



Altair

PBS Works™

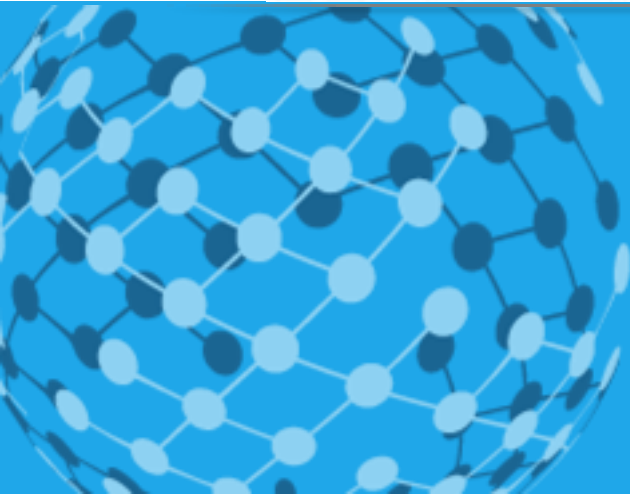
PBS Works

The #1 Software for HPC
Workload Management

Clinton Chee
7 Feb 2017 (DMFUG)



Radically changing the way organizations **design products** and **make decisions**

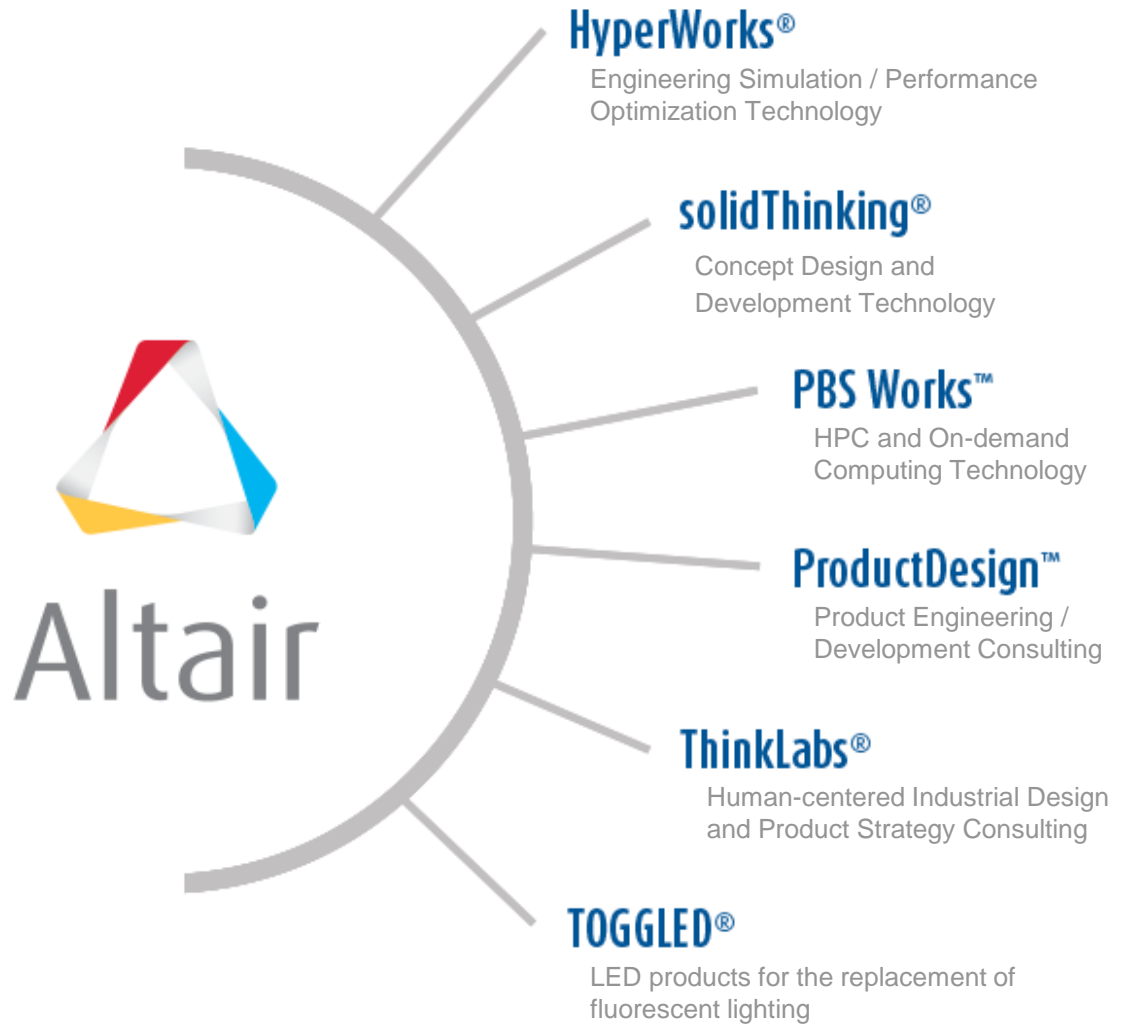


45+ offices in **23** countries on **6** continents with over **2,300** engineers, scientists, developers, designers and creative thinkers

