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Green Network An eco-friendly solution



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“An energy efficient facility is good, but a 100% renewable energy facility is better.”

Apple Environment report

High-speed, high-capacity networks are required because they power the world's Internet and digital economy. With the growth of high-speed networks, there is a rise in its usage that includes thousands of concurrent e-commerce transactions and millions of Web queries a day. There is no doubt that demand on networks will continue to grow and quickly become a “connected” world. The large-scale datacentres handle this demand, which consolidate hundreds and thousands of servers with other infrastructure such as cooling, storage and network systems. Many internet companies like Amazon, eBay, Google and Yahoo are operating such huge datacenters across the world.

The commercialisation of these developments is defined as Cloud computing where computing is delivered as utility on a pay-as-you-go basis. Cloud computing is an evolving paradigm. It enables outsourcing of all IT needs like storage, computation and software - office and Enterprise Resource Planning (ERP)-through large Internet. Users can store, access and share any amount of information in Cloud.

They require high energy usage for its operation. Publishing conglomerates now consume more energy from their datacentres than their printing presses.

Greenpeace has estimated that the aggregate electricity demand of digital infrastructure back in 2011 would have ranked sixth in the world among countries. This shift may be enabling much higher levels of consumption, increasing the total amount of electricity consumed and the associated pollution from electricity generation.

Leading Internet companies can find a way to create a space for the Internet that is renewably powered and coal free. Major internet companies are now committed to being 100% renewably powered. Apple, Facebook, Amazon, Salesforce, Microsoft, Rackspace, Box, Equinix, Google and other major technology companies are working towards completely power the Internet with 100% renewable energy. Amazon Web Services which provides cloud computing services to Fortune 500 companies plans to use wind farm energy and bringing on five new solar farms to help power its massive cloud datacentres. Google's datacentres and the offices are going to be powered entirely by renewable energy from 2017.

The present issue discusses how major tech companies are working to power the Internet with renewable energy. New technologies provide small-scale energy operators with precise data on optimal amount of energy requirement. It describes how Digital Wind Farm creates new opportunities for the renewable energy sector. It discusses the Cloud Computing – the IT solution for the 21st century.

The Green Internet

Steve Fox

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Major tech companies are working to power the Internet with renewable energy.

With in the next year, about 60 new wind turbines are scheduled to begin whirling above flat farmland in the state of Indiana, generating roughly the amount of electricity 46,000 American homes use annually. However, that electricity won't run televisions or dishwashers. Instead, the wind farm's energy will be used by Amazon Web Services, which provides cloud computing services to Fortune 500 companies; popular websites such as Netflix, Spotify and Pinterest; and, a number of government agencies

The Indiana facility advances Amazon's commitment "to achieve 100 percent renewable energy usage for the global Amazon Web Services infrastructure footprint," says a company spokesperson. With it, Amazon has joined Apple, Google, Facebook, Salesforce, Rackspace, Microsoft and other major tech companies working to completely power the

Internet with renewable energy. This is known as the "green Internet."

The Internet has transformed the way we live. However, there has been a significant environmental cost in terms of the enormous amounts of electricity required to power the data centers and telecom networks that make up the "cloud." Much of that electricity is generated by burning fossil fuels that emit substantial amounts of carbon dioxide and other greenhouse gases that contribute to climate change.

One indication of the Internet's environmental impact comes from a 2014 study by Greenpeace International, "Clicking Clean: How Companies Are Creating the Green Internet," which estimates that the "rapid growth of the cloud and our use of the Internet have produced a collective electricity demand that would currently rank in the top six if



compared alongside countries; that electricity demand is expected to increase by 60 percent or more by 2020 as the online population and our reliance on the Internet steadily increase.”

While equating the energy usage of the cloud and the Internet to one of the world's largest countries may seem startling, a comprehensive tally would be even bigger, says Gary Cook, lead author of the “Clicking Clean” study.

“The sixth largest country estimate counts just the data centers and the telecom networks that connect each of the data centers—what we're loosely calling the cloud,” says Cook. “That does not include devices. If we were to add the energy use associated with devices into the overall mix, the energy use would almost double, so we'd be talking about a much bigger country, energy-wise.”

