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5 Steps to a Successful Data Center Consolidation

Life Is On | Schneider Electric

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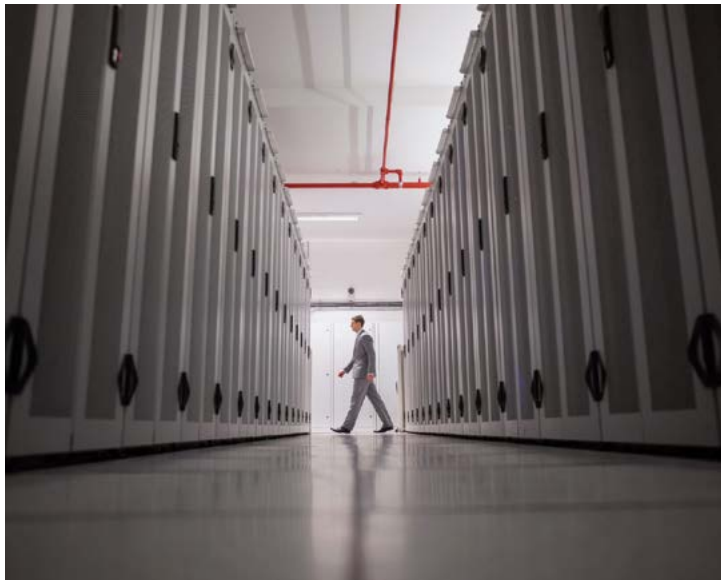
Introduction



Technologies such as cloud computing allow enterprises with multiple data center locations to consolidate into fewer data centers.

So you've decided to consolidate your data center. You're in good company: Nearly two-thirds of enterprises (63%) "either have consolidated data centers or are consolidating data centers today," according to ESG Research.

A major driver behind data center consolidation is the outsourcing of enterprise IT functions to the cloud to enable greater efficiency and scalability. As enterprises migrate their data centers, IT infrastructure processes, and computing platforms to the cloud, many seize the opportunity to realize cost savings by consolidating on-premise data center equipment and space.

To those IT professionals already running data centers that have been consolidated, the operational, financial and competitive advantages of consolidation are clear. Also clear is that successful data center consolidation requires careful planning, execution, and attention to detail; anything less invites unnecessary problems and potential disaster. Fortunately, the process of data center consolidation can be broken down into steps. This reference guide is designed to help data center professionals who are planning or considering a consolidation project. The guide should be viewed not as a detailed blueprint, but as a practical framework to help data center professionals plan and work through a consolidation project.

If you're serious about data center consolidation, it's because you understand its numerous advantages. Technologies such as cloud computing, virtualization, containers, software-defined networks and converged systems allow enterprises with multiple data center locations to consolidate into just one main data center with smaller or regional data centers to support critical application needs on the edge of their networks. They also allow organizations with a large, single data center to reduce hardware and support infrastructure.

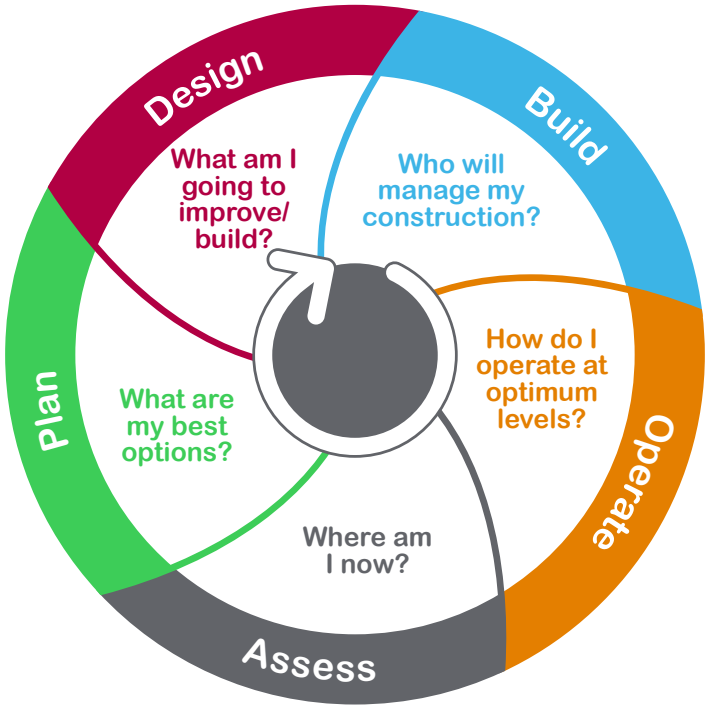
> "Nearly two-thirds of enterprises "either have consolidated data centers or are consolidating data centers today."

Introduction (cont.)

The benefits to be gained by reducing the number of physical data centers for IT to manage include:

- Lower energy and maintenance costs
- More strategic allocation of IT resources
- Fewer points of vulnerability
- Shorter Mean Time to Repair

Data center consolidation results in energy savings because there are fewer physical servers and other infrastructure components to power and cool. This is true whether the consolidation eliminates remote facilities or simply reduces the physical footprint of an enterprise's lone data center.



Numerous United States federal agencies have been consolidating data centers as part of an initiative launched in early 2010. A September 2014 report by the General Accountability Office shows that the federal government saved $1.1 billion from 2011 to 2013 by closing 10% of its nearly 10,000 data centers, with a goal of closing 44% by the end of 2015.

