

Simulation Data Management (What About my Spreadsheets?)

- Vendors that provide SDM capabilities tend to focus on their existing analysis tools, not Excel, R, Python, MATLAB
- A 2018 NAFEMS survey revealed that
 - Excel is used extensively as a preliminary design tool
 - The usage of Excel is *increasing*,
 - Little consideration is given to capturing and/or re-using the data generated
- This talk will focus on a new capability from EASA that enables easy capture and sharing of users' data and spreadsheet models

- “Simulation Data Management (SDM)” is a technology which uses database solutions to enable users to manage structures of simulation and process data across the **complete product lifecycle**. SDM artifacts can be data, models, processes, documents and metadata relevant to modeling, simulation, and analysis.

- from <https://www.nafems.org/blog/>

- “**complete product lifecycle**” – so by definition, EASA is NOT an SDM system

- ➊ EASA is a patented low-code development platform for “citizen developers” or “authors”
 - ➋ Enables “authors” to create and publish custom, fit-for-purpose apps
 - ➌ Leverage *existing tools* (e.g. spreadsheets and other assets) as web apps that authorized users can use on any device
 - ➍ Integrate multiple tools into a single app, simplifying and automating work flows
 - ➎ Integrate model-based apps into other enterprise systems
- ➏ Originally developed as an “*appification*” platform to deploy engineering and scientific models within an enterprise

Ball Bearing Smart Product Generator

Operational Requirements Recommended bearing type

Again, graphical feedback helps the user make the choices required



Recommended bearing type: **AngularContact**

Use or override recommendation?

Override recommendation: **DeepGroove**

Continue


DeepGroove
AngularContact
Thrust

Empirical guidelines are employed, here recommending a bearing type

Comet Spring Calculator

The performance engineering workplace

Spring Calculator



Design Realization

Specifications

Target Pressure Spring (psi): 7.8
 Coil Inner Diameter (in): 2.8
 Mean Coil Diameter (in): 3.0
 Spring Free Length (in): 2.0
 Number of Active Coils (Nc): 12
 Material: A229
 Spring Rate (lb/in): 100

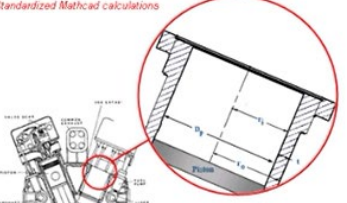
Design and Production Parameters

Spring Design Type: **Close**
 Wire Diameter (in): **0.035**
 Number of Active Coils (Nc): **12**
 Spring Rate (lb/in): **100**

Protected & Standardized Excel & Mathcad Calculations

Input Parameters Results

Standardized Mathcad calculations



Pressure requirements

Differential pressure (psi): 20
 Burst pressure (psi): 7500
 Test pressure (psi): 4000

Dimensional requirements

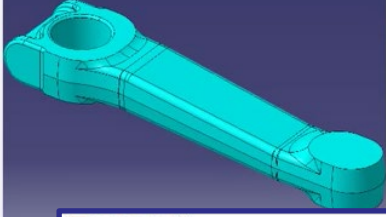
Piston diameter (in): 3.60
 Wall thickness (in): 0.30
 Piston angle (deg): 30
 Number of pistons: 8

Cast material selection

Cast aluminum material: 201-17

Pitman Arm Model Generator v0.2

Major Design Parameters Existing Configurations Forging Parameters Machining Parameters Structural Loading Outputs, Models, and Analyses



Major forging parameters

Material (series): 4140
 Offset distance (in): 0.90

Primary upper boss dimensions

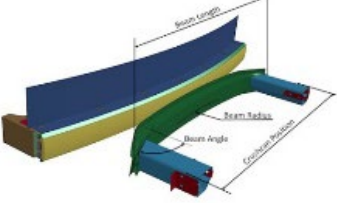
Thickness (in): 1.90
 Flat width (in): 2.97
 Upper bend dist (in): 6.00
 Length (in): 4.03

Primary lower boss dimensions

Forged thickness (in): 2.00
 Location (in): 16.00
 Lower bend dist (in): 10.00
 Width (in): 2.44

Comet Bumper Impact Calculator

Bumper IES Crash Test



Product Family

Region Family: IES

Design Parameters

Bumper Length: 1100 mm
 Bumper Radius: 3812 mm
 Bumper Angle: 97.7 deg
 Crumple Height: 1814 mm

Total Vehicle Mass: 1795 kg
 Thickness of Beams: 2.3 mm
 Thickness of Crossbars: 2.00 mm
 Thickness of Brackets: 1.5 mm


Simulation Parameters

Barrel Position: Confirms
 Simulation Time: 80 ms
 Task Size: 0.1 ms

Simulate Exit

Comet Hydraulic Rod Calculator

The performance engineering workplace



Model Assembly Type

One Design Valve Design

Boaring Option

Use Machine Use Manual

Final Configuration

Comp. Height: 1000 mm
 Pressure: 2400 psi
 Material: 303

Run Configuration Exit

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- ➏ Originally developed as an “*appification*” platform to deploy engineering and scientific models within an enterprise
- ➐ Today, by far the most common use-case is to deploy critical spreadsheets as enterprise-class web apps
- ➑ New areas include deployment of Machine Learning models

