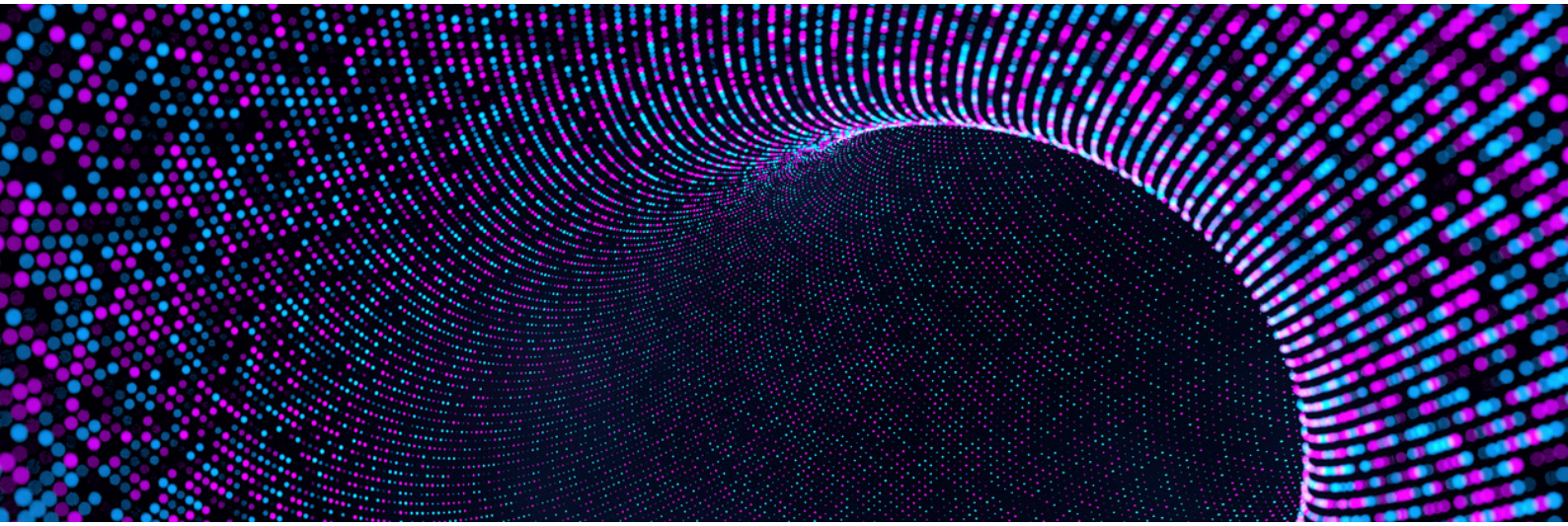
TECHVISION21
INSIDE VIEW



Microelectronics Commons

The Department of Defense (DoD) received a total of $2 billion in funding through the CHIPS and Science Act for a CHIPS for America Defense Fund with specific direction to establish a National Network for Microelectronics Research and Development (NNMRD).

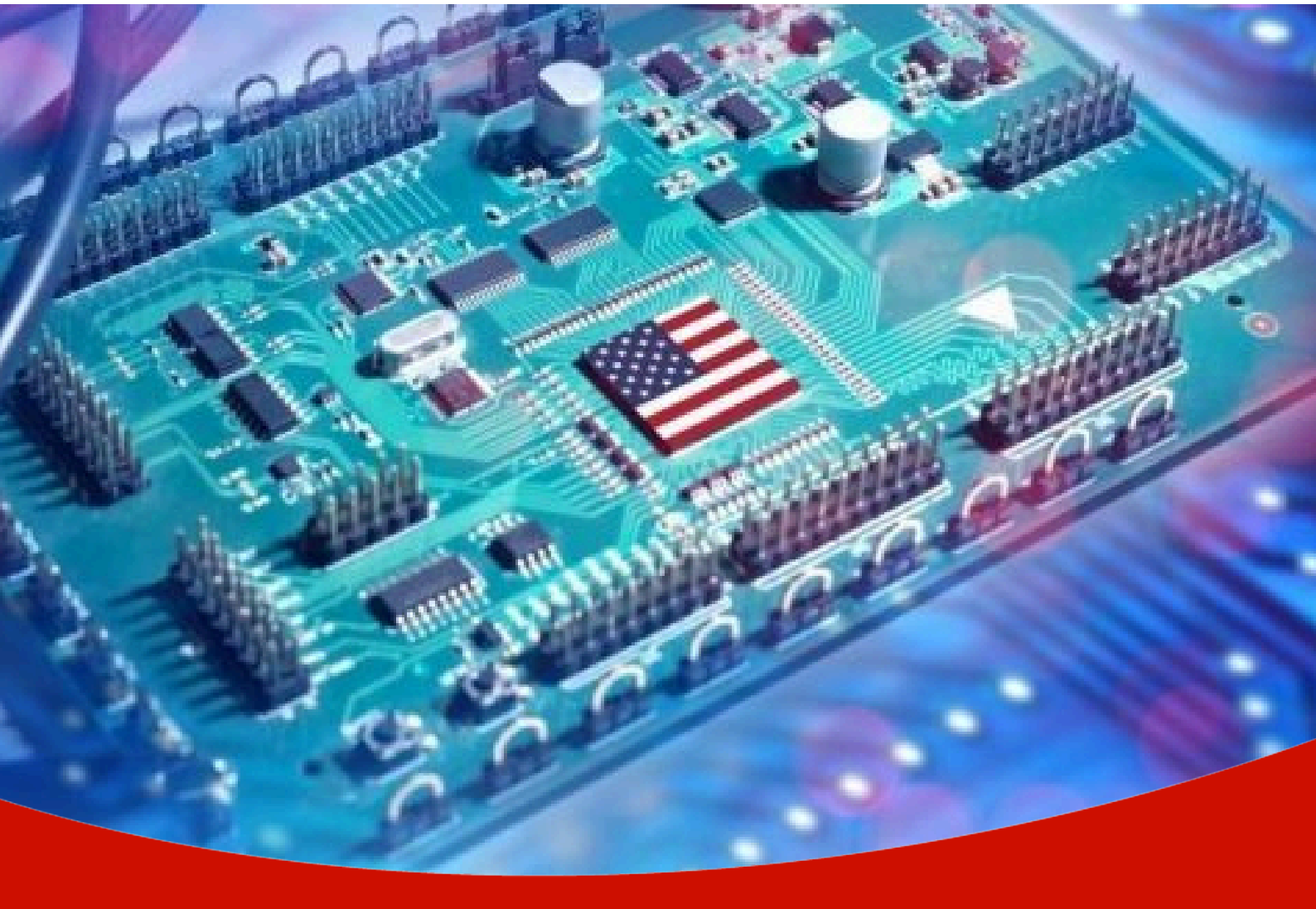
The Microelectronics Commons is a CHIPS-funded national network that will create direct pathways to commercialization for U.S. microelectronics researchers and designers from “lab to fab.”

