



Redshift: A radical change in the fabric of computing

Some companies are boosting their computing power to massive scales. Should your company? That depends on whether your company's needs are blueshifting or redshifting. **Greg Papadopoulos**, **Jonathan Schwartz** and **Jason Woods** explain why these new business terms could define your company's future.

A market-redefining shift is afoot in the information technology (IT) industry, one in which the consumption and delivery of computing is dramatically different from previous eras. Some areas of IT are experiencing geometric growth, while others seem confined to the more traditional computing patterns and requirements that have driven historical IT demands in most companies. In essence, we now have two distinct areas defining the IT marketplace, each with increasingly divergent requirements and demands.

Far-sighted executives will keep their eye on what we call “redshift” systems design and deployment; this is a global shift to *network scale services*, including “cloud computing” and software-as-a-service. Look carefully and you can see that the amount of investment and engineering

Moore’s Law predicts the doubling of the number of transistors on an integrated circuit approximately every 18–24 months, which (in turn) has been a good predictor of increases in computer performance and, thus, the supply of computing potential in the marketplace. Given that price bands for computers have remained fairly stable over the past decade, Moore’s Law is, in practice, an enormous and vicious deflationary force: the cost of performing a given computation is cut in half about every 18 months.

Traditional computing demands represent markets that tend to experience growth rates in step with a company’s growth and, in aggregate, something closer to global Gross Domestic Product. Notable examples include a company’s demands for customer relationship management (CRM), sales force automation (SFA), enterprise resource

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pouring into redshift systems design and deployment suggests this style of delivering IT services will soon dominate the marketplace. The result: future growth in IT will be derived from non-traditional market segments, and the implications for technology producers, operators and consumers are far-reaching.

For example, as companies, industries, governments, societies and, in fact, entire economies increasingly connect to the network, massive investments in IT are underway to support swelling infrastructure demands. The manner in which and the metrics behind how companies extract value from IT is shifting. Industry data show that, historically, the majority of money spent on IT was consumed in supporting the internal operations of the business. In the near future, the industry-wide spending pattern in IT will inflect. Our model shows future investments in IT will soon be dominated by decisions to use IT principally as a competitive weapon – *radically changing how companies should evaluate and think about IT*. Although this transition is still incipient in nature, it’s no longer anecdotal (or negligible). As we see it, this transition to redshift computing is inevitable.

The redshift evolution

The story begins with a simple, but powerful, observation.

planning (ERP), general ledger, payroll and the like. Many, but not all, of these functions are inwardly focused on the daily operations of the entity.

These functions were daunting workloads for even the most powerful computers in the 1990s, but the computing demand for these functions is growing far less than the ability of computers to process them. Simply put, increases in computer performance over-serve the needs of many enterprise IT applications. The result: a contraction in the absolute number of computers demanded by this market segment. It’s no surprise, then, that businesses are looking to cloud computing, virtualization, consolidation, and other leading computing trends to maximize business options and gain efficiencies. Such trends point to one simple yet compelling observation: as advancements in technology outpace the growth demanded from traditional IT, fewer computers are required to serve this segment of the market. It follows that massive efforts are underway to improve utilization, increase productivity, consolidate workloads and otherwise improve the ROI metrics from the majority of computing architectures deployed over the last several decades. Further advancements in technology promise tomorrow’s businesses even greater options for leveraging even less silicon-per-unit of workload demanded. In astrophysics, scientists use the word *blueshift* to talk about visible light moving toward the blue end of the →

→ spectrum (a compaction of the wavelength); similarly, blueshift can be used to describe the contraction that many businesses and industries are experiencing for their legacy IT environments. Moore's Law is outstripping the required demand. In stark contrast, there exist increasingly important hyper-growth segments of the IT industry that are severely under-served by current computing capability and are demanding scale and efficiencies historically unseen in the IT industry. These market segments can be described as *redshifting*, after the astrophysics term for an expansion or stretching of the wavelength of light. More specifically, the research suggests that redshift functions are demanding hyper-growth computing in these three basic areas:

Extreme bandwidth (BW = sum-of-bandwidth)

This area deals with delivering content from search and auction engines, network payment processing services, online gaming, video and telephony over

Computing Centre and TSUBAME at the Tokyo Institute of Technology are examples of some of the largest and most advanced massive-scale computational HPC achievements. Many corporations are also beginning to build-out technical, scientific and commercial HPC grids dedicated to solving highly computer-intensive problems that, if solved, will provide significant competitive business advantage.