A smaller physical infrastructure makes it easier for data center professionals to manage network and storage performance because there are fewer components to monitor. Further, streamlining the data center through consolidation typically involves automation of routine IT tasks. Freeing up data center staff from mundane housekeeping chores allows them to focus their talents on higher-value activities that serve the goals of the business.

Consolidating the data center improves enterprise security and compliance efforts by reducing network points of entry and increasing visibility. Consolidation also improves Mean Time to Repair (MTTR) because IT and facilities professionals can pinpoint problems and respond to them faster.

Getting started with consolidation

Without the right planning, tools, partners or execution, a data center consolidation project can disrupt the business, causing data to be inaccessible or lost, hurting employee productivity, and costing the enterprise revenue and customers.

Introduction (cont.)

The reference guide lays out for data center managers a step-by-step approach to data center consolidation. By breaking down the process into clear and identifiable actions – all of which are covered in the sections below – a data center consolidation becomes much more manageable, and the odds of its success much higher.

Have stakeholders such as IT managers, employees and partners been notified about the consolidation and included in the planning?

To begin with, getting to where you want to go requires knowing where you are. Any data center consolidation must start with an assessment of your current physical infrastructure and assets. These will need to be detailed and mapped. (Again, this step and others will be discussed in greater detail in the sections below.)

Once a full assessment is complete, data center professionals must develop strategic and tactical plans for the consolidation. Does the "receiving" site have enough floor space for the consolidated data center? Have stakeholders such as IT managers, employees and partners been notified about the consolidation and included in the planning? Does the consolidation present an opportunity for modernizing and upgrading data center equipment? Comprehensive planning will provide answers to all of those questions and more.

Designing a data center consolidation comes next. This is where an experienced partner can be invaluable by offering reference designs and helping data center professionals determine the costs of consolidation as well as strategic factors that determine design selection.

Once the assessment, planning and design phases are completed, you will be ready to build or retrofit your data center. This is when your meticulous planning, choice of the right consolidation services partner, and careful testing should pay off.

Finally, this reference guide will offer advice on operating your consolidated data center, including how to determine the appropriate level of maintenance required for optimum performance and how to select the right data center services vendor.

Data Center Consolidation Phase 1: The Assessment

While there are many obvious advantages to data center consolidation, enterprises should not embark upon such a major project without first knowing why they want to consolidate the data center. The potential benefits of data center consolidation to enterprise IT and Facilities departments include:

- Reducing operational costs, including energy use and staff levels
- Meeting modern energy efficiency standards
- Avoiding capital expenditures to replace aging hardware
- Higher utilization of equipment
- Better reliability and availability

But a major project such as a data center consolidation can't just be about the needs of the data center management and operations team. There must be a legitimate business interest served by a data center consolidation, one that goes beyond the considerations of IT and Facilities.

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Will a consolidated data center save the enterprise money? Will it make employees more productive by better enabling them to use technologies such as mobile and cloud? Will it enable advanced analytics that can improve operational efficiencies across lines of business? These are the types of questions that IT and business decision makers must answer before greenlighting a data center consolidation and mapping out a strategy.

Getting the ball rolling

Once enterprise decision makers are committed to data center consolidation, the project team must conduct a thorough assessment of existing data center technology and physical facilities, including remote locations, along with current level of IT staff skills. By first determining what they have, IT leaders can better determine what they need for a data center consolidation in terms of technology and human resources.

An assessment involves 1) establishing a baseline set of metrics that define the current data center environment, and 2) cataloguing assets and how they're used. The goal of the assessment is to provide a dynamic snapshot of the current data center environment. How many physical locations are hosting your data center equipment? How many and what kind of servers are in each location? What are the energy requirements (and equipment) at each site? The graphic below from a federal data center consolidation initiative plan is an example of a template for data center managers broken into four areas of focus:

Data Center Consolidation Phase 1: The Assessment (cont.)

Software Assets and Utilization Template

- Applications Supported (by Business Area, SLA Tier, # users)
- Applications Potential for Virtualization, Cloud Computing
- Applications Potential for Migration to Standard Vendor Supported Enterprise Platforms and Services

Hardware Assets and Utilization Template

- Number of Servers and Virtualization % by Type (Windows, Linux...)
- Server Capacity and Utilization by Type (GHz/MIPS, Peak/Average %)
- Storage Capacity by Type (Total/Used TB)

IT Facilities & Energy Usage Template

- PUE (Power Utilization Efficiency), Power Density (Watts/Sq Foot)
- Rack Density (Sq Feet/Rack), Rack Space Utilization (%)

Geographic Location and Real Estate Template

- Data Center Tier (I – IV), Gross Raised Floor Area (Sq Feet), Lease Cost ($/Sq Foot)

Source: Federal Data Center Consolidation Initiative Agency Consolidation Plan Template

One immediate benefit of the asset inventory process is the opportunity for "quick wins." As you catalog enterprise applications, for example, you may discover some haven't been used for long periods of time and therefore are candidates for decommissioning. Likewise, servers that aren't being used should be taken offline. You may even find (and remove) obstructions to airflow in the data center that can improve efficiency and save on energy use. The more detailed the asset inventory process, the better for your consolidation project.

