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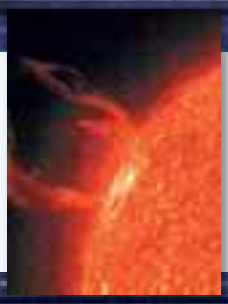
THE END-TO-END RELIABILITY FORUM

PUE VS PUE

HP Technology Services Strategy



Space Weather: A Brief Overview

A New Data Center That Will Hit Your Sweet Spot

Duffy Development Services

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Robert F. Kennedy, Jr.

2011 SPRING CONFERENCE

KEYNOTE SPEAKER

A NEW DATA CENTER THAT WILL HIT YOUR SWEET SPOT

OPTIMIZING THE PLACE WHERE FINANCE, IT AND FACILITIES CONVERGE. HERE'S HOW.

by **Mike Duffy**

EXECUTIVE SUMMARY

The decision to buy, build or lease a data center is a daunting challenge that requires a unique combination of financial, IT and real estate skills and resources. You always begin by looking hard for fatal flaws. A lack of reasonably-priced power, adequate water supply, or quality fiber provider should disqualify a potential data center or data center site from consideration.

The optimal data center offers a low total operating cost; on-site, reliable power; multiple fiber providers; scalability and flexibility; efficient, cost-saving technology; LEED Gold and/or Energy Star certification; a secure, desirable location; critical infrastructure management; one party decision-making; and flexible lease/purchase options.

Scalability and a low PUE is critical. Total cost of ownership may be fine today, but may be compromised when you need to expand. Long-term, more often than not a facility with a low PUE and more scalability is a better choice than a facility with marginally lower power cost. As the industry trends quickly toward virtualization and cloud computing, a "next generation" data center avoids the inefficiencies of partially-used servers, racks, and capacity.

It's all about finding the "sweet spot" where all the essential factors converge.

The decision to buy, build or lease a data center is a daunting challenge. It is one of the most significant financial decisions a company is likely to make in any given year, requiring consensus among financial, IT and real estate planners, the final choice will have an enormous impact on the company's future success.

The right data center should provide reliable functionality, security, flexibility, and convenience. It should also adapt as the future unfolds. The decision demands in-depth knowledge of sophisticated technology; a detailed grasp of current and projected data center capacity requirements; financial acumen; and cooperation of senior corporate leadership.

Data centers represent a unique combination of financial, IT and real estate resources. While all three must be evaluated, the weight or prioritization of each will vary based on your specific needs. It is essential to identify the optimal blend or "sweet spot" of finance, IT and real estate. Many projects and programs have failed for not having done so.

What's your ideal mix? (Note: all three areas are in flux and will change based on evolving business needs and new technology.)

HOW TO HIT THE SWEET SPOT BETWEEN FINANCE, IT AND REAL ESTATE

Years of Data Center Development Experience

Having spent over a decade at Microsoft immersed in data center design and construction, I learned the importance of addressing these complex, interrelated issues to achieve a successful outcome for all stakeholders. As Senior Development Manager for Data Centers, I was in charge of creating and managing Microsoft's multi-billion dollar expansion program. Working on four of the ten largest data centers in the world, my responsibilities included financial management, site selection, negotiating tax and utility incentives, and all facets of design, procurement and construction. During my tenure Micro-soft added seven data centers totaling almost 160 Megawatts of critical capacity.

It was a great experience. I worked with really smart people and gained visibility into the emerging data center industry. We defined the best way to build data centers internally, and we studied the competition. What is Google doing? Yahoo? What are their technologies? Locations? We also explored leased facilities in the U.S., Europe and Asia; large service firms such as Digital Realty Trust and DuPont Fabros; and technology solutions with industry leaders such as Intel.

I brought all this experience in founding Duffy Development Services, a data center consulting firm in the Pacific Northwest. I'd learned the importance of a detailed vision of a 'Dream Data Center:' the most important features, options and priorities for engineering, power sourcing, advanced technology, future flexibility, location, security and financing. The goal? To align business and technical needs to the optimal data center solution.

