

Global Automotive Business Overview 全球汽车行业概览

Kirk Gutmann, SVP of Industries
Siemens PLM Software

Kirk Gutmann, 行业战略高级副总裁
西门子PLM Software

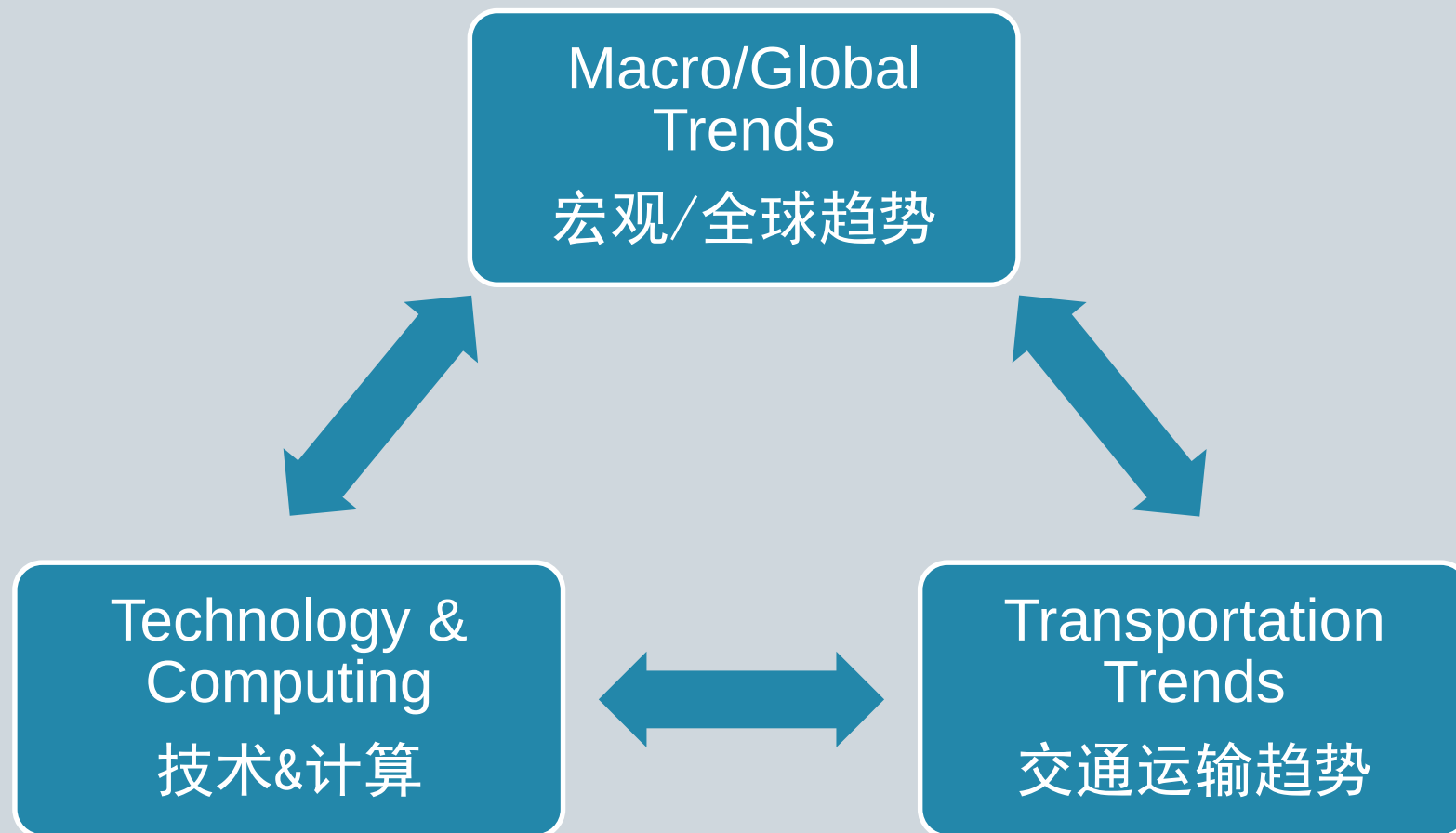


The Future of Transportation

交通运输的未来发展

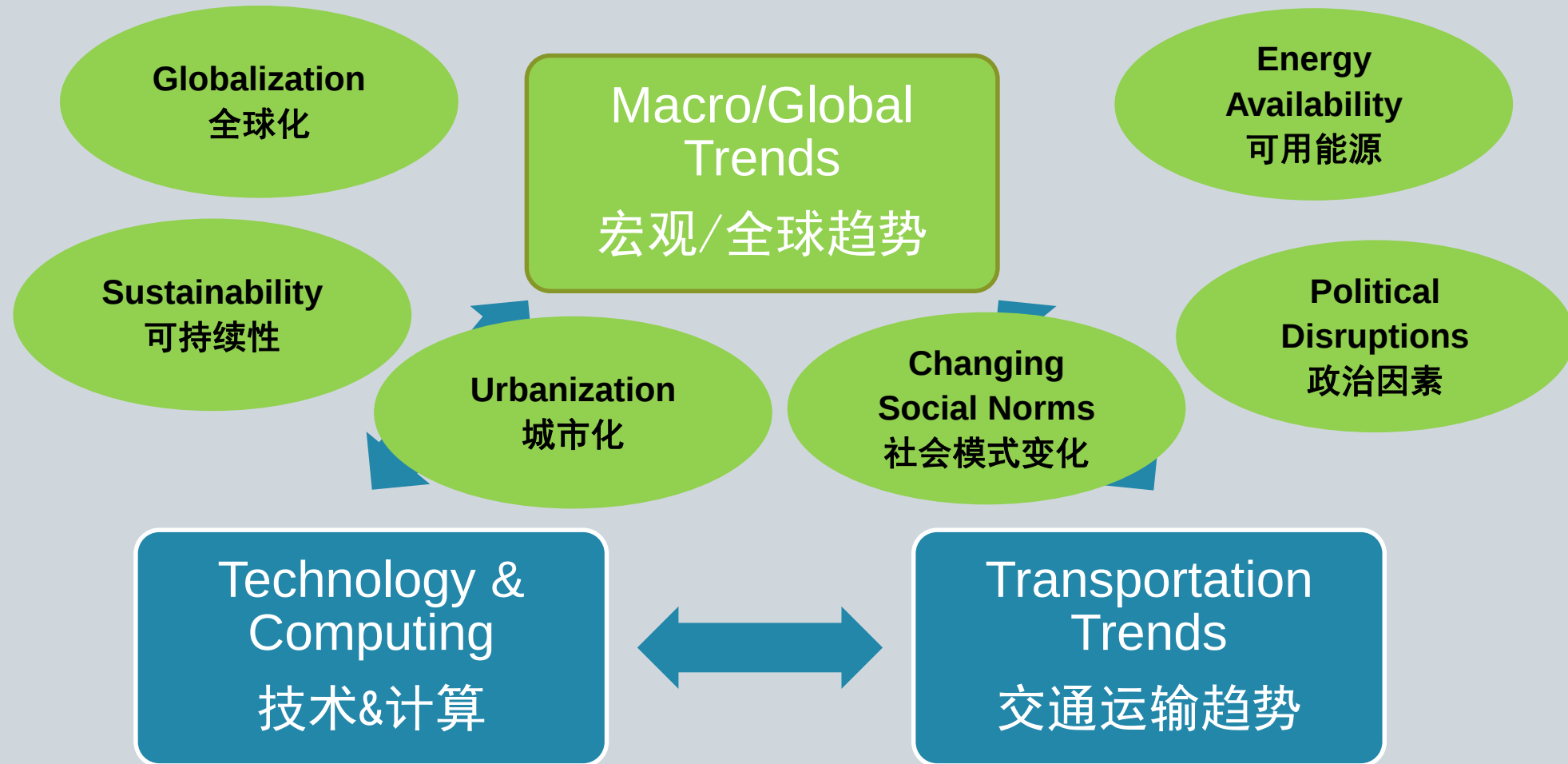
Future Trends Affect One-Another 未来趋势相互影响

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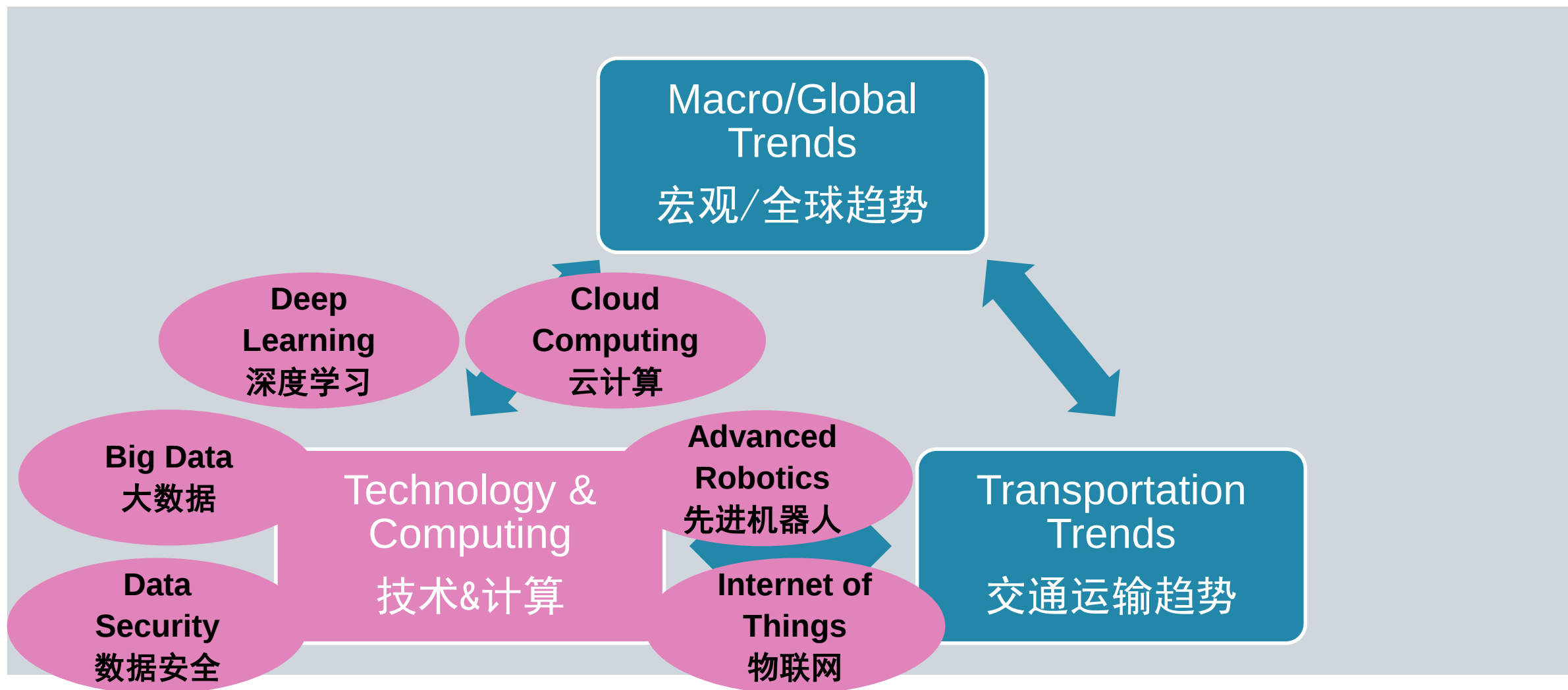
Future Trends Affect One-Another 未来趋势相互影响

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Future Trends Affect One-Another 未来趋势相互影响

