Best Practices in Data Center Design and Modernization

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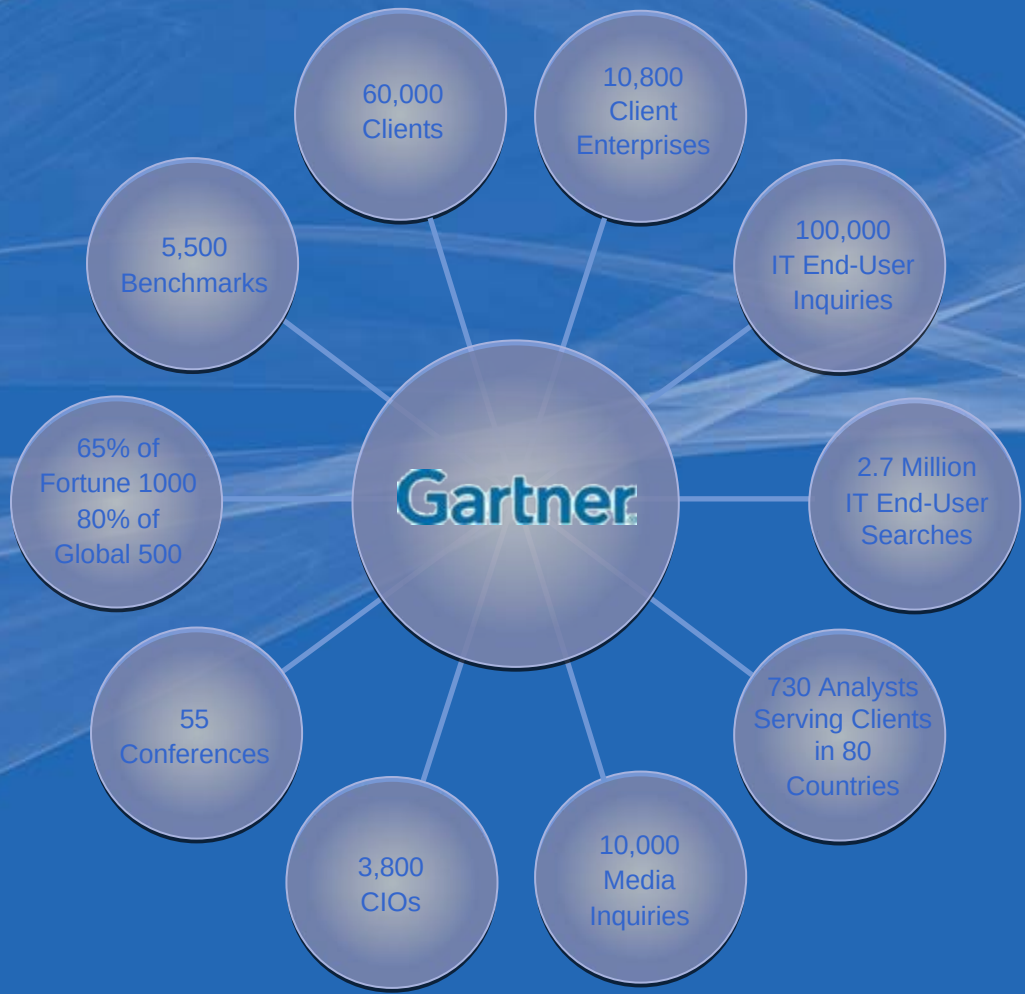
Thank you for joining this Gartner webinar.

