ANSYS and LSTC together: When one plus one is greater than two

Jean-Daniel Beley

Senior Director, Mechanical Solvers

Nordic LS-DYNA Users' Conference 2022

Ansys is the global leader in simulation for over 50 years

Courtesy BMW

Strong business, technology & partnership foundation

- In the S&P 500 and NASDAQ-100
- $1.9B annual revenue (2021)
- **$5B+** Investments in Physics advancements
- 5,000+ employees in 40 countries
- 750+ PhDs and 450+ patents
- 150+ channel partners
- 1050+ participants in **Startup Program**
- 1.4M+ student software downloads
- 2,750+ **Academic partners** in 92 countries

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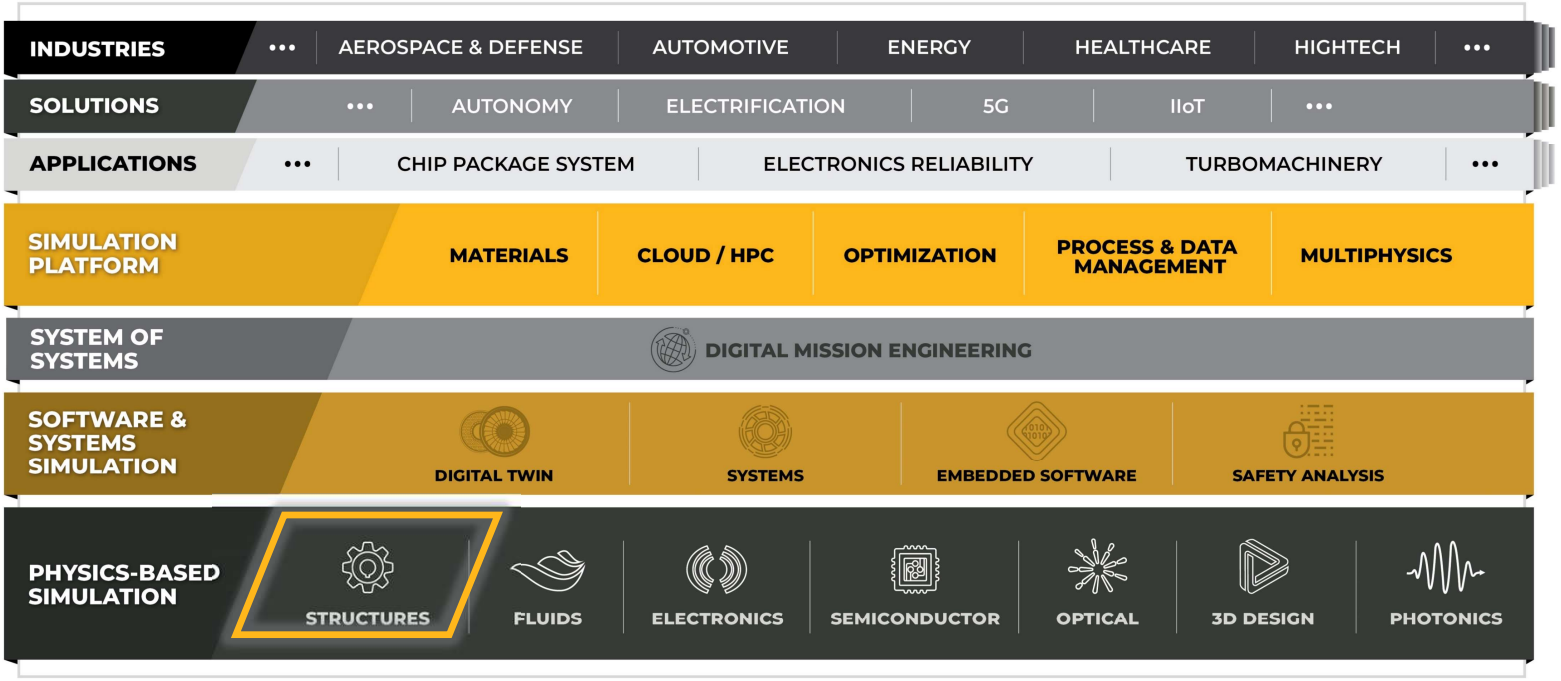
ANSYS Portfolio

"Driving digital transformation and test cost reduction in engineering"



CAD Agnostic Solutions

Open Ecosystem

Simulation is All We Do

- 85 Ansys products
- Development team focused on simulation
- A managed, customer-specific learning program