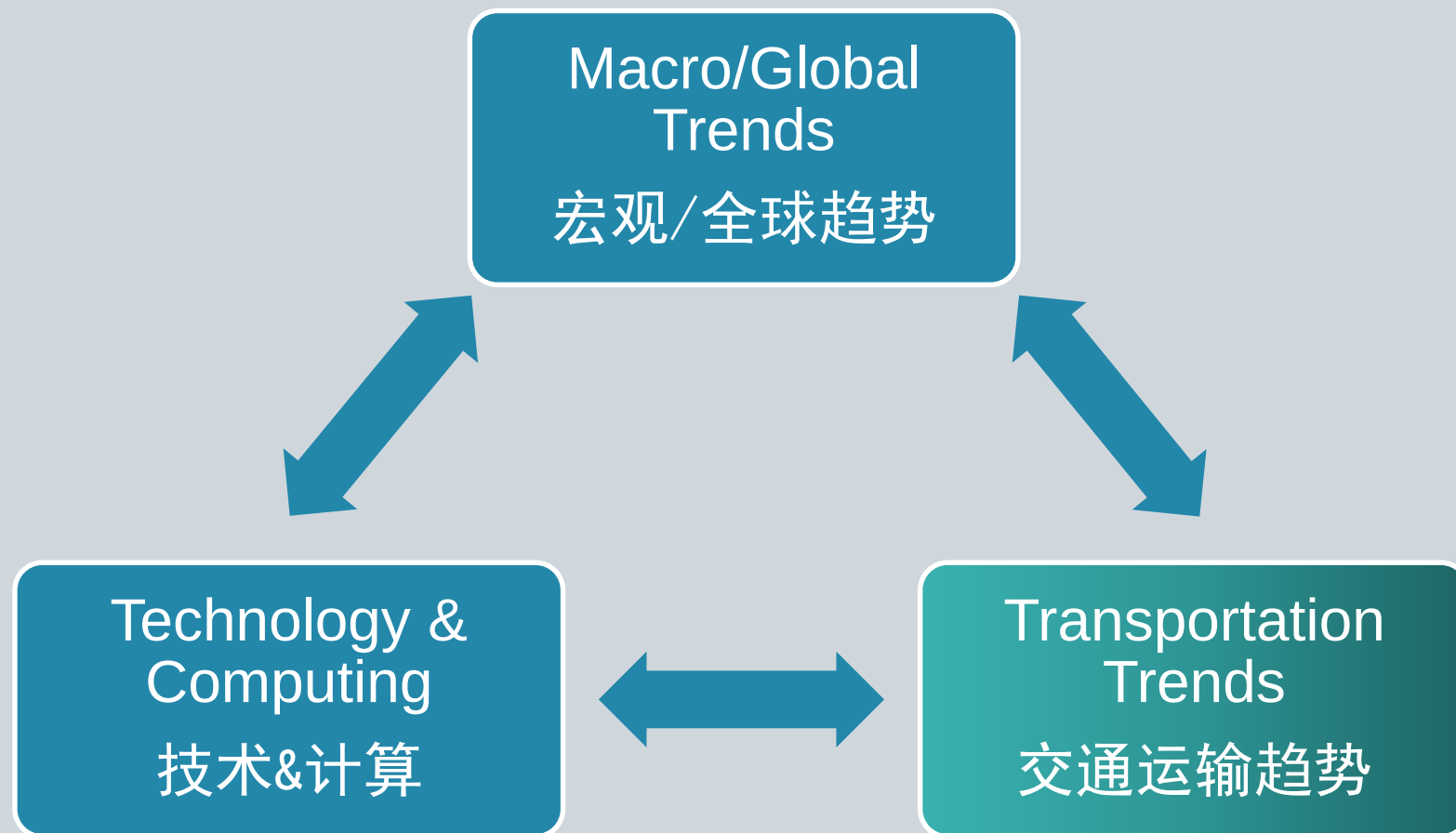
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We will Focus on Transportation Trends

我们关注于交通运输趋势

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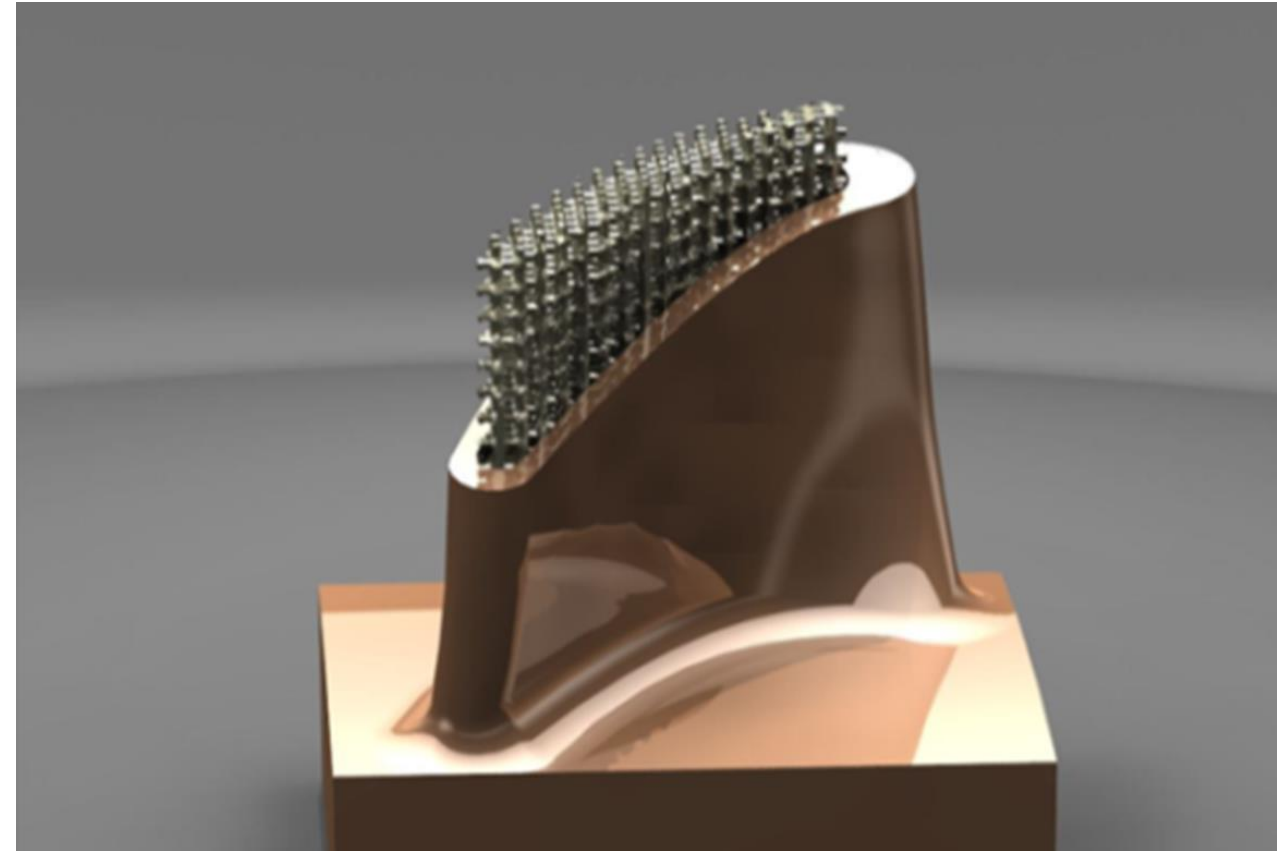
**“There’s a Revolution Underway in the
Transportation Industry.”**
“交通运输行业正处于激烈变革中”

The way vehicles are designed, built, sold, and used are changing more now than in the last 75+ years

当前汽车在设计、制造、销售和使用方面，较过去的75年改变许多

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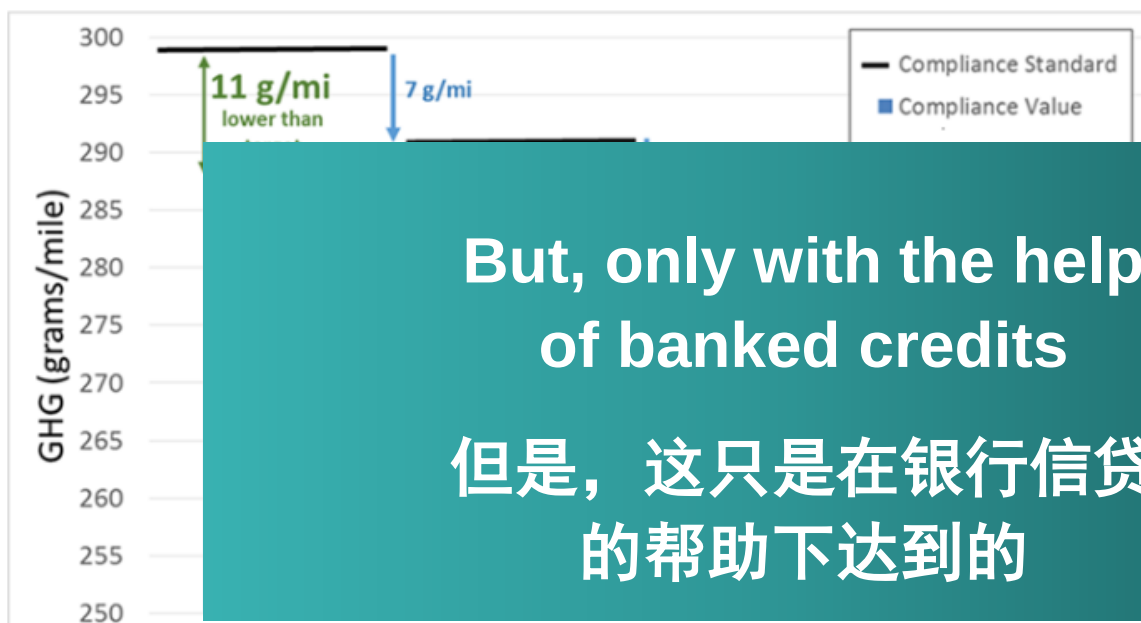
- Huge fuel economy improvements
燃油经济性的巨大改善
- Vehicle electrification
汽车电气化
- Autonomous Vehicles
自动驾驶汽车
- Infotainment and connectivity
信息系统和互联性
- Vehicle sharing (mobility)
共享汽车（出行共享）
- New manufacturing & 3D printing
制造新技术&3D打印



The Industry Has Been Meeting The GHG Requirements 汽车行业温室气体排放正在按要求逐步落实

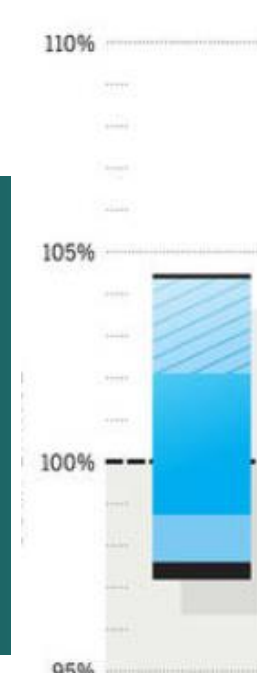
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Industry Compliance Values versus Standards in 2012-2015 Model Years



But, only with the help
of banked credits

但是，这只是在银行信贷
的帮助下达到的



— Average Tailpipe Emissions
— Flex-Fuel Vehicles
— Air-Conditioning-System Improvements
— Off-Cycle Technologies
— 2015 Model-Year Greenhouse-Gas Emissions

And, the hard part is still ahead – 40% stricter by 2025!

并且，最困难还在前面——到2025年实现更严格的40%减排要求

New Technologies Continue to Grow At An Incredible Pace

新技术以不可思议的速度在发展

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€122 billion
connected cars market
by 2021