Software as a service or *prise ("star-prise") These are areas in which companies have aggregated traditional computing functions (such as CRM, ERP and SFA) and created a network service to gain efficiencies by serving hundreds or thousands of customers from the same service. In almost all cases, a single company's *prise business demands tend to grow far less than Moore's Law's ability to provide increasingly powerful silicon every 18 or so months. However, hyper-scale infrastructure demands occur when companies such as Salesforce.com, Workday,

Computing is destined to follow in the footsteps of its more mature industry predecessors, such as energy, transportation, telecommunications and power utilities: computing (not to be confused with computers) is becoming a commodity.

the Internet and so on. Google, Baidu, YouTube, Facebook, Wikipedia, Yahoo!, World of Warcraft, Skype and a myriad of others are on a ferocious pace to deliver new content with new features to new consumers. The bandwidth demands required to deliver increasingly rich content, in increasingly rich formats, across an explosion of consumer-facing devices drives staggering infrastructure and data centre build-outs.

High-performance computing (HPC) Some examples include weather modelling, protein-folding simulation, finite-element structural analysis, Monte Carlo risk analysis at a brokerage house or seismic data computations by a global oil and gas exploration firm. Though more easily defined in terms of what the computing needs are, from an economic perspective, it's a perfectly elastic market. Businesses will spend every available computing dollar budgeted on IT because it provides competitive advantage. If you cut the cost of computing by one-half, businesses committed to HPC don't buy one-half as much, they buy *twice* as much or more as the return on investment dictates even more spending. The Texas Advanced

SugarCRM, OpenTable.com or Intuit (through its Turbo Tax Online product) leverage a "software-as-a-service" model to aggregate functionality for thousands of customers.

The shift to massive scale

Classifying IT needs as redshifting or blueshifting allows us to leverage research from International Data Corporation (IDC), the IT industry's largest quantitative analysis firm, to determine their relative growth rates. The market research (IDC Custom Research sponsored by Sun, Sun Redshift Workloads Research, September 2007) compares the number of server revenue and units, storage revenue and storage terabytes (or capacity) – all tied to compound annual growth rate (CAGR) for segments of the market categorized as redshifting.

The research reveals that the market demand for redshift-related servers and storage, both in terms of the number of physical units and revenue, is accelerating through 2011. The research also shows that the growing demand for redshift systems presents growth rates that far outpace overall market growth. Today, redshift systems represent a limited, but fast-growing segment of the market;

