

Ansys platform strategy update

Ansys WOST conference

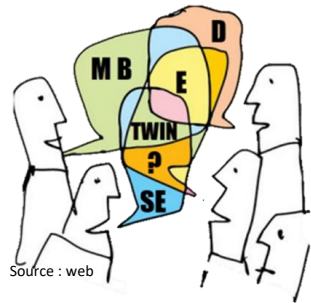
June 17th 2021



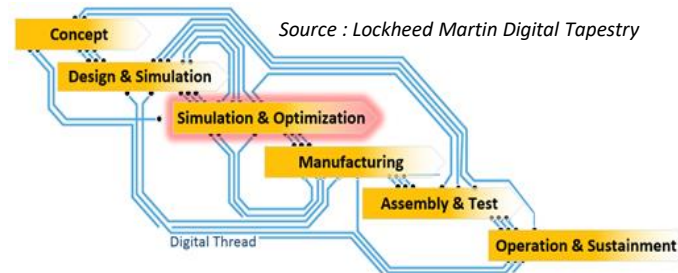
- **Platform drivers (customer perspective)**
- **Ansys platform strategy**
- **Ansys Minerva offering update**
- **Customer examples**

Digital transformation customer engagements, observations

50+ Engagements Digital Eng., Digital Thread, ...



Many initiatives, different maturity levels



Simulation is critical component of all

Ground reality ... customers

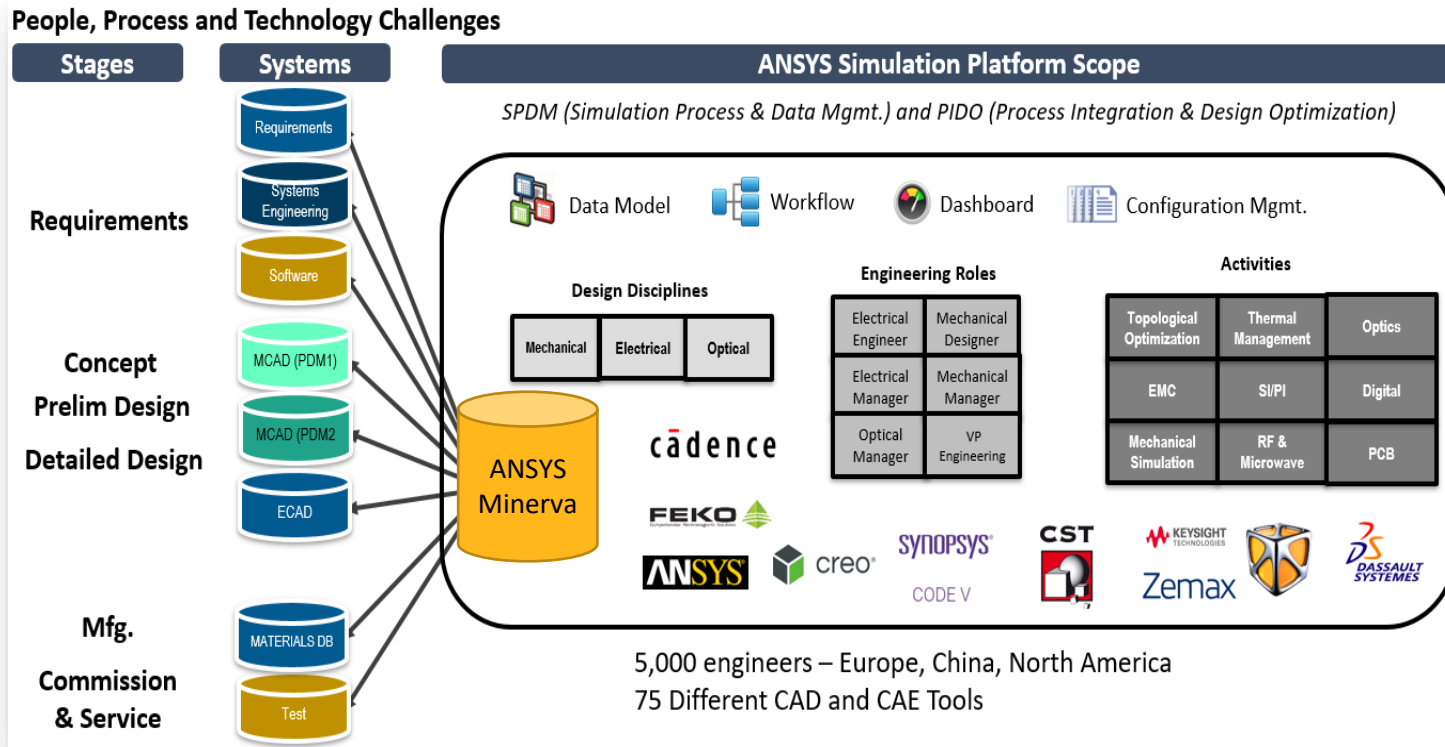
- ✓ **Heterogeneity** is the norm not exception – Domain specific tools/systems for PDM, Requirements, ERP, Simulation, ...needed
- ✓ **Rip and replace** - Multi-year, single vendor approach – Science project(s), expensive, rigid processes failed with no end user adoption