到2021, 互联汽车市场规模为
1220亿欧元



Source: strategy&

10 million
autonomous cars by
2020. +135% CAGR

到2020, 自动驾驶汽车市场规模为
1千万辆, 复合增长率+135%



Source: BI Intelligence Estimates

200+
electric / hybrid models
in 3 years

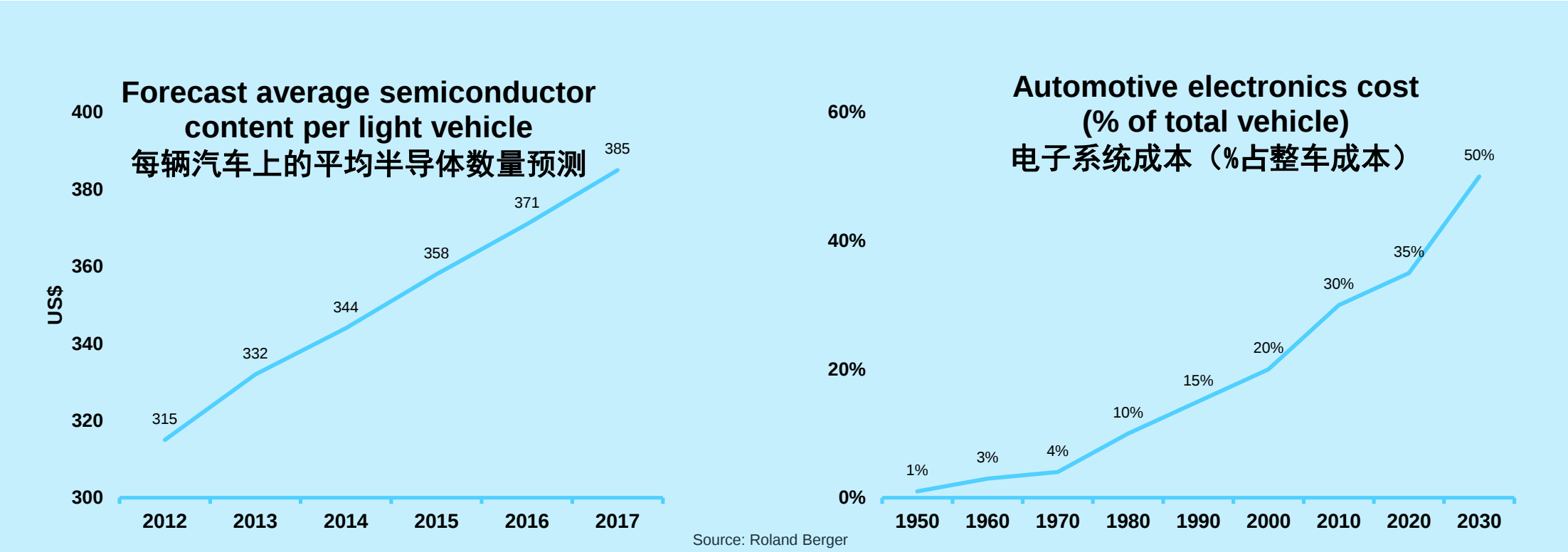
未来3年, 电动/混动汽车车型将超过



Source: McKinsey

Electronics Will Continue to Grow with Autonomous Vehicles

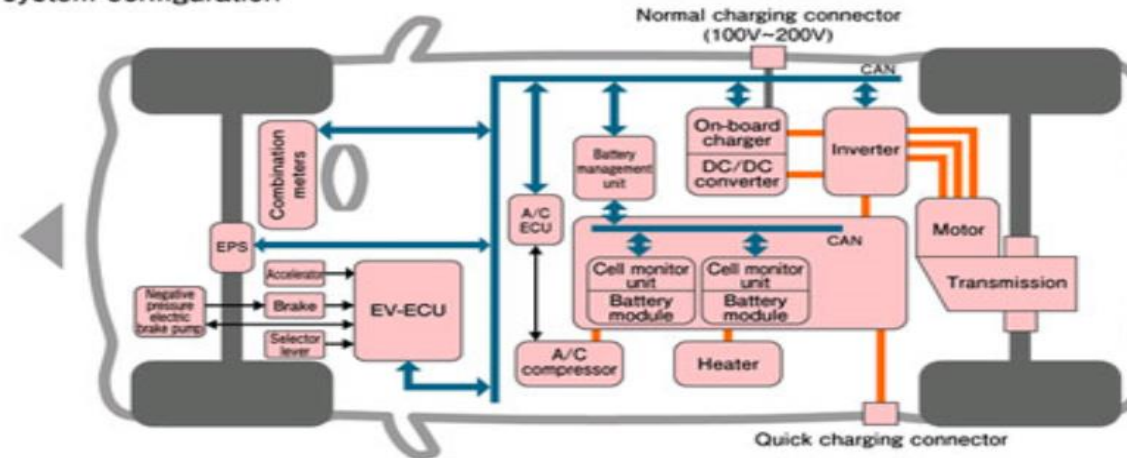
自动驾驶汽车上电子系统将继续增长



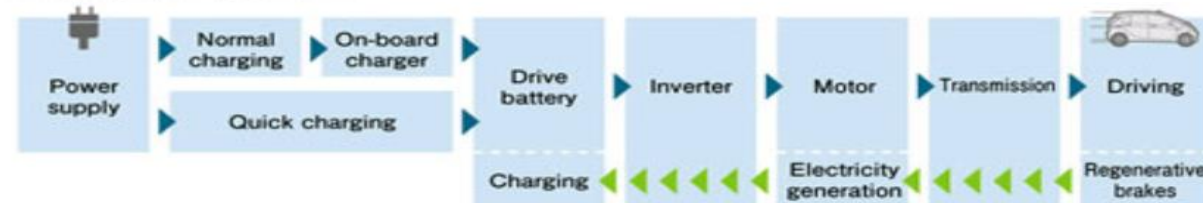
The Concept Of Powertrain Has Evolved From Stand Alone To A Complex Set of Interdependent Systems Across The Entire Vehicle

动力总成范畴从单一孤立的系统发展到跨越整车的相互内联的复杂系统

■ EV system configuration



Charging-to-driving process



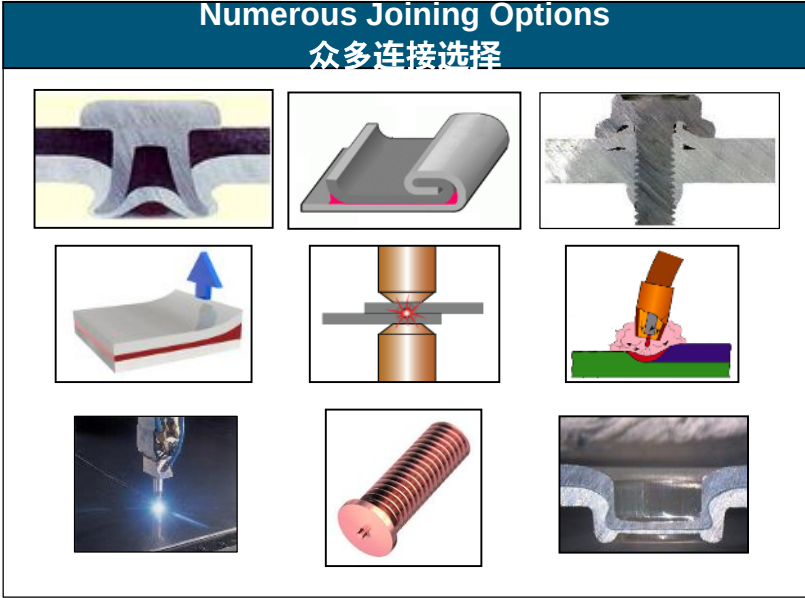
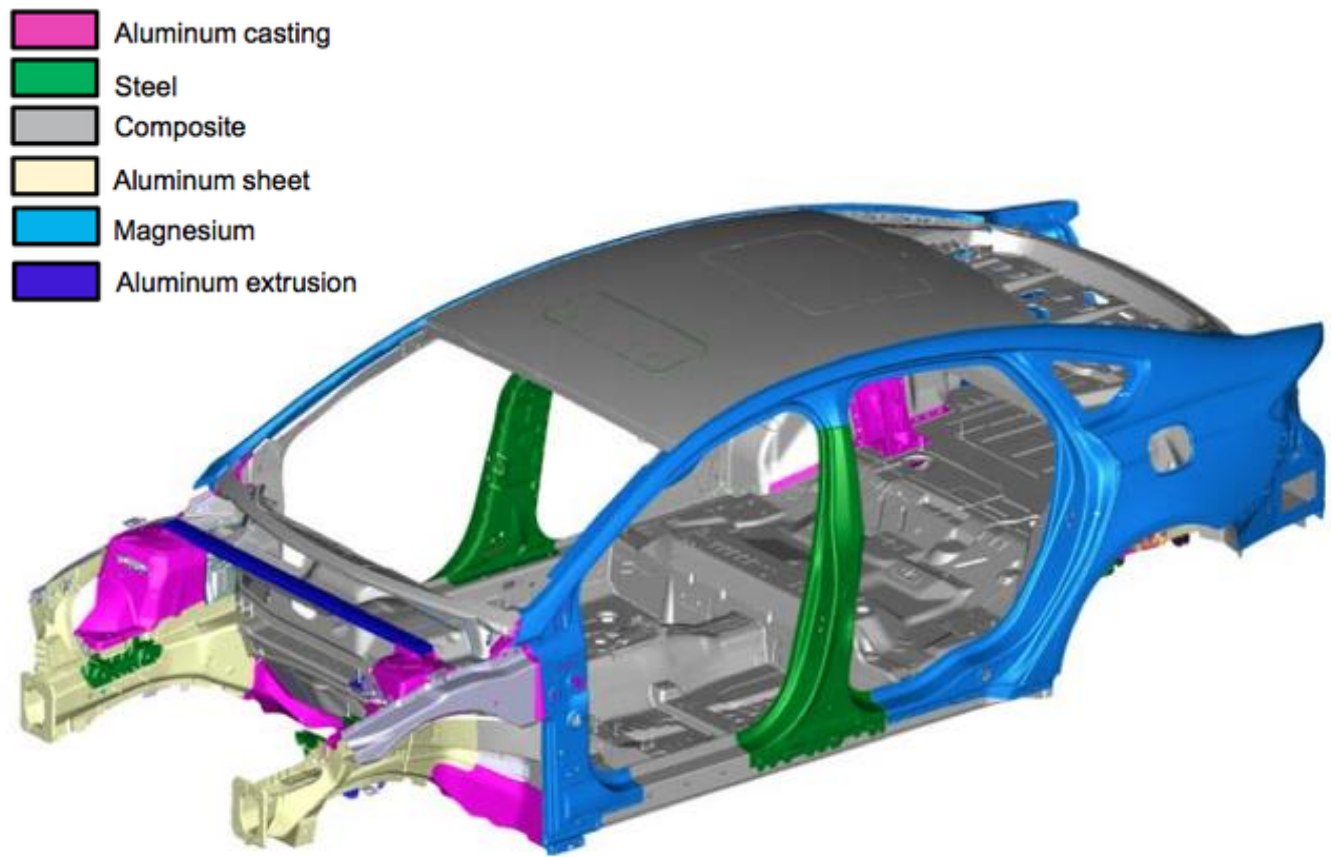
Vehicles Becoming Part of a System of Systems 汽车已成为系统之系统的一部分

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Vehicle Light-weighting Is Driving Huge Increases In Mixed Materials and Fastening Systems

汽车轻量化需求促进各种混合材料的大量使用和新连接方式的组合使用

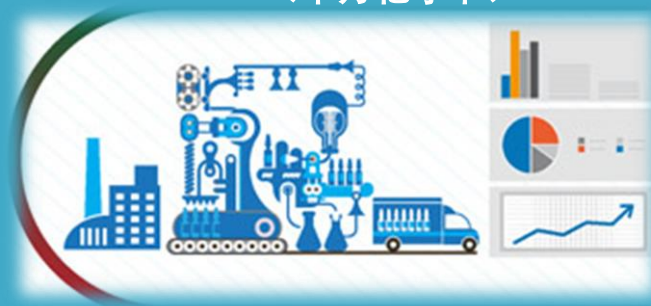


Body Technology 基材	Materials 材料	Joining Methods 连接方式	Joint Combinations 连接组合
Current Steel 目前用的钢材	1	1	1
All Aluminum 全铝	1	3	3
Future Multi-Material 未来多种材料	5+	10+	25+

