



bertrandt SAS – Engineering activities

Company overview

September 2021

bertrandt at a glance - One of the strongest engineering supplier in Europe



1974
Founded



~12,000
Employees
France : ~1,000



~50
Sites
France : 3

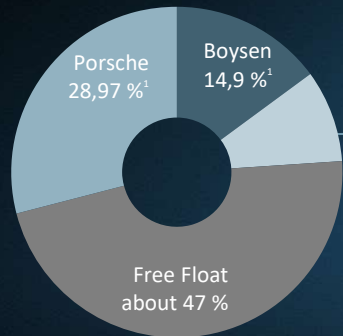


>900
€ m Revenue
France : >100



>40
% Equity ratio

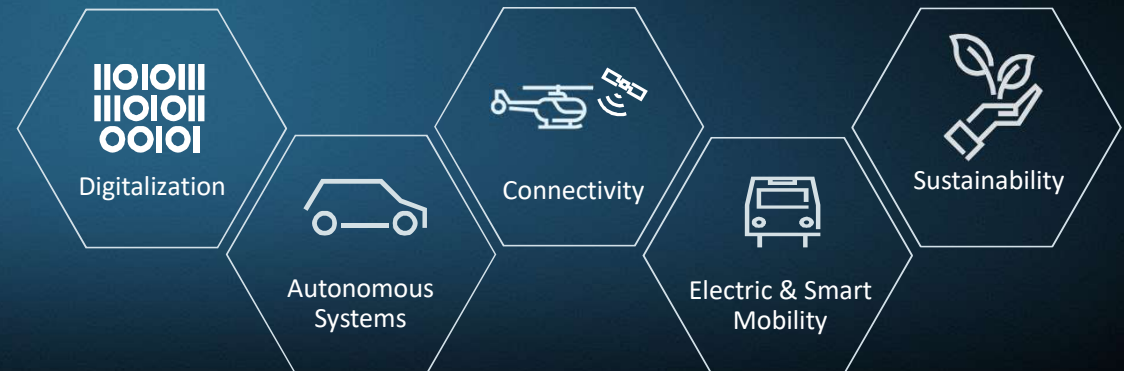
CURRENT SHAREHOLDERS



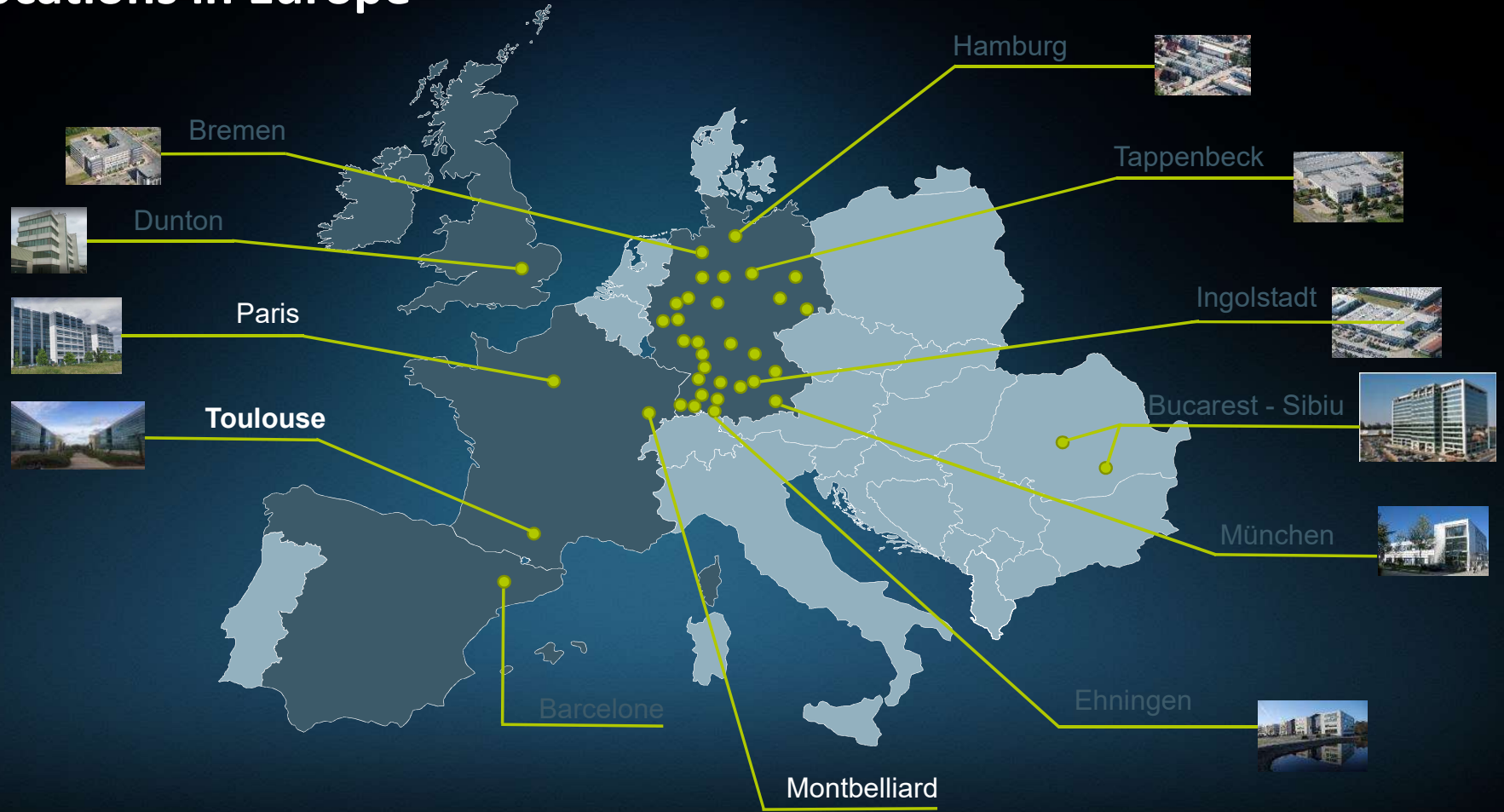
Management/
employee
shareholdings
about 9 %

