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MANAGING A GLOBAL IT INFRASTRUCTURE FOR CAE

Topic: Managing a Global IT Infrastructure for CAE | Presenter: Christopher Woll | Date: 11.10.2016 | Event: LS-DYNA Forum 2016 |

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AGENDA

- Company presentation
- Challenge
- Solution stack
- Business example and cost analysis
- Conclusion and outlook

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COMPANY PRESENTATION

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CORPORATE DATA

- Year of founding 1997
- Employees 65
- Sales goal 2016 5.6 Mio. EUR

- Author:
- Dipl.-Ing. (BA) Christopher Woll, M.Sc.
- Managing Director GNS Systems GmbH

LOCATIONS

- Braunschweig
- Flörsheim
- Munich
- Sindelfingen
- Wolfsburg

- Pune
- Prague
- Melbourne
- Shanghai

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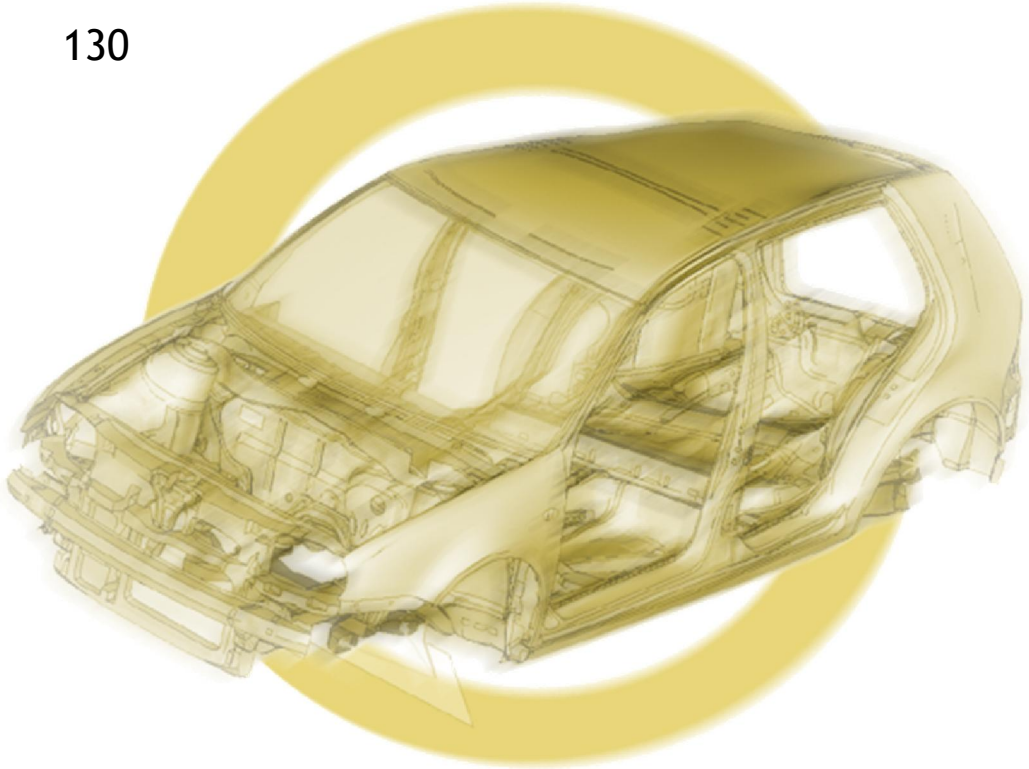
GNS MBH CORPORATE DATA

