Smarter Computing for Product Development
IBM views on Integration, Centralization and Cloud for Engineering Needs

David Coutts, IBM DE & STG Industrial Sector CTO
January 24, 2013
Topics

1. Dynamic industry forces and shared views on how to respond

2. IT at the strategic center of business
   - Implications to engineering and product development

3. IBM & ANSYS – combining capabilities → expert integration

4. Centralization and Cloud – values offered
   - Electronics chip design example
   - Electronics packaging and mechanical systems design example

5. IBM Cloud focus → Engineering Solutions for Cloud

6. Opportunities and Resources
Dramatic forces across Automotive / Aerospace & Defense industries create opportunities to enhance & transform product development

Automotive Industry Forces:

- **New technologies and capabilities** making vehicles more intelligent
- **Sophisticated consumers** driving demand for innovative and sustainable vehicles
- **Increased globalization** driving more integration within automotive companies
- **Rapidly integrating enterprises** driving increasingly dynamic operations
- **Consumer, regulatory & environmental requirements** driving the creation of collaborative partner ecosystems to innovate

Aerospace & Defense Industry Forces:

- **Soaring complexity** in design processes and delivery of innovative A&D products and services
- **Emerging market impact** on manufacturing and travel
- **Globalization** driving complex value chains, new strategies for collaborating with suppliers
- **Dramatic M&A and restructuring** to exploit new market opportunities
- **Extended financial crisis** forcing significant reductions in major market defense budgets
IBM & ANSYS hold shared views on current trends and opportunities to respond to these forces

• **World class engineering applications and IT infrastructure are critical assets to succeed**
  – Target: enhanced product innovation and quality at lower costs and improved time to market.

• **High Performance / Technical Computing growth is driven by this need**
  – IDC projects 8% CAGR 2012 – 2016, driving 70% server growth to 2015

• **Users of these assets can not afford to operate in Islands of isolation**
  – Skills and IT need to be leveraged based on availability and need, not tied to a location.
    • Improved efficiencies can be realized via remote access to centralized resources
  – Data needs to be kept close to computing.
    • Centralize design coherency and move design content only as needed.
  – Cloud technology can be used to shape IT to more rapidly meet project needs and to reduce capital expense

The impact of technology on business objectives in increasing
Technology in all forms, including Information Technology, is the leading force for impacting business.

Factors impacting organizations:

1. Technology factors
2. People skills
3. Market factors
4. Macro-economic factors
5. Regulatory concerns
6. Globalization

Source: IBM CEO Study 2012

Speed Value

90%

view cloud as critical to their plans

Extended Reach

1 Billion

Smartphones and 1.2 billion mobile employees by 2014

Responsiveness

20B+

Intelligent business assets

New Insights

2.7 ZB

of digital content in 2012, up 50% from 2011
The real question
Is IT ready for the challenge - will it block or enable change?

Only 1 in 5 clients

- Have highly efficient IT infrastructures
- Allocate 50% more of their IT budget to new projects and innovation

Smarter Computing means being “Tomorrow Ready”
Remote user access - supporting anytime, anywhere, collaborative work

Focus Areas for today

- Design Management & Process Control systems on consolidated, virtualized servers – for reduced cost, greater agility, scalability, efficiency, and availability

- Application Systems

- Business & Engineering Desktops

- Technical Computing Systems

- Storage Systems

- Service Management

- Security

- Compute intensive applications, such as Design Analysis, Big Data Insights & 3D visualization, on Technical Computing clusters - for improved analytical and operational insight

- Global file systems and scalable storage (block & file) for central control and worldwide access to valid data
IBM Technical Computing Portfolio

Solutions
- Integrated Solutions
- Industry Solutions
- Intelligent Cluster
- HPC Cloud
- Big Data

Systems & Software
- Parallel Environment Runtime
- Platform MPI
- Parallel Environment Developer
- Engineering and Scientific Libraries
- Platform LSF
- Platform HPC
- Platform Symphony (+MapReduce)
- Platform Application Center

Systems & Storage
- iDataPlex Intelligent Cluster
- PureFlex
- System x & BladeCenter
- BG/Q
- LTO Tape 3592 Automation
- P7-775
- DS5000
- DS3000
- DCS3700
- SoNAS

