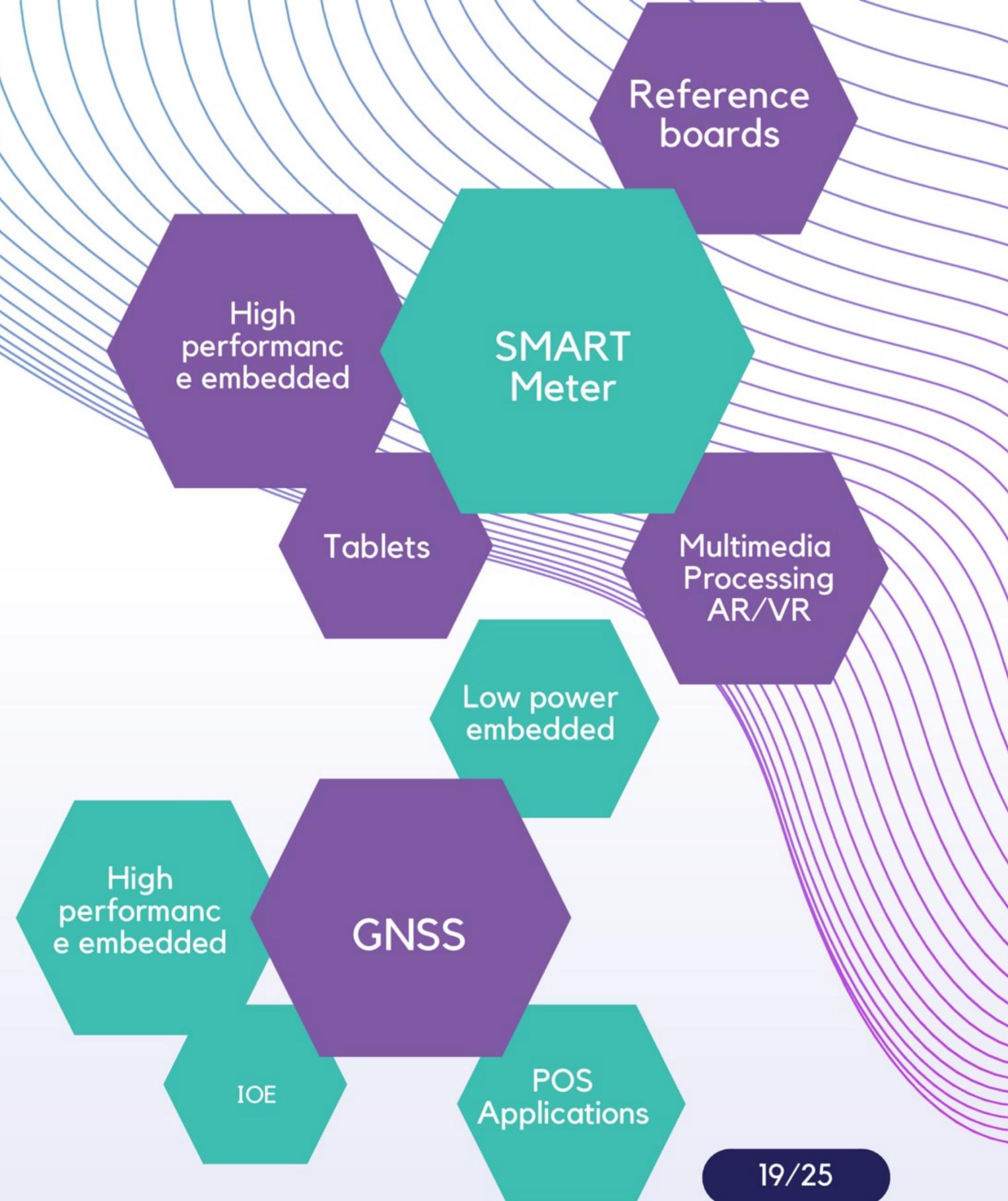


On board Sensors:

Digital Proximity, Ambient Light and Gesture Sensor
6 Axis Digital Accelerometer, Gyroscope Sensor
Gas, Humidity, Pressure, Temperature Sensor
WiFi/Bluetooth/Piezoelectric Buzzer
Potentiometer for Analog ADC input
2 Push button switches, 2 LED indicators

Applications

The VEGA Processor is versatile and can be applied in various fields, including high-performance embedded systems, IoE, smart meters, reference boards, tablets, multimedia processing, AR/VR, POS systems, low-power embedded devices, and GNSS applications.



Key Benefits



Strategic advantage - India will own the IP for high-end microprocessors



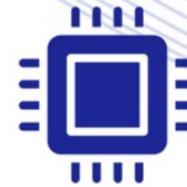
Mission Mode project dedicated for total implementation by interaction with academic & industry



Self-reliance, with clear financial and strategic advantages



Pave the way to Indian-designed and manufactured electronics chips and hardware - leading to success in MAKE IN INDIA initiative



Silicon based deliverables, directly deployable in products



Comprehensive hardware and software ecosystem for microprocessor based product design

VEGA Based Products



Advik-VEGA embedded development kit



CPU card for Urban Traffic Control Equipment



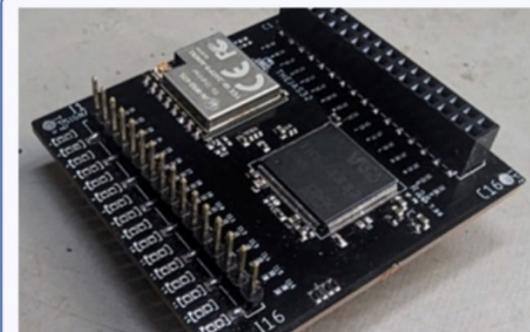
Industrial-grade autopilot system for drones



Indigenous ultrasonic liquid level sensor



Display interface unit in rotational speed sensor



E- Lagori rapid prototyping platform



Smart Energy meter

Comparison



| Board | Name | Arduino UNO R3 | ARIES V3 |
|--------------------------|-------------------------|-------------------------------------|------------------------|
| Processor | | ATmega328P | THEJAS32 |
| Data Bus Width | | 8-bit | 32-bit |
| Clock speed | Main Processor | 16 MHz | 100 MHz |
| Digital IOs(Pins) | Built-in LED | 1 (13) | RGB (22,23,24) |
| | GPIOs | 14 | 32 |
| | Analog inputs | 6 | 4 |
| | PWM output | 6 | 8 |
| Communication Interfaces | UART | 1 | 2 |
| | I2C | 1 | 2 |
| | SPI | 1 | 3 |
| Power | I/O Voltage | 5V | 3.3V |
| | Input voltage (nominal) | 7-12V | 7-12V |
| Memory | | 2KB SRAM, 32KB FLASH, 1KB EEPROM | 256KB SRAM, 2 MB FLASH |
| Timer | Timer | 3 (2x 8-bit Timer, 1x 16-bit Timer) | 3 (32 bits) |
| USB connector | | USB-B | USB-C |

ARIES Boards: Sales Platforms



<https://www.amazon.in/VEGA-Processor-ARIES-Development-Board/dp/B0CTZWBDV3>



<https://robu.in/product/aries-v2-0-development-board/>



<https://vegaprocessors.in/devboards/>



<https://www.electronicscomp.com/aries-v30-development-board>



Feel the VEGA...

VEGA Processors & ARIES Development Boards are designed and developed by C-DAC as part of the Digital India RISC-V (DIR-V) Program by MeitY, Govt. of India.

Thank You



groups.io/g/vegaprocessors



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[@VegaProcessor](https://twitter.com/VegaProcessor)

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