IN THIS ISSUE

Microelectronics Commons

The Commons is designed to:

- Enable sustained partnerships between emerging technology sources, manufacturing facilities, and interagency partners
- Develop a pipeline of talent to bolster local semiconductor economies and contribute more broadly to the growth of a domestic semiconductor workforce
- Bridge the microelectronics technological “Valley of Death”
- Expand domestic microelectronics fabrication capability
- Enhance microelectronics education and training pipeline to bolster the microelectronics engineering workforce

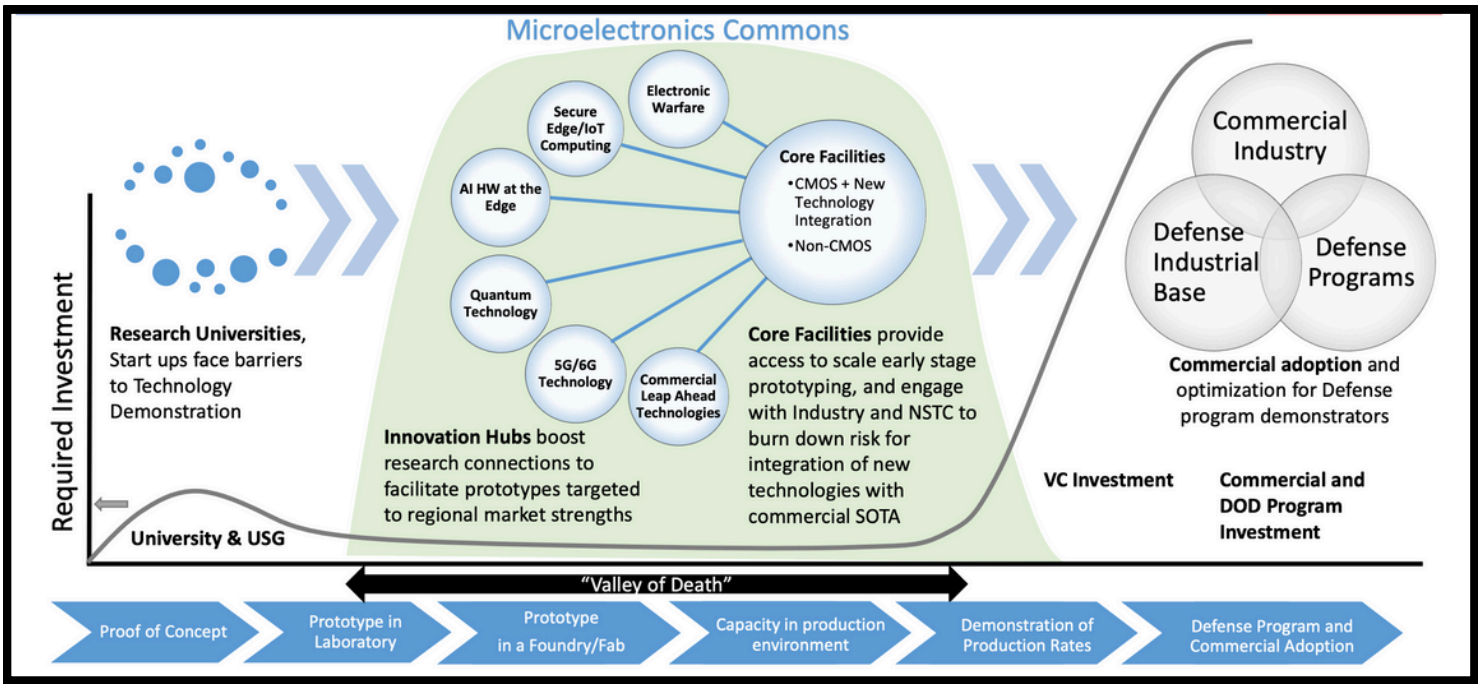


The Microelectronics Commons has three main elements:

Regional Hubs that are designed to connect researchers and designers to prototyping capabilities targeted to regional strengths in the Hub's technical topic area. There are eight competitively-selected Hubs. Each Hubs has a focus on one of six application areas: secure edge/IoT computing, 5G/6G technology, artificial intelligence hardware, quantum technology, electronic warfare, and commercial leap-ahead technologies.

