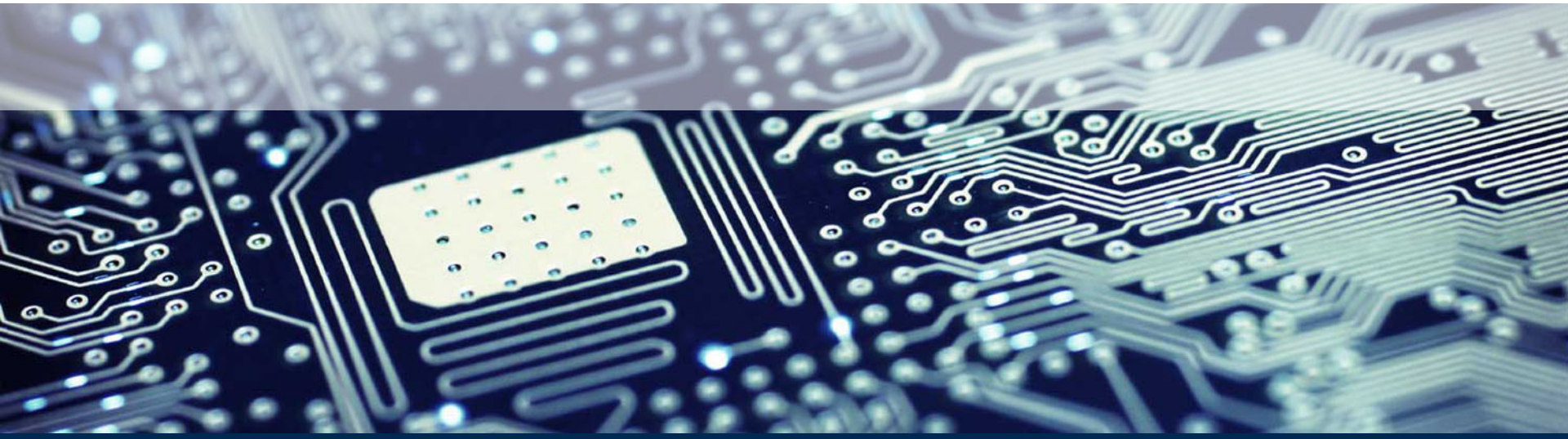


M+W Group´s Visionary Delta Datacenter

IKS Data Center Design & Engineering Conference 2014

Moscow, Russia

Region Central Europe
M+W Germany GmbH
A Company of the M+W Group
23rd April 2014

M+W Group at a Glance

EHS as core value

Over 8,500 highly skilled and experienced employees

Global presence

The leading global engineering and project company …

- more than 8,500 employees worldwide
- world class EHS records and awards
- technical expertise in process and automation

… for high-tech production facilities, mission critical infrastructure and energy & environmental solutions …

- **more than 300 successfully completed industrial turnkey projects**
- more than 200 Semiconductor Fabs realized
- more than 10 GWp Photovoltaic Fab capacity realized
- renewable energy, power plant and green building projects totaling over 22 GW of electrical energy
- **largest Data Center project in Central Europe**

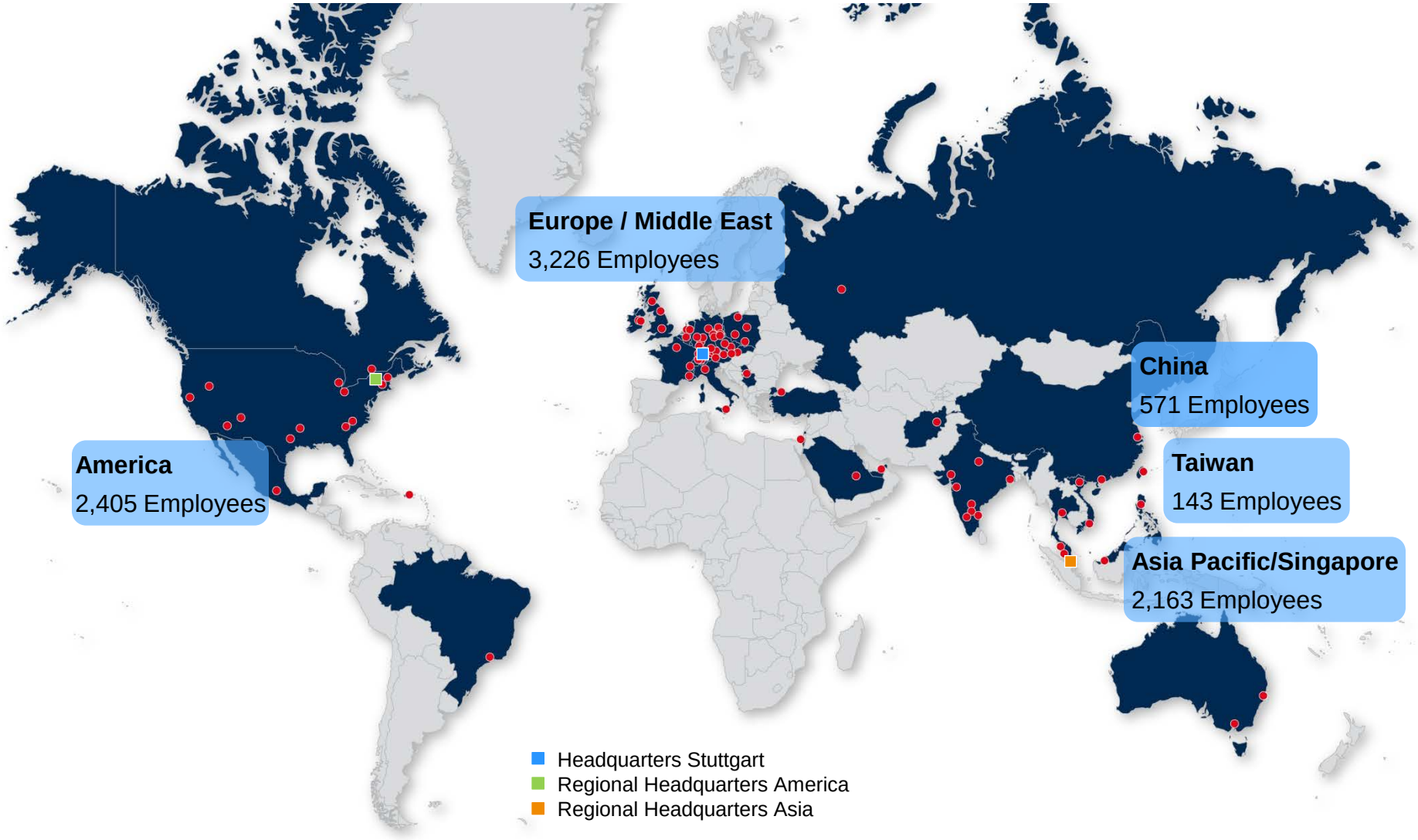
…committed to deliver customer value

Proven capability to manage complex projects

Energy-efficient & environmentally friendly solutions

Integrated solutions focused on customer value

Locations



Employees Status: Dec.31, 2013

M+W Group in Russia

- Leading engineering and construction company for high technology facilities and critical infrastructure in **Russia since 1985**
- Strategic Office location in Moscow
  - More than **70 full time employees** of all engineering disciplines
- M+W Group Russia as a partner from early project phases onwards
  - **Consulting** to develop realization strategies, define legal aspects, get acquainted with local rules, norms and regulations
  - Project initial **concept** development including the initial budget estimation
  - Choice of optimal **site location** considering the project specifics
  - Assistance in **approval** and getting necessary permissions from local authorities beginning from initial project stage through the whole project



M+W Group Portfolio

Semiconductor

Photovoltaics

Life Science

Science & Research

IT & Telecom

Space & Security

Renewable Energy

Green Buildings

Energy

M+W Group Data Center Scope of Services

M+W GROUP

Consulting Services, Evaluation, Programming	Planning and Design	Construction Management and Build	Facilities Services / Maintenance Operation
■ Site Selection ■ Datacenter Audits ■ Feasibility Studies ■ Technology Workshop ■ Flow Simulation (CFD) ■ Conceptual Design Studies	■ Preliminary Design ■ Detail and Final Design ■ Permits / Environmental Compliance ■ Value Engineering ■ TCO Calculations ■ PUE Calculations	■ Project Management ■ Procurement ■ General Contracting ■ Safety Management ■ Time Management ■ Cost Control ■ Start Up ■ Commissioning + Test	■ Maintenance of Technical Building Systems ■ Energy Management ■ Infrastructure Services ■ Commercial Services ■ Security Services

From Consultancy to Turnkey Solutions based on Client's specific requirements

M+W Group Integrated Design Approach
Supporting the Client's Focus

M+W GROUP

Integrated Energy Supply Concepts

Site Infrastructure

Building & Facility Systems

Critical Power & Cooling Systems

Server / Rack Environment

Equipment & Racks

Server Technologies

M+W Group approach: From INSIDE OUT

The function, operation and shape of any Data Center is primarily driven by the IT equipment's requirements.

