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Terra Soft Solutions Customers
1999-2008

Terra Soft Solutions Customers:
Commercial & Higher Education

Commercial & Higher Education Customers   2007-08

In just 12 months, Terra Soft delivered the following clusters or was contracted to support them with the recent release of YDL v6.0 and Y-HPC v2.0.1:

- CRL, India: 8 PS3s + YDL, Y-HPC
- Flagstone, Bermuda: 16 PS3s + YDL, Y-HPC
- Lawrence Berkley Lab: YDL, Y-HPC for 8 PS3s
- Los Alamos National Lab: 8 PS3s + YDL
- Nuclea Bio: 30 PS3s + YDL, Y-HPC, Y-Bio
- Pacific Northwest National Lab: Y-HPC for 16 + 64 Xserve G5s
- University of Alaska, Fairbanks: 8 PS3s + YDL, Y-HPC
- University of Buffalo, New York: 16 PS3s + YDL, Y-HPC
- University of Virginia Tech: YDL, Y-HPC for 1200 Xserve G5s
- University of Charles, Australia: YDL, Y-HPC for 8 PS3s
- University of Eastern Washington: 16 PS3s + YDL, Y-HPC
- University of Maryland, LPS: 32 + 32 PS3s + YDL, Y-HPC

Boeing   2002-07

Commercial aircraft.

The commercial division of Boeing in Seattle, Washington which builds the 737, 747, and 777 aircraft have since 2002 used Terra Soft's Yellow Dog Linux on Power architecture hardware to support realtime flight simulation in ground-base cockpit trainers.

Terra Soft's contributions include:
- Automated drive reconstruction system design.
- Turn-key system delivery.
- Annual support.
- Board Support Package preparation.
- Sales and support for sister companies Aerospace, Thales, and more.

(customer is confidential)   2004-05

CPU wafer inspection company.

Terra Soft provided this customer with Yellow Dog Linux and an advanced 64-bit kernel well in advance of Apple's own OSX capabilities, assisting with design and implementation of a tightly coupled cluster for realtime image processing.

University of Colorado, Boulder   2002
Departments of Biology and Applied Mathematics

This project was underwritten by a grant from the National Science Foundation for Professor Jeffrey Fox, Mathematics, and Professor Robert C. Eaton as co-principal investigator. The cluster is housed in the Departments of Biology (EPO), Center for Neuroscience, under the management of Professor Eaton.

- Dual 1GHz G4 CPUs per node.
- 1GB RAM per node.
- Single 60GB drive per node.
- A local YDL OS built by the Black Lab server.
- Gig-e internode communication fabric.

At the time of its construction, this was the world's largest Apple Xserve G4 cluster.

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Terra Soft Solutions Customers:
Department of Defense

Boeing   2003-06

B1 bomber ground-based flight simulator package.

- Enable dual-head support where none existed previously.
- Maintain functional dual-head config through hardware, software upgrades.
- Recommend future hardware systems.
- Custom configure YDL.
- Deliver turn-key solution.
- Provide remote and on-site support at U.S. Airforce bases.
- More info at www.terrasoftsolutions.com/showcase/customers/dod/boeing/

Lockheed Martin   2003-04

Sonar imaging system for U.S. Nuclear submarine fleet (TI02).

- Assisted Lockheed martin in optimization of imaging code for AltiVec.
- Gained 4x improvement over Intel foundation code.
- Designed modified Apple Xserve G4 chassis.
- Physically modified (rebuilt) custom Xserve G4 units.
- Removed front motherboard and reverse engineered Apple firmware.
- Enabled alternative boot method from PCI-X ATA card/drive.
- Co-authored high-availability fail-over system.
- Delivered over 300 systems total, 13 on-board every submarine.
- For more information:
  www.terrasoftsolutions.com/news/2003/2003-08-06.shtml

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Lockheed Martin   2004

Sonar imaging system for U.S. Nuclear submarine fleet (TI04).

- Delivered optimized 32/64-bit kernel for Apple G5 Xserves.
- 18 months ahead of Apple's OSX on Apple's own hardware.
- Conducted full in-house hardware validation.
- Prepared netboot installation and recovery systems.
- For more information:
    - www.terrasoftsolutions.com/news/2004/2004-12-02.shtml
    - www.linuxjournal.com/article/7789

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Presearch (SAIC)   2004

Ground-based sonar imaging system duplication system (TI04).

