



ASX Announcement

BrainChip Holding Ltd Year-End Update 2019

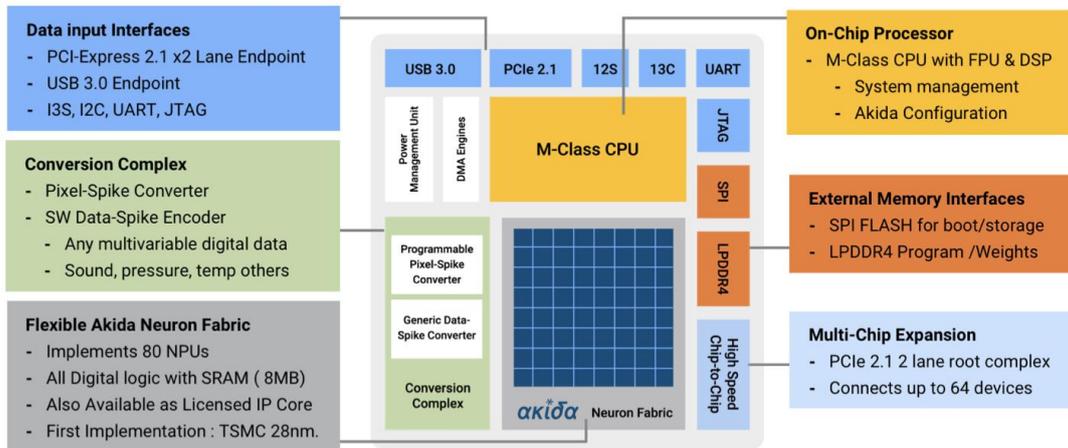
- Introduction of Akida™ Intellectual Property for Licensing to ASIC Suppliers
 - Introduction of a Neural Network Converter for CNN to Event-Based CNN and Native SNN translation
 - Definitive Agreement with Socionext for Akida Development and Manufacturing
 - Convertible Note issued, to raise US\$2.85M
 - Entitlement Offering Raised A\$10.7M
 - Expansion of Sales and Marketing Team
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Sydney, Australia – 2 January: BrainChip Holdings Ltd (ASX: BRN), a leading provider of ultra-low power high performance AI Edge technology, is pleased to confirm it will provide a webinar on Friday January 3 at 9:00 AM (AEDT). Interested investors can register for the webinar on the Company's website at <https://ir.brainchipinc.com/quarterly-update> and may submit questions in advance to brainchipupdate@brainchipinc.com. Today the Company provides the following update for the year ending 31 December 2019.

Akida Product Development Update:

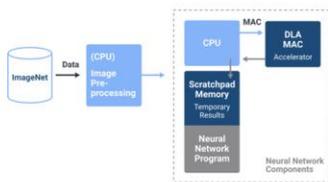
The Akida logic and layout designs are complete. Design-for-Test (DFT) will be completed and wafer fabrication will begin at Taiwan Semiconductor Manufacturing Company (TSMC) in January 2020. During the wafer fabrication cycle, test programs and hardware will be completed. Software development and collateral material are in development and will be available at the time of releasing engineering samples.

Akida is a complete neural network with on-chip training, inference and incremental learning. The device is simulated in the Akida Development Environment and emulated in an FPGA for verification. The device replaces current discrete solutions which require a host processor to run the neural network, external memory and a math accelerator device. The Akida device will be available in a Flip-Chip Ball Grid Array (FCBGA324) that is 15mm x 15mm and will support an industrial operating temperature range.



