



## *Feeling Overwhelmed in the Data Center?* — Understanding Why Will Help You Navigate

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### Overwhelmed?

Do you get to Friday night and say to yourself or your spouse or friends, “Thank goodness I survived another week of unrelenting uncertainty and insanity?” In the 21<sup>st</sup> Century, threats to your sanity come from multiple dimensions. The economy is terrible and putting all kinds of stress on governments, businesses, families, and individuals. As a result, you and your enterprise are regularly being asked to do more with the same or less (these days, it is usually less) and to make sacrifices, whether immediate or future, in order to provide for and support a better tomorrow (because today has already gone badly).

We used to be able to shrug off work and go home to our families or maybe out for a drink at the end of the day or week. The problem, now, is that we all have so many balls in the air that if we shrug (or let down) our attention for even an instant, things come crashing down all around us. These balls come in different sizes and colors. Some are clearly personal, some are clearly business-related, and some, you might say, are societal. Additionally, some, you might imagine, have sharp edges or even might be built around explosives, just waiting for an ungentle handling or bounce on the floor. When folks ask me what I do for a living, I often respond that I am a juggler, taking on incremental items to juggle each day and, hopefully, disposing of a few, as well.

In the good old days, and there were many in my nearly four decades of professional work, you would get to a point where you could say to your boss, *I just can't handle any more responsibility*, either *quantitatively* (i.e., the number of balls (tasks, projects, etc)) or *qualitatively* (i.e., *I might be able to take on something new, but something is going to suffer, as a consequence*). Well, the good old days are no more. With mergers, consolidations, and layoffs everywhere, we all are now in “grin and bear it” mode. We are working all of the time, or so it seems. The concept of a 40-hour workweek seems to be as anachronistic as the gray-flannelled suit. We may dress more casually but, certainly in the 21<sup>st</sup> Century, we are all either engaged or on-call for most of our waking hours. Sitting down for more than a few moments of relaxation or other distraction largely seems to be impossible. If you relate to this, then you are one of *The Overwhelmed*. This paper is for you. **While it is about being overwhelmed in the data center, the backdrop is the tug of war between the desire for SIMPLIFICATION and a conflicting desire for OPTIMIZATION. This conflict is both personal (for you) and organizational (for the IT department).**

For the next few pages, I will be your therapist and will attempt to provide some clarity on this conflict and some guidance that you can use to lessen the angst and to make better data center decisions. Read on to learn about being overwhelmed, in general, and being overwhelmed in the data center, in particular.

### Two Sides of the Same Coin

Simple explanations are sometimes best, because they do not require tiers of analysis and

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response. What I am about to divulge is a two-sided coin that you use regularly as you try to keep all of balls in the air. You might say that when tossing a coin in the air, you plan to decide in a binary way, depending on which side of the coin lands up. In our reality called the data-center, this metaphor is more bipolar. Each side represents an extreme position. You can position your response at one of the two polar extremes or somewhere in the middle. However, experience tells us that if you go for the middle all of the time, you will be less decisive and, thus, more balls will remain in the air to be juggled, i.e., you will be more overwhelmed.

OK, what are the two polar extremes? Each can be represented by a single word. **The first is SIMPLIFICATION. We all know that if we can *simplify* a problem or even a solution to a problem, it will be easier to perform and manage.** However, we also know that if we *oversimplify*, we might solve too little of the problem, or the maybe make the problem worse by not solving the most critical problem(s). **So we often migrate to the other extreme, which is OPTIMIZATION, which means coming up with a *better* (or maybe a *best*) solution.** It is a good thing to do, as long as you don't optimize to false or impaired parameters and as long as you can afford to consider the complications that usually come at the opposite end from the simple choices.

**My life at work and at home seems to be a tug of war between SIMPLIFICATION and OPTIMIZATION.** As a graduate industrial engineer<sup>1</sup>, I quite naturally look at everything in life as a *problem to be optimized*.

