SIEMENS
Ingenuity for life

Applications at Siemens

tackled by the optimization team at SIEMENS Corporate Technology

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Siemens Setup

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Operating Companies

Strategic Companies

Service Companies (Financial Services, Global Business Services, Real Estate Services)

Corporate Development (u.a. Siemens Advanta, Corporate Technology, Next47, Portfolio Companies)

Governance Units

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ance Units

My team is here!

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OSRAM OS

SIPLACE(ASM)

That are our customers

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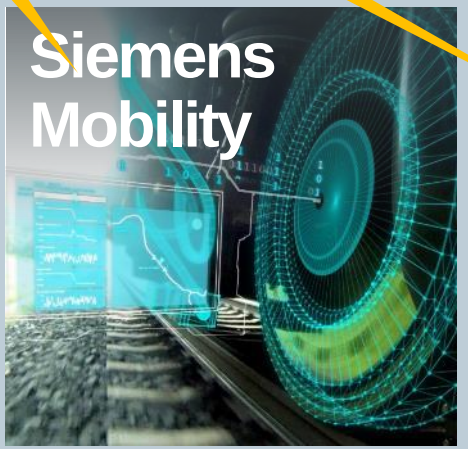
Operating Companies

Strategic Companies



Service Companies (Financial Services, Global Business Services, Real Estate Services)

Corporate Development (u.a. Siemens Advanta, Corporate Technology, Next47, Portfolio Companies)

nance Units

We are here!

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What is CT RDA BAM ORD ?

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Corporate Technology

- **2392** employees
- **336** patent experts
- **16** countries
- **7** departments

Research in Digitalization and Automation

- **1206** researcher
- **7** technology fields
- **5** Regions

Business Analytics and Monitoring

- **239** analytics experts
- **10** locations
- **8** countries
- **14** research groups

Operations Research for Decision Support

- **14** members
- **14** mathematicians
- **14** developers
- **2** architects

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Our mission & our technologies

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Mission

Design and development of **custom-tailored** planning **algorithms** and software **tools**.

Direct value creation for our company-internal customers and their end-customers.

Technologies

Mathematics

- (Non-)Linear & Mixed Integer Programming
- Graph Theory
- Discrete, Combinatorial & Stochastic Optimization

Software development competence

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Domain expert's world

Goals, rules, solution ideas as understood and presented by the domain expert.

Business domain

Capturing the business rules in a well-defined and precise way.

Modeling

Business rules as formulas.

Solving the problem

Requirements engineering

Formulate as mathematical model

Feed the model and the data to the solver algorithm

Find the optimal solution

Interpret the mathematical solution

In terms of the domain

Does the domain expert accept the solution?

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Requirements engineering

formulate as mathematical model

get & visualize solution in terms of the domain

Does the domain expert accept the solution?

AutoLP is a SW-development environment for c++, c##, fully embedded in Visual Studio, supporting the development of mathematical models using business-objects.

AutoLP offers the integration of all relevant MILP solvers.

MOaaS OptFace

MOaaS allows for describing mathematical optimization models, testing the performance of these models for various solver libraries, and demonstrating results on modifiable dashboards, interactively in a web-based UI.

MOaaS can be used without SW-development skills, thus provides a low threshold method to start with modelling.

SCIP is currently one of the fastest non commercial solvers for mixed integer programming (MIP) and mixed integer nonlinear programming (MINLP).

GUROBI OPTIMIZATION

IBM CPLEX

FICO

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MOaaS
OptFace

VLP

SCIP • SoPlex • ZIMPL • GCG • UG
THE SCIP OPTIMIZATION SUITE

GUROBI OPTIMIZATION

FICO

IBM CPLEX

To build a mathematical model you need the joint work of experts knowing about their application and modeling experts.

A good tool chain is the base to do this efficiently

Data is needed to do experiments and to check the model, data is not used to learn or extract the model !

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Optimization as engineering support function

