



Siemens Company Core Technologies

Overview, 2022



Technology is our passion. We want to make our customers successful, and therefore we focus on core technologies that are most important to them.

Dr. Peter Körte
CTO of Siemens

Siemens Company Core Technologies (CCTs) – Innovation fields for the long-term success of Siemens and our customers

Siemens R&D
(FY2022)

€5.6 bn

~€500 m

stringent investments in
future growth fields



Company Core
Technologies



Data analytics &
AI



Connectivity &
Edge



Simulation &
Digital Twin



Software Systems &
Processes



Future of
Automation



Cybersecurity &
Trust



Sustainable
Energy &
Infrastructure



Additive
Manufacturing &
Materials



Power
Electronics



User Experience



Integrated Circuits &
Electronics

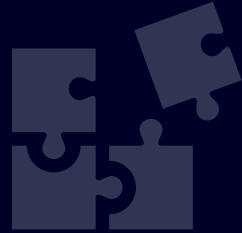
Siemens Company Core Technologies (CCT)

The Siemens approach to Technology and Innovation



Siemens Company Core Technologies

- Ambition



What

- Secure **technology leadership and (future) business impact** of Siemens with a **joint strategy in research and pre-development**
- Increase **alignment between businesses, Technology and our research & innovation ecosystem** in regards of research and pre-development
- **Ensure transfer of pre-development** results into Siemens' product and services portfolio

Clear goals, roadmaps and customer focus to leverage the maximum benefit of technologies across the businesses

How

- Strategic **direction, transparency** and **execution** of our research and pre-development activities
- Orchestration of **cross-company networks** to jointly drive technology development and commercialization
- **Joint pre-development roadmaps** agreed with all businesses for which the technology is relevant
- Definition and review of CCT specific **short- and mid-term objectives**, focusing on creation of customer value



CCT Data Analytics & Artificial Intelligence



Development of products, solutions, tools, and models for our business to accelerate their AI deployment and to become a recognized leader in Industrial AI

Our Ambition

- Generate value out of data: IoT analytics & AI enabled IoT architecture for responsible data eco-systems
- Scale solutions and use cases across regions and verticals: establish AI framework, decrease data preparation efforts
- Trustworthy, safe, and robust AI for industry needs

Products and Use Cases

- Train Brain: Autonomous tram and depot planning
- Siemens Predictive Analytics (SiePA) for operation and maintenance support, e.g. fault detection in heat pumps
- Digital Building: Data coherence along the life-cycle from design, construction, to operation leverages e.g. CO₂ neutral buildings



CCT Connectivity & Edge



Provide the technology foundation and the differentiating features for the Industrial Internet of Things to seamlessly connect the physical with the digital world

Our Ambition

- Enable real time collection, processing and understanding of data at the point of origin with performant industrial edge computing, smart sensors and field devices
- Deploy, connect and manage devices from the Sensor level to the Cloud with industry grade quality and low configuration efforts
- Ensure seamless connectivity and interoperable information exchange between IIoT components

Products and Use Cases

- First Siemens 5G router launched
- Industrial Edge: Market-leading solutions for edge computing in the field level (e.g. Sinumerik Edge)
- Web of Things: Standardized IIoT interoperability



CCT Simulation & Digital Twin



Simulating the physical world in the virtual world to develop the toolchain that allows advanced design, manufacturing and operation

Our Ambition

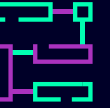
- Optimize design, performance and operation of Siemens assets
- Streamline the Siemens Digital Twin toolchain across verticals and product lifecycles
- Leverage the Executable Digital Twin to improve asset performance during lifetime

Products and Use Cases

- First Executable Digital Twin tools in the market (Simcenter 3D, 1D Amesim, ROM Builder) enhancing the value of assets during lifetime
- First Simcenter products using Generative Engineering and pilot with multiple customers
- AI enabled simulation methods introduced in industrial software tools
- Digital Twin Knowledge Graphs enhance configuration and lifecycle management of trains and buildings



CCT Software Systems & Processes



Research, pre-development and transfer of innovative software technologies and methodologies to enable, speed up and scale digitalization at Siemens

Our Ambition

- Technical visionary & driver of the IoT platform architecture across all units
- Technically enable new X-domain and X-company business
- Architecture guidance and speed up digital offering delivery

