ALPHA-Numerics GmbH
Römerstraße 32
56355 Nastätten

Request for proposal and project clarification
Mr. Tobias Best
Phone: +49 6772 969 3430
tobias.best@alpha-numerics.de

ALPHA-Numerics GmbH is a supplier and service provider in the field of CFD-supported temperature simulation.

1. We distribute the products of the manufacturer FutureFacilities as exclusive dealer and train users in the use of the software 6SigmaET. In addition, we offer a German and English language hotline for our licensed customers (Germany, Austria, Switzerland, Italy, Spain and Eastern Europe).

1. With our parallel offer for order simulations, we offer interested parties to take over the part of thermal simulation of electronic assemblies or entire devices as an extended workbench in close cooperation with your development department.
As a specialist for electronics cooling, we would be pleased to advise you on the optimisation potential in your application based on the simulation results.

Which data is required?

In order to be able to make a clean effort estimation, the first thing to do is to clearly define the task. Based on this task, the level of detail for a physically correct model can then be determined. Ultimately, the principle "only as many details as necessary" saves time and money!

If you are still in the concept phase, layout details and possibly a concrete component selection are not yet available. However, in this phase, no accuracies of +-1 K are expected from the simulation results.
Often there is a difference in effort, whether you are only interested in the temperature distribution in steady state or whether you want to see the time warm-up of clocked components with a temperature-controlled fan.

Therefore this document is structured as follows:

- Inquiry
    - technical details needed for an effort estimation
    - Variable offer and billing options

- Project start
    - Details needed according to your task
        - Concept level
        - Detailed model depending on data provision and task
    - Typical way of a service
    - Possibilities of reporting
    - Possibilities of the 3D model transfer & cost free viewer
    - Possibilities of the discussion of the results and the consultancy for optimisation

Request for quotation

**Technical details needed to estimate the costs.**
In order to get an idea of your application, we ask for a "STEP" file for each effort estimation, which contains your entire product or the specific assembly. Please send it to us by email, if it is not larger than 20 MB when zipped, or contact our support (support@alpha-numerics.de) to provide you with a customer area on our upload server. You are also welcome to provide us with a download area on your file transfer server.

NDA
To make data exchange possible, a signed NDA is often required. Please send this to tobias.best@alpha-numerics.de. We will check and return the signed NDA to you within 1 day. Please note briefly whether a signed scan with company stamp is sufficient for you, or whether you need the original by mail!

STEP-data
Please do not invest time in an anticipated simplification of CAD geometry. We can usually transfer your complex CAD data 1:1 with all chamfers, connectors, cables and mounting brackets into our simulation model without simplification, without it having a significant impact on the calculation time. It is rather cumbersome to fill the holes by hand, if screws are omitted, so that no air flows through them! Only possibly contained electronic components, which have been designed too detailed from CAD libraries, should be hidden before export:

BUT
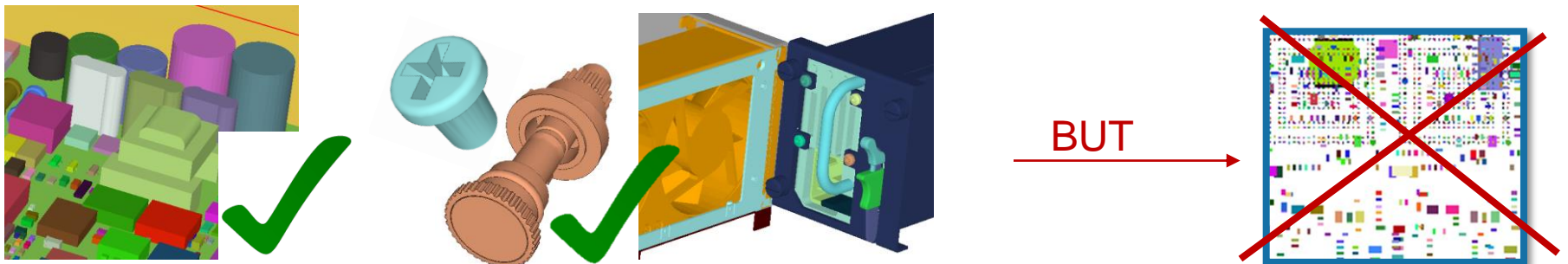
Request for quotation

Checklist – please fill out

Please fill out this checklist briefly so that we can get an idea of the task and the level of detail required for the solution in addition to the step file.

