

MACHINE LEARNING | COMPUTER VISION | SENSOR FUSION | CONNECTIVITY

reVISION™

Responsive and Reconfigurable Vision Systems

Customer and Partner Endorsements

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 **XILINX**
ALL PROGRAMMABLE.

Customers



Basler is a leading manufacturer of high-quality digital cameras and accessories for industry, medicine, traffic and a variety of other markets. The company's product portfolio encompasses line scan and area scan cameras in compact housing dimensions, camera modules in board-level variants for embedded solutions, and 3D cameras. The catalog is rounded off by a broad spectrum of accessories, including a number developed specially for Basler and optimally harmonized for our cameras. Basler has 30 years of experience in vision technologies. The company is home to approximately 500 employees at its headquarters in Ahrensburg, Germany, and its subsidiaries and sales offices in Europe, Asia and the USA.

"Basler recognizes the distinct advantages Xilinx All Programmable technology offers developers of vision guided systems," said Arndt Bake, Chief Marketing Officer. "Basler is pleased to partner with innovative companies like Xilinx that are delivering advanced technology that supports the developers of next-generation vision systems. The reVISION stack will allow Basler cameras and development platforms to make vision-system development accessible to a larger set of developers."



"DAQRI's powerful computer vision technology delivers best-in-class AR for the toughest of industrial environments," said Roy Ashok, Chief Product Officer at DAQRI. "Xilinx All Programmable technology and reVISION stack gives us the ability to rapidly implement computer vision and machine learning functionality, and accelerate the delivery of the DAQRI AR platform."



DeePhi delivers embedded-vision solutions for applications like drones and data-center applications including speech recognition.

"DeePhi has developed a complete workflow for deploying deep-learning algorithms on FPGAs that co-optimizes algorithms, software, and hardware. More and more intelligence will be added to all the things around us, and Xilinx all programmable technology will help do this by enabling us to continually adapt and reconfigure our systems," said Song Yao, Founder & CEO. "The complete toolkit in the reVISION stack will allow our

customers to harness All Programmable FPGAs and SoCs, with fewer development problems: even algorithm engineers with no FPGA background can deploy the trained models efficiently.”



EyeTech specializes in eye tracking technology that can read eye movements and characteristics. This provides a new natural interface to computers and machines as well as a new avenue for neurological medical diagnostics.

“Eye tracking technology has greatly benefited individuals suffering from ALS or other forms of paralysis, improving their quality of life by helping them communicate with family, friends, and the community at large,” said Robert Chappell, Founder & CEO. “Our eye tracking technology has immense potential to create similar impact across a wide spectrum of applications through our licensing customers—including automotive, education, security and medical applications. Using the Zynq All Programmable SOC in our platform has untethered our system by eliminating the need for a PC, opening up new areas of embedded applications at the edge. Partitioning our design allows us to accelerate the most compute-intensive, vision-based algorithms in programmable logic while shifting high-level control and processing to the ARM CPU. Our customers can easily configure our camera to meet specific design requirements, with the unique ability to do in-field upgrades as required. The new reVISION stack offers new opportunities for algorithm development by leveraging the power of machine learning. This can enable us to expand our offering of human interaction hardware as well as improving our core eye tracking products.



Phase Space has been creating the future of motion capture for over 20 years, continuously pushing the boundaries of virtual reality.

“At PhaseSpace, we are able to put users in a virtual world that is utterly realistic, thanks to our patented technology and capabilities that are beyond any standard video technology,” said Tracy McSheery, CEO. “Creating realistic worlds takes large amounts of data—data that enables us to do things like deliver video with high dynamic range, better compression, and other imaging techniques. Xilinx all programmable technology gives us the flexibility to do different things, like take advantage of the unique capabilities of new sensors in our platform, with the

ability to bring serious computational power to bear on all the gathered data, faster and in real time. Our competition cannot keep up with our solutions because they are still using ASICs, so their turnaround times are comparatively slow. The Xilinx reVISION stack is going to make it much easier to prototype custom solutions with new techniques and features, and bring them to production quickly. The ability to run our motion-capture application on top of a complete development stack based on the all programmable technology is invaluable.”



Plethora IIoT is part of the ETXE-TAR Group, a federation of closely coupled industrial manufacturing companies that develop sophisticated high-productivity and advanced manufacturing solutions. Some of these solutions comprise high throughput CNC machining, automation systems, and high-power laser processes requiring many sensors to permit unattended, autonomous operation.