Open Ecosystem

- Integration with partners & competitor products
- Connect on-premises and in the cloud
- Optimized with artificial intelligence and machine learning

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Our Commitment (unchanged since 2019)

CONTINUE LEGACY OF TWO LEGENDS IN CAE

ALLOW INNOVATION TO THRIVE

CONTINUE TO KEEP CUSTOMER CENTRIC FOCUS

- Continue Current Development Trajectory
- Integrate and Work with LSTC partners
  Continue Direct Customer Engagements
- Continue Partnership with 3rd Party Pre-Processors
- **No Forced Migration,** Use tools the way you see fit
- Integrate LS-DYNA into ANSYS Workbench
- Joint Projects with Flagship Solver technologies

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Benefits To Customers From Combined LSTC+ANSYS

LS-DYNA technology part of an established company dedicated to simulation

Along with the security that comes with a company with a proven track record for CAE, customers can be assured of LS-DYNA expanding more than ever.

Bringing together the world's best implicit and explicit solver technology and scientists

ANSYS and LSTC scientists have joined forces to push boundaries. This results in better software in both product lines.

LSTC provides an important piece of a broader scope of simulation tools within the ANSYS portfolio

Improved interaction and integration between DYNA and other tools such as Mechanical, optiSlang, Maxwell, Fluent, Material Calibration, Granta Material Information…

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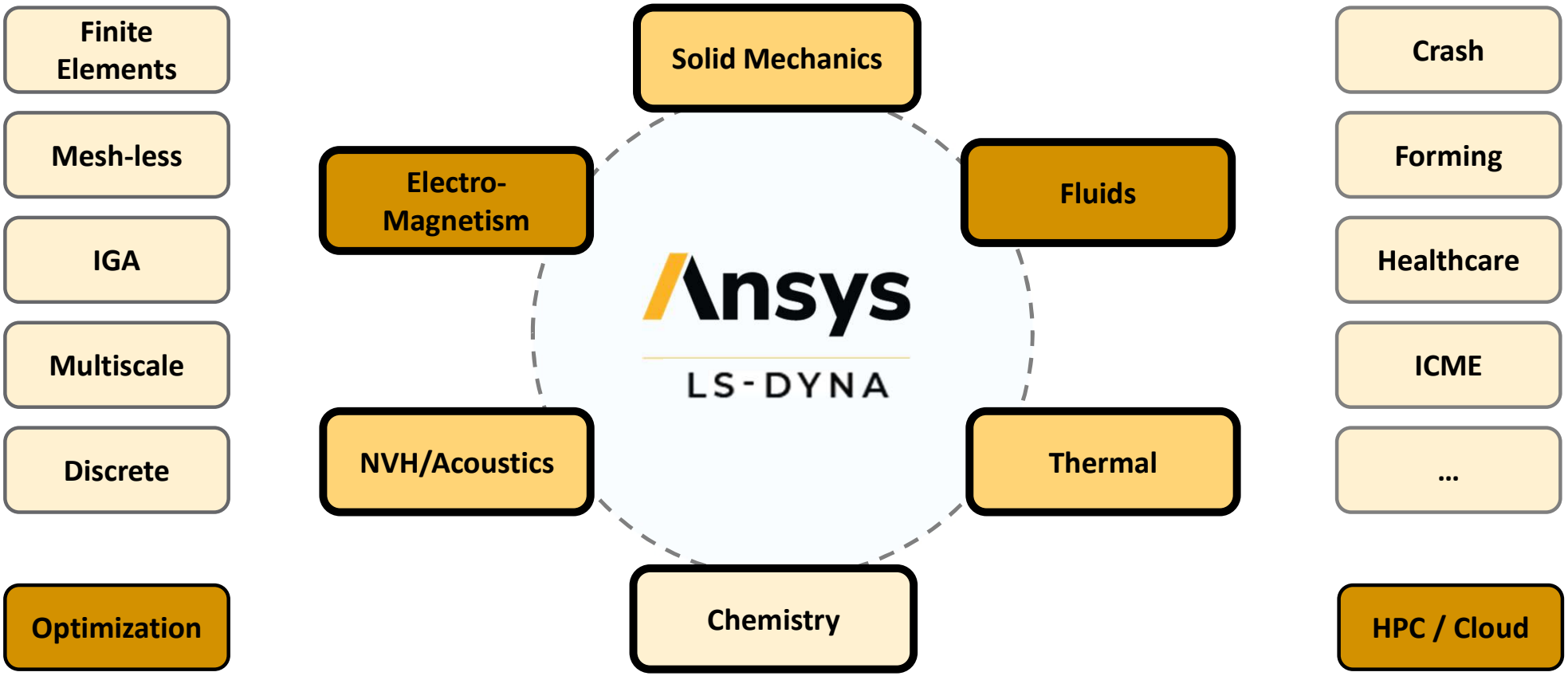
LS-DYNA: Tightly Coupled, Scalable Multi-Physics Solver



