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THE POWER OF EXCELLENCE

The Road to a PUE of 1.2 in Israel

Emerson Network Power is now Vertiv

Liebert.

נעים להכיר

- יגאל שניידר
- B.Sc.EE (Cum laude) , MBA, University of Southern California
- ATD Uptime Institute

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הוא השתגע לגמרי...

Need Verification?

- Eurovent

- Factory Witness Test

- Real-World Commissioning

Datacenter Objectives

Business Continuity

TCO
(CAPEX + OPEX)

Agility

ALEXANDER SCHNEIDER IT

Annual Datacenter Electricity Bill ₪

per KW IT load and PUE

	PUE 2.6	PUE 2.4	PUE 2.2	PUE 2	PUE 1.8	PUE 1.6	PUE 1.4	PUE 1.2	Over 20 Years
100KW	1,024,920	946,080	867,240	788,400	709,560	630,720	551,880	473,040	11,037,600
200KW	2,049,840	1,892,160	1,734,480	1,576,800	1,419,120	1,261,440	1,103,760	946,080	22,075,200
500KW	5,124,600	4,730,400	4,336,200	3,942,000	3,547,800	3,153,600	2,759,400	2,365,200	55,188,000
1MW	10,249,200	9,460,800	8,672,400	7,884,000	7,095,600	6,307,200	5,518,800	4,730,400	110,376,000
5MW	51,246,000	47,304,000	43,362,000	39,420,000	35,478,000	31,536,000	27,594,000	23,652,000	551,880,000

קוווט"ש = 45 אג'

Per 1MW IT: 0.1 delta in PUE = ₪400,000 /year

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$$PUE = \frac{\text{IT + Aircon + Electrical}}{\text{IT Power}}$$

$$pPUE = \frac{\text{IT + Aircon}}{\text{IT Power}}$$

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The Road to a PUE of 1.2

- Air (Hot/Cold) Containment
- Advanced Air Flow Management
- Efficient CRACs
- High CW Temperatures
- Free Cooling Chillers
- Unified Control Software

Most of the Waste is in Air-Conditioning

> No real requirement in the spec for energy efficiency

- No Containment
- Common Chiller for Datacenter & Office space
- Chilled water Temp 7-12
- No Free Cooling

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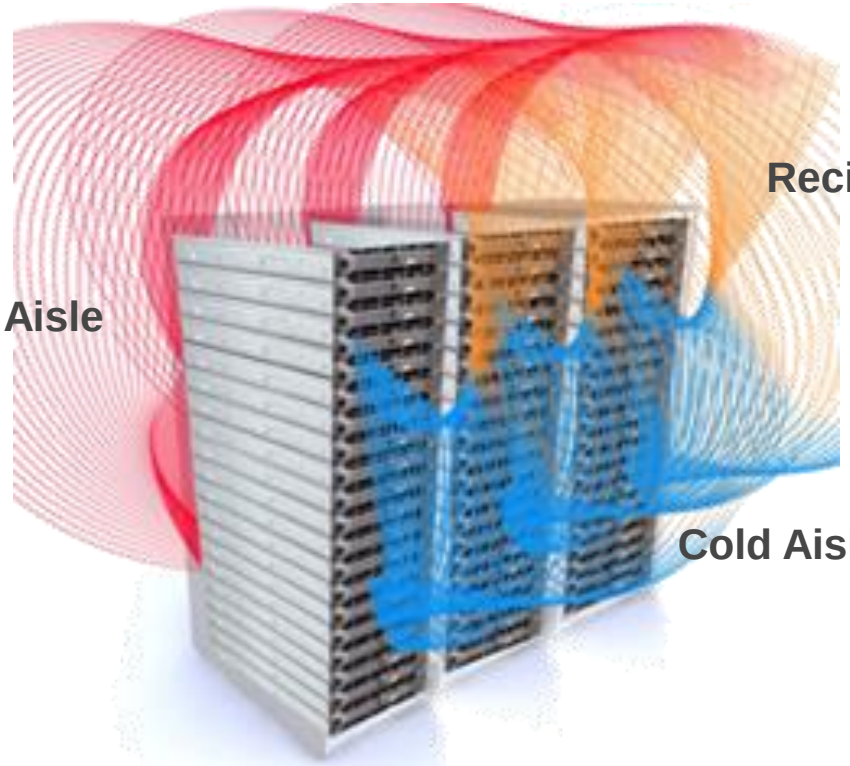
Airflow is Key



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The Road to a PUE of 1.2

Air (Hot/Cold) Containment

- Cold Aisle Containment w/ CRACs
- Cold/Hot Aisle Containment with InRow
- Hot Containment (Chimney, hot Corridor) w/ CRACs