For example, how do I get the most from my dollars spent on groceries? One way might be by clipping every coupon and carefully shopping the specials at several grocery stores each week. That way, I get more *bang for my buck*. Of course, I have to invest much more time and my life becomes more complicated. (You might call this *less bang for my time* and I also might need more space for storage.) What about at the other extreme, how could I make this as simple as possible? Two types of simplification come to mind, both a kind of outsourcing. First, I could eat all of my meals in restaurants. Thus, I wouldn't

have to worry very much about grocery shopping or even need to equip a kitchen. Second, I could have an online grocer deliver all that I order. Of course, both will cost a lot more money than being an extreme shopper, but would save a lot of time and possibly some infrastructure. **You might say that SIMPLIFICATION and OPTIMIZATION are the *Yin and Yang*<sup>2</sup> of our modern world, both personally and professionally.** Certainly, they are *complementary opposites*. I look at them as the *ping-pong paddles of life*, where I am the ping-pong ball bouncing back and forth between the opposite ends of the table, just hoping that the play comes to an end. **It is a desire to achieve both, simultaneously, which are the source of much consternation within the data center and the real topic of this paper.**

### Size Matters

Unfortunately, for those seeking a short answer, not all data centers are the same. To a mid-sized business, the data center might be a room at the end of the hall with a dozen or fewer servers. To a mega-enterprise, the data center may be one of many, each containing more than a thousand servers. **Scale makes a big difference when you are overwhelmed. In fact, scale may be the reason that you are overwhelmed.** Your IT organization might be so small that you are inadequately staffed for the challenges. Your IT organization may be so large that you only see a fraction of the big picture or you may see it all but can't get your arms around it.

**The two extremes of IT organizational size are a lot like the bipolar states of SIMPLIFICATION and OPTIMIZATION.** In many ways, the answer usually is parked somewhere between the extremes, but rarely in the middle. Thus, as we explore SIMPLIFICATION and OPTIMIZATION, and what they mean to the data center, we will have to address the size of the data center.

### SIMPLIFICATION

Everyone who visits a data center, large or small, seems to reach the same conclusion...*it looks so complicated*. This gives rise to the first

<sup>1</sup> Back in the late 1960s and early 1970s when I was an undergraduate and graduate student, the concept of an information systems major had not yet formalized. So I studied industrial engineering, focusing on the efficiency of information systems and end-user interfaces.

<sup>2</sup> Yin and Yang ... *is used to describe how seemingly disjunct or opposing forces are interconnected and interdependent in the natural world, giving rise to each other in turn. Yin and yang are complementary opposites within a greater whole.* Wikipedia contributors. Yin and yang. Wikipedia, The Free Encyclopedia. March 9, 2009, 02:30 UTC. Available at: [http://en.wikipedia.org/w/index.php?title=Yin\\_and\\_yang&oldid=275949686](http://en.wikipedia.org/w/index.php?title=Yin_and_yang&oldid=275949686). Accessed March 9, 2009.

question of importance: *Can't this be simpler?* Whether you have 10 servers or ten thousand, why do you have so many? The simple answer is that *it was the simplest thing to do*. Each application or part of an application ended up on its own server, because it was simpler and because the servers, say at the turn of the century, weren't too powerful. Yes, we knew that it became an increasingly inefficient approach but doing something about it meant deploying complex vehicles for OPTIMIZATION. One of those vehicles is virtualization, which is just coming into common use on mission-critical applications, because its deployment and managed operation can be very complicated.

Doing something simple almost always means using less-expensive building blocks (because more fully-featured (complicated) solutions almost always cost more). Unfortunately, you typically end up using them less efficiently (i.e., in an unoptimized way), because they are, individually, not too expensive and thus not worth optimizing (unless you have a lot of them).