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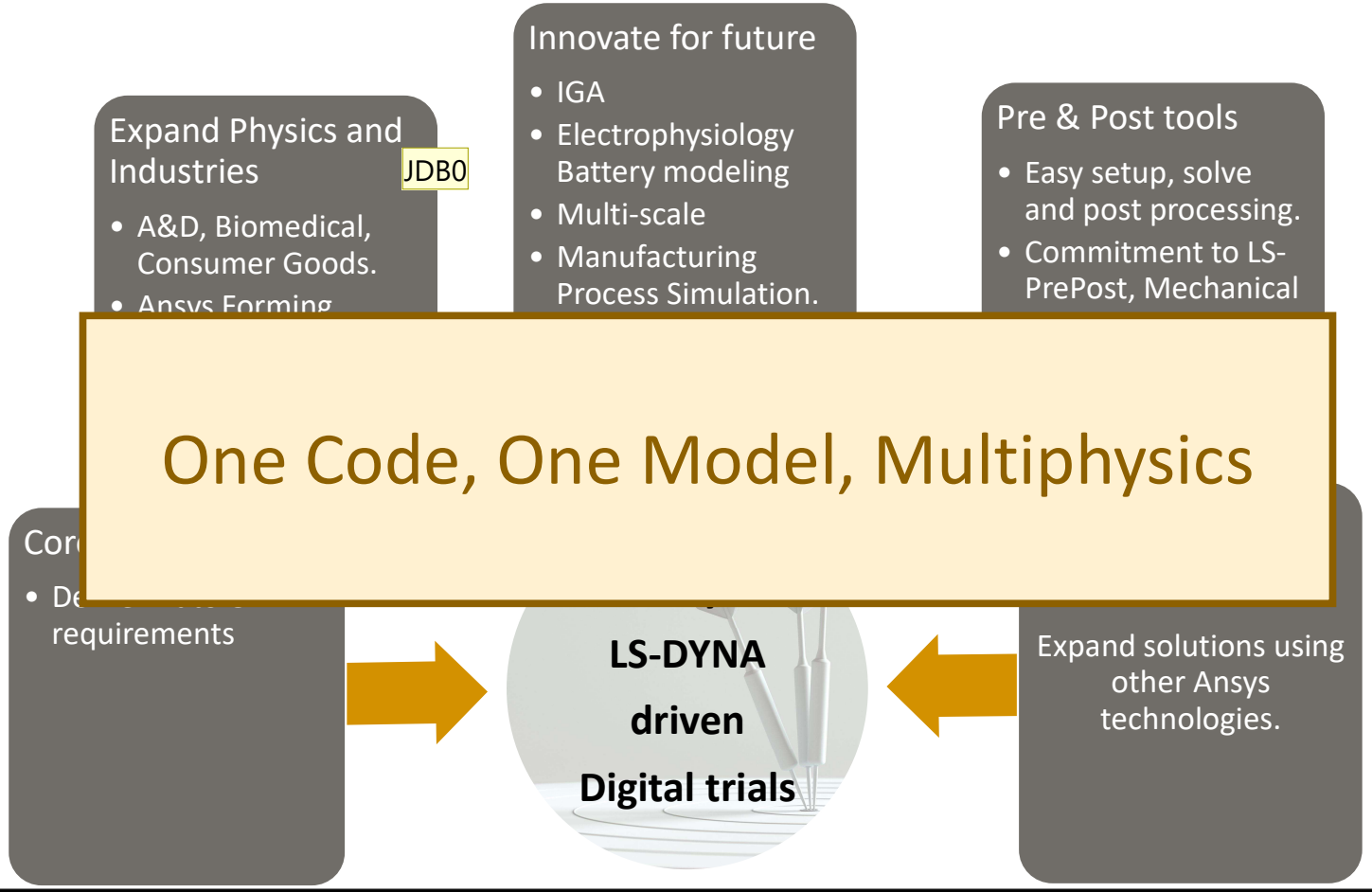
LS-DYNA Development Strategy