Name of project:_____

Product area:_____

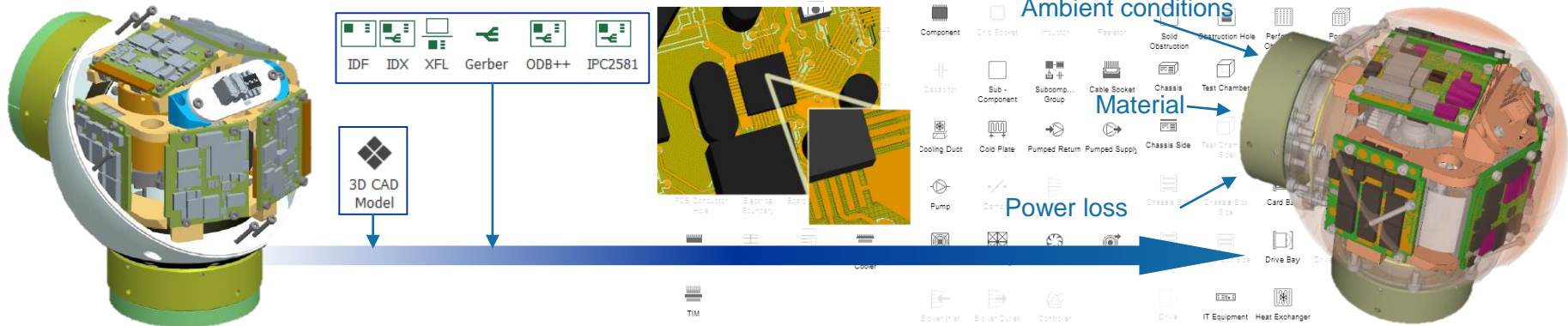|	Yes	No	Short description
Interested in the steady state?			
Time consideration desired? If yes, period, number of time steps			
With fan?			
With fluid (e.g. water) cooler?			
PCB Layout available ? ODB++, Gerber, IDF			
Amount of main power loss components			
Main components: Data sheets available?			
Short description of the surroundings (On table, outdoor, etc.)			
Special shapes: -Peltier modules, heat exchanger, energized conductor structures (Joule heating)			
Time pressure?			
Target of the simulation, Point of Interest?			

Procedure for a commissioned service

Are you a new customer?
If yes we will discuss your CAD project, already imported into 6SigmaET, with you via web meeting to clarify the data to be delivered.
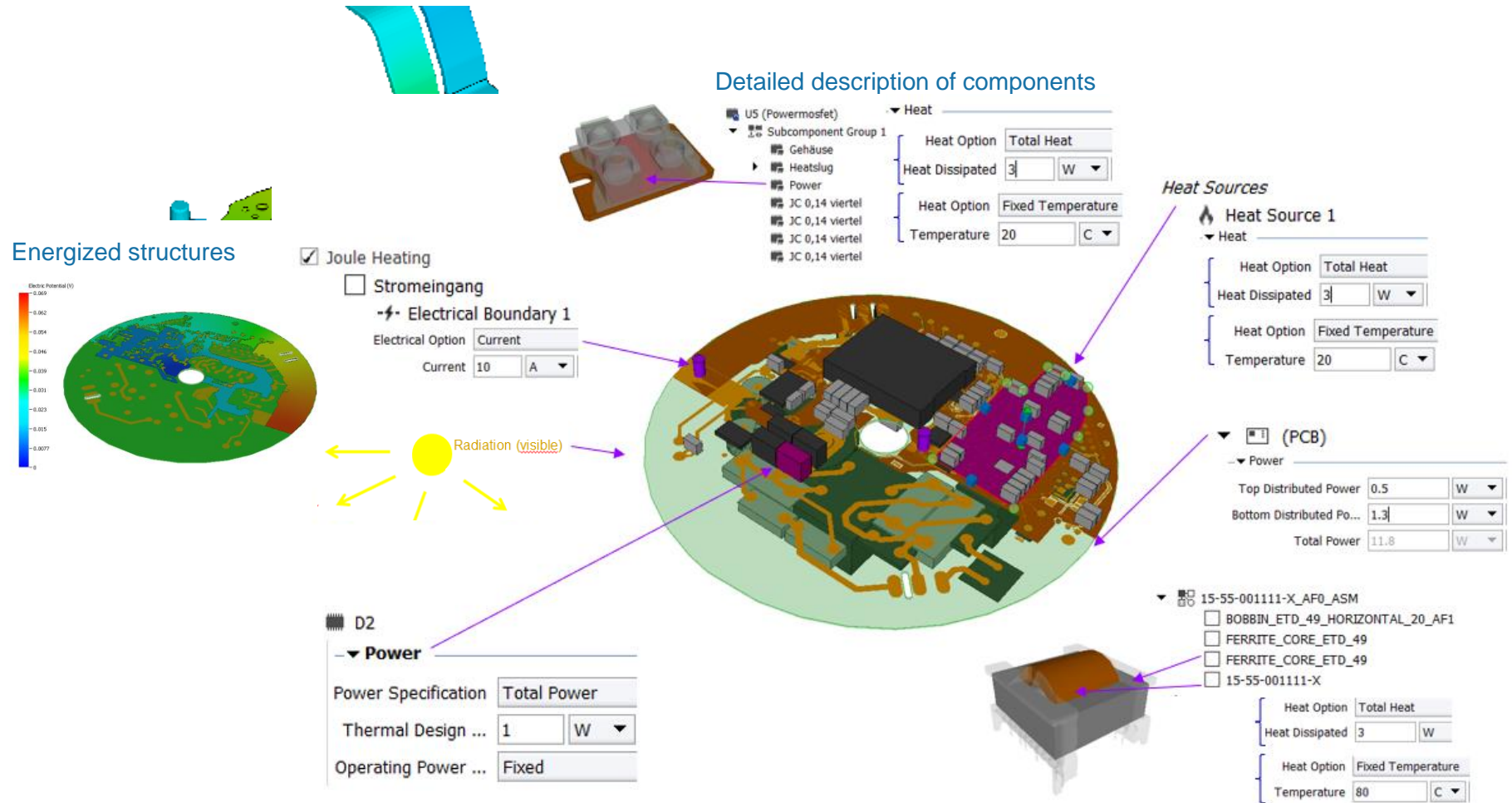
After an order the typical steps are as follows:

