Designing Electronic Products? Don't ignore heat!

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Application Engineer – InnoFour

Oct 2016 - D&E

Agenda:

- Company Overview

- Why is Electronics Cooling important?

- Product Overview

- PADS FloTHERM XT Demo

InnoFour:

- Value Added Reseller (VAR), privately owned

- Distribution throughout the Benelux and Scandinavia

- 11 persons

- Headquarter in Almelo, The Netherlands

- Offices in Denmark (near Copenhagen) and Sweden (near Stockholm)

Whom we represent?

A technology leader in electronic design automation (EDA)

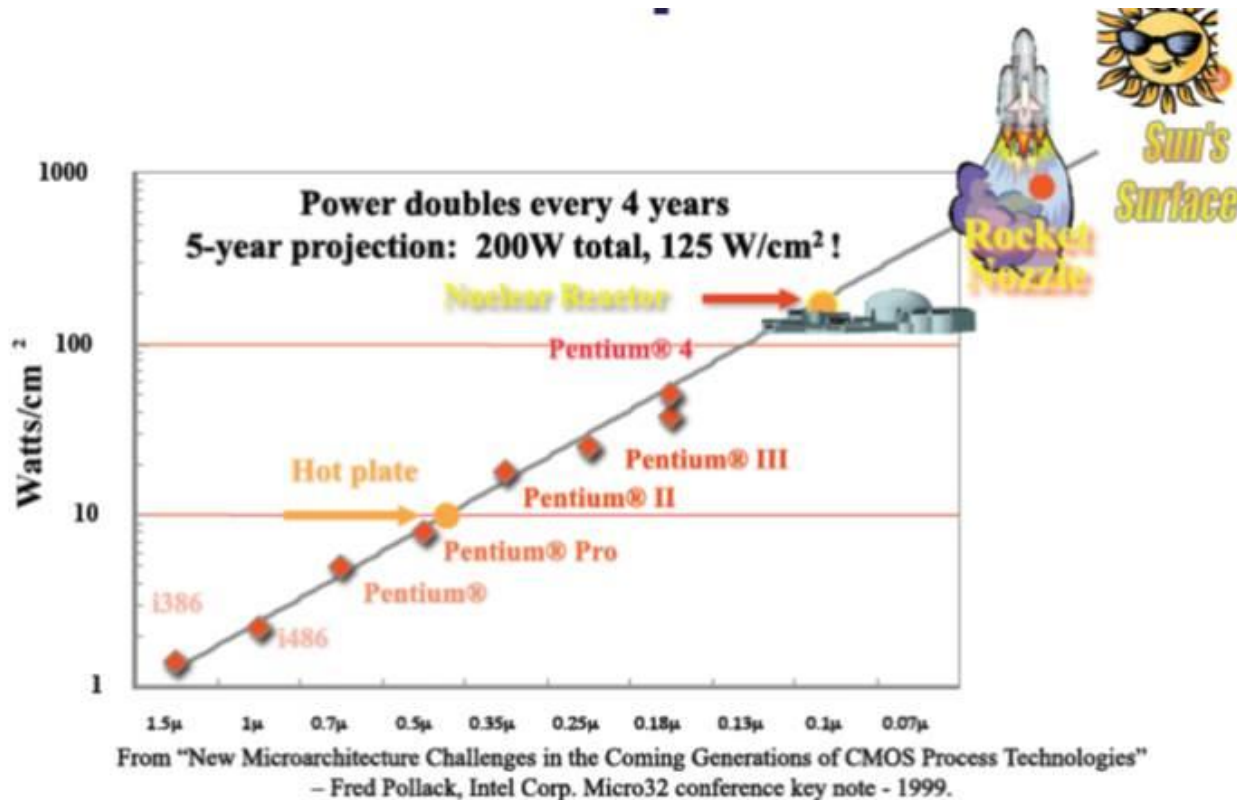Focus on helping high-tech engineering organizations automate the PCB Release Process

Product Lifecycle Management (PLM) solution

Design Failure Mode Effects Analysis (DFMEA) software dedicated to electronics

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Why is Electronics Cooling important?

Power doubles every 4 years
5-year projection: 200W total, 125 W/cm^2 !