Today's topic is “New Data Center Designs Improve Efficiency and Scalability With a Lower Cost Structure"



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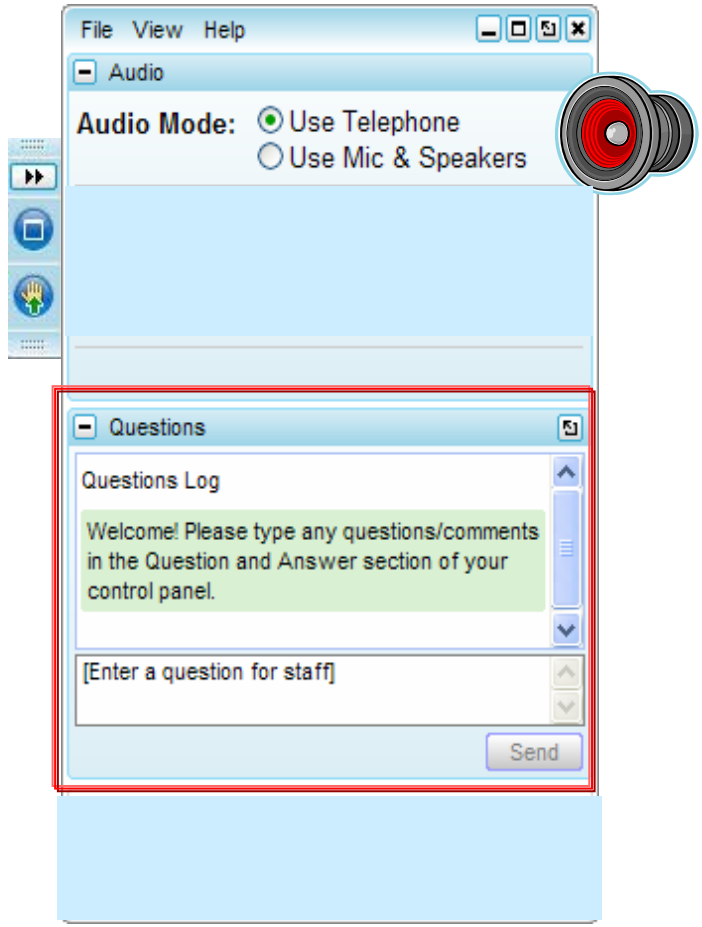

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The Emerging Data Center

- New data centers are NOT like the old ones.
- New data centers are designed around efficiency:
  - In power utilization
  - In space allocation
  - In capital expenditures

New data centers, designed well, can provide

300% capacity growth in

60% less space.

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Key Issues

1. What emerging trends will have the greatest impacts on data center design and operations?

2. What are the critical design considerations and best practices in emerging data centers?

3. How can efficiency and scalability be implemented in the data center while keeping costs reasonable?

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Emerging Design Trends

- Build small, build often
- Build for density
- Scale vertically, then horizontally
- Build (and rebuild) pods
- Build density zones
- Consider multitiered designs
- Use free air, and reuse heat
- Design for the unknown

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Build Only What You Need

"What if" design?

- What if I had the power?
- What if I had the cooling?
- What if I designed it right?
- What if I racked and stacked the right way?
- What then would I really need?

An efficient design can reduce data center size estimates by 60% or more

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One Tier Is Not a Requirement

- All applications are not equal.
- Redundancy level based on business need.
- Reduce capex by 20%
- Reduce opex by increasing efficiencies.

Tier	Availability	Downtime	Cost	Use Point
1	99.6%	28.8 hours	$9.94M	Server room
2	99.75%	22 hours	$19.3M	Web services, back office
3	99.98%	1.6 hours	$25.6M	Business-critical
4	99.995%	0.4 hours	$34.5M	Crucial services, continuity

Average cost to build 10,000-square-foot facility

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Data Center in a Box: Focused Solutions

- ✓ IBM — PMDC
- ✓ SGI — ICE Cube
- ✓ Oracle (Sun) — Black Box
- ✓ HP — POD

- Fully functional data center often with multivendor support
- Portable — easy to relocate
- Targeted for temporary and remote data centers
- Rapidly deploy in 12-14 weeks
- Level 3 design; energy efficiencies