“Machine learning techniques and sensor fusion are critical to our unattended, autonomous solutions—where sensors are continuously sending 10’s of thousands of variables at high speed machine real-time, depending on the technology, from different domains and timestamps that must be processed, analyzed and then provide feedback if there is any system malfunction affecting the work product quality,” said Javier Diaz, Plethora IIoT Team Leader. The integration of these artificial intelligence paradigms within our high-productivity manufacturing solutions are possible because of the flexibility of Xilinx’s FPGAs and All Programmable SoCs that combine ARM processing and programmable logic which give our designs strong capabilities for continual improvement of advanced manufacturing technologies, in production plants. For example, our fully autonomous laser heat treatment machines employ many contactless sensors and high-speed cameras for quality control. In this case, Xilinx All Programmable devices support the high frame rates needed for vision pre-processing to relate process system data with machine data (i.e., sensor fusion) and process that information to analyze regions of interest for dimensionality reduction (proportional to the frame resolution). Also, these programmable SOC devices enable us to revise and reconfigure machine learning algorithms within the system once deployed in the plant – where minimal downtime is key in our industry. Plethora IIoT is working in close collaboration with Xilinx to further develop innovative solutions for the Industrial IoT including vision-guided autonomous manufacturing systems. Through the use of the reVISION stack,

supporting machine learning and computer vision, we will be able to introduce more highly complex mathematics into these systems in a much more efficient manner.”



For more than 20 years, Vision Components (VC) has developed and distributed intelligent, network-compatible, real-time Smart Cameras that operate without a PC. Typical applications include quality inspection and automation. Furthermore, VC provides software libraries for many applications including license plate recognition, motion capture, decoding, and measurement. These embedded-vision solutions can be easily integrated into almost any machine or plant.

“Having the ability to integrate new features and capabilities into our Zynq-based cameras requires a robust set of design practices that straddles both hardware and software design. Having the ability to rapidly update and reconfigure the systems is critical,” said Miriam Schreiber, Marketing & PR Manager. “Xilinx’s new reVISION stack with support for optimized OpenCV functions and deep learning will enable our R&D team to more rapidly integrate new features and capabilities into our systems and libraries, helping our customers to better address their demanding applications. We are looking forward to using the reVISION stack.”



Vrvana is the brainchild of Bertrand Nepveu, who dreamt of a truly immersive virtual reality platform. Vrvana’s Totem Mixed-Reality (MR) headset was designed with robust technology and user comfort in mind. Back in 2005, it started as a personal quest to improve his video gaming experience with VR, and it quickly expanded into blended and augmented reality. With an expanded team of software and hardware engineers and 5 prototype versions completed, they have a product that’s ready for developers to begin using to create outstanding 3D AR & VR experiences at an unrivalled 120 degrees field-of-view.

“Vrvana enables truly immersive Mixed-Reality experiences by leveraging Xilinx’s All Programmable technology, which provides the flexibility and throughput capability important for a low-latency, high-resolution, camera-based Mixed-Reality solution that is unique on the market,” said Bertrand Nepveu, CEO. The release of the reVISION stack for Xilinx will give us the ability to

more rapidly integrate new computer vision and machine learning features into our headsets.”



Drawing on two decades of experience in the industry, XIMEA currently offers state-of-the-art digital cameras with FireWire, USB 2.0, USB 3.0, PCI Express and Thunderbolt™ interfaces. Besides monochrome, color and near-infrared enhanced cameras, as well as cooled and temperature stabilized cameras, XIMEA also develops and markets X-RAY and Hyperspectral cameras. During this period XIMEA has developed, manufactured and sold both retail and OEM cameras for machine vision applications in motion control, assembly, robotics, industrial inspection and security, as well as scientific grade cameras for life science and microscopy.

“As a world leading producer of camera systems for machine vision, XIMEA relies on advanced technology partners like Xilinx to enable it to build differentiated systems for the industrial and scientific markets. Kintex UltraScale+ offers a high performance platform that allows us to integrate innovative features in our cameras. The high performance of the FPGA enables us to achieve very high bandwidth supporting a 64Gb/s data path directly from camera to the PC memory. The programmable IOs in the FPGA allow us to support all industry standard interfaces today and, thanks to the reconfigurable nature of the platform, we can support future standards as they evolve without needing to change the underlying hardware,” said Max Larin, CEO. “The reVISION stack from Xilinx will offer our development team new levels of productivity through Xilinx optimized OpenCV library functions. Also, as the industry moves toward deep learning techniques for image detection and classification we are excited to begin developing systems using the Xilinx machine learning libraries that are part of the reVISION stack. All in all, Xilinx provides the leverage to maximize the feature set of our cameras: high speed, low power consumption, low operating temperatures and minimal footprint for even the most demanding customers.”