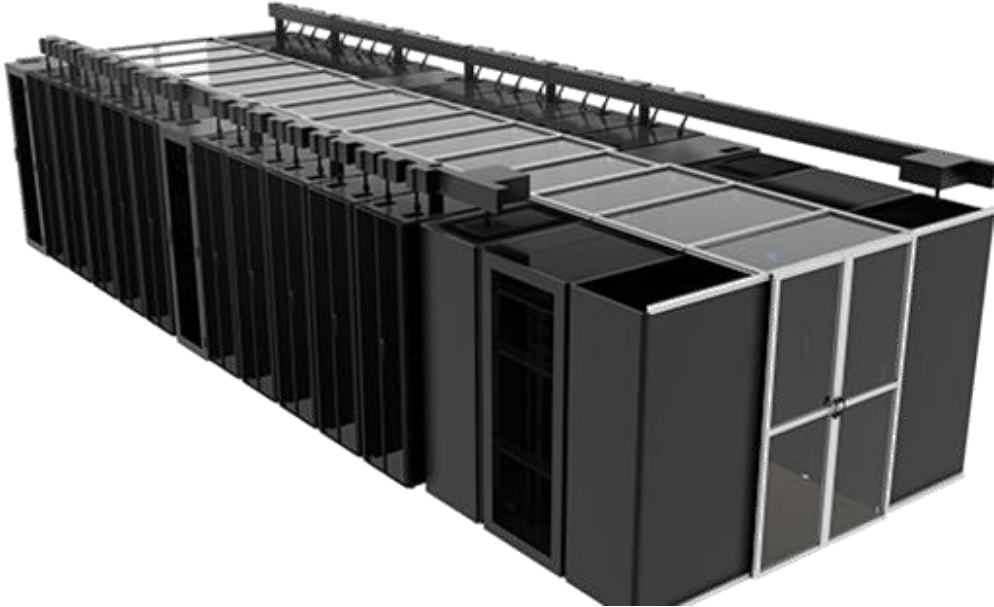
Advanced Air Flow Management

Efficient CRACs

High CW Temperatures

Free Cooling Chillers

Unified Control Software



מעבר קר סגור

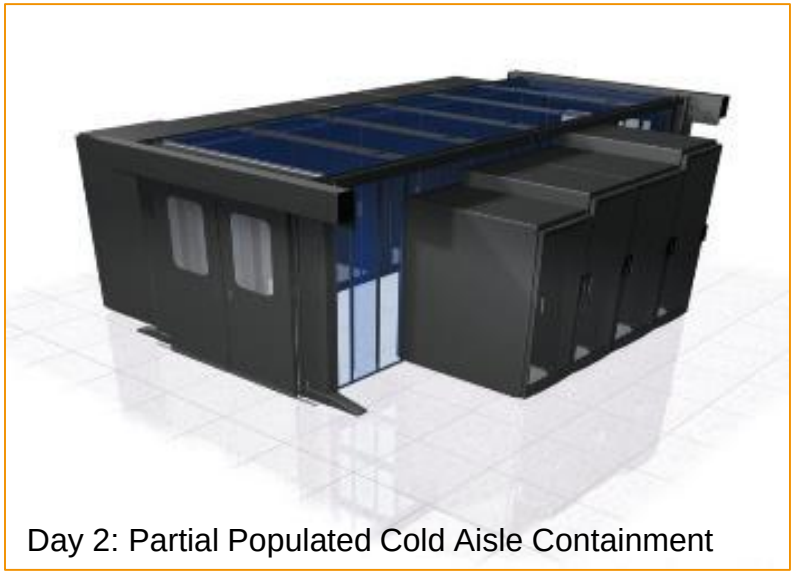
מעבר חם סגור

ארונות ארובה

מעבר חם סגור

Application Flexibility

Day 1: Containment ready



Day 2: Partial Populated Cold Aisle Containment

PANDUIT®

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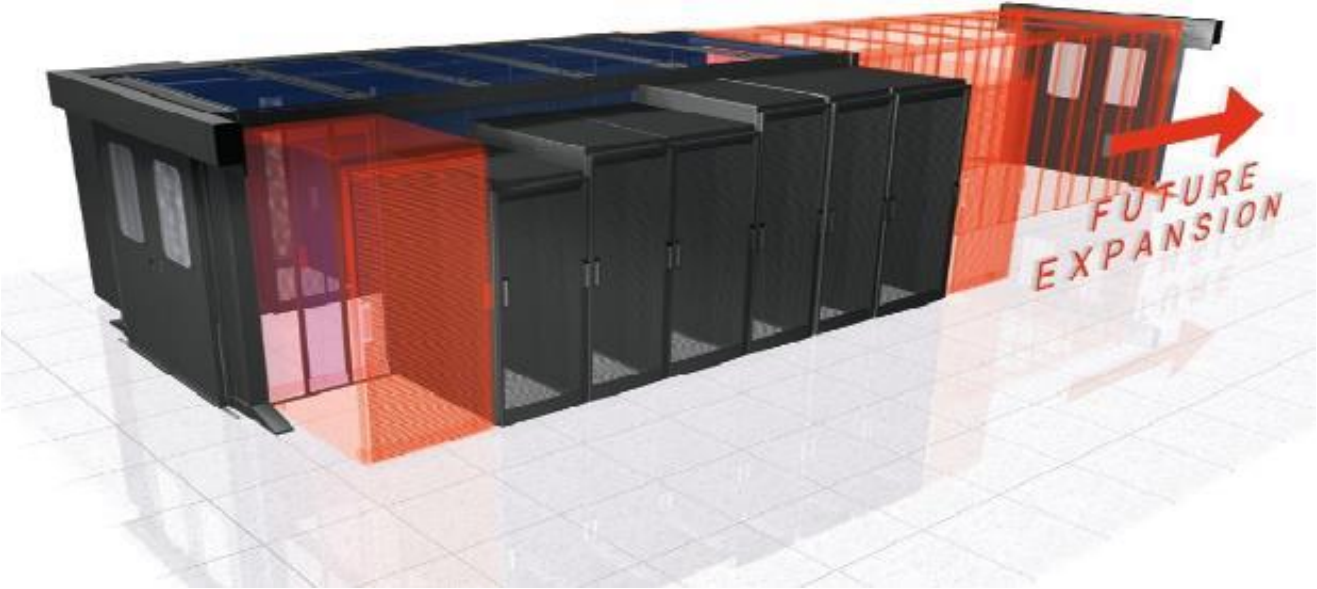
Application Flexibility