- After receipt of the order
  - Initial data preparation in 6SigmaET based on the information already available
  - Clarification with the customer which details are still required (checklist on next slide)
    - With new clients mostly via Web-meeting (30 min.)
    - With existing customers mostly everything is already available and one is only briefly informed via email or a telephone call about any missing information.
  - Model construction and gridding - possibly a trial simulation.
    - For new customers and complex tasks, we usually arrange another 30-minute web meeting in order to compare all modelled details with the task at hand. This helps to clear up misunderstandings and avoid unnecessary calculation time or even documentation work.

Possible Heat Sources

Possibilities of defining the heat sources for the simulation

Additional details for the modelling

According to the data set we received for a quotation, the task or the complexity of the CAD data must not change, otherwise a new task will be necessary.

Furthermore, additional details are requested, such as

- Material data
  - Name of the material, thermal conductivity value in W/(mK) and surface specification (blank, painted, anodized, chromated, powder coated)
  - With transient calculation also the density and specific heat
  - With Joule heating calculation also the electrical conductance (in S/M)
  - For desired contact resistances on surfaces the respective value (in K/W)
  - For paste, pad or foil the thermal resistance (in K/W) or thickness, area and thermal conductivity
  - For orthotropic materials, e.g. graphite, please specify axis-oriented thermal conductivity values

- PCB details (different levels of detail are required depending on the task)
  - PCB thickness (often not correctly reproduced in CAD)
    - Number of layers and thickness
    - %-age of copper per layer
    - Thermal Vias? Then hole diameter, thickness copper inlay and filling material in the core - position / number
  - Or simply send us all details via ODB++ data

- Component-Details
  - Data sheets?
  - Thermal resistors Junction-Case and Junction-Board
  - If available: Detailed CAD design (often for FET, IGBT or windings) Or simply left as a volume block with 10 W/(mK)? Please contact us to discuss this.

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- Fan / Blower
    - Exact model name
    - Fan geometry (Outer dimensions, hub diameter)
    - Fan curve
      or simply a fixed air flow
    - Direction of the air flow
    - Temperature controlled?
    - Altitude-based (e.g. 2.500 m above zero) with height dependant density

- Fluid-Cooler
   - Flow (in l/h)
    - Fluid values (material values, temperature at inlet)
    - Inlet - outlet marking (direction of flow)

- Current carrying conductors
    - Mark relevant structures
    - Define current, input and the routing (we could send you examples)
    - Electronic components are "no" current-carrying objects. They are thermal surrogate models!
   - Time-varying current intensity possible - Please supply as table time step/current as *.xls

- Current carrying conductors
    - For time-switched objects, please describe switching operations
      (% of maximum power over time (*.xls))
    - Desired simulation time with time steps as *.xls
    - Should relevant points in time be evaluated in 3D?

