"The Cloud" Explained, Part 2 of 2

By Larry Port, Rocket Matter

In Part One of this article we explored the meaning of "The Cloud" and arrived at a definition: The cloud is a collection of utilities built on Internet technologies for on-demand services. In Part Two, we'll explore data centers, the facilities where Internet information actually resides.

Experiencing a Data Center

If you have the opportunity to see a data center first hand, it's a great opportunity. I toured one for the first time recently, namely the NAP of the Americas (the NAP for short), one of the largest and most connected data centers in the world. The majority of all Internet traffic going to and from South America, Central America, and the Caribbean passes through this building.

Seeing a data center firsthand, whether you're a technologist or not, is an overwhelming experience. The size and scale of the operation can boggle your mind. My reaction to the enormity of the NAP reminded me of similar moments from cinema where characters behold wonder, like when Luke and Han first encounter the Death Star in Star Wars or when Maximus enters Rome and initially sees the Coliseum in Gladiator.

From the outside, the NAP of the Americas is large, windowless, and ugly, and in a random area of downtown Miami. Architecturally, the primary purpose of the structure is to survive disasters. In fact, the NAP is designed to survive Category 5 hurricane winds, in excess of 155 MPH. The panels on the exterior walls are seven inches thick and made of steel-reinforced concrete. The floor of the data center is built 32 feet above sea level, in a FEMA-designated low risk flood area. Its fire protection system is specifically designed with the health of electronic equipment in mind.

Touring the data center, I was freezing. I was told to wear long sleeves to the facility but would have been better served by a jacket. Server computers generate heat as they process information, and with thousands of such machines mounted in close proximity, data centers must take measures against overheating and consequently, machine failure. At the NAP, we saw what's required to cool the data center: a hallway the length of a city block lined with 15 foot-tall air conditioning units.

Security Concerns

One thing I did not anticipate prior to my tour of the NAP was the paramilitary-style operations of the security team. In order for us to tour the facility, we had to clear two checkpoints. The first was a standard, airport-style metal-detector walkthrough at the front entrance. On an upper floor, to enter the actual computer area, our guide gained access via a biometric hand scan. Further permission to the enter locked rooms, elevators, and hallways required key card access. Cameras and guards continuously monitory the entire facility.

Physical security is extremely important when dealing with data, and the NAP's measures are typical for large data centers. Most theft is not caused by high-tech hacking, but via low-tech means. Just as identify theft is five times more likely to be caused by stolen wallets than Internet crime, the removal of actual computers and components from an office are more probable security risks than an online attack.

For this reason, any company or individual with sensitive data needs to ask themselves the following questions: Who has access to my equipment, including employees, cleaning staff, and landlords? And where are my machines better protected - in a server closet or in a fortified data center?

Redundant Power and Connectivity Sources

So what happens if you run a data center containing thousands of computers and the power goes out?

The answer is the power doesn't go out. A facility as large as the NAP of the Americas is fed by two independent electricity substations. If one of them suffers an outage, then the NAP can draw from the other. If both power sources are knocked out, then the NAP powers itself with an uninterrupted supply of electricity. Row after row of rooms house backup generators, providing sustained emergency power for the center's operations.

What happens if the internet connectivity itself is interrupted? Major data centers have multiple sources of Internet connectivity, often entering the facility at different locations to protect against failure and physical damage. The NAP maintains redundant connections to the Internet by its nature, as it serves as an exchange point for multiple communication providers. A surplus of Internet connectivity is common for data centers. For example, Rackspace, a leading player in server hosting, partners with no less than nine different Internet providers for redundancy.

Data Centers Evolved For The Cloud

As more and more computing takes place in the cloud, the need for more powerful and efficient data centers has increased. Google, Microsoft, Yahoo, and Amazon have all invested in the next-generation data facilities in the Columbia River Valley. In their effort to bring their cloud offerings to market, these companies designed facilities to house tens of thousands of computers operating at a higher degree of efficiency than most of today's existing data centers.

The scale of these new data centers is colossal. The Microsoft building in Quincy, WA measures over 469,000 square feet, large enough to house approximately seven Boeing 747 airliners. In order to reduce electricity needs, alternatives to air-conditioning cooling schemes are needed. The chilly waters from the Columbia river, piped through these facilities, prevents overheating. The river is also a source of hydroelectric power. And the ready availability of high-bandwidth fiber-optic cable makes this geographic location a particularly rich one to drive the increasingly larger and more powerful cloud.

The Future of The Cloud

Even though we've come far with Internet-based computing, we're only in the beginning phases of a massive movement towards increased usage. Economics already drives this adoption, as more businesses, especially smaller ones, recognize that their bulky client-server networks, security and backup practices, and software licenses are better handled via Software as a Service companies or other Internet computing providers. As familiarity and confidence increases with the emergent cloud, so too will adoption. And data centers - those gigantic, windowless, modern fortresses - will power it all.

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