ZEROTECH is a drone UAV company that has been developing drones systems for the last 10 years. Headquartered in China, ZEROTECH is the creator of the Dobby AI personal “selfie” drone.

“Our Dobby AI ‘selfie’ drone integrates complex computer-vision and machine-learning techniques to offer consumers a unique experience through gesture control and object and subject tracking,” said Yang Jianjun, CEO of ZEROTECH. “These capabilities, until recently, were reserved for much more expensive systems. We were able to leverage Zynq All Programmable devices to implement these complex algorithms into the Dobby AI. The Xilinx reVISION stack will allow our teams to more easily improve these critical computer vision and machine learning algorithms that help to give Dobby AI its personality. Having a partner like Xilinx committed to these disciplines ensures that we will be able to continue to develop groundbreaking solutions in this space.”

Partners



Aldec, Inc. is an industry-leading Electronic Design Automation (EDA) company delivering innovative design creation, simulation and verification solutions to assist in the development of complex FPGA, ASIC, SoC and embedded system designs.

“Aldec's expertise in developing hardware solutions for functional verification have been leveraged to deliver high-performance Xilinx Zynq SoC development boards for embedded vision applications,” said Zibi Zalewski, General Manager. “As safety becomes the most critical factor in a world with increasingly intelligent vehicles, solutions require fast processing capabilities to keep up with ever-changing conditions in real driving situations. When it comes to visual processing for automotive driver assistance systems (ADAS), Aldec has used Xilinx Zynq devices along with Xilinx's SDSoC development environment to transform complex visual processing software algorithms into highly accelerated and responsive hardware in FPGA fabric. Aldec's multicamera surround-view reference design for TySOM embedded development boards provides a full 360-degree view of a vehicle's surroundings with an edge-detection overlay to distinguish objects and provide up-to-date information to the driver. The performance delivered by Xilinx Zynq SoC solutions have helped Aldec deliver radically superior processing speeds versus a lower-performance, software-only approach. Aldec anticipates further improvements to SDSoC and the availability of RTL optimized libraries for OpenCV in Xilinx's reVISION stack to provide even greater performance as the transformation of software algorithms to programmable logic becomes more fine-tuned.”



Alpha Data is a leading supplier of FPGA- and SOM-based solutions for the Aerospace, Defense, and Datacenter markets.

“Our customers need to rapidly develop and deploy increasingly complex image and video processing tasks with minimum size, weight, and power,” said Andrew McCormick, Technical Director. “Alpha Data enables this by offering a framework for image capture and video transport that allows end user customization of the image and video processing. This Embedded Vision SDK runs on a proven range of products that utilize the latest Xilinx devices with flexible IO modules for CameraLink and CoaXpress enabling reconfigurability. Our customers rapidly develop and deploy their video processing solutions in harsh environments using several generations of Xilinx-based FPGA hardware,

including the latest UltraScale devices. With the increase in complexity of FPGA image and video processing capabilities, customers will benefit greatly from using the reVISION stack elements such as OpenCV library components and machine learning CNN/DNN. Coupled with a deployment-ready board-level solution, such as the ADM-XRC-KU1 with a Xilinx UltraScale KU115 FPGA or an ADM-VPX3-9Z2 with a Zynq UltraScale+ ZU15EG MPSoC, these image and video-based stacks will give customers a very rapid route to market.”



AptCore offers application-specific processor IP and extensive design experience for embedded vision systems. AptCore has developed smart systems that fuse visible and non-visible data from multiple heterogeneous sensors for responsive applications including collision avoidance, traffic monitoring, and autonomous vehicles to allow humans and machines to make intelligent, real-time safety decisions. Their extensive knowledge of low-power, parallel-processing techniques enables them to provide highly reconfigurable and fully software-programmable processor cores that can achieve the highest performance and efficiency for the target application.

“The Zynq-7000 SoC is an ideal platform for our proprietary IP. Its FPGA fabric performance greatly accelerates our radar and optical image processing algorithms whilst the ARM cores give needed programmability and flexibility— we are able to pack supercomputer performance into a small, low-power package,” said Jim Hutchinson, CEO. “Additionally, the ARM SDK gives our customers a familiar development environment to access performance without the need for detailed knowledge of the processor architectures. We are excited to leverage the new Xilinx reVISION development stack as we see it accelerating development, implementation, and testing of image processing algorithms from software to hardware prototyping platforms using OpenCV and the SDSoC flow. This will shorten our development cycle for new products and upgrades by as much as 12 months—a substantial competitive advantage.”