Tech companies have adopted a number of renewable energy initiatives, with the “Clicking Clean” study singling out “six major cloud brands—Apple, Box, Facebook, Google, Salesforce and Rackspace—(that) have committed to a goal of powering data centers with 100 percent renewable

**Tech companies
have adopted a
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“CLICKING CLEAN”**

energy and are providing the early signs of the promise and potential impact of a renewably powered Internet.” Apple has built four solar farms and now runs all of its data centers on renewable energy. Google minimizes electricity usage at its data centers by locating them in areas where natural climate resources can offset the heat produced by its computer servers. For instance, a Google data center in Hamina, Finland, is cooled by seawater drawn from the Gulf of Finland.

Google, which has been carbon neutral (no net emissions) since 2007, also provides detailed information on its energy efficiency and renewable energy efforts—something Greenpeace considers vital.

“We feel companies are serious when they announce a new project and, at the same time, also announce how they are going to meet that additional energy demand with renewable energy,” says Cook.

The “Clicking Clean” study has also praised Facebook, noting that the company “continues to prove its commitment to build a green Internet, with its decision to locate a data center in Iowa driving the largest purchase of wind turbines in the world.” The

study also cited joint efforts by Apple, Facebook and Google that resulted in the largest utility in the United States, North Carolina-based Duke Energy, adopting policies that opened the market to renewable electricity purchases for large-scale customers.

Individual Internet users can also make a difference, says Cook.

“There certainly are things consumers can do,” he says. “You can choose products that are energy efficient, and really think about whether you need a new model every two years. It's also important that consumers keep pushing companies to do more with renewable energy.”

Source: *Span*, May/June 2015
<https://span.state.gov/science-technology/green-internet>

Leveraging Data to Save Energy

Kimberly Gyatso

A freelance writer based in San Francisco.

Chicago-based Root3 Technologies provides small-scale energy operators with precise data on optimal amount of energy requirement.

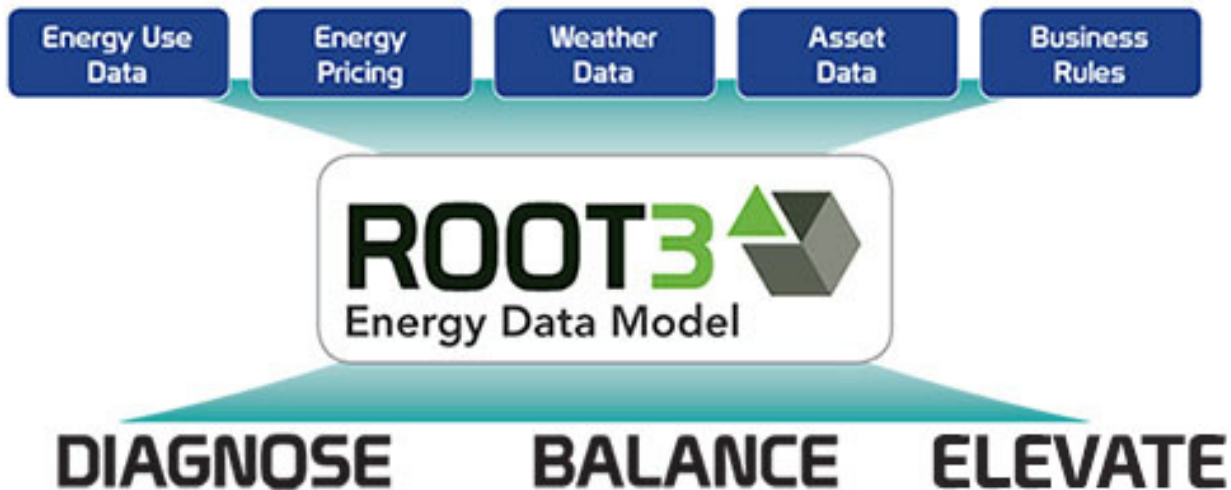


At a time when energy efficiency is at the top of global priority lists, it's no wonder that companies around the world are taking innovative approaches toward the issue. One such company is Root3 Technologies, which is offering independent energy operators a solution to efficiently manage their energy usage. Using patented cloud-based software, Root3 provides clients, including hotels, universities, hospitals and corporations, with precise data on how much energy their facility needs to operate optimally. Welcome to the new face of modern environmentalism: big data analytics.

