

$d=25'$   
Light = "red"  
 $\sigma/\sqrt{n}$

$d=9' 6''$   
 $\sigma=.5''$   
 $\sigma/\sqrt{n}$

$d=9' 10''$   
 $\sigma=.6''$   
 $\sigma/\sqrt{n}$

### Company snapshot

Name: **Hailo**  
Vertical: **IoT - automotive**  
Size: **40 employees**  
HQ: **Tel Aviv, Israel**  
Founded: **2017**

### Hailo Goal

Design, prototype and secure funding for a new embedded SoC, capable of both traditional and neural network processing at the edge based on Arm Cortex processors.

### Arm Solution

Hailo used Arm DesignStart Pro in order to quickly gain access to the IP necessary to create a prototype device, pairing a high-efficiency Arm Cortex-M3 CPU with its own proprietary hardware IP. Creating a viable proof of concept using Arm IP with no upfront license fee helped Hailo to secure \$16 million in funding.

### Benefits for Hailo

- + High-efficiency, high-performance compute acceleration for complex machine learning (ML) workloads
- + Developers can use an established Arm toolchain to program the processor
- + Enables independent real-time ML in devices at the network edge
- + Supports all current neural network models
- + Enables embedded ML in various applications including drones, cars, smart home appliances and cameras

### Proof of concept through DesignStart Pro helps secure \$16 million in funding

Hailo has a single vision: to enable edge devices such as drones, cars and smart home appliances to think for themselves. Founded by Orr Danon, the Israeli-based startup does this by combining traditional compute processes with intuitive machine learning capability.

"Like the two hemispheres of the human brain, when it comes to solving a real-life problem, it is the objective, logical side working together with the subjective, intuitive side that results in a decision," Danon says. Hailo's designs use tried-and-tested processor technology as a foundation for its own proprietary neural network hardware. In selecting a foundation, however, a low barrier to entry was paramount for the start-up.



**Hailo Co-founders:**

Orr Danon, Hadar Zeitlin and Avi Baum

With \$0 upfront license fees and a success-based, royalty-only model, the Arm DesignStart Pro program provided the ideal development environment in which Hailo could quickly and reliably prototype its SoC (system-on-chip) design.

“DesignStart Pro has proven invaluable to us,” Danon says. “It tackles the pain points typically experienced by early stage startups when funding is extremely tight. At this point in our journey we had to spend our money wisely, taking the custom approach in areas we wanted to really differentiate in, while using readily available, high-quality IP and tools everywhere else.”

To build its prototype, Hailo selected the Arm Cortex-M3 processor, designed to enable high-performance, low-cost platforms for use in a broad range of devices.

“We chose the Arm Cortex-M3 for a number of reasons,” Danon explains. “It’s an incredibly capable processor in its class, with low power requirements. By properly allocating what is running where and joining forces between it and our own IP, we managed to create a highly capable yet also extremely power-efficient prototype.”

Cortex-M3 also opens the door for Hailo to augment its design with further Arm-based IP, such as sensors and memory processors. Most importantly, the Arm processor acts as the ‘security guard’ for the whole device: secure boot ensures that firmware cannot be tampered with, and all further processing occurs within the CPU’s trusted execution environment.

**An unparalleled ecosystem**

Hailo’s multi-disciplinary team is made up of industry experts with system-oriented backgrounds, committed to develop end-to-end solutions. An important part of this, explains Danon, is co-designing the software and hardware.

“Creating robust hardware requires an equally robust software ecosystem with a tried-and-tested software toolchain. We’re not interested in forcing the industry to use non-standard toolsets; our toolchain combines the standard Arm tools seamlessly with our own software development kit. “Arm’s extensive software ecosystem, combined with the variety of support and resources that exist, made it the obvious choice for us to ensure successful adoption in the market.”

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#### Getting funded

“Prototyping using Arm DesignStart Pro enabled us to design and demonstrate a comprehensive proof of concept to potential investors, helping to gather more than \$16 million in funding from stakeholders,” Danon says.

This funding, which comes from Israeli crowdfunding and a number of angel investors, lets Hailo build on its prototype to create a finished product that demonstrates the success of this technology.

While the Arm Cortex-M3 processor is more than sufficient for Hailo’s current use cases, Danon believes that the continuity of the Arm ecosystem provides a great springboard into more advanced Arm processors for higher performance applications.

Hailo’s key market, Danon says, is the automotive industry — specifically, its move toward autonomous driving technology.

“Vehicle autonomy requires a lot of compute from an edge perspective; currently, an autonomous vehicle needs to be a tiny datacenter on wheels. Our solution can accommodate high-level requirements for autonomous driving, and for that we may need a more powerful Arm solution such as dual or quad-core Cortex-A, or even Cortex-R, CPUs. Conversely, some solutions could incorporate an even lower-power Arm Cortex-M0 processor. Using Arm, we have complete flexibility.”

[Learn how Arm is enabling machine learning at the edge.](#)

[Interested in creating your own design? Learn more about Arm DesignStart.](#)