PANDUIT®

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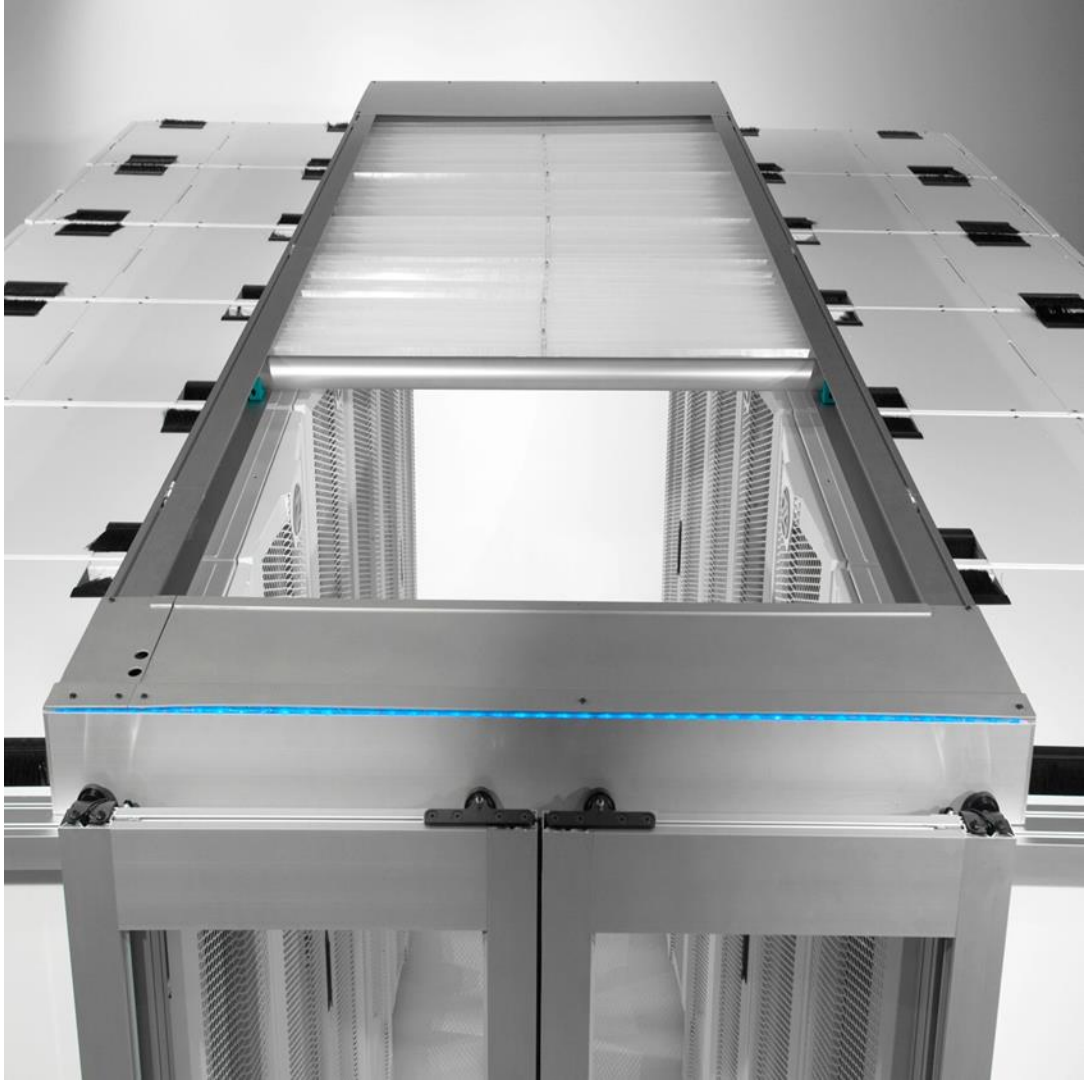
The only NFPA approved Containment System



The Road to a PUE of 1.2

- Air (Hot/Cold) Containment
- **Advanced Air Flow Management**
- Efficient CRACs
- High CW Temperatures
- Free Cooling Chillers
- Unified Control Software

Two Levels of Containment Benefits

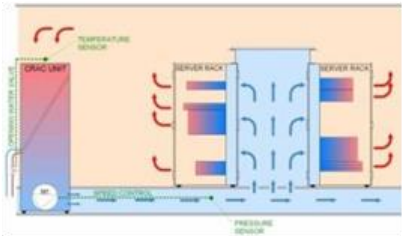
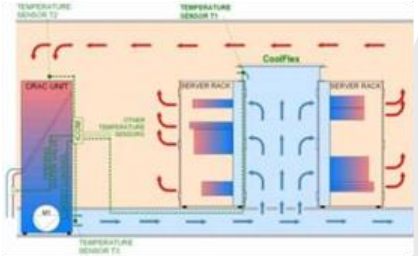
Level 1: Mechanical Aisle Containment

- Improvement but…
- Servers may be under- or oversupplied!

Level 2: Dynamic Control

- High resiliency against failure
- Optimal efficiency
- Agility

SmartAisle™ vs. Pressure Control

	Pressure Control	Liebert SmartAisle
		
Pressure	**20 Pa**	**0…1 Pa**
Effective Total Area Slots	**→ 0,882 m²**	**→ 0,899 m²**
Air Volume	(52.800 m³/h)	(52.800 m³/h)
→ Necessary Air Volume	**→ 72,021 m³/h**	**→ 55.973 m³/h**
	Difference 16.048 m³/h	