Delta Data Center

M+W GROUP

The concept consists of three main pillars

Fan Tower Cooling

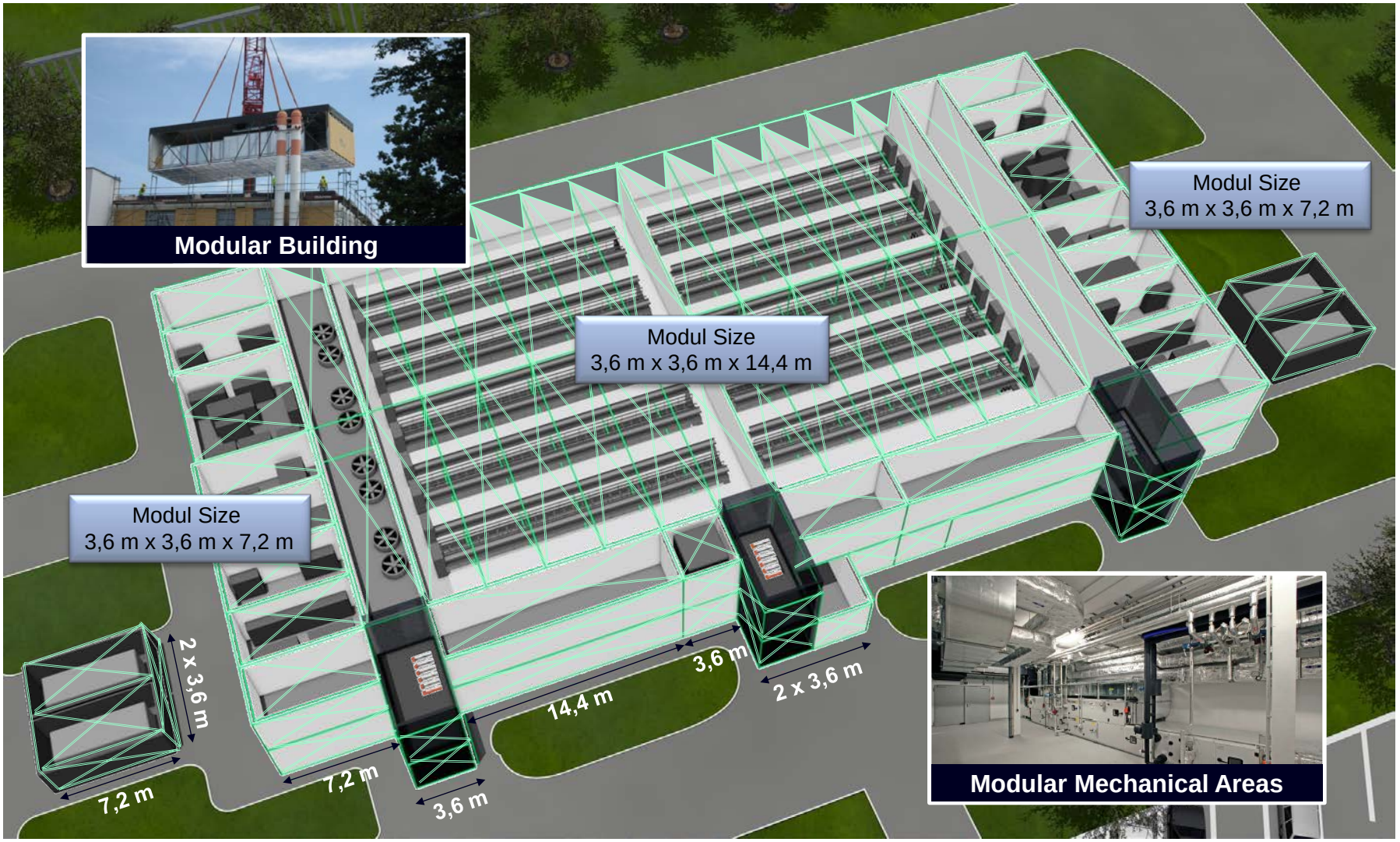
Pre-fabricated Modules

Modular Approach

Delta Data Center
Modular Construction

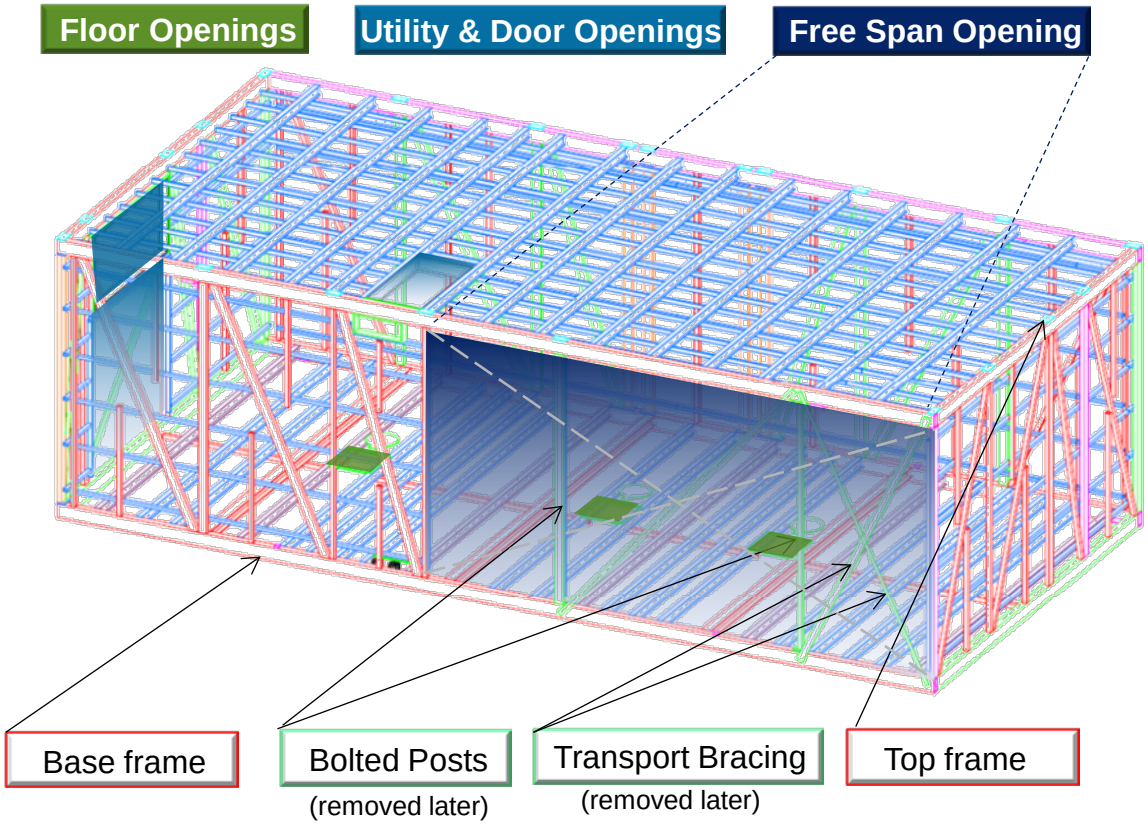
DEUTSCHER RECHENZENTRUMSPREIS 2014
1. PLATZ KATEGORIE 1: VISIONÄRE RZ-ARCHITEKTUR