“For the last 10 years, Concurrent EDA has created FPGA designs that are 10 to 45 times faster than server-class CPUs. Synthetic Aperture Radar (SAR) combines multiple echo returns from a moving radar source into a 2D or 3D image. At 3GHz, a CPU core

can execute about 3 Giga-Ops per second (GOPS) and a quadcore CPU can execute 12,” said Dr. Ray Hoare, CEO. “There is an ever-increasing need for compute capacity that quickly outstrips the capabilities of these traditional technologies. We offer a library of embedded-vision cores that provide 10 to 100 GOPS on Xilinx FPGAs, resulting in an implementation that is functionally identical to the user’s software executable and that operates 3x to more than 10x faster. One example is our implemented the DARPA HPEC Challenge Benchmark SAR Suite using a C-to-gates flow on a Xilinx FPGA. For the Image Formation part of the benchmark, the single FPGA implementation was 15x faster than an i7 core and 45x faster using three FPGAs. For the Target Detection section, the single FPGA implementation was 37x faster and consumed only a fraction of the chip. When filling three FPGAs, the speed improvement is more than 900x faster! We have also demonstrated increased convolution performance in CNNs that are 45x faster than a CPU core. With Xilinx’s new development stack, examples, and OpenCV library elements, we will be able to rapidly transition PC-based algorithms into real-time, embedded products while continuing to deliver these extremely accelerated applications.”



Digital Design Corporation is a Xilinx Premier Design Services Member. They have delivered countless projects in embedded vision, image processing, and sensor fusion for military and aerospace, medical, automotive, and industrial clients.

“Today’s intelligent systems require fast processing and fusing of increasingly complex and heterogeneous sensor data to make real-time decisions for systems that require high frame rate, high resolution, high dynamic range, or small SWaP (Size, Weight, Power), and that task is often problematic for software-only based CPU and DSP platforms,” said Brian Donahoe, CEO. “Recent systems we designed required small solutions in rugged environments. We used NUC, BPR, LAP AGC, fusion, filters, and alpha-blended overlays from our extensive in-house IP library to tackle the stringent image processing performance requirements. We designed interfaces for multiple heterogeneous sensors, integrated the video line-up, and designed and built the underlying circuit board. Xilinx FPGA and SoC devices support the massive parallel computational requirements for these demanding embedded-vision systems. Further, the Xilinx Vivado and SDx FPGA/SoC tools permit us to meet tight, deterministic development schedules with incredible extensibility for adding

future sensors and algorithms, and without the need to respin electronics. We commend Xilinx support for software-centric design flows through the coming release of their development stack, which will greatly simplify the design process and will provide direct access to the power of their SoCs and FPGAs through the new OpenCV library elements for embedded vision and machine learning.”



As the inaugural North American member of Xilinx’s Premier Design Services program, Fidus is at the forefront of Xilinx-based video solutions development. Fidus merges sensor data and video, offering differentiated services to the embedded vision market.

“Fidus recently developed an augmented reality solution that required live fusion of image sensor data with a video feed and real-time display. This development required Xilinx’s IP video cores, knowledge of image sensor operation, and Northwest Logic’s MIPI CSI/DSI IP. We further extended this system with custom code. The end system was instantiated and successfully demonstrated using a Xilinx-based development platform,” said Michael Wakim, President & CEO. “Our customers require solutions for processing real-time, high-resolution data using complex, low-latency algorithms. Xilinx’s existing technology offers key advantages: High Level Synthesis (HLS) enables efficient coding of complex algorithms in ‘C’, a multitude of ready-to-go IP building blocks, the inherent parallelism of programmable logic, and on-chip memory meet the latency needs of these real-time applications. In addition, we can easily jump-start projects using Xilinx-based kits. Xilinx’s new reVISION stack will enable us to accelerate these developments while enhancing consistency, portability, and supportability. That’s a huge benefit for us as well as our customers.”



IRIDA Labs’ unique machine and deep learning technologies are used to develop computer vision applications for mobile devices, security and surveillance, automotive, home electronics, industrial/robot vision, and drones.