¹All data is based on disclosures made to the company pursuant to Section 21 et. Seq. WpHG. As of 1. June 2016

PRESENT & OUTLOOK: 5 MEGATRENDS



bertrandt locations in Europe



FR

1,000 FTE
3 locations

- Renault/PSA
- Siemens Mobility
- Airbus DS
- Continental
- Safran

bertrandt Best cost country capacity

Capacity & flexibility in BCC

None exhaustive capacity

- Software development
- Mechanical design
- Testing
- Prototyping
- Etc...

bertrandt endorsed quality

- A key people for each project
- Ability to answer to the specific questions and needs
- Driven quality and customer satisfaction



Romania

Sibiu

Bucharest



China

Changchun

Shanghai



India

Bengaluru
(Partnership)

bertrandt Academy

A technical and technological community in charge of knowledge capitalization

A training school capable of responding to the need for support: structure that guarantees knowledge management and dissemination of our corporate culture > A technical and technological community in charge of knowledge capitalization.



Know

Expertise

- Technical competence
- State of the art
- Job environment



Knowhow

Operational skills

- Steering & project
- Process
- Tools
- Missions and expected skills



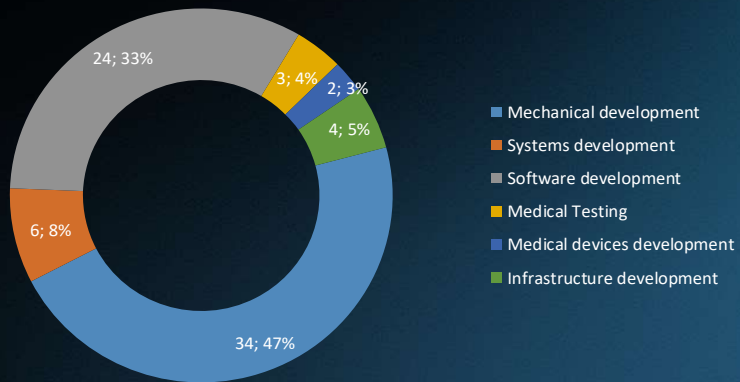
Behavior

Behavioral and inter-personal skills

- Communication and transversal animation
- Behavior and values

A multi-sector industrial know-how

Majors' partner in many industries



Automotive



Agricultural machinery



Aeronautic,
defense & space



Train



Medical



Energy

Collaboration Mode

Tailor-made service - adapted to your needs



1. Turnkey / Project package

In charge of a complete study or project with a commitment to results within a contractual deadline and budget

2. Services center or « Work packages »

With a management structure that is contractually committed to the contract deliverables. Invoicing per deliverable regardless of the resources mobilized

3. Technical Assistance (TA) & Globalization

Additional know-how intended to assist in the production, application or development of a product or technique

Quality, safety and environment



Certifications

Our management system is continually evolving and is audited annually by external certification and accreditation company

Quality management according to ISO 9001

Quality management in the field of aeronautics according to EN 9100

Environmental management according to ISO 14001

Information security according to VDA TISAX based on ISO/IEC 27001

Accreditation of testing laboratories according to ISO/IEC 17025

Quality management in the medical field according to ISO 13485

Occupational health and safety according to VBG AMS based on ISO 45001

Benefits



Customer focus and flexibility

- Focus on customer satisfaction
- Ability to take responsibility
- Long-term commitment
- Financial strength



Experts

- Technology partner
- Solution provider
- Important technical means
- Internal training school



International network

- Presence in Europe, Asia, USA
- > 50 sites worldwide
- Best Cost Country capacity

Our Objectives



1. To bring effective added value



2. To become a French major development partner in long term > part of our global strategy to become a reference supplier in railway



3. Support for innovation > focus our investments in areas that are necessary but not mandatory to your core business

Railways experiences

Integration of
rolling-stock
subsystems

Worksite supervision
Commissioning



Quality
Management

Development / validation SW
on VCU

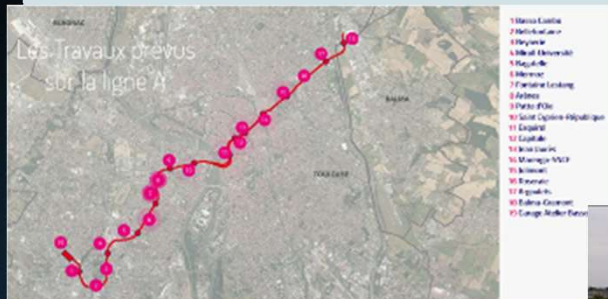
Integration of centralized
control station equipments

