SUPERCOMPUTING FOR HOLOGRAPHIC DISPLAYS

ACENET
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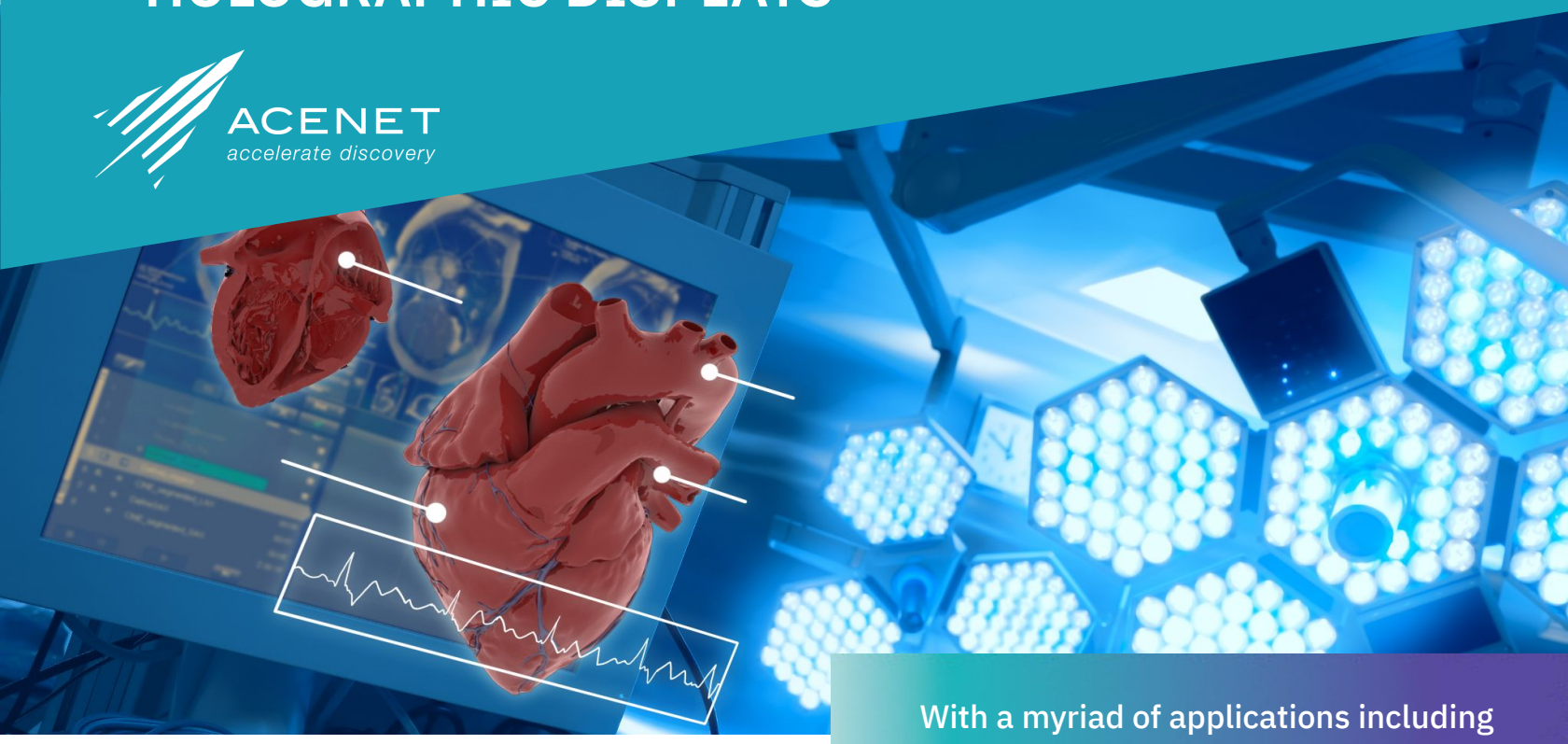

With a myriad of applications including medical, defence and consumer use cases, Avalon Holographics is poised to disrupt the industry while setting the standard for holographic displays.

CREATING A FULLY IMMERSIVE 3D EXPERIENCE

Avalon Holographics is a Canadian business leading the next wave of display technology by pioneering development of the world's first "true" 3D professional holographic displays that revolutionize the way people produce, view and understand visual content.

By replicating the experience of looking at real objects, Avalon's patented holographic displays eliminates the nausea, fatigue, and other physical effects of headgear, glasses and other wearables.

Avalon Holographics is developing a flat panel holographic display that has multiple design challenges including data processing, pixel density, and micro-optics.