Through A Unique Blend of Software and Services



Altair's corporate structure is tightly aligned with its **brand family**



Altair is the only company that... (“eat our own dogfood”)

...**makes** HPC middleware:  Altair | PBS Works™

...**develops** HPC applications:  Altair | HyperWorks®

...and **uses** these to do HPC every day:  Altair | ProductDesign



Altair Knows HPC

Products List

Simulation Technology

OptiStruct

RADIOSS

AcuSolve

nanoFluidX

FEKO

WinProp

Flux

Multiscale Designer

HyperStudy

MotionSolve

Modeling & Visualization

HyperMesh

HyperView

HyperGraph

HyperCrash

SimLab

MotionView

Vertical & Design Solutions

HyperForm

Click2Extrude

Click2Cast

HyperWorks VWT

solidThinking Inspire

solidThinking Evolve

solidThinking Compose

solidThinking Activate

solidThinking Embed

Cloud & HPC

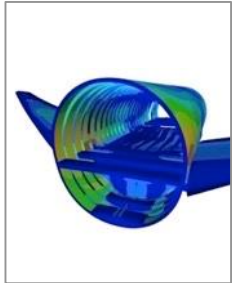
Envision

Simulation Manager

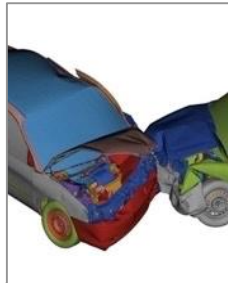
HyperWorks Unlimited

PBS Works

Altair Solver Technology



Structural
Analysis



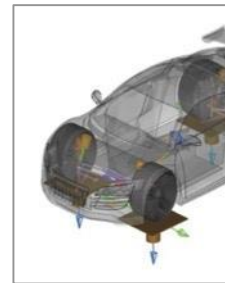
Crash, Safety,
Impact & Blast



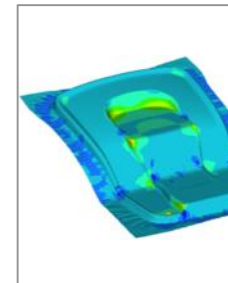
Thermal
Analysis



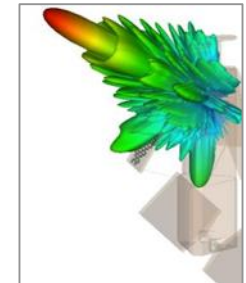
Fluid
Dynamics



Systems
Simulation



Manufacturing
Simulation

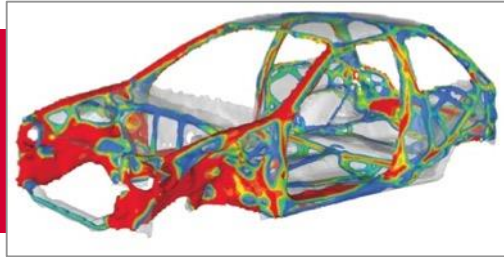
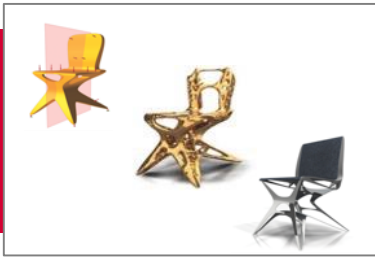


Electro-
Magnetics

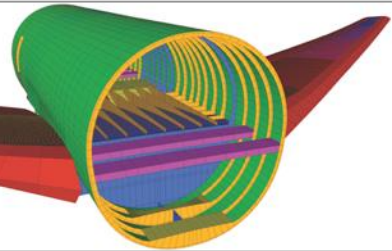
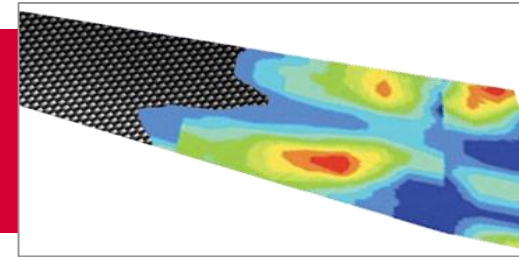
Multiphysics Analysis and Optimization