Smaller IT organizations typically are not technology pioneers. Their goal is to keep the systems running and “the balls in the air”. You might dream of optimizing the “mess” that makes up your small data center, but you know that you don't have the experience or budget to do what that really implies. **OPTIMIZATION means to you, at best, keeping the balls in the air without spending all of your time doing it. SIMPLIFICATION is your goal and optimization is not near the top of the list of your annual review.**

You might seek simplification in other ways. First, you may prefer to buy from a single reseller or vendor. Homogeneity can make your life simpler. Second, you might get some help in doing the more complicated tasks that need to be done. Maybe you outsource the physical provisioning of your servers and/or storage and someone comes to your place and does it for you. Your existence is made simpler. Maybe you decide to outsource some parts of your IT function; e-mail is a good example, and a royal pain. Why bother doing this in-house when you can get someone outside to do it for you, and do it better? Maybe you decide to “rent” an application on as SaaS (Software as a Service) basis? Why bother running off-the-shelf customer relationship management (CRM) software when there are excellent Internet solutions available?

I hope that you can see where this is going.

**SIMPLIFICATION usually does make it easier, but almost always at a higher cost.** The more that you simplify, the more that you will pay for the same amount of service that you might have done in-house. **SIMPLIFICATION always should be your first thought.** However, too much of it usually leads to the desire to optimize.

## OPTIMIZATION

### *Cost Reduction and ROI*

As stated earlier, OPTIMIZATION is well understood by the phrase *more bang for the buck*. Lowering the unit price of something is a first order of optimization but quickly leads to other factors, both economic and non-economic. For example, I can get a great deal on pens, if I order a case at a time. (Let's assume that there are 144 pens in a case.) This might give me the lowest unit cost. However, it ignores five factors that I might also wish to optimize.

- First is the time-value of money. If 144 pens of a given type, point width, and color represents a multi-year supply, might I have been wiser to buy only a three- or six-month supply and not tie up the extra cost for future year's consumption?
- That brings us to the second factor, what is the value of those pens in the future? Will they still work or will they have dried up? Will more of them have “walked away”, if there appears to be a more than needed supply?
- Third, how much extra space do I need to keep an extra year's supply of anything?
- Fourth, what will pens cost in the future?
- Fifth, will I even need pens in the future or will everything be done online or offsite (i.e., the paperless office)?

**By optimizing on cost, I actually might have spent more.** That's why so many manufacturers have gone to *just-in-time (JIT)* deliveries. Why buy more than you need today? Of course, JIT requires accurate planning and operational controls, which don't come cheaply but are important to avoid exposure when components are not available when needed. **The important lesson is to remember is that Return-On-Investment (ROI) is not a simple indicator, most of the time.** Add one more reason for feeling overwhelmed!

### *Total Cost of Ownership*

In the IT community, we often rely on a

*Total Cost of Ownership (TCO)* calculation to compare alternatives. This works fine if you are comparing, say, two similar storage arrays from different vendors. However, if you are looking at two different kinds of solution to the same problem, TCO analysis becomes much harder because the components and parameters of cost may be very different. This is especially true when you are comparing options at the bipolar ends of the SIMPLIFICATION-OPTIMIZATION continuum, because it usually is about something more than the cost of assets, maintenance, and the time-value of money. A big component of those extraordinary factors may be tied to varying levels of Quality of Service (QoS) and varying requirements for staff time. If you are going to use TCO as your primary determinant in choosing between alternatives, then you must be both *careful* (in the way that you construct your model) and fair (i.e., make sure that you consider all of the factors of cost and benefit of each alternative in a documentably unbiased way). This is why SIMPLIFICATION is so appealing, as you can look at things more simply because the factors of OPTIMIZATION are beyond your purview. **However, if you venture at all in the direction of OPTIMIZATION then you have added to the complexity of your existence!**

### **Total Budget**

Often we choose what we can do by what we have to spend. Usually, the first question a car salesperson asks is *how much can you afford monthly?* That simplifies the decision process. Most likely, it does not optimize your bang for the buck, adding to the stress that you feel as you still try to live within your budget while doing measurably more with it.