- Year of founding 1994
- Employees 130



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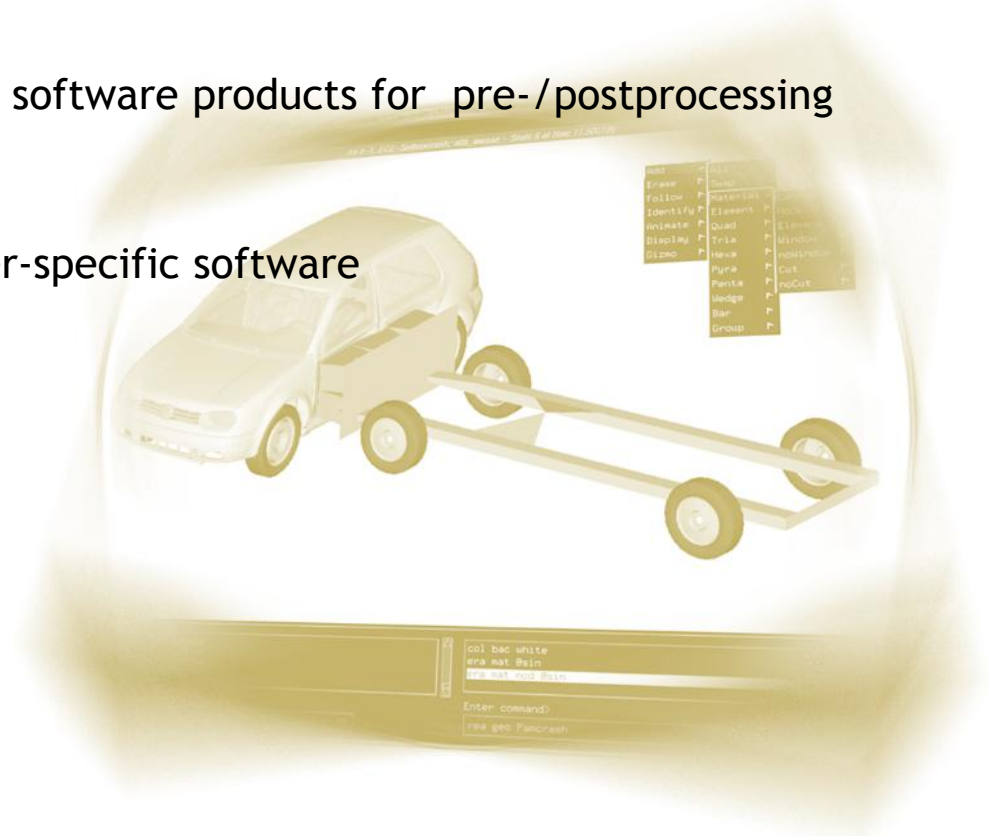
GNS MBH SERVICE PORTFOLIO

- Simulation and analysis for product development
- Development and sale of software products for pre-/postprocessing and analysis
- Development of customer-specific software
- Consulting



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SERVICE PORTFOLIO

- Systems and applications infrastructures
  - Linux/Windows systems management
  - High-performance computing
  - Technical data management
  - Software development
  - Application management
  - Outsourcing

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CUSTOMER EXCERPT

- Automobile Manufacturers
  - Audi
  - Autoeuropa
  - BMW
  - Daimler
  - Hyundai
  - Porsche
  - Seat
  - Skoda
  - Volkswagen
  - Volkswagen do Brasil
- Suppliers
  - Autoliv
  - Faurecia
  - HBPO
  - Knorr-Bremse
  - TRW
- Aerospace Companies
  - Airbus Group
- Engineering Services Companies
  - IAV
  - TECOSIM
  - GNS
  - Bertrandt, EDAG, Italdesign, Semcon, Volke (indirectly)
- Hardware Vendors
  - Dell
  - HP
  - NEC
- Software Vendors
  - Altair
  - MSC.Software

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CHALLENGE

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CHALLENGE FOR GLOBAL CAE ENVIRONMENTS

- IT should support business processes as good as possible
- Costs should remain stable or decrease, while quality should increase
- Challenge for CAE IT at automotive suppliers and OEMs
  - > 100 engineers worldwide
  - 5 - 20 sites worldwide with CAE teams
  - Many workstations, HPC systems and applications to manage
  - Engineers need to collaborate around the world
  - 1-2 system administrators per site
  - Often locally designed and managed systems
- Goal:
  - Homogeneous CAE IT environment worldwide
  - Optimal support for engineering strategy and engineering processes
  - Quick response to demanding and changing CAE requirements