- Built modifed, solid-state Apple Xserve G5s that boot from Compact Flash.
- Prepared netboot installation and recovery systems.
- Delivered 20 turn-key systems.
- (no public disclosure)

Colsa Corporation   Nov 2004

Rebuilt world's largest Apple Xserve G5 cluster.

- 1566 Apple G5 Xserves.
- Installed Yellow Dog Linux.
- Installed beta version of Y-HPC.
- Rebuilt entire cluster in 72 hours where customer has failed to achieve a functional system in over six months effort with OSX.
- For more information:
  www.terrasoftsolutions.com/news/2005/2005-11-30.shtml

Additional Department of Defense Customers

- Applied Research Labs
- Array Systems Computing
- BAE
- BBN
- General Dynamics
- Northrop Grumman
- Raytheon
- Sierra Nevada Corporation
- Smiths Aerospace
- United Defense
- United States AirForce
- United States Army
- United States Navy

Terra Soft Solutions Customers:
Department of Energy

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Sandia National Lab 2000

Intruder detection program.

- Provided Apple G4s pre-installed with Yellow Dog Linux.
- Provided AltiVec optimization and configuration.
- Provided automated netboot and recovery system.
- For more information:
  www.terrasoftsolutions.com/showcase/customers/doe/sandia/agents/

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Lawrence Livermore National Lab   2004-05

Secure, vaulted cluster (details remain confidential).

- 18 x dual 2.0GHz G5 Xserve Cluster Nodes.
- 2 x Xserve RAID cabinets.
- FibreChannel connection from Xserves to RAID.
- Gigabit ethernet cluster control.
- Yellow Dog Linux OS pre-installed.
- Y-HPC cluster construction suite pre-installed.
- On-site, hands-on training.

Sandia National Lab   2005

LAMMPS geo-chem model cluster.

- Designed, built, installed, tested, trained 18 node Apple Xserve G5 cluster.
- Yellow Dog Linux and Y-HPC pre-installed.
- Assisted with optimization of LAMMPS for AltiVec.
- ~5000+ atom box of period water, executed for one (1) nanosecond:
  - Single AMD-242 CPU, 4GB RAM, using PCG   161 hours
  - Single G5 CPU, 4GB RAM, using gcc 64   130 hours
  - Single G5 CPU, 4GB RAM, using XLC 64   104 hours

- For more information:
  www.terrasoftsolutions.com/showcase/customers/doe/sandia/geochem/

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Argonne National Lab   2005
Bioinformatics cluster.

- Designed, built, delivered 100 CPU Apple Xserve G5 cluster.
- Yellow Dog Linux, Y-HPC, Y-Bio pre-installed:
    1 dual 2.3GHz G5 PowerMac (development workstation).
    4 x dual 2.3GHz G5 Xserves w/max local drives for distributed cluster storage.
    45 x dual 2.3GHz G5 Xserve Cluster Nodes.
    Gigabit ethernet internode communication fabric.

Additional Department of Energy customers:

- Ames Scalable Lab
- Fermi Lab
- Los Alamos National Lab
- Sandia National Lab, Livermore, CA

Terra Soft Solutions Customers:
NASA

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NASA JPL   2001-02

VICAR optimization; Cluster installation.

Since 1966, VICAR has processed images delivered by Viking, Voyager, Galileo, and recent Mars missions. Terra Soft's efforts included:

- Assistance with the optimization of VICAR for the AltiVec unit found on G4 CPUs.
- Hands-on effort at NASA JPL MIPL (Mission Image Processing Lab).
- Installation of 36 Yellow Dog Linux compute nodes.
- 3 weeks on-site preparation, installation, and training.

Additional NASA customers:

- NASA Ames Research Center
- NASA Goddard
- NASA Langley

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Terra Soft Solutions Customers:
Original Equipment Manufacturers
CPU Vendors

Apple Computer 2002-06

Reverse Engineering

In the 5 years that Terra Soft served as a Value Added Reseller for Apple Computer (gaining the #5 position in the U.S.), Terra Soft reverse engineered over 50 models of Macintosh systems, not once receiving code nor assistance from Apple.

These support endeavors included:
- Graphics cards (includes sleep, PB buttons).
- Audio subsystems.
- Modems.
- Ethernet drivers.
- SCSI, ATA, and SATA drivers.
- Airport Extreme configuration.

