DIGITAL REALTY TRUST

Maximizing Datacenter Uptime through Systems and Maintenance

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How often does the end product of countless hours of planning and activity, not to mention financial commitment, fail to live up to expectations? Often, the product or operation is launched with great fanfare only to prove unable to perform its desired function on a consistent basis. Think about how different nautical history may have been had greater thought gone into planning what to do just in case the Titanic happened to hit an iceberg. In many instances, datacenters follow this same course of initial promise followed by an unpredictable stream of service disruptions and system's failures. [1]

Components of a First-Class Operation

Achieving the highest level of reliability within your datacenter operations is best described as maintaining a constant balance between multiple, interrelated components. The interactions between the providers that you select to maintain your datacenter, the documentation and standards that they use to guide their efforts, the people that operate your facility and the systems that they use to monitor and control the major components of your infrastructure are intrinsically related. The failure of even one of these components will manifest itself in the interruption of your regular datacenter operations. Achieving the level of operational excellence that your datacenter requires is a function of determining how process documentation, providers, people and systems are to be structured and administered.

Process Documentation

A majority of infrastructure failures coincide with human activity. [2] An improperly executed switching procedure or ignorance of the process to put a unit into bypass are only two examples of causes of outages that can result from a lack of clearly documented operational procedures and metrics. At Digital Realty Trust we have used the metrics and processes defined by leading standards bodies such as ASHRAE, NETA, NFPA and IEEE as the foundation for developing our methods and practices. The baseline provided by these standards bodies has been coupled with the real world experience of our field personnel and this enables us to capitalize on the best parameters and maintenance methodologies. This has led to the development of an overall set of guidelines that are then customized based on the specific needs of each of our sites. However you choose to develop the standards for your activities and processes, they must be documented and available to necessary personnel to ensure that proactive maintenance functions are done on time, in the correct manner and meet clearly defined specifications.

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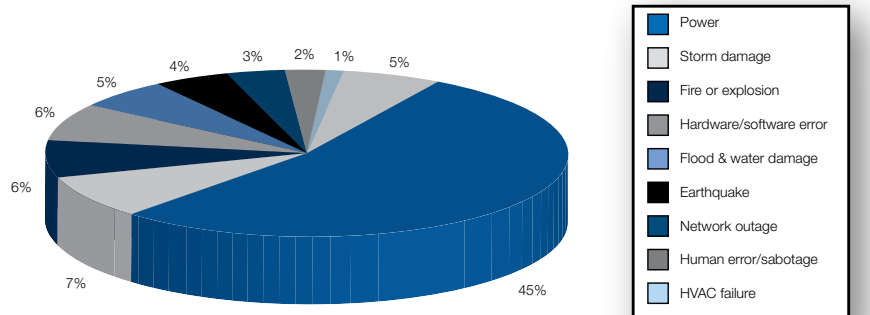
1 In a recent article for The Uptime Institute, Kenneth Brill points out the increasing incidence of this occurrence. The recent trend toward downsizing and outsourcing has become problematic for the datacenter industry, and rarely do the costs saved in labor make up for the loss of efficiency and accuracy. To go beyond blame and actually change the status quo, Brill says, "Management must actually talk the talk and walk the walk of implementing the steps required to achieve activity reliability." While the problem may seem initially complex, the reason behind the datacenter failures is usually quite simple: the amount of time spent designing the datacenter eclipses the effort expended on establishing a solid foundation for its ongoing operations.

2 54 percent: Liebert High Availability Response Team, Down Analysis, 100-1000 kVA, September 2005 - August 2006



54 percent of infrastructure errors are coincident with human activity

Providers

Determining who will provide preventive maintenance services for your datacenter is a critical issue that must be addressed prior to commencing operations. While using your own employees is always an option, careful consideration must be given to their skill sets and workloads to determine if you are not better served by outsourcing these functions. The decision to outsource your datacenter maintenance services should not be viewed as an indictment of the capabilities of your own personnel, but rather, the opportunity to use them more efficiently by adopting a "best-in-class" provider structure. When using outside providers, however, it is extremely important that they are trained to perform their operations to your documented specifications and regularly monitored to ensure their ongoing compliance. [3]

People

The capabilities of your facility engineers are a critical factor in achieving operational excellence. Since these are the people who will be supervising outside personnel and maintaining your systems, they must be both knowledgeable and comfortable with the equipment and procedures used within your datacenter. Their training and certifications must be consistent with the functions and equipment for which they will be responsible. For example, the person maintaining your network is probably not the right one to maintain your CRAC units. Most importantly, you must ensure that regular testing and maintenance is not neglected due to a fear of "touching and breaking something." In short, the degree of familiarity with your datacenter by your engineer directly translates into the success of your ongoing operations.