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Slide 7

JDB0 Expand Physics beyond crash

Jean-Daniel Beley, 2022-10-05T10:22:00.193

Selected Projects: LS-DYNA Solvers

- Sustain excellence and leadership in core **Explicit** technology areas including **Crash**
- Exchange and unify the best **Implicit** solver technologies with **LS-DYNA** and **MAPDL**
- Combine **AUTODYN** solver with **LS-DYNA** for world class **Blast** and **Explosion** modeling
- Enhance optimization technology and workflows with **LS-OPT** , **LS-TaSC** and **optiSLang**
- Accelerate **IGA** initiative with added preprocessing/meshing/postprocessing support from other Ansys flagship Technologies
- Develop workflows with **LS-DYNA** and **MAPDL** for a comprehensive **Acoustics** solution
- Develop **Multi-Scale** modeling for solving **Electronics** reliability problems
- Develop and align **LS-DYNA** technology to augment Ansys **Battery** Modeling initiative

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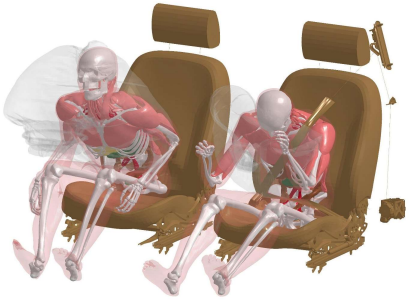
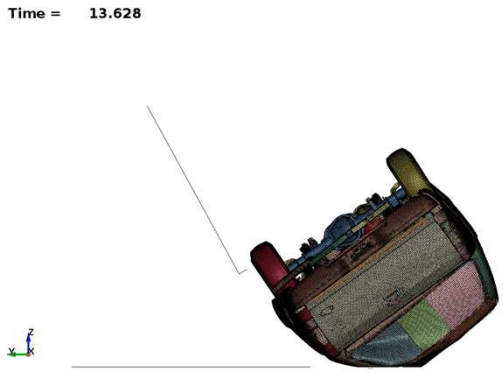
VISION for Automotive



- **Enhancing accuracy**
  - Iso Geometric Analysis (IGA) for higher order spatial accuracy with larger time steps
  - IGA for more accurate NVH and acoustic results
  - Improving the incorporation of manufacturing modeling results into crash analysis
  - Replacing Human Body Models with virtual humans with technology from biomedical industry work
  - Enhance Airbags modeling

Courtesy General Motors

- **Enhancing speed**
  - Reduced meshing time and coarse mesh accuracy with IGA
  - Alternative discretizations for speed, e.g., ISPH instead of traditional ICFD
  - Support for advanced computer architectures as they become available
- **Enhancing product development integration**
  - Closing the loop on CAD and CAE through IGA
  - Improved communications between LS-DYNA and 3rd party applications (e.g., controls modeling) for autonomous driving and airbag deployment



Dynamic Roll-over Roof-Crush

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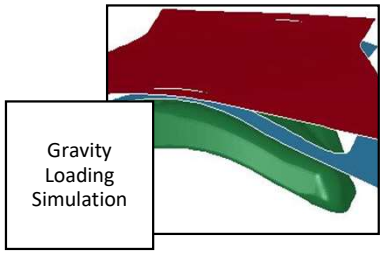
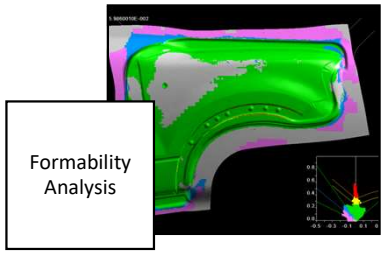
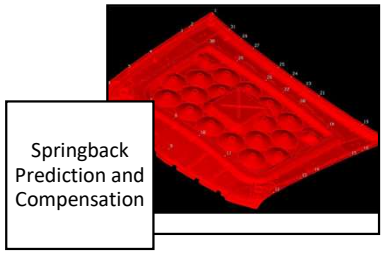
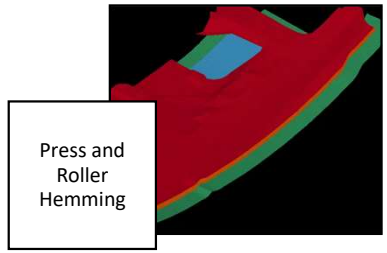
Ansys Forming

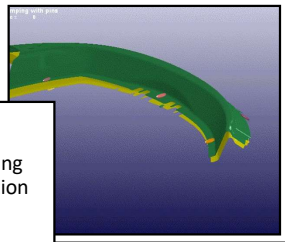
- A process-centric solution for metal stamping simulation.
- Easy to setup multi-stage forming simulations.
- Customizable templates for easy setup of forming processes.
- Easy job submission and monitoring.
- Integrated Post processing.