From "New Microarchitecture Challenges in the Coming Generations of CMOS Process Technologies"
– Fred Pollack, Intel Corp. Micro32 conference key note - 1999.
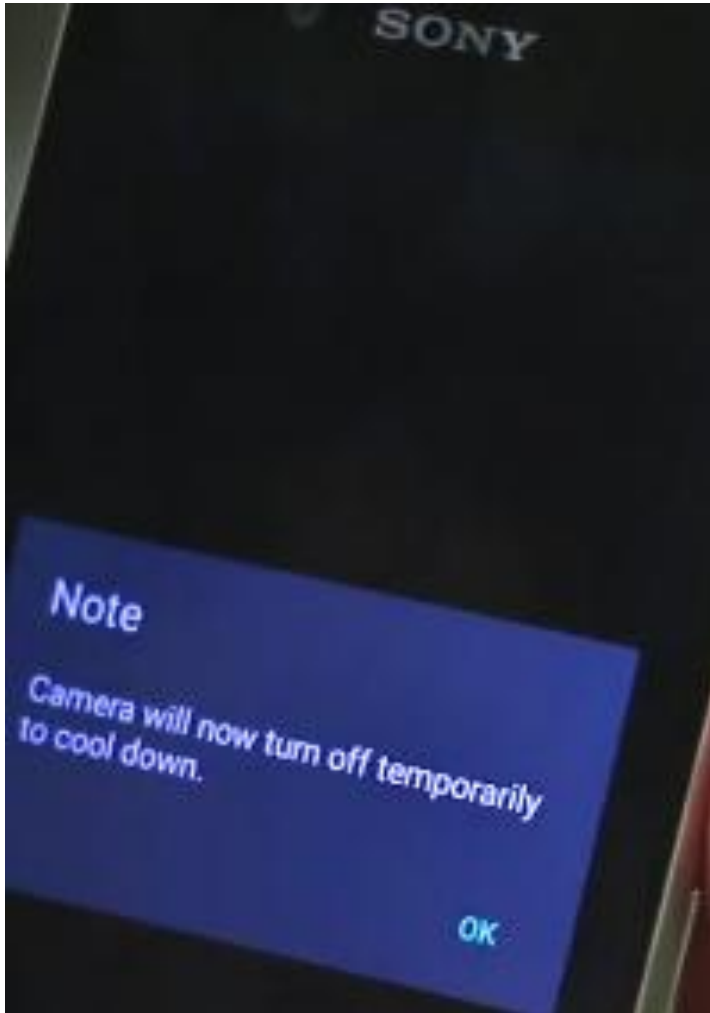
DeNSer   *Faster*   Hotter!

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Why is Electronics Cooling important?

Source: Olivier's Cell Phone, Ljubljana, 2015; https://www.thesun.co.uk/news/1772176/samsung-s7-edge-overheated-and-then-exploded-in-teachers-hands-in-the-middle-of-busy-cafe/

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Why is Electronics Cooling important?

A Study of **Electrolytic**

Ripple current (℃)

ΔT_1 = Actual internal temp raise (℃)

According to Eq.1, a 10°C temperature raise (either ambient temperature or internal temperature) will degrade the lifetime of the capacitor by 50%.

100

ΔT_1 = Actual internal temp raise (℃)

According to Eq.1, a 10°C temperature raise (either ambient temperature or internal temperature) will degrade the lifetime of the capacitor by 50%.
In order to devise an adequate cooling solution to prevent the electrolytic capacitor from overheating or even burning, the thermal designer needs to

transfer point of view, heat is exchanged between the capacitor, PCB, and the ambient air. The heat transfer modes include conduction, convection, and radiation.