1 Petabyte

Data from connected
manufacturing systems (IoT)
by 2020

到2020年，互联制造系统的数据将达到
1PB（千万亿字节）



Source: strategy&

15% Annual Growth

in manufacturing automation
by 2020

到2020年，制造自动化年增长率为15%

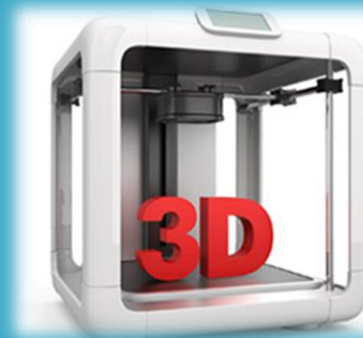


Source: BI Intelligence Estimates

\$22 billion

invested in 3D printing by
2020

到2020年，3D打印投资额220亿美元



正在改变目前汽车开发流程

Changing The Vehicle Development Process

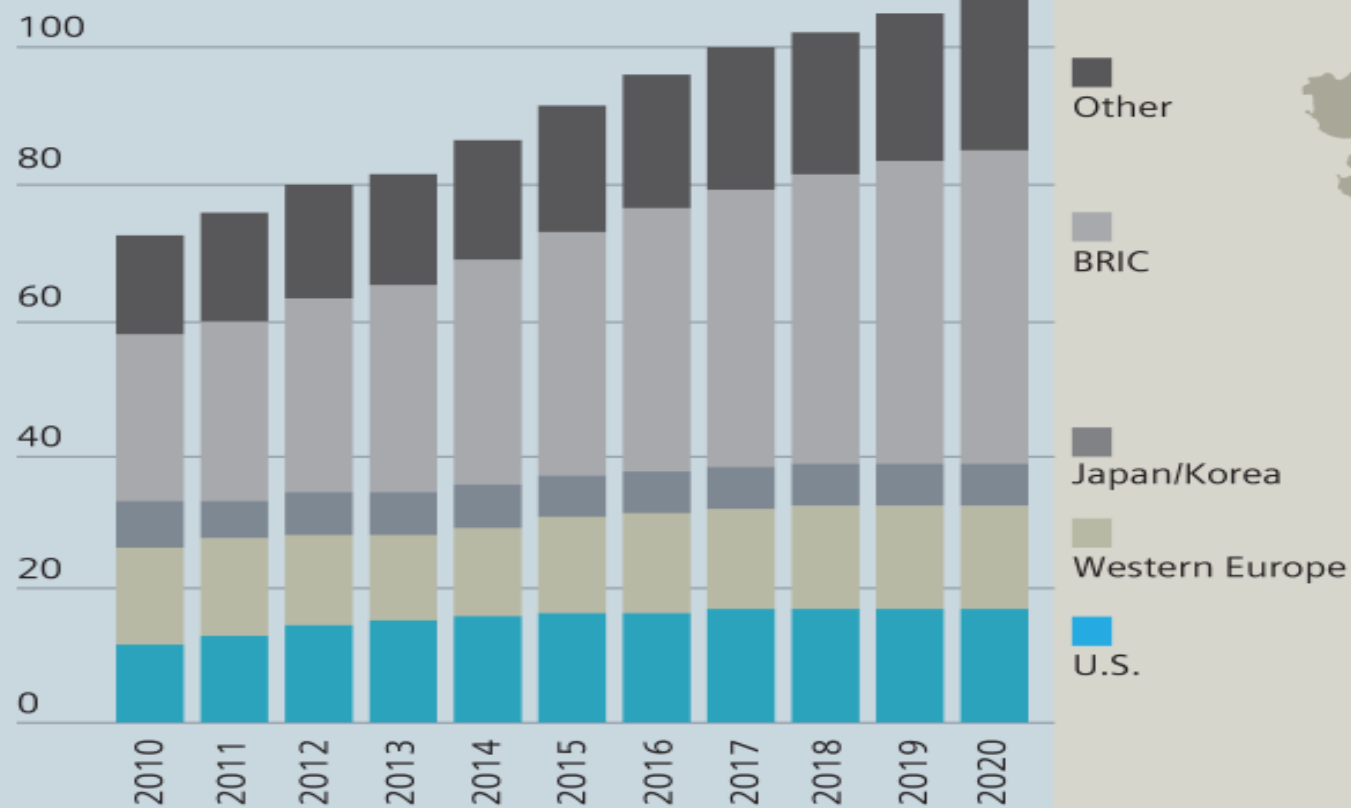
Source: McKinsey

Much of the Automotive Growth Will be in China

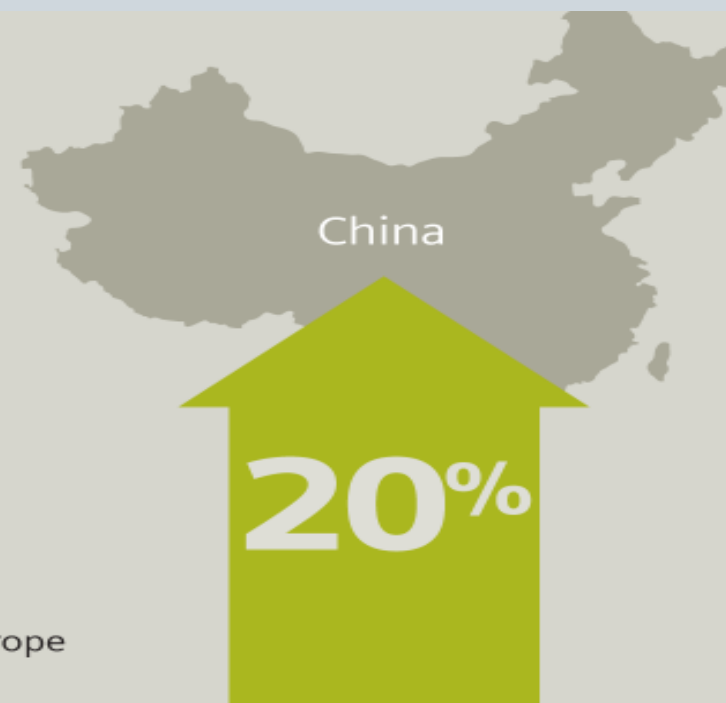
汽车行业增长的大量份额将来自中国

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Light-vehicle sales in millions



(Source: IHS Auto Insight)

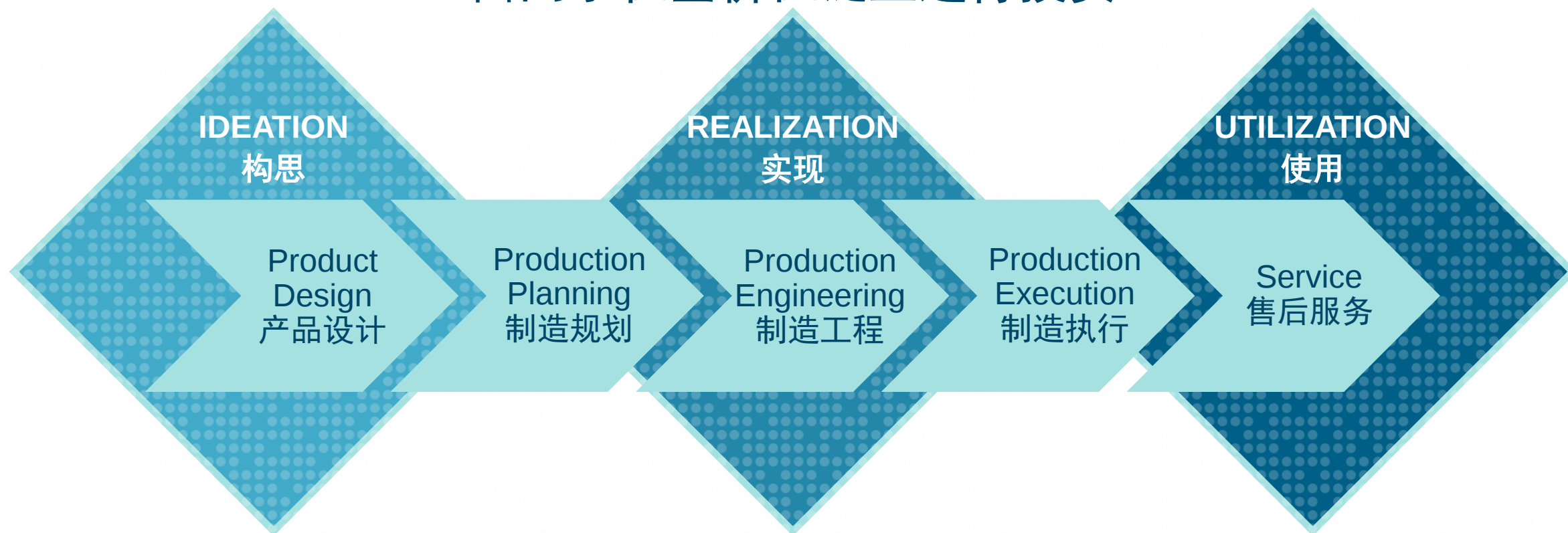


For the top 12 OEMs, China's share in total light-vehicle sales will grow up to 20% by 2019.

(Source: IHS)

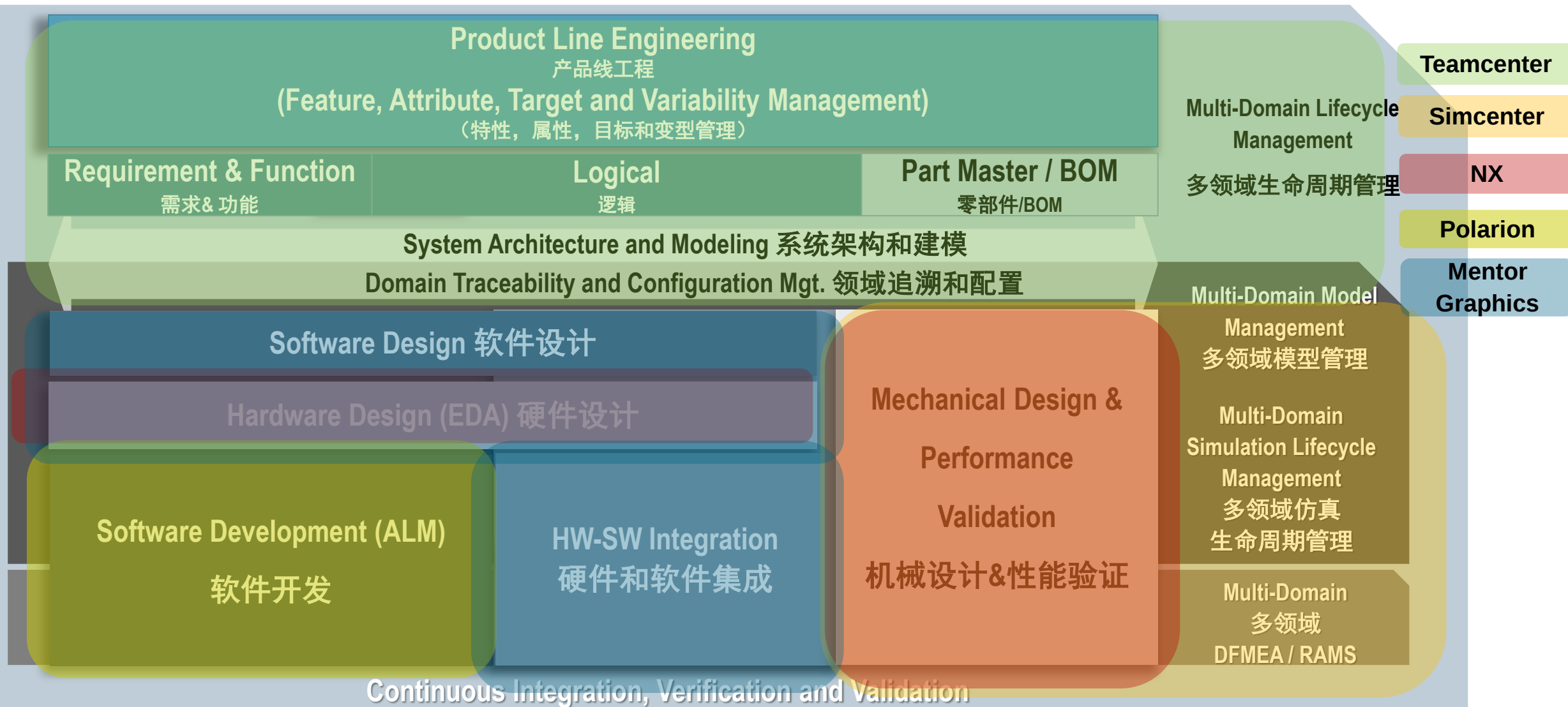
Siemens has invested in solutions across the entire value chain

西门子在全价值链上进行投资



Systems Driven Product Development (SDPD) 系统驱动的产品开发

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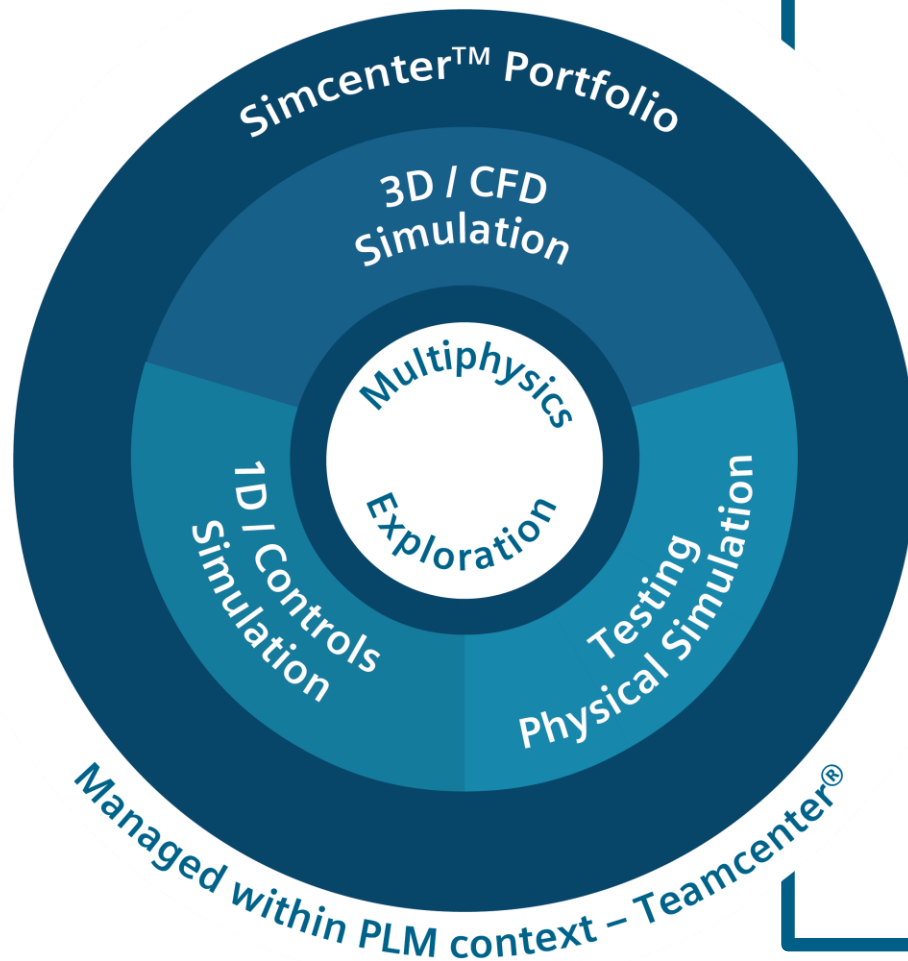


