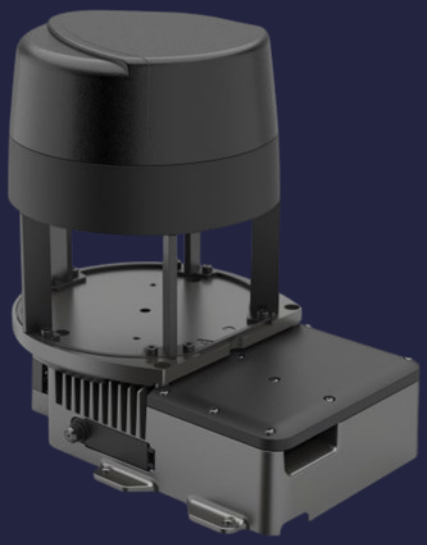
Rugged Small Form Factor GPU



Nvidia Jetson Xavier NX SoM

Passively Cooled Only

36.2W Total Power Draw

25°C improvement in operating temperature

IP67 Compliant solution

About Our Partner

Our customer is an engineering and robotics design company which specialises in advanced mobile manipulation robots. They use sensor-based control and computation to unlock the potential of complex mechanisms.

In addition to the functionality and access provided by their baseline products, our customer augments their robots with functional payloads offering flexibility to users for unique requirements.

Producing the Best

In order to fit as payload on their mobile robotic units, peripheral computer systems used must be highly considerate of size, mass and weight as physical restrictions between legs of the robot will impair movement if the payload is too large. Our customers's robots are typically powered by onboard battery systems, providing a strong incentive to minimise power draw from the payload to extend the robots life. These factors each contribute to an increasing thermal challenge for the electronics within the payload.

While our customer have a team of phenomenal engineers, **they are keenly aware of the benefits of adhering to expertise on specific subject matters**. The opportunity to improve the performance of their product line is firmly their driving factor and so they acted quickly to determine what route their system could take.

Their intent was to integrate a small, easily configurable GPU based platform which could operate across the range of environments their customers may deploy. In order to mitigate the effects of noise and additional power draw, the unit was required to be passively cooled. To drive this system, the Nvidia Jetson Xavier NX was selected as the functional architecture of the unit.

As our customer maintain an incredibly high quality standard on their products, they were looking for an **expert partner who could work efficiently with their design team & maintain clear communication** throughout the design process.

Utilising your Network

With **glowing feedback from a previous collaboration**, Entropy were selected to help develop this solution. Entropy had shown they could **analyse a problem, independently lead improvements to the design, and deliver high quality.**

A high accuracy simulation would be required to reduce the development time allowing our customer to receive detailed

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feedback on a number of design experiments without incurring the cost of multiple prototype testing.

We were able to clearly communicate our progress and findings through weekly review calls, while maintained an open line directly with the engineers to readily absorb scope and schematic changes as they developed.

The Entropy Process

Working with the design team from the outset, we were able to model a number of possible component positions to **mitigate thermal risks with layout options before the electrical design team had started routing**.

With our expertise developing electronics cooling, we are not here to just plug numbers into a model. We looked carefully into the expected power figures generated, the intended use cases of the devices and operating schematics to help the hardware team estimate performance figures, and identify simulation false flags.

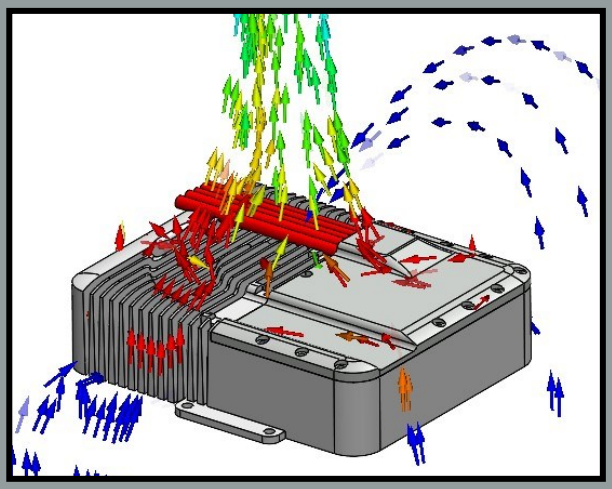


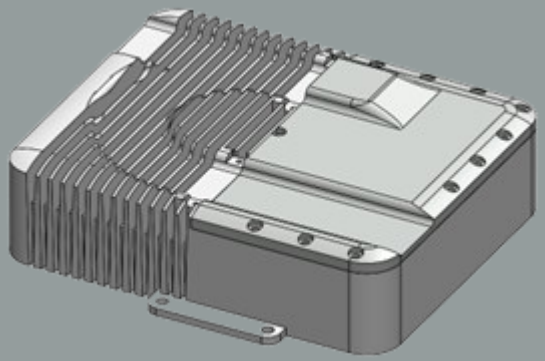
Image of air flow passing over the unit fins. Consideration for passing air around adjacent hardware made a typical solution more challenging.

To evaluate all possible solutions, Entropy identified six key aspects of an optimisation study:

- **Environment Review** – We take the time to review with the customer the true operating characteristics of their products, to ensure the units are built for purpose and not for generic standards. This can often change the solution drastically.
- **Component Position** – Essential to be completed early as other areas of the product design are dependent.
- **Detailed Component Modelling** – if we do not already have the model in our library, we will research each component used in the model to create the most accurate representation of the device available.
- **Correctly Selected Thermal Interfaces Materials** – Using a single solution is ideal but not realistic. More highly critical devices may need more consideration
- **Fin Optimisation** – Maximising the heat transfer from the fins to the ambient air is critical in static cooling applications. We run specialised parametric studies to identify the best fin geometry for this solution.
- **Material Selection** – If necessary, improved performance can be achieved by investigating higher conductivity materials.

A Better Solution

Utilising the stages discussed above and skills we have nurtured as part of our specialty, Entropy achieved a **25°C improvement in operating temperature** for the unit. This improvement allows our customers' customers to run the payload in far more challenging environments without risk of data drops or processor throttling.



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