Root3's founders noticed that a data-driven approach to sustainability existed in the larger arenas of the energy industry, but not for smaller-

scale, independent energy generators, who don't always install sophisticated management systems. In 2013, there were 24,000 independent power plants in the United States.

Archisman "Archie" Gupta, Root3's co-founder and CEO, has a master's degree in electrical engineering from Clemson University, South Carolina, and has previously held various engineering, business development and leadership roles at Schneider Electric and ITC Holdings. He and co-founder Allison Hannon came up with the idea for Root3 Technologies while working on their MBA's at the University of Chicago Booth School of Business. It's no surprise then Root3's first client was the founders' alma mater, the University of Chicago, where peak winter natural gas costs reached \$1 million.



Root3's pilot ran at the university in June 2012 and was a success. "After running the beta for a month, they saved nearly 10 percent on their overall energy costs," says Gupta in an Ecopreneurist blog, "GreenStart's Fall 2012 Demo Day Launches 4 Cleantech Companies." The University of Chicago signed on as a full-time client.

Since then, Gupta has gone on to win the Innovaro Strategos Award for Most Innovative Business Model and a Gallup Award for Innovative Go-To Market Strategy for the Gallup WorldView product.

What makes Root3's work stand apart? "It's a significant bottom-line benefit" that helps clients cut their costs of generating power by up to 30 percent, says Gupta in a New York Times article, "Harnessing the Net to Power a Green Revolution." Root3's products go a step further than traditional energy management systems by using advanced algorithms and business and engineering rules to improve the efficacy of energy systems. This is done by leveraging the existing data, so there is no new capital cost for the client.

Global investors poured \$1.2 billion into "cleanweb" ventures in 2011 alone, highlighting the demand for

economically efficient technology like Root3's software. "All the data is already there," explains Gupta in the New York Times article.

"We are taking the data and converting it into actionable information, and this is actionable information hour by hour. What do you need to do? What do you need to turn on? How much do you need to produce?" Root3 uses prescriptive analytics to provide operators and engineers with forward-looking instructions and applies predictive analysis to simulate their clients' energy profiles with new equipment, operational practices or market considerations in a fraction of the time required by typical consulting firms.

By doing so, Root3 not only saves its clients significant costs, but also helps the environment by reducing energy usage.

It seems that Root3 Technologies has come up with a winning formula: use data analysis to best understand systems and empower the client to make informed decisions in order to operate as efficiently as possible.

*Source: Span, May/June 2015
<https://span.state.gov/science-technology/leveraging-data-ve-energy/20150505>*

Blowin' in the Wind, Connected in the Cloud

Carrie Loewenthal Massey

A New York City-based freelance writer

GE's Digital Wind Farm creates new opportunities for the renewable energy sector.

Bob Dylan might have said it right in his song: the answer, at least to some of the world's energy problems, may be “blowin' in the wind.”

That answer is wind power. A new technology from General Electric (GE) is set to boost the capacity of wind farms, or groupings of wind turbines, by 20 percent.

Announced in May 2015, the GE Digital Wind Farm consists of two components. First are the turbines. In 2013, GE released its new two megawatt wind turbines that include sensors for tracking wind speed, blade position, changes in conditions and more. These sensors enable the second component—a digital connection that allows the turbines to communicate with each other and automatically adjust their performance to accommodate real-time demands. GE's Predix, a cloud-based software, facilitates this link between the sensors.

“Our Digital Wind Farm essentially couples big wind with big data,” said Anne M. McEntee, president and chief executive officer of GE Power & Water—Renewable Energy, in an article published by RenewableEnergyWorld.com.