Substantially smaller air flow with SmartAisle control

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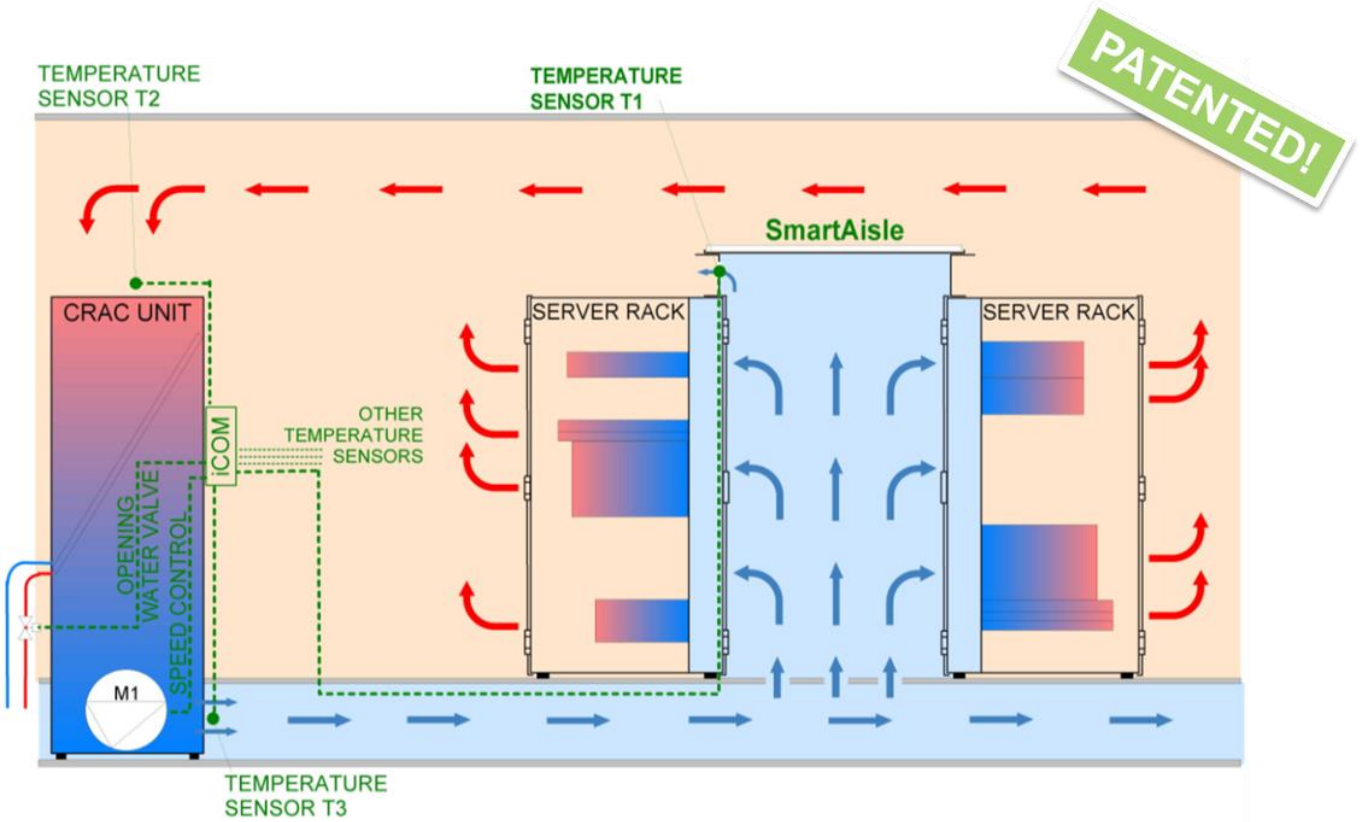
Containment with Active Airflow Management is Key

SmartAisle™ Dynamic Control



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Air Flow Control Methods - Comparison

Power for run of the CRACs	Pressure Control	SmartAisle
No control (3 CRACs 90KW, oversupply)	fan speed 100% **15,03 kW ₪59,000/year**	
"full-load operation" (3 CRACs)	fan speed 98% **14,43 kW**	fan speed 67% **5,25 kW**
"normal operation" (4 CRACs)	fan speed 78% **10,76 kW**	fan speed 52% **3,40 kW ₪13,400/year**

Reducing Power Big Time With SmartAisle!

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The Road to a PUE of 1.2

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- **Efficient CRACs**
- High CW Temperatures
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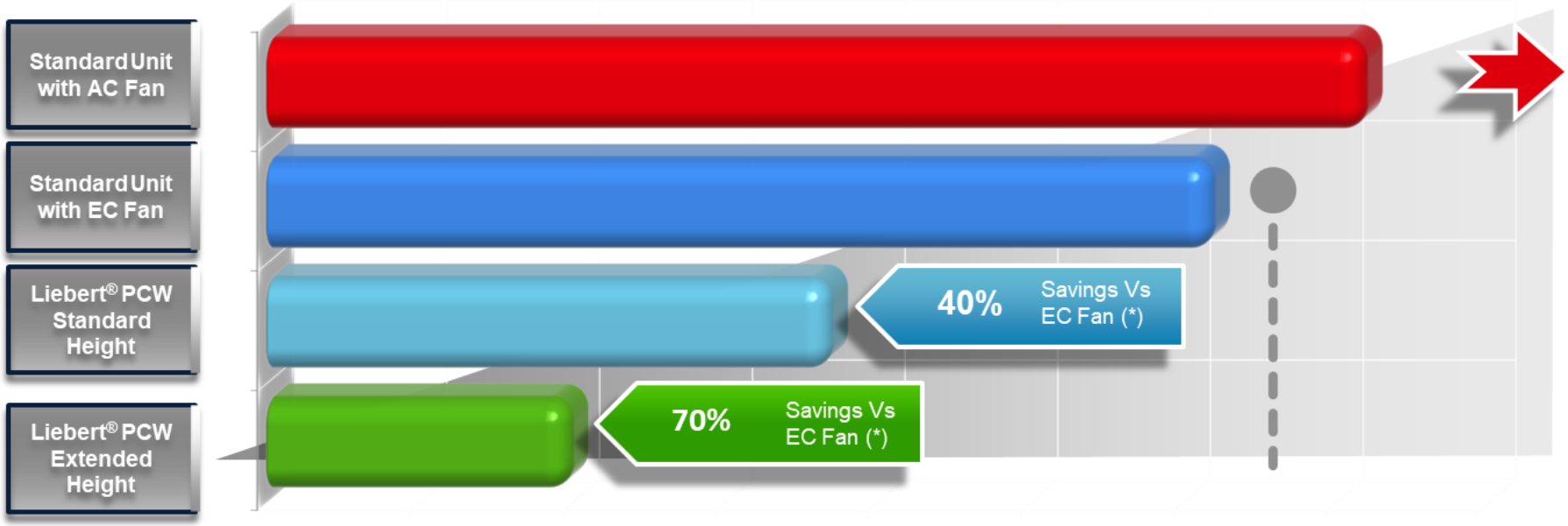
Liebert® PCW: Efficiency



Return Temperature to the unit	24° C 50%	Net Sensible Capacity	115 kW
Water	7° C-12° C	Energy Cost	0.1 €/kWh

(*) Current Industry standard perimeter units equipped with EC Fan

Power Input and Annual Electricity Cost

at 70KW net sensible cooling

Model	Description	Power input KW	Annual KWh	Annual ₪	Max Net sensible capacity KW	Dimensions mm W x D x H
New Liebert PH066DL	Extended	0.75	6,570	3,198	95KW	1750x890x2570
Currently Installed 16 year old CRAC	Standard	7.2	63,070	30,703	70KW	