Systems

This final component of a first-class datacenter operation effectively ties together the preceding three attributes. By integrating the right monitoring and control systems, you place a powerful tool set into the hands of your datacenter management staff. The purpose of any combination of datacenter management systems is to provide your personnel with both a real-time overview of all of your operations, as well as to capture critical historical information. This collected information can then be used in a variety of ways. Trending, for example, can be used to identify the precursors to system problems or failures, thereby enabling your personnel to proactively defuse them as well as correctly budget for repairs.

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3 This process requires a due diligence that can be lost in the pursuit of the lowest price provider. According to a recent article by Gartner, "IT operations outsourcing proposals are often evaluated and executed with inadequate information about services and costs. The result may be an agreement that does not define the full set of services required, does not result in expected cost savings, and requires retaining a significant number of internal staff to close service gaps and monitor the outsourcer." Again, the commitment by management to quality above all else is critical.

The Importance of Effective Datacenter Management Systems

When establishing an effective datacenter management system, there are a number of alternatives to choose from. Some operators elect to use tools of their own design because they feel they are the best way to monitor and control the "unique" operations of their datacenters. At Digital Realty Trust we have opted to utilize a "best-of-breed" approach in which we carefully selected the best management components available to integrate into our own Critical Facilities Management™ system. Regardless of which alternative you choose, homegrown or best-of-class, your datacenter management system should include the following components:

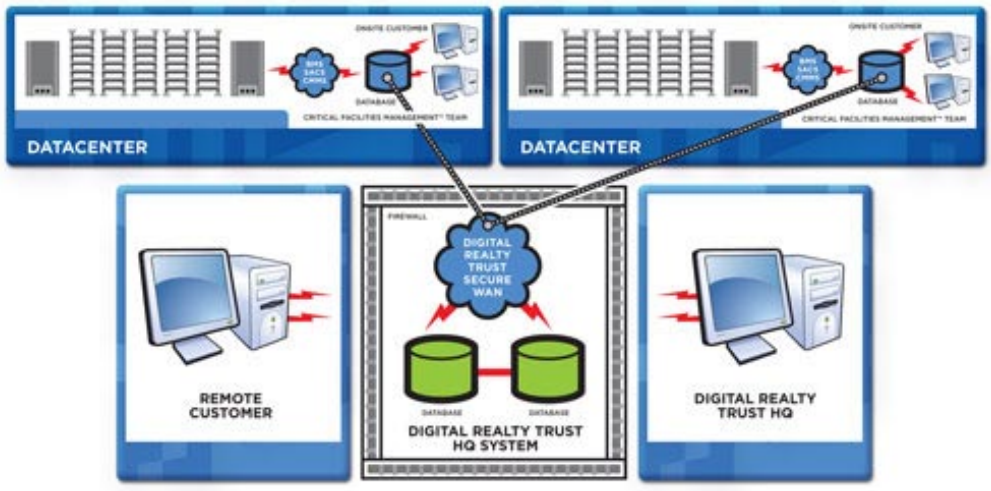
- Secure Network
- Building Management System (BMS)
- Security and Access Control System (SACS)
- Computerized Maintenance Management System (CMMS).

Secure Network

The security of the network connecting your locations is the most fundamental aspect of your management system. Whether your facilities are housed within a single building or, like us, in facilities throughout North America and Europe, the successful monitoring and control of your operations is predicated on the need for accurate data. An "open door" policy for management system access is the surest path to performance problems and service disruption. Although a network attack by a hacker is the potential breach of security that first comes to mind, more often than not, the root cause of management system problems is the use by unauthorized personnel. [4] For this reason, your establishment of a secure network must begin with a clearly defined hierarchy that provides individuals with only the level of network access that they require. This multi-level scheme must also embrace the use of firewalls and data encryption for your remote users to both limit unnecessary access and ensure the data integrity of transmissions to and from your remote sites.

The security and availability of your network is further bolstered through planned redundancy. At Digital Realty Trust we have architected our Critical Facilities Management™ systems to capture data at each local location as well as in our central database. System redundancy and security is then further preserved at our main management facility by using a synchronous database structure to ensure that we always have a real-time back-up of all collected information. By incorporating redundancy into your management system design you inject an extra level of security into your operations.

4 According to a recent article by ArcSight, a growing number of security breaches are caused by negligent or malicious employees.



A secure network design must include a multi-level access scheme, firewall protection for remote sites, and redundancy.