Managing risk

IT also must understand and manage the risks associated with a data center consolidation. Taking servers off line, removing IT hardware from remote locations, and migrating data and applications to new servers or a converged infrastructure must be well-planned and executed. Without effective risk and change management, an enterprise in the middle of a data center consolidation could suffer unplanned network downtime or even loss of data assets, both of which can be extremely damaging to the business. Since nearly every facet of a modern enterprise is tied to the data center, it is imperative that IT develop a comprehensive change management plan that maps all data center assets from existing hardware and facilities to the new, consolidated infrastructure. Failure to do so could impact compliance requirements, company finances, customer and vendor relationships, and ongoing projects following a poorly planned consolidation.

Another element of change management is educating employees about the need for and benefits of data center consolidation, particularly remote workers who may worry that losing their own IT equipment will make their jobs more difficult or even be a prelude to layoffs.

Enterprises with compelling business reasons for data center consolidation must be aware of the obvious and not-so-obvious risks. An experienced provider of data center lifecycle services can guide enterprise data center professionals through the entire consolidation process and beyond, including asset mapping, site assessment, choosing technology options, determining new energy requirements, and much more.

Schneider Electric offers a full set of assessment services to help you achieve your business goals based on a data center consolidation effort, click here to learn more.

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Data Center Consolidation Phase 2: Strategic and Tactical Planning

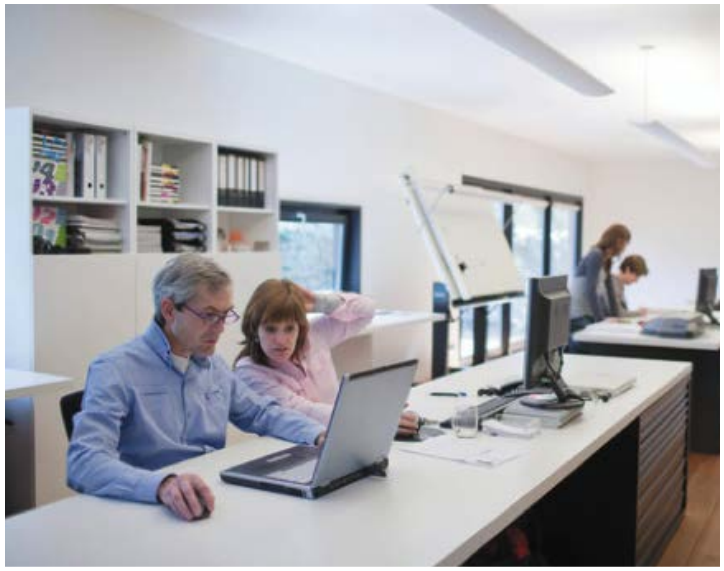
Once a thorough data center assessment is conducted, IT decision makers must develop strategic and tactical plans to ensure a successful consolidation. Since any data center consolidation involves risks and challenges, failure to develop and follow strategic and tactical blueprints risks downtime or, worse, costly miscalculations regarding the physical space, power and cooling capabilities, and capacity for growth of the site where the consolidated data center will reside. This is known as the "receiving" facility.

Data center professionals may have to confront a number of unanticipated complications during a consolidation, including:

- Limitations of the consolidated data center's power supply and cooling capacity
- The inability of legacy applications to run on the new equipment
- Lack of in-house skills to manage the consolidation process and post-consolidation facility
- Physical security shortcomings in the consolidated site

For large enterprises with data center equipment in multiple remote locations or with data center components from various vendors, detailed consolidation plans are particularly critical.

After enterprise IT creates a data center asset discovery map, it then must create a dependency map that shows how various data center applications and processes interact with each other and with infrastructure components. Essentially this dependency map is a map of your data center as an ecosystem in action.



Before diving into planning and designing a consolidation, data center professionals must get input from business leaders and departmental managers in the enterprise about what they hope to achieve through consolidating.

Define the consolidation strategy

The entire point of a data center consolidation is to accomplish business and/or operational goals. Before diving into planning and designing a consolidation, data center professionals must get input from business leaders and departmental managers in the enterprise about what they hope to achieve through consolidating as well as what different business units require for computational power, continuity, storage, back-up, and future capacity.

They also must gain buy-in across the organization, from the CEO down through rank-and-file employees whose jobs may be affected by data center consolidation. Projects as large as a data center consolidation may be doomed to

Data Center Consolidation Phase 2: Strategic and Tactical Planning (cont.)

failure if infighting, conflicting agendas, and lack of clarity poison the process. Thus it's important that data center professionals spell out potential operational implications of a data center consolidation, including any necessary changes in processes or organizational structure.

Physical and space issues

An asset map and a dependency map will give IT a clear picture of the assets and operational interdependencies of data center hardware and software. The next step is to assess and prepare the receiving site for the consolidation. An assessment should determine the power, cooling, and space capacities of the receiving data center. Schneider Electric has developed a standardized method to help you assess an existing data center facility's power, cooling and space capacities, which you can read about in detail in this white paper, "Determining the Power, Cooling and Space Capacities when Consolidating Data Centers." Among the steps in this standardized approach are:

- Evaluating critical infrastructure capacity and current utilization
- Determining cooling distribution effectiveness
- Assessing the condition of power and cooling equipment
- Making recommendations for optimizing the capacity of existing equipment
- Establishing the capacity for expansion
- Using Computational Fluid Dynamics to analyze airflow and temperature patterns
- Making recommendations to optimize density capabilities of existing equipment

Table 1 from Schneider Electric details standardized capacity metrics for the receiving facility.