Railways experiences

Extension of the Metro line A Toulouse

2016-2019

- Doubling of metro trains from 26 to 52 meters
- Worksite supervision



NEOVAL Project Metro line B Rennes

2020-2021

- Véhicule automatique léger (VAL), Metro on tires, fully automatic, used for urban transport
- Software development on VCU
 - Test integration
 - Quality



NExTEO Project, Extension of the RER line E

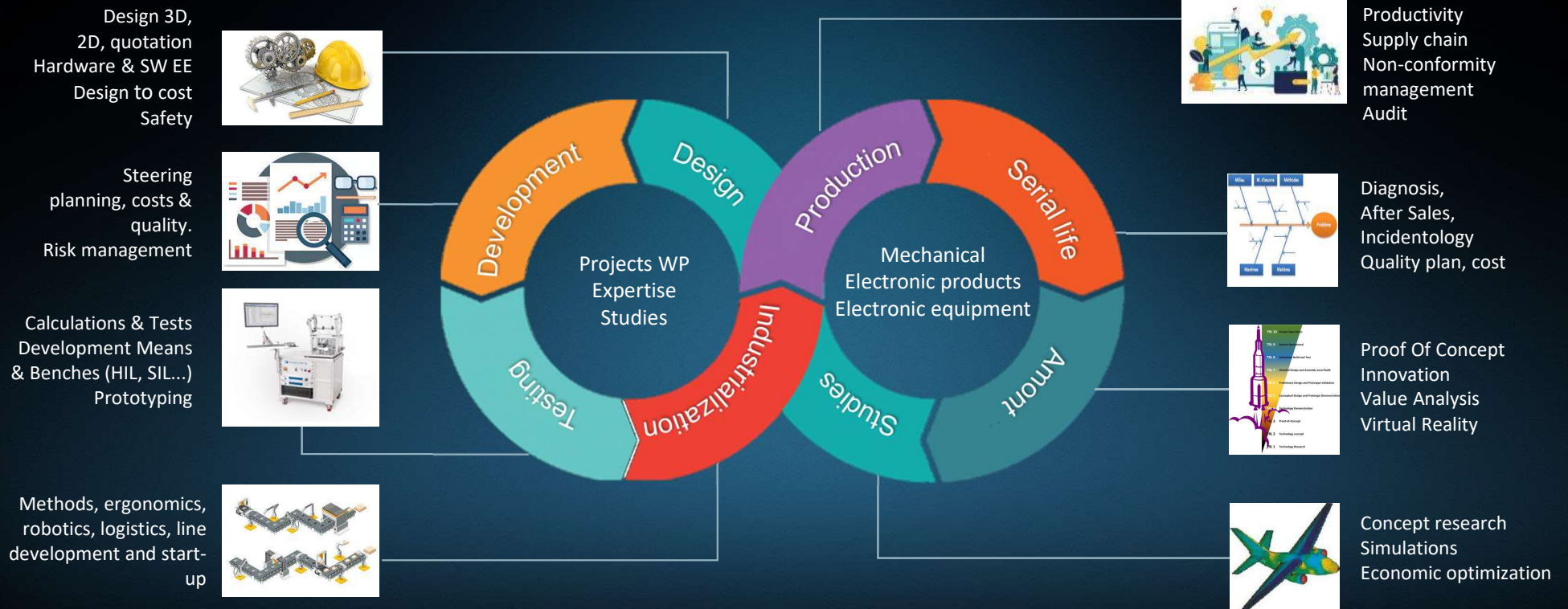
Communication Based Train Control (CBTC),