Customer/Industry mindset shift

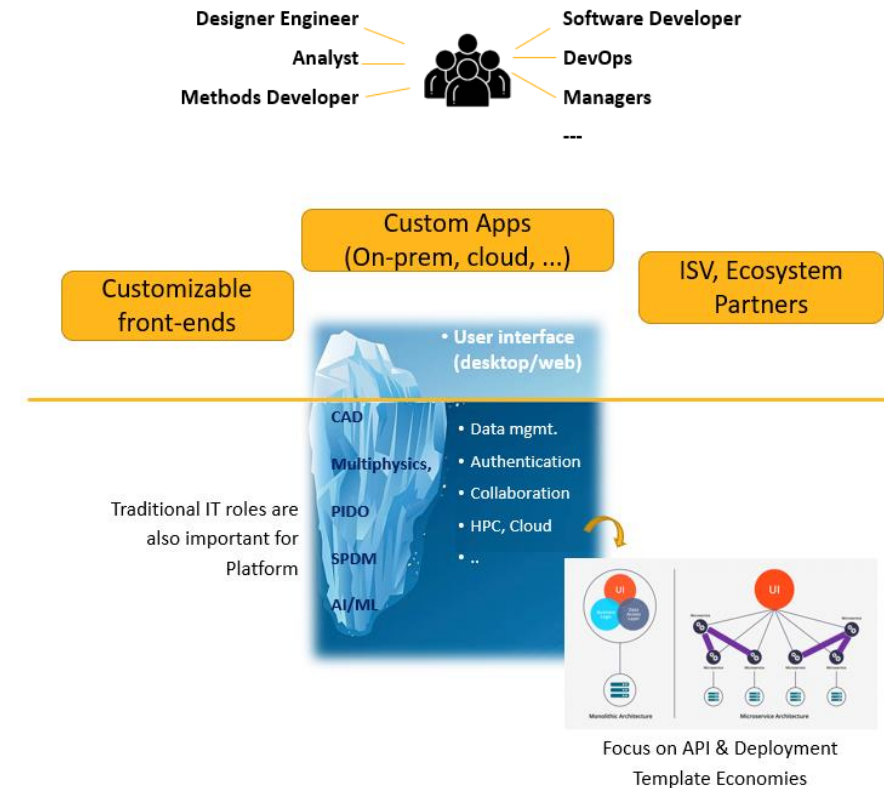
- ✓ **Single source** of truth to **Authoritative** source of truth
- ✓ Single vendor **monolithic** to purpose built, open and **federated**

Observations from customer engagements/Journey with a few

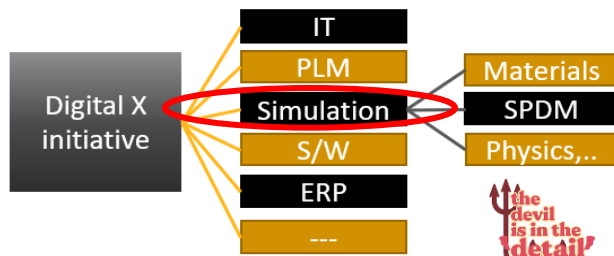
Issues to address NOW w.r.t simulation, process, data, HPC and interoperability



Customer and partner requirements driving EVOLUTION of our platform



Voice of the customer(s) – Domain specific targets are critical



It's not just a traditional data management conversation"



KPIS

Category	SPDM features
Data Management	<ul style="list-style-type: none"> CAE models, results, reports, meta-data CAE library management, Archival, reuse, compliance Parametrization, search, ...
Process Management	<ul style="list-style-type: none"> Application, template management <u>PIDO/MDO, automation, data exchange</u> Simulation business process Project management for CAE Web apps,
HPC Management	<ul style="list-style-type: none"> Job submission, monitoring, etc. (on-prem, cloud) Custom templates, Remote desktop,...
Collaboration & Visualization	<ul style="list-style-type: none"> 2d, 3d, plot visualization Collaboration, notifications
Traceability	<ul style="list-style-type: none"> Context, link to PLM, Materials, Inhouse Change notifications, versioning,

Typically broken down by customer maturity

Category	Priority/ Wt.
<u>User Experience</u>	9
<u>Automation templatization</u>	6
<u>Interface to materials, requirements</u>	4
<u>Large file and folder management</u>	8
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Broken down by use case and simulation practices

Simulation domain requirements impact overall deliverables for digitization

Simulation maturity



- Core simulation applications and Solver offerings

- Vendor neutral parametric workflows, DOE, optimization,..