@ 7-12 CW, 30C return air, 70KW

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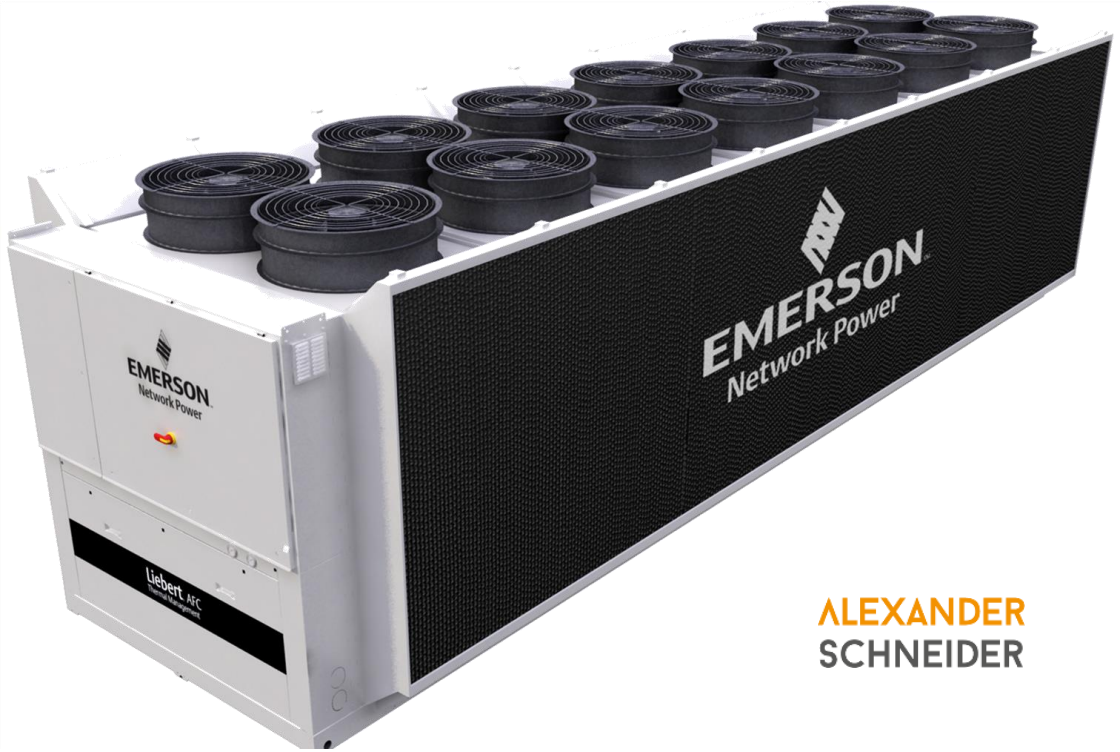

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Fast Start Chiller

(All compressors working within 60-70 seconds)

Fast Start Ramp
Fast restart after power failure: **first compressor ON after 20 seconds**

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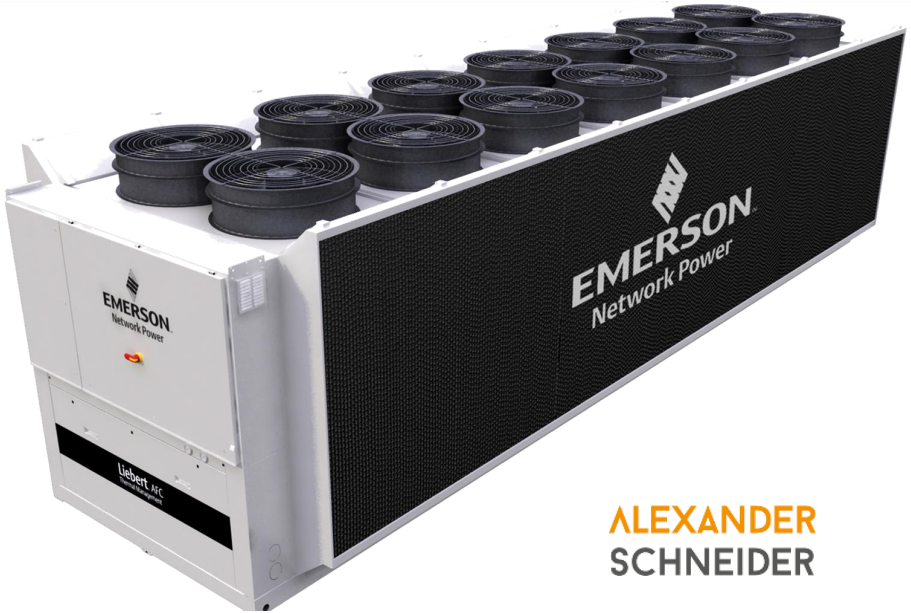
Benefits to Increasing CW Temperatures

- Energy savings (~3% per each delta of 1°C)
- Smaller Chiller (lower Capex)
- Smaller footprint
- Less weight
- More energy savings with free Cooling