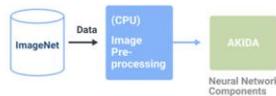
• **Data-Based Convolutional**

- Discrete Solution – CPU, Memory and Accelerator
- Deep Layers – 20 to 50
- Math Intensive – MACS
- Inefficient Power – 40 Watts to 100 Watts



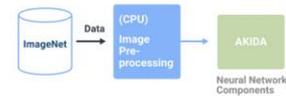
• **Event-Based Convolutional**

- Integrated Solution – No CPU, External Memory or Accelerator
- Deep Layers – 20 to 50
- Sparsity of Data – Less Operations
- Efficient Power – 500 micro Watts to 4 Watts



• **Spiking**

- Integrated Solution – No CPU, External Memory or Accelerator
- Shallow Layers – 2 to 5
- Sparsity of Data – Less Operations
- Efficient Power – 50 micro Watts to 2 Watts
- Continuous Learning – Add classifiers without re-training the entire network



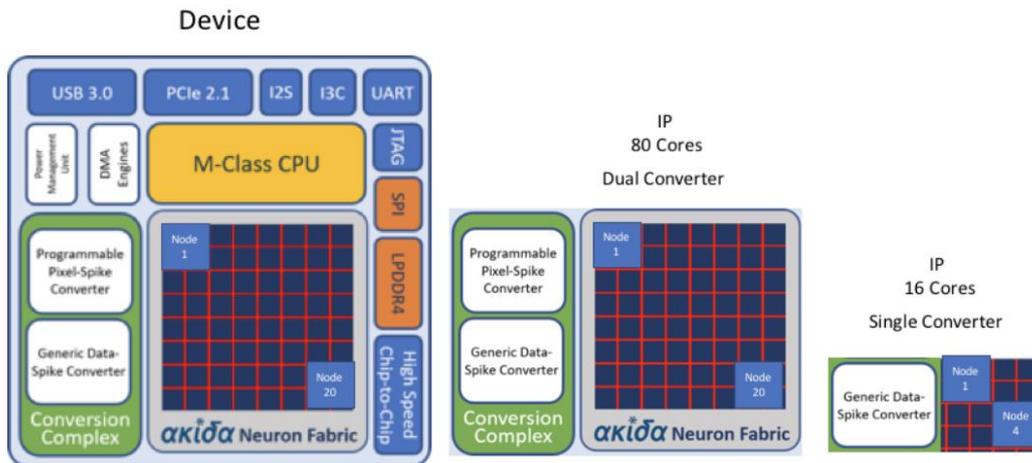
The Akida performance benchmarks are impressive and are well-suited for emerging AI Edge applications. Keyword spotting at 150µW for a full network is unparalleled. Object detection at 200µW opens applications for integration into image sensors at high volume and image classification with MobileNet v1 at 150mW demonstrates the efficiency of Akida processing events.

Application	Network	Data Set	FPS or IPS	Input Data Size	Number of Classes	Accuracy	Power No CPU
Key Word Spotting	Published CNN (DWC)* 38K 4.7M MACs/inf	Google Commands	7	10x49x1	30	92%	150uW
Object Detection	Custom CNN 137K 29M MACs/inf	Proprietary	5	112x112x3	2	90%	200uW
Object Detection	Custom CNN 137K 29M MACs/inf	Proprietary	5	224x224x3	2	90%	800uW
Image Classification	MobileNet V1 (DWC)* 4.7M parameters 569M MACs/inf	ImageNet 1000	30	224x224x3	1000	68% Top 1	150mW
Object Detection	Tiny YOLO V2 15.9M parameters 1.8B MACs/inf	VOC	241	416x416x3	20	TBD	784mW
Object Detection - LIDAR	Complex Yolo V2 50M parameters 10.3B MACs/inf	KITTI	133	512x1024x3	8	65%	4W



Akida Intellectual Property Update:

The Akida neural fabric is organized in nodes comprising four Akida cores. The nodes are mesh networked which provides application scalability. The neural fabric has been developed on a standard 28nm CMOS logic process and is portable to virtually any geometry.