Step length = 4 s

Procedure for a commissioned service
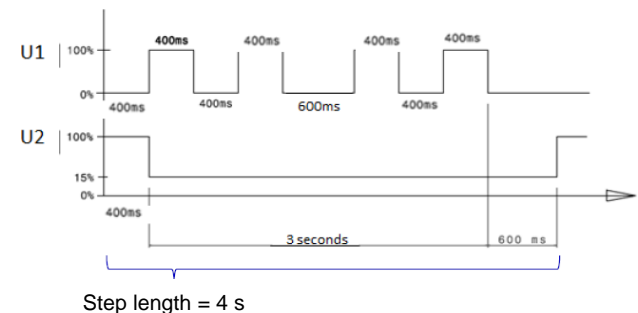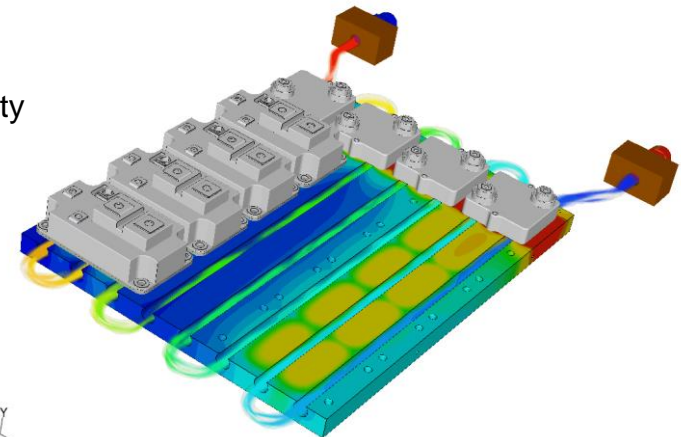
- After the modelling
    - Simulation of the heat paths in 6SigmaET
        - Heat conduction (Temperatures, Heat Fluxes, Surface temperatures)
        - Convection (Velocities, pressures, Flows at openings, Operating point for fans)
        - Heat radiation, Shadows
        - Joule heat in electrical conductors (high power applications)
   - Solar radiation (Outdoor use)
        - …and much more
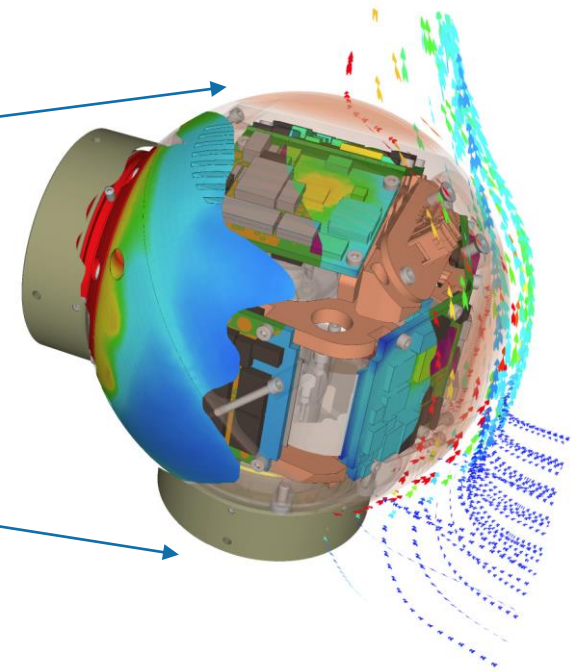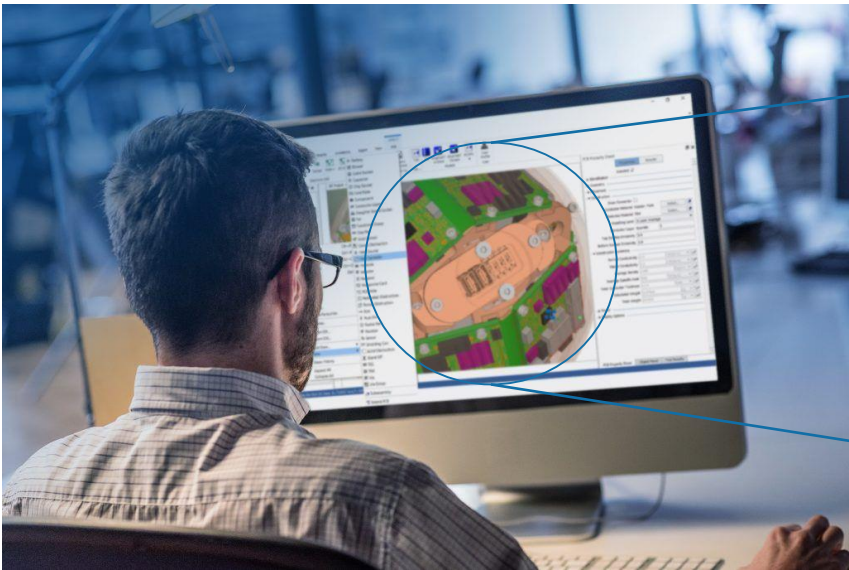
Procedure for a commissioned service