Figure 1 (overleaf) illustrates the heat transfer mechanisms. A thermal resistance network model can also be used to represent this. Since this study was focused on a forced convection system, the effect of heat radiation is ignored because it has very little
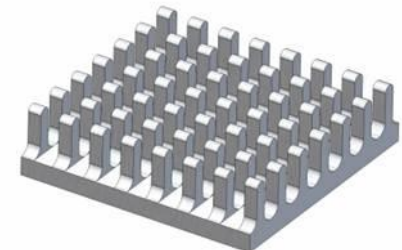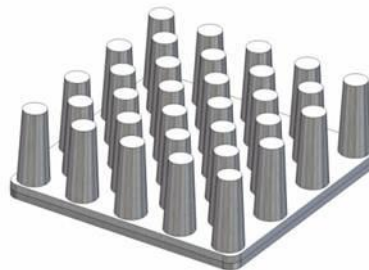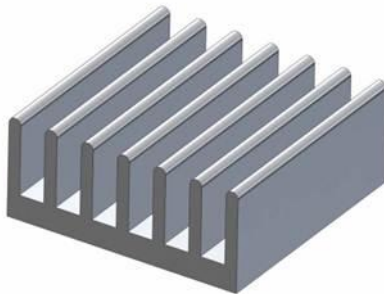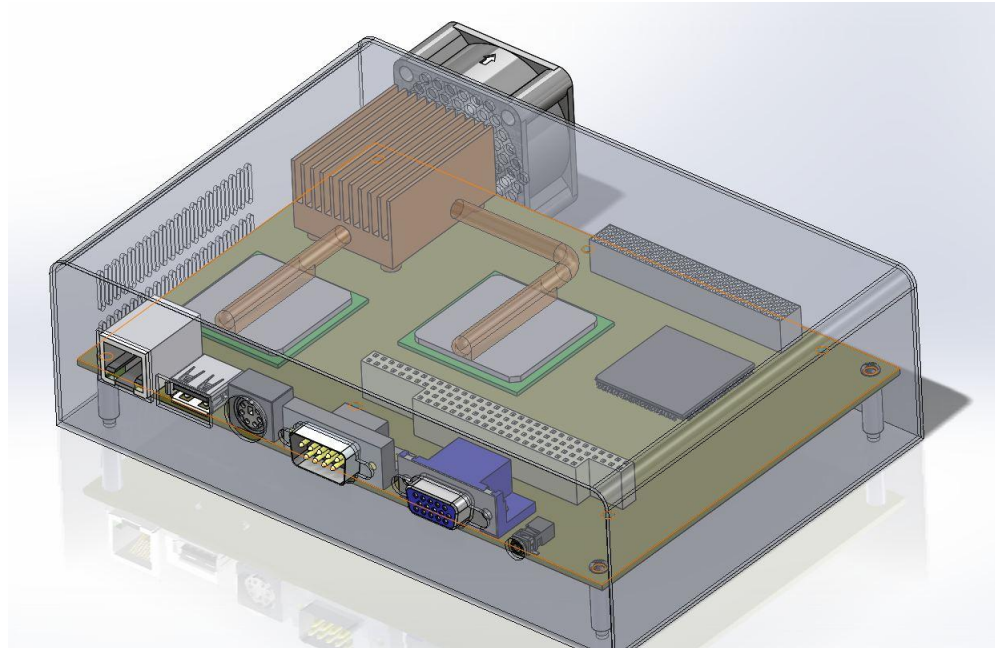
Source: Mentor Paper 47723, Solving the System-Level Thermal Management Challenges of LEDs,
Engineering Edge Volume 5 Issue 1, Page: 41

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To avoid design flaws like……
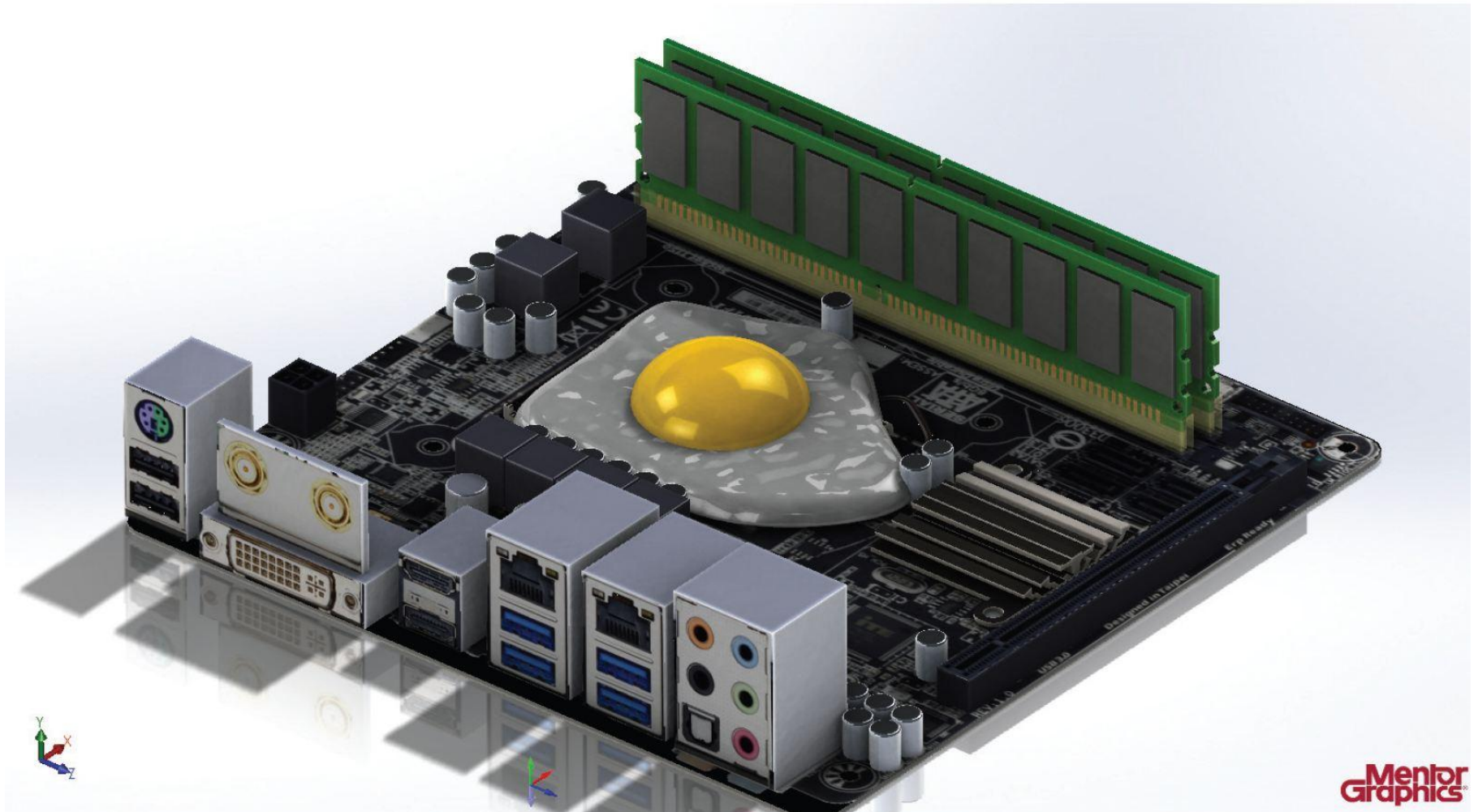
Simple Example: Which Heat Sink is the best?