The Predix software continuously analyzes data from the wind turbines within the farm. It contains digital models of the turbines that enable farm operators to see, at any given time, how each turbine is performing. As the cloud platform gathers more data over time, it can predict performance more accurately, seamlessly increase power output and, perhaps, even help reduce maintenance costs.

Digitizing the wind farm's performance is a key to making wind power more attractive to utilities and other energy providers as a competitive replacement for fossil fuels.



GE's “Digital Wind Farm technology is helping utilities and industrial users integrate wind power more easily and at lower costs,” says Kevin Haley, director of communications at the American Council On Renewable Energy, a nonprofit organization focused on the integration of renewables into the U.S. energy profile.

As with any technology in its early days, the Digital Wind Farm is subject to speculation as to its true capacity to make wind a reliable source of renewable energy.

“For utility companies worried about the learning curve associated with adding new power technologies like wind, digital integration brings greater control over power assets and better performance to boost reliability—a top concern related to renewables,” says Haley.

“There are concerns that even these digital tools are not enough to fill the gap between intermittent renewables like wind and utilities' need for consistent, uninterrupted power. Digital management tools are very helpful to improve wind farm efficiency, but are they as important as things like [energy] storage? It remains to be seen,” he adds.

Whether or not GE's Digital Wind Farm fulfills all expectations, it does contribute to wind's current standing as the lowest-cost new generation renewable technology, according to the American Council On Renewable Energy. It already makes more financial sense to build a wind farm than it does to build a coal or natural gas plant in the United States, says Haley.

He expects to see wind energy expand offshore in the United States as well. Offshore farms have distinct advantages: their turbines can be "massive," thereby capable of generating more power, and they can fuel some of the most energy-reliant parts of the country, like New York City.

"It'd be difficult to build a wind farm near New York City, unless it's [25 or 30 kilometers] out in the ocean, where nobody will be bothered by it," says Haley.

Offshore wind farms along the East Coast alone could power up to 30 percent of the United States,

predicts Haley, adding that GE's technology will be "instrumental in managing these enormous turbines out at sea, where more constant wind means better, more consistent power." GE's Digital Wind Farm could be a model for India too. According to the American Council On Renewable Energy, research shows that wind is already cost-competitive with imported coal in the country.

"India can immediately start improving its air quality, environmental quality and public health, as well as hedge against rising coal costs, by adding wind," says Haley.

The country, according to him, is a "top prospect" for many businesses developing renewable solutions. "India really is the next frontier for all types of renewable energy."

Source: Span, January/February 2016
<https://span.state.gov/science-technology/digital-wind-farm/20160112>

Cloud Computing – The IT Solution for the 21st Century

"Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."

Across business, executives are looking for ways in which they can operate more sustainably and thereby increase their competitive edge. Information Communications Technology (ICT) is seen as a key area of focus for achieving sustainability goals.



The Carbon Disclosure Project (CDP) has released a comprehensive study "Cloud Computing – The IT Solution for the 21st Century" that outlines and predicts Cloud Computing business models as the IT solution of the 21st century. The independent analyst firm Verdantix, provided detailed analysis of the financial and carbon benefits of cloud computing.

The sustainability agenda of many firms is increasingly seen as a core strategic priority. Executives are looking across the entire business to understand ways in which they can operate more sustainably and thereby increase their competitive edge.

ICT is seen as a key area of focus for achieving sustainability goals. Computing requirements have accelerated rapidly over the last ten years. Back in 2006, the Environmental Protection Agency (EPA) estimated data centers consumed 1.5% of total US electricity and they suggested this was double the consumption in 2000. With data center growth continuing, the Department of Energy believes data centers may be consuming up to 3% of total US electricity today.

Businesses are aware this level of electricity usage comes at a cost in both financial and carbon terms. The adoption of cloud computing allows firms to deliver on sustainability while reducing costs. Executives are coming to view cloud computing as a way to transition to a lower carbon business model while increasing the efficiency and effectiveness of business operations.