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CSPI 1999

Board Support Package

Terra Soft was contracted by CSPI in its first year of operations to provide a Yellow Dog Linux based board support package for the 2841 Multicomputer Power architecture system that continued to ship through 2007.

IBM   2000

Board Support Package

Terra Soft was contracted by IBM in its second year of operations to provide a Yellow Dog Linux based board support package for the RISC processor based systems.

IBM   2004

Board Support Package

Terra Soft was contracted by IBM to provide the official Linux operating system for the 970 (G5) evaluation board manufactured by Momentum Computer (later acquired by Mercury Computer).

Mercury Computer   Feb 2005

Board Support Package

Terra Soft was contracted by Mercury Computer to provide the official Linux operating system for the XR9 1U rackmount server.

Mercury Computer   Nov 2005-06

Board Support Package

Terra Soft was contracted by Mercury Computer to provide the world's first commercial Linux operating system for a Cell processor, the IBM BladeCenter form-factor Mercury Cell blade.

Sony Computer Entertainment   Jun 2006

Board Support Package; Supercomputing facility construction.

Terra Soft was contracted by Sony Computer Entertainment to provide a Yellow Dog Linux board support package for the PLAYSTATION3.

Terra Soft was contracted by Sony Computer Entertainment to design and build a 3,000 sq-ft supercomputing facility capable of housing 2,000 1U rackmount systems. This was completed in August of 2006 in just three months, on schedule, on budget.

Themis Fall 2006

Board Support Package.

Terra Soft was contracted by Themis to provide a Yellow Dog Linux board support package for the Themis TPPC64 6U VME bus SBC.

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Sony Computer Entertainment   Fall 2007-08

Board Support Package.

   Terra Soft was contracted by Sony Computer Entertainment to provide a Yellow Dog
      Linux board support package for the IBM QS20.

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Sony B2B   Fall 2007-08

Board Support Package.

   Terra Soft was contracted by Sony BNP to provide a Yellow Dog Linux board support
       package for the BCU-100 1U rackmount Cell server.

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IBM   Oct 2007

Board Support Package.

Terra Soft was contracted by IBM to prepare Yellow Dog Linux board support
package for the IBM BladeCenter form-factor QS21. This BSP was the first release
of the YDL v6.0 product line and included:

- Yellow Dog Linux (CentOS/RHEL) foundation.
- Fully tested IBM Cell SDK v3.0
- Automated net-install via NFS.

Terra Soft Solutions Customers:
PLAYSTATION3

Sony PLAYSTATION3 Customers   Mar-Dec 2007

Atmospheric Sciences Research Center
Aerospace Corp
Argonne National Lab
Astek Corp
Columbia University
Computational Research Labs, India
Digital Video S.p.A
Dream Works
Florida Institute for Human & Machine Cognition
General Dynamics Robotic Systems
Georgia Institute of Tech, College of Computing
Georgia Southern University
Honeywell-Defense Avionics Systems
Isilon Systems
Los Alamos National Lab
Lawrence Berkeley National Lab
LG Electronics
MIT Lincoln Lab
Naval Post Grad School
Naval Underseas Warfare Center
Oak Ridge National Lab, DOE
Purdue University

SAIC
Sodankyla Geophysical Observatory
Stanford University
University of Alaska
University of Akron, Ohio
University of Buffalo, New York
University of California, CalTech
University of California Davis, CS Department
University of Delaware
University of Kentucky, Center for Visualization
University of Maryland, Lab for Physical Science
University of Minnesota
University of North Carolina, Charlotte
Uviversity of Utah
Uppsala University, Dt. of Cell & Molecular Biology
U.S. Army Research Lab
U.S. Airforce Research Lab (AFRL)
U.S. Food & Drug Administration
U.S. Naval Air Warfare Center
U.S. Naval Post Grad School
Wright Patterson Airforce Base

## University Massechusetts   2007-2008

Blackhole graviton research using PS3 cluster.

A cluster of 20 interlinked PS3s works to solve a celestial mystery involving gravitational waves and what happens when a super-massive black hole, about a million times the mass of our own sun, swallows up a star.

Gaurav Khanna, assistant professor at the University of Massachusetts, Dartmouth used YDL for this endeavor.