IT expertise



What we do

bertrandt designs and develops technological solutions for many industries



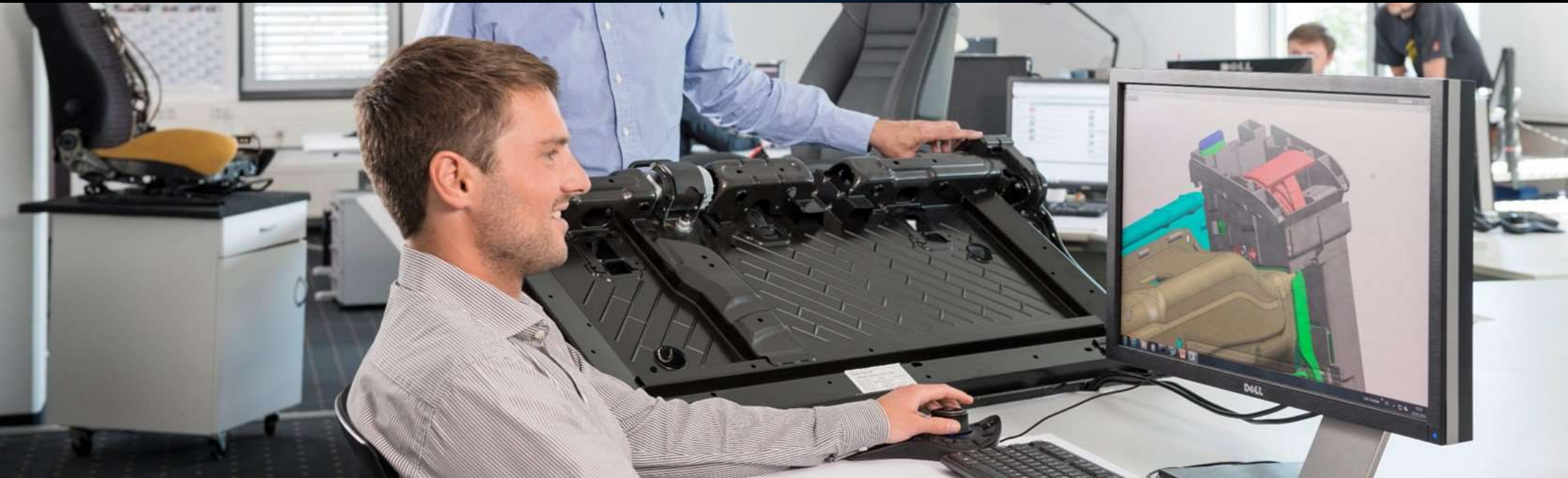
What we do - Analysis value

Through our value optimization process, we develop the best cost level VS sales optimization > the product is focused on customer expectations



Studies carried out continuously or in task force mode

What we do – Mechanical Design



Concept

- Need analysis
- Concepts research
- Solutions comparative
- Cost Optimization
- Diversity optimization

3D

- Volumes design & surfaces
- Parametric building
- Spoils analyses
- Typical sections
- Architecture robustness

Simulations

- Analytics, Statistics
- Quadratics
- Bill of materials management
- Calculations - deformations, shocks, vibrations, temperatures...

2D & Chains

- ISO rating
- Functional dimensioning
- CATIA
- Standard M026, M0267, M016

Process

- Plastics Processing
- Tools and Movements
- Shrinkage,
- Thickness management
- Perceived quality
- ...

What we do – Electrical architecture design

bertrandt is organized to cover all the band of activities to develop electrical systems from initial need to production :

- *Small-scale series*
- *Restrictions might happen for supplying some specific connectors*

1 - Pre-Architecture & Concept

2 – Modularity, Variants

3 - Electrical Studies and sizing

4 – Components Choosing

5 - 3D Integration

6 - 2D Plans & BOM

7 - RFQ Management

8 - Cost synthesis



9 – Prototyping

10 - Suppliers Management

11 - Automatic Test bench development

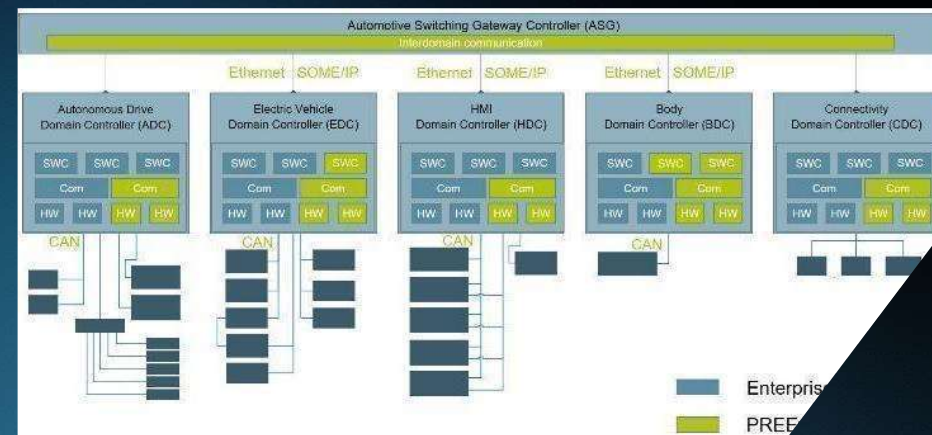
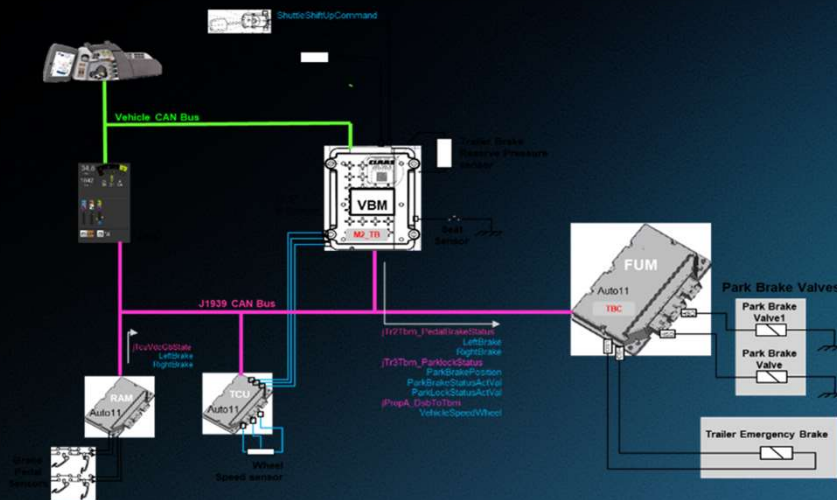
12 – Testing

13 - Quality Analyses

15 – Benchmark

16 - Failure analysis / Flying doctors

What we do – Electrical architecture design



1 - Pre-Architecture, Concept & functional allocation

2 – Modularity, Variants

3 – Network sizing

4 – Components Specification

5 - RFQ Management

6 - Cost & risks synthesis

7 – Prototyping

8 - Suppliers Management

9 - Automatic Test bench development

10 – Testing

11 – Benchmark

12 - Failure analysis

What we do – Software development

Cross-cutting competencies such as process and functional knowledge as well as methodological know-how and a continuous tool chain strengthen the five content pillars for convincing results.