The Akida IP was released for sale as a license in mid 2019 and has received positive response from prospective customers. The Company has targeted applications in vision and acoustic systems with a direct OEM sales presence. Tier-1 suppliers in the automotive industry include third party vendors such as Bosch, Valeo, Continental, Aptiv and ZF. Automotive applications include Radar, LiDAR and cameras for ADAS/AV. Other Vision and Acoustic applications include smart cameras and smart home systems. Tier-1 Image sensor manufacturers include Sony, On Semi and Omnivision. Acoustic applications for smart home include Tier-1 supplies in the United States, Europe and China for cameras, hubs and peripherals.

The Company has retained SurroundHD a team of seasoned IP sales executives for direct sales engagement and is working with Application Specific Integrated Circuit (ASIC) suppliers and Design Services suppliers to broaden exposure and develop an IP ecosystem. In Europe the Company has an existing relationship with T2M, a major independent supplier of IP and is in discussions with resources in Japan, China and Israel. The Company has applied for an export license for the sale of IP into China. China represents a large component of AI Edge applications in smart cameras for surveillance, automotive ADAS/AV and vision guided robotics.



Business Update:

The Company has dedicated all resources to the design, introduction, sales and marketing of Akida as a device and intellectual property. BrainChip Studio sales efforts are exclusively focused on OEM engagements rather than end-users in order to optimize resource allocation. BrainChip Gaming, Gaming Partners International (“GPI”) is a well-developed product that requires adaptation for Angel Playing Cards Pty (“Angel”), which was acquired GPI in May 2019. The Company has signed a Non-Exclusive Distribution Agreement with Angel to resell the BrainChip Gaming vision system. At this time the Company is not investing in the required adaptation and maintains its focus on the Akida commercialization.

Financial Update:

The Company ended the September 2019 quarter with US\$9.5M in cash. The Company has initiated significant reductions in planned expenses for the 2020 financial year, primarily employee headcount, while completing the Akida development and commercialization.

Financial Year 2020 Outlook:

Akida Intellectual Property licensing is expected based on current customer engagements. IP licensing can precede Akida device sales by several quarters as no manufacturing cycle is required, the licenses will be pre-paid and the IP is well documented. IP licenses represent significant gross margin and operating margin and can add support for the Company’s cash requirements in 2020.

Akida Device design wins can be established on engineering samples. OEM customers design cycles are variable and are dependent on end-market. Consumer applications are typically six to nine months, while industrial and automotive applications can be several years.

The Company is evaluating opening two Innovation Centers in 2020. The first in Western Australia where the Company has significant historical presence and there is a talented engineering community that can support Advanced Research as well as regional customer activity. The second in Shanghai, China to support the large and growing AI Edge market in the region.

Company Announcements:

On 4 December 2019 BrainChip and Tata Consultancy Services (TCS) announced that the Company would jointly present a demonstration featuring Akida Neuromorphic Technology Platform at NeurIPS 2019. The Company demonstrated hand gesture recognition using DVS spiking input on the Akida Neuromorphic Technology Platform at this leading industry conference.

On 31 October 2019 The Company provided “The Linley Group Microprocessor Report Highlights BrainChip’s Akida™ Spiking Neural Network Processor.” This report examines applications of Akida’s capabilities around pattern identification in unlabeled data.



On 22 October 2019 BrainChip was granted a new patent for Artificial Intelligence Dynamic Neural Network. United States Patent number 10,410,117 addresses a dynamic neural network within an AI device. During a learning process, values are generated and stored in the synaptic registers of the AI device to generate a training model. Training models are themselves stored in the dynamic neural function library of the AI device, and the function library can then be used to train another device.

On 13 October 2019 BrainChip announced the Akida™ Development Workshop. The Company conducted a Development Workshop for Qualified Developers and Data Scientists in Perth, Western Australia on 1 November 2019.

On 3 October 2019 BrainChip accelerated a Global Marketing Initiatives in advance of Bringing Akida™ Neuromorphic System-on-Chip to Market, the Company hired ActualTech Media and JPR Communications to inform key decision makers about its innovative technology.