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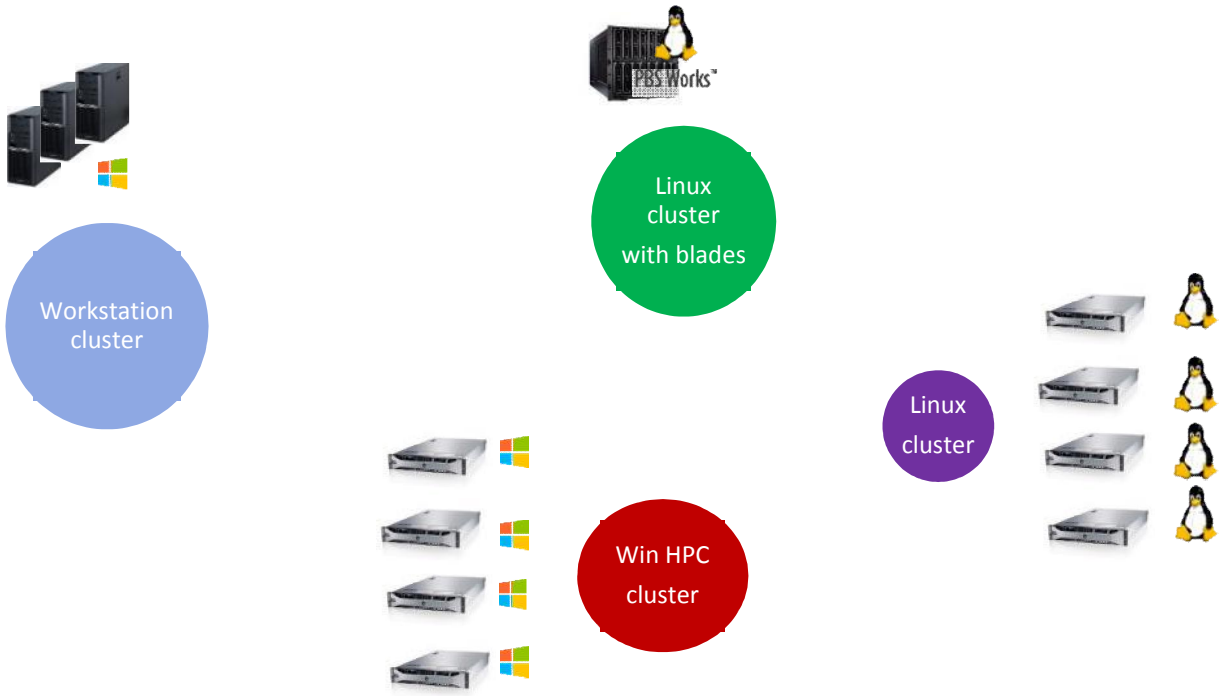
CHALLENGE FOR GLOBAL CAE ENVIRONMENTS



Challenge: Local CAE infrastructures

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SOLUTION STACK

WHAT YOU NEED

- Before you can globally manage an IT infrastructure for CAE you need to
  - have the **same or similar hardware**
  - have the **same operating system** installation and configuration
  - have the **same application** installations
  - have the **same queuing system** installation and configuration
  - have the **same job submission tool** installation and configuration
  - have the **same queuing strategies** applied
  - have the **same monitoring** tools for load and health
  - have the **same people** in one small team to operate, upgrade, and maintain the infrastructure worldwide (with local support)

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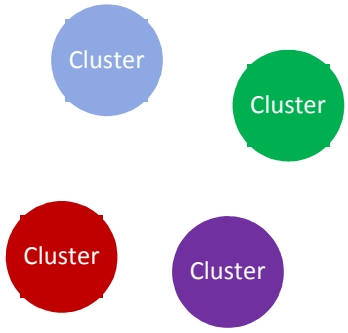
WHAT YOU NEED, ROADMAP