Core Facilities are existing facilities that have scalable capacity beyond what the regional hubs can provide. The Cores serve two functions: complementing and amplifying the work of the regional hubs (for example, 200 mm wafer fab for Silicon CMOS-compatible technologies and 150 mm wafer fab for compound semiconductors); and engaging with commercial fabs to align them better to commercial processes to facilitate transition to commercial companies. Cores provide access to repeatable processes, back-end manufacturing and integration and full flow-fabrication.

A non-profit management company, the National Security Technology Accelerator (NSTXL), that administers the Microelectronics Commons program.



Microelectronic Commons Hubs

In August of 2023, under the CHIPS and Science Act, the Department of Defense (DoD) selected eight awardees or “Hubs”, to build regional hubs to advance microelectronic technical development. Each Hub proposes and submits projects within the Microelectronic Commons program. Commons seeks to accelerate domestic prototyping and to cultivate a pipeline of skilled semiconductor professionals in the United States. Over five years, DoD will release projects within the six designated technical areas, and each Hub will build technology for one or more of these areas.

Their expertise in these fields makes them leaders in microelectronic technology within the United States. Each Hub is recruiting its own members who will support the development of new technology. The team at NSTXL supports each Hub as they move these innovations from conception to fabrication. The eight Hubs are:

Silicon Crossroads Microelectronics Commons Hub (SCMC)

The SCMC Hub, based out of Bloomington, IN, and led by the Applied Research Institute, supports:

- Artificial Intelligence/Hardware
- 5G/6G Technology
- Commercial Leap-Ahead Technologies
- Electromagnetic Warfare
- Secure Edge Computing/Internet of Things
- Quantum Technology

SCMC is an innovation ecosystem that attracts talent, secures investments, and bridges the R&D to production gap. It fosters collaboration for workforce development, innovation and infrastructure needs.

Southwest Advanced Prototyping Hub (SWAP)

The SWAP Hub, based out of Phoenix, Arizona, and led by Arizona State University, supports:

- Artificial Intelligence/Hardware
- 5G/6G Technology
- Commercial Leap-Ahead Technologies

SWAP Hub unites semiconductor and defense companies, academic institutions, and national laboratories from across the nation. The hub delivers flexible, low-cost microelectronics prototyping capabilities tailored to Department of Defense needs.

California-Pacific-Northwest AI Hardware Hub (Northwest-AI-Hub)

The Northwest-AI-Hub, based out of Stanford University, supports:

- Artificial Intelligence/Hardware

The Northwest-AI-Hub comprising physical and virtual facilities seeks to facilitate lab-to-fab translation of AI hardware technologies, catering to regional and national needs.

Northeast Microelectronics Coalition Hub (NEMC)

The NEMC Hub, based out of Westborough, MA, in association with the Massachusetts Technology Collaborative, supports:

- Artificial Intelligence/Hardware
- 5G/6G Technology
- Commercial Leap-Ahead Technologies
- Electromagnetic Warfare
- Secure Edge Computing/Internet of Things
- Quantum Technology

The NEMC Hub comprises more than 100 organizations in eight northeastern states, with a focus on defense-oriented microelectronics. With a 70-year track record of driving DoD innovation and major defense industry partners, the NEMC Hub seeks to fulfill the vision of the Microelectronic Commons while stimulating job creation, startup growth and workforce development in the region’s advanced manufacturing and emerging technology sectors.

Midwest Microelectronics Consortium Hub (MMEC)

The MMEC Hub, based out of Dayton, Ohio, supports:

- Commercial Leap-Ahead Technologies
- Electromagnetic Warfare
- Quantum Technology