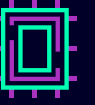
Products and Use Cases

- Zero-downtime upgrades of automation functions on containerized Edge-devices
- Data Layer – Use Cases on Edge for several customers from different verticals and across different countries (e.g. financial service industry in China)
- SaaS evolution Smart Building Suite, Asset Performance Suite

SIEMENS



CCT Power Electronics



Develop and implement power electronics technologies as pre-condition for our digitalization business in industry, infrastructure and transportation

Our Ambition

- Smart Power Electronics: Seamless data access and control for future service business opportunities
- Modular, scalable, functionally integrated Power Electronics products for high flexibility and short time to market
- Sustainable portfolio with high compactness, less material consumption and high energy efficiency

Products and Use Cases

- Compact and functionally integrated SINAMICS converter design (increased performance & functionality with double the power and half the size)
- SiC* converter building blocks e.g. for small and lightweight auxiliary power supply in trains
- Fast and save AC/DC Solid State Switch design





CCT Additive Manufacturing & Materials



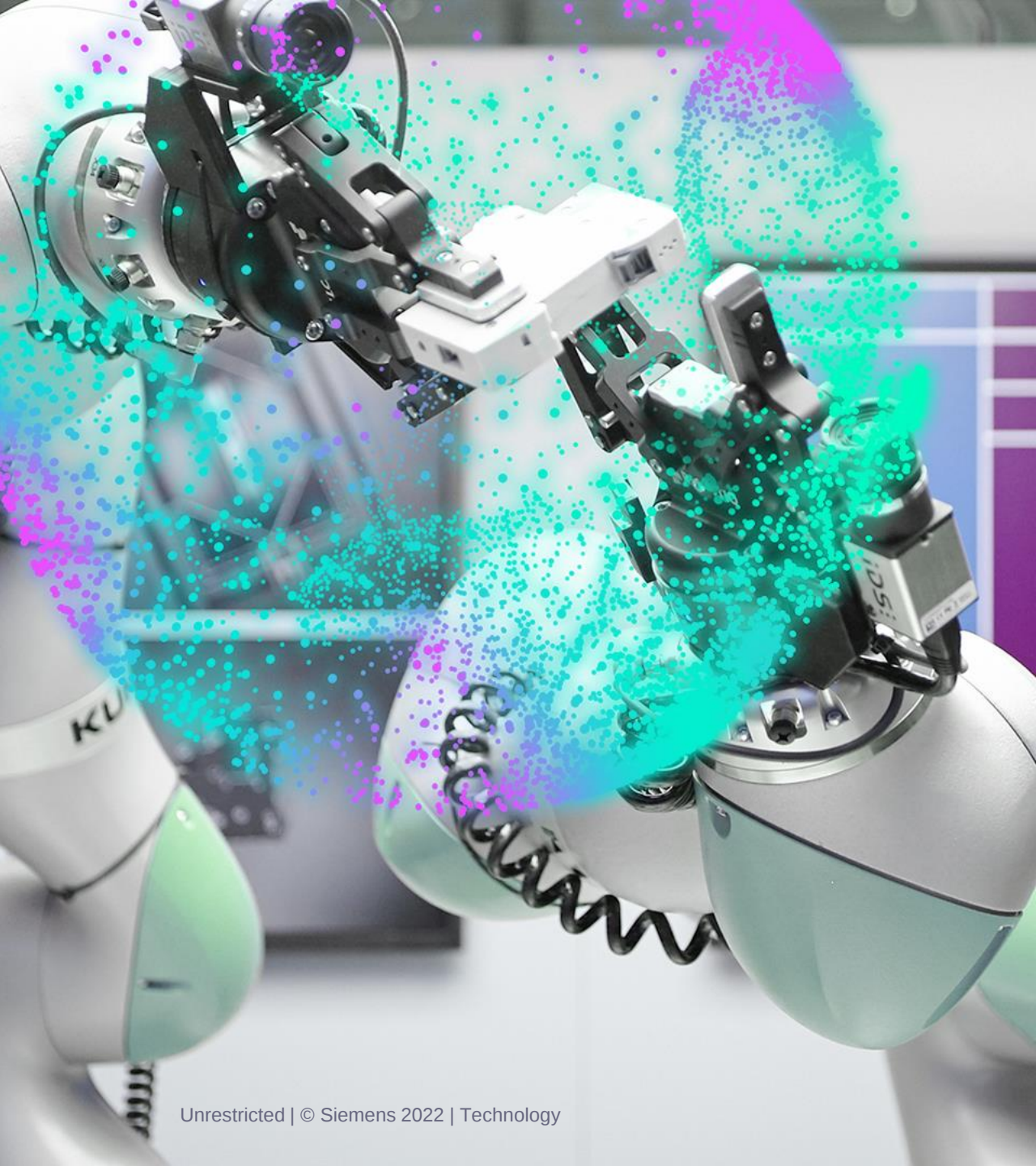
Development of advanced materials and its production processes with focus on automation of design and manufacturing and scalable platform applications