- **After the simulation**

  A report contains depending on the task:
  - Task definition
  - Protocol of the received data
  - 6SigmaET model explanation with any assumptions made (from time to time we can help with missing data)
  - Flow conditions (result levels, flow lines, flow rates, pressure drop, sensor values)
  - PCB and component temperatures (temperature tables, result layers, surface plots, heat flows as vectors)
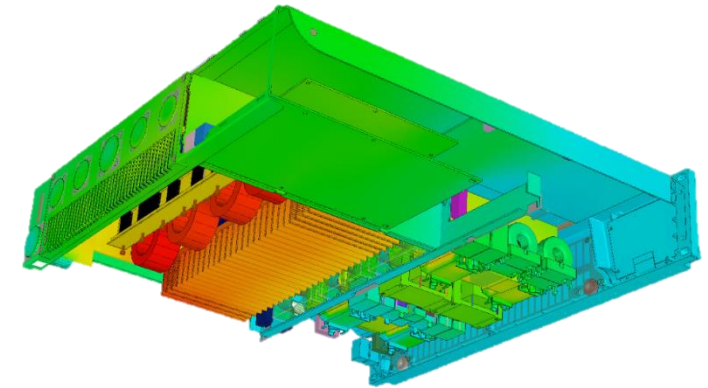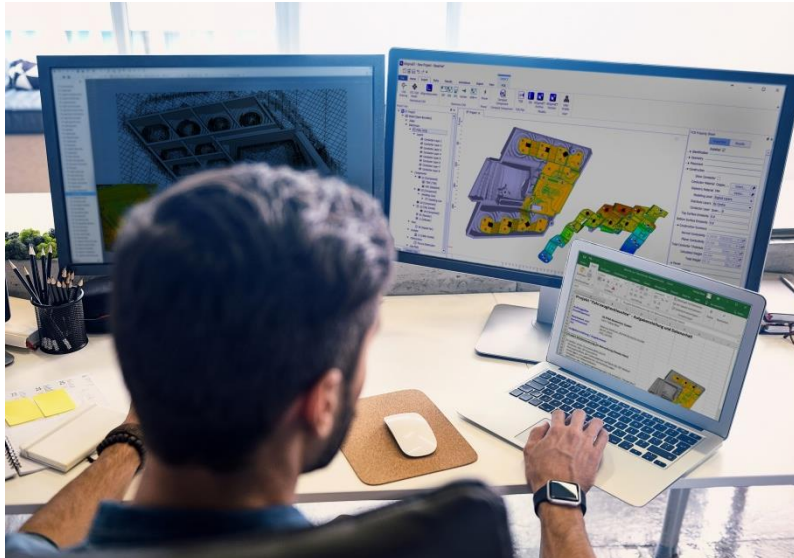
- Enclosure temperatures
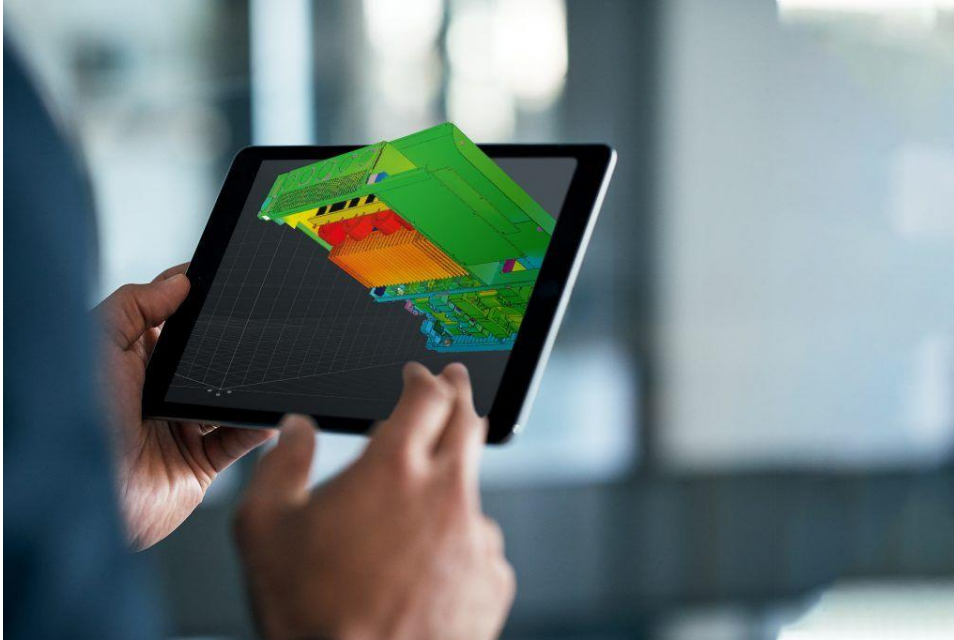- Comparison of variants
- Optimisation proposals
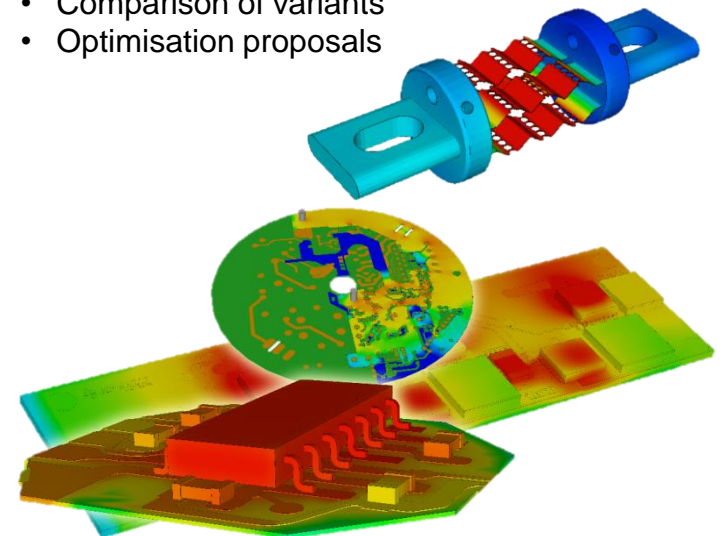
The results and the next steps
We can respond to each of our customers individually. How do we best fit into your process?