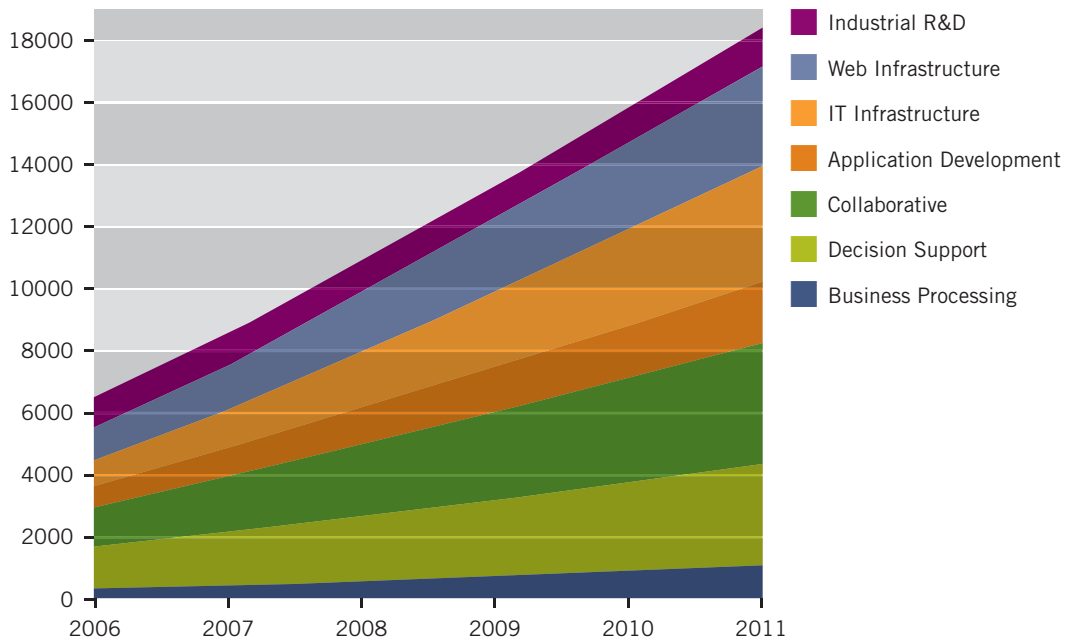


Figure 1. Redshift Storage Revenue

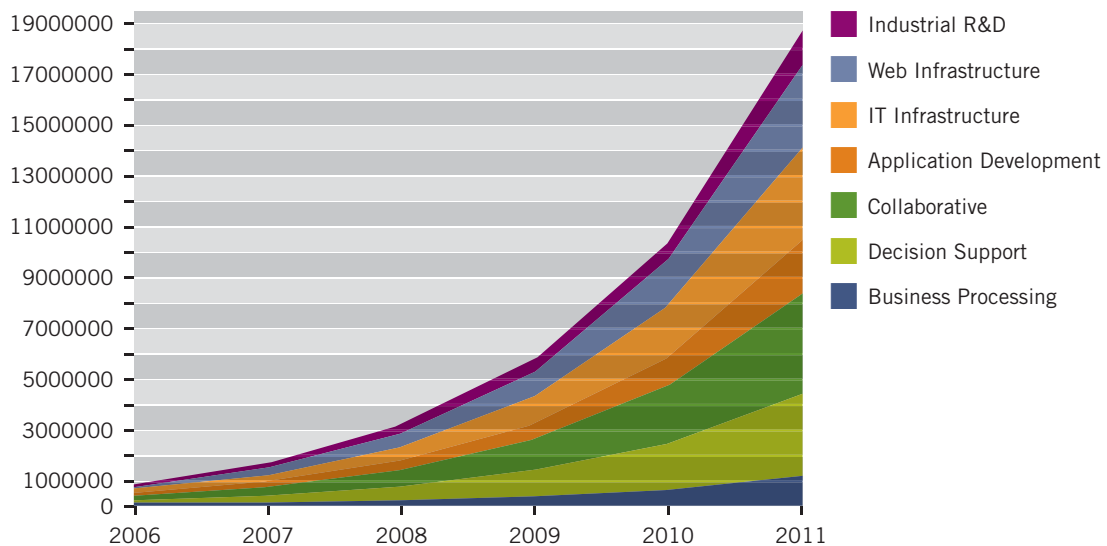


Figure 2. Redshift Storage Terabytes

however, within the next few years, redshift infrastructure will become the dominant IT design and deployment style. This architectural shift in the marketplace will drive foundational changes for infrastructure providers, technology operators and consumers. At a basic level, redshift infrastructure emphasizes scale efficiencies; so we expect the world will evolve around fewer, but much larger, computing installations. Graphically illustrating the extreme growth in just one of these redshift categories, figures 1 and 2 show IDC's predicted growth in redshift storage revenue and terabytes, respectively, through 2011.

Graphically depicting the computing demand over time provides a useful perspective as executives consider their own IT infrastructure requirements.

More telling, of course, is the conclusion one can draw from the research. A fundamental phase change is underway. Computing is destined to follow in the footsteps of its more mature industry predecessors, such as energy, transportation, telecommunications and power utilities: *computing (not to be confused with computers) is becoming a commodity*. And the journey towards the commodification of computing promises a new world of efficiencies and opportunities for both classic and newly emerging businesses.

Youshift?

How does all this affect you and your company? Much depends on what kind of business you operate. As numerous market experts have pointed out, massive investments are being made to →

Data	View of IT	Value to the Business	Examples
Keep	IT as a Weapon (Redshift)	Differentiated	Search or Auction Engine, HPC
Out-service	IT as a Cost (Blueshift)	Undifferentiated	email, ERP, CRM, SFA
Keep	IT for Control	Strategic	Identity, Workflow, Orchestration

Figure 3: Rules for IT functions

→ build-out new compute, storage and network data centres capable of extraordinary scale – IT services are increasingly expected to drive utility-scale efficiency. At the same time, redshift capability is expanding while blueshift demands continue to contract. Those businesses (or segments of the business) whose computing needs can be accommodated with blueshift-style IT patterns and deployments are seeing their computing costs go down, simply because their needs can be met in lower-cost ways. For example, most small businesses today would rather not purchase, set up and maintain an email service – clearly a blueshift type workload from the context of a single company. After all, though it's core to run the business, how many companies gain competitive advantage by deploying and managing their own email system? More likely, emerging businesses will purchase email as a service from a vendor whose business employs redshift-style infrastructure to accommodate many customers. Google, Yahoo!, AOL or a number of other email service providers would host, operate, and manage email as a business service. The same is true for a host of similar core IT functions and services. The reality – most companies are not exclusively red or blue, but rather a mix of the two.

Do you need to shift? The question, better phrased: are parts of your company's IT infrastructure redshifting – and if so, how do you recognize and rationalize this "shift" to your advantage?