- The PS3's Cell processor delivers massive amounts of power ... comparable to that 200 BlueGene nodes.
- Terra Soft built and maintains a PS3 cluster used by Khanna for his research.
- For more information: www.wired.com/techbiz/it/news/2007/10/ps3_supercomputer
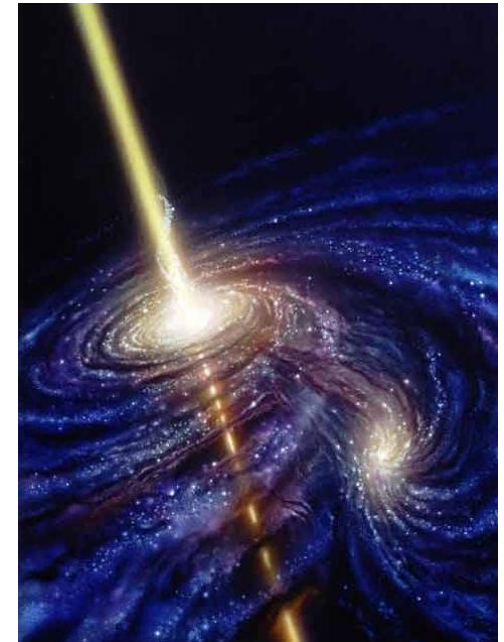
Axion Racing Team
Nov 2007

Realtime image processing for DARPA Autonomous Vehicle Challenge.

- Terra Soft Solutions lent an innovative hand to the Axion Racing team with a Sony PS3 running Yellow Dog Linux to assist with on-board, realtime image processing system.
- In 10 days, Terra Soft ported, wrote, and optimized code for a Yellow Dog Linux PS3 connected to an RGB camera, enabling this realtime image processing system enabled the robot vehicle to "see" the street terrain and avoid obstacles.

- The RGB camera is tied into the Axion arbitrator and other computerized sensors to help determine the best path for the 3/4 ton Jeep.
- All sensors vote and then send commands to actuators that control steering, gas, and brakes for the vehicle.

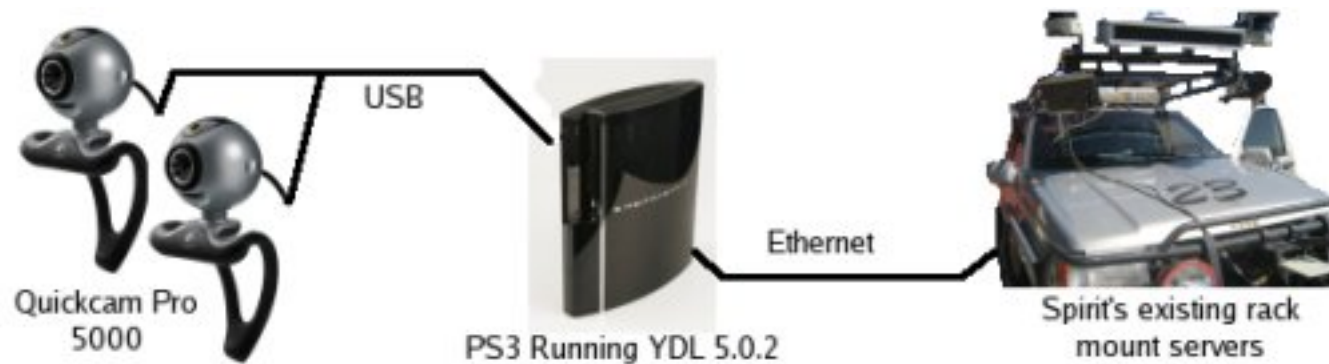**Axion Racing Team**   Nov 2007

Realtime image processing for DARPA Autonomous Vehicle Challenge.

- Two Logitech Quickcam Pro 5000's are connected via USB to the PS3 running YDL 5.0.2. The PS3 is connected to Spirit's Dell server rack over 100Mb ethernet. The PS3 captures the images, processes the data, and sends a message to Spirit indicating the presence, distance, and general direction of obstacle.

Quickcam Pro 5000 — USB — PS3 Running YDL 5.0.2 — Ethernet — Spirit's existing rack mount servers

**Axion Racing Team**   Nov 2007

Realtime image processing for DARPA Autonomous Vehicle Challenge.

- The two cameras are placed side by side. Pictures from the right and left cameras are taken simultaneously. This data is fed into an algorithm that detects apparent shift of objects in the images which generates a disparity map. The greater the shift, the higher the value in the disparity map.