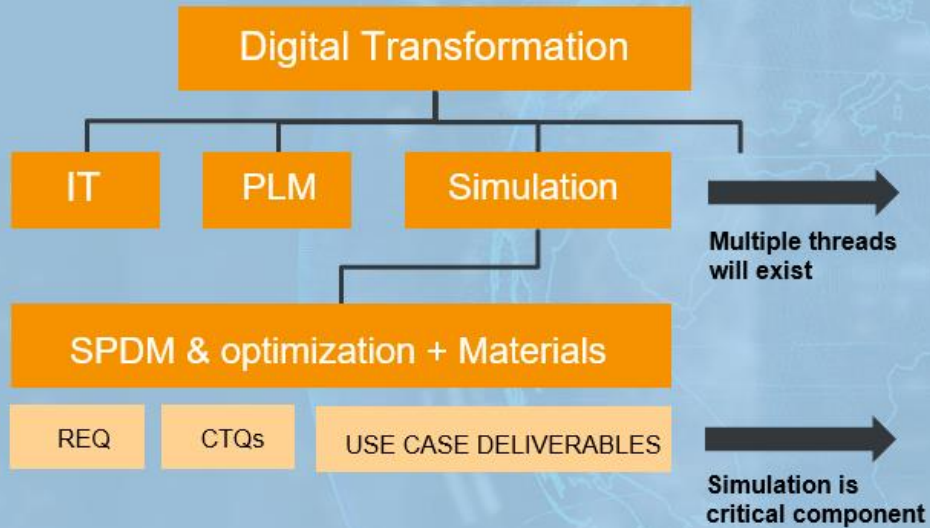
- Materials management
- Enterprise web deployment, interoperability, traceability

Customer Example

The journey and break down



Digital transformation domain specific break down and staging



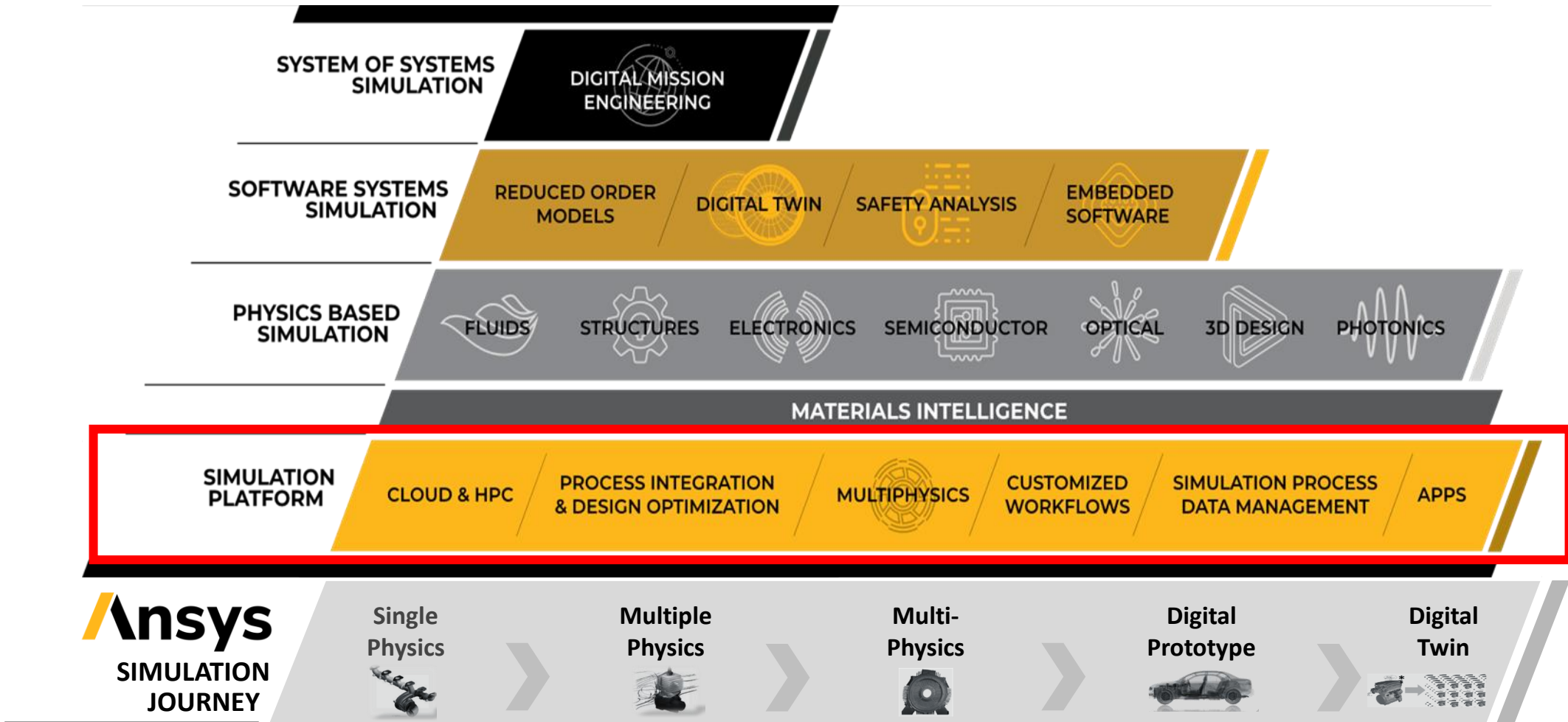
Domain specific capabilities mapping with end user experience