When The Benaroya Company approached me to consult on their Seattle area South Hill Data Center project, I was a bit skeptical. At Microsoft I did a lot of site selection, including potential repurposing of existing facilities. The vast majority of properties that owners thought could be converted to data centers were completely unworkable. The opposite was true at South Hill.

Eliminating Fatal Flaws and Tallying Up The Assets

The first task in evaluating a potential data center is to look hard for negatives. Any one of three fatal flaws should immediately disqualify a site.

1. Not enough reasonably-priced power
2. Inadequate water supply (less important with air-based cooling);
3. Lack of at least one quality fiber provider (two or more are best, to provide diversity and price competition).

If a site has no fatal flaws, you begin to tally all the positive features. The more, the better. Things to look for include:

- [ ] a low total operating cost – not just the base power rate
- [ ] ultra-reliable power – preferably on-site and easily expandable
- [ ] multiple fi ber providers
- [ ] scalability and flexibility throughout
- [ ] efficient, cost-saving technology
- [ ] LEED Gold and/or Energy Star certification: efficient, sustainable, adaptive, secure, desirable location with critical infrastructure management
- [ ] one party decision-making, with flexible lease/purchase options

THE BEST DATA CENTER I'VE SEEN IN YEARS

I've seen a lot of data centers and the one I'm most excited about is the new South Hill Data Center south of Seattle. This new data center is a reuse of a $220 million facility, originally built for chip manufacturing with a Class 1 clean room. The shell is uniquely designed to push air in a way that a typical data center can't. Intel deployed similar high density cooling principles to develop their Jones Farm facility in Oregon. The plant at South Hill was clearly an extraordinary property to reposition as a data center.

South Hill Data Center was designed with operations best practices in mind. Many facilities focus exclusively on creating capacity, to get it on the market fast. Operations then become the tenants' headache.

South Hill offers operational efficiencies such as loading dock areas for asset management, head-count areas for staffing, room for IT and facilities personnel, and storage areas so vendors won't have to work out of the backs of vans. It's a very functional, pleasant environment.

In addition, South Hill is the only data center I've seen that offers a unique combination of these three highly desirable features:

WHY DO USERS PLACE SUCH A PREMIUM ON THESE FEATURES?

To increase high density capabilities, you must add additional electrical capacity. In most locations this is rarely a problem. It's adding the necessary cooling capacity that often becomes a fatal flaw – because it requires financial premiums and/or significantly impacts efficiency.

South Hill is well-equipped to increase high density capabilities, quickly and economically. With evaporative cooling and air-side economizers: essentially free cooling capabilities. You don't pay for mechanical cooling; there's only the minimal cost of running the fans. For many data centers, increasing the capacity of an air-side economizer with an evaporative cooling system is challenging – sometimes impossible – because of the sheer volume required for air. South Hill can quickly increase capacity, without disruption and without premium.

South Hill's in-place scalability is unmatched in other facilities. Initially, the facility infrastructure is at 150 Watts per square foot, which can quickly scale up to 260 Watts per square foot. That's a 73% increase in power density, unheard of in data centers. South Hill can even expand further, without any impact to the server occupants.

FUTURE-PROOFING THE INVESTMENT

Scalability is a huge advantage for an operational data center. Essentially, it future-proofs your investment, because the demand for density will continue to rise. There are already a number of 80-to-100 Watt facilities that can't increase their power density, because they can't accommodate a flexible, efficient infrastructure upgrade. Basically, they are already outmoded.

Looking into the future, a true "next generation" data center must be equipped to support an industry trending toward virtualization and cloud computing.

Virtualization optimizes network and IT resources, getting away from "hands on." It's a more managed, holistic, and unified approach that avoids the inefficiencies of partially-used servers, partially-used racks, partially-used data centers. Virtualization optimizes and combines those resources, to better utilize IT assets, and to maximize their value and return.