Building Management System (BMS)

Although they are referred to under a number of aliases, including Energy Management Systems (EMS) or Building Automation Systems (BAS), Building Management Systems all provide the same basic services to building equipment. These systems are responsible for controlling, monitoring, alarming and trending for the connected equipment. Most commonly a BMS system will perform the monitoring and control for all datacenter infrastructure including: UPS units, PDUs, generators, switchgear, CRAC units, chillers and cooling towers.

Of all its capabilities, perhaps the most important service that a BMS provides is the trending of data related to alarms, utilities and space temperatures. By regularly reviewing this data, you can recalibrate your maintenance and operations schemes to adjust for the specific performance characteristics of your major infrastructure components. Correctly implemented and used, your BMS can help you become more data-driven in the management of your datacenter, as well as providing you with important insight into the forensics and root causes of system incidents.

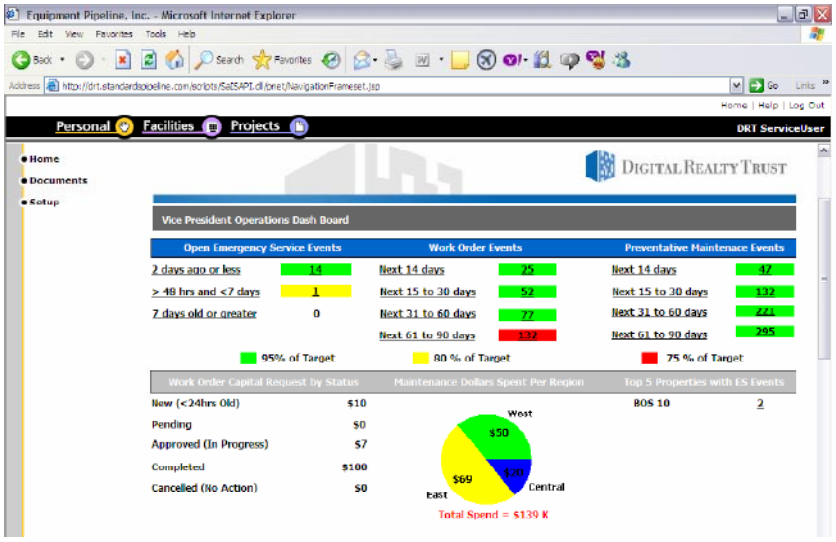
Security Access and Control System (SACS)

Quite simply, SACS is the gatekeeper to your datacenter. Through the use of a variety of components including: card readers, biometric readers, cameras, video monitors, gates and man traps, your SACS monitors the comings and goings of the customers, vendors and/or personnel within your datacenter facility. At Digital Realty Trust we have even found our SACS to have a major impact on the consistency of our branding. By using a one badge, one system approach our tenants have constant reminder that they are operating within one of our facilities.

Computerized Maintenance Management System (CMMS)

Perhaps the most important component of your datacenter management tool set is the Computerized Maintenance Management System (CMMS). Although some datacenter professionals tend to regard them as high-grade work order or building management systems, nothing could be farther from the truth. Correctly implemented and utilized, a CMMS is a maintenance management system, work management system, asset management system, purchasing management system and a facilities reporting system combined within one platform. From a single dashboard screen your CMMS can provide you a real time snapshot of the status of all the activities surrounding the operation of your datacenter through the effective integration of the BMS and SACS over the secure network.

The capabilities of a well managed CMMS are especially important should you elect to use outside maintenance personnel. Your CMMS should provide you with the complete, accurate and consistent management capability of your facilities assets and their maintenance histories. Among the information that your CMMS should capture is verification of the performance of all scheduled maintenance activities, equipment maintenance and maintenance cost histories. It should also provide you with an important repository for maintenance and asset data. Over time your CMMS can become a useful predictive maintenance tool. At Digital Realty Trust our customers and our Critical Facilities Management™ team access their CMMS data via a web portal to further update and refine their own operational plans as well as receive a real-time dashboard of alarms, work orders and other management information.



Your personnel can view real-time system information via our web portal.

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Summary

The planning and commissioning of a new datacenter is a huge undertaking where, in many respects, the real work begins after the initial project is completed. Achieving the level of reliability that the facility was designed to deliver requires a commitment to an equal, if not greater, degree of planning regarding its on-going operations and maintenance. By understanding and incorporating the required human and systems elements for operational excellence into an integrated management program, you can ensure that your datacenter's performance will always live up to its expectations.

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About Digital Realty Trust

Digital Realty Trust is the largest purchaser, owner, developer and operator of datacenter space in the industry. Since 2004, we have purchased over $2 billion in datacenter assets and designed and built facilities across North America and Europe. We currently own over 60 properties in 25 markets and manage over one (1) million square feet of datacenter space worldwide. This is why over 50 Fortune 500 firms rely on Digital Realty Trust to provide their datacenter solutions.