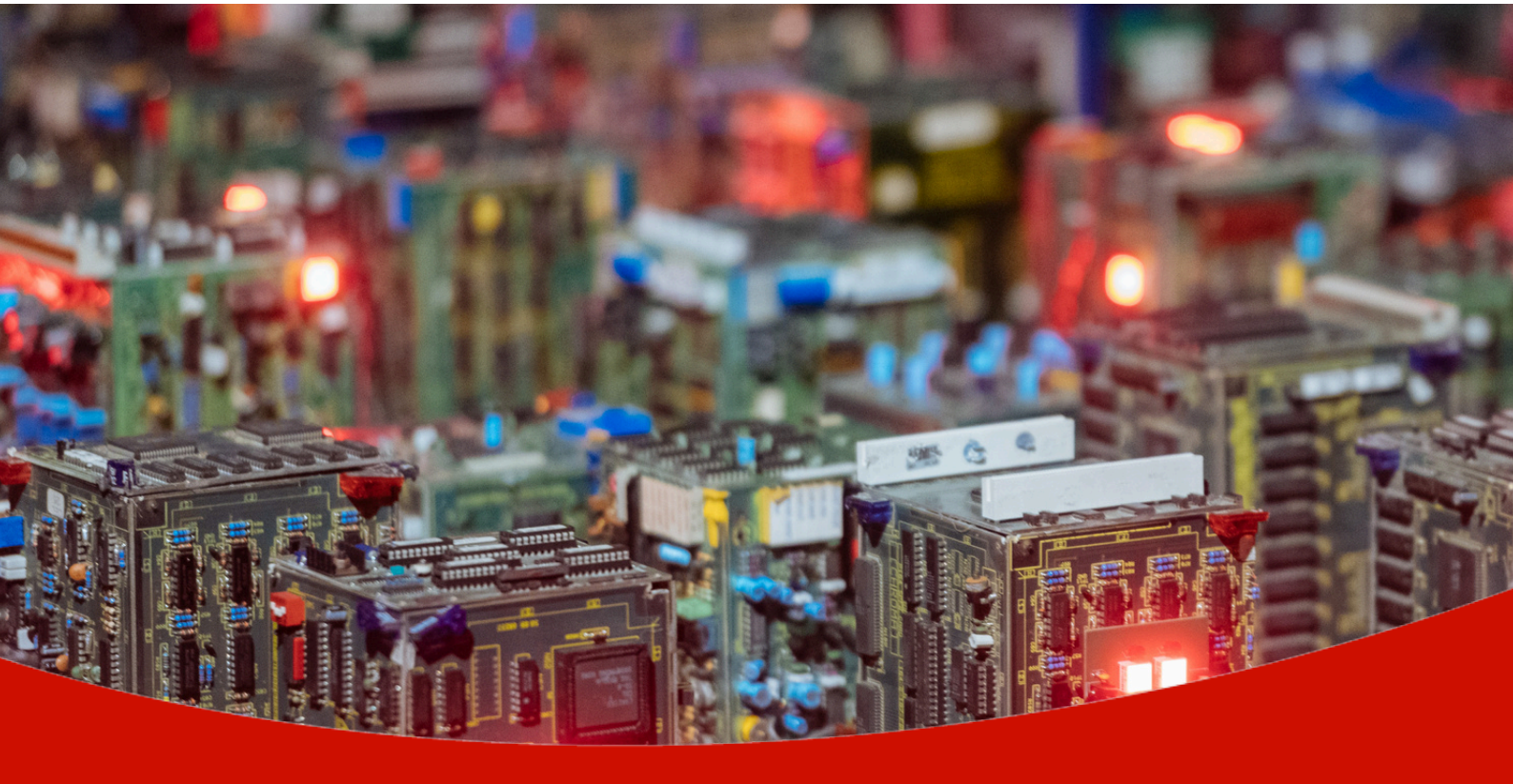
MMEC is a non-profit consortium uniting industry, academia and government that seeks to fosters innovation from lab-to-fab, empower members to share knowledge, help to develop the next-gen workforce, and bring innovation to scalable commercial production.

Commercial Leap Ahead for Wide-bandgap Semiconductors Hubs (CLAWS)

The CLAWS Hub, based out of Raleigh, North Carolina, at North Carolina State University supports Commercial Leap-Ahead Technologies. The Hub aims to fast-track production and integration of wide bandgap semiconductors for civilian and DoD applications. The program focuses on:

1. High voltage, high power Silicon Carbide power electronics
2. III-Nitride electronics
3. III-Nitride Photonics
4. Ultra-Wide Bandgap devices

To achieve this, the program enables research and pilot foundry capabilities with a transition path to volume manufacturing with assistance from industry partners.



Northeast Regional Defense Technology Hub (NORDTECH)

NORDTECH's five founding members who comprise the leadership team/governance committee of the Hub include: NY CREATES, the University at Albany College of Nanotechnology, Science, and Engineering (CNSE), Cornell University, Rensselaer Polytechnic Institute (RPI), and IBM. The Hub supports:

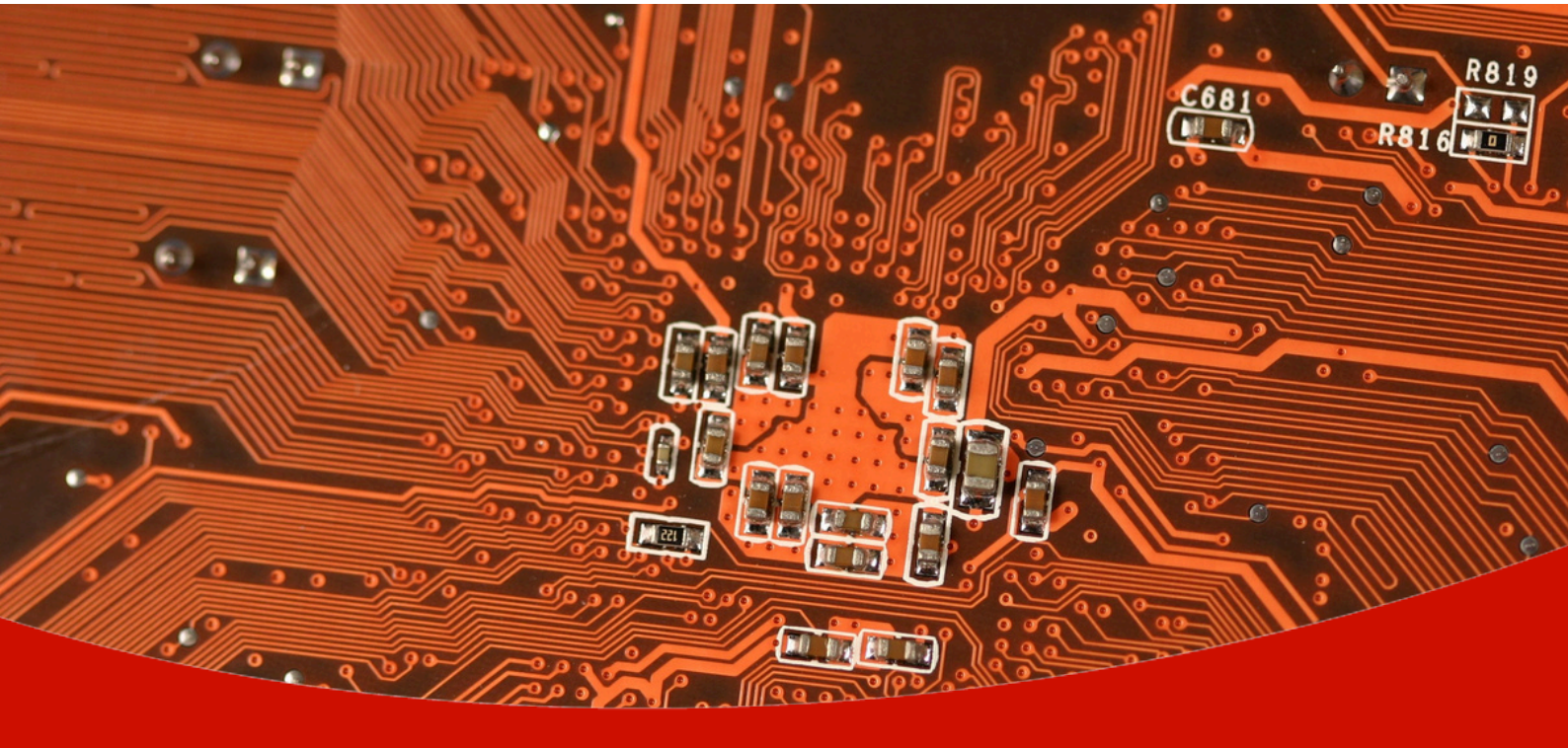
- Artificial Intelligence/Hardware
- Commercial Leap-Ahead Technologies
- Secure Edge Computing/Internet of Things
- Quantum Technology