Predictive Engineering Analytics

Introducing Simcenter

预测性工程分析: Simcenter产品

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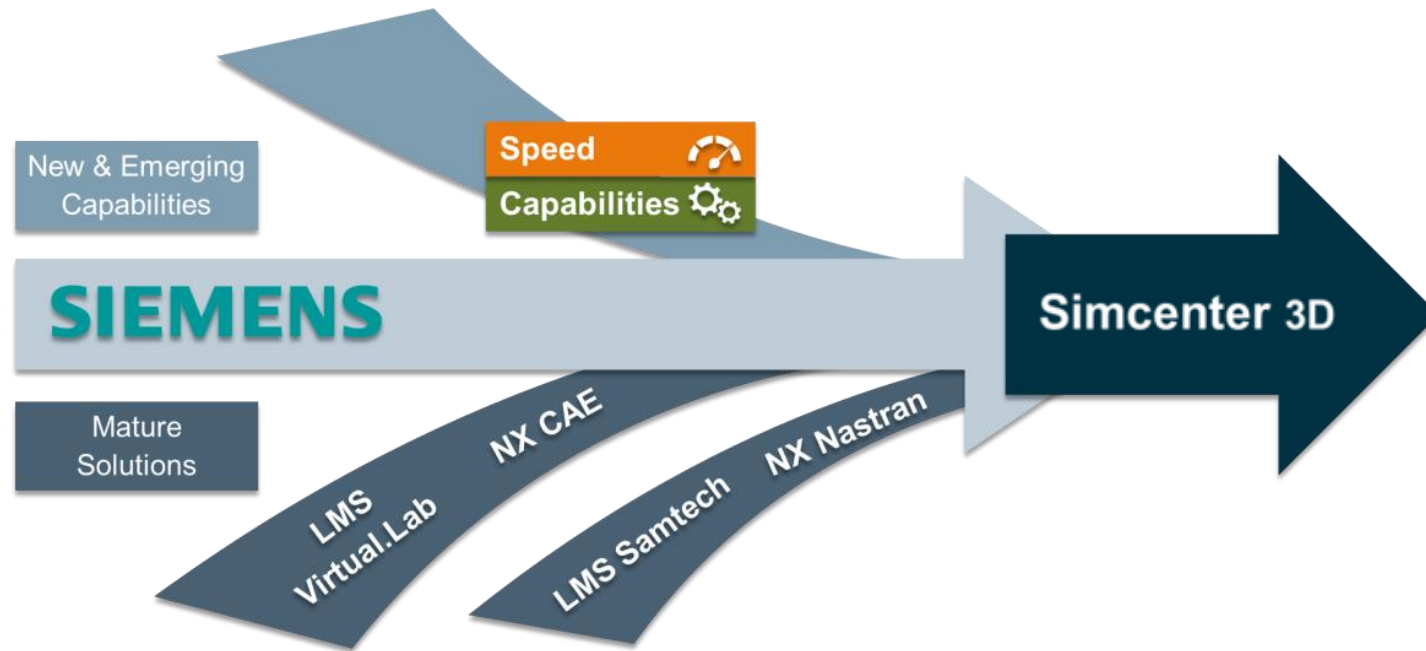
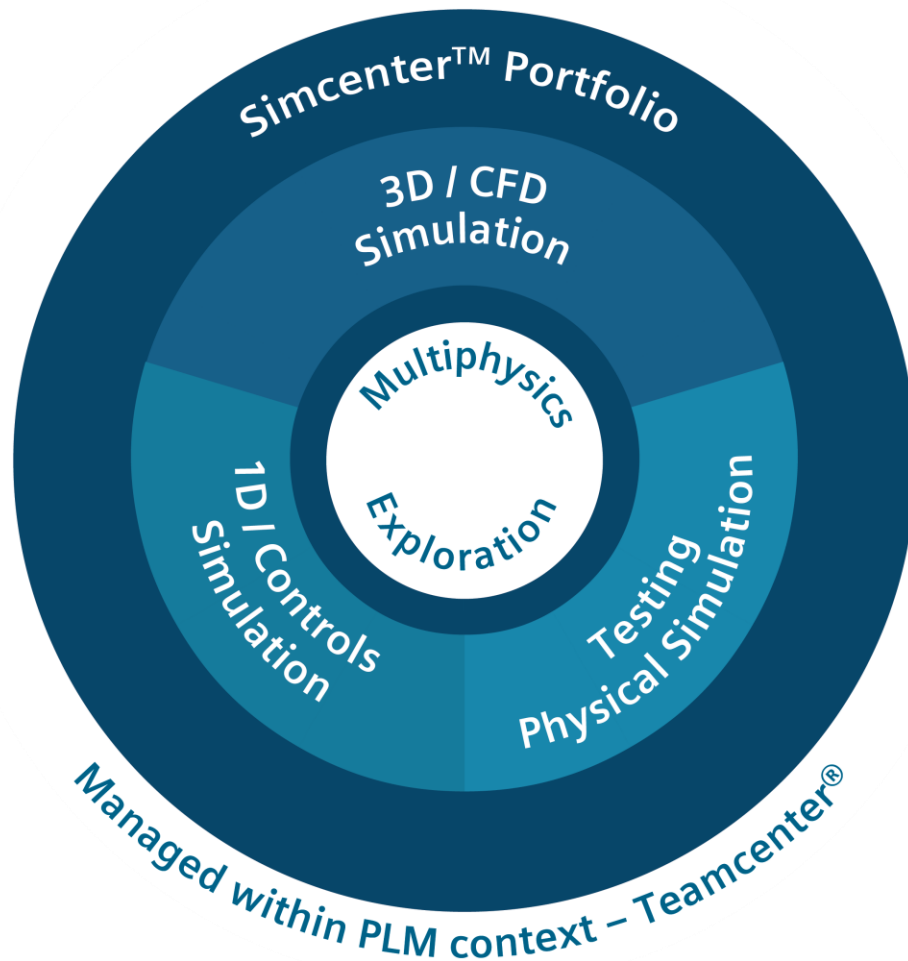
Simcenter™

Predictive Engineering Analytics

Aligning our portfolio

预测性产品分析：产品组合的不断丰富

SIEMENS



Simcenter™ Portfolio for Predictive Engineering Analytics

Simcenter™ 产品组合应用于产品预测性工程分析

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Simcenter™ Portfolio for Predictive Engineering Analytics

Multiphysics simulation: Aero-acoustics

多领域仿真：气动噪声

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WIND NOISE 风噪

A challenging subject in
automotive engineering

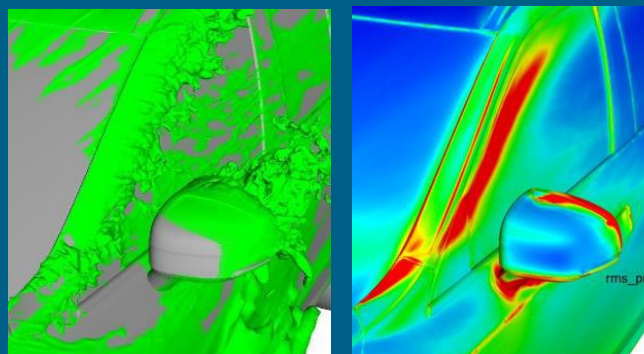
汽车工程中具有挑战的课题



Cooperation Volvo Cars
Chalmers University
Siemens PLM Software

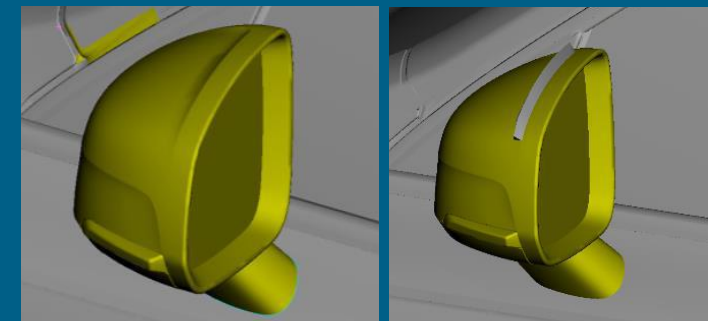
CFD for Load Prediction

CFD进行载荷预测



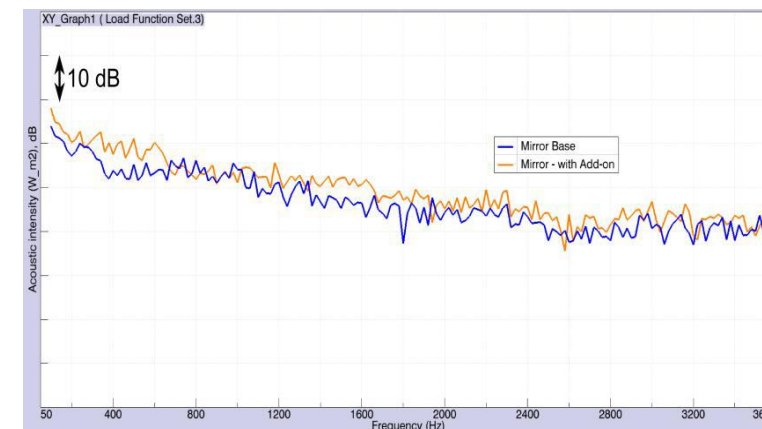
Review Design Alternatives

评估多个设计方案



3D NVH Car Body Model

3D NVH车身模型



Ref. "Prediction of Exterior Wind Noise Generated by a Side Mirror of an SUV", Published at Internoise 2016

Siemens PLM vision

Solutions along the complete Autonomous Vehicle product lifecycle

西门子PLM愿景：提供覆盖自动驾驶汽车产品生命周期的完整解决方案

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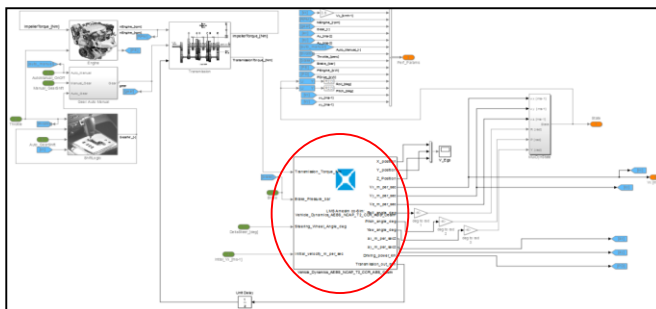
LMS Imagine.Lab Amesim plant models in Model in the Loop

EuroNCAP Autonomous Emergency Braking test simulation

LMS Imagine.Lab Amesim 被控对象模型在环

EuroNCAP自动紧急刹车测试仿真

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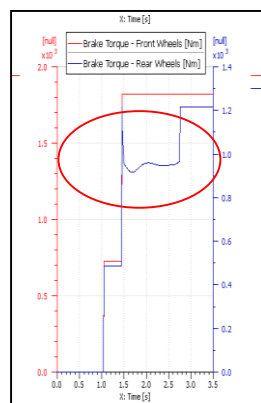


AMESim chassis model in TASS

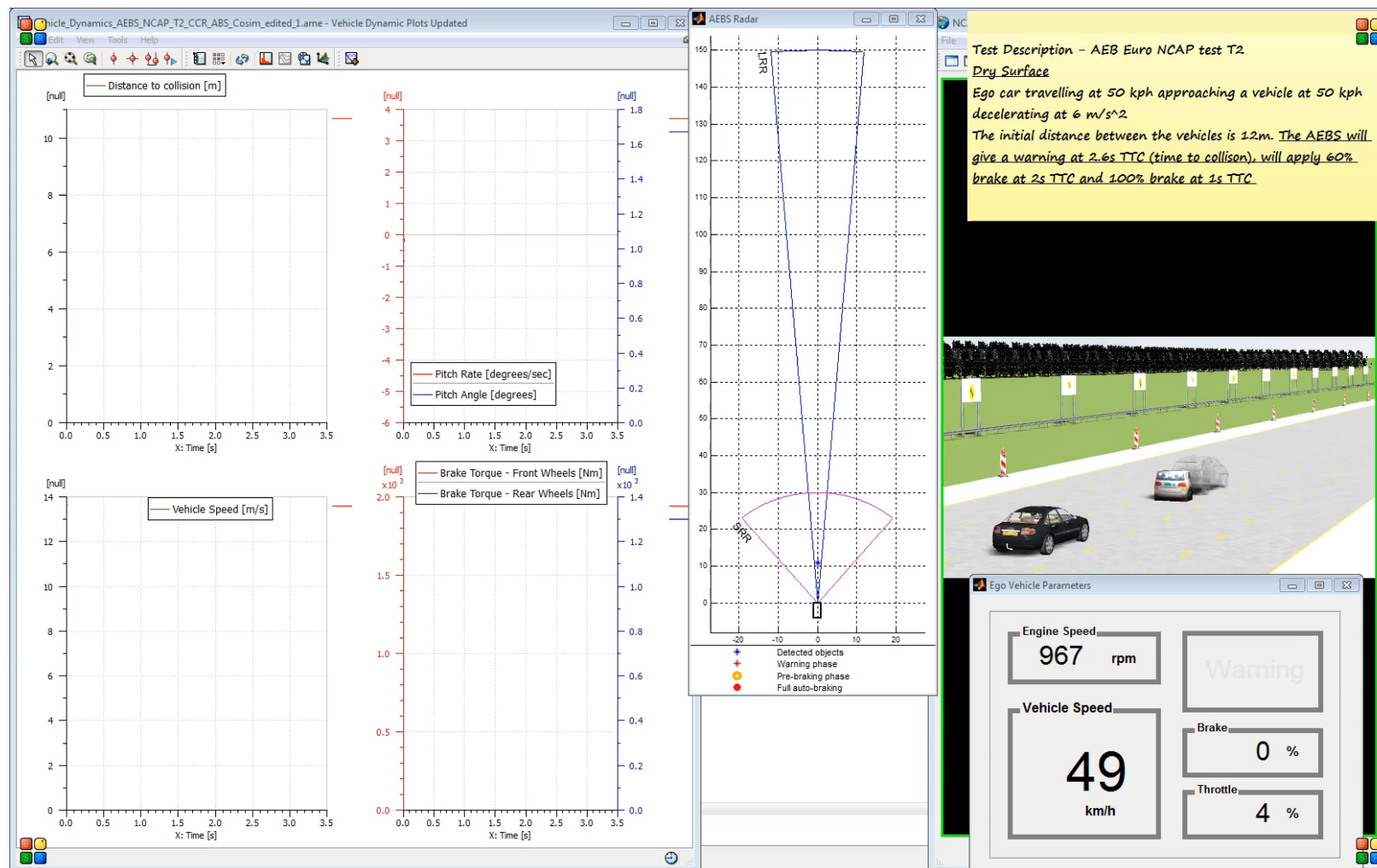
TASS 中 AMESim 底盘模型

AMESim plots show rear wheel slip

AMESIM图表显示后轮侧滑



prescan



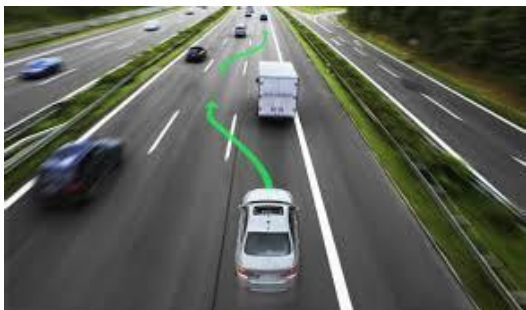
STS Engineering Services autonomous vehicle control algorithm

