

## IBM AND THE FUTURE OF SMART IT

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LANINGHAM: Welcome to a podcast on IBM and the Future of Smart IT. I'm Scott Laningham. We're here to talk about the ballooning energy use by computing data centers, and look at some of the things being done to address that issue.

I'm joined by [Dan Esty](#), one of the world's leading experts on corporate environmental strategy and co-author of the recent book, *Green to Gold*, which explores what every executive must know to manage the environmental challenges facing business and society.

Dan is Hillhouse Professor of Environmental Law and Policy at Yale University and Chairman of Esty Environmental Partners. Thanks for making time for this, Dan.

ESTY: Oh, it's my pleasure. Great to be with you.

LANINGHAM: Also joining is Dr. Dennis Quan, Chief Technology Officer for IBM High-Performance On Demand Solutions and lead for the IBM/Google partnership on cloud computing that has been covered extensively in the press over the past several months. Welcome to you, Dennis.

QUAN: Thank you for having me.

LANINGHAM: Now, there's an EPA report that came out last August that says power use by computing data centers is about 1.5 percent of total US electricity consumption or 60 billion kilowatt hours anyway in 2006, it was.

And so we're obviously talking about a lot of power, and a lot of money for that power. And I'm wondering, gentlemen, would it be fair to say that the way we use energy on a macro scale has not been all that coordinated to a great extent with how we supply it, and that we're getting to a point where that's just going to have to change?

ESTY: Well, I think that's absolutely right. We've got rapidly growing demand for energy, particularly from our high-tech electronics gadgets both at the home and in the office and in the IT centers in businesses. This is a major growth area for electricity demand.

And the truth is we have not been able to site many new power plants. We don't have a lot of enthusiasm for new coal-fired plants. It's been impossible to bring new nuclear plants online. So we're going to have to do something here to ensure that that rising demand doesn't get trapped by a limited supply.

LANINGHAM: Dennis, I'd love to hear your thoughts on this, too, and what I'm

wondering, is the distributed nature of computing a part of the problem here? Is that why we're having not only so much power use but this explosion of growth in that use?

QUAN: I think the distributed nature of the problem is both part of the problem and part of the solution. I think with the growing demand for compute services -- you know, the applications that people see on the Web and their information, being able to get at it from anywhere, from their mobile phones and from their laptops...

There's a growing need to have sufficient compute power in data centers worldwide, and that is part of the growing demand for energy that we're talking about right now.

Now, on the flipside of that, though, is that as we start to build up these large data centers with increasing amounts of compute power, there are amazing efficiencies of scale that can be...economies of scale that can be leveraged.

And we are in the process of studying this, and this is an ongoing trend within the IT industry, to understand how to run these data centers that could have hundreds of thousands of servers co-located in one place at much greater levels of efficiency.

ESTY: Scott, if I can just add to that. Let me say that I do think there's enormous productivity gains that are brought to our society by the use of information technologies. So we really want to make sure that we as a society are doing everything we can to promote the advances that Dennis is telling us about.

So we want to make sure that there doesn't come a clash between what we need to do to be environmentally secure as a society and our desire for economic growth that's driven in part by the information revolution.

LANINGHAM: So again, this is about becoming more intelligent with the way we handle these things, then, right? Not eliminating things but just being smarter about it.

ESTY: Being smarter about it, and frankly being more efficient. We have not found a company yet that can't achieve substantial efficiencies and therefore reduced electricity consumption when it puts its mind to it.

And one of the things we're impressed by is how much of that can come out of the IT department. We've found a number of companies that have improved the way they line up their servers, have taken on some of these new high efficiency operations that Dennis is telling us about, and in doing so, often are able to bring down their electricity consumption out of the IT arena by 30 or 40 percent.

QUAN: And to build on what Dan is saying, I think we see a number of companies out there that have put their mind to it because they've hit upon the problem very immediately and they are the ones experiencing the pain of having to manage hundreds of thousands of machines in the data center.

And those techniques can then be captured and brought to bear on other areas of the industry.

And it isn't just with high amounts of compute power used to power these Internet applications, but it really pervades the entire corporate IT space that you're able to apply these data center management techniques to optimize and to make more energy efficient a lot of the common business processes that go on inside of a corporation.

ESTY: That is an extremely important point to make. So it's critical not just to focus on electricity consumption in the IT department, but think as well about how IT can help manage resource productivity across the entire enterprise.

And there's a growing opportunity for real competitive advantage based on paying attention to these environmental issues that can be achieved by tracking energy consumption, tracking other resources, becoming more efficient...

...having good indicators or metrics that allow you to understand where the consumption is, how it's going, whether it can be brought down, where in the operation the best practices are in terms of efficiencies and conservation and then really disseminating that across the entire enterprise. And a lot of that really is an information management exercise.

LANINGHAM: Dennis, why don't you talk a bit if you would about some of the solutions that IBM is looking at in relation to all of this, and then maybe Dan chime in on that as well in a broader context.

QUAN: Certainly.

We've had a number of green initiatives go on that are underway and are in collaboration with others in the industry to make more energy efficient the compute power that is provided by these data centers through techniques such as shutting down servers when they're not needed and moving workloads and consolidating them on to existing machines so that you make better utilization out of the machines that you already have.

There's also some techniques going on around this concept called cloud computing, which is, going back to what I was saying earlier about building out extremely large data centers and achieving economies of scale...

It's about the concept that from a consumer's perspective that they're going to be able to get at their applications and their information from anywhere, and that's going to be a very good thing from a productivity perspective.