- Simulation Data Management**
 - Simulation Decision support:** Role based dashboards, reports
 - Reports and visualization:** Automated extraction of relevant information
 - Data Management:** Data organization, libraries, security, search
 - Configuration mgmt. Manage versions, references:** Check in, check out, version and change history
- Simulation Project management:** Vendor neutral Process Integration and Design optimization
- Materials Management:** Material property graphs and data tables
- CAE and Materials traceability:** Minerva Sim Projects and Granta MI material integration

Source: Arjun Tekalur, R&D Innovation Manager, Eaton presentation at Ansys Simulation World, April 2021



Ansys Holistic simulation portfolio

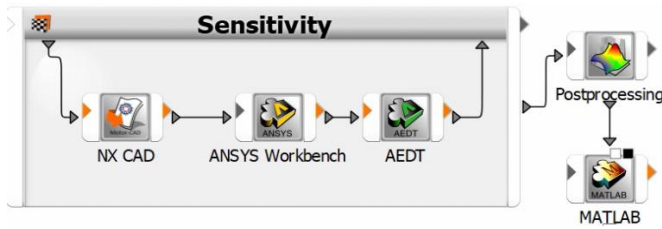


ANSYS
SIMULATION
JOURNEY

ANSYS

ANSYS Enterprise Offerings evolution for Engineering Workflows

ANSYS optiSLang



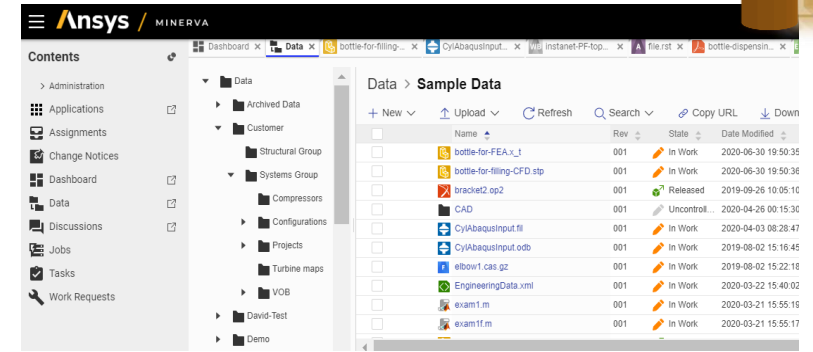
Best practices capture, Automation and optimization

- Ansys and 3rd party
- Tool chaining / automation
- Design of experiments
- Optimization
- Sensitivity, robust design, surrogate models..

