

Customer Success Story

Swift Engineering - Making Cars Go Faster With Platform HPC

Customer

Swift Engineering

Industry

Design, Engineering and Manufacturing: Automotive, Aviation and Aerospace

Challenges

- Time needed for analysis of vast amounts of data
- Iterations & evaluation of design changes
- Time to market
- Affordable state-of-the-art HPC solution
- Small company with limited IT resources to manage complex HPC systems

Solution

Platform HPC foundation of Cray Cluster Manager
Cray CX 1000 & Cray CX 1

Business Results

Speed to Results - 50 X faster
Solve problems 15 X larger
Enables more projects with greater efficiency
HPCWire Award Winner for best HPC application in automotive 2010

Swift Engineering began in 1983 as a constructor of world-class, open-wheel race cars. Today Swift is a leader in design and manufacture of composite structures and has expanded their portfolio to include race cars capable of reaching 200 MPH, as

"We wanted a solution where we spent more time solving complex problems than administering the system" said Dr. John F Winkler, Chief Aerodynamicist, Swift Engineering.

"With Cray and Platform Computing Swift is able to develop more rapidly. Answer more complex questions and in addition we will be able to offer those services at a better rate to new customers."

Casper vander Schoot, Motor Sports Director, Swift.

well as conventional and military aircraft. Swift is based in San Clemente, California in a 60,000 ft² fully integrated facility, allowing for a continuous interface between design and manufacture under one roof. Swift has produced over 500 formula race cars and won over 40 national and international racing championships. Mark Page, Swift's Chief Scientist, describes the company and their requirements, "We design and build high performance vehicles in quick turn under one roof. We process huge amounts of data simultaneously, so we need some serious computing power to do that."

From Humble Beginnings

In 2001, Swift began experimenting with high performance computing power and assembled a 16 node cluster specifically for use with Computational Fluid Dynamics (CFD) analysis. Two linked Linux workstations replaced this system in 2006 and increased computing power on the order of 2 fold, when the Eclipse private jet project increased interest in CFD. However, Swift's in-house solution did not meet growing demands for CFD analysis. By 2008, Swift's needs had outgrown the workstation cluster, its associated costs outweighed its benefits, and demands on employee time were no longer feasible.

Swift has a lean organization structure and does not have full-time IT staff. Despite this, Swift's CFD capabilities helped enable the Eclipse jet plane project to go from paper to test flight in 200 days! Swift knew a state-of-the-art, purpose built, High Performance Computing (HPC) solution was needed to further significantly increase its efficiency and output. "This HPC solution had to be simple and require minimal management," said Dr. John F. Winkler, Swift's Chief Aerodynamicist. "We needed a HPC solution where we spent more time solving complex problems than we did administering the system. Cray and Platform Computing provided a turn-key HPC solution to Swift allowing us to develop client projects more rapidly, answer more complex questions".





The Cray Platform Computing HPC Solution

Swift chose Cray and Platform Computing's complete market leading HPC solution for small businesses. Cray's CX 1 and CX 1000 combined with Platform HPC (foundation for Cray Cluster Manager) creates a compact computing cluster leveraging the latest Intel® Xeon® processors. With these new capabilities, Swift then began the newest chapter of its racing achievements with the design of its next generation Formula Nippon racecar featuring an aerodynamic innovation that reduces the car's aero wake called the 'Mushroom Buster.' Formula Nippon is Japan's premier formula racing series. The cars reach speeds up to 200 mph, using bespoke 3.4 liter normally aspirated V-8 Honda and Toyota engines which produce approximately 650 BHP. Swift's updated Formula Nippon aerodynamic package achieves high downforce values efficiently. Due to an underwing with full-sized tunnels and an efficient wing package, drag levels are similar to the previous generation Formula Nippon cars, while downforce was increased by 30%. This resulted in significant higher cornering speeds (approximately 4 times greater than Gravity: 4.0 Gs). The aero package was designed to generate a cleaner aerodynamic wake signature behind the car, improving close proximity racing and making racing more exciting for all.

Increasing Competitive Advantage

Maintaining global leadership in design and manufacturing requires Swift to find competitive advantages wherever possible. Two of the key areas of the design cycle that are critical for achieving an advantage are testing and simulation. These are time intensive processes with each new idea or part requiring a scale prototype and wind tunnel testing. According to Chris Norris, Swift's Chief Engineer, "The problem is whenever you come up with a new idea or a concept you have to make a part to test on the wind tunnel model. Finding ways to reduce the cycle and expedite testing through computer simulation reduces the time to market. Platform HPC is the ideal solution for Swift to accomplish this. The management software enables Swift to solve bigger problems with more enhanced graphics at real time speed. Vast amounts of data can be processed fifty times faster."

Currently 100% of the Platform HPC work at Swift is focused on Computational Fluid Dynamics (CFD). Using the software a new design idea can easily be simulated without having to build a scale model and conduct extensive wind tunnel testing. Swift engineers can evaluate concepts within hours instead of days and make design changes in real time. Moving forward,

Platform HPC will incorporate crash simulation, Finite Element Analysis (FEA) and more CFD with more complex flow fields including multiple vehicles. Bigger grids translate to more data to analyze. The largest CFD grid to date was a high lift grid of 90 million cells. The Platform Cray CX1000 solution has been so successful, it has eliminated the need for an onsite wind tunnel and subsequently, Swift's wind tunnel was decommissioned in June of 2011.