Manufacturing



Pharmaceutical



Chemicals & Materials

CORNING



Technology



Financial



- On the surface, it looks like EASA does some of the things that an SDM system does...
 - Capture of local data in a central searchable environment
 - Authoring and management of repeatable simulation processes
 - Assembly of models and load cases from 1 to 1000s of simulations
 - Launching simulations in an HPC environment
 - Sorting through data to get design insights
 - Report creation and comparison of test results
 - Traceability of simulation pedigree from model to report
- But – this is all within the context of encapsulating processes as (intentionally restrictive) web apps

EASA makes Excel (& other models) into secure web apps

BEFORE

AFTER

Professional Indemnity Target Premium: 0

Exposure Information

Turnover (USD)	Total
2009	
2010	
2011	
3-year average Turnover	0

Geographic Operation Split

	Turnover (USD)	% Turnover
Africa		
Asia-Pacific Other		
Brazil		
Canada		
Central/South America		
China		
Europe Other		

PRICING ID: 11

Professional Indemnity Target Premium: 12,144

Exposure Information

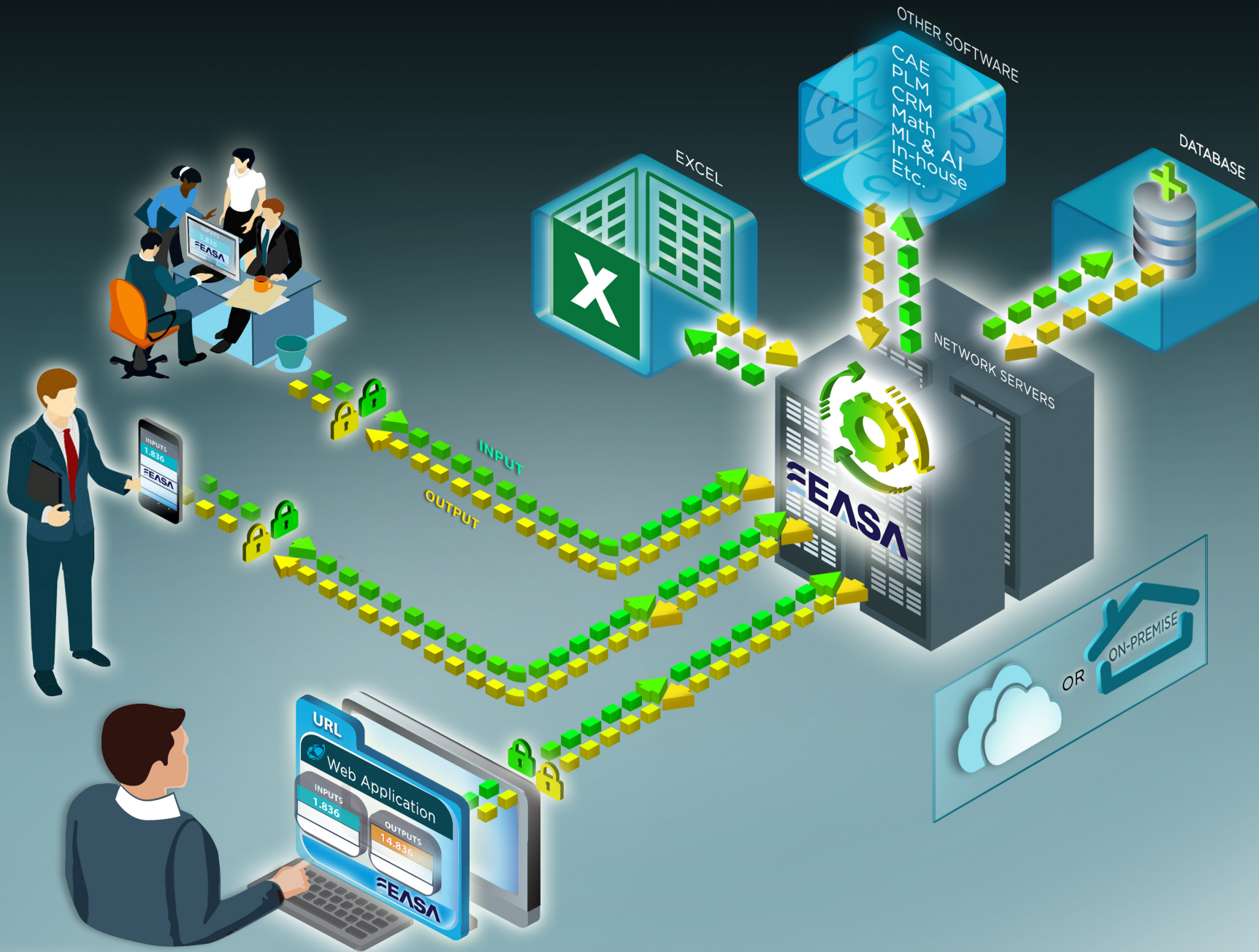
Turnover (USD)	Total
2016	1,000,000
2017	2,000,000
2018	3,000,000
3-year average Turnover	2,000,000