California Defense Ready Electronics and Microdevices Superhub (California Dreams)

The California DREAMS Hub, based out of Los Angeles, CA at the University of Southern California, supports:

- 5G/6G Technology
- Electromagnetic Warfare

The Hub consists of state-of-the-art compound-semiconductor labs and DoD-volume fabs. California DREAMS Hub has core facilities and workforce development partners situated across the nation. The users of the Hub have access to MOSIS 2.0, a brokerage and engineering service, which aims to promote innovation by facilitating lab-to-fab transitions, removing obstacles to prototyping and reducing fabrication cycle times.



Hubs Calls for Projects by Hub Closed

On July 26, 2024, a call for projects was closed

Previously calls for projects were closed on February 28, 2024, for each of the designated technical areas. The 32 awards for these calls totaling ~ $222.8M are described below.

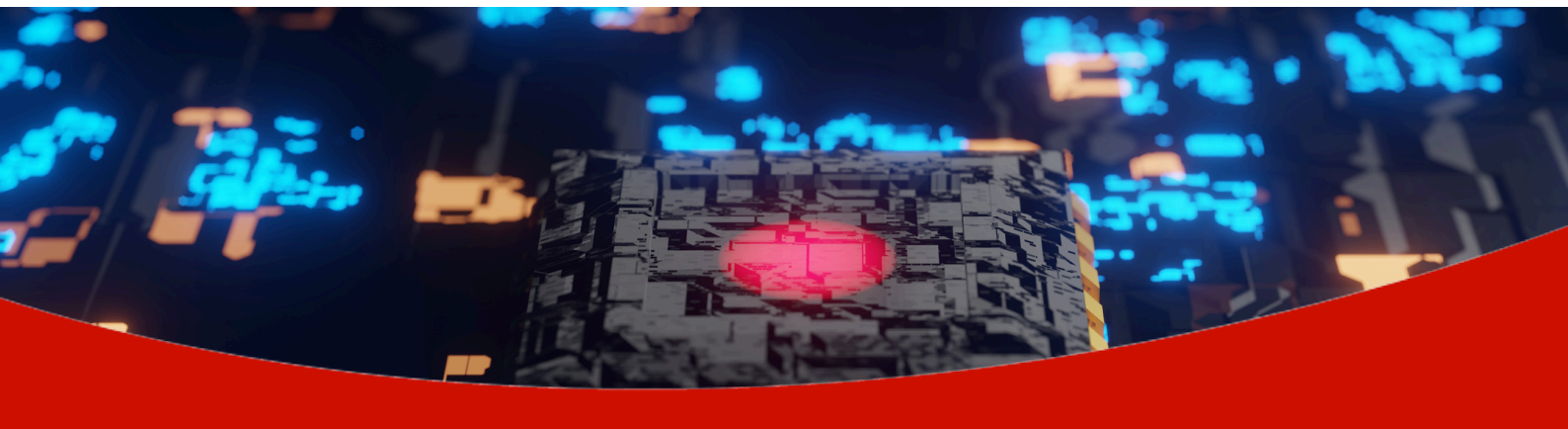
California Dreams (2 projects, ~$31.9M)

- **Electromagnetic Warfare**

GaN Amplifier Prototypes Targeting Microwave to Submillimeter-wave Frequency Spectrum ($16.2M)
The award seeks to mature advanced gallium nitride (GaN) technology to enable broad-spectrum, high power, and high efficiency solutions for future DoD EW systems. The project seeks to develop GaN amplifier chipsets from the microwave to the sub-millimeter wave frequency spectrum making advancements at the semiconductor-device, the integrated circuit, and the package level.

- **5G/6G**

AmmP3 – Accelerated mmW Phased Array Prototyping ($15.7M)
The award supports the development 5G/6G-relevant prototypes to accelerate availability of high-performance front ends, including phased array antennas, beamforming integrated circuits (ICs), and broadband amplifiers integrated using state-of-the-art (SOTA) advanced (2.5D and 3D heterogeneous integration [HI]) packaging for leading-edge size, weight, power, and cost (SWAP-C) systems.