For 8 areas of harmonization, we need

8 steps towards the gloabal infrastructure

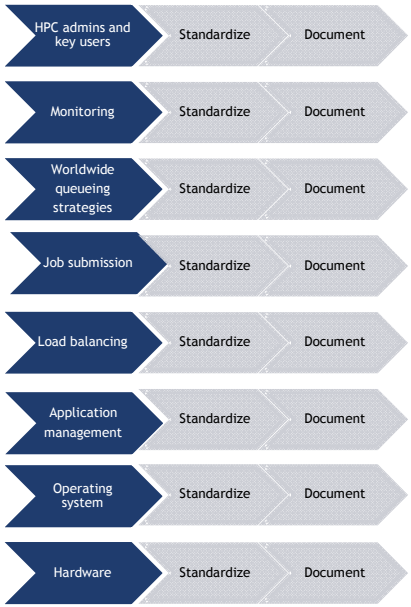
to have the same cluster everywhere

Current state



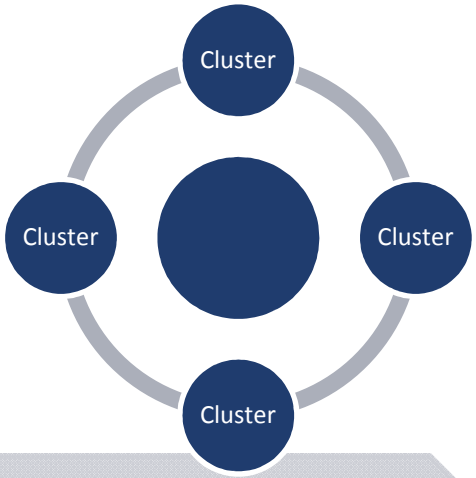
Local CAE infrastructures

Migration



Harmonization

Future



Operate globally

Global standard

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TECHNICAL SOLUTION STACK

Monitoring	• Ganglia, Nagios, …
Job control	• JGen, EnginFrame, PBS ComputeManager etc.
Applications	• LS-Dyna, Abaqus, etc
Middleware	• PBS Pro, LSF, Grid Engine, SLURM, Adaptive, … • MPI
Operating system & systems Management	• Red Hat Linux, SuSE Linux, Windows HPC, • Puppet, Bright, Install server
Hardware	• Dell, HP, Nec, Fujitsu, Lenovo, Transtec, Megware, ….

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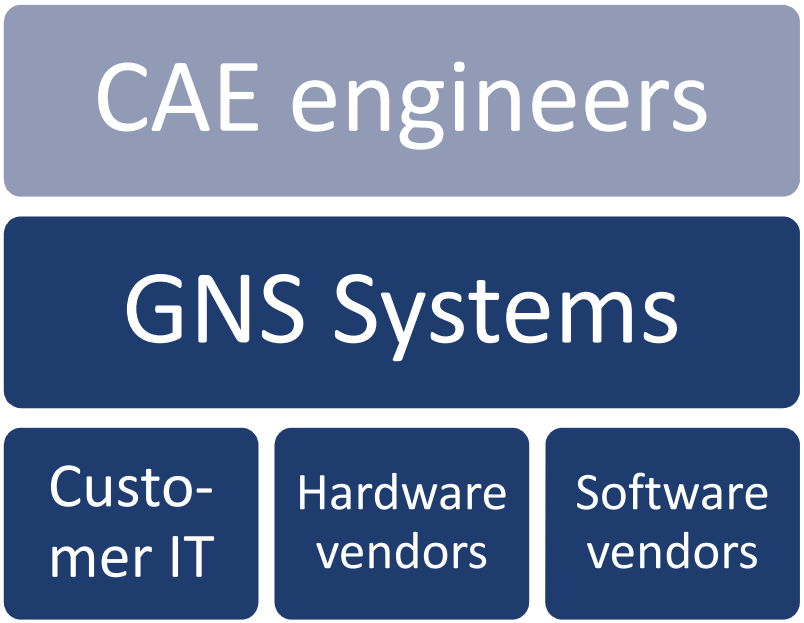
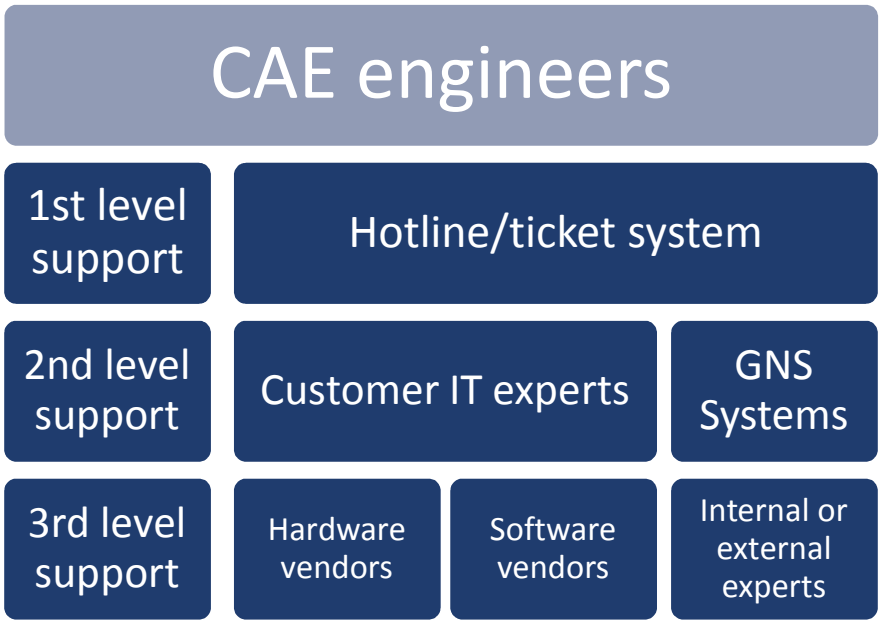
OPERATIONAL MODELS





Operational model 1: Outsourcing
GNS Systems is responsible for CAE IT

Operational model 2:
GNS Systems is integrated in customer IT support organization