M+W GROUP



Module Features

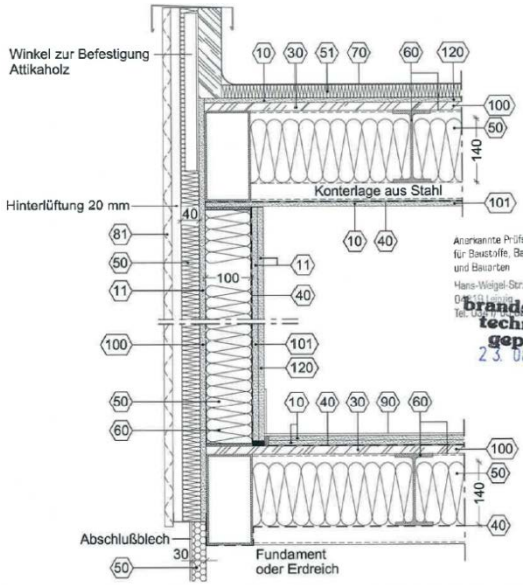
STRUCTURAL FRAMEWORK W/O CLADDING



CLADDING DETAILS

Fire Rated Wall F90 A

Top Structure & Insulation



Base Structure & Insulation

Source:ADK

- Free spanning of roof structure up to 25 m possible
- Structural specifications for transportation typically exceed load bearing specs

Structure of a Modular Unit

Why pre-fab / pre-assembly / modularization?

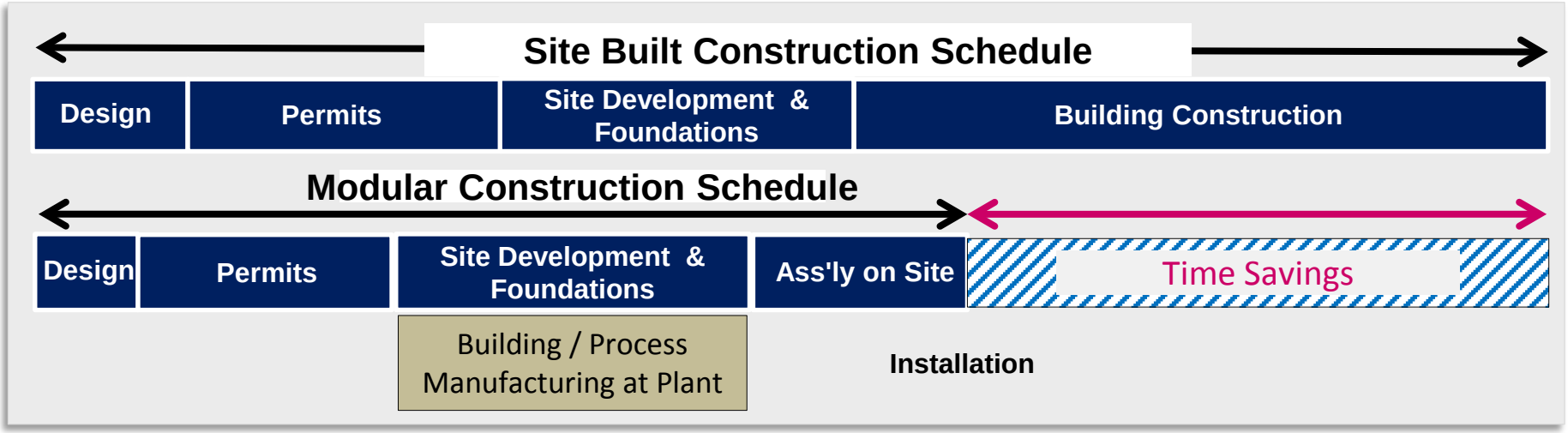
M+W GROUP

GREATER USE OF

- Off-site fabrication techniques and processes
- Pre-fabrication, Pre-assembly
- Modularization
- Pretesting and validation

FEATURES

- Faster
- Less waste
- Labor efficiency increase
- EHS improvement
- Early choice of method required!



PROMISES

- Lower project cost
- Shorter schedules
- Improved quality
- More efficient use of materials and labor

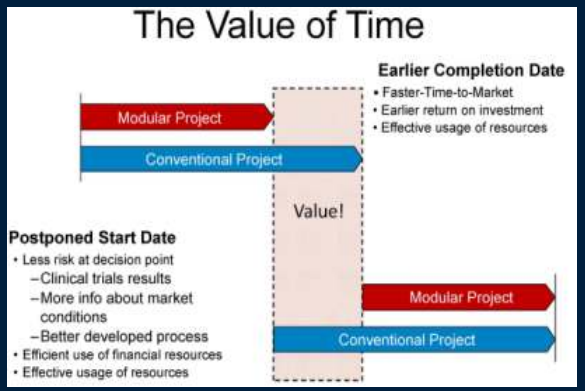
OBSTACLES

- Building codes – fire regulations
- Conventional project approach, design /construction processes and practices
- Commercial interests of locals
- Transportation issues

Modular Facility Example in Biotech -
M+W Cooperation with GE Healthcare

M+W GROUP

- Modular, pre-engineered
- Total size: 2200 m²
- Footprint: 1200 m², two floors
- cGMP-compliant facility design
- Grade C and D processing areas
- Central utilities including WFI and clean steam