California-Pacific-Northwest AI Hardware Hub (NW AI) (2 projects, ~$16.4M)

- **Artificial Intelligence (AI) Hardware**

Energy-Efficient and Scalable AI Hardware Systems through Heterogeneous Integration of Specialized Chiplets ($6.7M)

This project uses innovations in semiconductor materials, integration technologies and AI system architecture to significantly improve energy consumption and performance of AI hardware. Interconnected heterogeneous chiplets, built using leading-edge CMOS and 3D CMOS+X semiconductor technologies such as carbon nanotube transistors, resistive memory, and oxide semiconductors, form the foundation for such AI systems.

- **Artificial Intelligence (AI) Hardware**

Energy-Efficient, Scalable, and Self-Learning AI Hardware with 3D Electronic-Photonic-Integrated-Circuits ($5.7M)

This project pursues transformative improvements in AI hardware's speed, energy-efficiency, scalability, and self-learning capabilities for next-generation U.S. defense needs. The project approach combines innovations in photonics and electronics, including CMOS+X devices, and integrates them into compact 3D photonic-electronic-integrated circuit modules.

- **Artificial Intelligence (AI) Hardware**

CMOS+X: Integrated Ferroelectric Technologies for Ultra Efficient AI Hardware ($4M)

This project aims to substantially improve energy efficiency for future AI hardware by exploiting unique properties of ferroelectric materials. This project will focus on lowering the power supply voltage of computing hardware as well as achieving non-volatile memory that can be directly integrated with the microprocessor.

Commercial Leap Ahead for Wide-bandgap Semiconductors (CLAWS) (4 projects, ~$18.9 M)

- **Commercial Leap Ahead**

High Permittivity Dielectrics to Increase the Performance of III-Nitride Transistors ($3.83M)

The award seeks to increase the efficiency and radiation hardness of advanced transistors used in avionics and satellite applications.

- **Commercial Leap Ahead**

Transition Readiness for NITride Rf Overmatch (T/R NITRO) ($3.68M)

The award seems to deliver advance prototypes of high frequency transistors and circuits for use in electronic warfare, radars, and 5G/6G telecommunications.

- **Commercial Leap Ahead**

Advanced High Voltage Silicon Carbide Switches ($7.82M)

The award seeks to push the development of 6.5 to 10 kV planar field-effect transistors (FETs) into a low-volume production environment and develop 6.5 to 10 kV Superjunction (SJ) devices.

- **Commercial Leap Ahead**

Advanced Power Switches using UWBG Gallium Oxide ($3.52M)

This award seeks to advance the state-of-the-art in gallium oxide high voltage switching devices by producing power diodes and power transistors capable of blocking up to 10kV, and make available the epilayers, devices, and composite substrates to the DoD and community at-large through the CLAWS hub.

Midwest Microelectronics Consortium (MMEC) (5 projects, ~$31.8M)

- **5G/6G**

Wideband Multifunctional Software Defined Radio (WMSDR) ($8M)

This award seeks to meet a critical need for the Warfighter with heterogeneous RF reconfigurable filters and a multi-function transceiver architecture. It also seeks to develop wideband SDR capable of selectively attenuating interfering signals of interest will enable a low SWAP 5G/6G solution that can successfully operate in contested and congested environments.

- **Artificial Intelligence (AI) Hardware**

Ultra Efficient In-Hardware Prototype Using Hyperdimensional Computing ($1.6M)

This award seeks to demonstrate an FPGA-driven, ferroelectric diode-based compute-in-memory prototype that slashes sample, time, and power burdens by orders of magnitude compared with state-of-practice CPU/GPU implementations.Breakthroughs seek to unlock the full potential of AI at the true edge, in size-, weight-, and power-constrained platforms such as drones, vehicles, and mobile devices.

- **Electromagnetic Warfare**

Co-packaged Reconfigurable Signal and Intelligence Architecture (CORSAIR) ($8.6M)

This award seeks the development of fully programmable, RF-enabled dual-use chiplet targeting >20x system-level performance versus incumbent technology in signal processing and artificial intelligence via a novel Configurable Spatial Architecture (CSA) runtime, reconfigurable array (RTRA). It also seeks to help reshore processor manufacturing.

- **Electromagnetic Warfare**

Center for Technology Transition and Rapid Prototyping of Infrared Detectors ($8.8M)

This award seeks the development of cost-effective advanced large-format 3D infrared focal plane arrays (IRFPAs) by integrating pre-screened high-yield Digital Read Out Integrated Circuit (DROIC) chiplets with seamless large infrared sensor array via a high-yield, high-aspect-ratio interposer wafer. It also seeks to prototype a broad-band midwave-infrared (MWIR) detector with a nominal of 4k x 4k resolution and a 10 µm pixel pitch.

- **Secure Edge/Internet of Things (IoT)**

Validated GPU Based Secure Processing Module ($4.8M)

This award seeks to develop and demonstrate a Secure GPU prototype that is based on mature commercial GPUs and proven secure processor concepts to enable a forward-looking architecture for a family of secure edge GPU ecosystems for both DoD and commercial applications. Low Size, Weight, and Power (SWaP) secure GPU modules will enable users to rapidly deploy and update emerging AI algorithms to promote an asymmetric advantage in AI and sensor processing.