Value
IBM & ANSYS – combining capabilities to improve customer time to value and innovation quality

**ANSYS Applications**
Fluent, Structural Mechanics, etc.

**STG Infrastructure**
Servers, Storage, Networking, Systems Management

**IBM Systems Software + 3D VDI**
Platform LSF, Platform Application Center, Platform MPI, Nice DCV...

**Cloud Management Technology**
Platform Cluster Manager – Adv Edition, IBM Workload Deployer, SmartCloud Entry/Enterprise/Enterprise+

**Standardized Workflows**
Software as a Service & Business Process as a Service

**Fully integrated and tested at each level**

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**Powerful**
Achieve world class results with ANSYS applications running on STG high performance infrastructure – specified, configured and optimized for application needs

**Efficient / Comprehensive / Intuitive**
Demonstrate enhanced value by consolidating resources and assigning to users and projects based on priority. Application templates, Web Portal for job submission & 3D VDI for rapid access

**Dynamic / Responsive**
Demonstrate the ability to dynamically shape IT infrastructure to meet changing needs and rapidly respond to user/project requirements

**Trusted / Repeatable**
Capture and leverage known good data models and process workflows for trusted, repeatable solution patterns.

**Ready**
ANSYS Structural Mechanics and IBM High Perf Infrastructure

- Reducing time to market & development expense for innovative, high quality new product offerings

ANSYS Structural Mechanics Software
- Linear, nonlinear, dynamics analysis,
- thermal analysis and coupled physics
  Parallel algorithms
  GPU leverage for computational acceleration

IBM Intelligent Clusters w/
- High performance computing nodes with multi-core processors, DRAM capacity and GPUs adapters
- Robust storage solutions
- Networking/Communication fabrics
- IBM Platform Computing Software
  - Platform Application Center
  - Platform LSF
  - Platform MPI

**World class results**

with **ANSYS** applications on **IBM** Systems and Software

- High Performance
- Easier Deployment
- Lower Operating cost

Single, reliable source for world-class solutions that optimize product performance and improve product development processes

**IBM-ANSYS Structural Mechanics Solution Brief**

IBM and Business Partner Use Only

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ANSYS and Platform Computing on IBM PureFlex System enables rapid engineering analysis application deployment

Problem:
- Costly HPC infrastructure management.
- Time consuming deployment of HPC applications.
- Limited internal HPC expertise.

Solution:
- The IBM PureFlex™ System is an ideal platform for high-performance computing (HPC) clients who lack HPC expertise or have limited bandwidth and budget to manage HPC systems.
- A combination of ANSYS, and PureFlex powered by IBM Platform HPC delivers ready to use cluster for ANSYS FLUENT users.

Results:
- IBM PureFlex System and IBM Platform HPC is benchmark-tested for ANSYS FLUENT.
- Customers get to results faster
- IBM PureFlex System allows engineering simulations to scale using IBM Platform workload management
- State-of-the-Art Software / Middleware / Compute Solution

“ANSYS is pleased to be partnering with IBM on their new IBM PureFlex System launch. IBM PureFlex System running ANSYS solutions and IBM/Platform HPC promises to provide a compelling, innovative solution for our customers.

— Barbara Hutchings, Director of Strategic Partnerships, ANSYS, Inc.

“Whether in structural mechanics, electromagnetics, fluid dynamics or multi-physics, the combined solutions from Platform Computing and ANSYS dramatically simplify application integration, enhance application performance and increase workflow throughput. Now, as Platform becomes an integral part of IBM’s Systems and Technology Group, our mutual customers will be able to reap the added benefits of rapid IBM PureFlex System integration, deployment and management.”

— Tripp Purvis
Vice-President, Business Development
IBM Platform Computing
ANSYS boosts information sharing and collaboration with a technical computing cluster file system solution

"Deploying ANSYS simulation data management software in conjunction with a scalable storage system is mission critical for ANSYS, in order to enhance knowledge sharing and collaboration within our technical services team. IBM’s cluster file system, GPFS, provided us with a solution that was easy to configure and manage - providing a single file system image for database access and manageability. The system’s fault tolerance gives us the reliability we need to secure our data and the ability to easily expand the system will be key as our data volume inevitably continues to grow."

David Clifton, Senior Systems Administrator, ANSYS, Inc.