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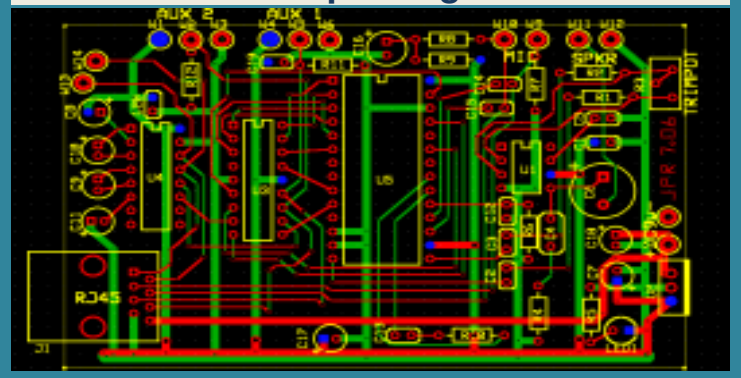
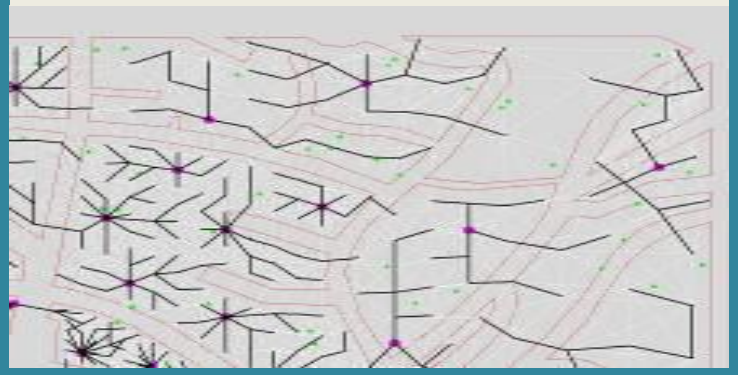
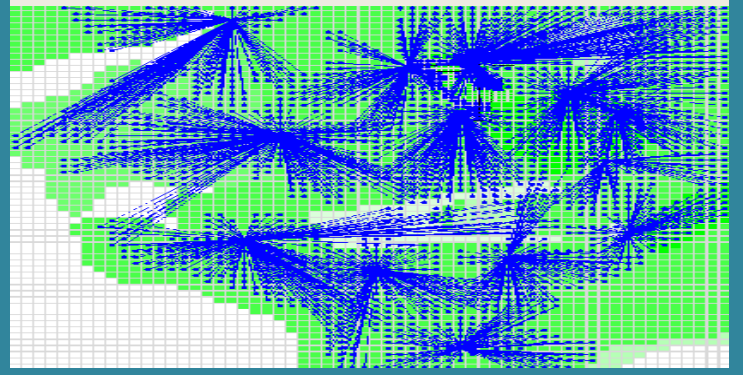
1992 – 1994 Chip Design



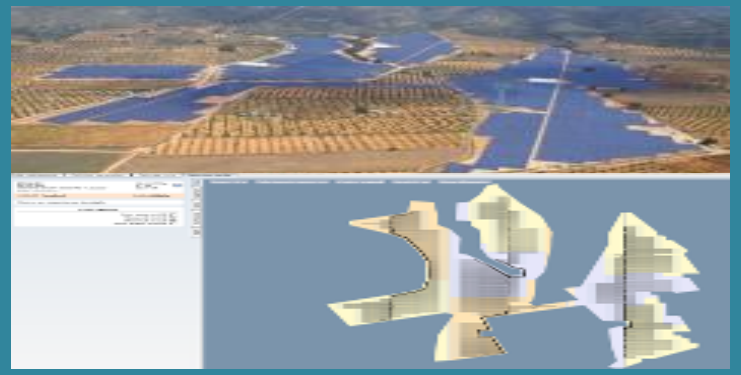
1993 – 1997 Phone Networks



1996 – 2004 Mobile Phone Networks



2009 – 2012 Layout of PV-Plants



2015 -2016 Truck Layout

2015 – 2020 Power Grids

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Optimizing the perfomance of machines

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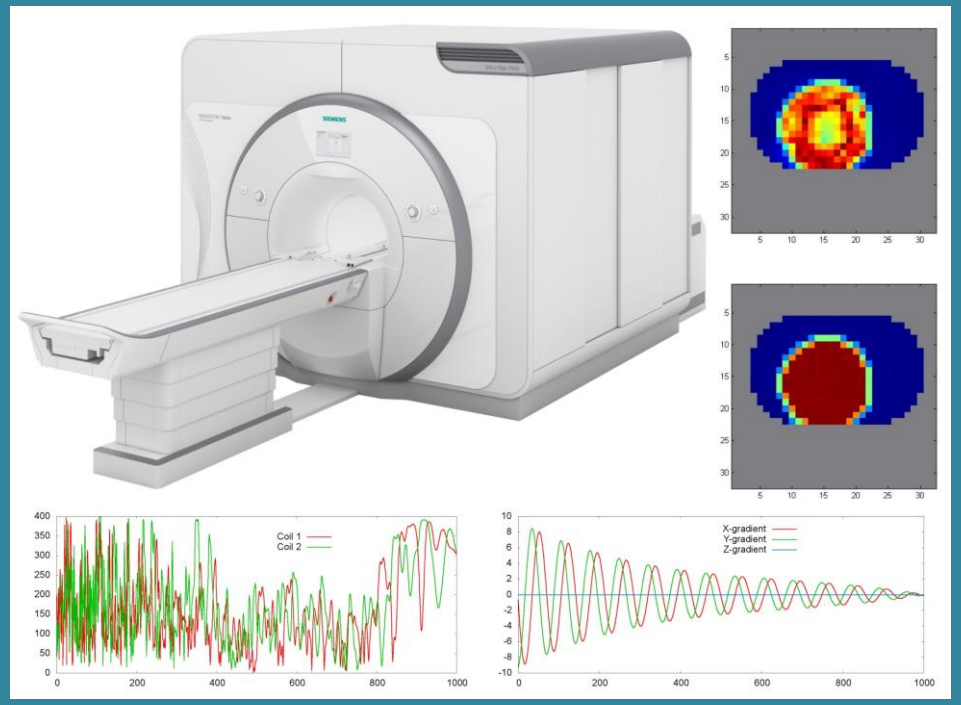