Embedded Software



Application Software



App & Web



IT-Solutions

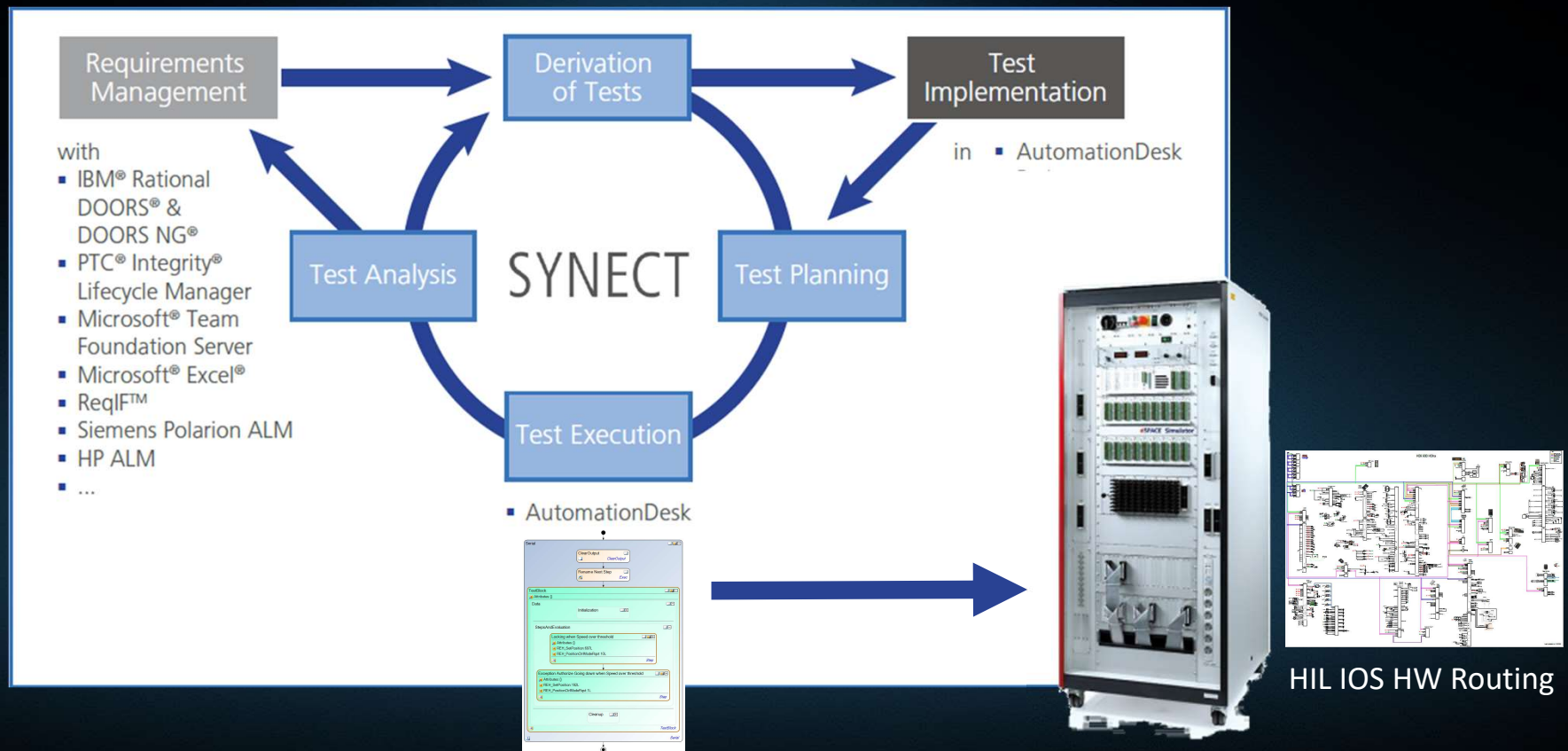


Data Science



What we do – Focus Software testing

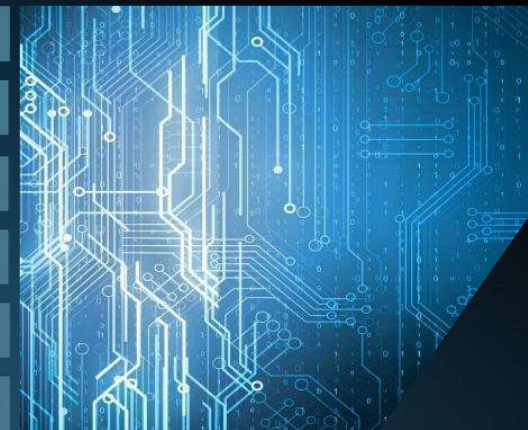
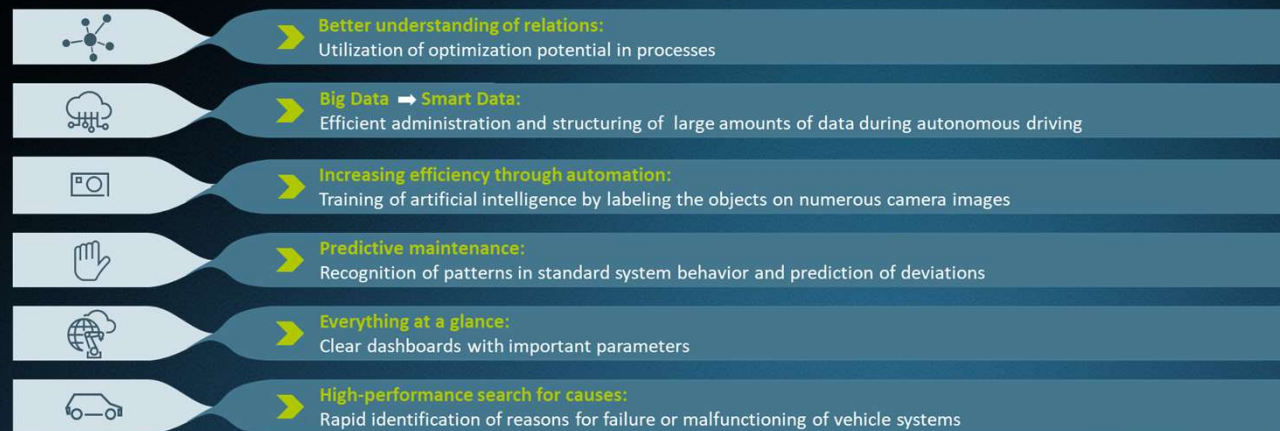
bertrandt is organized to manage testing from HIL test bench development to operational tests



What we do – Embedded Software development