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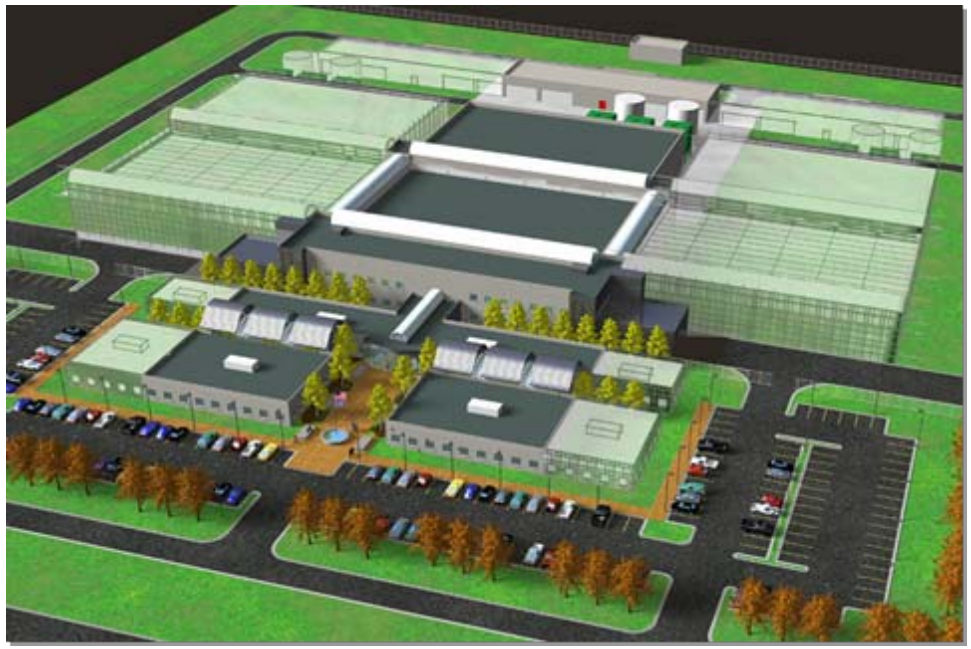
Modular Designs for Sustained Growth

- Incremental build-out methodology
- Standard components to maximize flexibility, cost-effectiveness
- Component configuration optimizes power and cooling.
- Reduce capex
- Multiple modules over time.
- Overall life cycle exceeds 60 years.



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Power and Cooling Density Zones

- **Density Zones**
  - High Density
  - Medium Density
  - Low Density
- Based on workload mix
- Power and cooling designed at the zone level
- Expandable over time
- Scale up then scale out
- Dramatically reduce capital costs up front

- ✓ Minimize overprovisioning and capex
- ✓ Reduce operating expenses up to 40%
- ✓ Allow very high-density computing

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Emerging Trends in Power

- Racks could soon to exceed 35kW and more.
- Cooling becoming the biggest issue.
- Cost of power on par with cost of equipment.
- Alternative cooling sources needed.
- Consumption is the new KPI.

Server vendors are driving energy consumption downwards – but unit growth can negate the gains

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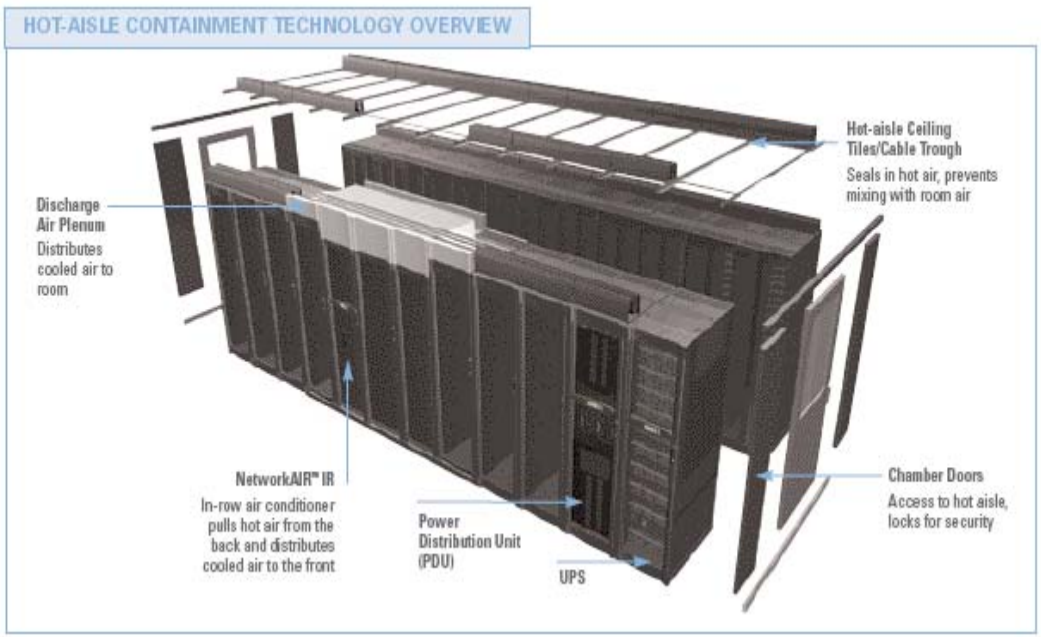
Emerging Trends in Rack Density