Problem:
- Hard to support collaborative development of technical services
- Time consuming configuration and management of cluster data
- Limited storage environment scalability and resiliency

Solution:
- Modular storage solution options
  - IBM GPFS NSD servers with DCS3700 storage
  - or Scale Out Network Attached Storage

Results:
- High performance, elastic scalability and robust resiliency
- Simplified configuration and management
- Single file system across multiple engineering sites
Integration with ANSYS applications for improved time to value

**ANSYS Remote Solver Manager**

- Submit and manage ANSYS FLUENT jobs through ANSYS RSM with the integration of Platform LSF and Platform MPI

**Remote Visualization Integration**

- Schedule and launch remote visualization sessions using Platform LSF and Platform Application Center
Centralization and Cloud – each is important for value offered

<table>
<thead>
<tr>
<th>Centralization</th>
<th>Cloud</th>
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<tbody>
<tr>
<td><strong>Characteristics</strong></td>
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<tr>
<td>• Consolidation of resources</td>
<td>• On-demand self-service</td>
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<tr>
<td>– Servers, storage, NW</td>
<td>– Users setup services with minimal help</td>
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<td>– Strategic Global or Geo centric locations</td>
<td>• Ubiquitous network access</td>
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<tr>
<td>• Remote Access</td>
<td>– Service access through standard internet enabled devices</td>
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<tr>
<td>– Browser, 2D/3D client</td>
<td>• Location independent resource pooling</td>
</tr>
<tr>
<td>• Global file system</td>
<td>– processing and storage demands are balanced across a common infrastructure with no particular resource assigned to any individual user</td>
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<tr>
<td>– Single view of all data</td>
<td>• Rapid elasticity</td>
</tr>
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<td>• Geo-centric file caching</td>
<td>– Consumer can increase or decrease capacity at will</td>
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<td>– Place content where needed for performance</td>
<td>• Measured service / Pay per-use</td>
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<tr>
<td>• Resource sharing and Multi-tenancy</td>
<td>– Usage based consumption fees</td>
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<tr>
<td>– Policy based scheduling</td>
<td>• Engineering Value</td>
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<tr>
<td>– Isolating customer specific traffic, data and resources</td>
<td>• Dynamically request systems and services as needed</td>
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<td></td>
<td>• Experience rapid service delivery response</td>
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<td></td>
<td>– Improve startup productivity</td>
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<td></td>
<td>• Pay based on service consumption</td>
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<td></td>
<td>• Move CapEx to OpEx</td>
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<td><strong>Engineering Value</strong></td>
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<tr>
<td>• Access larger, more powerful amounts of compute &amp; storage resources</td>
<td>• Improve operational efficiency, agility and resiliency</td>
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<td>• Designers can work on multiple projects, anywhere, anytime</td>
<td>• Standardize and automate service delivery policies</td>
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<td>• Expanded training and collaboration</td>
<td>• Reduce cost and risk</td>
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<td><strong>IT Value</strong></td>
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<td>• Realize more efficient Data Centers</td>
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<td>• Achieve higher peak usage of servers and storage</td>
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**Engineering Value**

- Access larger, more powerful amounts of compute & storage resources
- Designers can work on multiple projects, anywhere, anytime
- Expanded training and collaboration

**IT Value**

- Realize more efficient Data Centers
- Achieve higher peak usage of servers and storage
- Reduced/minimized upgrade impact
- Reduce complexity and support costs
- Improve security
As an example, IBM used HPC Cloud technology and Remote 2D visualization to enhance our own POWER7 development. . .

**Engineering Characteristics**

- Global adoption of:
  - Common Process
  - Common Tools
  - Integrated Governance

**IT Characteristics**

**Remote user Access**

Designers in all locations access centralized resources via Thinkpad and a remote (2D) access client.

**Shared, Centralized Development**

Austin systems used for interactive and batch work at 90% utilization around the clock, seven days a week.

*Note: site examples, not complete location list*

. . . realizing key business value propositions

- IBM IT cost per developer reduced by \( \approx 50\% \)
- Skills sharing: 2 programs staffed out of 1.75 teams
- Centralized servers achieved >90% utilization 24x7
- Power 7 development cycle shortened by six months (18 months versus 24 months)
Similar characteristics are emerging for mechanical systems and electronics packaging design

**Characteristics**

**Remote user Access**
Designers remotely access geo or globally centralized resources with 2D/3D remote clients and browsers

**Shared, Centralized Resources**
Design **coherency** and control is managed in one global operations center
Design **content** is strategically placed in a shared geo centric datacenter for remote access

STG engineering lead: “I want/need to operate in an environment with the same value propositions as my chip design peers!”