Table 1

Metric	Definition	Notes
Bulk power capacity	The usable IT capacity (kW) of bulk power subsystems: facility-level UPS, generator, switchgear	Identify bulk power subsystem with lowest usable IT capacity
Bulk cooling capacity	The usable IT capacity (kW) of bulk cooling subsystems: heat rejection components (i.e. chiller, cooling tower)	Identify bulk cooling subsystem with lowest usable IT capacity
Power distribution capacity	The usable IT capacity (kW) of power distribution subsystems: PDUs, branch circuit	Identify usable IT capacity; assessed per row or pod and summed for total
Cooling distribution capacity	The usable IT capacity (kW) of cooling distribution subsystems: Perimeter/row/rack CRACs/CRAHs	Identify usable IT capacity; assessed per row or pod and summed for total
Data center capacity	The maximum usable IT load (kW) that can be supported	Minimum kW value of above 4 capacities
Total current max IT load	Max IT load (kW) measured (for dynamic loads, need to track over period of time)	Commonly assessed from PDU outputs and summed for total

Source: Schneider Electric White Paper 177: Determining the Power, Cooling and Space Capacities When Consolidating Data Centers

An assessment should determine the power, cooling, and space capacities of the receiving data center.

Data Center Consolidation Phase 2: Strategic and Tactical Planning (cont.)

Opportunity to modernize

As with an asset inventory, an assessment of the receiving facility for a data center consolidation can offer opportunities for IT decision makers. For example, if IT determines that the physical infrastructure of the receiving facility is near the end of its life or simply is too old to be scalable, then it makes sense to consider modernizing or upgrading data center infrastructure equipment.

The benefits of data center modernization are numerous and business-critical. A QuinStreet Enterprise survey shows that IT professionals credit data center modernization with enhancing security, improving uptime and availability, improving IT resource usage and staff efficiency, enabling greater business agility, lowering hardware costs, reducing power consumption, and easing the integration of mobile technology into the enterprise.

Data center professionals must assess in-house skill sets to ensure that IT employees have the necessary training or experience to run the consolidated data center.

> Modernization enables enterprises to fully leverage newer technologies such as virtualization and automation.

Modernization enables enterprises to fully leverage newer technologies such as virtualization and automation. In addition, modernization can improve data center manageability, security, and scalability by providing state-of-the-art hardware and software tools.

Similarly, should the metrics collected during the assessment show that the receiving data center's power and cooling equipment is aging or inefficient – and thus not capable of meeting IT's post-consolidation requirements and beyond – an upgrade may be necessary. Schneider Electric provides modern power and cooling equipment and services to upgrade support infrastructure for data center consolidations.

Tactical planning

In addition to determining strategic, physical and operational requirements for a consolidation, data center professionals must assess in-house skill sets to ensure that IT employees have the necessary training or experience to run the consolidated data center, which may include modernized equipment. Expertise in virtualization,

Data Center Consolidation Phase 2: Strategic and Tactical Planning (cont.)

performance management, remote monitoring, capacity planning and more are needed to manage today's data centers. If an enterprise lacks these skills internally, IT decision makers should consider engaging an experience data center services provider.

Reducing business risk and increasing resiliency

Consolidation of a data center by definition means a less distributed IT infrastructure. The advantages of consolidation, as noted previously, are clear and compelling. But the ongoing challenge of a consolidated data center is maintaining resiliency: With most or even all users accessing data, applications and backend processes through a single data center or network, the cost of downtime can be enormous. Consolidation planning, therefore, must go beyond the transition itself to ensure that the data center's new architecture integrate effective backup and failover mechanisms to avert disastrous outages.

Determining the most appropriate infrastructure backup plan requires enterprise data center professionals to consider a number of factors, including 1) whether they plan to deploy backup IT systems on site or in a remote facility 2) what type (if any) of cloud model they prefer (public, private, managed, etc.), and 3) how to ensure connectivity should the enterprise's WAN go down.

What's it all cost?

IT decision makers should determine the costs of each consolidation option before choosing a plan. Again, this can be a seemingly overwhelming task depending on the number of vendor service contracts involved, as well as hardware outlays, ongoing maintenance costs and whether current IT staff possesses the skills necessary for a consolidated data center.

Data center managers should also be sure to factor in energy savings in any consolidation plan. Reducing the number of data center facilities or server racks means lowering power consumption and hardware cooling requirements. Modernizing the power and cooling infrastructure could also yield additional energy savings. Since reducing power and cooling costs is a primary goal of many data center consolidations, IT should work with enterprise finance pros to develop a reliable estimate of the new data center's energy consumption.

Schneider Electric is an experienced provider of data center lifecycle services that can guide IT professionals through the process of resiliency planning and determining costs and savings for a data center consolidation project and beyond.

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Data Center Consolidation Phase 3: The Design

Until this point, the activities related to data center consolidation have been all about assessing, planning, and preparing. But once assets have been mapped, risk strategies developed, stakeholders across the business brought on board, consolidation candidates selected, and costs determined, IT professionals must begin the process of choosing a design for their consolidated data center.