- Liebert XD Series
- HP Modular Cooling
- APC InfraStruXure
- IBM High Density Zone
- Knurr CoolTherm



- Self-contained
- Up to 40kW per rack
- Existing environments
- Raised floor or slab

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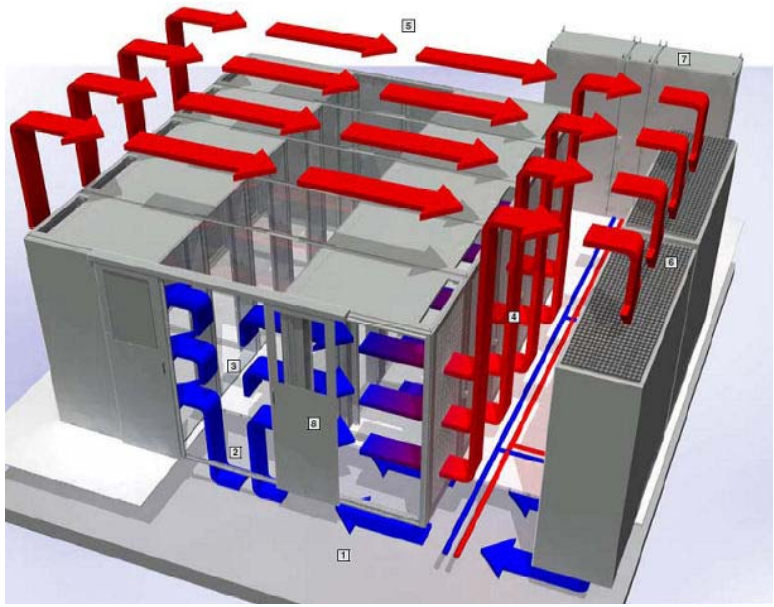
Contain Air, Contain Costs

Contained controls flow for optimal efficiency



Source: Rittal

- Hot or cold containment
- Supports very high heat

- Hot or cold aisle
- Contained rooms
- Control air flow
- Waste directed to a plenum
- Reuse heat
- Reduce energy by 20%
- 20kW per rack

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Energy Consumption and Efficiency

- PUE, DCiE are de facto standards — use them.
- But PUE is not the goal — it's the beginning
- PPE: Performance and Capacity per kW are key.
- Incremental year-to-year improvements.
- Use airside or waterside economizers