“The challenge we address at IRIDA Labs is how to encapsulate the power of deep learning in an embedded device while meeting challenging memory, power and performance requirements. Our

expertise in object detection and identification using both traditional methods and deep/machine learning is a big advantage during data gathering and CNN training for specific identification problems. In addition, we provide a modified CNN structure that delivers the same accuracy provided by well-known structures like GoogleNet and Alexnet, but with 10x the performance,” said Vassilis Tsagaris, CEO. “Our motivation for implementing our custom CNN structures in Xilinx All Programmable technology is to maintain this high performance while improving power consumption. To do this, we take advantage of the Xilinx SDSoC platform that improves overall performance and allows us to reuse our previous work optimizing computer vision algorithms on the Zynq-7000 SoC platform. Our customers need a robust and durable solution that also solves migration problems for their next-generation products where Xilinx FPGA platforms offer a strong advantages. These advantages are now further enhanced by the hardware platforms, OpenCV libraries for embedded vision and machine learning, and SDSoC software development environment that Xilinx will deliver as part of its reVISION stack.”



iveia is a hardware and solutions provider specializing in heterogeneous computing platforms, particularly for embedded vision and software-defined radio (SDR) markets. iveia draws upon its hardware products, reference designs, software, and design services to accelerate its customers’ time to market.

“We support a number of different applications involving embedded vision and sensor fusion, and we’re witnessing a stronger demand for machine learning capabilities as the benefits for such techniques are becoming better understood in a multitude of complex applications. Many of our customers’ applications demand high-performance in small form factors, necessitating a heterogeneous computing solution,” said Michael Fawcett, CTO. “The smaller form factor further complicates system design in terms of power and thermal management. We often hear the same comment from potential customers: ‘I know I need to start considering FPGAs for my products, but I have no idea how to program them or where to start.’ Tools that simplify the design flow in an efficient cohesive manner, such as the Xilinx SDSoC development environment and the reVISION development stack provide an excellent starting point to implement vision-based neural networks, giving our customers a much clearer

vision of the path forward and ultimately accelerating their time to market.”



MathWorks® is the leading developer of mathematical computing software. MATLAB® is a programming environment for algorithm development, data analysis, visualization, and numeric computation. Simulink® is a graphical environment for simulation and Model-Based Design for multidomain dynamic and embedded systems. MATLAB and Simulink provide a common design environment for engineers and scientists to work across multiple design disciplines to implement increasingly complex systems, leveraging vision and other sensor data to design the next generation of responsive “smart” systems. With a large library of toolboxes and blocksets featuring algorithms, functions, and apps, along with advanced data visualization and continuous design verification, these developers can acquire and analyze vision and other data, design processing systems, and explore implementation tradeoffs targeting embedded platforms.

“The Xilinx reVISION development stack, combined with the development capabilities of MATLAB and Simulink, will give designers multiple IP options for their next embedded vision project” said Noam Levine, partner manager, MathWorks.”



As a Design Service Partner to the Xilinx ecosystem, Missing Link Electronics (MLE) has been actively supporting key innovators in the automotive and industrial space in the US and in Europe.

“The convergence of software and programmable logic for computing has been made possible by innovative Xilinx design tools including Vivado High-Level Synthesis and SDSoC, and resource efficient IP core libraries for open Computer Vision,” said Andreas Schuler, Head of Applications. “Furthermore, Xilinx heterogeneous multi-core compute architectures, Zynq-7000 and Zynq UltraScale+ MPSoCs deliver Tera-OPS range processing performance which is needed by modern machine learning algorithms. MLE's engineering team is driven by the many possibilities of machine learning to build smarter, safer, and more energy efficient systems and has been at the forefront in adopting new architectures, tools, stacks, and IP libraries from Xilinx. A multi-camera optical flow computer vision platform for SDSoC is one of our more recent examples how we can de-risk

and shorten time-to-market for automotive OEMs and Tiers-1 suppliers."

NEXVISION

NEXVISION is a hardware and software design house specializing in vision system and video over IP network technologies. Its expertise includes support for video electronics hardware design, electro-optics (EO) system design, vision system architecture, video processing, as well as video analysis algorithm design. NEXVISION services support a number of customers in a number of markets including extreme sport video cameras, cinema/broadcast mobile video cameras, machine vision/industrial inspection, security/defense (night vision) and automotive advanced driver assistance systems (ADAS).

"Given the extreme requirements that many of our clients have, we find that Xilinx FPGAs, SoCs and MPSoCs tend to offer the most processing capability in the most power-efficient envelope," said Vincent Carrier, CEO. "Designing these systems requires very tight integration between both hardware and software. Having advanced development environments is critical to us and helps assure that our clients introduce their products in market on time or even ahead of their expected schedule. The new Xilinx reVISION stack will enable our team to be even more productive when designing with Xilinx SoCs. Having optimized functions for OpenCV and libraries that support machine learning inference will enable NEXVISION to adeptly meet the extreme requirements of our clients."



