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Mission Critical Facilities

Healthcare IT - Impact on Facilities

Introduction

The impact of IT on healthcare facilities has been increasing over the years, where the need for reliable infrastructure in support of patient care is becoming even more critical. With the move toward digital imaging, digital pharmacy, and the ever-growing patient record data bases, the need for real-time communication throughout the medical professions is reaching a threshold. As hospitals continue to move away from paper forms in favor of PC tablets, and away from X-rays in favor of digital imaging, the need for a reliable electronic repository (i.e., data center) is paramount. This article will address the rapidly evolving relationship between the medical professions and the need for reliable IT infrastructure, and its impact on existing facilities.

The Growth

The digitizing of patient records is a growing trend in healthcare IT. Where thousands of folders once stored patient information in paper form, this information is now being digitized and stored electronically at a consolidated facility that can be, but does not necessarily need to be, located on site. As the cost of storage media such as SANs and tape storage is becoming more affordable, the business case to remove the hard copies of the past is becoming more apparent. Electronic retrieval of patient records and the ability to cross reference these records using network software, can now link multiple hospitals through central data centers.

Digital Radiology is another growth sector where images of Cat scans and X-rays can be stored for future reference. The high resolution image files require tremendous data space. The IT facility needs to be capable of storing these digital images, but accessible to the physicians at a moment's notice. IT growth in Pathology, Cardiology, Oncology, and Pharmacy to name a just a few are also expected to grow. A relatively new approach to point of use patient care is the PC tablet for the Physician to track and document notes and recommendations.

Equally important to maintaining healthcare records, is the ever growing volume of healthcare financials and reimbursement claims. As more patient records are stored in electronic data bases, the financials for the hospitals are less prone to errors in billing to insurance providers and patients. This reduced error rate increases efficiency and creates higher revenue. The electronic doctors' notes, digital pharmacy costs, radiology cost, et al can all be easily linked and accurately summarized with each statement.

Historically, hospitals had been renovated with small server closets or, in the case of many older facilities, house their computer within the mechanical / electrical rooms often in the basement of the building where piping or high voltage power lines originate. Until recently, maintaining the integrity of the IT network and infrastructure was considered a luxury, and not a necessity, as this had little or no impact on the day to day operation of the hospital.

The Johns Hopkins Hospital has developed Electronic Patient Record (EPR), an application providung patient medical records across their network of hospitals and medical facilities. The patient data retention in hospitals can generate a tremendous volume of data that needs to be stored and accessible. The healthcare IT field is growing and is increasingly becoming more commonplace through many institutions. According to Edward Fields of The Johns Hopkins Hospital, data centers are an integral part of operations of the hospital.

In many cases, the increased demand is creating a burden on the existing computing capabilities for hospitals. Interruption and loss of the communication will hamper hospital operation and efficiencies gained by the digital communication. In order to maintain a smooth, efficient and well run facility, reliable IT infrastructure (i.e., data center) will be necessary.

As the need for a dedicated data center pushes its way to the forefront, it is critical that proper planning accounts for both the current demand, as well as the projected growth. "Medical images that used to be two-dimensional and 1MB in size a few years ago, are now four-dimensional and 1TB in size! By 2010, it is estimated that 30% of the world's digital storage will consist of these medical images." [1] In the case of those hospitals which are affiliated with Universities, the addition of medical research (human genome) and academic research (physics, engineering, weather and climate change) will extend the data center to even greater limits. IBM recently introduced their "Blue Gene" supercomputer, capable of providing up to 20 peta flops (which is about 20 bazillion operations per seconds). Supercomputers such as these require significant power (up to 35kW per cabinet) and cooling, in an extremely compact footprint (less than 25 SF each).

Economic Impact

The growth in healthcare IT is generating a need for larger and more reliable infrastructure to support the data centers where IT resides. This is creating a tremendous strain on the facility where an indirect revenue generation component of the hospital can consume significant financial resources.

Traditionally, hospitals have located their data centers as an afterthought, either in basements of the buildings or next to facility plants. They are limited by space, power and cooling for any significant growth. They are also typically designed at a Tier I level or sometimes Tier II (refer to The Uptime Institute white paper for more details on tier level and uptime of the data center).

To support the high load densities associated with a data center, the required power and cooling can be as much as twice that of the critical (IT) load. Amplifying the cost of the infrastructure requirements is the need for reliability which often results in redundant equipment and multiple paths of distribution. The cost to support mission critical space can be extremely high compared to traditional commercial construction. The metrics for construction cost such as $/SF are typically not relevant for data centers. Instead, the construction cost is a function of level of reliability and the proposed critical load density within a data center. The growth factors that influence the facility are critical load, HVAC systems to support the critical load, and system inefficiencies. As such, the preferred metric for data center construction costs should be $/KW (critical power).