It's also a good thing from the management perspective because there are things you can do at the scale of tens of thousands to hundreds of thousands of machines in a cloud computing data center that are made possible through more advanced

automation techniques for monitoring and for getting applications online inside of these large data centers.

ESTY: Let me just add that I think we're we're moving towards a world where people are going to be expected increasingly to pay for the harms they cause. We're likely to see carbon charges in some form being adopted in the United States over the next year; these are already in place in Europe and Japan.

And I think again we're going to see a really interesting set of opportunities emerge where information technologies are going to be seen as the solution to a number of the challenges we face. It's going to be critical to know where carbon emissions and greenhouse gas emissions are coming from.

Companies are going to need to know how big their emissions are. They're going to increasingly have to pay for those emissions. And they're going to want to figure out how to reduce them in the optimal way possible.

LANINGHAM: Dan, when you're talking about this, how do you illustrate the potential consequences, for example, of not making these changes? I'm assuming that, you know, you have the environmental issues and then you have issues of power supply -- meeting demand and things like that. How do you illustrate those?

<p><b>Dan </b>Well, I think there are two different elements here. There is a societal challenge of trying to ramp up electricity generation consistent with the needs for a society that's becoming more energy intensive. And this is potentially a good not a bad thing. It's all a question of how we generate that electricity to make sure we don't end up with supply shortfalls. And of course there are some real issues there.

And then from within a company's point of view, there is really as I've said almost no company that can afford to let these issues kind of slide by. Becoming more focused on environment and related energy issues as an element of core business strategy is going to be essential to really every industry and every company in this country.

And those that pay attention are going to be positioned for competitive advantage; doubly so as we move into this world where we're going to be carbon constrained and where there's going to be charges for greenhouse gas emissions.

<p><b>Dennis </b>And I think that you really see a trend going on that customers that I've interacted with in the past year or so have really hit upon these issues from an operational perspective. They really cannot afford to keep utilization of their equipment at such low levels.

There's actually a well-quoted statistic that says that X86 based data centers out there on average only use about 10 percent of the compute power that's actually present in that data center. And that's a staggering figure given the rising costs of energy that are

trying to be addressed as well as the constraints in terms of space for putting in new machines and the added energy burden that is created as a result.

LANINGHAM: But what about maybe the concern that some of these solutions are only viable for large enterprises? Do either of you want to address that one? Dennis, do you want to speak about that one?

QUAN: Sure. I'd say that there are certainly economies of scale that you get from running extremely large data centers, but it isn't to say that there aren't benefits for smaller or medium-sized businesses as a result.

A good example of this is, you know, in the space of cloud computing, we've seen a whole spectrum of different ways to take advantage of this extremely large data center concepts.

But even in scenarios with smaller companies or folks with smaller compute demands, there are ways to take advantage of a centralized compute facility that might be hosted by a service provider or in many cases that we're seeing today being hosted by government entities that then provide those fixed capital costs on behalf of that economy and enable entrepreneurs or businesses, small businesses, medium sized businesses, to take advantage of those compute resources and gain those efficiencies.

ESTY: I think a lot of companies are finding that there are ways to bring to bear information systems that can help optimize all of the activities across a factory or a facility. So there are more and more opportunities to ensure that heating, and lighting, and air conditioning, and insulation, are all being run with smart systems.

And lights are going out when people don't need them, air conditioning is being turned down overnight, and then brought up during the early morning hours as people are coming to work.

I think smart IT managers are seeing themselves as not constrained to just running the servers but actually helping the company to figure out where these opportunities are for smart systems and better management.

**Dennis** One thing I'd add to what Dan is saying is that there's a lot of creative solutions that can be applied to a lot of these problems. As a good example, I think looking at it from an energy efficiency perspective actually creates opportunities for different kinds of hardware configurations and different kinds of data center layouts that can be considered.

We actually had a client that was able to take 600 X86 servers and consolidate them on to a single mainframe. And you can imagine the kinds of efficiencies you get out of that by having only one set of power supplies and memory, et cetera, versus 600.

And so we find that through uses of technology such as virtualization and multi core architectures we can actually achieve energy efficiencies by looking at different hardware architectures.

LANINGHAM: Thank you for that example, Dennis. I appreciate that. Dan, I'm wondering if we could turn back to you for a closing thought here and maybe speak a little bit more about some of the other areas where IT departments can look to smarten their operations. You spoke about this a little bit, but maybe share a few more thoughts about that, if you would.

ESTY: Well, I think as IT departments are gearing up green initiatives, energy efficiency is going to be at the center of this particularly given society's focus on climate change and the likelihood that we're going to have legislation there soon.

But there are some other issues as well that IT managers have to keep their eye on. And one of the ones that I think is going to emerge quite bit in the next month or two or year or two is e-waste.

Already a significant number of states have begun to adopt legislation here, so I think it's going to be critical for IT departments to become better at the disposal of their laptops and desktops and servers and printers.

And I think there are companies out there. I've been working with one that is very sophisticated about taking back equipment, ensuring that it's reused to the extent possible, that the parts are taken out and reused when that is possible, and that the end result is that almost every bit of the computer is recycled in a way that does not end up in a landfill. And I think this is going to be very important to avoid having the electronic world being seen as a burden on society.

LANINGHAM: Well, clearly a big issue, and some big ideas being shared here today. And we appreciate you both so much for making time for this. Thank you, gentlemen.

QUAN: My pleasure.

ESTY: Thanks.

LANINGHAM: We've been talking with Dan Esty, Professor of Environmental Law and Policy at Yale University; and Dennis Quan, CTO for IBM High-Performance On Demand Solutions. This has been IBM and the Future of Smart IT. I'm Scott Laningham. Thanks for listening.

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