NGCodec® has been in passionate pursuit of next-generation video compression since 2012. With the support of investors including Xilinx and NSF, NGCodec's agile startup team has created RealityCodec™, a compressor-decompressor technology optimized for ultra-low latency, high-quality applications.

"NGCodec is excited to learn about Xilinx's new reVISION stack for embedded vision system developers," said Oliver Gunasekara, CEO & Co-Founder. "Our RealityCodec supports H.265/HEVC in conjunction with the reVISION stack from Xilinx. This will enable developers to build innovative and responsive vision guided systems."



A Premier Design Service member of the Xilinx Alliance Program, OKI IDS in Japan has designed and delivered numerous customer projects for embedded vision and video based on Xilinx All Programmable FPGAs and SoCs.

“Many customers recognize the value of FPGAs for hardware acceleration and are considering migrating legacy CPU/DSP designs to the Xilinx Zynq-7000 SoC and the Zynq UltraScale+ MPSoC,” said Yasuo Yamamoto, Director of Engineering Development. “OKI IDS, with strong expertise on FPGA and embedded system design, is well suited to support customers to implement Xilinx FPGA and SoC designs. In a recent design win with a leading automotive customer, we ported a legacy C/C++ based system to the Zynq-7000 and accelerated the computation-intensive Moving Object Detection algorithms by moving them to the Zynq SoC’s FPGA fabric. The increase in overall system performance is just amazing. The Xilinx SDSoC design tool provides us a very effective development environment to design and implement embedded vision systems on Xilinx FPGAs, SoCs, and MPSoCs. We are excited about the many new features in the reVISION Development stack such as the increased support for OpenCV and the machine learning libraries, and we’re eager to use it and support it.”



Omnitek are a leading supplier of video and embedded vision IP and design services.

“Our core strength is algorithm design and optimum implementation on the various compute engines of Xilinx’s All Programmable devices. Our solutions cover all stages of the image processing pipeline from camera sensor input to display output,” said Roger Fawcett, CEO. “The benefits of small footprint IP include lower system cost and the highest performance per watt, enabling us to outperform ASIC/ASSP and GPU solutions. By providing turnkey design solutions, we are particularly able to assist clients who are either unfamiliar with Xilinx technology or who require a rapid solution design. Our IP portfolio includes connectivity (HDMI, SDI, V-by-One, ISP), Video over Ethernet, Video Processing, Warp, HDR, Surround View, 3D depth-map machine vision, and Codec IP. Since releasing this IP, we have enabled our clients to be first to market with new 4K, 8K and HDR solutions. Xilinx provides by far the most flexible programmable platforms, which build on the FPGA fabric with hard DSP, CPU, GPU and Codec compute engines, while also enabling connectivity such as PCI Express and MIPI. The reVISION

stack will provide Omnitek and our clients with a range of IP, tools, and boards to further accelerate design time in the growing embedded vision and machine learning market.”



A Design Service member of the Xilinx Alliance Program, Regulus in Japan offers design services for embedded vision and video processing across a wide range of applications such as intelligent cameras, machine vision, and autonomous vehicles (e.g. Drones). We have developed many in-house IP cores, reference boards, mass-production camera boards, and we have designed and delivered numerous customer projects.

“Many new vision applications require real-time processing of large amounts of image data, which can easily out run CPUs, DSPs, or even GPUs,” said Masaru Sakai, Director of Engineering. “Xilinx FPGAs and Zynq SoCs can meet the design challenges posed by many new embedded vision applications, which require high performance, must be responsive and reconfigurable. Regulus has implemented many customer designs on Xilinx FPGAs and SoCs in the past years, including a Stereo Camera image-processing design for a major Japanese drone manufacturer. The performance and programmability of the Zynq-7000, combined with the Xilinx Vivado and SDSoC development tools provide the best platform for our embedded vision developments. We expect that the new reVISION development stack will further increase our design service productivity and customer satisfaction.”



A Design Service member of the Xilinx Alliance Program, SANEI HYTECS in Japan offers design services for Artificial Intelligence (AI) systems.