Model Predictive Control technology in driver strategy intelligence

STS工程服务致力于自动驾驶控制算法开发

驾驶策略智能化的模型预测控制技术

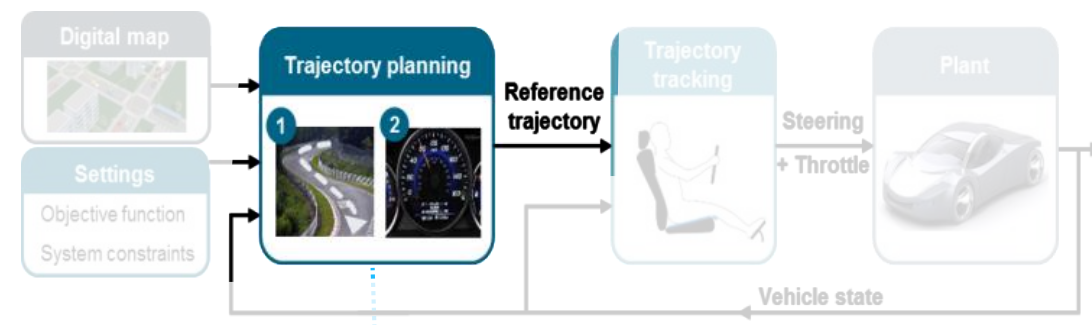
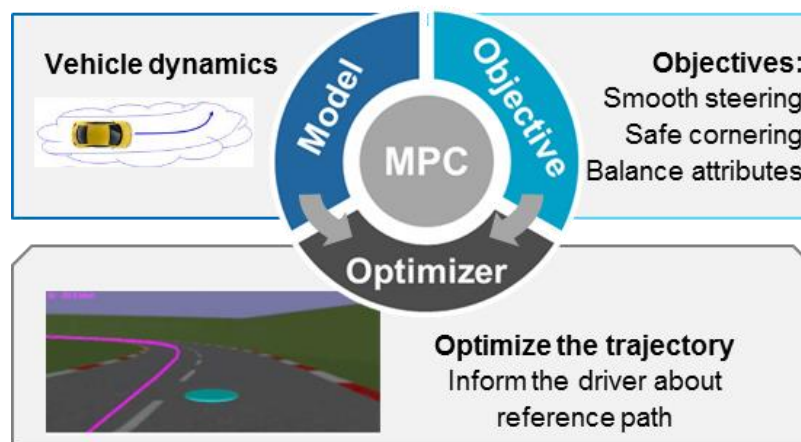
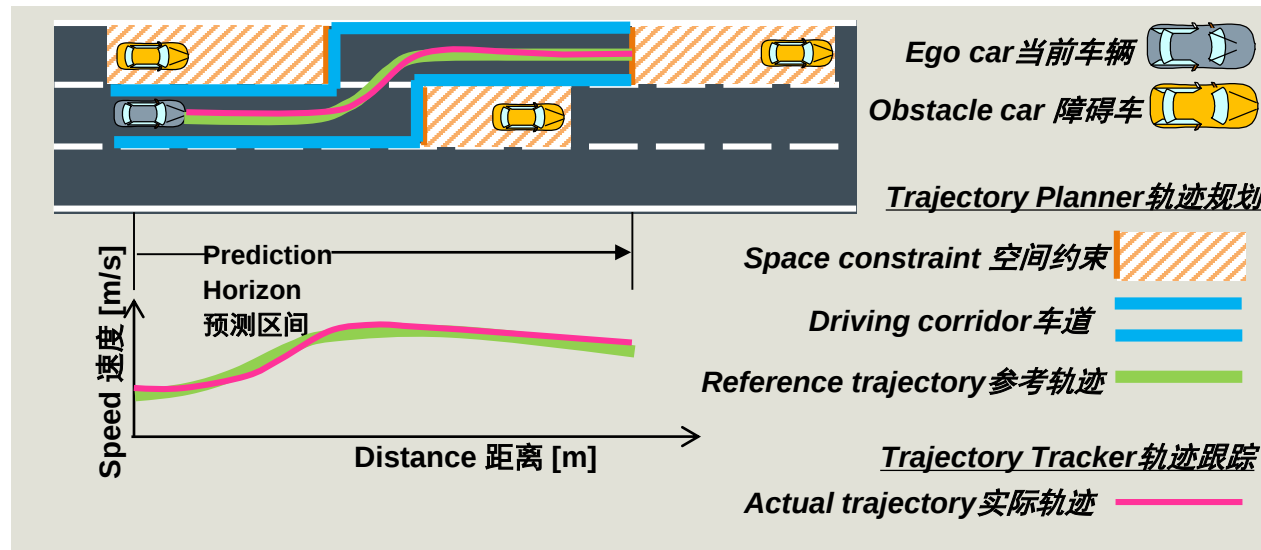
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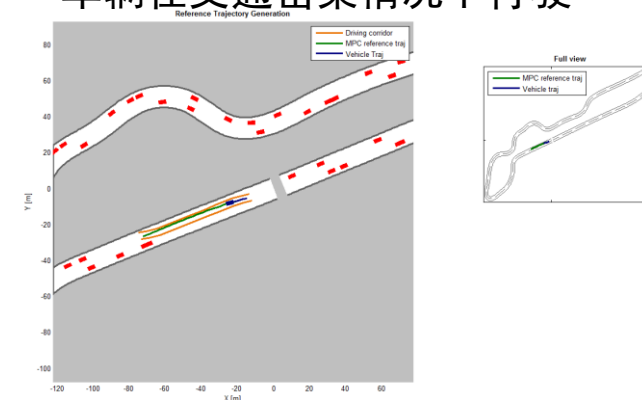
MPC Trajectory planner (模型预测控制轨迹规划)

optimizing the trajectory and the travelling velocity upon driver's preference (balance between smooth driving and time to destination) thanks to prediction of vehicle dynamics over the next hundreds meters (from GPS + Map)

从GPS+地图获得下一段数百米的路径输入，根据车辆动力学模型，考虑驾驶人偏好（平衡平稳驾驶和目的地进近时间），来优化行驶轨迹和车辆速度。

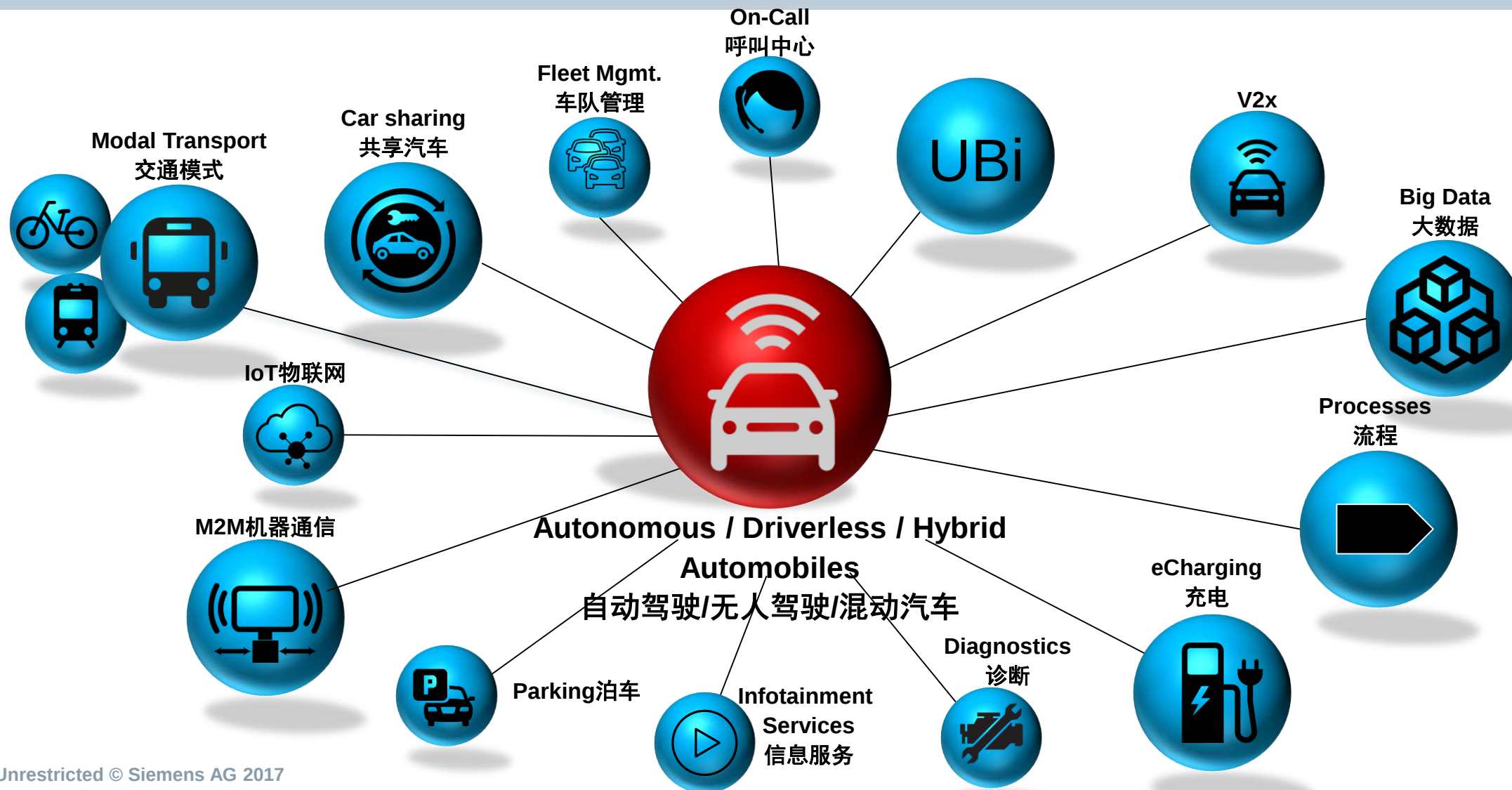


Vehicle moving in a dense traffic
车辆在交通密集情况下行驶



Software engineering demands collaboration 软件工程需要协作

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Polarion ALM - A better way managing complexity

Polarion ALM – 更佳的方式去管理复杂度

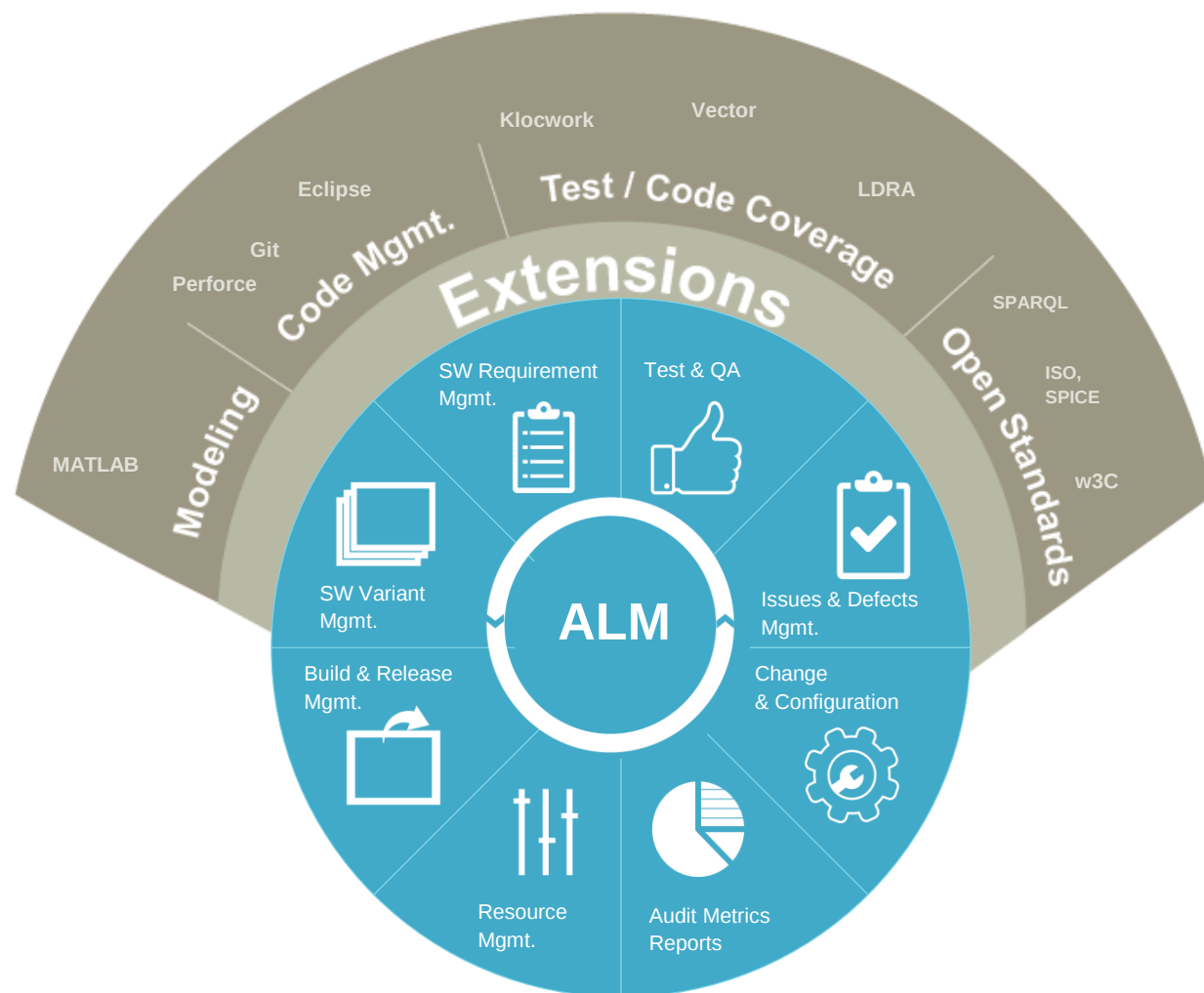
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POLARION ALM orchestration with existing ecosystem