With more virtualization, server loads will go up. And the loads will be more predictable, more sustainable, and better managed. 80 Watt per square foot data centers will quickly become antiquated. 150 Watt data centers will still have a place, but demand will grow for 200 to 250 Watt data centers.

You'll need a standard high-density pod environment, with hot-aisle/cold-aisle containment. An ideal facility is not only scalable within its own footprint, but its infrastructure and density can also scale.

And with the industry trending toward additional servers housed in containers, you'll need real estate to accommodate those containers. South Hill offers more than enough space for containers and/or additional construction, including an existing cold shell building with plenty of power and fiber.

Apart from engineering, power, technological, safety and security considerations, the bottom line affecting any major financial investment is what will it cost to run? What will it take to finance? The power rate at South Hill is 5.3 cents and the PUE is 1.32. In a typical facility with a PUE of 2.0, power rates would need to be 3.5 cents to match South Hill.

And South Hill is a turnkey facility, ready for immediate occupancy. There's no risk of construction delays and cost-overruns. The easy expandability and scalability protects your investment against unforeseen financial stress.

CALCULATING TOTAL COST OF OWNERSHIP

Too often, Return On Investment (ROI) is categorized as Capital Cost per Megawatt on a balance sheet. However, companies must also run on a P&L model, with expenses in mind. You may have built the cheapest facility in the world, based on Least Cost Per Megawatt. But if the facility and infrastructure aren't efficient, operating costs will be high. If you built too much capacity – or the wrong density – expenses will be high because utilization will be low. And if critical infrastructure – especially the mechanical system – is not efficient, power use will be too high.

ROI should be calculated by Total Cost of Ownership rather than just capital cost, or cost per megawatt. It's about optimizing processing power and rack space. How many KW do you actually use relative to what you pay for? If you're using just 50% of your resources, even efficiently, you're not optimized around the Total Cost of Ownership.

That is why scalability and a low PUE is absolutely critical. When calculating Total

Cost of Ownership, you need to look long-term. Total Cost of Ownership may be fine today, but when you need to expand or scale, it may be compromised.

Looking at the total picture, you'll likely determine that it's better to go with a facility that has a lower PUE and more scalability, rather than simply a marginally lower power cost. It's all about finding that "sweet spot" where all the factors converge. If you overdo any of the critical factors to compensate for potential future demands – taking too much space, building too high a density or too much space, or settling for a poor PUE – you're stuck. South Hill has an enviably low PUE and low power costs. It fulfills all the variables for an optimized Total Cost of Ownership, both short-term and long-term.

One more thing to consider on the financial side – who holds the purse strings? In my experience, The Benaroya Company is a unique owner. They self-finance, so they don't need to get a bank, a lender, a partners' or investors' input or approval. The Company is exceptionally pro-active, willing to take calculated financial risk. They know how to move quickly, and can help you do the same.

BACK TO THE SWEET SPOT

I hope I've given you some useful guidelines for defining – and ultimately finding – your own data center sweet spot, optimized for a company's current and future financial, IT and real estate needs.

South Hill Data Center aligns well with today's medium to high density requirements. For details, please visit www.southhilldatacenter.com, or contact Dave Vranizan at 425-440-6711.

A CLOSER LOOK

South Hill Data Center gets the green light for anyone seeking an extremely reliable, secure, highly efficient, immediately available, state-of-the-art facility.

Minutes from Sea-Tac International airport, it's built on solid bedrock, high on a hill, well above the 500 year flood plain. It's constructed as a building within a building to withstand seismic activity. The site also has a huge water capacity AND multiple fiber providers for redundancy.

Today, South Hill controls 42.5 Megawatts of sub-station capacity – the largest unused block of power in the Northwest and is expandable to 67.5 megawatts. Because the on-site sub-station is dual fed by Alderton and White River, the entire region would have to lose power for the sub-station to go down. The world-class grid quality and Bonneville power backbone mean that any short outage – even a millisecond disruption – would be picked up by UPS. The backup generators will likely never be needed.

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