“We have designed and implemented CNN and Deep Learning algorithms on the Xilinx Zynq-7000 SoC. AI algorithms generally require high performance computing, but high performance computer processors are often not suitable to be included in embedded AI systems due to their size, weight, and power consumption. Such AI systems include moving devices such as robots and automobiles,” said Norihito Suzuki, Engineering Manager. “The concept of ‘Edge Computing’ is becoming a popular design methodology in the AI world. By Edge Computing, we split out the AI algorithms that require fast real-time processing and implement them on a Zynq SoC, while keeping

other delay-tolerant processing on the high performance computer. The Zynq SoC edge device is deployed in the AI system, but networked to the remote high performance computer. The Xilinx Zynq-7000 SoC, with fully integrated CPUs (ARM Cortex-A9s) and FPGA logic resources are well suited for AI algorithm designs in terms of system performance and optimization. The SDSoC design tools include both a software-development IDE and High Level Synthesis, which allows us to easily partition algorithms between CPU and FPGA, and to conduct system level optimizations. We are excited to see the enhanced capabilities of the reVISION development stack, and we hope to leverage it for our future AI designs.”



Stereolabs is the leading provider of 3D depth and motion sensing technology based on stereo vision. From AR and VR devices to robots and drones, Stereolabs empowers objects with the ability to see and understand the world the way we do. It enables developers across multiple industries to create spatially-aware applications that support us in our daily lives.

“Stereolabs is pleased that Xilinx has selected the Zed camera to complement its reVISION stack,” said Cecile Schmollgruber, CEO. “Our camera system enables developers to quickly integrate enhanced perception capabilities in to their system design. This along with the reVISION stack will enable vision system developers to design extremely responsive systems that are capable of perceiving their surrounding environment.”



As a development services provider, Super Computing Systems brings two decades of industrial experience in the areas of electronics, software and system design into projects. Their work is based on reliable technical expertise, well-founded methodological competence as well as significant experience in project management.

The team, consisting of 90 proven experts, covers a broad spectrum of technologies: Hardware, FPGAs, DSPs fast communication; embedded and low level software, FPGA-Firmware; OO-Software based on C++, C#/.NET and JAVA as well as database applications. Their algorithm specialists find even the finest of signals in enormous data volumes and develop effective decision-making tools to optimize complex procedures.

“Supercomputing Systems AG located in Zurich assists their visionary customers in realizing complex implementations of vision and machine learning algorithms on embedded systems, while shrinking the form factor and reducing the power by 10x and increasing the throughput by 100x. For example, our solution for a German OEM consists of a Zynq-based accelerator with hand-optimized implementations of their stereo vision and machine learning algorithms. Compared to a CPU or GPU solution, our hardware accelerator allows real-time responsive operation in a car with much lower power consumption and a smaller form factor,” said Felix Eberli, Department Head of Embedded and Automotive. “The Zynq SoC is the appropriate platform for streamlined image and neural network processing; it allows for a pipelined architecture with highly parallelized computation engines. This is the key for high-throughput, low-latency requirements in advanced driver assistance systems. The tight coupling of CPU and programmable logic in the Zynq SoC facilitates an optimal separation of control and data paths without sacrificing performance. We look forward to the Xilinx development stack toolchain to reduce the need for hand-crafted optimizations. Extreme flexibility is especially desirable in machine learning. The ability to quickly change the topology of a neural network allows for a shorter time to market and increased product quality.”



TeraDeep is a pioneer in the development of specialized neural networks and acceleration technology for deep learning. The company develops and markets unique AI Appliances offering complete solutions embodying a creative combination of specialized hardware designed for purpose-trained networks, available through a robust set of APIs. TeraDeep AI Appliances are leased either directly or through its value-added partners. It licenses reference designs and pursues OEM models with qualified parties.

“TeraDeep’s Deep Learning IP technology for FPGA applications is currently used for low-power, low-latency on-premise or ‘Edge’ applications,” said Didier Lacroix, CEO. “A Kintex UltraScale KU115 FPGA board delivers as many as 750 inferences per second (IFS), which represents close to a 2X performance advantage compared with large GPUs while consuming 5x less power. In addition, the FPGA-based solution delivers 10x the performance while consuming 5x less power compared to an Intel Xeon implementation. In combination with the Xilinx reVISION stack, a

full Deep Learning for edge-based embedded vision application is now a reality.”



As a Premier Partner of Xilinx, Topic Products provides a complete ecosystem of embedded acceleration solutions. We have extensive experience fusing heterogeneous sensor and video data for Ultrasound, MRI, Endoscopy, radar, image-processing, and facial-recognition applications.

