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Data Centre Trends in the Healthcare Sector

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Growing IT applications are taking a central position in the functioning of any healthcare facility. Existing sites are commonly relying on older IT and technical facilities, not able to support the new and demanding requirements of tomorrow's organisations. Cooperation with other similar healthcare companies allows for optimised investment and operational budgets, whilst this differentiated on-site/off site approach ensures required speed and reliability for the critical services.

Identifying Trends

The healthcare sector has, over the past few years, seen an unprecedented evolution towards electronic applications. As broad a range of services as one can think of are currently in use, or being rolled out on a large scale. To list only a few significant applications:

• Electronic Patient Records (EPR);

• PACS Server & Storage;

• Nurse Call Stations;

• Patient and ICS Monitoring;

• Pharmacy Information & Recipe;

• Patient Bedside Entertainment;

• Remote Applications;

• Geolocation Services   and even veterinary practices are run through local and larger networks.

Reference healthcare projects in the USA have shown a 300 percent growth in power, and a 200 percent growth in IT space over the last three years. The impact the immense growth of these services has on the required facilities to manage and maintain such operations is staggering. This article aims at identifying some key challenges and attempts to suggest a few (out of many different) solutions that could offer means to address these challenges. To conclude this introduction, some examples of specific applications which have made international press coverage throughout Europe recently:

• Finland expects to have its National Medical Archives grown to a capacity of 550 PB by 2025;

• UZ of Leuven, Belgium, is introducing patient bedside terminals to offer monitoring, as well as entertainment stations;

• SMS alerting patients to take in critical medications;

• Remote Telepresence services cutting out the doctor to patient distance; and

• The training of aspiring surgical students with the Wii.

Challenge: IT and Applications

Applications that have grown out of different perspectives are increasingly expected to communicate with each other; or even to offer a single platform for all healthcare services. From the EPR archive to the imaging databases to hospital administrative services, these applications are becoming more and more integrated. A considerable effort in software and systems is needed to transfer existing single services into fully integrated application platforms.

Data can be critical, sizeable, "living" or dormant in archives. To correctly identify the required application's handling, one must assess the nature of the data and allocate the required resources.

• Critical data ("life or death"), like intensive care monitoring, imaging databases and medication management services need to be readily

available. Speed and reliability are paramount.

• EPR archives and storage can be bulky, but needn't be kept in such critical environments as the critical data.

• Patient entertainment systems could be considered "obsolete" in the case of system failure, but when integrated into patient monitoring systems, are immediately upgraded to semi-critical applications.

As far as IT related services are concerned, these critical requirements can be translated into Bandwidth (processing the data as fast as possible), Redundancy (allowing for timely and secure backups), and Disaster Recovery solutions. In any case, the strategy for each of these is to be nested deep in the overall site's Business Continuity Plan.

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When applying this to significant medical infrastructures (hospitals, doctor/specialist co-ops, etc), the way forward is on one hand to maintain a relatively small, but very critical facility on-site or on campus, and a second, larger and maybe even shared off-site "data warehouse". The on-site facility, with minimal latency delays to the end-users, manages critical data (intensive care, operating rooms, "active" patient records) being built for speed and reliability.

The off-site facility is mainly focused on archiving dormant patient records and medical information. Sharing the burden on campus, regional, national or even international level allows for optimal allocation of resources, reducing shared costs and outsourcing specialised services. This is where National Medical Archive type projects come into view. This off-site facility is also setup as a Disaster Recovery site, able to take of critical processes should the primary on-site facility fail. Required latencies/bandwidth for such scenarios is to be evaluated.

Taking it one step further, an even more diversified approach is adviseable. Duplicating archives over different sites (nationally, or why not, internationally diverse), mitigates many technical, natural and regional risks, and although perhaps counter-intuitive, can significantly reduce investment costs and operational expenses.

Looking toward private "Cloud"-type solutions could very well be the final step, but, as further discussed, will raise significant data security and compliance concerns.