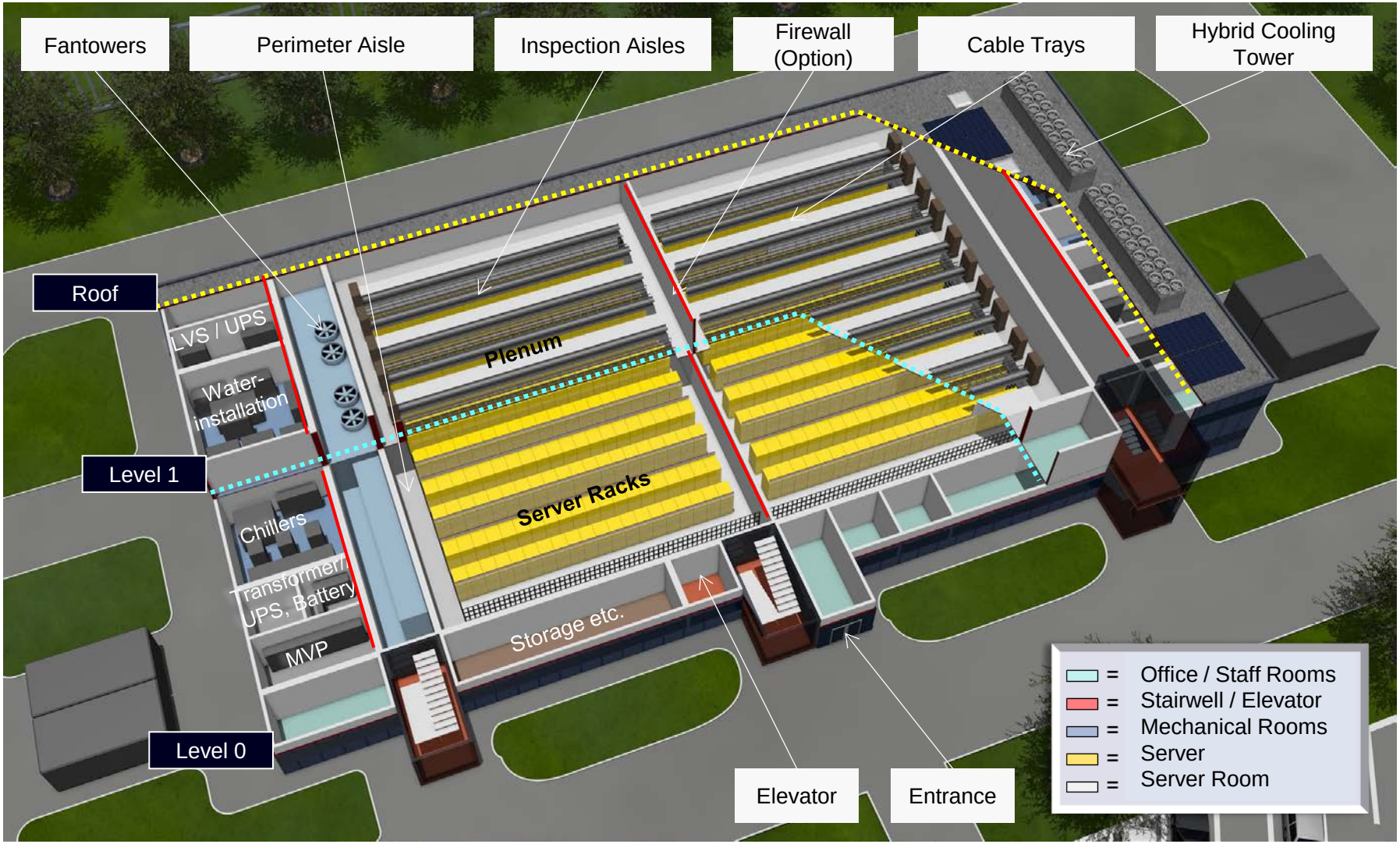


M+W Modular Facility ***KUBio GE***

Delta Data Center
Building Section Level 0 & 1

DEUTSCHER RECHENZENTRUMSPREIS 2014
1. PLATZ KATEGORIE 1: VISIONÄRE RZ-ARCHITEKTUR

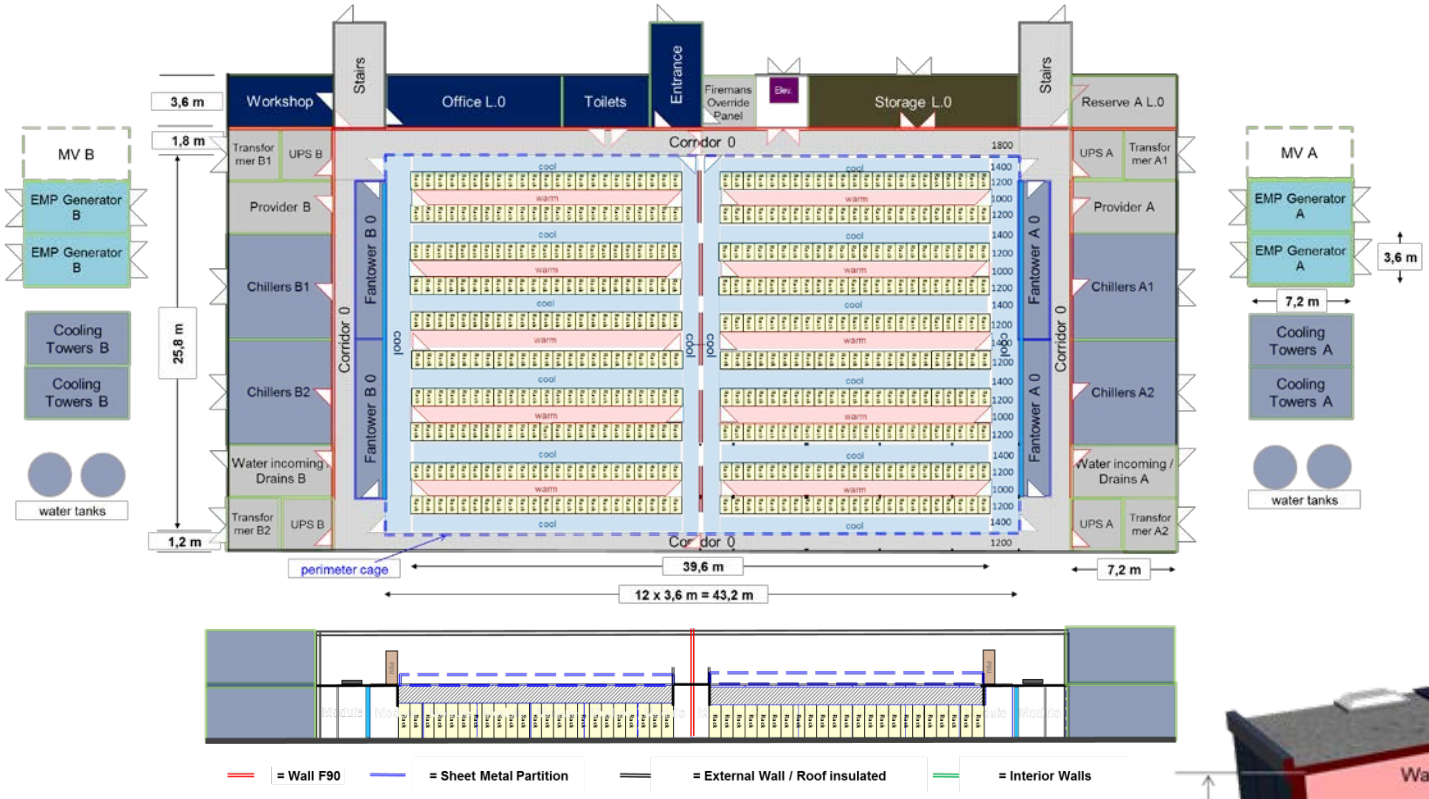
M+W GROUP

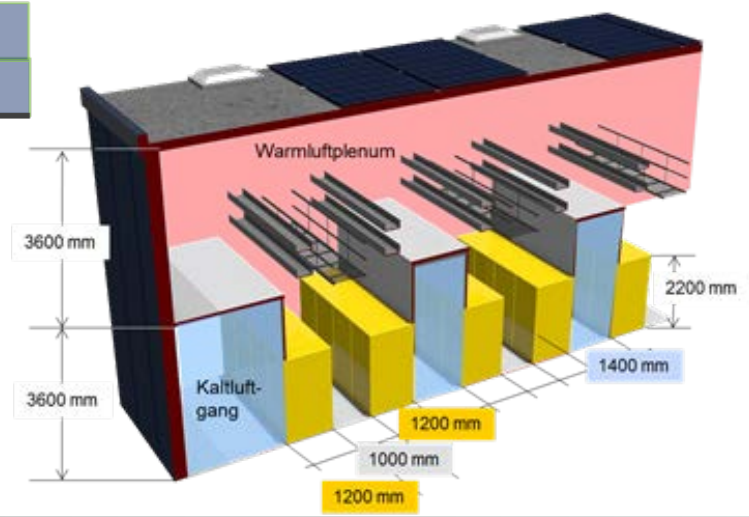


Delta Data Center Concept – Level 0 Groundfloor

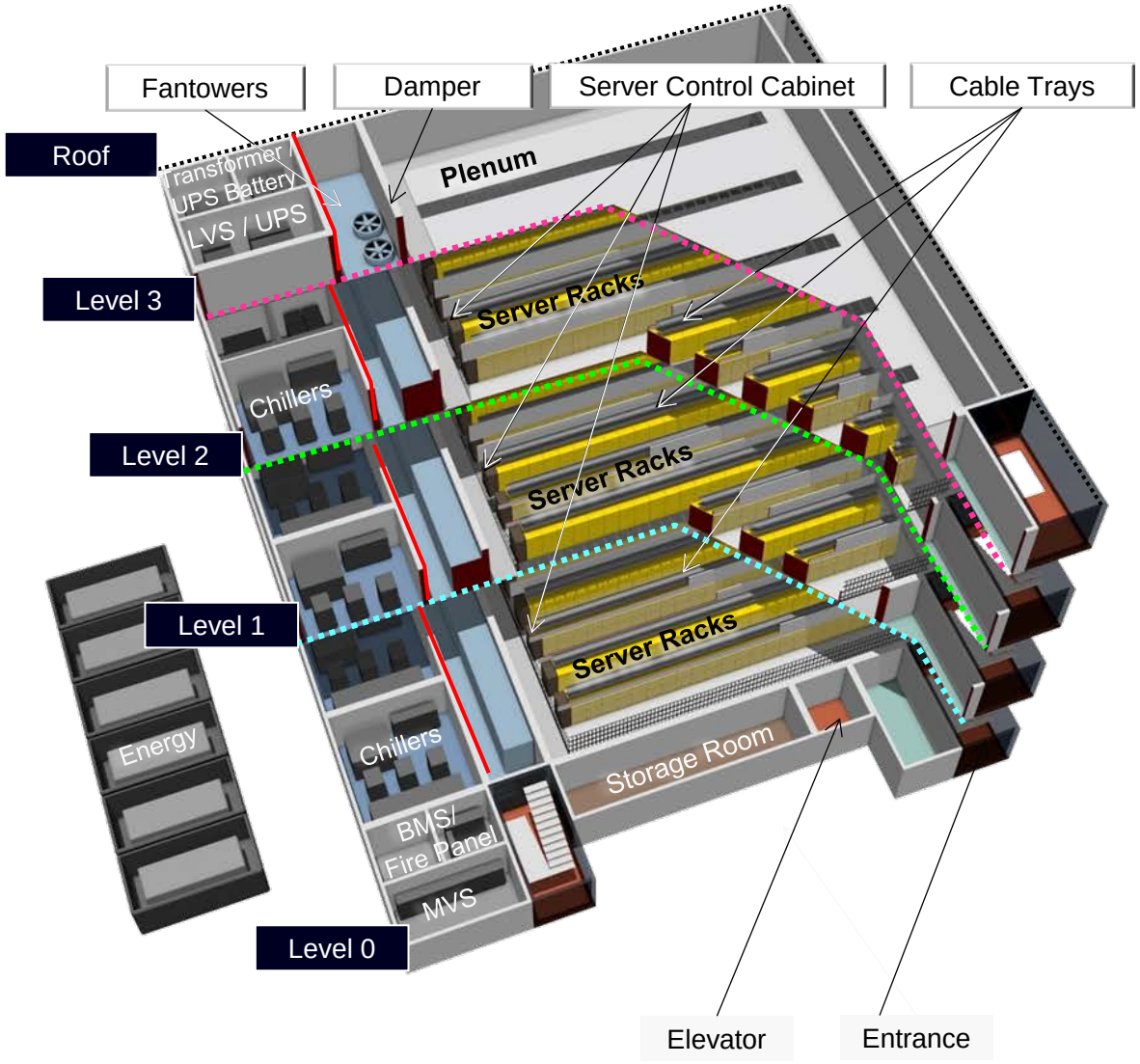
DEUTSCHER RECHENZENTRUMSPREIS 2014
1. PLATZ KATEGORIE 1: VISIONÄRE RZ-ARCHITEKTUR

M+W GROUP





Delta “Data Tower”