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BUSINESS EXAMPLE AND COST ANALYSIS

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BUSINESS EXAMPLE AUTOMOTIVE SUPPLIER

- Business example
  - ~ 100 CAE engineers
  - 5 sites (Western Europe, Eastern Europe, US, China)
  - ~ 150 compute server, 2,600 CPU cores
- Initially 4 completely independently designed and managed HPC systems

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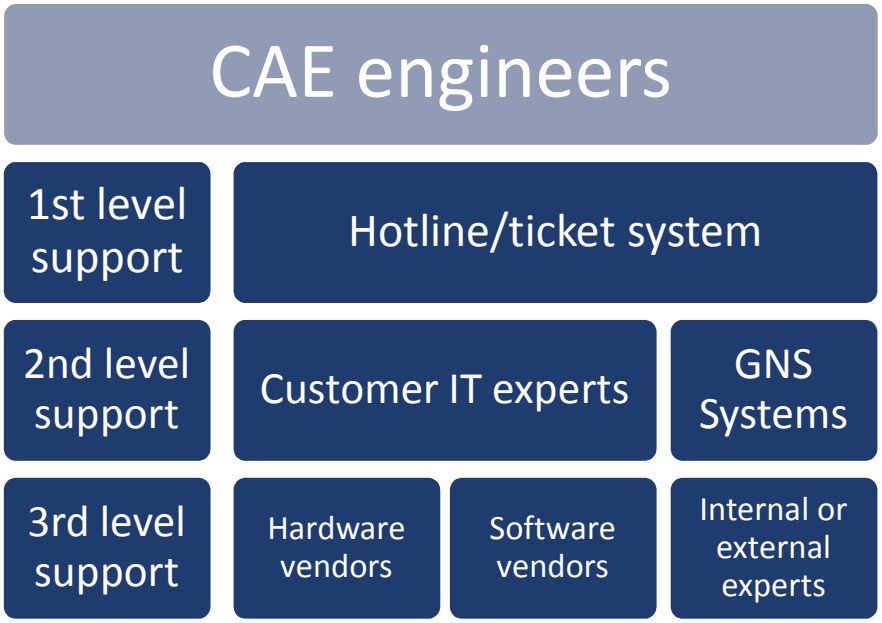
BUSINESS EXAMPLE TECHNICAL SOLUTION STACK

Monitoring	• Ganglia & Nagios
Job control	• JGen by GNS Systems
Applications	• LS-Dyna, Abaqus, Ansys etc.
Middleware	• Altair PBSPro • Intel & Platform MPI
Operating system & systems Management	• Red Hat Enterprise Linux • Own install server
Hardware	• Dell server

BUSINESS EXAMPLE OPERATIONAL MODEL



- GNS Systems is largely responsible for CAE IT
- Requests/changes have to be submitted to customer IT ticket systems
- Key users are dedicated contact for GNS Systems
- GNS Systems solves issues or coordinates solution with internal and external partners

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BUSINESS EXAMPLE PROJECT PLANNING

Month 1-6

- Project kick-off and consulting project:
  - Triggered by: Changed business strategy
- Result:
  - Short strategy document
  - New hardware and operating system unified

Month 7-12

- IT strategy project
- Result:
  - Detailed planning of
    - Technology stack
    - Support organization
    - Budget

Month 13 – 18

- Implementation of solution stack:
  - Global systems
  - Migration of sites
  - Transfer to support

Month 19 and onwards

- Support
- Continouus improvement

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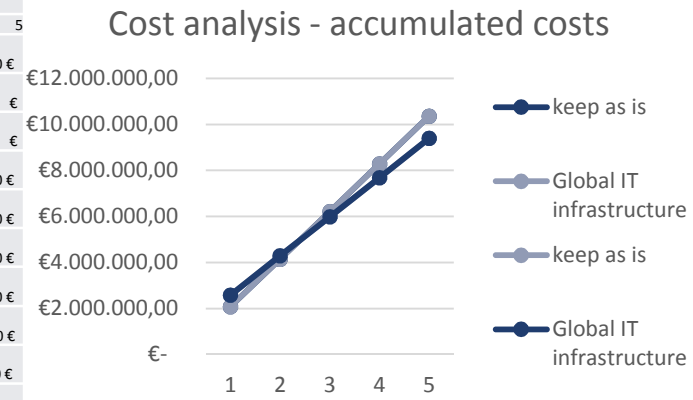
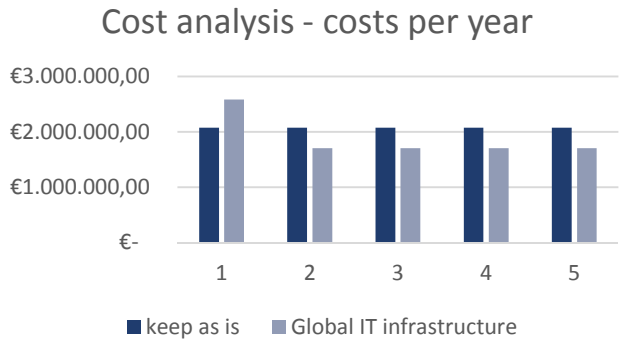
BUSINESS EXAMPLE COST ANALYSIS