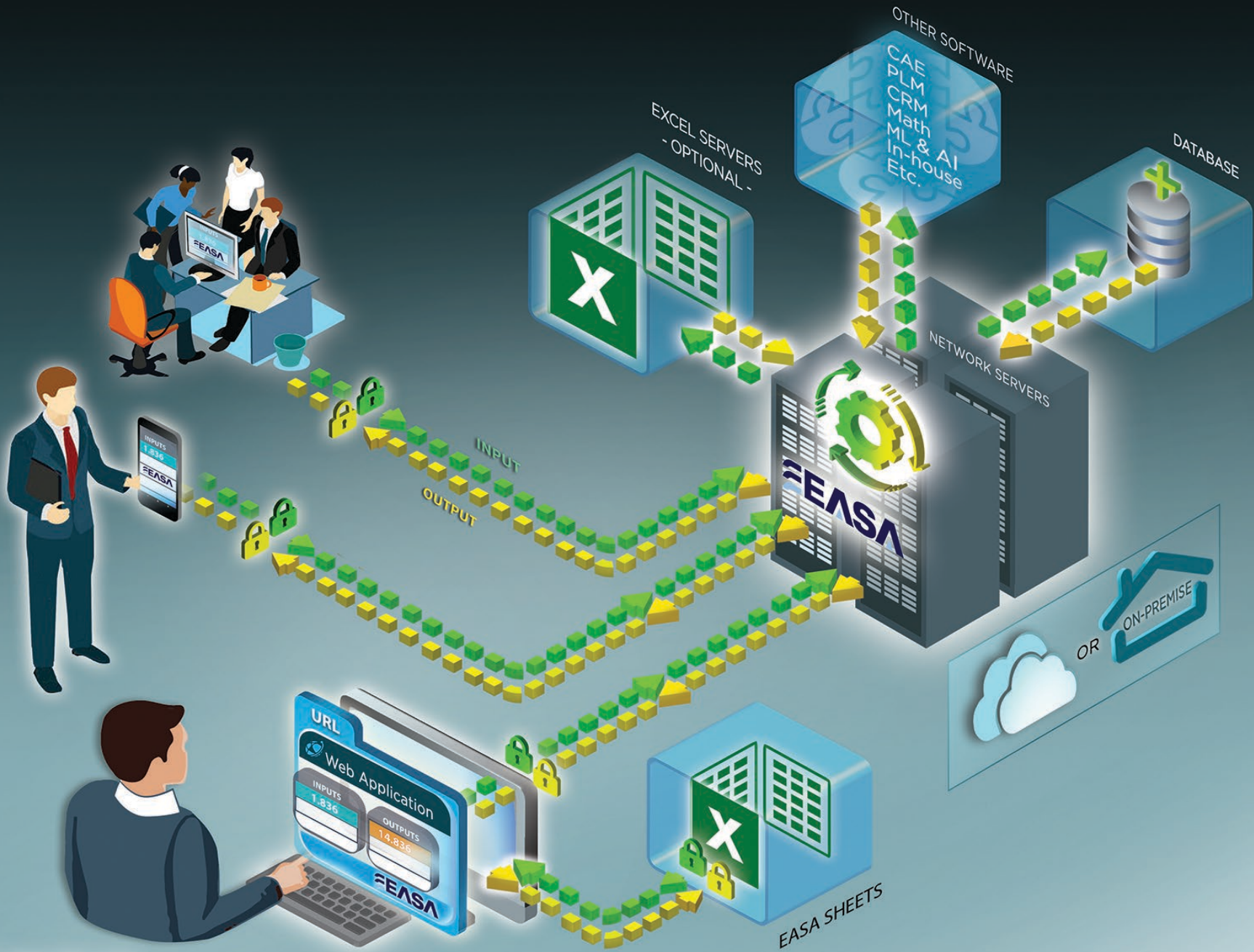
Geographic Operation Split

	Turnover (USD)	% Turnover
Africa		
Asia-Pacific Other	500,000	25%
Brazil		
Canada		
Central/South America		
China		
Europe Other		
France		
Germany		
India		
Japan		
Mexico		
Middle East		
Russia		
UK		
USA	1,500,000	75%
Total	2,000,000	100%

Geographic Operation Split

- ➊ EASA makes Excel (& other models) into secure web apps
- ➋ But what if you don't have time to build a web app?
 - ➌ *“EASA has been great – we have rapidly deployed nearly 30 of our most critical spreadsheets in 2 years. But we can't justify building web apps for 300 less critical spreadsheets. Can you help?”*
- ➍ EASA Sheets (included in EASA 6.0)
 - ➎ Easy to add spreadsheet models to a controlled process - demo
 - ➏ Eliminates “Save As” version proliferation, captures models and data
 - ➐ For larger companies, can be incorporated into a larger SDM strategy
 - ➑ For smaller companies, can be the first step towards SDM





Demonstration