What is CFD?

"Computational Fluid Dynamics or CFD is the analysis of systems involving fluid flow, heat transfer and associated phenomena, such as chemical reactions by means of computer-based simulation"*

Source: *Versteeg, H. K. and Malalasekera, W. (2007). An Introduction to Computational Fluid Dynamics, 2nd Edition, Pearson Prentice Hall

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Word of Wisdom

"No one believes an analysis,
except the one who made it."*

"Everyone believes an experiment,
except the one who made it."*

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Product Portfolio

- **Thermal Design of Electronics**
  - FloTHERM - Market leading software for optimizing airflow, temperature distribution and contamination control in and around electronics equipment.
  - FloTHERM XT – Next generation electronics cooling simulation tool.

- **Engineering Fluid Dynamics**
  - FloEFD – is a general-purpose 3D-CFD code that is fully embedded within major MCAD systems.

- **1D System Level Analysis**
  - Flowmaster – 1D Thermo-Fluid CFD for Aero, Auto, Process and Power Generation Industries.

- **Building Heating & Ventilation**
  - Market leading software for optimizing airflow, temperature distribution and contamination control in and around buildings and HVAC equipment

- **Thermal Transient Tester**
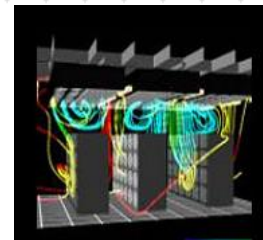 - T3Ster – a hardware measurement product for the thermal characterisation of semiconductor devices.
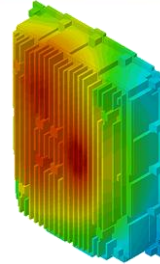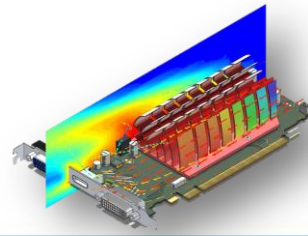
FloTHERM

