

Optimizing AI performance with Immersion-Cooled Data Centers



The Cisco-GRC Alliance addresses mounting data center power and cooling demands with an integrated immersion cooling solution that enables sustainable, high-performance computing from core to edge.

About Cisco

Cisco (NASDAQ: CSCO) is the worldwide leader in technology that powers the internet. Cisco inspires new possibilities by reimagining your applications, securing your enterprise, transforming your infrastructure, and empowering your teams for a global and inclusive future.

About GRC

GRC (Green revolution Cooling) was founded in 2009 with a vision to change the way data centers are designed, built and operated. GRC's patented immersion cooling technology simplifies deployment of data center cooling infrastructure eliminating the need for conventional cooling components and reducing data center design, build, energy and maintenance costs.

Partner Alliance Solution Brief

The Cisco-GRC partnership enables organizations to dramatically reduce environmental impact while supporting demanding AI and high-performance workloads from enterprise data centers to edge locations. GRC's ICeraQ micro-modular platform, combined with Cisco's proven compute and connectivity infrastructure, delivers a plug-and-play solution ideal for edge deployments, data centers, and remote sites that require reliable, high-density computing with minimal infrastructure requirements.

The Challenge

Today's data centers are experiencing unprecedented pressures as digital transformation accelerates across industries. These challenges are pushing traditional infrastructure to its limits and demanding innovative solutions.

Power and Cooling Demands

- Data centers currently consume approximately 1.5-2% of global electricity
- Up to 40% of data center energy consumption goes to cooling alone
- Traditional air-cooling systems struggle with densities above 15kW per rack

Environmental Impact

- Data centers in the US alone consumed over 5.13×10^8 m³ of water in 2018
- Carbon emissions from data centers account for between 1% and 5% of global CO₂ emissions
- 92% of S&P 500 companies now publish sustainability reports, increasing scrutiny on data center operations

Infrastructure Limitations

- Traditional data center construction lead times are too long for current market needs
- Existing facilities are running out of power and space before achieving required density
- Mounting challenges from limited grid capacity, renewable energy access, and power infrastructure constraints.

Technology Evolution

- Next-generation applications like AI, ML, and AR require ever-denser, more complex CPUs and GPU's that generate unprecedented heat
- Edge computing demands rapid deployment in remote and often harsh environments

The Solution : Single Phase Liquid Immersion Cooling

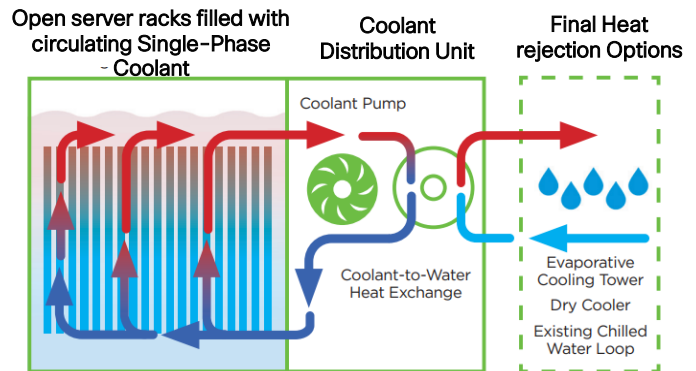
As a pioneer of data center liquid immersion cooling, GRC has perfected single-phase immersion technology. GRC's technology submerges servers in ElectroSafe® coolants, a specialized non-conductive fluid that captures 100% of heat while circulating around components. Unlike traditional air cooling or complex two-phase solutions, this simpler approach achieves superior efficiency with minimal power, delivering an industry-leading PUE of <1.03.

How It Works

The solution's elegance is its simplicity: servers and switching infrastructure are immersed in coolant-filled horizontal racks while a small pump circulates fluid through a heat exchanger. This eliminates the need for raised floors, CRACs, and other complex cooling infrastructure while delivering superior thermal performance.

The core of the solution is GRC's system consists of several key components:

- Horizontal immersion-cooled racks that house Cisco servers
- Integrated Coolant Distribution Unit (CDU)
- Single Phase dielectric coolants specifically formulated for optimal performance
- Advanced monitoring and control systems
- Redundant pumping and control infrastructure



Heated Coolant exits top of rack, cycles through the CDU and returns to the rack at a user specified temperature

Cooling Process

1. **Server Immersion:** Cisco UCS servers are fully immersed in Shell S3 X coolant
2. **Heat Transfer:** The coolant circulates around all server components, capturing 100% of the heat, compared to only 30% with traditional air-cooling
3. **Heat Removal:** Heated coolant is pumped through the CDU where heat is transferred to facility water
4. **Coolant Return:** Cooled fluid is returned to the rack at a precise, user-specified temperature
5. **Continuous Circulation:** The system maintains optimal operating temperatures with minimal energy use

ICEraQ MICRO

Self-contained, 24U immersion cooled rack designed to be easy to get up and running — virtually anywhere. All you need is power, water service, and a level floor.



ICEraQ SX

Integrated modules with 4x42U or 2x42U racks, CDU, internal plumbing, and sensors makes the SX fast and easy to deploy in virtually data center

Key Benefits



Sustainability

The Cisco-GRC solution reduces environmental impact through innovative immersion cooling and optimized infrastructure. By replacing traditional air-cooling with efficient immersion technology, organizations achieve superior energy efficiency while meeting sustainability goals.

- Up to 90% reduction in cooling energy consumption
- Dramatically reduced water usage versus traditional cooling
- Lower carbon emissions
- Industry-leading PUE of <1.03"



Performance

Immersion cooling optimizes Cisco compute infrastructure performance, eliminating thermal throttling while enabling maximum efficiency for demanding workloads.

- Support for high-density AI/ML workloads up to 184 kW per rack
- 10–20% reduction in server power consumption
- Enhanced hardware reliability and longevity
- Zero thermal throttling for sustained performance



Cost Efficiency

The partnership delivers substantial savings from deployment through operations. By simplifying infrastructure and reducing energy use, organizations lower both CapEx and OpEx while improving efficiency.

- Up to 50% reduction in cooling infrastructure costs
- Lower operational costs through reduced power use
- Minimal maintenance with only three moving parts
- Extended hardware lifecycle
- Reduced space requirements



Edge and Deployment Flexibility

The Cisco-GRC solution enables rapid high-density computing deployment anywhere. Its self-contained, micro-modular design excels in edge scenarios where traditional infrastructure isn't feasible.

- Three-month deployment versus industry average of nine months
- Plug-and-play solution for edge locations
- Minimal requirements: power, water, level floor
- Operates in conditions from 5–40°C (41–104°F)
- Built-in resilience for harsh environments
- Remote cloud monitoring



100%

Heat capture in coolant fluid



90%

Reduction in cooling energy consumption



50%

Reduction in cooling infrastructure costs

Summary

The Cisco-GRC partnership delivers a transformative solution for modern data center and edge deployment challenges. By combining Cisco's compute infrastructure expertise with GRC's cooling innovation, organizations can achieve unprecedented heat density, sustainability, and performance.