Holographic display is accomplished through an array of holographic pixels (Hogels). Each hogel consists of an array of pixels and directional optics, so that each pixel emits a cone of light in a specific direction. The left and right eyes of one or more viewers will see different light from each hogel, which reproduces a natural three-dimensional experience without requiring a headset.

Metasurfaces are broadly defined as dense, two-dimensional arrays of subwavelength structures which are used to shape a wave front. At optical wavelengths this means ~10^5 structures per mm^2!

Avalon Holographics is designing an optical metasurface to achieve diffraction-limited directional micro-optics.

Optical metasurfaces are constructed using fabrication techniques common to the semiconductor industry making large scale production achievable. But making prototypes is expensive and time-consuming. Computational modelling of optical metasurfaces is crucial to the design process as many design iterations can be simulated at a fraction of the time and cost, de-risking the eventual fabrication costs.

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What were the computing challenges?

Nearfield electrodynamics are notoriously difficult to solve. Predicting how light will interact with the metasurface requires knowledge of the nearfield interactions between the light and each nanostructure in its local environment within the metasurface.
Avalon Holographics uses a Finite Difference Time Domain (FDTD) electromagnetic solver (Lumerical) to simulate how the metasurface will direct light from the display.

FDTD is a powerful and computationally demanding technique to solve arbitrary electromagnetic problems. Even high-end desktop computers struggle running modest simulations of metasurfaces with a low degree of symmetry.

How has ACENET helped?

Access to ACENET's Siku cluster.
This cluster offers massive computational power, especially the high memory compute nodes, up to 375 GB of memory, which allow Avalon Holographics to simulate large areas of the metasurface.

ACENET increases Avalon Holographics' efficiency by letting it run multiple simulations on the Siku cluster while doing less computationally demanding work on its desktops.

They made it easy.
ACENET's support staff installed the Lumerical software and integrated it into their job scheduler (SLURM). They ensured that all the capabilities that Avalon Holographics required of the cluster were accessible.

Skills Development.
ACENET's 'parallel computing school' presents an overview of high-performance computing. It provided Avalon Holographics staff with broad computational skills, and the knowledge of what computational techniques are best suited to their needs.

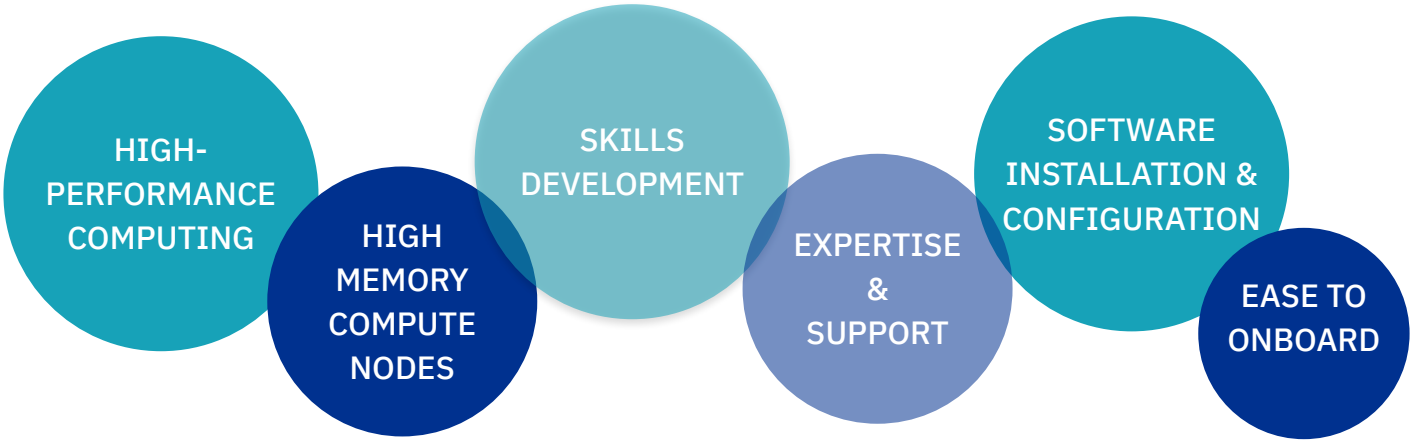
> "Beyond a computing cluster, ACENET is a knowledge resource, with very helpful and prompt support staff."
>
> ANDREW BARTLETT, OPTICS DESIGN SPECIALIST

What was the outcome?

ACENET onboarding and support accelerated R&D by removing technical barriers to getting started on the cluster.

The ability to run large scale metasurface simulation, through the access to ACENET's Siku cluster's high memory compute nodes, provides the necessary confidence in our design process before costly device fabrication.

HOW ACENET CONTRIBUTED



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