Stereo Vision Line of Site

Near Object

Far Object

Composited Stereo

Disparity Map
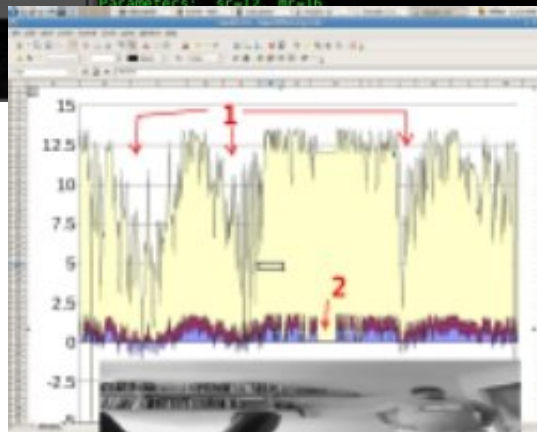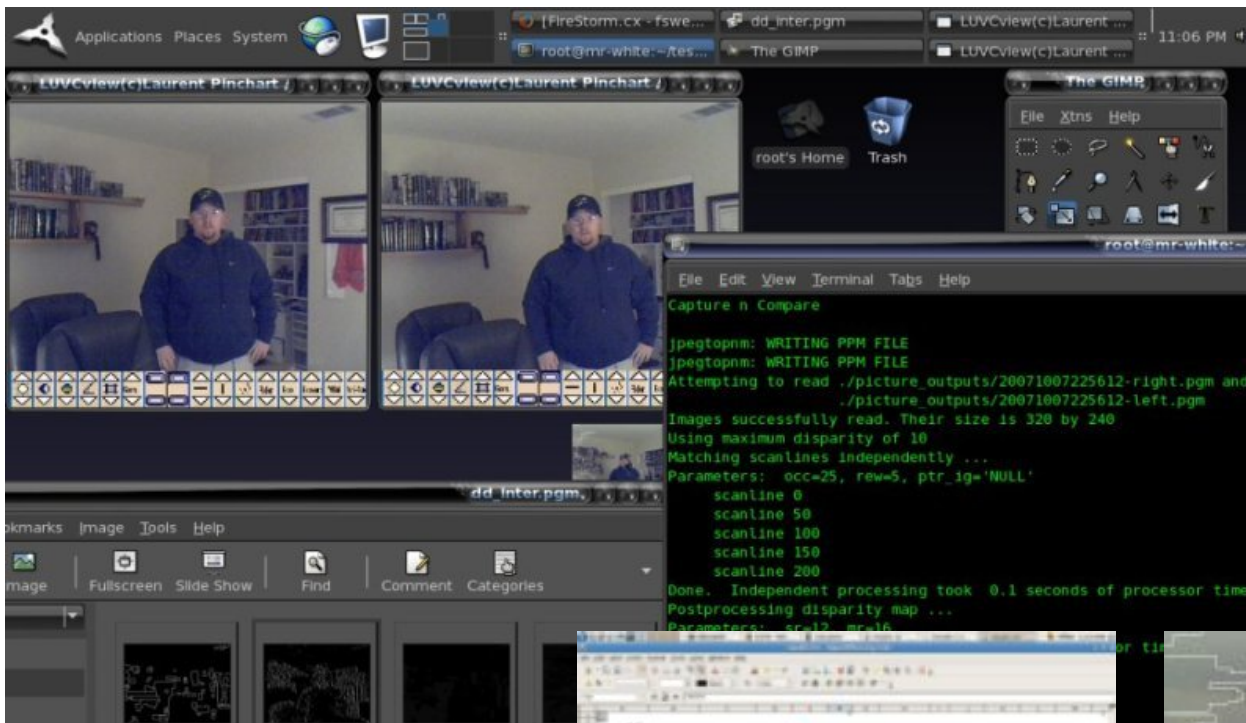
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U.S Air Force, Rome Labs   2009
World's Largest PS3 cluster.

Following his departure from Fixstars (which acquired Terra Soft in the fall of 2008), Staats continued to work as a contractor to Fixstars, helping to bring to close a 3+ year effort to provide the United States Airforce, Rome Lab, Yew York, with a massive PlayStation 3 supercomputer. This contract was awarded in January of 2010, marking the largest Sony PS3 cluster in the world at 1700 units.

- Read more at Air Force's PS3 Condor Cluster Takes Flight