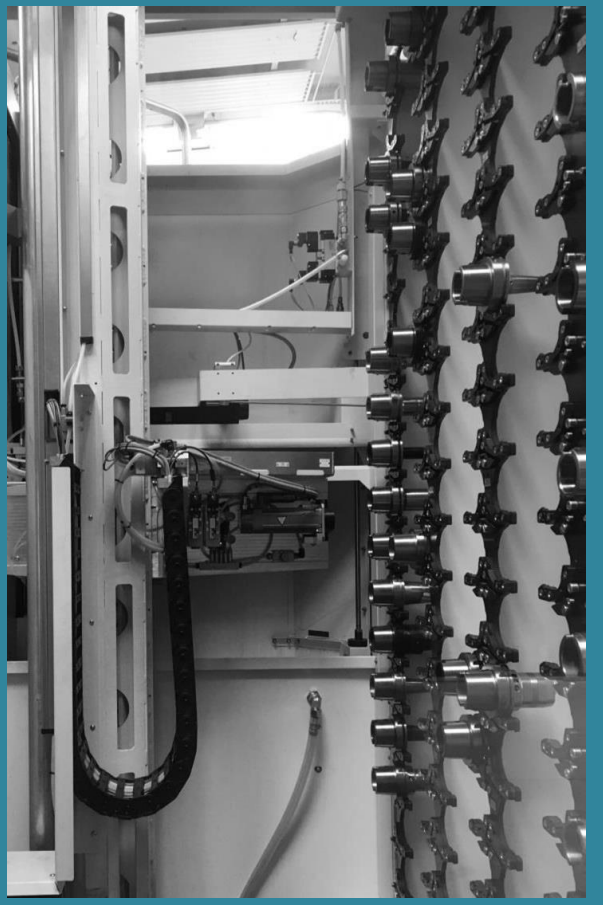

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Improving the operation in the shop floor

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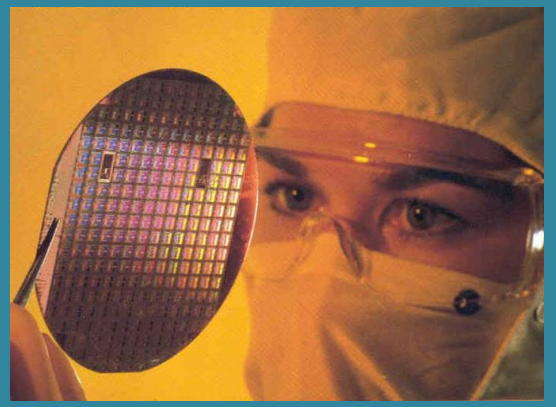

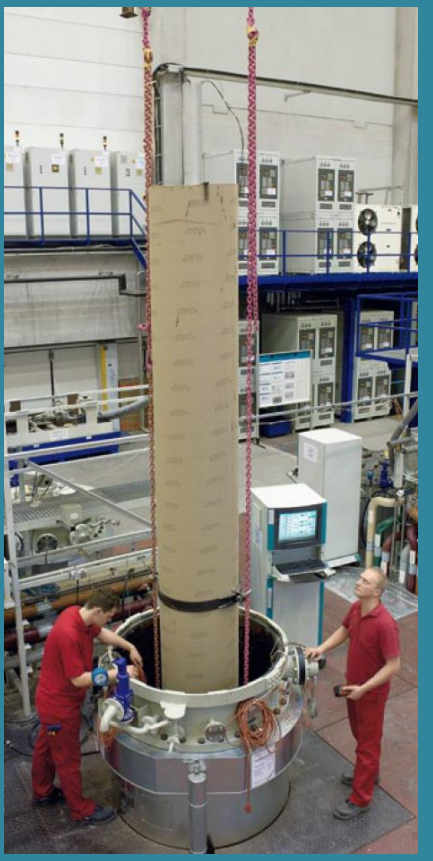

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Questions?

Join the session on the 25th September at 10:00 or 21:00 (CET)

Applying optimization in real world

applications can be fun - even in industry

Christoph Moll
Head of Research Group
Operation Research for Decision Support

Corporate Technology

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