POLARION ALM基础上构建现有生态

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Leverage Existing Environment

利用现有环境

Connectors for Partners & Extensions for 3rd parties

Quick Turn Around

快速实现工具连接

Tools can integrate or Polarion provides connector

Complete Traceability

完整追溯过程

Support Any Methodology

支持各种开发方法

Agile/Lean, Traditional, Hybrid, FDA, FAA, CMMI, ISO, IEC, CPI, SPICE, DevOps

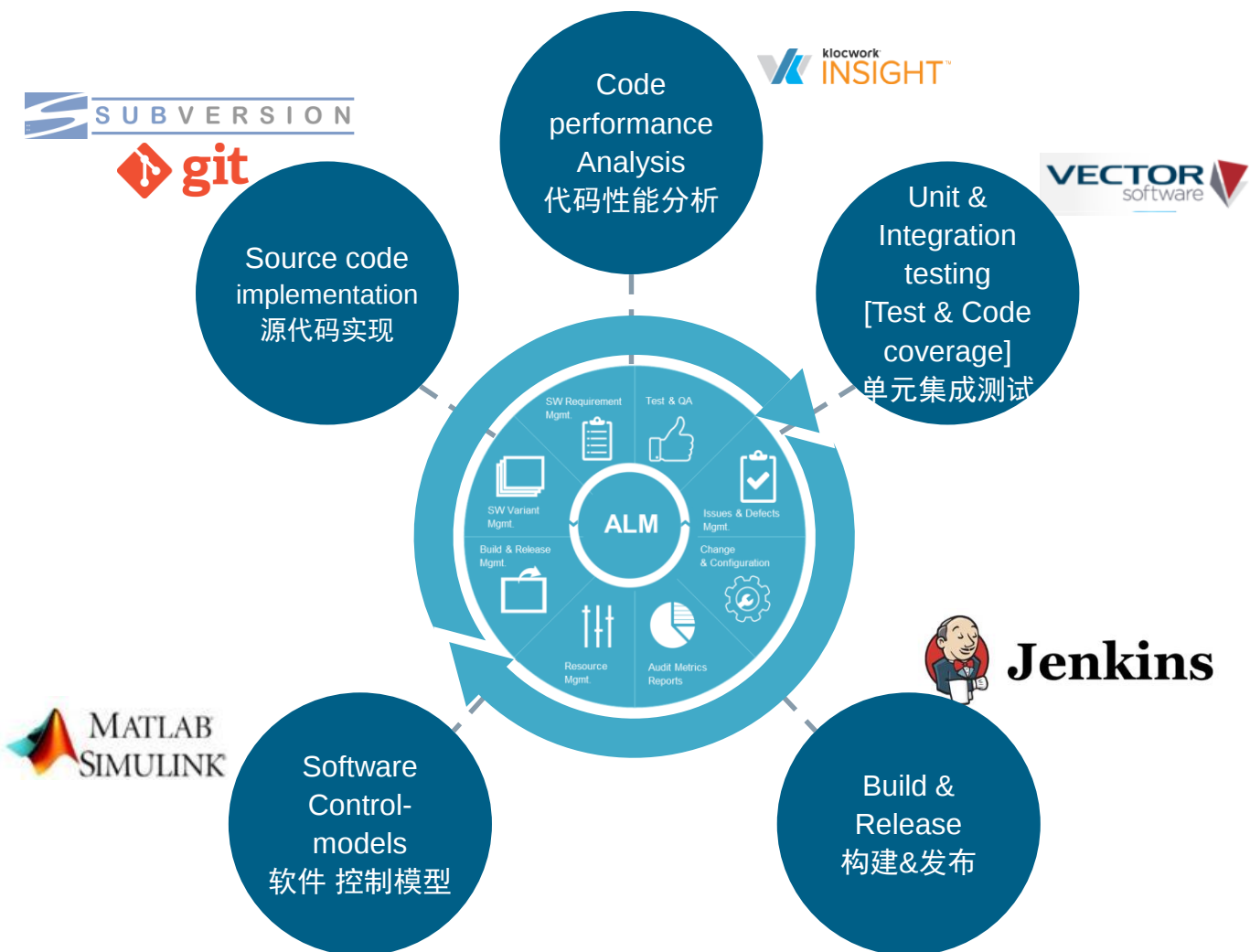
Flexible, Adoptable & Affordable

灵活, 适应&性价比

Closed Loop Software Engineering – [ALM]

闭环软件工程

SIEMENS



Software engineering
Continuous Delivery
软件工程 持续交付

Complete engineering accountability
完整工程责任

Models – Requirements – Code – Test – software-builds

ALM Orchestrated Software Engineering
基于ALM实施软件工程

Third party vendors and partners integrated

Systems Engineering approach
系统工程方法

Single Source Management
单一源代码管理

**37% Growth
Rate**
37%的市场增长

200+

Extensions
插件

250+

Fortune 1000
Deployments
财富1000强部署客户

2.5+M

Users
用户

15K

Registered
Community
Members
注册社区会员



Benefits of a comprehensive ALM and PLM solution

ALM和PLM一体化解决方案的收益

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Software ↔ Product traceability
软件与产品追溯

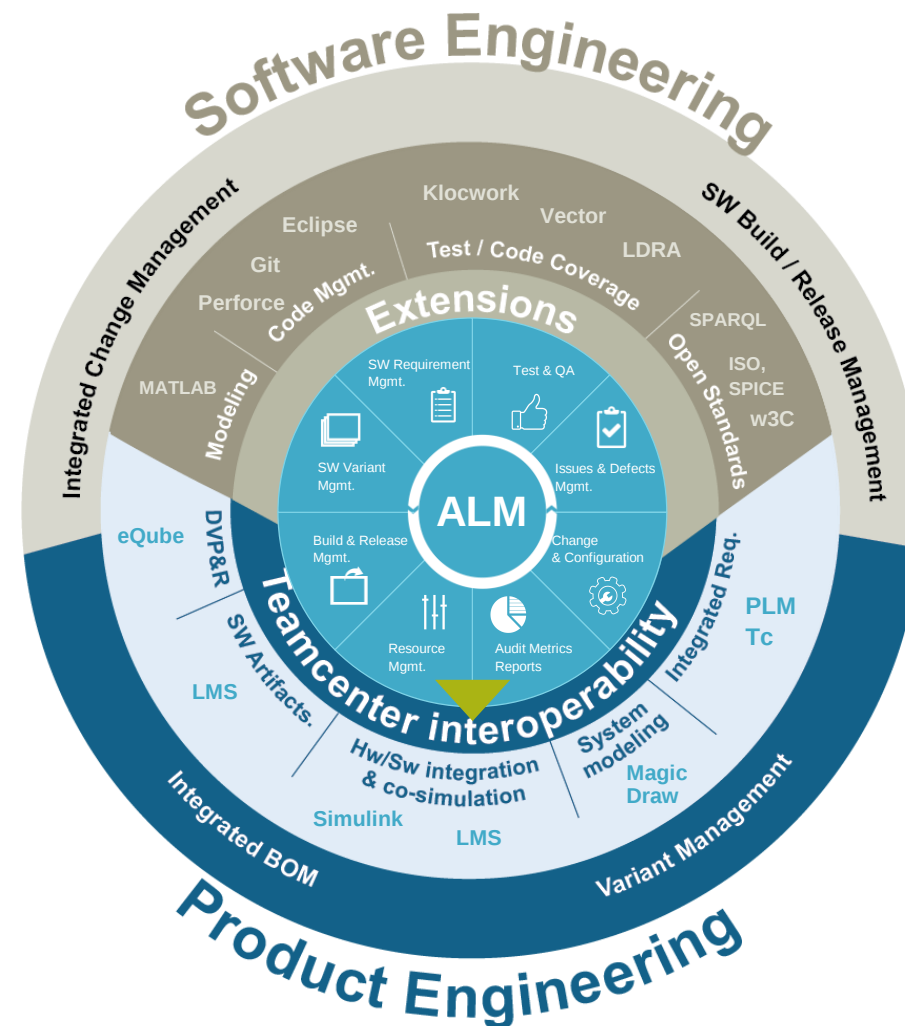
Integrated requirement management
集成需求管理

Integrated change management
集成变更管理

Ease-of-use
使用便捷

Builds on top of Teamcenter
基于Teamcenter管理软件构建

Connects with best-in-class industry tools
业界最佳工具链互联



ALM – Customers

ALM的客户

SIEMENS

AUTOMOTIVE & TRANSPORTATION 汽车&交通运输行业



“With Polarion ALM requirements management we found the solution to both of our biggest pain points: achieving SPICE compliance and enabling us to seamlessly fit into the OEM supply chain.”

Christian Posluschni
Team Leader – Development Electronics/Software Development
Küster

“在Polarion ALM的帮助下，我们解决了两大痛点：SPICE合规；协助我们达到OEM供应商的要求。”



“Polarion ALM requirements management was significantly more affordable than the competing solution. And it was simple to purchase: one single solution that covers everything. No costly integration of several different products.”

Christian Posluschni
Team Leader – Development Electronics/Software Development
Küster

“Polarion ALM 比起其他解决方案具有更高的性价比。采购与部署更为简单：单一整体的解决方案，包括所需的全部功能，没有集成的代价。”

Industry Analysts Recognize the Transformational Opportunity

行业分析师一致认可的转型机会

SIEMENS



“ This combination opens up grand **new vistas for next-generation product design**, and also may offer new detailed capabilities for designers and manufacturing companies. ”

这些组合将开启**下一代产品设计的新天地**，同时为制造企业和工程师提供新的技术能力



“Combining Mentor Graphics with the rest of the Siemens PLM Software portfolio, especially the software assets of Polarion, is a huge step forward and gives them **unprecedented breadth.**”

明导国际与西门子PLM软件组合的联合，特别是与Polarion，这将跨越了非常大的一步，提供了**前所未有的解决方案广度**。



“This merger deal is unprecedented in the design, engineering and product lifecycle management (PLM) software markets.”

此次收购融合是设计、工程和PLM软件市场上史无前例的。



“ This deal furthers Siemens' electrification focus and **support of the model-based systems engineering and design of connected products**—of which IDC predicts there will be 30 billion by 2020. ”

此次交易加深了西门子在电气化方面的专注，**支撑基于模型的系统工程和互联产品设计**，IDC预测到2020年，这会是300亿美金的市场



Integrated Systems Design 集成系统设计



PCB Design & Mfg.
硬件设计&制造



Embedded Software
嵌入式软件



IC Design & Mfg.
(supplier)
半导体设计&制造（供应商）



Wiring Harnesses
线束工程

Impact of additive design to production processes 增材设计到制造流程的影响

SIEMENS

- End-to-end support to design, optimize and produce parts using additive manufacturing processes is revolutionizing the way future vehicle structures are developed
从零部件设计、优化、制造的端到端增材制造流程支持，对未来汽车结构的开发将是一场变革
- Siemens is leading in the development of next generation software and processes to enable this shift
西门子将引领下一代软件和流程的开发来应对这次转变

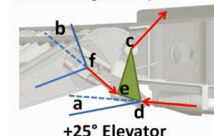
Requirements driven design & validation 需求驱动设计&验证

$$\text{reaction_force_c_angle_at_angle_max} := \text{convert}\left(\arctan\left(\frac{\text{reaction_c_y_at_angle_max}}{\text{reaction_c_x_at_angle_max}}\right), t\right)$$

$$\text{simplify}(\text{reaction_force_c_angle_at_angle_max})$$

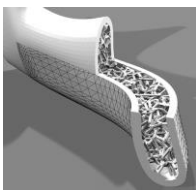
49.680 x 10° degrees

And so visualizing this result yields:



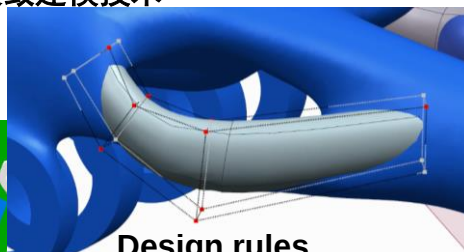
Step 13. Design linkage to maximum load.