ANSYS Minerva

SPDM, Democratization, AI, Insights

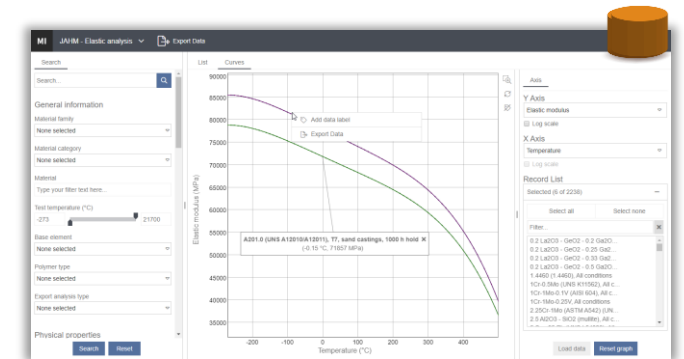
- Data and configuration mgmt.
- Project/Process mgmt.
- HPC job mgmt.
- Collaboration, Traceability
- Dashboards, AI, insights
- Enterprise web deployment, interoperability



ANSYS Granta MI

Materials Intelligence

- Manage and apply proprietary material information
- Comprehensive library of reference data
- Integrations with CAD, PLM tools
- Materials traceability

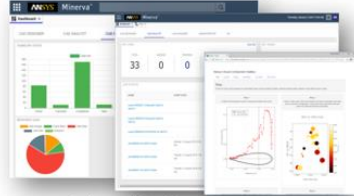


Ansys Minerva update

Minerva Commercial release in Sep 2019

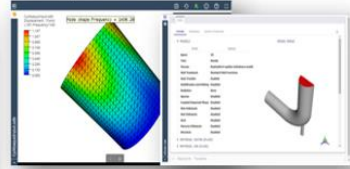
✓ Rich set of capabilities, guided by customers across industries

Simulation Decision support



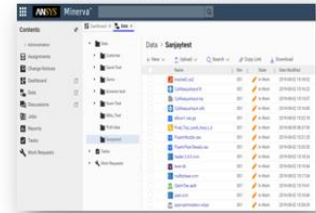
Role based dashboards, reports

Reports and visualization



Automated extraction of relevant information

Data Management



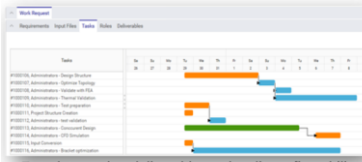
Data organization, libraries, security, search

Configuration mgmt. Manage versions, references

Name	Rev	State	Modified on	Modified By
st1v1_1.tbd	001	Released	2019-11-26 12:02:26	Mary Kate
st1v1_2.tbd	002	In Work	2019-11-26 12:18:18	ANSYS Admin
st1v1_3.tbd	001	Released	2019-11-26 12:02:26	Tom Styer
st1v1_5.tbd	001	Released	2019-11-26 12:02:26	ANSYS Admin

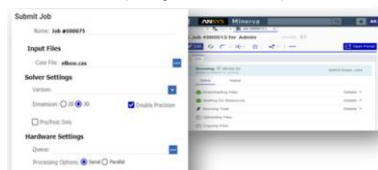
Check in, check out, version and change history

Simulation Project Management for teams



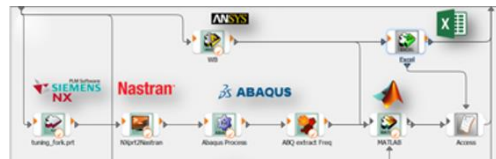
Templates, roles, deliverables and audit configurability

HPC(on-prem/cloud)



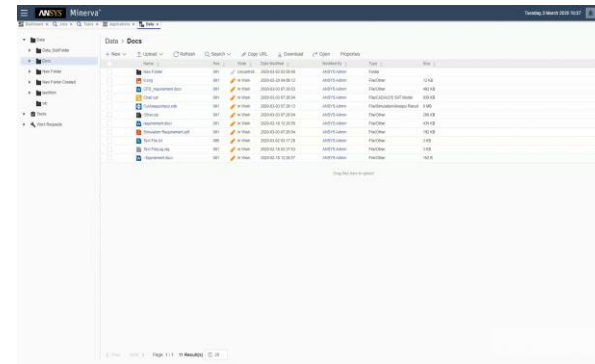
Execute and Manage interactive and batch jobs