The table below illustrates the sliding scale for construction costs for a typical data center with 200kW of Critical power located on 2,000 square feet of raised floor (100 w/SF).

Cost Metrics for Data Center

	Tier I	Tier II	Tier III	Tier IV
* Infrastructure ($/kW)	$11,500	$12,500	$23,000	$25,000
Building ($/SF)	$190	$190	$190	$190
M/E/P	$2,300,000	$2,500,000	$4,600,000	$5,000,000
Building	$665,000	$709,333	$886,667	$931,000
Subtotal	$2,965,000	$3,209,333	$5,486,667	$5,931,000
$/KW	$14,825	$16,047	$27,433	$29,655
$/Square Feet	$847	$860	$1,176	$1,210

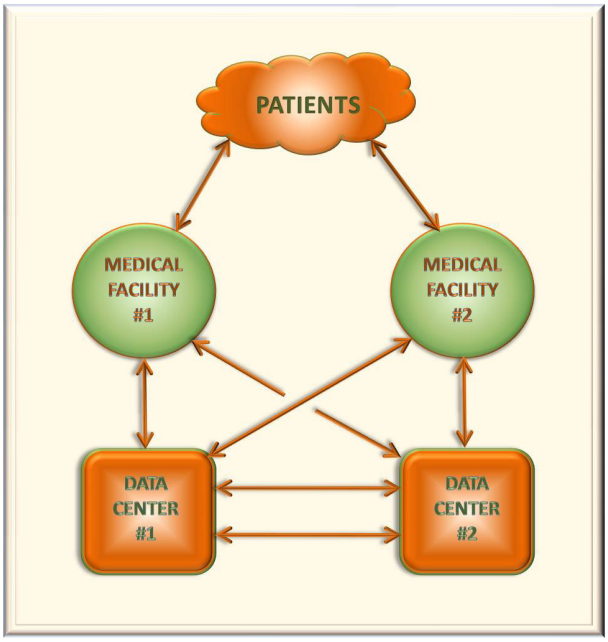
** Uptime Institute - Cost Model: dollars per kW plus dollars per square foot of computer floor.*

[1] IBM's Vision For The New Enterprise Data Center – IBM Point of View - October 2008.

Data Center Mission

Typical construction cost for a Tier II data center can be approximately $12,500/KW and a Tier IV facility can be twice that cost. Even with the high construction cost of a Tier IV site, they are still prone to catastrophic failure. Some facilities utilize a remote Disaster Recovery site (leased or owned facility), which as the name implies, consists of a smaller facility located offsite and stores only the most critical data in case of a prolonged outage at the main facility.

Due to high cost of data center construction, the “hot-hot” site solution is becoming more prevalent. An example of this would be to have two Tier II sites, or a Tier III and a Tier I site located in two distinct facilities, having redundant communication between the sites and redundant communication to the hospital. The hot-hot site can provide backup for critical systems while still maintaining a fully redundant solution to the hospital. This helps to reduce the initial capital cost for providing higher reliability facilities, while proving even greater benefits in OPex savings (which can be as high $100K/month per site).



Typical data hot-hot data center configuration to support 2N to the mission (patient support)

Conclusion

The growth in healthcare IT is becoming more prevalent and affecting not only large institutions, but smaller medical providers as well. The growth in media storage and high density computing is becoming integral to day to day operation of many hospitals. This increased growth in high density computing and medical imaging is creating a greater demand on hospital capital and operating expenditures, where traditionally the data center has been considered an overhead component of hospital operation with little operational impact.

The IT growth is also impacting facility capital and operational budgets. Consideration of evaluating existing data center operation to determine the impact of the data center on the hospital operation should be addressed by both facilities and IT in a collaborative effort to the challenges awaiting a relatively new field for hospitals and healthcare providers. A systematic approach in evaluating existing facility, projected growth, capacity, and fiscal planning is key in order to stay ahead of the healthcare IT growth curve.

About BKM Mission Critical Facilities

Established to meet the demands of mission critical facilities, BKM Mission Critical Facilities (BKM-MCF) is dedicated to the advancement of critical systems for data centers, network operation centers, and readiness centers. From a small LAN closet to a large Tier IV facility responsible for millions of dollars in corporate revenue, BKM-MCF understands the critical nature and value of keeping a company or agency online 24x7, 365 days a year. BKM-MCF provides energy conscious design for facilities with a need for high reliability. This engineering passion is expressed through the firm's elegant design solutions to solve the challenges faced by its clients.

About the Author

This white paper was authored by Rajan Battish, PE LEED AP. Battish is the managing principal of BKM Mission Critical Facilities and has more than 15 years' of experience in electrical design, with a specialty in power infrastructure for mission critical facilities.

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