Northeast Microelectronics Coalition (NEMC) (6 projects, ~$37.6M)

- **Electromagnetic Warfare**

LADDER: a giant Leap AheaD for all filter DesignERs! ($4M)

This award seeks to deliver a bulk acoustic wave (BAW) filter creation tool, enabling all electrical engineers to rapidly design filters to meet given specifications, thus enabling broader adoption of BAW filters in Radar, Electromagnetic Warfare, Comms, and general commercial applications spanning S through X and Ku bands.

- **Commercial Leap Ahead**

Power Systems: Transition of High Al% AlGaN from Lab to Fab ($4.5M)

This award is focused on the lab-to-fab transfer of advanced semiconductor technologies to improve the performance of state-of-the-art high voltage switches by an order of magnitude, resulting in more efficient power management solutions with smaller footprints.

- **Quantum Technology**

Community-driven Hybrid Integrated Quantum-Photonic Integrated circuits (CHIQPI) ($9.6M)

This award is focused on the creation of a community-accessible, manufacture-grade quantum-classical hybrid integration platform with the potential to significantly reduce the size, weight, power and cost of quantum systems for use in Department of Defense applications.

- **Artificial Intelligence (AI) Hardware**

Lab-to-Fab Transfer of CMOS+memristor Chips for Edge Intelligence ($7.9M)

This project is focused on lab-to-fab development and transfer of hybrid chips and systems integrating memristor devices with CMOS leading to compact, fast, intelligent and secure electronic systems for edge-intelligence applications.

- **5G/6G**

Wideband, scalable MIMO arrays for NextG Systems. from antennas to decoders ($6M)

This award seeks the development of wideband, scalable transmit/receive MIMO systems for 5G/6G deployments, enabling lower costs and increases in overall network capacity.

- **Electromagnetic Warfare**

Wideband Same-Frequency STAR Array Platform Based on Heterogeneous Multi-Domain Self-Interference Cancellation ($5.6M)

This award is focused on the development of wideband same-frequency STAR array platforms for next-generation EW applications.

Northeast Regional Defense Technology Hub (NORDTECH) (4 projects, ~$29.7M)

- **Quantum**

Improved Materials for Superconducting Qubits with Scalable Fabrication ($8.9M)

NY CREATES and partners in academia, industry, and government seek to co-develop technologies necessary to demonstrate scalable quantum error correction, using new materials, innovative quantum circuits and qubit control schemes.

- **Quantum**

Quantum Ultra-broadband Photonic Integrated Circuits and Systems (QUPICS) ($8.5M)

The QUPICS team, led by the American Institute for Manufacturing Integrated Photonics (AIM Photonics) and Cornell University, seek to develop a novel 300mm foundry fabrication platform for quantum technologies which will span the ultraviolet to the infrared.

- **Quantum**

Heterogeneous Quantum Networking ($3.9M)

The Rochester Institute of Technology, AFRL, and partners seek to realize a heterogeneous quantum network (HQN) that connects ion-based qubits with superconducting and photonic-based qubits using high speed photonics chips.

- **Commercial Leap Ahead**

Nitride RF Next-Generation Technology (NITRIDER) ($8.4M)

High-speed gallium nitride (GaN) high-electron mobility transistors (HEMTs) have revolutionized defense radar and communication systems, despite delivering only 1/10th of the radio frequency (RF) output power for which this semiconductor family is capable. Under this award, Cornell University and its team seek to unleash the dormant 90% output using novel and patented nitride HEMTs and aluminum nitride (AIN) substrates.

Silicon Crossroads Microelectronics Commons (SCMC) (4 projects, ~$26.9M)

- **Artificial Intelligence (AI) Hardware**

CHEETA: CMOS+MRAM Hardware for Energy-EfficienT AI ($8.7M)

This award seeks to develop a neuromorphic processor with in-memory computing (IMC) to overcome the von Neumann bottleneck and MRAM for higher density and energy efficiency that enables a new generation of robust energy efficient AI. The desired end-state seeks a greater than 100X improvement in energy efficiency and sensor-to-decision latency over current commercial state-of-the-art solutions.

- **Electromagnetic Warfare**

High-Performance Diamond Electronics for Next Generation Defense Systems ($6.2M)

This award seeks to develop a new generation of diamond-based high power radio frequency (RF) transistors for future electronic warfare systems and the associated power transistors to condition the sensor prime power.

- **Secure Edge/Internet of Things (IoT)**

IMCRYPTO: An Efficient Hardware Crypto Engine based on In-Memory Computing ($2.8M)

This award seeks to fabricate and assess a cryptographic accelerator that offers enhanced security and orders of magnitude improvement to key metrics such as throughput, energy consumption and latency.

- **Secure Edge/Internet of Things (IoT)**

Modular Digital Direct Waveform Synthesizer w/ Integrated ADC Functionality (DDWS) ($9.2M)

This award seeks to develop the first broadband Digital Direct Waveform Synthesizer that is highly programmable, offers high-speed communication links, direct data acquisition for flexible processing, secure storage, and ability to create a root-of-trust processing environment. Successful development will lead to advancements in performance of cognitive radar, EW, ISR, and ELINT systems.

Southwest Advanced Prototyping (SWAP) (5 projects, ~$29.6M)

Integrated RF GaN Technology to Support NextGeneration Wireless Systems ($5.1M)

- **5G/6G**

Integrated RF GaN Technology to Support NextGeneration Wireless Systems ($5.1M)

This award seeks to leverage disruptive innovations in radio equipment to offer dynamic adjustments through small form-factor Gallium nitride (GaN) power amplifier technology.