✓ Process integration and Design and Materials integration

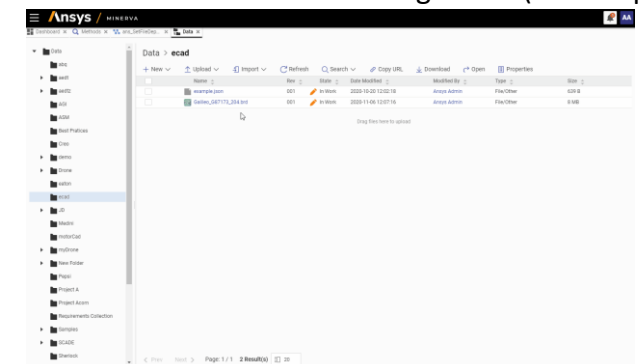


Roadmap driven/prioritized by lighthouse customers

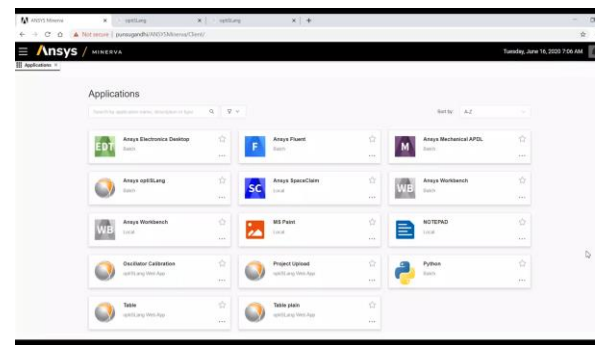
✓ Traceability



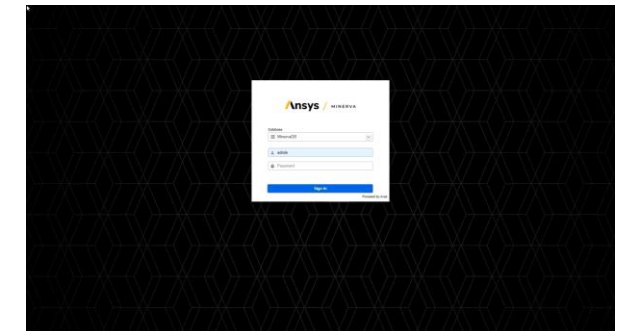
✓ ECAD simulation management (roadmap)



✓ Democratization (simulation web apps)



✓ Dashboards



Key Differentiators

- ➔ User experience tuned for CAE
- ➔ Ansys and Non-Ansys support
- ➔ Open, and Configurable

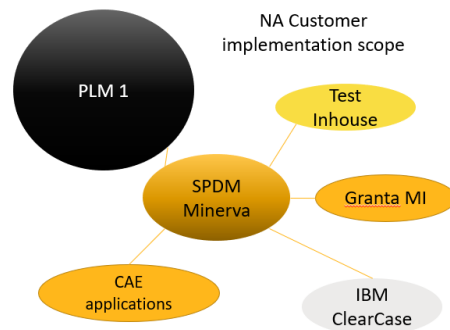


Customer perspectives



Automotive Customer

Digital Engineering challenge	Faster Throughput On Simulation Workflows, leverage optimization early and increase decision making through simulation		
Impacts	1000 + CAE users	600 + Systems Group	1000s + Non-CAE
Delivers results	25-50% Faster Throughput On Simulation engineering Workflows	30-50% Designers Decision Making Assisted with Automated Simulations and optimization	
Foundation Enables via interoperability	Digital Twins (Part, Product, and System Level)	Simulation Analytics & AI Post processing, Physics and Data Driven Models	Formalization of New Methods 3D Printing, Electrification, MBSE



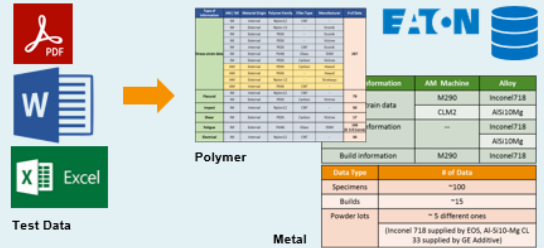
“Ansys Minerva is important to Eaton and plays a key part in our larger, enterprise-wide digital prototyping and additive manufacturing (AM) initiatives... Ansys Minerva will help make our user experience more streamlined than it is today.”

Todd Earls, Vice President of Information Technology at Eaton.

Ansys-CIMdata ebook

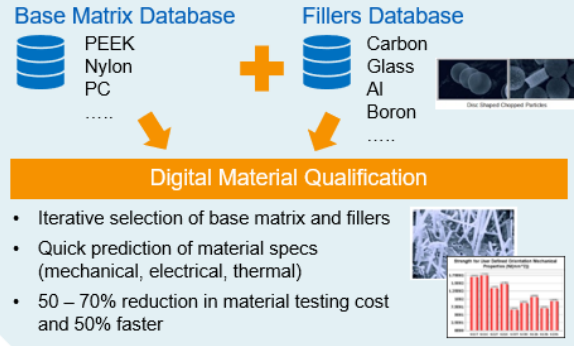
Customer examples(1)

Material Tracing

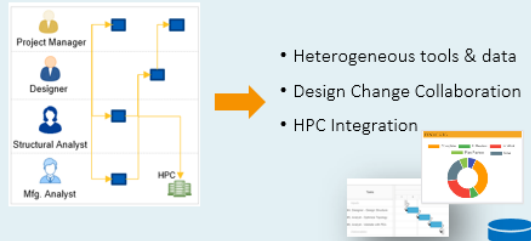


10+ years of material development (Eaton IP) and Testing data consolidated curated in one database