FloEFD
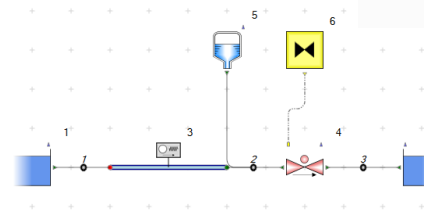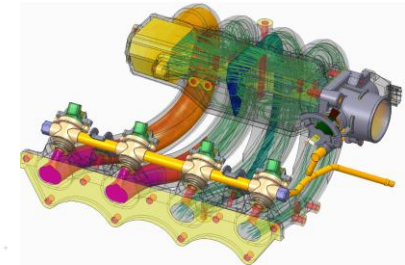
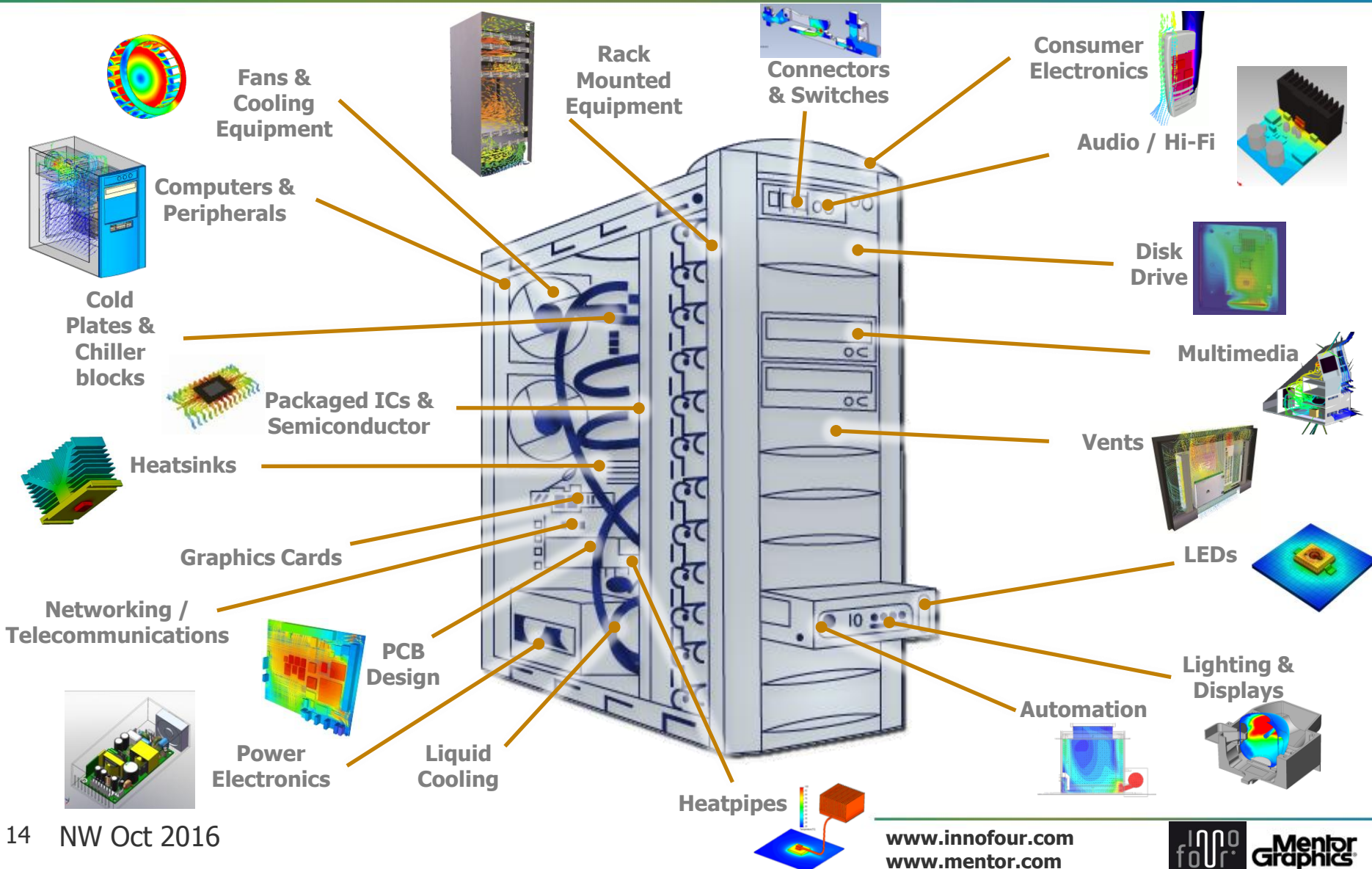**Flowmaster**

FloVENT

T3Ster

PADS FloTHERM XT: Some Key Features

- Full 3D CFD solver for flow and heat transfer including radiation.

- Fully integrated with 3D CAD Functionality for creating and importing models.

- SmartParts for quick set up of Electronics focussed applications.

- Drag and drop library functionality for parts and properties.

- Import ECAD data (pushed from within PADS)

Typical Applications

Fans & Cooling Equipment

Rack Mounted Equipment

Connectors & Switches

Consumer Electronics

Audio / Hi-Fi

Computers & Peripherals

Cold Plates & Chiller blocks

Packaged ICs & Semiconductor

Heatsinks

Graphics Cards

Networking / Telecommunications

PCB Design

Power Electronics

Liquid Cooling

Heatpipes

Disk Drive

Multimedia

Vents

LEDs

Lighting & Displays

Automation

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GO TO
PADS FLOTHERM XT

Questions?