Data science: from acquisition to Intelligence

We generate knowledge from data : interaction between mathematics, computer science and our engineering competency solves your big data challenges >



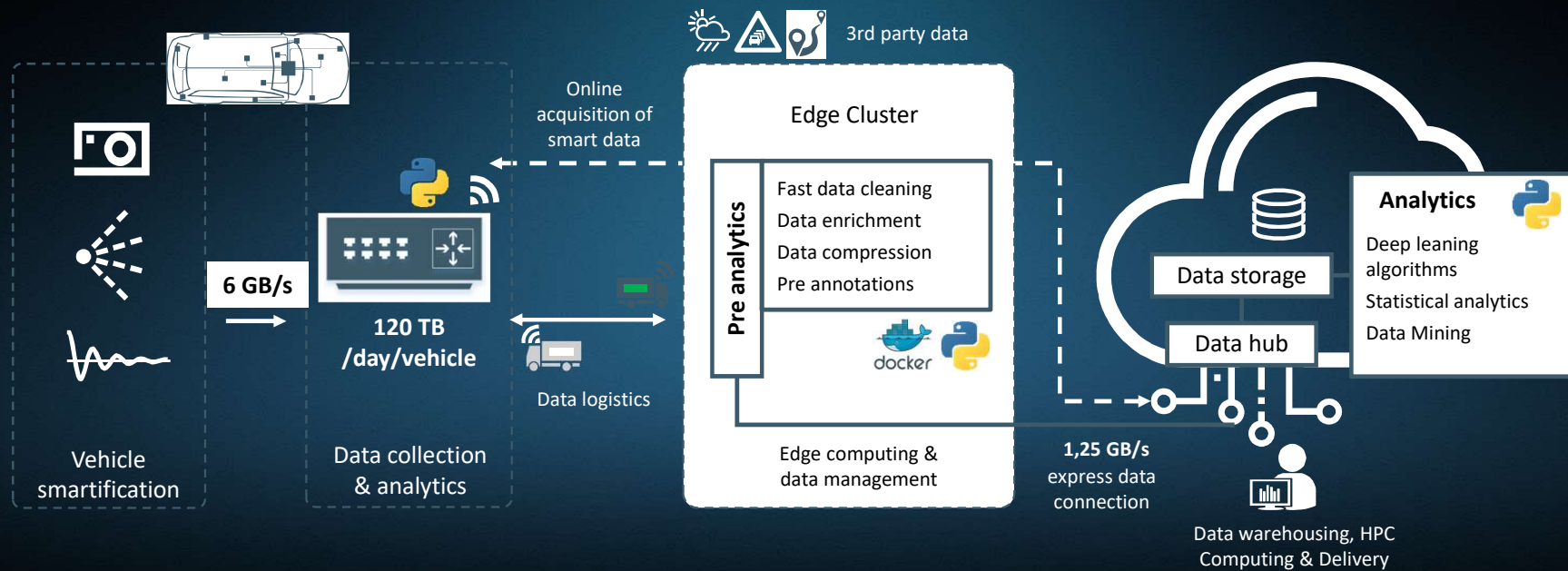
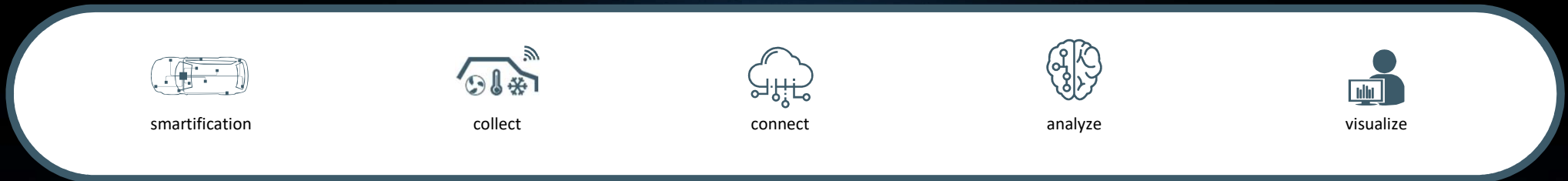
Data insight & data consulting: to identify potential and to create additional values