Distribution of identical modules on multiple levels



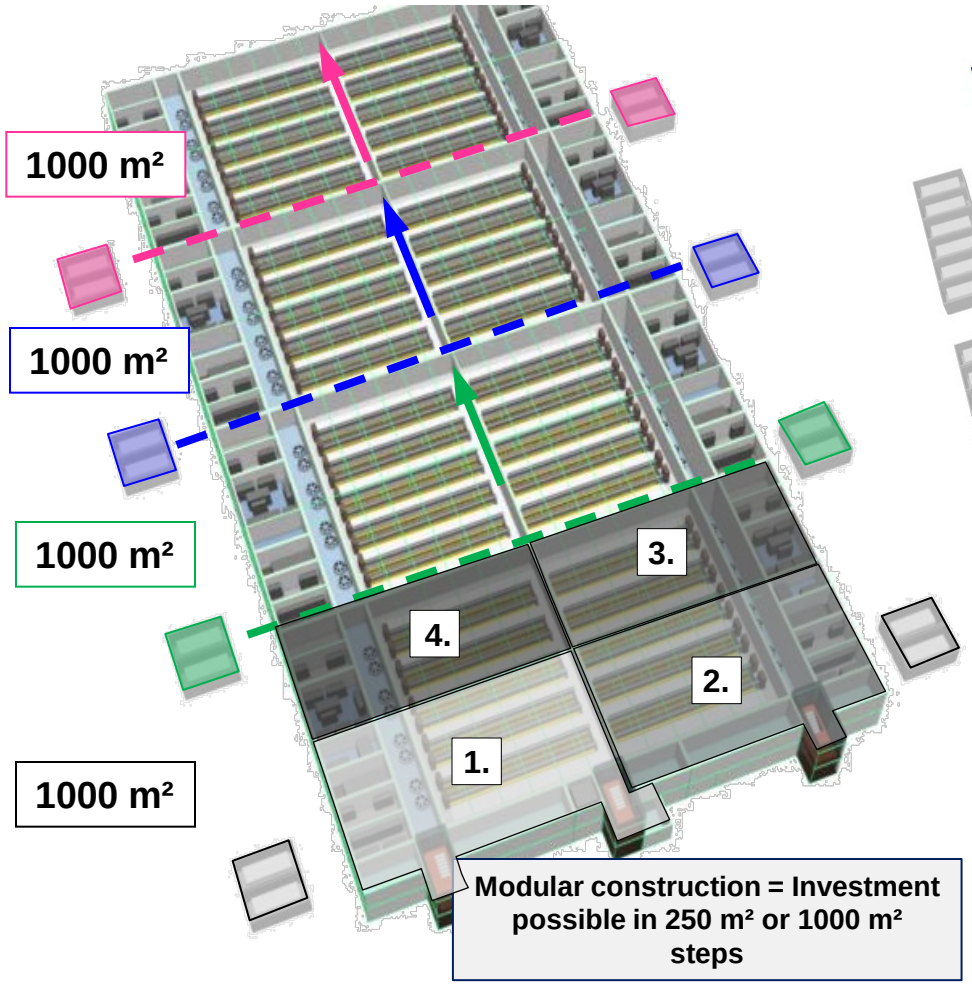
- Up to 3 Server levels
- Each level in modular construction
- Server control cabinets and cable trays aligned above the server lines
- Up to 3 levels can be supplied by one central Fantower system
- Redundancies from Fantower capacity reserves

Delta Data Center
Modular Expansion Concepts (Server areas)

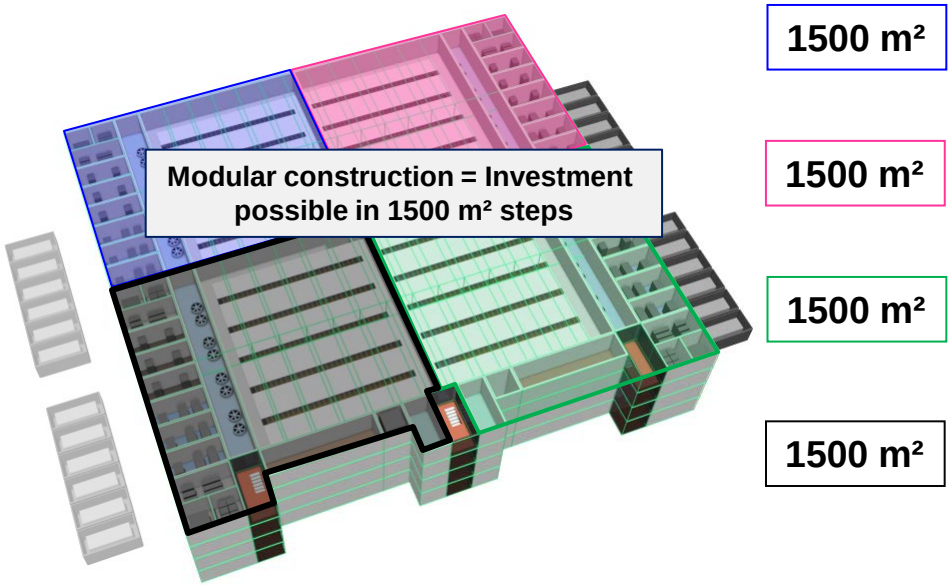
DEUTSCHER RECHENZENTRUMSPREIS 2014
1. PLATZ KATEGORIE 1: VISIONÄRE RZ-ARCHITEKTUR