As seen above, the loading cases on the green hinge are very similar at the

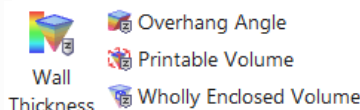


Lightweight structure design
& optimization
轻量化结构设计 & 优化

Convergent Modeling™ technology 收敛建模技术

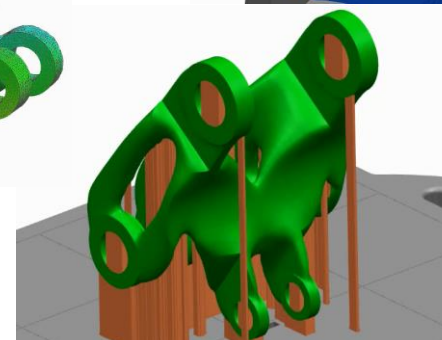
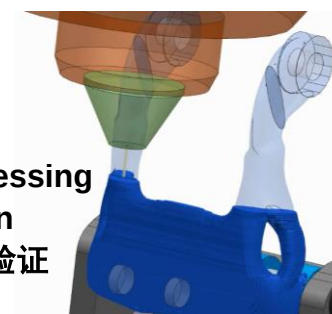


Design rules
& validation
设计规则&验证



Performance
Optimization & validation
性能优化&验证

Build processing
& validation
构建流程&验证



Divergent 3D, 3D Printed Blade Supercar

CES 2017

Siemens PLM Software customer

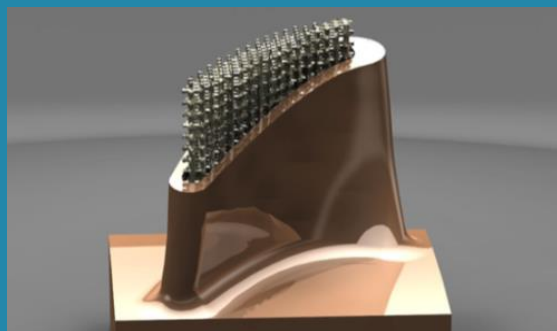
西门子客户



Complete Additive Manufacturing Solution 完整的增材制造解决方案

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One Integrated System 单一集成系统



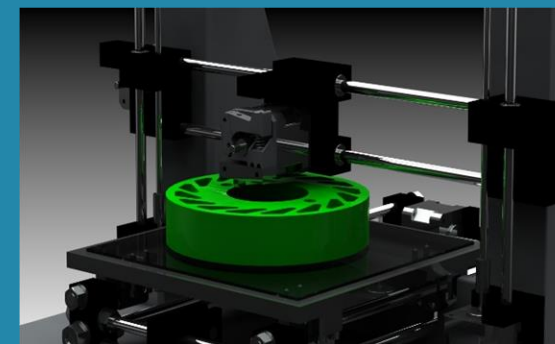
NX CAD

- Convergent modeling收敛建模
- Lattice structures晶格结构
- Surface Textures 面纹理
- Design rules设计规则
- Multi-material design多材料设计



Simcenter 3D

- Generative design生成设计
- Topology optimization拓扑优化
- Process validation流程验证
- Performance validation性能验证



Additive Manufacturing增材制造

- Build tray definition构建托盘定义
- 2D / 3D nesting 2D/3D嵌套
- Support structures 结构支持
- Build processors 构建处理
- Hybrid Manufacturing Solution 混合制造模式

Data management and shop floor connectivity 数据管理和车间互联

Siemens production software and MES systems 西门子制造软件和MES系统

Hardware vendors 硬件提供商

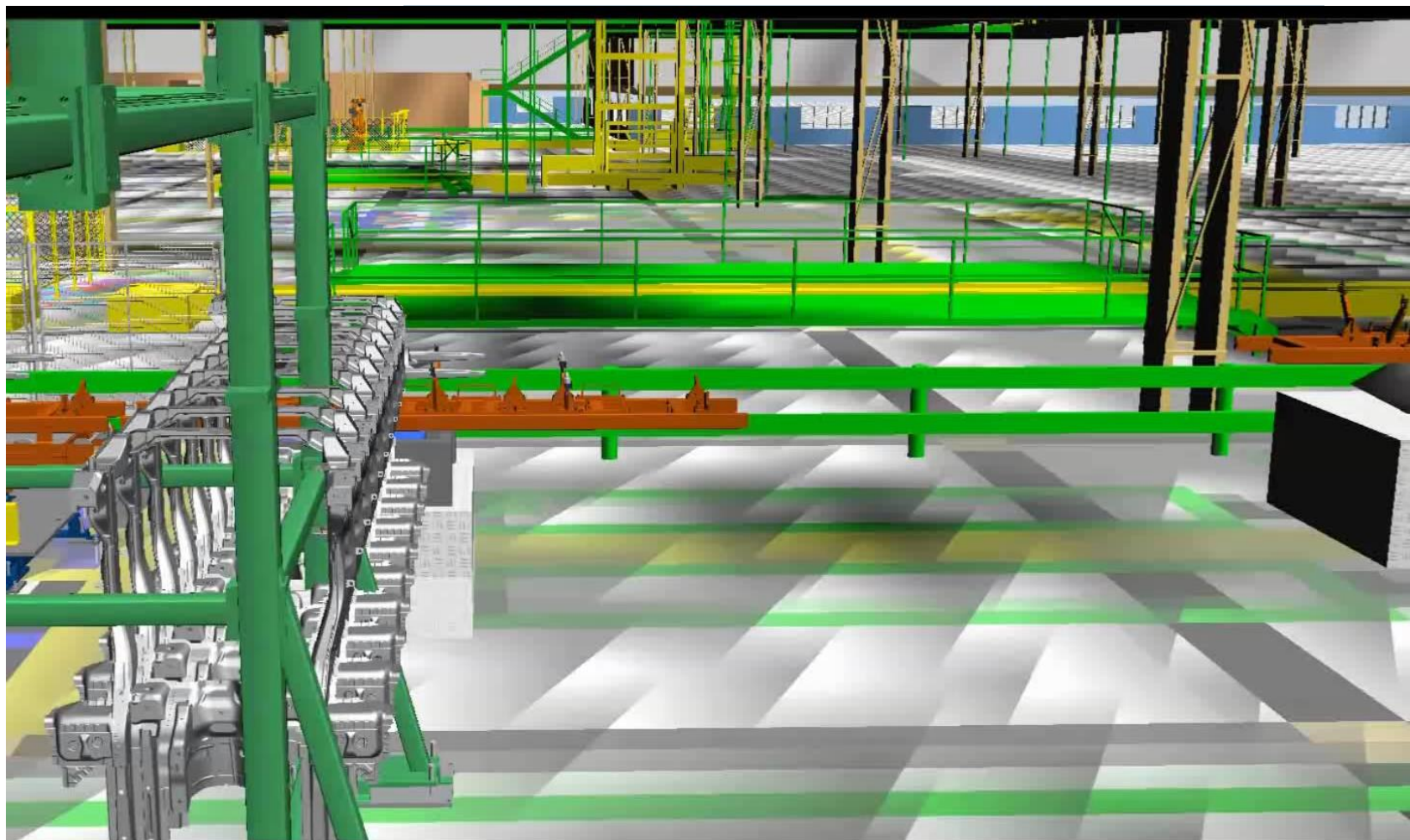
Virtually
commission
production
to launch
flawlessly

虚拟试生产保证
一次投产成功



Accurately
represent what
is real....
and simulate what
is possible

精确表达现实...
并模拟所有可能...

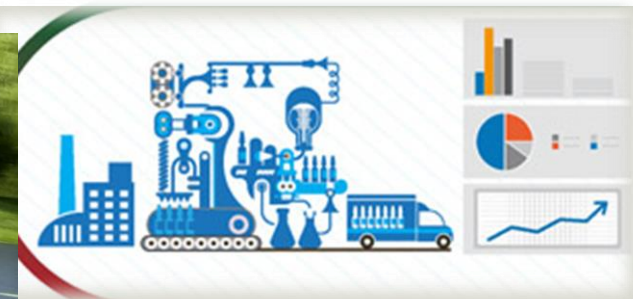
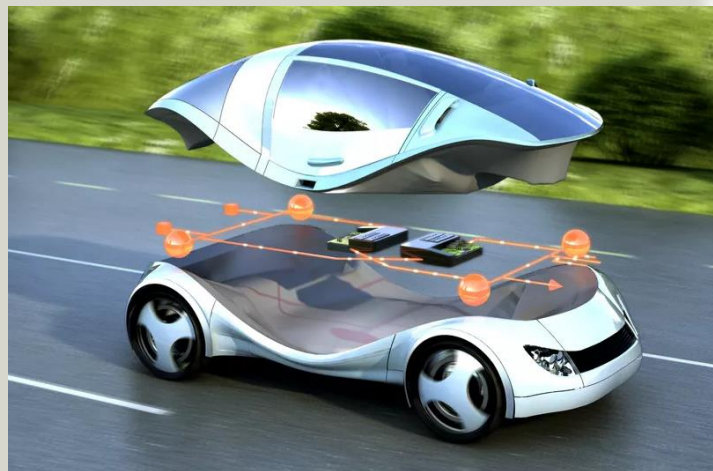


Summary – Siemens Continues to Invest in the Hot Trends in Automotive

小结 – 西门子在汽车行业的热点趋势上持续投资

SIEMENS

- **Software Development**
软件开发
- **Digital Twin**
数字化双胞胎
- **Manufacturing Optimization**
制造优化
- **Electronics Integration**
电子设计集成
- **Systems Engineering**
系统工程
- **Engineering Analysis (CAE)**
工程分析(CAE)
- **Big Data Analytics**
大数据分析



Siemens solutions support the automotive future

西门子解决方案支撑汽车行业的未来

SIEMENS

- Huge fuel economy improvements
燃油经济性大幅改进
- Vehicle electrification
汽车电气化
- Autonomous Vehicles
自动驾驶汽车
- Infotainment and connectivity
信息系统和互联性
- Vehicle sharing (mobility)
共享汽车（共享出行）
- New manufacturing & 3D printing
新制造技术&3D 打印

Teamcenter

Simcenter

NX

Polarion

Mentor
Graphics **

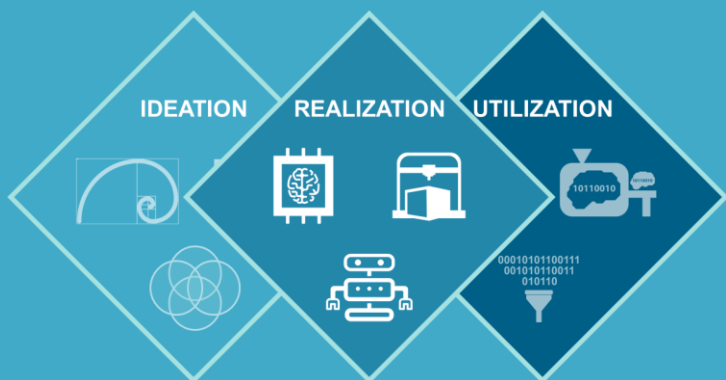
Siemens – The #1 provider
of Automotive PLM
solutions!

西门子——排名 第1 的汽车
PLM解决方案提供商

Siemens Investments Are Supporting the Automotive Transformation 西门子投资支撑汽车行业的变革

SIEMENS

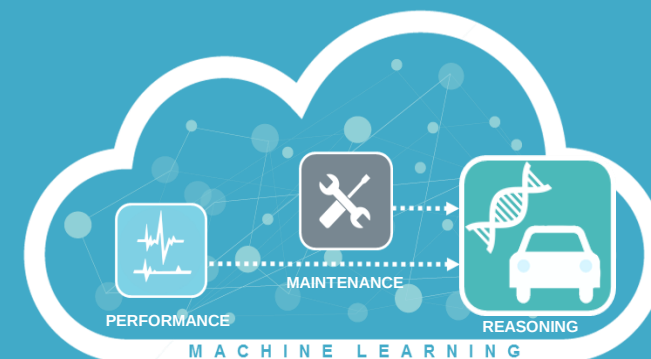
Digitalization 数字化



The Digital Enterprise Software Suite 数字化企业软件套件



The Language of Products 产品语言



Rethinking every phase
of the Digital Enterprise
重新思考数字化企业的每个阶段

Driving continuous
business transformation
驱动持续业务变革

Gaining insight from data
从数据中获得洞见



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Thank You.
谢谢！