While there is no single “best” approach to data center design, the process always must include the creation of a construction blueprint that accommodates the combined outputs required to run the consolidated data center. This process typically is undertaken in conjunction with a construction contractor chosen for the job and may include input from architects, engineers (structural and civil), IT and energy consultants, and several subcontractors.

Consolidating a data center is a complex project that carries high risk for the business if done incorrectly or inefficiently. The good news is there’s simply no need to reinvent the wheel by architecting a new data center from the ground up when you instead can leverage the knowledge and experience gained from project teams who already have built operational data centers.

Consolidating a data center is a complex project that carries high risk for the business if done incorrectly or inefficiently.

While there is no single “best” approach to data center design, the process always must include the creation of a construction blueprint that accommodates the combined outputs required to run the consolidated data center.

This is where data center reference designs come in. Reference designs are high-level conceptual designs used in the early planning phase of a data center consolidation after IT requirements have been defined. While they are not blueprints for construction, reference designs enable data center professionals to determine key parameters of a project such as criticality, density, efficiency and budget.

Using a pre-existing reference design from an actual consolidated data center allows enterprises to compare and contrast design alternatives. Once a reference design is chosen, it serves as a starting point for consulting engineers to create detailed, site-specific construction

Data Center Consolidation Phase 3: The Design (cont.)

documents that the contractor can use in the build phase. Reference designs make a consolidation project go more smoothly and cost less, while helping to ensure the new data center operates reliably over the long run. Data center reference designs embody a number of attributes, including:

- Criticality features (that are essential to the functioning of the business)
- Power density
- Capacity (maximum final load during a data center's lifetime)
- Equipment technologies
- Scalability features
- Instrumentation level
- System level performance specifications (weight, footprint, list of specific components and materials, etc.)

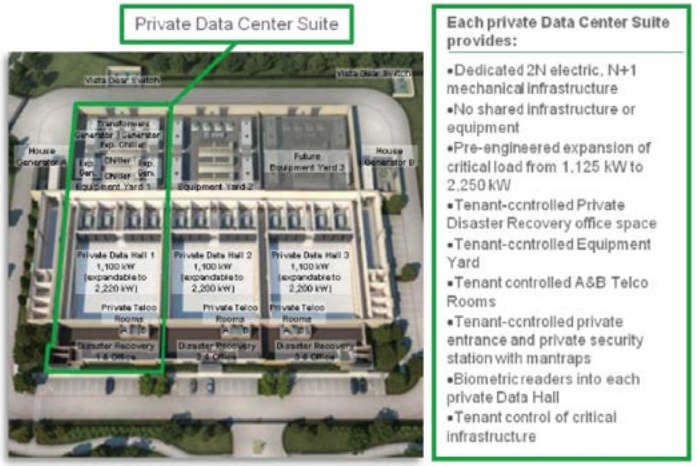
Knowing the kind of information a reference design provides enables enterprise decision makers to advance quickly and with confidence. A reference design immediately lets stakeholders know if a particular design meets the enterprise's strategic, operational, logistical, and financial needs. Will this data center provide enough capacity and flexibility for the business? Can it scale? Can we afford it? Do we have the cash flow for the building process? And will the consolidated data center even fit into the proposed "receiving" facility? Reference designs should help answer all of those questions.

There are reference designs for nearly every conceivable data center project – from massive data centers all the way down to storage closets in remote offices. Schneider Electric offers customers a Data Center Reference Design Selector that allows IT professionals to find the right design by filtering searches based on factors such as anticipated total power consumption, target uptime availability, power usage effectiveness, total racks, floor space, and cost per watt.

A good data center reference design includes an equipment list, floor layouts, electrical one-line diagrams, piping diagrams, a breakdown of facility power and cooling attributes, voltage values, rack count, and more.

Below are examples of two vastly different data center designs offered by Schneider Electric. The first reference design is for a data center massive enough (70,000 square feet) to be split into multiple "data halls" that each can accommodate more than 400 servers. The image below offers IT professionals a quick visual of the facility's size and layout.

The reference document also spells out the power ranges

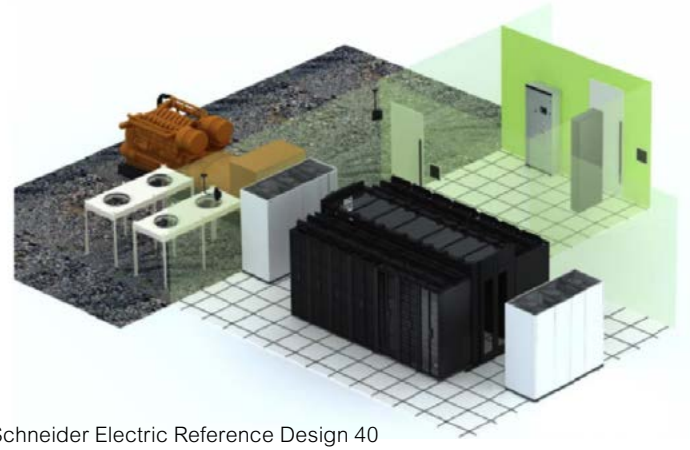


Schneider Electric Reference Design 22.