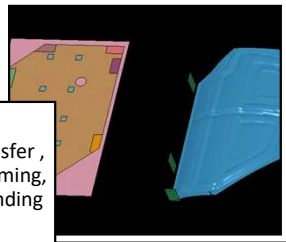

Gravity Loading Simulation

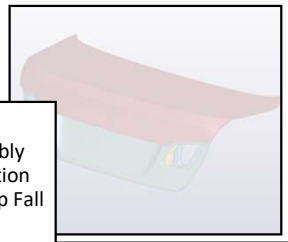

Formability Analysis


Springback Prediction and Compensation


Press and Roller Hemming


Clamping Simulation


Part Transfer , Hydroforming, Tube Bending


Assembly Simulation and Scrap Fall

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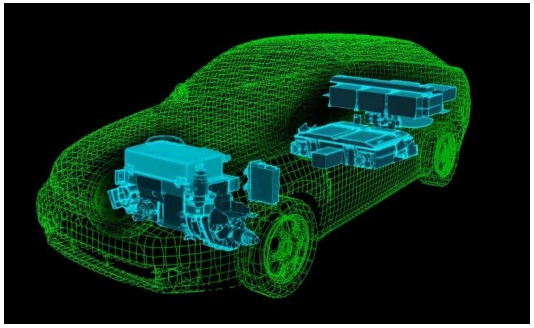
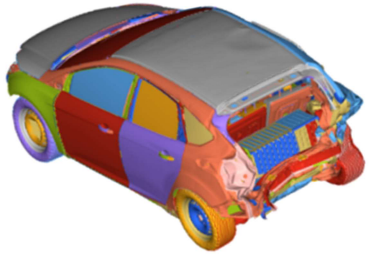
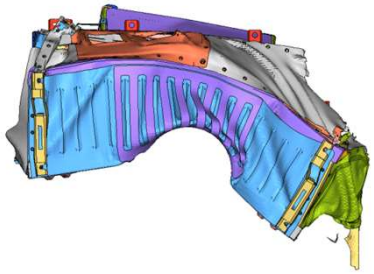
Ansys Battery Abuse Program

- A framework of battery safety modeling that couples mechanical, thermal, electrical and electrochemical responses of batteries.
- No other code has this Multiphysics capability, especially the coupling between the mechanics and the rest.
- Development is working in collaboration with industry partners.
- Calibration of simulation solver is effective only when industries & academia shares experimental test data.