M+W GROUP

1 x Server Level



3 x Server Levels

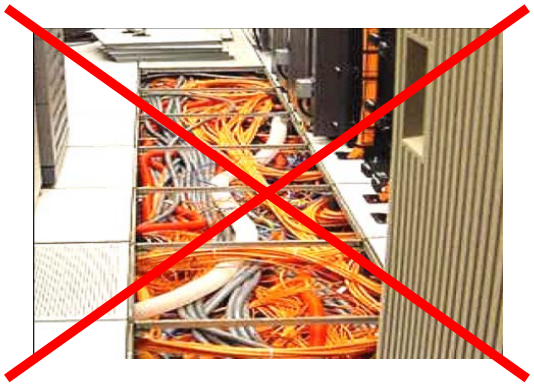


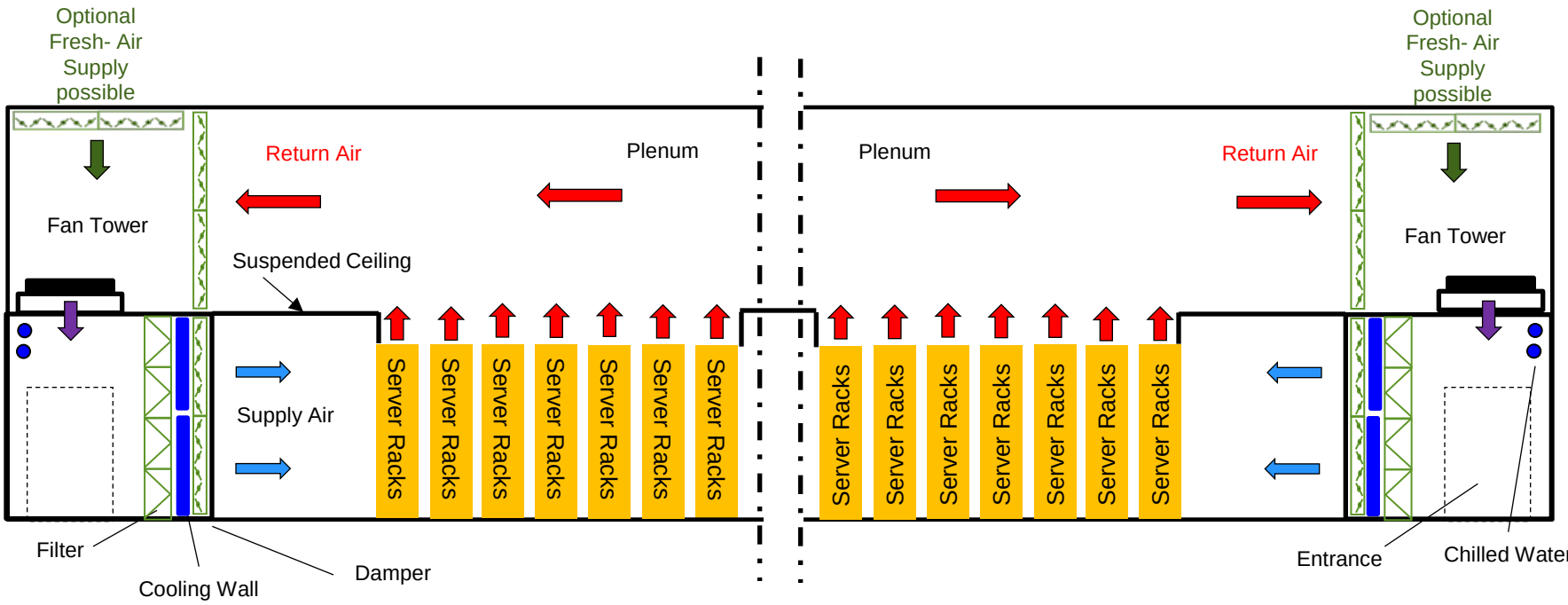
- Optimal Expansion Strategy
- Maximum Flexibility
- Smallest expansion 250 m²
- Largest Expansion 1000 m² or more
- Modular components can be installed on one or multiple levels

Delta Data Center
Cooling

M+W GROUP

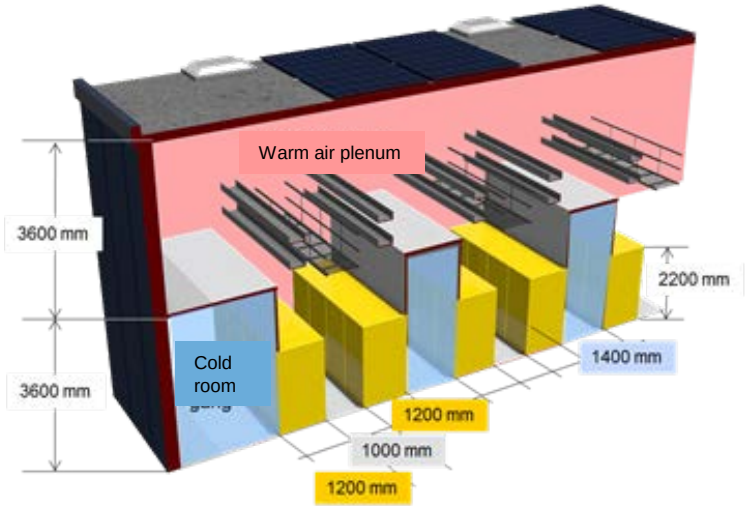
- Fan Tower – slow air supply with low pressure drop
- Cooling possible with recirculated air, mixed air or make-up air only
- Cold room principle, warm return air via plenum, no raised floor required
- No water in server rooms