Data Center Consolidation Phase 3: The Design (cont.)

for which this design is suitable (1100 kW to 2200 kW per hall), as well as UPS capacity, cooling technology and requirements, rack configuration and density, annualized power usage effectiveness (PUE) at 100% load, and best use case ("well suited to co-location service providers interested in building tenant controlled private data suites").

At the other end of the data center spectrum is this reference design for an 867-square-foot facility housing just 11 racks. While the scope of this design is small, the same details which must be spelled out when designing huge data centers also must be included here to ensure the design works within an enterprise's facility and budget. Miscalculating power consumption is a problem, no matter how large the data center.



Schneider Electric Reference Design 40

It's unlikely that any particular reference design will be an "exact fit" for a specific database consolidation project, so IT professionals should work with their data center services vendor to compare features and costs of various reference designs in order to determine the best choice for their enterprise. The vendor can suggest modifications to a reference design if necessary.

The right reference design – one that not only is appropriate for a specific project, but has been tested and validated – can accelerate a data center consolidation, saving an enterprise time and money. More importantly, it helps reduce the risk of consolidation because it provides a map of what already has worked in similar data centers.

Modular, prefab and micro data centers

Advances in technology and design now allow data centers to be constructed in prefabricated, modular configurations that are simple to install and deploy while offering high scalability.

Modular designs can reduce total data center lifecycle costs and physical infrastructure costs. Of more

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Data Center Consolidation Phase 3: The Design (cont.)

immediate concern, “out of the box” physical infrastructure management, and integrated systems of modular, factory-built data centers accelerate the planning and deployment process for data center consolidation.

For smaller enterprises (<150 kW) or “edge” locations, micro data centers offer self-contained computing environments that come in a single container and include power, cooling, security, and data center management tools.

An experienced data center services provider will have a large library of reference designs for data center professionals to consider. You can read more here about the advantages of using a data center reference design for consolidation projects.

The data center design process typically is undertaken in conjunction with a construction contractor chosen for the job and may include input from architects and engineers.

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Data Center Consolidation Phase 4: Build & Commission

Once a data center design has been chosen, consolidation project decision makers must assemble a team of professionals that can turn the chosen blueprint into a fully functional data facility. How many different players are involved depends, to a large extent, on the scope of the consolidation and the process used to go forward.

For a "light" consolidation that involves relocating some data center hardware into an existing space and relies on a relatively simple reference design, enterprises typically can rely on the services provider from whom they chose the design to do the actual build.

Projects in which the "receiving" site is an older building (whether it's where the existing data center is located or an entirely different building) would require a larger team that might include the design firm, an architect, a construction contractor and subcontractors, energy consultants, attorneys, equipment vendors, and the IT department. The same goes for "greenfield" data center projects, in which a data center is designed and built from the ground up. Both of these types of major data center consolidations also may include a bidding process to select the project team members. These factors must be considered when determining project timelines and budgets.

Projects in which the "receiving" site is an older building would require a larger team that might include the design firm, an architect, a construction contractor and subcontractors.

Everything in writing

Just as any successful data center consolidation relies on detail – a complete asset inventory, a comprehensive mapping process, a design blueprint – execution of the actual project requires legal documents that define:

- The role and responsibilities of key stakeholders in each phase
- Cost of the work
- Compensation and insurance requirements
- Dispute resolution steps
- Change order process and limitations
- Termination grounds and processes

No consolidation project should proceed before all parties sign contracts that spell out performance and support expectations.

The data center consolidation "construction team" (contractor, subcontractor, equipment vendors) must create a project plan that clarifies critical path items and includes details of the budget, billing processes, a project schedule, and a commissioning plan. This team should work with the "design team" (architect, IT, CE firm) to ensure the project plan 1) adheres to design specifications and 2) is

Data Center Consolidation Phase 4: Build & Commission (cont.)

> No consolidation project should proceed before all parties sign contracts that spell out performance and support expectations.

realistic in terms of budget, schedule, and scope. It is crucial that the data center owner review and sign off on each phase of the project plan.

The build phase

Now it's time for the construction team to implement the consolidation project plan. As the work proceeds, the construction team should generate regular reports on the results of quality assurance and audits to share with the data center owner, along with updates on the construction process. Data center owners should establish weekly meetings to go over the reports, discuss potential build complications, and explore potential solutions. In addition, data center owners may need to assist the construction team in filing building documents seeking approval from AHJs (Authorities Having Jurisdiction) such as municipal building officials or boards.

During the build, the construction team will create documentation – the punch list, drawings, equipment operating manuals, sequence of operation documents, material safety data sheets, and warranty documents. The team should provide this documentation as well as hands-on training on the physical infrastructure systems to the data center owner and facilities operations team. This training and documentation can be used to develop Emergency Operating Procedures (EOPs) and Methods Of Procedure (MOPs).

The building phase is complete only when:

- A quality assurance review confirms the finished work has met project requirements
- The owner receives a final certification of completion from the construction team leader
- The new facility passes commissioning tests

Finally, the data center owner must sign and deliver a letter formally accepting the consolidation project to conclude the build phase.

The importance of commissioning

The commission testing mentioned above is the process by which the new facility is put through its paces to make sure everything works as planned. To commission a newly consolidated facility, the data center owner typically will hire a commissioning agent during the design phase.