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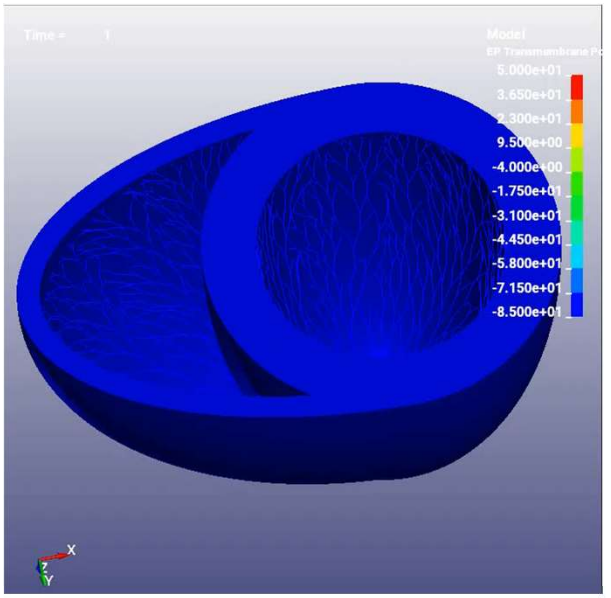
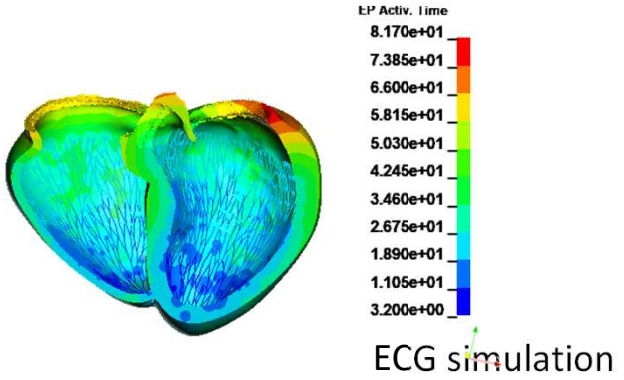
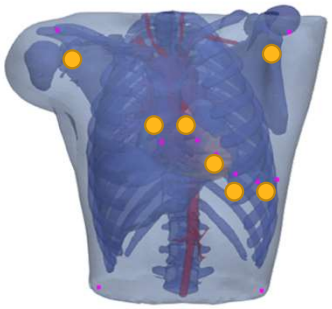
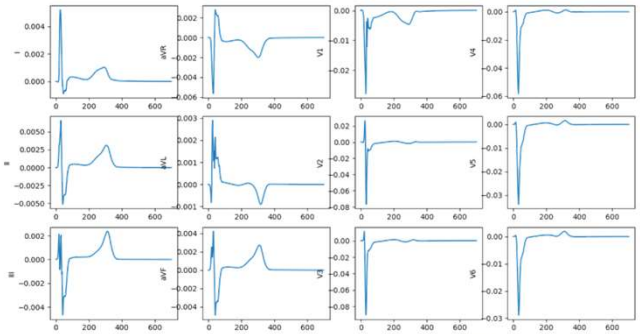
Healthcare - Electrophysiology (EP)

- Automatic generation of Purkinje network which can be coupled to mono/bi domain models
- Ionic cell models: FitzHugh-Nagumo, Fenton-Karma, ten-Tussher, TO-ORD, user defined
- Computation of EKG from trans-membrane potential
- Computation of external potential function of TM potential in monodomain.









ECG simulation

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Isogeometric Analysis – Current Status

- Explicit, implicit dynamics and modal analysis.
- Structured and unstructured discretization.
- Shell, continuum shell and solid elements.
  - Reduce utilized memory, speed up computation *without* compromising on accuracy
- Coupling with other solvers e.g., ICFD, acoustics
- Standard LS-DYNA and user defined material models.
  - Failure and element erosion.
  - Spatially varying baseline orientation using point cloud and field for non-isotropic materials.

First full body in white IGA using trimmed NURBS.
courtesy of K TAKADA, Honda (2019)

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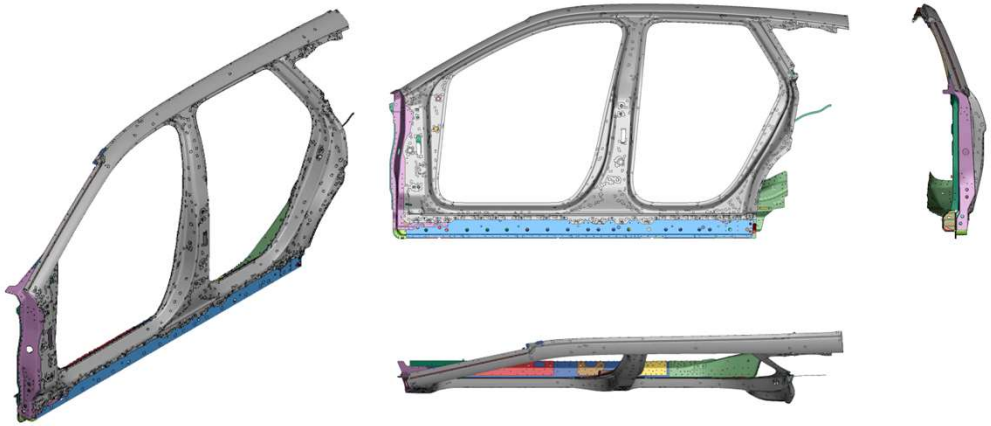
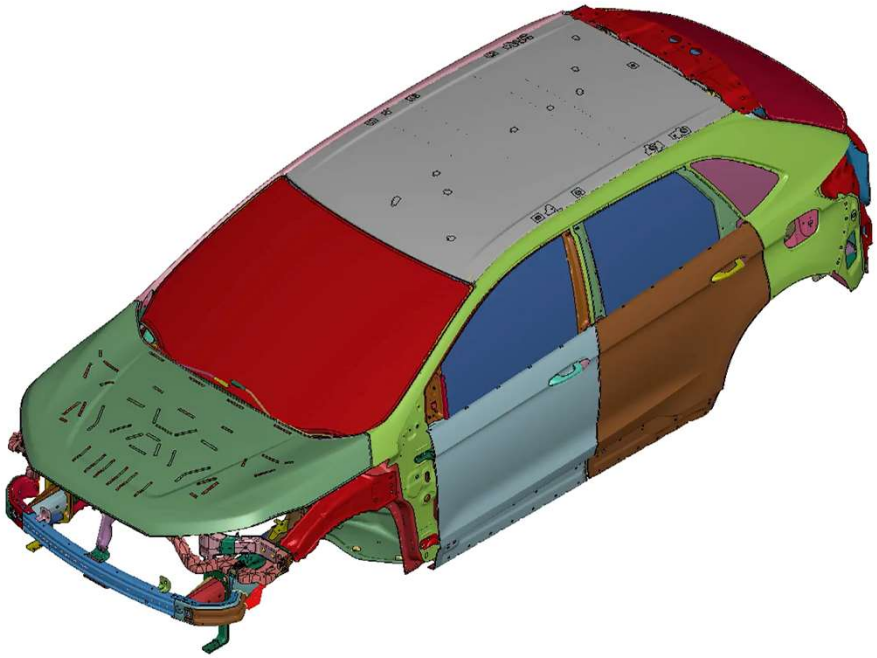
Hybrid FEA/IGA assembly using unstructured splines