An efficient data center will use 30% less energy

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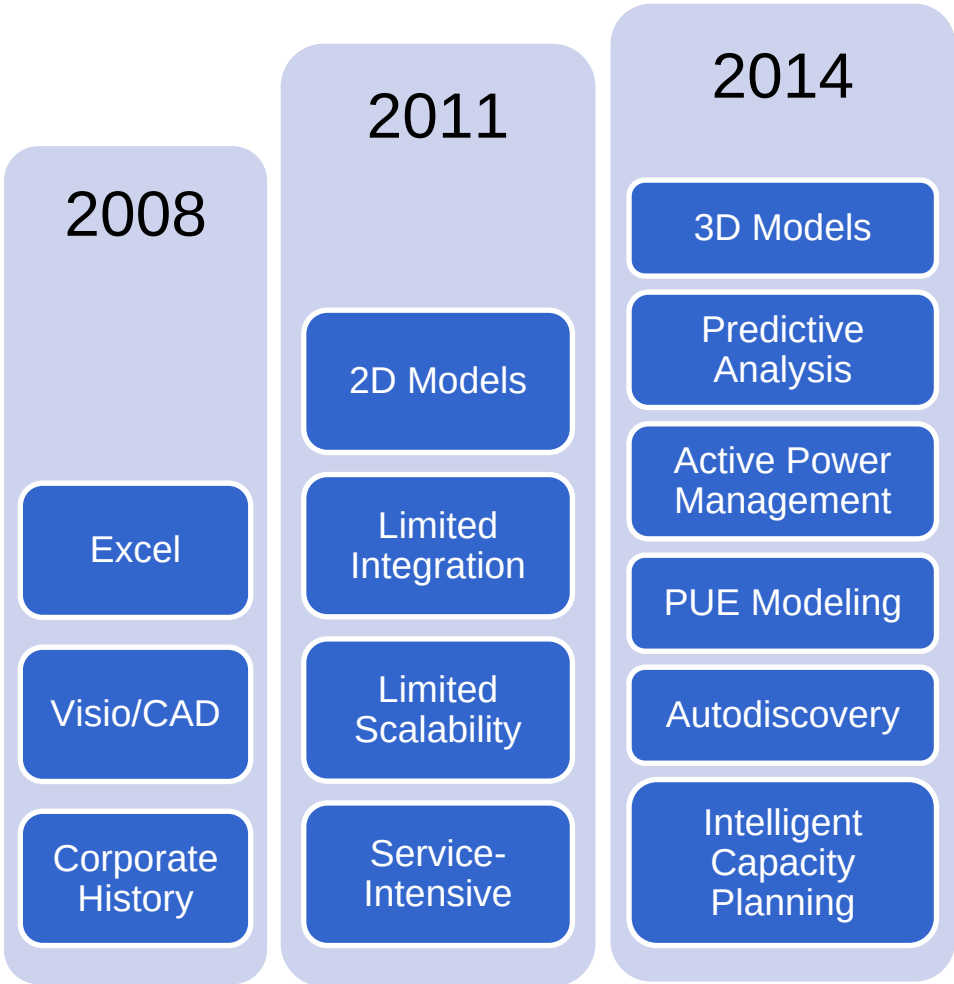
Data Center Infrastructure Management



It's not about what you use — but how you use it….

- Optimize the energy utilization of assets
- Visualize the power consumption of resources
- Automate and control server energy usage to optimal levels
- Dynamically move workloads based on policy
- Shut down or power on resources
- Monitor and report consumption
- Use trending and capacity planning tools to manage resource usage proactively

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Raised Floor Not Required

Traditional Need	Today
Bulky cabling	Fiber, thin copper
Cables rarely change	Change often
Dedicated circuits	Standard receptacles
Circuits rarely change	Branch circuits change many times
Cooling requirement doesn't change over time	Changes and moves with new equipment
Primary equipment cooling mechanism	Inadequate cooling for future needs

Raised flooring is no longer required in new data centers

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Facilities Design

By 2013, the use of efficient facilities design will reduce data center energy consumption by 40% compared to today's environments.