On 2 October 2019 BrainChip CTO Peter van der Made discussed a new breed of AI Neuromorphic Computing at two 'Not-to-be-Missed' events. Mr van der Made discussed its flagship technology, Akida™, an advanced Spiking Neural Network processor for edge AI applications.

On 24 September BrainChip CEO Louis DiNardo was accepted into Forbes Technology Council. Forbes Technology Council is an invitation-only community for world-class CIOs, CTOs, and Technology Executives.

On 26 June BrainChip and Socionext signed a Definitive Agreement to develop the Akida™ Neuromorphic System-on-Chip. This joint program pairs Socionext's wide variety of engineering disciplines and decades of ASIC design experience with BrainChip's proven AI engineering teams in Aliso Viejo, California and Toulouse, France.

On 11 June 2019, the Company announced the availability of a powerful neural network converter which enables users to easily convert existing convolutional neural networks (CNNs) to an Akida compatible event-based spiking neural network (SNN). The converter is integrated with the Akida Development Environment (ADE) to provide network conversion and simulation.

On 16 June 2019, the Company executed a Definitive Agreement with Socionext Americas to collaborate on the development of the Akida NSoC and manufacture the device. Wafers will be produced on a 28nm digital process at Taiwan Semiconductor Manufacturing Corporation (TSMC). Socionext, formerly known as the Fujitsu Semiconductor business, is a global leader in Application Specific Integrated Circuits (ASIC) products.

On 25 June 2019, the Company entered into a convertible securities agreement with CST Capital Pty Ltd as trustee of the CST Investments Fund under which BrainChip was



advanced US\$2.85M. The principal amount may be converted into equity during the loan term, or repaid (if not converted by CST Capital at that time) in 12 months (or up to 30 months, at the Company's election). In addition, the Company issued CST Capital 30,000,000 'collateral shares' for no consideration, which must be returned to the Company at the end of the term (if not converted into equity on the same terms of the loan amount); together with 1,561,279 shares at \$0.079/share in payment of the drawdown fee. CST Capital was also issued 21,868,976 options (with a three-year term, and a strike price of \$0.117).

On 26 June 2019, the Company announced a 1 for 4 Accelerated Entitlement Offering. A total of approximately A\$10.7 million was raised under the Entitlement Offer at a price of \$0.06 per shares and net of fees. The retail component of the Entitlement Offer closed on 12 July 2019, and a retail book build was conducted on 16 July 2019 for the shortfall of entitlements not taken up. The institutional component of the entitlement offer closed on 26 June 2019 and raised approximately A\$6.7M. The retail entitlement offer raised approximately A\$2.8M and was well-supported by BrainChip's eligible retail shareholders. The balance of the raise, approximately A\$1.2M, was taken by additional bids from institutions and sophisticated investors.

On 26 May 2019, the Company announced the availability of the Akida intellectual property for licensing by companies seeking to incorporate a low-power, small, flexible and accurate neural network into their proprietary Application Specific Integrated Circuits (ASIC).

Please see the Company's website at www.brainchipinc.com for additional press releases in 2019.

This announcement was authorised for release by the BRN Board of Directors.

About BrainChip Holdings Ltd (ASX: BRN)

BrainChip is a global technology company that has developed a revolutionary advanced neural networking processor that brings artificial intelligence to the edge in a way that existing technologies are not capable. The solution is high performance, small, ultra-low power and enables a wide array of edge capabilities that include local training, learning and inference. The company markets an innovative event-based neural network processor that is inspired by the spiking nature of the human brain and implements the network processor in an industry standard digital process. By mimicking brain processing BrainChip has pioneered a spiking neural network, called Akida™, which is both scalable and flexible to address the requirements in edge devices. At the edge, sensor inputs are analyzed at the point of acquisition rather than transmission to the cloud or a datacenter. Akida is designed to provide a complete ultra-low power AI Edge Network for vision, audio and smart transducer applications. The reduction in system latency provides faster response and a



more power efficient system that can reduce the large carbon footprint datacenters.
Additional information is available at <https://www.brainchipinc.com>.

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