Digital Materials

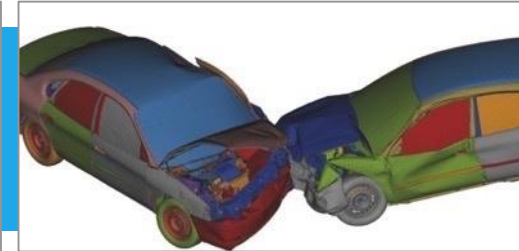
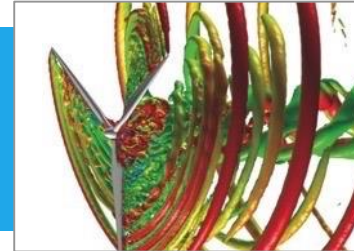
Altair HyperWorks: Simulation-driven Innovation



Getting to
the right design

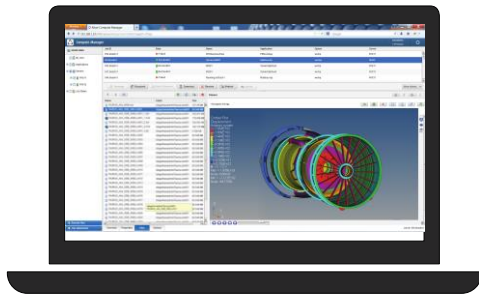


Saving time
in the process



Access to the latest
technologies

End Users



Visualization & Management Portals

- Compute Manager
- Display Manager

Systems



Workload Management & Job Scheduling

- PBS Professional

Managers



Analytics & Reporting

- PBS Analytics
- Software Asset Optimization

Why Altair and PBS Works?



“The cost savings to the government is **huge.**”



“Altair did all the customizations we needed & drew on their engineering expertise to make creative suggestions. They are **problem solvers.**”



“PBS **beat the competition** in both performance and flexibility... Altair really knows HPC.”

StanleyBlack&Decker

“Altair’s **engineering leadership** was a key decision factor... no other single vendor has the expertise we needed.”



“We’ve been very pleased with Altair’s **responsiveness** to our product feedback.”



“The product’s flexibility, and the company’s expertise and support, is simply **unparalleled.**”

PBS Works History

1991-1995	1996-1999	2000-2002	2003-2008	2009-2012	2013-2015...
<p>PBS developed for NASA</p>	<p>Early production grids built using PBS</p>	<p>PBS Pro 5.0: enhanced, hardened, commercial</p> <p><i>Running on all 7 continents</i></p>	<p>Altair acquires PBS Pro</p> <p>PBS Analytics</p> <p><i>Topology-aware scheduling</i></p> <p><i>Green Provisioning™</i></p>	<p>Clouds powered by PBS Pro</p> <p>Compute Manager</p> <p><i>EAL3+ Security</i></p> <p><i>Plugin Framework</i></p> <p><i>GPU Scheduling</i></p>	<p>PBS Works named #1 HPC Software</p> <p>PBS Professional 13.0</p> <p><i>Pleiades</i></p> <p><i>TSUBAME2</i></p> <p><i>Raijin</i></p> <p><i>ARCHER</i></p> <p><i>DoD HPCMP</i></p> <p><i>NCI</i></p> <p><i>ECMWF</i></p> <p>...</p>

Partnerships with HPC Vendors Worldwide

All major platforms and operating systems supported



Key Application Integrations (by industry)



- PBS Works products are integrated with the most popular and widely used software across all vertical industries
- Hundreds of commercial, open source and proprietary code integrations

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Life & Chemical Sciences

Energy / Oil & Gas

Manufacturing

And many more

Top Academic Organizations Using PBS Works



Arizona State Univ.
California Institute of Technology
CINES
Clemson University
Ecole Polytechnique Federale de Lausanne
Gregor Mendel Institute
Heinrich-Heine University
Imperial College London
Indian Institute of Technology (IIT)
Japan Advanced Institute of Science and Technology
Kiel University
Louisiana State Univ.
Massachusetts Institute of Technology (MIT)
Rice University
Scuola Normale di Pisa (Dell/Intel Competence Center)
Tata Institute of Fundamental Research
Technion (Israel)
Tokyo Institute of Technology
TU Duisburg
University of Arizona
University of Florida
University of Nottingham
University of Stuttgart



Top Aerospace Companies Using PBS Works



Aeronautical Development Agency
Agusta Westland
Alenia Aeronautica
AS System
ATK Thiokol
AVIO Group
BAE systems
Boeing
British Aerospace
CEG Gramat
CIRA
CNES
Department of Defense HPCMP
ELAN-AUSY
Eurocopter
Japan Aerospace Exploration Agency
Lockheed-Martin
MTU Aeroengines
NASA
Northrop Grumman
Piaggio Aero
Pilatus
Thales Alenia Spaces
US Air Force & Navy