Key findings

This study used detailed case study evidence from 11 global firms that have been using cloud computing for at least two years. The firms are *Applied Materials, Aviva Matthew, Barclays Capital, Boeing, Bouygues Telecom, Citigroup, Dell, Deutsche Bank, Juniper Networks, Novartis and State Street*. The information was used to build a forecast model which assesses the financial benefits and carbon reductions for a firm opting for a particular cloud computing service. The analysis also demonstrates how projected cloud computing adoption would drive economy-wide business benefits from a financial and carbon reduction perspective in the US.

Cloud computing can avoid millions of metric tons of CO₂

- A typical food & beverage firm transitioning its human resources (HR) application from dedicated IT to a public cloud can reduce CO₂ emissions by 30,000 metric tons over five years.



These reductions are equivalent to the annual emissions from 5,900 passenger vehicles.

- The same food & beverage firm transitioning its HR application from dedicated IT to a private internal cloud can reduce CO₂ emissions by 25,000 metric tons over five years. These reductions are equivalent to the annual emissions from 4,900 passenger vehicles.
- From an economy-wide standpoint, US businesses with annual revenues of more than \$1 billion can cut CO₂ emissions by 85.7 million metric tons annually by 2020 as a result of spending 69% of infrastructure, platform and software budgets on cloud services.

Potential financial benefits from cloud computing run into \$ billions

Through the forecast uptake of cloud computing, US businesses with annual revenues of more than \$1 billion can achieve economy-wide savings in energy alone of \$12.3 billion a year by 2020.

Cloud computing delivers a positive net present value (NPV)

- A typical food & beverage firm transitioning its HR application from dedicated IT to a public cloud can achieve a NPV of \$10.1 million over five years with a payback period of under a year.
- A typical food & beverage firm transitioning its HR application from dedicated IT to a private internal cloud can achieve a NPV of \$4.4 million over five years with the payback coming during year two.

Cloud computing brings business efficiency savings
Significant non-monetary benefits are also achieved with cloud computing including business process efficiency and increased organizational flexibility.

The report serves as a forecast study to assess the financial and sustainability benefits for a company that is opting for cloud computing services, such as infrastructure-as-a-service, software-as-a-service and platform-as-a-service. The results show that by 2020, large US companies that use cloud computing can achieve annual energy savings of \$12.3 billion

and annual carbon reductions equivalent to 200 million barrels of oil – enough to power 5.7 million cars for one year. The report also delves into the advantages and potential barriers to cloud computing adoption and gives insights from the multi-national firms that were interviewed.

Source: http://ericksonstrategies.com/wp-content/uploads/2014/06/2011_Cloud-Computing-The-IT-Solution-for-the-21st-Century.pdf
<https://www.greenbiz.com/research/report/2011/07/20/cloud-computing-it-solution-21st-century>

Is Your Head in the Clouds?

Howard Cincotta
U.S. State Department writer and editor

That may not be a bad thing. Cloud computing is a growing field with exciting opportunities. But do keep your feet on the ground.

There is nothing fuzzy or vague about cloud computing's appeal. It can save money, sometimes lots of it, by treating computing—and IT generally—as a service that customers pay for as they use it, much as they pay for utilities like electricity or water.

In general, all the user needs is a computer interface with the cloud, which can often be as simple as a Web browser and a menu of options. The mainframe computers, servers, software and data storage reside on the back end, or “cloud.” Where do the savings come from? By sharing resources and services on integrated networks and massive servers, cloud companies can achieve significant economies of scale.

Entering the field

Cloud computing is unquestionably a fast-growing field. The global tech firm Forrester Research claims that the market for cloud services was \$40 billion in 2011 and will expand to more than \$240 billion by 2020. A Microsoft study estimates that cloud computing will create as many as 14 million jobs globally by 2015.

So if you have a technology background or aspirations, the smart move would be to major in cloud computing, right? Not exactly.

“The foundation of cloud [computing] is IT, of course, and there are specific skills required to support cloud services,” says technology author and researcher Joe McKendrick, who also writes for Forbes magazine. “But technology is only part of the story. Individuals seeking to enter the cloud computing field should have both a working knowledge of business—finance, human resources, marketing—as well as computer skills.”

