



Collaborative Partnership in Cloud Computing Hardware Development

Introduction

Oxide Computer Company (“Oxide”), a technology company serving some of the US National Laboratories (the leading institutions for scientific innovation in the United States) and focused on building a commercial cloud computer, embarked on a mission to bring hyperscale design to the on-premises infrastructure market. While initially deciding between Benchmark and a Benchmark competitor, Oxide chose to partner with Benchmark due to our responsiveness and extensive experience with large, custom, and high-speed computer systems. Benchmark’s expertise in building supercomputers and racks for industry-leading multinational technology companies demonstrates our ability to handle complexities and constraints, such as those present in Oxide’s project. The partnership was marked by rapid iteration, hands-on collaboration, and end-to-end solution delivery.

Challenges

Oxide faced several challenges, including the design of new custom hardware with large processors that

required meticulous thermal analysis. As a startup, Oxide aimed to move quickly and prototype extensively, while also navigating the complexities of working with sheet metal and the supply chain disruptions caused by the COVID-19 pandemic. Due to this desire for rapid iteration and “outside the box” thinking, Oxide also opted to design with limited specific requirements or specifications to support experimentation and iteration, which posed an additional challenge in designing and building a large, complex rack system. Collaborating across different areas of expertise — including mechanical engineering led by Benchmark and software and electrical engineering led by Oxide — required seamless coordination. Finally, Oxide needed production-built units before they could finalize the design, leading to early Benchmark manufacturing engagement and requiring more flexibility than usual from the production team to support the builds.

Solutions

Benchmark’s solutions effectively addressed these challenges. Our experienced engineers anticipated potential design constraints and collaborated closely

with Oxide. Frequent and detailed touchpoints ensured that design, interfaces, and issues were promptly addressed. Instead of waiting for a polished final product, both teams reviewed in-progress work, fostering transparency and trust. Benchmark's flexibility allowed for rapid iteration and prototyping, aligning with Oxide's software-oriented agile approach. The partnership extended to engaging suppliers early, mitigating potential delays, and optimizing the manufacturing process. Additionally, the manufacturing team accommodated Oxide's mid-build updates and design changes by keeping a dedicated rework team on-hand to quickly turn around parts as Oxide learned from each build.

Results

The collaboration between Oxide and Benchmark yielded impressive results, including:

1. Successful Prototyping

Benchmark produced functional prototypes of the servers, switches, and racks through multiple iterations. Each build was powered on successfully, demonstrating Benchmark's proficiency in assembling complex components and addressing potential thermal challenges. Benchmark also kept technicians on call during bring-up, ensuring that late-breaking changes or rework could be integrated into the prototypes in real time.

2. Efficient Compliance Integration

Despite designing without specific compliance requirements, Benchmark's experienced team provided guidance on likely standards based on the product design and target markets. As a result, Oxide's design verification testing against these standards required minimal modifications, saving time and potentially hundreds of thousands of dollars in redesign costs.

3. Integration of Expertise

The collaboration between Benchmark and Oxide bridged the gap between mechanical and electrical/software engineering. While Benchmark led the mechanical design, Oxide handled the software and electrical aspects.



The successful integration of these areas resulted in a functional and innovative product. By maintaining clear communication and frequent joint reviews throughout development, these elements were able to come together successfully in this complex system.

Successful Partnership from Proof of Concept to Manufacturing – and Beyond

We are honored to highlight a unique and successful partnership marked by innovation, collaboration, and adaptability. Our responsive approach, hands-on collaboration, and transparent working methods facilitated rapid iteration and seamless integration across different engineering disciplines. The results highlight the success of this partnership, leading to a cost-effective and compliant high-speed computing hardware solution. In the rapidly evolving advanced computing industry, Benchmark's ability to adapt and innovate aligned perfectly with Oxide's goals, demonstrating the power of collaborative problem solving.

Benchmark

56 S. Rockford Drive | Tempe, AZ 85288, USA

623.300.7000 | www.bench.com

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