Data planning: to integrate our best practices into your data acquisition

Data creativity: to shape used cases of tomorrow

Data visualization: for a fast overview of your data

What we do – Data science: from acquisition to intelligence



What we do – IT Solutions



We develop **customized solutions** using modern **cloud technologies** or classic on premise solutions:

- Individual software
- IaaS – Infrastructure as a Service incl. CI/CD-Pipeline
- IaC – Infrastructure as Code
- PaaS – Platform as a Service
- Data analysis and AI
- Operation, 2nd Level Support & 3rd Level Support

Individual methodology for your requirements.



- Classical procedure models
- Agile procedure models
- DevOps Methodology

bertrandt means of testing

>100 000 m2 of Workshop

Batteries tests benches



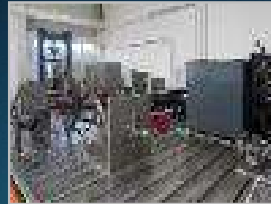
Acoustic chambers (4)



Mechanical robot (>10)



Banc HIL (>30)



Rolling laboratory (1)



Bundle laboratory (1)



Saddlery (2)



Anechoic chamber



Shaker (>30)



Hexapod (2)



Sunshine IR (>100)



Data acquisition



EMC



Autonomous platform



Chassis dynamometer



Climatic chamber (>180)



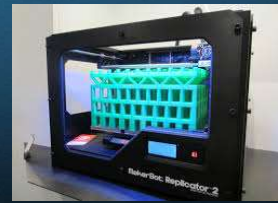
Pulse Hydro bench



Catapult



3D printers



Shocks (>20)



AI Drone platform



Success story

bertrandt France - turn key End 2 End development for high value / small series product



Customer: Alpine (Group Renault)



Scope: Design & development (Les Ulis) of:

- Body and doors, underbody
- Interior equipment, exterior equipment
- Lighting and signaling equipment
- Electronic equipment
- Engine peripherals
- Industrialization Planning



Responsibility: Full firm fixed price / turnkey



Volume: 100 FTE
Duration: 4 years



Tools: Catia; OEM PLM-Software (derived from Dassault Enovia; predecessor of 3DX), Mathsub



Roles for bertrandt (nomenclature OEM): Management of painting and sealing process; design of architecture, minimum cutouts; management of geometry convergence; digital and physical validations; project management, teambuilding management part suppliers; industrialization (Dieppe), tooling, semi automatic manufacturing; significant cost / time savings due to integrated dev. / industrialization; innovative materials and bonding (aluminum, gluing / riveting)



Cross functional focus – Airbus nomenclature

bertrandt acting as key player for **E**ngineering, **M**anufacturing **E**ngineering and in service **S**upport



Success story

ADAS continuous development



Customer: Automotive car manufacturer



Scope: Series support and continuous development for Advanced Driver Assistance Systems (ADAS); Service Packs (SP) 2013, 2015, 2018:

- Responsible for 87 functions
- Roll-out Service Pack 2018 > 30 Versions/16 PU's



Responsibility: Full firm fixed price / turnkey



Volume: Project start: 105 FTE, Project end: 60 FTE
Duration: 2019 – 2022, optional extension until 2024



Tools: FSEP; C/C++, Doors; Codify; Python, Canape; HIL-Tools; GIT / Jira; Matlab / Simulink; MBSD (Model Based Software Development); A-spice conformity; Agile development methods



Roles for bertrandt (nomenclature OEM): Cluster manager, Test manager, function developer (elements and chains), software developer, test supervisor, coordinator standard modules, module supervisor, functional safety manager, problem manager



Cross functional focus – Airbus nomenclature

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Success story

Industrialization



Customer: PSA / Group Stellantis



Scope: Bertrandt France has been working with PSA since 2010:

- Support in developing integration processes for assembly lines
- Expansion into full development of assembly lines
- Expert partnership for engineering, manufacturing and support
- Cross-functional tasks including simulation and digitization