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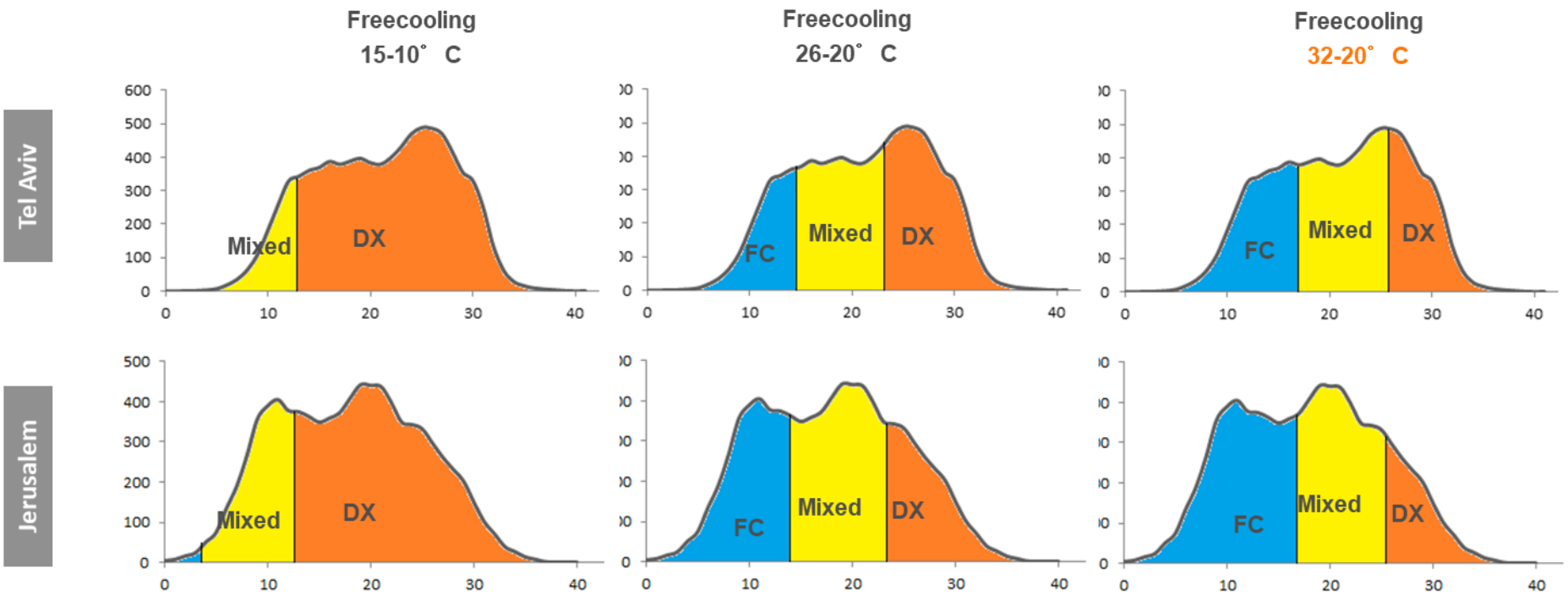
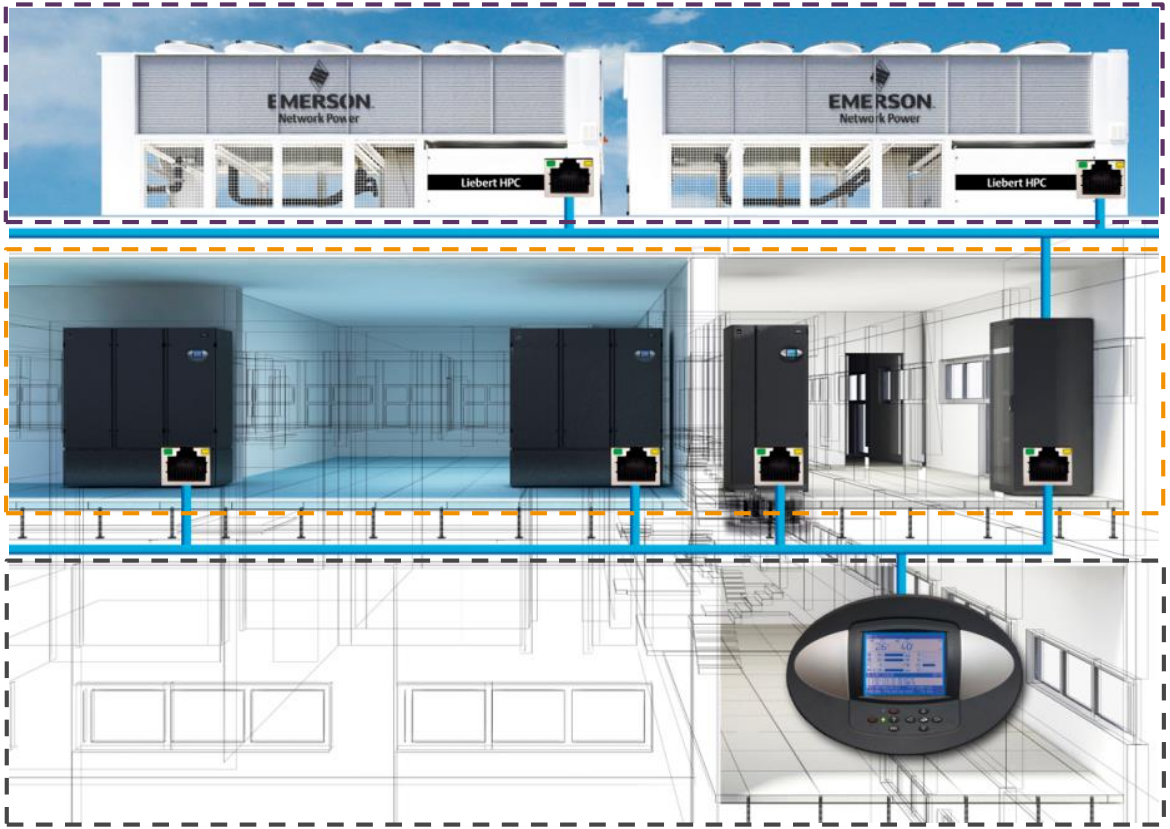
Israel Climatic Conditions



A Holistic System Approach...



Free cooling Chillers:

- 40-1600KW
- Maximizes the free cooling effect.
- Increases CW temperatures (up to 26/20°C CWT).

CW Floor Mount units:

- Full range from 30 to 200 kW
- Up to 70% improvements compared to industry standards.

Control of air flow and temperature in front of the servers:

- Always provides the right quantity of air at the right temperature.
- Free cooling chillers and floor mount control and set point integration.