	YEAR					
	0	1	2	3	4	5
Support costs	120.000,00 €	120.000,00 €	90.000,00 €	90.000,00 €	90.000,00 €	90.000,00 €
Project costs	- €	300.000,00 €	- €	- €	- €	- €
Monitoring	- €	- €	- €	- €	- €	- €
Job control	57.600,00 €	57.600,00 €	46.080,00 €	46.080,00 €	46.080,00 €	46.080,00 €
Applications installation	57.600,00 €	54.720,00 €	27.360,00 €	27.360,00 €	27.360,00 €	27.360,00 €
Middleware	12.500,00 €	25.000,00 €	25.000,00 €	25.000,00 €	25.000,00 €	25.000,00 €
Operating system & systems management	25.000,00 €	25.000,00 €	25.000,00 €	25.000,00 €	25.000,00 €	25.000,00 €
Hardware	200.000,00 €	300.000,00 €	200.000,00 €	200.000,00 €	200.000,00 €	200.000,00 €
Efficiency win business	- €	100.000,00 €	- 150.000,00 €	- 150.000,00 €	- 150.000,00 €	- 150.000,00 €
License costs	1.600.000,00 €	1.600.000,00 €	1.440.000,00 €	1.440.000,00 €	1.440.000,00 €	1.440.000,00 €
Sum	2.072.700,00 €	2.582.320,00 €	1.703.440,00 €	1.703.440,00 €	1.703.440,00 €	1.703.440,00 €

	0	1	2	3	4	5
Support costs	120.000,00 €	120.000,00 €	120.000,00 €	120.000,00 €	120.000,00 €	120.000,00 €
Project costs	- €	- €	- €	- €	- €	- €
Monitoring	- €	- €	- €	- €	- €	- €
Job control	57.600,00 €	57.600,00 €	57.600,00 €	57.600,00 €	57.600,00 €	57.600,00 €
Applications installation	57.600,00 €	57.600,00 €	57.600,00 €	57.600,00 €	57.600,00 €	57.600,00 €
Middleware	12.500,00 €	12.500,00 €	12.500,00 €	12.500,00 €	12.500,00 €	12.500,00 €
Operating system & systems management	25.000,00 €	25.000,00 €	25.000,00 €	25.000,00 €	25.000,00 €	25.000,00 €
Hardware	200.000,00 €	200.000,00 €	200.000,00 €	200.000,00 €	200.000,00 €	200.000,00 €
Efficiency win business	- €	- €	- €	- €	- €	- €
License costs	1.600.000,00 €	1.600.000,00 €	1.600.000,00 €	1.600.000,00 €	1.600.000,00 €	1.600.000,00 €
Sum	2.072.700,00 €	2.072.700,00 €	2.072.700,00 €	2.072.700,00 €	2.072.700,00 €	2.072.700,00 €





Invest	509,620 €
Yearly savings	18%
ROI	after 1.4 years

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CONCLUSION & OUTLOOK

CONCLUSION & OUTLOOK

- CONCLUSION
  - IT infrastructures for CAE are complex
  - However, it is possible to find global standards while respecting local requirements
  - Standardization leads to the following positive effects:
    - Global management is possible with few experienced administrators and local field support
    - Cost savings through optimal utilization of licenses and hardware
    - Engineering teams focus on engineering and collaborate globally
  - Return on investement can be reached in 1.5 years

CONCLUSION & OUTLOOK

- OUTLOOK
  - New infrastructure technologies will be applied broadly to CAE
    - Centralization and virtual desktops
    - Remote data centers
    - Utilization of cloud technologies

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GNS SYSTEMS SAYS „THANK YOU“ FOR YOUR ATTENTION! HOW CAN WE SUPPORT YOU ?

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