The IT industry is being rebuilt from the ground up. Historical market segments are in an extended period of contraction while emerging areas are experiencing an unprecedented and sometimes astonishing expansion. Rather than simply a rubric analysis, the implications and consequences for nearly every business are quite real.

Going forward, executives should carefully consider the growth rates for various business functions and the application types that support the business. Separately, they should ask whether demand on the underlying computing infrastructure will double within the next two years. If not, executives should characterize the investment as a blueshifting expense to be managed and limited.

If, on the other hand, a company's computing demand for a particular project or environment is projected to more than double every year or two, executives should understand that these fast-

growing business services will require innovative, brutally efficient redshift infrastructure to handle steep growth rates.

Executives should consider questions such as the following:

- What metrics will we use to measure the efficiency of the company's existing computing capability, both from a technology and business success perspective?
- Can we leverage another organization's redshift systems to avoid capital expenditures?
- How will we invest more time in carefully evaluating products and services from vendors?
- What are our costs to acquire, operate and exit a technology or service?

As IT markets and associated technologies become more complex, both the IT industry and its customers must change the models used for investing in and extracting value from technology goods and services.

As the above questions turn into well-researched and fully discussed answers, a key priority for executives will be to determine what IT functions should be kept in-house and self-managed compared to functions that should be out-serviced through a qualified third party. When considering the above, a few simple rules can help; these rules can be quickly charted (see Figure 3).

Areas in which IT is largely undifferentiated (that is, managed primarily as a cost) are blueshifting and are typically ideal candidates for out-servicing. For many new businesses, it makes little sense to invest in their own ERP or CRM systems when the value to the business is undifferentiated. Instead, companies should consider ceding operational control and outsourcing these core services. Doing so allows a single company's blueshifting expense to be optimized leveraging another company's redshift scale and efficiencies.

Within your enterprise, there are two primary areas in which your company should keep control of its computing capability (and possibly expand it). First, segments of your business in which technology is used as a competitive weapon in the marketplace, that is, in which your business can garner a unique and differentiated capability compared to your peers through technology. Mega technology consumers such as eBay and Google are good examples of large

companies whose IT budgets are dominated by investing in technology to not only run the business but also to grow top-line revenue. Correspondingly, businesses of all sizes needing to solve industry-specific challenges such as cargo loading and delivery, an airline looking to optimize its revenue management systems, or a financial services company performing complex risk analysis computations on its investment activities all are examples of technology used within the department or within the business unit to increase the company's market competitiveness. These activities all require a redshift-style approach to technology consumption and delivery. They are often fast-growing, highly efficient, and business-specific implementations of IT. For these initiatives, maintaining architectural, and frequently operational, control is critical.

Secondly, companies should keep control of internal environments such as identity management, key process and workflow technologies and ownership of service composition and orchestration activities. These foundational IT capabilities should be kept in-house for strategic reasons and not be ceded to third-party operators.

Putting it all together

The next wave of leading-edge enterprises will excel in putting it all together. They will leverage technologies such as identity management, security, service-oriented architectures and various programming models and languages to effectively and efficiently create bridges between their own core IT systems and emerging, fast-growing redshifting business services.

First order, executives should decide where to utilize IT-as-a-weapon versus IT-as-a-cost and deploy redshifting- or blueshifting-type strategies

and architectures respectively. Concomitantly, steps should be taken to maximize business options with "everything as a service" architectures (becoming popularly known as cloud computing). These include designating open infrastructure platforms for the applications maintained in-house and insisting upon open services for outsourced applications. Conceptually, "open services" is to services as "open source" is to software. When outsourcing it's important to insist that:

- all interfaces and formats are open and standard
- you always own the data
- you own the relationships and metadata, and
- you can extract, sync or purge your information unilaterally from a service provider

Ensuring a company's oft-increasing technology bets are maximally leveraged and aligned to achieve corporate objectives is crucial. Many enterprises employ detailed strategies and techniques to measure the Total Cost of Acquisition (TCA) and the Total Cost of Operating (TCO) IT and link these analyses to planned projections or corporate outlooks. Unfortunately, many enterprises fail to consider the enormous barriers associated with exiting a technology or platform. In today's marketplace, flexibility and efficiency are key to maintaining competitive options. Frequently, the Total Cost to Exit dwarfs the TCA and TCO.

Enterprises should consider that as IT shifts to a new model, new methodologies are required and new strategies taken to deliver maximum return from investments in IT. As redshift architectures will soon dominate IT infrastructure, business efficiency, openness and flexibility should be paramount concerns for every executive, technical and non-technical alike. ■

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