PBS Works Dominant in Automotive

19 OF THE TOP 25 AUTOMOTIVE COMPANIES USE PBS WORKS



Top Government & Research Organizations Using PBS Works



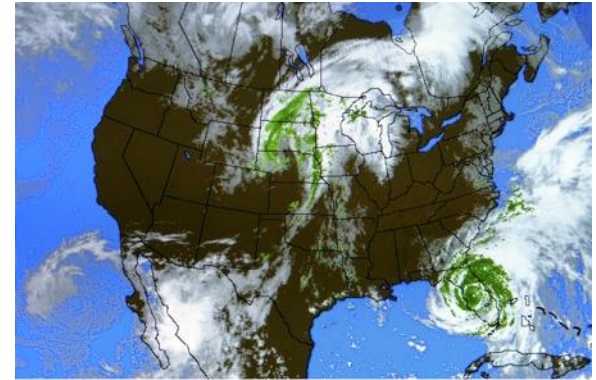
Advanced Numerical Research & Analysis Group
Argonne National Labs
Army Research Labs (ARL)
AEDC (Arnold Air Force Base)
CEG Gramat (France)
CILEA/CINECA
CMMACS – 4PI
Department of Defense MOD Program
ESPRC (Archer)
Federal Waterways Engineering & Research Institute
Gas Turbine and Research Establishment
Institute for Molecular Science (Japan)
KISTI Supercomputing Center (Korea)
MIMOS (Malaysia)
NASA (6 locations)
National Center for Supercomputing Applications (NSCA)
National Institute for Materials Science (Japan)
Naval Research Labs (NRL)
Pittsburg Supercomputing Center (PSC)
Sandia National Labs
Scientific Application Group
Snow and Avalanche Study Establishment
Weizmann Institute



PBS Works Dominant in Weather / Earth Sciences



APEC Climate Center
CINECA
Deutscher Wetterdienst (DWD)
Danish Meteorological Institute (DMI)
European Center for Medium Range Weather Forecasting (ECMWF)
ESPRC – ARCHER & HECTOR (UK)
Hydrometeo Russia
Indian National Centre for Ocean Information Services (INCOIS)
INGV
INPE (Brazil)
Israel Meteorological Center
Japan Agency for Marine-Earth Science & Technology
KIAPS (Korea Institute of Atmosphere Prediction Systems)
Korean Airforce Weather forecasting Center
Korean Meteorological Administration (KMA)
NASA Goddard Center for Climate Simulation FNMOC (Fleet)
National Astronomical Observatory of Japan (NAOJ)
NIMR (National Institute of Meteorological Research)
NTNU (Norwegian University of Science and Technology)
Royal Meteorological Institute of Belgium (KMI)
Slovenia Meteo
Taiwan Central Weather Bureau (TWB)
Taiwan Weather Bureau
Turkish State Meteorological Service (TSMS)
UK Met Office
Weather channel



Top Life Sciences Companies Using PBS Works



Biogen
Genentech
The Italian Institute of Technology (IIT)
Lynx Therapeutics
Merck
National Cancer Institute
National Institute of Pharmaceutical Education and Research
Odyssey Therapeutics, Inc.
Pfizer Global research
Protein Design Labs
Sanofi-Synthelabo
San Raffaele
Scripps Institute
Structural Genomics
Translation Genomics (tGen)
Tularik-Amgen



Top Oil & Gas Companies Using PBS Works



Chevron

ConocoPhillips

ENI

Fairfield Nodal

GE

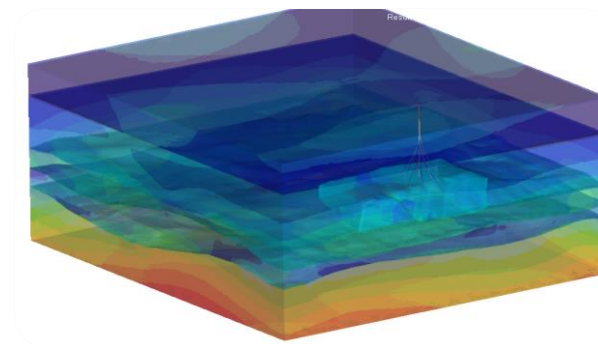
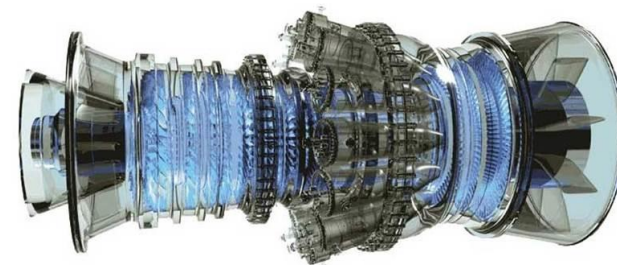
Oil and Natural Gas Consortium (OGNC)

Petrobras

Reliance Energy

Schlumberger

Subsea 7



Top Banks / Financial Institutions Using PBS Works



CNP Assurance

DBS Singapore

Deutsche Bank

Scuola Alti Studi di Lucca