Material Discovery

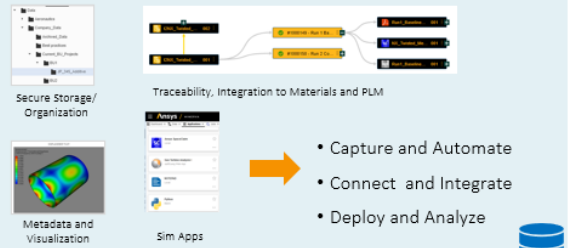


Simulation Process Management



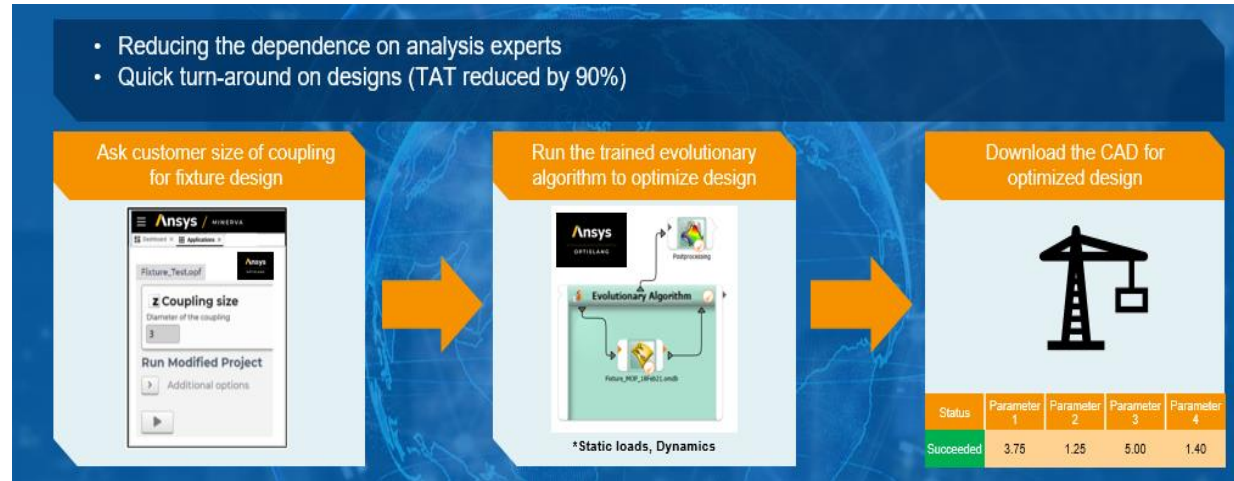
Visibility and streamlined workflow for integrated activities for simulation, data and information flow

Authoritative source of simulation data



Simulation data (Eaton IP) and best practices consolidated, curated in one database

- Integrated workflows for Engineered to Order products
- Reducing overall product development and qualification time



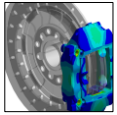
Customer examples(2)

PLM system(s) Other

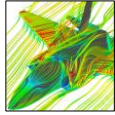
	Japan – Automotive Siemens, Dassault Multiple, Granta MI	NA – Automotive PTC IBM clear case, Inhouse, Granta	India - Pharma Multiple Various inhouse tools
Goal	Streamlining iterative engineering workflows	Designer-Analyst collaboration, simulation driven design	Simulation driven validation and verification and traceability
Pain Points	<ul style="list-style-type: none"> Repetitive tasks/ hand offs on projects not managed Requirements, Data, reports, communications manual With simulation demand increasing, governance an issue 	<ul style="list-style-type: none"> Adhoc sim process between designers and analysts with no visibility, manual communication and unmanaged data Distributed global teams with no reuse or management 	<ul style="list-style-type: none"> FDA CFR 21 Compliance, extensive approval process, time & cost “In-Silico” approach to reduce time-to-market through SDPD Virtual Verification and Validation (V&V) for FDA compliance
Decision	<p>SE Requirements EE Data, reports CAE Teams, process PM Signoffs X</p> <p>Systems Engineer Electrical Engineer CAE Engineer Project Manager</p> <ul style="list-style-type: none"> Minerva for CAE department unique process needs Federated system allowed for faster deployment and ramp up across groups across regions (ramp up 70→1000) 	<div style="border: 1px solid red; padding: 5px; margin-bottom: 10px;"> <p>1 process flow</p> <ul style="list-style-type: none"> Component Development Analysis Method 11 People Involved Takes 6 months – 1 year </div> <p style="text-align: center; color: red; font-size: 2em;">↓</p> <div style="border: 1px solid red; padding: 5px;"> <p>50-60 such workflows</p> </div> <ul style="list-style-type: none"> Minerva for designer-CAE analyst collaboration, model libraries and Simulation and optimization activities mgmt. Group based ramp up (5000 users) 	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid orange; padding: 5px; width: 30%;"> <p>Device Development</p> <ul style="list-style-type: none"> NPI Acceleration Product Differentiation High quality & affordable medicine and support </div> <div style="border: 1px solid orange; padding: 5px; width: 30%;"> <p>Regulation and Simulation</p> <ul style="list-style-type: none"> Secure faster approval through simulation Simulation in Clinical trial Reduce Time to Market </div> <div style="border: 1px solid orange; padding: 5px; width: 30%;"> <p>Manufacturing and Scale-up</p> <ul style="list-style-type: none"> Faster tech transfer Trouble shooting Savings through optimization Technology and Innovation </div> </div> <ul style="list-style-type: none"> Minerva user experience, configurability and deployment Openness allowed for 3rd party, inhouse tools integration