### **Quality**

Another object of optimization is quality. In order to optimize for quality, you need to understand quality parameters and controls. For database access, which is more important: *response time to queries* or *quality of data*? The first is easily measurable but the second is more important. No one wants to make speedier decisions on questionable data. Considerations of quality take you to the softer sides of the SIMPLIFICATION-OPTIMIZATION spectrum, usually adding enough to put you over the edge, in terms of being able to juggle everything capably.

### **Preparedness**

How much are you willing to spend to reduce or avoid adverse consequences? What's it worth

to ensure that your application never fails? Would you pay twice as much to mirror everything (hardware, storage, networks, software, etc.)? At one time, that is what it meant to *Be Prepared*. Usually, if you want to optimize to cover numerous worst-case scenarios, money is less important than being able to respond to the circumstances.<sup>3</sup> The level of preparedness determines the nature and complexity of the solutions that you will need to deploy, adding to your inability to resolve the optimization of too many variables.

### **Strategic Impact**

There are a lot of levers to pull in the name of optimization. Many of them are easily quantifiable. However, many are not. For example, "doing what needs to be done, and no more" is very clear but very hard to quantify. To which business strategies or tactics do you attempt to target that directive? How are they prioritized? The mud gets very thick and occasionally entrapping as you try to optimize to strategy or business objective. When juggling, watch out for mud-laden balls – they can be very messy.

### **Optimizing Across Multiple Variables**

Optimizing for a single variable is (relatively) easy. You can find the mathematical answer that gives you the lowest TCO, annual capital expenditures, or response time, or the highest ROI, business impact, or other single indicator of efficiency. The problem is that you don't want to optimize across one variable, you want to optimize across many (or even all) of them. (Now, you are beginning to yearn for SIMPLIFICATION!)

If you are beginning to understand why your head throbs like someone stuck a spike in it, you truly feel the pain. **The more you want to optimize in the multi-variate real world, the further you are from knowingly reaching a meaningful, justifiable, and leveragable solution.** As a result, you want to return to anything that implies SIMPLIFICATION. You want to reduce the variables on which you must, continually and repeatedly, attempt to optimize.

### **Conclusion**

If you work for a large enterprise and seek to optimize the data center, you naturally crave (more) simplification. If you work in a mid-sized

<sup>3</sup> As an example, this why even small towns have either two fire trucks or a mutual aid agreement with a neighboring town. Just because there is one fire doesn't prevent another from starting in a different location while you are fighting the first.

organization and exist in a simplified universe, you may see opportunities (or temptations) for OPTIMIZATION on all fronts. In both cases, you are frustrated by what you have been told to do, what you are allowed to do, and what you are able to do.

As many therapists will tell you, there is no simple solution for what ails you; however, when you better understand its cause and effects, you should be better able to deal with it. **You live in a world that pulls you, many times a day, between the extremes of SIMPLIFICATION and OPTIMIZATION. Understanding the cause and effects of your existence and suffering are the first step to dealing with it.** Hopefully, this bulletin has brought this conflict into more clarity for you.

If what you seek is a singular cure, there is none. In most situations, there is no way to limit the opposing forces of SIMPLIFICATION and OPTIMIZATION. You are afloat in a sea of many influences, with many levers at your disposal.

Unfortunately, your 50 minutes of therapy are almost over and we need to wrap up and set the stage for your next step. You have several choices.

- You can come back next week and talk about it some more.
- You can return to your real world and try to deal better with the Yin and Yang of your IT existence.
- You might be brave and do this alone (but now being more mindful of the situation).
- Or, you might seek a co-pilot to assist you as you traverse the seas ahead, preferably one who understands the tides and under-currents from the confluence of the *seas of simplification and optimization*. This may make to most sense.

Whatever you do, don't presume that the sailing will be straight to where you want to go! Infrequently, the wind is at your back. The winds shift and you must be prepared to react swiftly to adjust your course dynamically. Now, it's time for you to decide how you want to proceed. *Good luck!*



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