The agent's job is to test how the entire new data center infrastructure performs under real-world inputs and changes. It is important to test the overall system – rather than the various components as each phase of the build is completed – to ensure that the entire facility is operating efficiently and safely.

Data Center Consolidation Phase 4: Build & Commission (cont.)

While commissioning is optional, failure to commission can expose the data center owner to potential undetected system-level problems that can hamper productivity and increase the risk of outages.

As the commissioning process unfolds, the commissioning agent should be gathering documentation, including a line-by-line report of what passed or failed, an error log report for components that lays out what failed and what was impacted, and an executive summary of performance trends.

While commissioning is designed to help avoid problems, the process can be undermined by a number of common errors made by data center owners. Those include:

- Failure to engage a commissioning agent in the design phase
- Hiring an agent who uses outmoded tests and procedures for new equipment
- Failure to simulate heat loads
- Leaving the commissioning agent vulnerable to budget cuts

Converting a data center consolidation design into an operating facility requires a team approach. While the number of team members can vary based on the scope of the consolidation project, the processes required are identical: Roles and responsibilities must be spelled out in writing, a project plan must be developed, legal requirements must be covered, and quality assurance and commissioning tests must be passed. Only after these conditions are met should the data center owner sign off on the consolidation project.

Converting a data center consolidation design into an operating facility requires a team approach.

- To learn more about the commissioning process and tools, please read this white paper, "Data Center Projects: Commissioning."

Data Center Consolidation Phase 5: Operating

Your consolidated data center has passed all commissioning tests and is up and running. Now it's time for the IT team to implement a post-consolidation management strategy while also determining the level of maintenance required for optimum long-term performance of the data center.

Though each previous phase of the consolidation process (assess, plan, design, build) was critical, they were means to a strategic end: To create an operational data center capable of meeting design performance specifications over the lifespan of the facility (which typically could be anywhere from 10 to 20 years).

The operational phase is now what the job is all about. Data center professionals must ensure that the physical infrastructure – power and cooling equipment, IT servers, networking equipment, even the actual room – enables the continuous operation of the facility. To accomplish this, they need an operations and maintenance (O&M) program for the data center.

The operational phase of a data center's lifecycle is the backbone upon which an organization's ability to execute and meet strategic goals rest.

There are a number of factors that go into effective O&M, but paramount is a "mission-critical" mindset that sets out the principles under which the data center will operate. See Table 2.

Table 2

A description of the mission critical management philosophy

"Mission Critical Mindset" principles	Impact
Focused on risk mitigation in all operational and mainte- nance activities, work processes, and procedures	Proactively deals with all potential threats to system availability and worker/occupant safety
Acting with confidence and patience that is an out- growth of careful planning and preparation	Prevents risks from becoming problems; enables faster response times and fewer errors if problems do arise
Analytical, process-driven approach to risk avoidance and problem solving	Helps identify and mitigate risk in complex environ- ments; ensures predictable and safe operation
Comprehensive understanding of the function and inter- connectedness of facility systems and components	Quickly identify and resolve potential threats or actual problems; avoid or reduce system downtime
Commitment to continuous learning and process improvement	Increases skills and operational efficiency to maintain an edge in a constantly changing environment

Source: Schneider Electric White Paper 196: Essential Elements of Data Centers Facility Operations

Implicit in this mission-critical approach is the responsibility of data center and IT personnel to proactively manage equipment maintenance and replacement, constantly monitor systems for potential problems that could lead to downtime, devise an action plan for disaster recovery for when downtime is unavoidable – all while adapting to the changing needs of the business and IT.

Done properly, a data center O&M program will help avoid

Data Center Consolidation Phase 5: Operating (cont.)

risk, save money on operational, repair and recovery costs, and enable the business to meet strategic objectives. Conversely, a poorly designed or managed O&M initiative will jeopardize data center continuity, increase costs, and undermine the business – perhaps to the point of no return.

Essential O&M program elements

White paper 195, "Fundamentals of Managing the Data Center Life Cycle for Owners," lays out a dozen fundamental elements critical to the successful operation and maintenance of a data center. See Table 3.

Table 3

12 fundemental elements of a data center O&M program

O&M Program Element	Description
Environmental Health & Safety	Program should cover injury and illness prevention, electrical safety, hazard analysis, and hazard communication.
Personnel Management	Element involves the hiring and development of competent, team-oriented people; having subject matter experts in the following disciplines: electrical, mechanical, controls, fire detection/suppression, quality management, training, and computerized maintenance management systems (CMMS); and developing an appropriate staffing model.
Emergency Preparedness & Response	Program includes the development and practice of emergency operating procedures (EOPs) for high risk scenarios, regular training and review of procedures as conditions change, and failure analysis performed after emergencies occur and have been responded to.
Maintenance Management	Involves asset intelligence combined with a proactive preventative and predictive mainte- nance plan. Three key tasks for this element are asset management, work order manage- ment, and spare parts management.
Change Management	Managing change in the data center should rely on the use of MOPs, or methods of procedure, detailed checklists for each step in a specified process such as a preventative or corrective maintenance activity.
Documentation Management	Management system to automate processes and facilitate document processing, storage, retrieval, and archiving should be in place.
Training	Program should organize all operational and maintenance tasks into categories that correspond to specific levels of capability. All activities should be mapped to these levels. Training should enable new technicians to be brought to a minimum level of competency and achieve steady progress until fully qualified. Program should also ensure personnel maintain certifications and expertise through regular re-certification.
Infrastructure Management	Using data center infrastructure management (DCIM) software tools to provide facility monitoring, capacity planning & management, and to facilitate facilities/IT integration and cooperation.
Quality Management	This element should include quality assurance (process and procedure standardization), quality control (checks, inspections, and audits), and continuous quality improvement.
Energy Management	The program involves three core tasks: performance benchmarking, efficiency analysis, and strategic energy sourcing. DCIM is used to accurately collect and analyze data to uncover energy savings opportunities. The program should manage both internal (i.e., energy efficiency/use) and external (sourcing) energy savings opportunities.
Financial Management	Financial management processes should be in place that focus on purchasing, invoice matching, and financial reporting/analysis.
Performance Monitoring & Review	This is a program that regularly collects, reviews, and analyzes well-defined, quantifiable KPIs and associated facility SLAs.