Challenge: Facilities

The cumulative effect of the identified trends is placing an evergreater demand on healthcare facilities to provide more data centre space, capacity and fit for purpose infrastructure. Space is at a premium, and where core business is of a medical nature, supporting services are often driven underground.

In existing sites, one can spend days in the basement, hopping from one department's "IT shed" to the next. None are designed for function, none are efficient in either space or energy consumption and more often than not, significant vulnerabilities to accidental mishandling can be quickly identified. Expanding and upgrading these legacy housings is challenging, costly, if not downright impossible, posing significant threat for the site to manage current and future evolutions.

The proposed solution as highlighted in the "IT and Applications" section, is relevant here as well. Integrating all critical applications at a site-wide level into a single designed-for-purpose location reduces operational costs, combines investment efforts and better manages current and future needs.

The key challenge for this to work lies with the company's CFO. All too often, budgets are spread out over different departments and it is difficult to identify available budgets for IT-related systems, let alone to get these departments get to see eyeto- eye when it comes down to the money talk. The care and management for the IT infrastructure needs to be centralised and must not be segregated between a number of departments.

Returning to the on-site facility, one would expect a high-power density, very efficiently operated (electrically and mechanically) installation, built for speed and reliability. As mentioned, the off-site facility/ facilities can be outsourced to specialised companies, providing infrastructure with relevant service level agreements.

Challenge: What Does the Future Bring?

Barring scientific breakthroughs in the research field of space and time, it is impossible to predict what the current evolution of e-services will look like in five, ten, let alone 20 years. Accurately predicting growth for a 5 - 20 year period will remain, for the foreseeable future, a fool's errand.

Building massively oversized installations, both in space, power, cooling and communications is costly, inefficient, and downright bad for business. Though looking back a couple years can prove helpful to understand what could happen, pinpointing what will happen is not possible. Therefore, it is imperative to design facilities to requirements and allow for quick and safe expansions in future. Modular data centres and scalable installations are buzzwords of the IT facilities sector, but are certainly worth looking into. The advantages are clear:

• Reduced investment costs;

• Improved efficiency;

• Optimal use of space and resources.

There are however dangers for scalable sites too. Again, the IT strategy needs to be controlled centrally, and any changes, upgrades or expansions of installations need to be well considered, and must not adversely impact future flexibility. A critical site needs to be thoroughly commissioned before release. How will you commission future expansion on, an at that point, live data centre? It's certainly not impossible, but it can be quickly made impossible.

Legal and Security

When integrating critical and confidential patient records, security and privacy must not be overlooked. Many national governments have implemented privacy and data protection acts. European regulations are also coming into view, such as:

• The Data Retention Directive;

• The Personal Data Processing Directive; and

• European Medicines Agency guidelines.

But apart from these market-specific guidelines, other issues need to be scrutinised as well. Local criminal law and law enforcement specifications can force your medical database facility to open its doors during investigation procedures.

Joining all data into a single medical archive raises further concerns. One advantage would seem that all emergency rooms possess full and relevant patient records, but do we allow all doctors to access all patient records? Weighing quick accessibility in emergencies against patient record security and privacy will be a difficult hurdle to take. How is privacy aligned to the installment of medical databanks? This is certainly an issue to liven up legal debate in coming years.

Conclusions

The explosive growth in e-health applications puts significant strain on IT departments, supporting facilities and allocated budgets. A diverse approach to managing medical data and other related services has proven a valid model.

The healthcare facility data centre is no longer a mere supporting element but has become the very core of the operations of the healthcare sector. An effort needs to be made to get the IT shed out of the basement and give it the status and reliability it needs. However, integrating many sources and types of medical data requires significant thought to protect patient privacy.

An integrated solution calls for an integrated approach, where the central management office play a crucial role: requirements need to be detected at an centralised level, budgets need to be allocated at centralised level, and the very IT infrastructure and facility needs to managed and operated at centralised level.

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