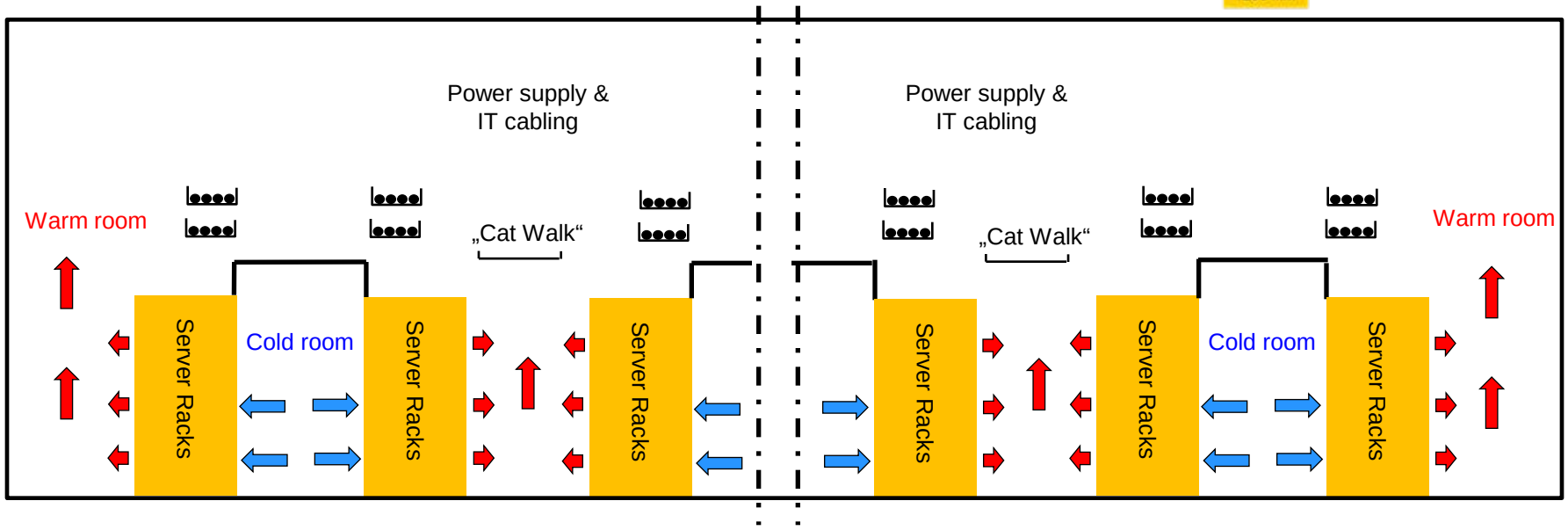




Delta Data Center
Cooling

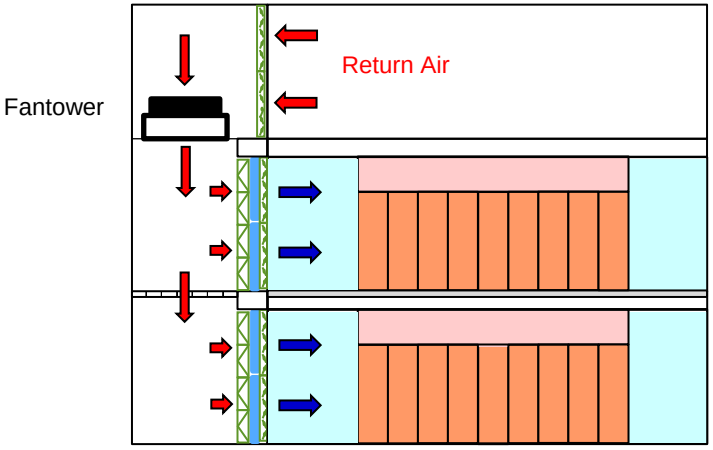
- Separate power supply (A+B) of fans per Fan Tower
- High redundancy and energy-efficient partial load operation of the fans (running redundancy), Reserve for emergency operation
- Space-saving cooling wall, very large heat exchanger areas
- Power supply and IT cabling from the top, easier reach, easy cabling, short distances



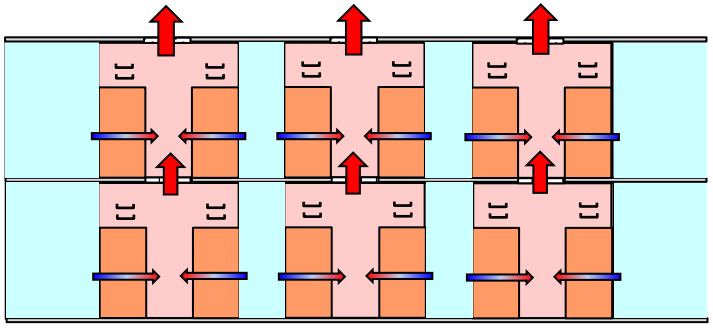


Delta Data Center
Multi-Level-Cooling

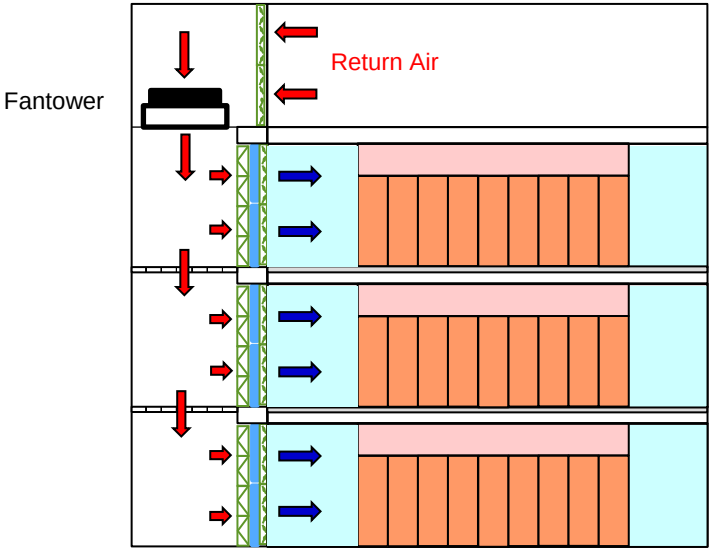
- Up to 3 Server levels possible per Fantower System
- Air velocity max 2,5m/s on 3rd level



2 Leverls

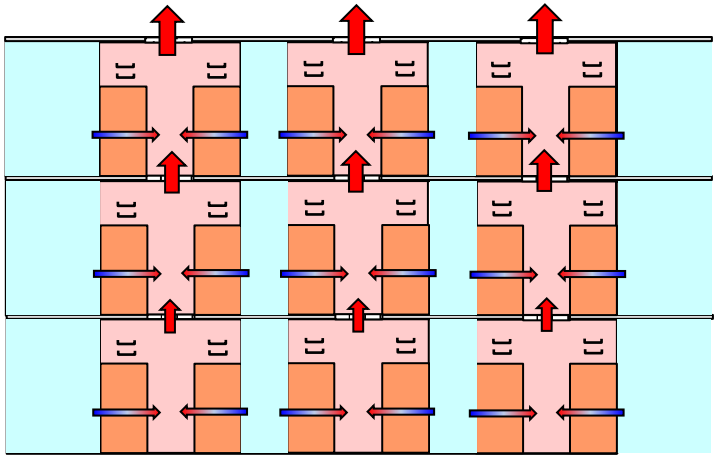


Lateral Views



3 Levels

Racks
Frontal Views

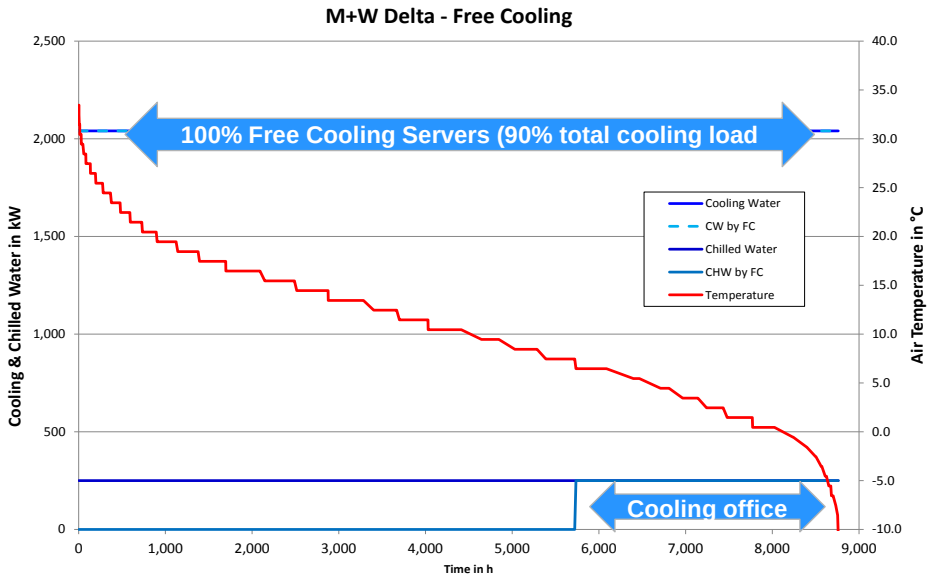


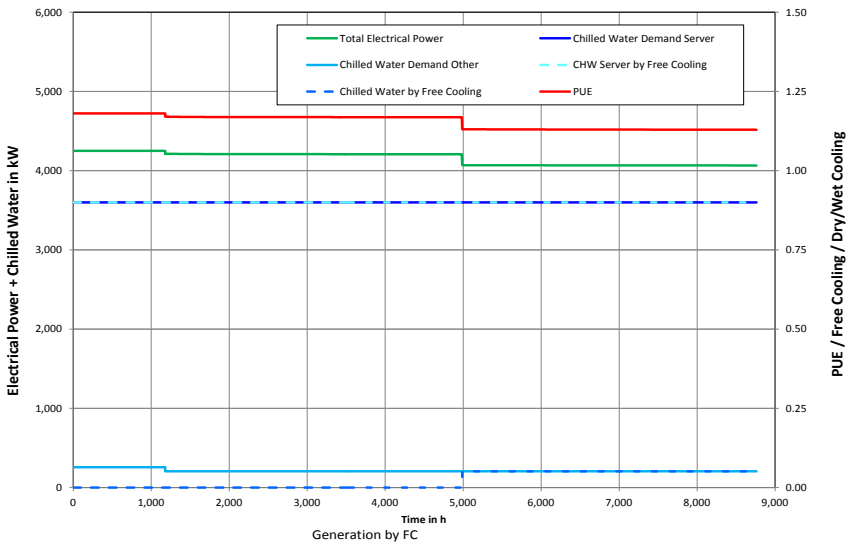
Delta Data Center
Chilled Water System and PUE