Data Center Consolidation Phase 5: Operating (cont.)

There are a number of factors that go into effective O&M, but paramount is a "mission-critical" mindset that sets out the principles under which the data center will operate.

The common threads running through the fundamentals of a database O&M program are continuous data collection, proactive planning, documentation, and quality assurance.

Just as its physical components must be well-integrated for a data center to meet performance standards, it is important that the IT and facilities teams communicate and work together to ensure the data center runs smoothly on a day-to-day basis. Further, close cooperation and joint planning by the two teams is crucial to minimizing downtime caused by unexpected disasters, equipment failure, or changes to the physical infrastructure.

A second assessment phase

The assessment phase at the beginning of the consolidation process had a beginning and an end.

Once a new data center is operational, another assessment phase begins. This one, however, goes on over the life of the facility. The operational assessment phase is a perpetual process of monitoring the performance of multiple data center components, measuring the collected data against benchmarks, and taking action when necessary to correct problems.

By identifying key performance indicators (KPIs), data center managers can determine the facility's level of energy efficiency, power usage trends, conformance to security policies, critical load and support system uptime, training compliance, current physical infrastructure health and risk profile, and much more. These metrics should be regularly reviewed by IT and the organization's management.

Getting expert help

The operational phase of a data center's lifecycle is the backbone upon which an organization's ability to execute and meet strategic goals rest. Thus, it's not something to leave in the hands of an inexperienced or overextended IT team. Data center professionals who want their facilities to run smoothly should consider contracting with an experienced data center lifecycle services provider. First and foremost, organizations should look for a vendor with the right background, experience, level of field training, and familiarity with data center equipment.

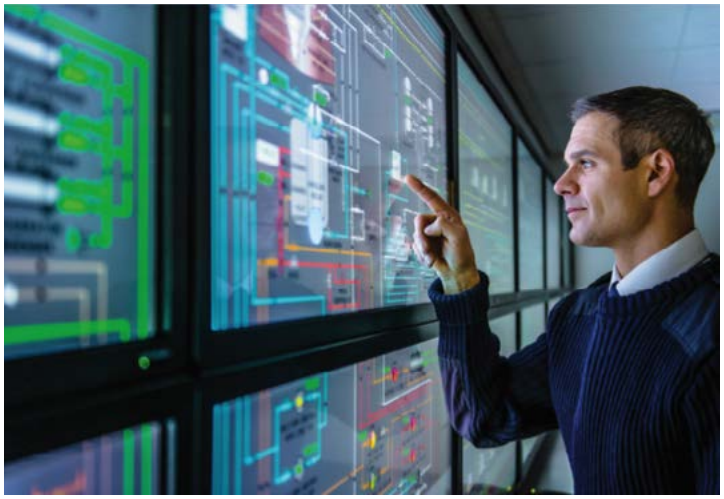
More specifically, data center operators must understand what each vendor specifically offers in terms of available services, promised service levels, emergency response time, parts inspections and replacement, areas of expertise, and costs.

Data Center Consolidation Phase 5: Operating (cont.)

Summary of steps for data center consolidation

1. Conduct a full assessment of current physical infrastructure and assets
2. Develop strategic and tactical plans to ensure the project's success
3. Use reference designs to help choose the best design for consolidation
4. Build and commission the consolidated data center
5. Operate and manage data center after consolidation

Schneider Electric offers a full range of data center lifecycle field services. Click here to learn more. To learn about Schneider Electric's StruxureWare for data center infrastructure management, click here.



The operational assessment phase is a perpetual process of monitoring the performance of multiple data center components, measuring the collected data against benchmarks, and taking action when necessary to correct problems.

Additional Resources

For more information to plan your Data Center Consolidation, please visit these resources:

TOOLS

Reference Design Portal

VIDEOS

The Data Center Dilemma: Build Your Own or Outsource

The Data Center Life Cycle: Operation Services

Why Use Schneider Electric for Your Data Center Lifecycle Services?

CASE STUDIES

Operation Services: City of San Antonio

Operation Services: Sunesys

WHITE PAPERS

Calculating Space and Power Density Requirements for Data Centers

Data Center Projects: Advantages of Using a Reference Design

Data Center Projects Commissioning

Determining the Power, Cooling and Space Capacities when Consolidating Data Centers

Fundamentals of Managing the Data Center Life Cycle for Owners

Preventive Maintenance Strategy for Data Centers

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