Our Ambition

- We industrialize Additive Manufacturing to empower our customers to create, make and use additive applications at scale
- We identify, modify and qualify materials, the manufacturing processes and workflows together with our partners for the application in the Siemens Production System

Products and Use Cases

- Automation of design and manufacturing of the end-to-end workflow in AM (e.g. NX CAM, Simcenter, Simatic, Sinumerik, Opcenter, AM Network)
- Mobility's spare parts on demand business utilizing a global printer network and customer platform mobase



CCT Future of Automation



Exploring the future of today's automation: "Automation of automation" by enabling more autonomy, modularity (plug & operate style) as well as simplification and automation of engineering processes

Our Ambition

- Autonomy: Executing high-level tasks without detailed programming
- IT/OT integration: Convergence of automation OT with IT development paradigms
- Accelerate application of robotics & self-surveillance

Products and Use Cases

- Robot flexible grasping based on vision and AI for manufacturing cells
- Low-complexity building automation on edge/cloud, e.g. when integrating several installers in a building
- Obstacle detection for driverless trains



CCT Cybersecurity & Trust



Mastering cybersecurity and trust technologies in industrial environments as fundamental differentiator for our digital business to give Siemens and its customers a competitive edge

Our Ambition

- Securing enterprise, production, products & solutions in the shift towards vertical software and IIoT*
- Raising efficiency through security automation
- Focus on data driven business models in open industrial ecosystems

Products and Use Cases

- Centrally hosted industrial PKI services to ease imprinting of manufacturer certificates (1 mio. devices)
- Zero Touch Onboarding implemented in Smart Infrastructure products
- SiGREEN – Trustworthy C-footprint calculation for CO2 taxation and zero emission production, open and with cross-company standards

*Industrial Internet of Things



CCT Sustainable Energy & Infrastructure



Develop technologies for sustainable, reliable, and resilient infrastructure in energy, industry, buildings, and mobility

Our Ambition

- Secure leading grid control business and develop future grid technologies
- Improve lifecycle performance of customer sites, microgrids, buildings, and other assets
- Develop tools for 'sustainability as business'
- Enabling technologies for growing decarbonization and electrification of mobility & transportation

Products and Use Cases

Tools and services for sustainable infrastructure:

- Lifecycle monitoring and performance (DESMAC)
- Siemens District Twin (e.g. SiDiTwin Siemensstadt 2.0)
- Design and simulation tool for distributed energy solutions, incl. multimodal design (PSS®DE)