Reasons to Keep Old Designs

- Sunk cost with 7-20 year life span
- Known configuration with consistent power/cooling issues
- Organizational issues
- Because we've always done it that way

Reasons to Upgrade Facilities

- Reduce energy costs dramatically
- Increased agility and flexibility
- Greater data center capacity
- Focus on data center metrics
- Corporate social responsibility
- Longer data center life cycles

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Best Practices in Reducing Electrical Consumption

Action	Savings	How
Virtualize	10%-50%	Push server performance to 65%. Reduce physical footprints.
Air economizers	4%-15%	Use outside air whenever possible. Enable economizer mode in existing equipment.
Rightsizing	10%-30%	Build and provision only what you need today — expand only when needed.
Floor layout	5%-12%	Hot aisle/cold aisle. Reduce air movement (distance).
Power equipment	4%-10%	Best-in-class UPS. Focus on light load efficiency, not full load.
Cooling	7%-15%	Row- and rack-based cooling for high density. Higher return temperatures.

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Recommendations

- ✓ Design to scale vertically, then horizontally
- ✓ Don't be wed to the past — innovation in design will yield reduced capex and opex.
- ✓ Think small, think dense — the objective is the highest compute performance per kilowatt.
- ✓ Build once, build often — modules are smarter designs with life cycles of many decades.
- ✓ All applications are not created equal — design to suit many requirements, not just a set of common requirements.

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Your Action Plan

CIOs and data center heads should:

- **Today**
  - *Fix what you can — Focus on cooling, airflow and equipment placement to optimize existing space.*
  - *Consider virtualization for consolidation and energy savings.*
  - *Rack density will continue to grow — plan for it.*
- **Near Future**
  - *Begin planning for the next data center — at least four years in advance.*
  - *Implement monitoring tools for dynamic airflow, heat identification and energy management.*
- **Longer Term**
  - *Design for flexibility and scalability.*
  - *Use the rack unit as the basis for estimating power and space requirements.*
  - *Zones and pods — Build what you need in the near term.*

Actions are set in italics.

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Related Gartner Research

- ***DCIM: Going Beyond IT***
  March 2010, David Cappuccio (G00174769)
- ***Hype Cycle for Data Center Power and Cooling Technologies, 2009***
  John R. Phelps, Mark Fabbi, Martin Reynolds, Simon Mingay, Rakesh Kumar, Philip Dawson, David J. Cappuccio (G00169853)
- ***Data Center Efficiency and Capacity: A Metric to Calculate Both***
  September 2009, David Cappuccio, (G00164493)
- ***Building a New Data Center? 10 Questions to Answer Before You Begin***
  January 2010, David Cappuccio, (G00172532)
- ***A Checklist for Data Center Relocation***
  September 2009, John Phelps, David Cappuccio (G00170738)

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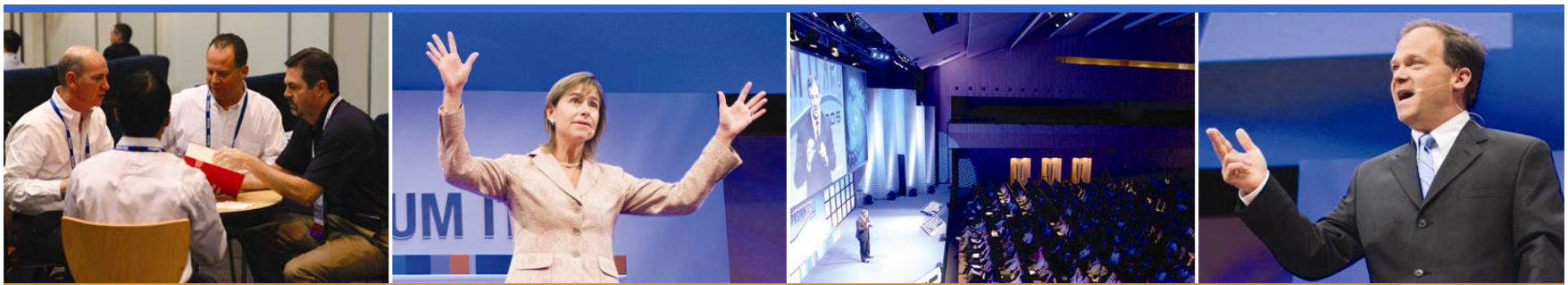

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