1. Global PDM/SCM system for central management of design state/coherency
2. Geo-centric design content placement – moving file content to a shared geo-centric data center
Client opportunities and values realized through centralized engineering solutions on cloud

- Replace Workstations with Laptops, Pads, etc.
  - Gain control over client application proliferation
  - Increase mobility while reducing support.
- Consolidate Data/Storage
  - Reduce support
  - No local storage to manage
  - Reduce network shadowing
- Consolidate Servers/Workstations
  - Significantly reduce support
- Consolidate Data Centers
  - Achieve higher peak usage with same number of servers.
  - Compute power never a schedule gate
  - Reduce complexity and support costs
  - Realize more efficient Data Centers
- Consolidate Applications
  - Emphasis on common usage of best tools and techniques for the tasks and processes at hand
- Designers
  - Can work from anywhere any time
  - Work on multiple projects
  - Seamless access to large compute cloud
  - Projects no longer location bound by skills
- Managers
  - Access to resources (systems, tools, data, designers) when and where required
  - Realize expanded training options (collaboration)
- Data Centers
  - Scale within the enterprise
  - Able to address peak usages
  - More efficiently utilized across projects
  - Prioritize capacity to critical projects
- Improve Security / Compliance
  - Data secured in one location
  - Data import/export not required

Synergistic Engineering and IT Transformation is a powerful value proposition which we are jointly positioned to address
The full realization of these capabilities comes together in an integrated cloud environment.
IBM and ANSYS Solution Architecture

ANSYS and IBM: Smart Storage and ANSYS EKM Solutions Brief
Based on Cloud’s potential positive impact, organizations are actively evolving their infrastructure toward private cloud, and considering the leverage potential of public and hybrid clouds.

Evolve existing infrastructure to HPC Cloud to enhance responsiveness, flexibility, and cost effectiveness.

Enable integrated approach to improve HPC cost and capability.

Access additional HPC capacity with variable cost model.
Values offered to customers by IBM, ANSYS and our joint partners in this opportunity space

- **Accelerated** application performance and user productivity
- **Improved systems utilization** with high availability and shared resources
- **Reduce costs associated with client workstation management** by centralizing computing, graphics generation functions and application management associated with GPGPU intensive software.
- **Reduced costs and risks associated with infrastructure design, validation and deployment** through a reliable, scalable solution offering a robust set of cluster and workload management and monitoring capabilities.
- **Reduced time to engineering productivity** through integrated application support and advanced management of ANSYS jobs and cluster resource utilization.
- **Increased operational agility and resiliency** by being able to quickly scale up, down or share resources to meet demands of the business
- **Improved product development collaboration** by providing secure access to all product data regardless of geography or device
- **Higher levels of exploration and innovation** through more time spent on engineering analysis and design exploration and less time managing and maintaining a powerful, available engineering infrastructure.
- **Greater exploitation of ANSYS applications** across projects and geographies as focus tools in the methodology
Resources

IBM Solutions for ANSYS @ HPC

Partner Programs

- [http://www.ansys.com/About+ANSYS/Partner+Programs/HPC+Partners/IBM](http://www.ansys.com/About+ANSYS/Partner+Programs/HPC+Partners/IBM)
  - IBM solution sizing and configuration recommendations for ANSYS Fluent 14.0
  - IBM server and storage solutions
  - IBM Best Practice Cluster System Recommendations for ANSYS Fluent
  - IBM Solutions using ANSYS Structural Mechanics
  - IBM server and storage portfolio insights

Cabot Partners Paper (Jan 2013)

- Addressing Engineering Simulation Data Management Challenges, Dr. Srini Chari

IBM Partner World - solution briefs & guides

Second source for ANSYS site postings. For example:

- [ANSYS and IBM: Optimized structural mechanics simulations](#)

IBM Web sites

- IBM Technical Computing
- IBM Platform Computing
- IBM Smarter Computing
Thank You!

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