Responsibility: Full firm fixed price / turnkey



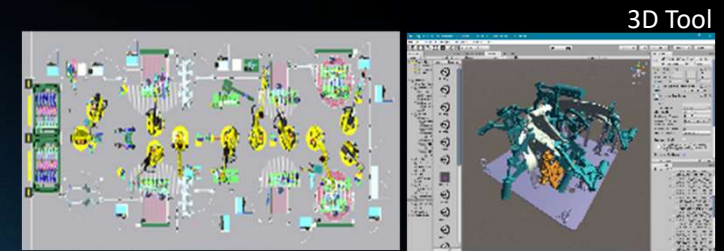
Volume: Constantly above 60 FTE on an expert level since start of cooperation in 2010



Tools: 3D simulation tools; robotic programming software; Matlab / Simulink; C/C++; Doors; Link into ERP systems; learning tools; CAD/PLM



Roles for Bertrandt (nomenclature OEM): Project supervision; construction/modeling; installation; manufacturing automation; robotics; production ramp-up while maintaining unit conformity; metrology (tracing and control); equipment installation (currently pool of 54 robots)



3D Tool



Robotics and Automation

Ramp-up



Cross functional focus – Airbus nomenclature

bertrandt acting as key player for **E**ngineering, **M**anufacturing **E**ngineering and in service **S**upport

Success story

Experience in Hydrogen Technology



Dedicated Unit for Powertrain Solutions in Place

- ✓ > 5 years of experience for H₂ based powertrain solutions including hybrid applications
- ✓ Experts for H₂ system & component development in place
- ✓ Internal & external system & component benchmarks & feasibility studies performed



Extract of H₂ related development activities:

- ✓ Complete vehicle “e-APE H₂” internally developed; e-propulsion system with H₂ range extender
- ✓ Development of carbon fiber high pressure storage (700 bar), handling system & components
- ✓ Construction of carbon fiber light weight high pressure tanks and components
- ✓ Development of H₂ lab test equipment & test facility design
- ✓ Strategic cooperation established for H₂ test facilities: ET, TesTneT and TÜV Süd
- ✓ Package impact analyses, system design benchmarks and integration
- ✓ Crash simulations
- ✓ Fuel cell stack & electrolysis process development & simulations
- ✓ Application of storage system control units



- ✓ Development of H₂ lab test equipment & test facility design
- ✓ Strategic cooperation established for H₂ test facilities: ET, TesTneT and TÜV Süd
- ✓ Package impact analyses, system design benchmarks and integration



- ✓ Crash simulations
- ✓ Fuel cell stack & electrolysis process development & simulations
- ✓ Application of storage system control units



Fit For Future in H₂ applications:

- ✓ Our own internal employee education program in place
- ✓ bertrandt engagement towards H₂ science aerospace clusters such as Hamburg, Bremen
- ✓ Invest in POC combining H₂ with hybrid approaches



Short video: vehicle [“e-APE H₂”](#)

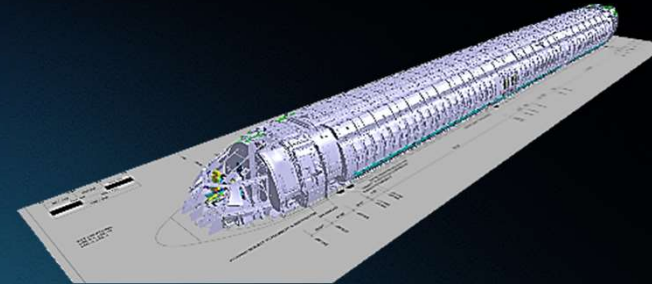
Success story

Digital transformation



1. Aerospace - Single Aisle End 2 End

- ✓ bertrandt as major realizer for eeDMU and enabler for Lean PLM / DDMS
- ✓ Early valid definition of full 3D dataset as basis for time reduction
- ✓ Realize automated customizing approaches



2. Automotive - Digital customer portal for testing and validation services

- ✓ Interactive project and time planning between bertrandt and customer via internet / cloud
- ✓ Digital-interactive inventory and test asset management, flexible and configurable
- ✓ Live monitoring of test processes, results and deadlines, AI based improvement proposals



3. bertrandt internal

- ✓ **HARRI & SALLI**
our own Innovation / technology platform
- ✓ Upskilling 300 FTE > 25 IPs



[Learn more about HARRI](#)



4. bertrandt internal

- ✓ **CLIFE**
our own Digital Twin solution for manufacturing of the future



[Learn more about CLIFE](#)

6.1. SAFe Experts (Agile)

- ✓ 10 certified Agile Coaches at group level in dedicated PM centre of competence with direct link to management board
- ✓ 250 fully trained SAFe specialists cross divisional, cross industry available → Today +200 FTE in qualification process

6.3. What CAD solutions do you use?

- ✓ bertrandt as major licence holder for all relevant CAD products → Users, experts, trainers



bertrandt is positioned for combining classical product engineering with top level digital experience

Our customers



Understanding you better to help you better

- What are your objectives when you decide to outsource ? (cost reduction, need for expertise, lack of staff, partnership...)
- What are the main qualities you expect from your engineering suppliers ?
- Who is your main engineering supplier today ? What are the main reasons for you to change supplier ?
- What are your keys criteria for choosing your suppliers ?
- Do you have a vision of your future needs (over the coming months and years) ?

Thank you for your attention

Contact: Jean-Paul Darlavoix – Key Account Manager



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