Many IT professionals already have the necessary skills for cloud computing, according to Bharat Rao, associate professor of technology management at the Polytechnic Institute of New York University. “So it's mainly a question of increasing awareness and getting involved in sample scenarios,” he observes.

In other words, the best qualifications are broad technological training and education, not necessarily specialization in a particular cloud-related application.



Computational power

One of the most striking benefits of cloud computing is that both established companies and aspiring start-ups can access enormous amounts of computational power through major providers like Amazon Web Services and Rackspace.

A common theme of cloud clients is that they no longer have to worry about managing their own networks. The World Triathlon Corporation, for example, which runs the international Ironman athletic competitions, uses Rackspace's networks of servers to manage the huge spikes in online traffic that occur during their athletic events.

In a Rackspace online video, T.J. Horlacher, CTO of the Web site builder SnapPages, says, "As our demand grows, we need to have giant databases. We don't have to think about servers anymore. We can spin up new databases on demand. ...That's a huge advantage for us."

Cloud computing can also facilitate an expansive and seamless exchange of information. Through its global server, Amazon continues to stream data, images and video of the Mars rover Curiosity, which landed on the planet in August, to viewers throughout the world.

A recent survey by The Economist and IBM cites another example of innovative information exchange: HealthHiway, a health information network in Bangalore.

"By connecting more than 1,100 hospitals and 10,000 doctors," the report states, "the company's software-as-a-service solution facilitates better collaboration and information sharing, helping deliver improved care at a low cost, particularly important in growing markets."

The cloud computing image is quite apt in one respect: the closer you examine the cloud, the harder it becomes to see and define it clearly.

"Don't be surprised if, in a few years, we stop using the term 'cloud computing,' " says technology analyst McKendrick. "It will be simply computing, and it will be very commonplace to be building and

running applications and systems that are hosted elsewhere. So I wouldn't suggest building a career path around 'cloud.' Rather, focus on both IT and business."

Qualifying for the Cloud

When SPAN magazine asked Rackspace, one of the world's leading cloud providers, what kind of advice they would offer someone considering the field of cloud computing, here is what they had to say:

A quality education is paramount in today's economy. You are going to need a degree to get ahead in the world of technology today.

Beyond institutional education, you must self-educate in the ever-changing world of cloud computing. Search the Web, get down and dirty and spin up a server, learn different coding languages, understand engineering, human computer interaction and visual design. Grow your cloud computing knowledge by first learning the fundamentals and then dive deep into the cloud.

Here at Rackspace, we have a comprehensive cloud computing program called CloudU, a vendor-neutral curriculum designed for students, business owners and technical professionals who want to bolster their knowledge of the fundamentals of cloud computing. At CloudU, you will find a comprehensive series of original white papers, live and on-demand Webinars, events, blogs, videos and e-books aimed at increasing cloud computing knowledge. You can also earn a CloudU Certificate and enhance your cloud computing résumé as well.

And finally, get involved in the start-up community. All over the world, on a weekly basis, you can find a start-up event happening in your geographic region. New tech meet-ups provide a venue for people to see the latest and greatest technology being built in their own backyards.

Hackathons are held where developers gather and build applications, hack code, learn new skills and make new friends. Networking in the start-up movement allows you to socialize with like-minded people, build a professional network, and possibly find a cofounder for your grand start-up idea.

Source: Span, November/December 2012
https://span.state.gov/science-technology/your-head-in-clouds/20121102?qt-science_technology_related_link=0



Source: <https://www.dreamstime.com/royalty-free-stock-photos-green-network-server-hosting-icons-image22656678>

The Environmental Information System acronymed as ENVIS was implemented by the Ministry of Environment & Forests by end of 6th Five Year Plan as a Plan Scheme for environmental information collection, collation, storage, retrieval and dissemination to policy planners, decision makers, scientists and environmentalists, researchers, academicians and other stakeholders.

The Ministry of Environment and Forests has identified Consumer Education and Research Centre (CERC), Ahmedabad, as one of the centers to collect and disseminate information on "Eco-labelling and Promotion of Eco-friendly Products". The main objective of this ENVIS Centre is to disseminate information on Eco products, International, and National Eco labeling programs.

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