“Today’s embedded vision system developers have to make difficult architectural design tradeoffs to meet increasing performance requirements for processing multiple, heterogeneous, high-resolution imaging sensors. Our Dynamic Process Loader (or Dyplo) framework enables developers to accelerate their embedded vision designs by abstracting the process of evaluation and implementation, making performance and power tradeoffs by partitioning the software and hardware portions of their systems in a software-centric design flow,” said Rieny Rijnen, CEO. “The Xilinx Zynq-7000 SoC and Zynq UltraScale+ MPSoC combine multiple ARM processors with high-performance FPGA fabric that supports runtime partial reconfiguration. These devices are the ideal platform for our technology, yielding small footprint, low-power designs with high integration for applications that require high performance levels. Our design flow leverages Xilinx Vivado and High-Level Synthesis tools under the hood to streamline the design and development process. Xilinx has been a great technology partner through its industry-leading silicon and software tools. We look forward to leveraging the power of their coming OpenCV libraries for embedded vision and also for machine learning, which is quickly becoming a critical enabler of intelligent responsive vision systems.”



Trenz Electronic develops, manufactures, integrates, and sells FPGA and All Programmable SoC modules for business and science. A Certified Member of the Xilinx Alliance Program, Trenz focuses on application-specific HDL and FPGA design plus hardware and software development.

“Modern markets require increasingly complex systems. Vision systems require more camera inputs and more processing power. Sensor systems need to be smaller and cheaper whilst processing requirements increase. While design complexity increases the

time to market, competitive pressure demands fast development cycles,” said Thorsten Trenz, CEO. “With easy-to-use Zynq-7000 SoC and Zynq UltraScale+ MPSoC modules, we deliver maximum processing power in very small form factors. Using modules helps customers to concentrate on their core competencies and succeed faster. Free available reference designs allow quick startup and faster development. Custom HDL Development completes our portfolio. Trenz is pleased to be working with Xilinx to offer embedded vision tuned hardware that will work with the reVISION stack.”



A Certified Design Service member of the Xilinx Alliance Program and Authorized Training Partner, V3 Technology in China offers embedded vision and video solutions and services based on Xilinx FPGAs, SoCs and MPSoCs. V3 solutions include Zynq-7000 SoC and Zynq UltraScale+ MPSoC development boards and SOMs with pre-built OpenCV libraries. They also offer turnkey smart camera solutions based on Zynq-7000 SoC.

“In recent years, we have seen an increasing number of customers developing embedded vision systems across a wide range of applications, including intelligent surveillance, machine vision, and advanced driver assistance systems,” said Yuan Yao, General Manager. V3 Technology’s embedded vision solutions based on Xilinx FPGAs and SoCs offer customers All Programmable flexibility, high performance, and an easy-to-use development flow to jump start embedded vision designs. We recently implemented a CNN-based Deep Learning algorithm on our EagleGo Platform, which further proved the performance of the Zynq-7000 SoC and the productivity of the SDSoC design tool. With our new Zynq UltraScale+ MPSoC System-on-Module (SOM) coming soon, the timing is perfect for us to leverage the new reVISION development stack for our next ZU+ MPSoC Vision Solution Kit. “



A Premier member of the Xilinx Alliance Program, Xylon is a provider of design services, IP cores and solutions for Xilinx All Programmable devices. The company serves several markets, with a particular focus on the automotive advanced driver assistance system (ADAS) market.

“Xylon’s Four-Camera Surround View parking assistance, which enables the driver to see 360° around the vehicle with no blind

spots, has been on the road in production automotive systems for years,” said Davor Kovacec, CEO. “This complete solution includes logicBRICKS IPs for customized Xilinx SoCs, vehicle calibration and application software, documentation, and technical support. Reference designs can be demonstrated on the logiVID Vision Development Platform, which is appropriate for test vehicle installations. Xilinx SoC and MPSoC devices are the basis of Xylon’s focus because of the combination of powerful processing system with programmable logic that enables parallel execution of several ADAS algorithms backed up by custom hardware accelerators. The result is unbeatable sensor-fusion support in a single device. Efficient design tools enable Xylon customers to easily mix logicBRICKS with their own IP cores that differentiate their ADAS product while giving them full control at the hardware level. With the new reVISION development stack, Xylon will be able to offer logicBRICKS solutions on predefined Xilinx platforms and use the SDSoC design environment to help customers design their ADAS/AD (Automated Driving) products even faster and easier than before. We plan to merge machine learning libraries with our existing portfolio and use it in automotive applications to improve driver safety.”