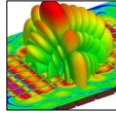
ANSYS Cloud as part of our platform strategy : ANSYS SaaS offering



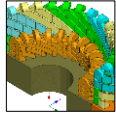
Mechanical



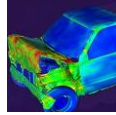
Fluent



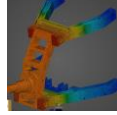
HFSS,
Siwave, Icepak



Maxwell,
Q3D (2D & 3D)*



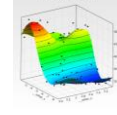
ANSYS
LS-DYNA



ANSYS
Discovery



ANSYS Speos



ANSYS
optiSLang



CFX
2021 R2

From 6-core up to 120 cores cloud-based workstation available in minutes

ANSYS Solutions installed and ready to use

Can be used with AHC's and BYOL

Performance optimized to ensure reduced latency

Pre or post process in the cloud or complete a full workstation solve

2019
Feb



2021

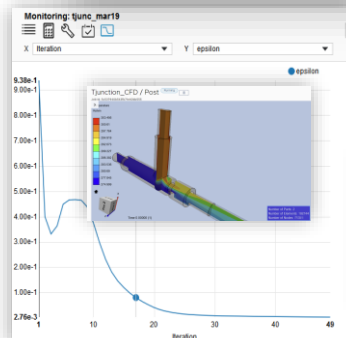
Name	State	Start Time	Finish
BoltedBracketFEA	Running	1/31/2019 4:29:10 PM	N/A
Tjunction_CFD	Running	1/31/2019 4:27:51 PM	N/A
BoltedBracket2019R1	Completed	1/17/2019 11:35:01 AM	1/17/2019

```

> define/ mesh/ solve/
  disp/    pash/ tel/   surface/
  exit/    report/     report/
  file/

> (launch "tjunc.cas.gz" "tjunc.dat.gz")
/!file/read-cas "tjunc.cas.gz"
Multicore processors detected. Processor affinity set!
Reading "tjunc" gunzip -c "tjunc.cas.gz"
Buffering for file scan...

40127 mixed cells, zone 144, binary.
92893 mixed cells, zone 149, binary.
Warning: reading 4 partition grid onto 12 compute node each
will auto partition.
40127 cell partition ids, zone 144, 4 partitions, binary
Warning: reading 4 partition grid onto 12 compute node each
will auto partition.
92893 cell partition ids, zone 145, 4 partitions, binary
204330 mixed interior faces, zone 147, binary.
89064 mixed interior faces, zone 146, binary.
9407 triangular wall faces, zone 27, binary.
176 mixed pressure-inlet faces, zone 31, binary.
180 mixed velocity-inlet faces, zone 31, binary.
4494 triangular wall faces, zone 29, binary.
180 mixed interior faces, zone 28, binary.
49233 nodes, binary.
45233 node flags, binary.
    
```



Current Month

- Jobs / Solved: 17 Jobs / 17 Solved
- Jobs / Queue: 17 Jobs / 0 Queue

Resource Usage

- Account Balance: 9863.46 AEU
- Storage Used: 1.18 GB of 1.00 TB
- Concurrent Jobs: 0 / 5

ANSYS / CLOUD

Airliner / Desktop postprocess

3D visualization of an airliner wing with stress and flow analysis results.



Thank you !

- Please reach out to us to learn more