Optimization Step 4: System Logics Optimization

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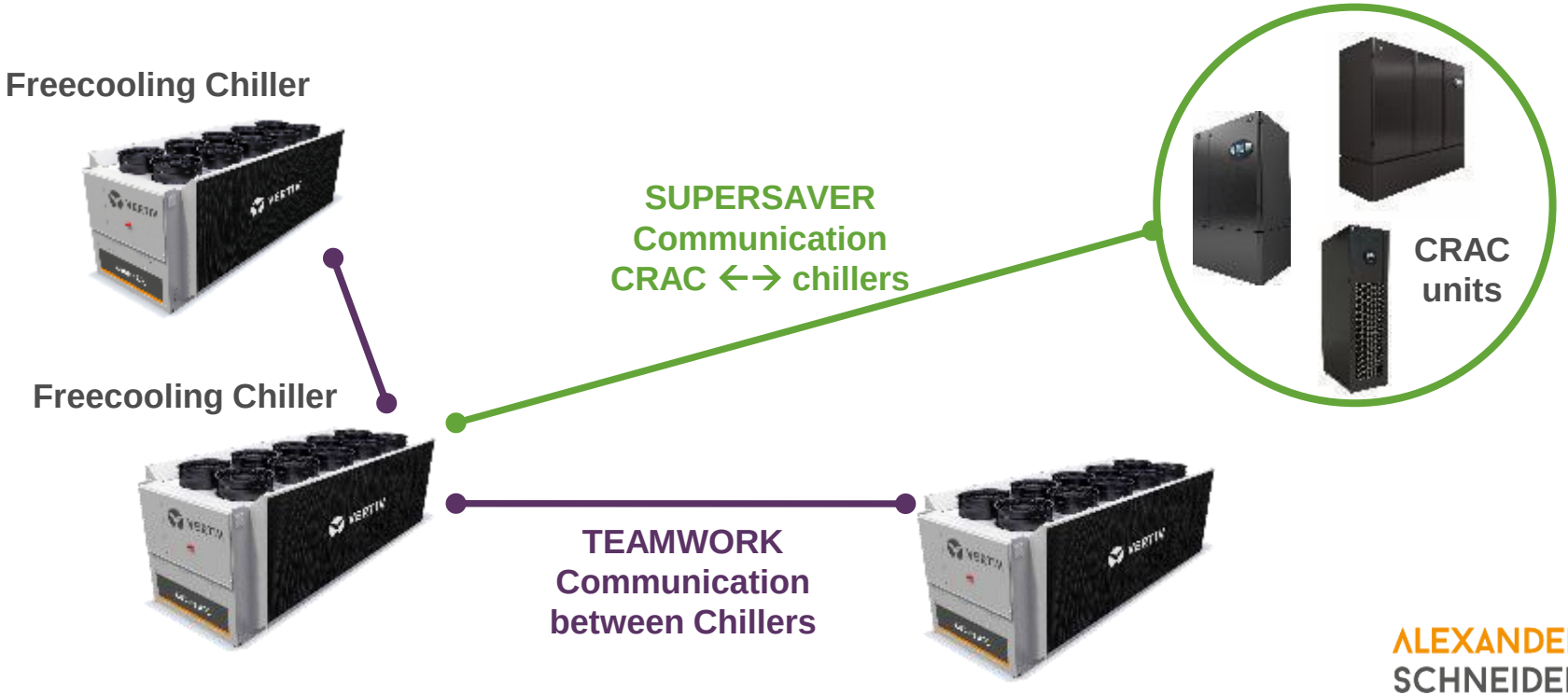
Optimization Step 4: System Logics of the Control



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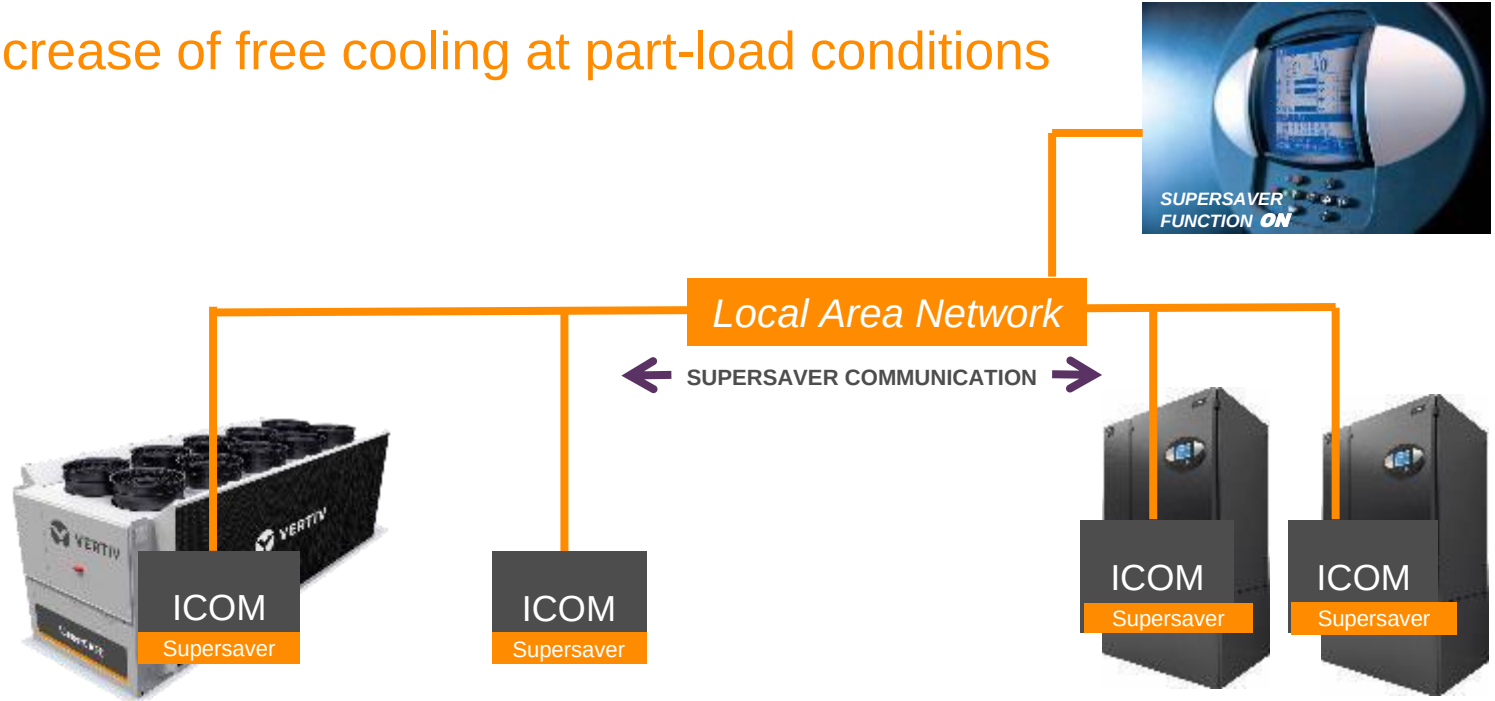
Supersaver Logic Dynamic CW Set-point Optimization

> Software function embedded in the units' control
> Leverages the communication between indoor and outdoor units

