Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2023-0052

Topic # N202-099
Implementing Neural Network Algorithms on Neuromorphic Processors
Bascom Hunter Technologies

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA-265

Transition Target: EA-18G

TPOC: (301) 342-9126

Other Transition Opportunities: F/A-18, Other aircraft, weapons and intelligence platforms.

Notes: This technology will be a key enabler in USN and broader DOD initiatives to perform increasingly complex machine learning computations at the edge or even on-sensor. Moreover, this TRL 5, 3U VPX, SOSA-aligned processor provides for mission enablement on delivery, not after years of NRE.

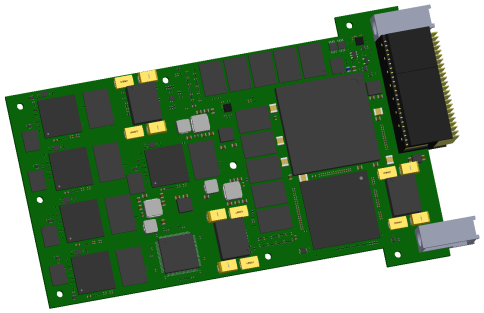

Image courtesy of Bascom Hunter (2023)

WHAT

Operational Need and Improvement: Neuromorphic processors have demonstrated the capacity to perform complex state-of-the-art machine learning algorithms in just a few Watts. GPUs perform these same computations in tens to hundreds of Watts.

Specifications Required: Neuromorphic processors have demonstrated the capacity to perform complex state-of-the-art machine learning algorithms in just a few Watts. GPUs perform these same computations in tens to hundreds of Watts.

Technology Developed: Bascom Hunter developed a SOSA-aligned 3U VPX card that can accelerate most machine learning algorithms faster than current GPU offerings and with unparalleled power efficiency. This performance is due to the architecture of the chipsets themselves, having been modeled after the biological workings of the human brain.

Warfighter Value: Power Efficiency - Neuromorphic processors require 10's-100's of Watts less than traditional GPUs to perform the state-of-the-art machine learning tasks, enabling UAS systems to make more nuanced inferences at the edge without sacrifing flight time.

Ease of Integration - Traditionally, this novel of a technology would require years of engineering effort to integrate our processor into a key weapons system. Bascom Hunter leveraged our expertise in designing these high-technology prototypes to bake in SOSA-alignment and HOST-compliance, APIs and common packet support (e.g., VRT, DIFI, etc.), and all in a mission-relevant 3U VPX form factor.

WHEN

Contract Number: N68335-22-C-0159 **Ending on:** Feb 24, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Prototype Design Review	Low	Successful PSpice simulation results	5	4th QTR FY23
Prototype Manufacturing	Low	Delivery of a prototype board for internal testing	5	2nd QTR FY24
Internal Lab-Based Prototype Testing	Low	Successful execution of state-of-the-art algorithim performance while integrated into a misison relevant VPX backplane	6	3rd QTR FY24
Government Field Testing and Evaluation	Low	Successful execution of state-of-the-art algorithim performance while integrated into a misison relevant VPX backplane	7	4th QTR FY24

HOW

Projected Business Model: Bascom Hunter is in the process of developing a software platform that would enable end-users to dynamically load machine learning algorithims and datasets, translate them into spiking-neuromoprhic algorithims, and then deploy them onto the processor we've developed. This will allow customers to purchase these processor cards off-the-shelf and configure them themselves without the need for engineering support.

Company Objectives: Bascom Hunter intends to lead the market with this technology, marrying it with our similar advances in neuromorphic photonics and our advanced RF systems designs; creating a new class of "snap-in" neuromorphic processors designed for the U.S. Armed Services and Intelligence Community.

Potential Commercial Applications: We intend to target (3) main areas within the U.S. Government: research laboratories (ONRL, AFRL, etc.), intelligence platforms (SIGINT, IMINT, MASINT), and various weapons platforms/airframes across the services (EA-18G, etc.). We also see this technology as being an excellent fit for concurrently processing the real-time information necessary for the successful, automated, navigation of cars and aircraft in GPS-denied environments. We are also open to partnerships and sub-contracting opportunities with prime integrators.

Contact: Jim Stroup, Director, Advanced Systems
stroup@bascomhunter.com (321) 266-3096