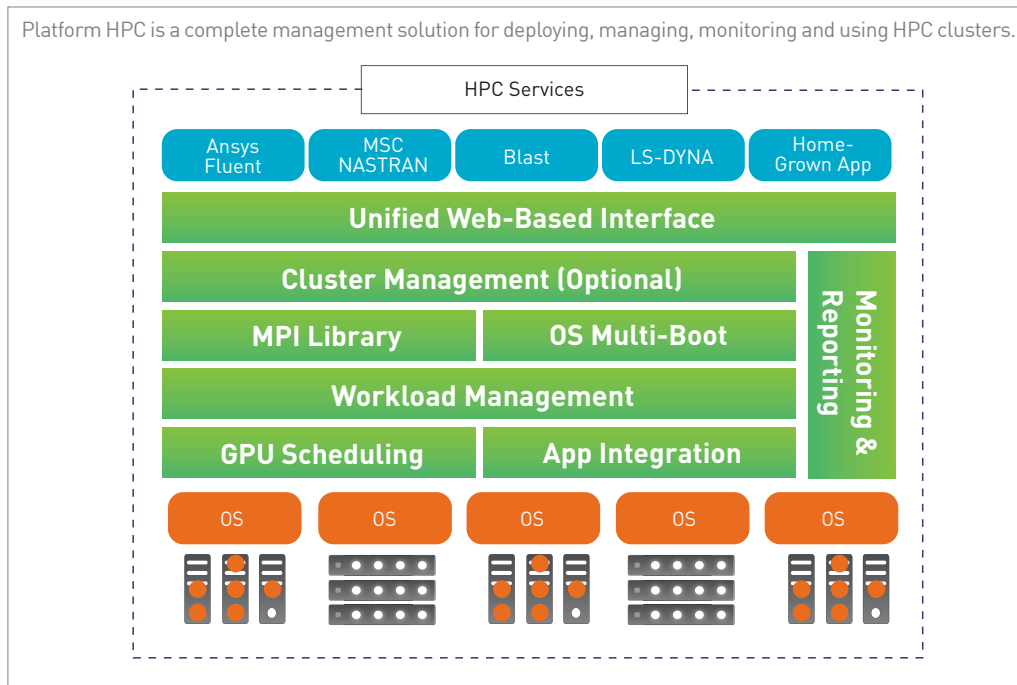
Market Leading Platform HPC Helps Make Cars and Planes go Faster

Installing, configuring and sourcing software for your state-of-the-art HPC clusters may be a daunting task. With Platform HPC and Cray's CX1000 compact computing cluster, Swift Engineering was up and running within a week. "With incredible support from Cray and Platform Computing, we transitioned from a two workstation solution to a full-scale HPC Cluster within a week very quickly and very efficiently," said Dr. Winkler.

Platform HPC enables Swift to schedule large computations so design engineers are not waiting around for their analysis to complete overnight. Now the jobs are started in the morning with results in the afternoon. Additionally, analysis can be run in parallel, further increasing the amount of analysis that can be completed within a single day.

Management Made Easy

Platform HPC being a pre-integrated, certified ready to use software package reduced the amount of training needed and has enabled Swift to manage their cluster with their existing team. Dr. Winkler is able to provision, instantly submit jobs, monitor and report and easily re-provision a computer node when necessary, requiring less than 10% of his time for process overhead depending on the size of the job. Efficient computing makes more efficient aerodynamic vehicles, providing Swift designs with an 'unfair advantage'. In motorsports, teams pursue this by outwitting the competition through better preparation and resources. Swift believes Cray and Platform HPC are key to maintaining the 'unfair advantage' in the future.



Platform Computing is the leader in cluster, grid and cloud management software - serving more than 2,000 of the world's most demanding organizations for over 18 years. Our workload and resource management solutions deliver IT responsiveness and lower costs for enterprise and HPC applications. Platform has strategic relationships with Cray, DellTM, HP, IBM®, Intel®, Microsoft®, Red Hat®, and SAS®. Visit www.platform.com.

World Headquarters
Platform Computing Corporation
3760 14th Avenue
Markham, Ontario
Canada L3R 3T7
Tel: +1 905 948 8448
Fax: +1 905 948 9975
Toll-free Tel: 1 877 528 3676
info@platform.com

Sales - Headquarters
Toll-free Tel: 1 877 710 4477
Tel: +1 905 948 8448

North America
New York: +1 212 888 6270
San Jose: +1 408 392 4900

Europe
Bramley: +44 (0) 1256 883756
London: +44 (0) 20 3206 1470
Paris: +33 (0) 1 41 10 09 20
Düsseldorf: +49 2102 61039 0

Asia-Pacific
Beijing: +86 10 82276000
Xi'an: +86 029 87607400
Tokyo: +81(0)3 6302 2901
Singapore: 65 6307 6590

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