Closing
- We write the report in
  - German or in English
  - PowerPoint, Excel (graphs and tables), Word
    and deliver the report as data via Email or File-Transfer-Center

- Discussion of results
  - At your site (please mention for the offer, as travel costs will be charged)
  - Via webmeeting (usually about 1 - 1.5 h)

- Meeting-Content
  - Simulated results are explained
  - HotSpots and thermal barriers are discussed
  - Optimization potentials are identified
  - Possible variants are defined
  - Variant costs are worked out for you and offered again (much cheaper than the basic model)

- CFD-Data
  - We will also zip and send you the 3D result data from 6SigmaET
  - You will receive a free viewer with operating tutorial. So you can open and analyse the results on your own (on an adequate computer).
  - On request we also offer 6SigmaET as a 4-week free trial license with tutorials and introduction slides. (a later one-day training is recommended - price on request). After the training you would be able to perform your own variant studies. Please clarify the minimum PC requirements with us!

It is faster and cheaper than expected

Our Selling-Points

1. We can usually start within 1-3 days

2. The daily rate is not the cheapest, but due to the speed, the project simulation is usually cheaper than with any other provider

3. Usually only 2-5 days elapse between the start of the order and the delivery of results

4. Due to the number of projects / month we are "the" simulation specialists for electronics cooling in Germany!

5. As the technical hotline for license sales of 6SigmaET we put our heads into real tasks and face daily challenges

6. Known as a competence leader and speaker at various conferences

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Let us provide you a non-binding quote