courtesy of General Motors (2022)



courtesy of the Ford Motor Company (2021)

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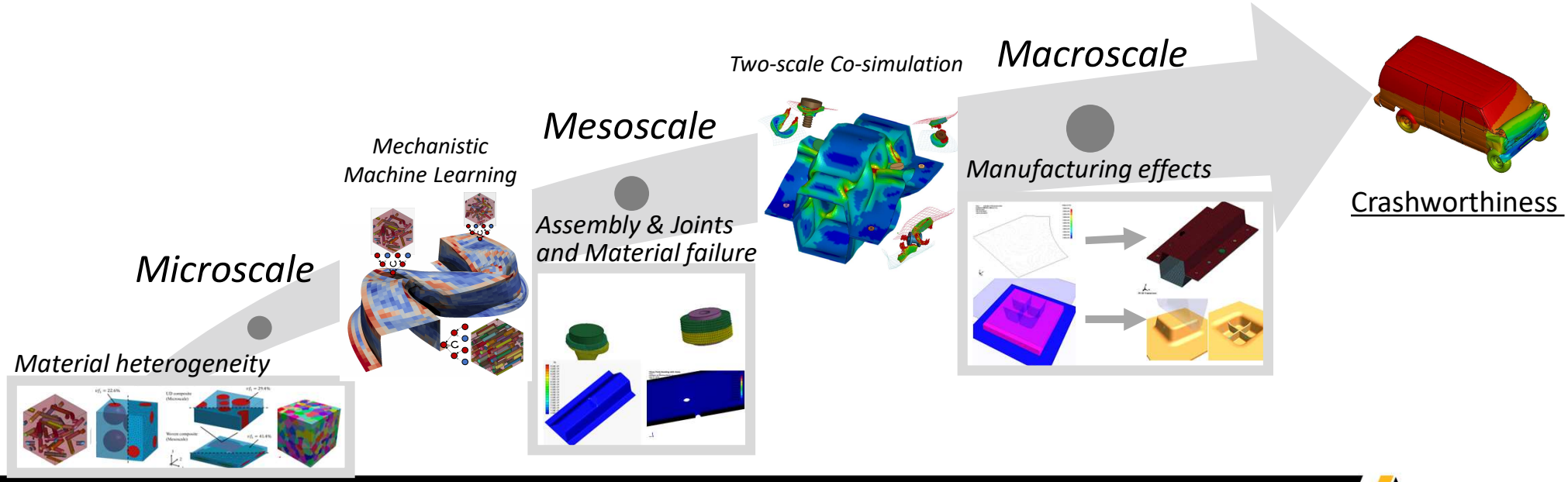
Multi-Scale

- Multiscale problems inevitably arise in many fields and applications.
- In solids/structures, fine-scale solutions can be found in **material failure, joints/assembly, manufacturing** and **microstructure** strongly affecting the simulation accuracy.
- Traditional multiscale methods is computationally very expensive.
- Need to develop effective numerical methods to solve the multiscale problems.