- **5G/6G**

SMART – Scalable Modular Architecture for RF Transceivers ($5.7M)

This award seeks to advance radio frequency (RF) transceiver technology to improve national defense and commercial capabilities.

- **Artificial Intelligence (AI) Hardware**

Spaceborne Low-Energy AI Computing (SLEAC) ($6M)

This award seeks to extend the power of artificial intelligence (AI) to satellites orbiting the planet by directly integrating a highly efficient, radiation hard AI chip with focal plane array image sensors used in space.

- **Commercial Leap Ahead**

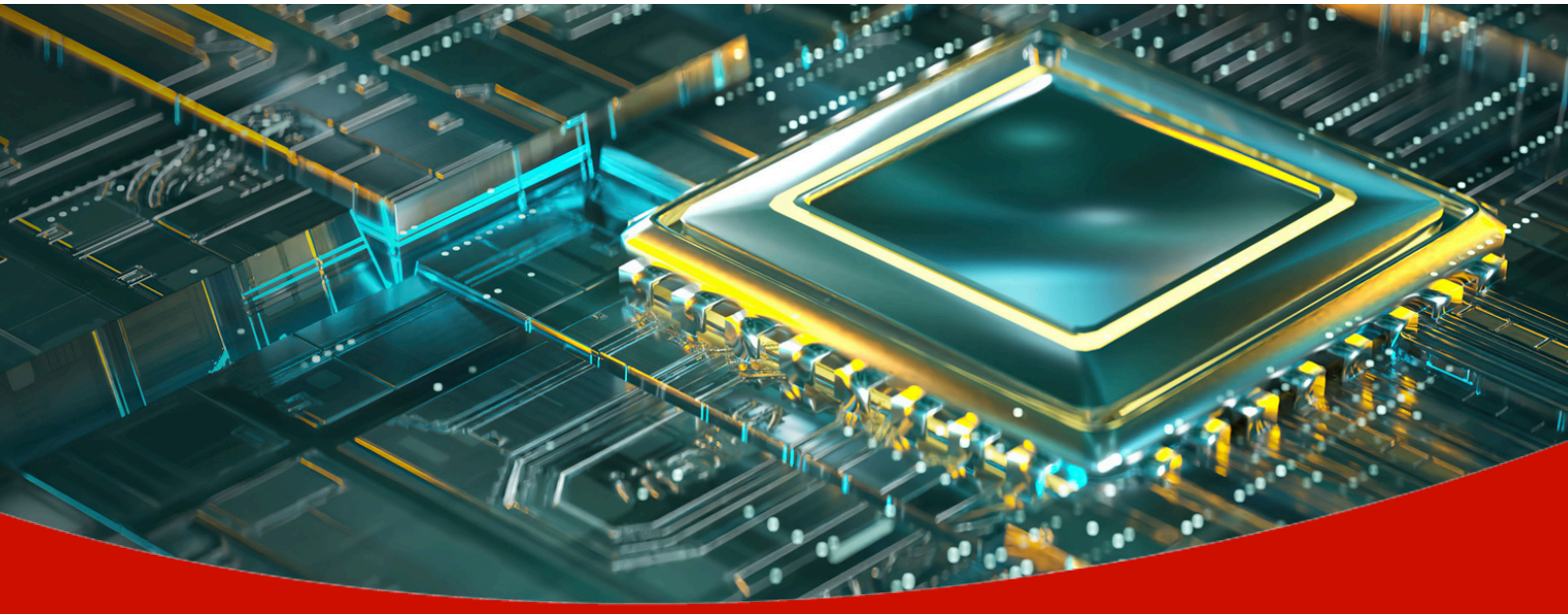
Multi-MHz, High Density, Ultra-fast RADAR Power Converter ($5M)

This award seeks to advance radar power systems in critical defense applications. The project will specifically develop a multi-megahertz, multi-kilowatt, high-density ultra-fast radar power converter that forms the heart of advanced radar systems.

- **Secure Edge/Internet of Things (IoT) ($7.8M)**

ARC-V Secure Processor

This award's primary objective is to create a secure, low-power processor that allows the military to confidently deploy advanced systems, even in contested environments, that rely on powerful but vulnerable commercial electronics.



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GET CRITICAL INSIGHTS

TechVision21 President and CEO's book—*Next Generation Innovation: Supercharge Your Business Through Strategic Government Partnerships* offers rich insights drawn from Kelly Carnes' real-world experience as an attorney for technology companies, Senior Advisor to the Secretary of Commerce and Senate-confirmed Assistant Secretary of Commerce for Technology Policy, and her current entrepreneurial effort.

TechVision21 offers assistance to technology visionaries interested in doing well by doing good for the Nation. TechVision21 offers its clients the opportunity to collaborate with an expert team deeply knowledgeable about theories and models of innovation, the history of science and technology policy, and the details of U.S. government programs and budget-making processes. This includes how to access Federal funding to advance clients' research, technology, and policy interests. You can officially purchase a print copy or the e-book from Amazon today.

Kelly Carnes
President & CEO TechVision21

Bottom Line...

Washington is dishing out hundreds of billions of dollars in grants, loans, and tax credits for R&D, technology development, manufacturing, and clean energy. The funding landscape changes fast with new opportunities coming across government weekly. TechVision21 is ready to help advance your technology and clean energy interests in Washington—meetings with policy makers and program managers, pinpointing funding for projects, identifying key partners, and helping you prepare complex grant proposals. We have years of experience supporting clients in a wide range of technologies.

Do not hesitate to contact TechVision21 at (202) 966-6610 or at kcarnes@TechVision21.com