EFFECT: increase of free cooling at part-load conditions



Simulation Results: 4MW, 2N, Beit Dagan, Israel

SCENARIO 1 - Standard CRAC with 1 COIL, Water Temperature 19/25 DRY MODE					
Yearly Absorbed energy kWh *Air temp CRAC 36°C -30% RH.*					
				2N, Full load **2 LEGS in operation**	
				AFC running @ 50% capacity	
			48 x PH201EL	KWh	**pPUE**
			8 x FA0117-1	KWh	
			Total kWh	KWh	

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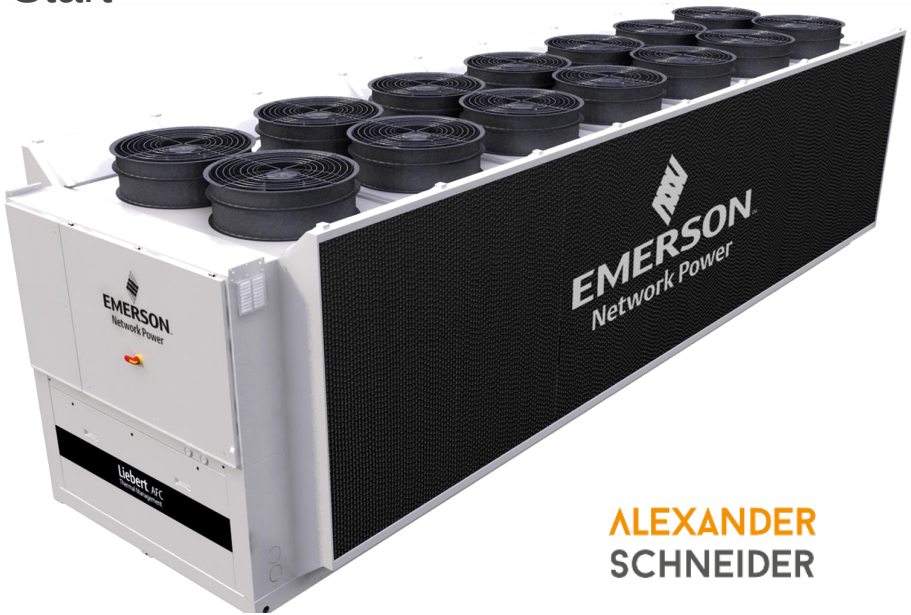
Recommendations

- pPUE at the right climate is the spec requirement
- Dedicated Datacenter Chiller with Fast Start
- CW at least 20-26ºC
- Free Cooling
- System (CRAC-Chiller) optimization
- Containment & Smart Aisle air flow
- High efficiency CRACs/CRAHs



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- Real-World Commissioning

קצת על אלכסנדר שניידר...

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130 Employees

2 Countries:
Israel & USA

Aerospace
Quality Standard

24X7
Service

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THE POWER OF EXCELLENCE

500
Active Customers

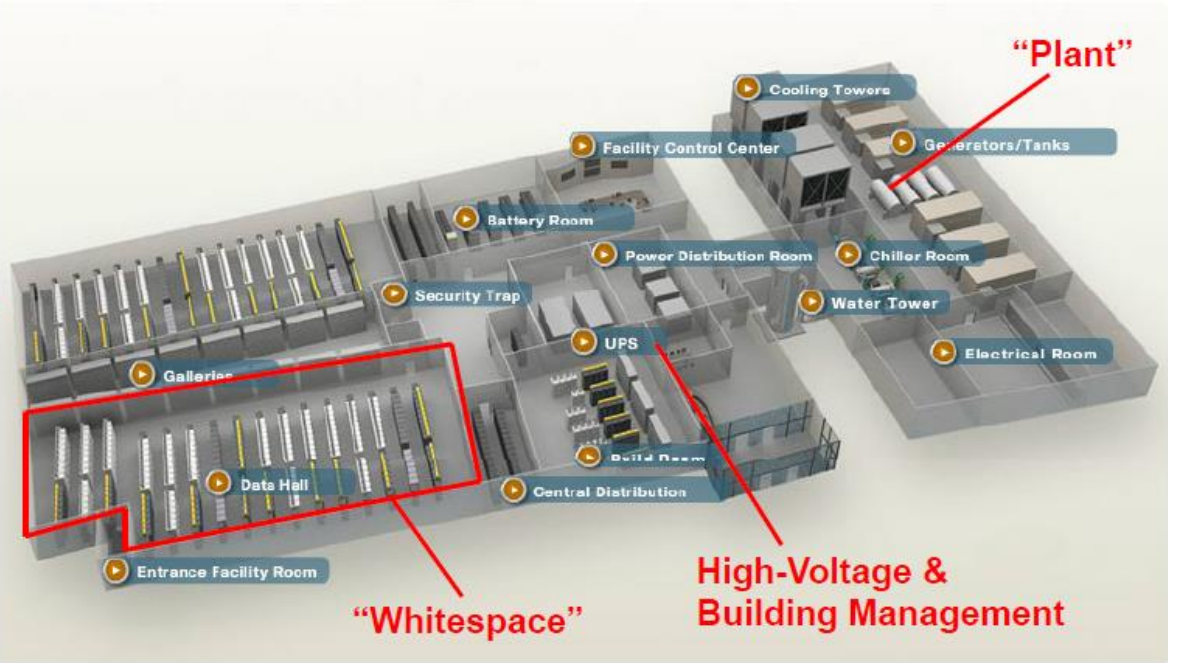
54 Years of Excellence
Privately Owned & Operated

#1 in Israel

Alexander Schneider IT

Solutions for Enterprises and resilient, energy efficient datacenters

- Air-Conditioning
- UPS
- Rack PDUs, Transfer Switches
- KVM
- Racks & Cabinets
- Connectivity
- Cable Pathways
- Overhead Busways
- DCIM
- Professional Services
- POE LED Lighting
- Wireless



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THE DATACENTER EXPERIENCE CENTER

Datacenter Academy

יום עיון בנושא Datacenter Best Practices

ללא עלות.

הרשמה באתר www.schneider.co.il

או בטלפון 09-8924444

Let’s Talk…

yigals@Schneider.co.il

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