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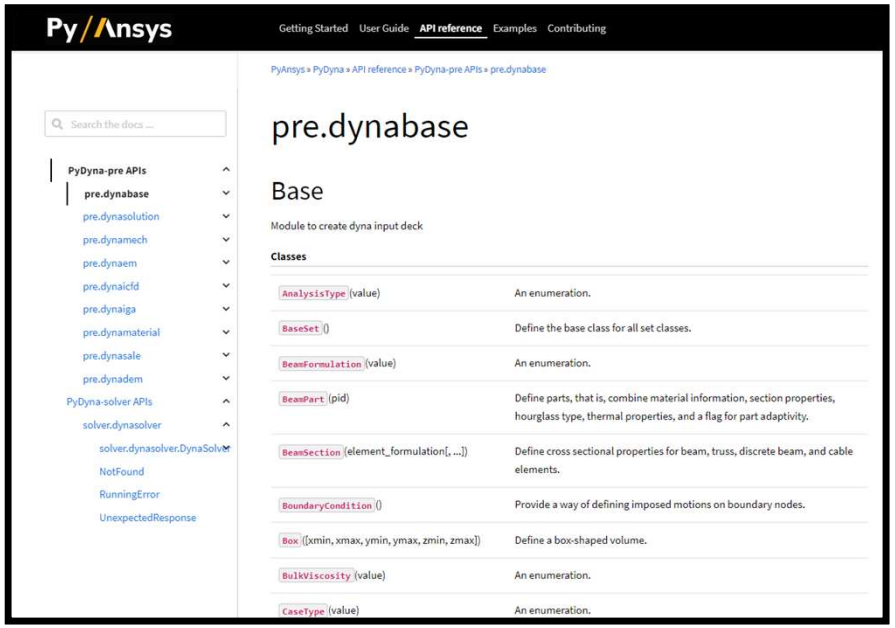
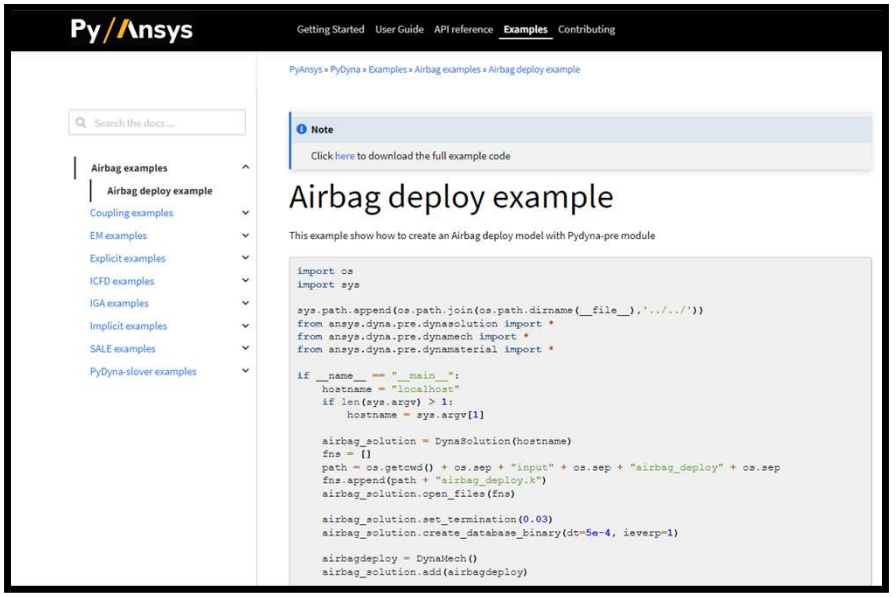
pyAnsys/pyDyna: Cloud-enabled APIs to all ANSYS products





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Summary

- Ansys is committed to meet market requirements for the industries we serve
- Ansys has a keen focus on performance and relentless pursuit of innovation
- Ansys is agile with a close network of developers to keep pace with customer needs
- Ansys is strongly engaged with prototype reduction strategies and digital certification
- Ansys will enable customer workflows & solutions with Ansys/Partner tools
- Ansys and Dynamore is the best partnership to help you achieve your goals

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Dynamore and Ansys – a Partnership

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