Total (indirect) Free Cooling Potential 93%
only 7% provided by chillers (Frankfurt, Germany)

All Year Free Cooling of the IT equipment (servers) (8,760 h/a)
Free Cooling of the remaining consumers (office etc.) (appr. 3,700 h/a)

Maximum PUE = 1.20 **Average PUE = 1.15**
→(incl. cooling of the office areas (human climate)!





Summary

Modular Construction + **Fantower System** + **Prefabricated building**

Saves time and reduces costs	No water in the server room	Less installed chiller capacity
Variable layout (1 + x floor levels)	Large coils surface, low PUE	Vertical alignment of the servers possible
Modular expansion	> 40 % surface reduction due to lower building surface	Adaptable to different climatic regions if required

=

Cost efficiency

Selected References
Currently Executed Global Data Center Projects

M+W GROUP

Khazna Data Center
United Arab Emirates
2012 - ongoing

Two Data Centers
EPC
Server Space: 2 x 2,200 m² (each extendable to 6,600 m²)

- Largest commercial whole-sale Data Center in the GCC
- Two sites of same kind and size erected simultaneously, one in Abu Dhabi and one in Dubai
- Targeting a PUE factor <1.8

T-Systems
Germany
2012 - ongoing

Two Data Centers
MEP Design Build
Server Space: 7,400 m² (1. phase) 7,200 m² (2. phase)

- Expandable per cluster (5,400 m² IT-space) consisting of three modules (3x1,800 m² IT-space)
- TIER III+ state of the art Data Center (Electrical: 2N and Mechanical: N+1 topology)
- Targeting a LEED Gold rating with a PUE factor <1.3

Global Switch
Australia
2012 - ongoing

IT Data Center
Design + Build (incl. Fit out, Test + Commission)
Technical Space: 12,500 m²

- 6-storey Data Center with gross floor area of 24,000 m²
- Targeting a LEED Gold rating with a PUE factor <1.5

Selected References
Currently Executed Global Data Center Projects

M+W GROUP

Pacnet
Singapore
2012 - ongoing

Data Center
Design + Build
Gross Floor Area: 14,000m²

- Conversion of an existing 8-storey free standing warehouse building into a Tier III Data Center with associated corporate office
- When completed, the building shall be the industry leading co-location data center in Singapore

IO
Singapore
2012 - ongoing

Data Center
EPC

- Scope of works involves the conversion of the first floor of an existing building into Data Center suites and will complete in phases as IO increases capacity
- M+W is looking at a long term partnering relationship with IO not only as their contractor but also to assist in business development

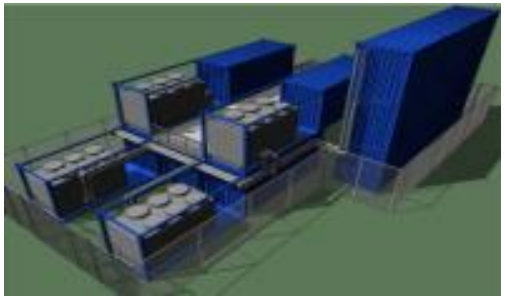
Equinix
Singapore
2012 - ongoing

Data Center
Design + Build
Expansion of Gross Floor Area: 8,000 m²

- Fifth phase of Equinix' second Singapore IBX data center (SG2), A&A works involving data processing on the 4th-storey of an existing 6th-storey building
- 920 additional cabinets (total number: 4,176 cabinets)
- Enables the provision of a high-connectivity, high-availability environment to support its customers' cloud-based services

Summary – Our Data Center Expertise M+W Group…..

- Offers experience in the **design & construction** of **state-of-the-art** Data Centers from a **global client base** that serves **different industries**.
- Is a **technology-driven** company that tracks and implements **new Data Center trends** and **technology innovations into customized solutions** for its clients.
- Is focused on **increasing the overall energy efficiency** of Data Centers such as implementation of **sustainable energy sources**.
- Uses **copy smart concepts** with focus on **modularity and scalability.**
- Provides **fully integrated project services** from consulting through design and construction to technical 24/7 facility management.
- Executes **fast-track projects** by “over-lapping” the design and construction activities, thereby reducing the overall duration of greenfield projects.

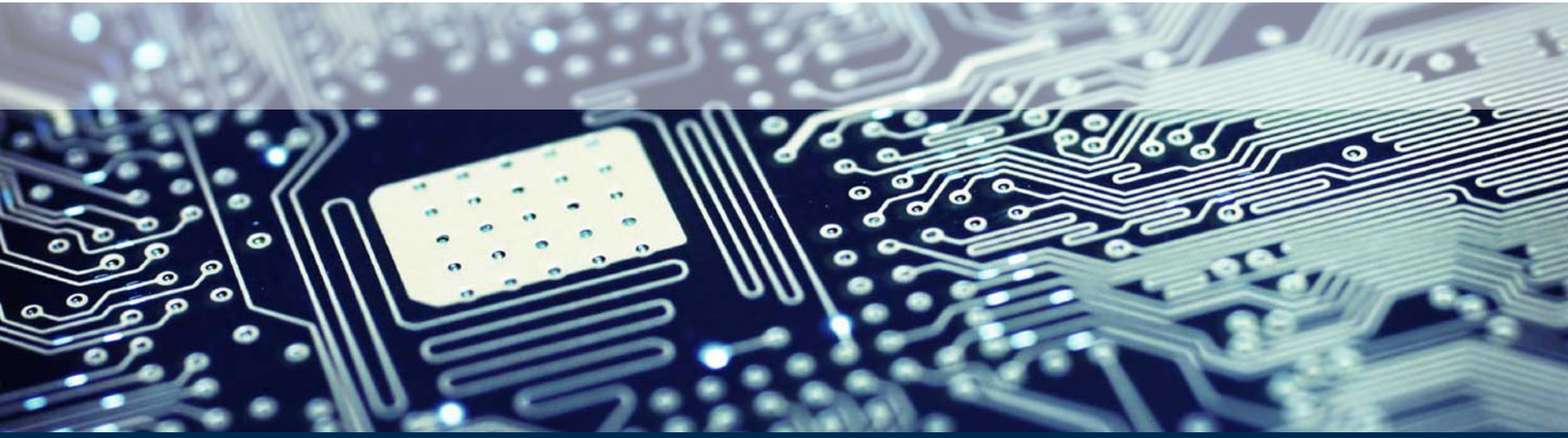

Member of

BITKOM

the green grid member

EUROPEAN DATA CENTRE ASSOCIATION

M+W GROUP



Contact:

Region Central Europe
M+W Germany GmbH – A Company of the M+W Group

Malte Matthies
Head of Business Development IT & Telecom

Lotterbergstraße 30
70499 Stuttgart
Germany

Email: malte.matthies@mwgroup.net

We stand for **reliability** and **long-term relationship**