CCT User Experience



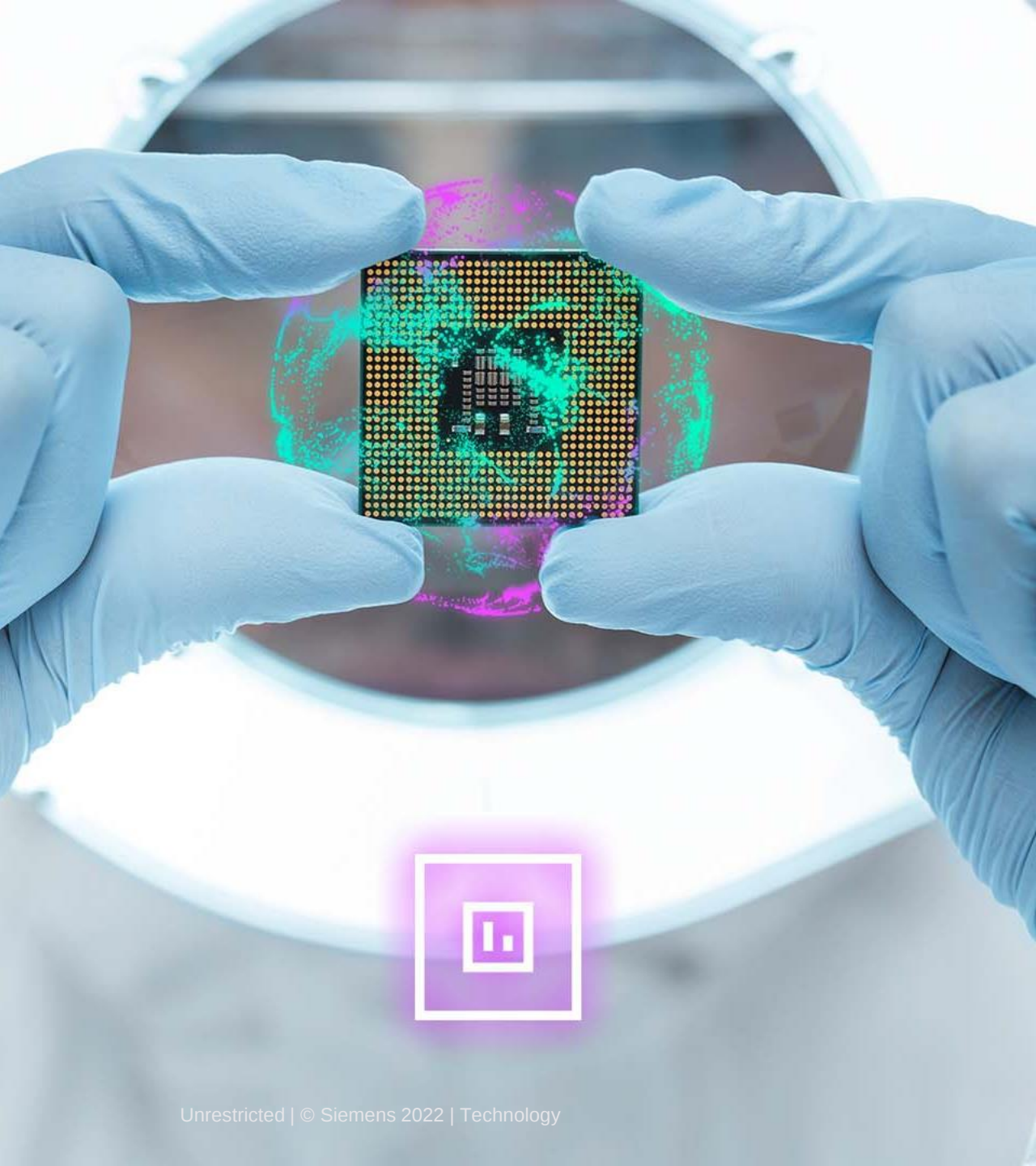
Establish a user-centric culture & mindset for the entire value chain to ensure UX as one of the key differentiators of our products, services & systems by providing trainings, tools and procedures

Our Ambition

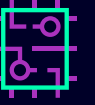
- Digital Solutions and SaaS transition: Focus on UX to ensure a seamless and smooth user journey
- Using UX best practices, foundation & process integration for digital transformation
- Anchor user-centered development in selected pilot projects (e.g. Future of Industrial Operations - FoIO)

Next Milestones

- All developers, product managers and relevant stakeholders take a mandatory UX awareness training
- UX maturity level: At least 1 level up in all BUs and support for user-centered process integration for all BUs by 2024



CCT Integrated Circuits & Electronics



Powerful, sustainable and cost-efficient industrial electronics as the solid core of our system capabilities & performance

Our Ambition

- Leverage scale effects
- Reduce cost of development of electronics
- Enable novel technologies
- Integration of hardware & firmware using modular toolboxes for speed & scale
- Improve resilient and trustworthy supply chains and the stepwise implementation of circularity for electronics-based products and batteries

Products and Use Cases

- AI-powered IC verification accelerating time-to-market for innovative silicon designs
- Unleashing production efficiency of optical communication technologies for space
- Enhance SINAMICS portfolio with connectivity for a better customer service

To find out more:

[Siemens Company
Core Technologies](#)

[Siemens Innovation
Ecosystem](#)

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