

Innovating IT in Tough Times

Moving towards Autonomic Systems

A Blast from the Past - August 1981



IBM Model 5150 Specifications

Processor	Intel 8088
Speed	4.77 MHz
RAM	16KB
Storage	Cassette Tape, optionally 5.25" 160KB floppy drives
Expansion	5 expansion slots
Bus	Industry Standard Architecture (ISA)
Video	Initially CGA (320x200x16 color, 640x200x2 color) or monochrome (80x25 text only))
I/O	Parallel, Serial
OS	Microsoft Basic 1 (ROM)
Killer App	VisiCalc

Fast Forward – to 2008

- Today, we have CPUs which are 1,000x faster
- Today, we have RAM which is 2,000,000x larger
- Today, we have disks which are 6,000,000x larger
- So what's the problem?

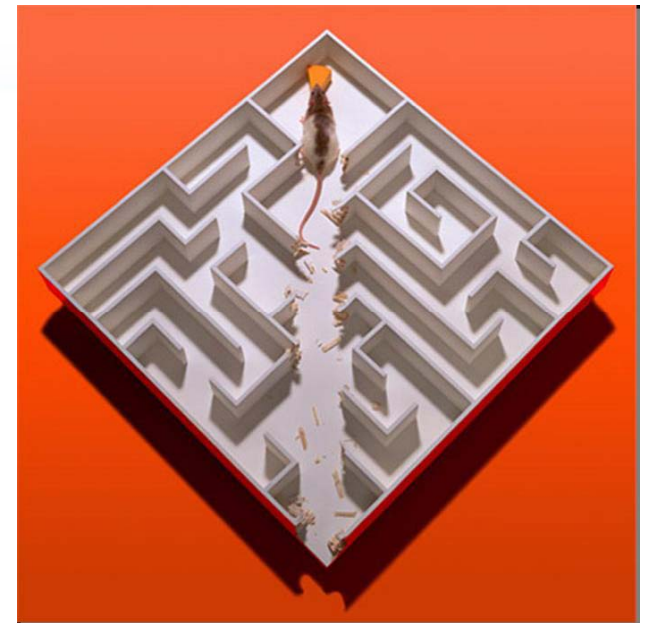
What is the Problem?

- The MANAGEMENT nightmare
 - Too many different
 - » Servers – now both physical and virtual
 - » Operating systems/Hypervisors
 - » Switching systems
 - » Storage systems and protocols
 - » Management consoles
 - IT staff skill levels and budget (the lack thereof)
- Availability requirements driven by online access
 - 24x7 for applications when needed (some 24x7xforever)
 - Zero tolerance for downtime – planned or unplanned
- Typical (non-virtualized) asset utilization
 - Servers – 5-10%
 - Disk: 30 - 50%
 - Tape: 20 - 40%



What can Virtualization do to help innovate?

- Capacity
- Availability
- Performance
- Flexibility/Change of Attributes
- **Management**
- **Strategy**



What are Autonomic Systems?

- **Autonomic Systems:** Computer systems capable of self-management, to overcome the rapidly growing complexity of systems management, and to reduce the barrier that complexity poses to further innovation.
- There are four main functional areas:
 - Self-Configuration: Automatic configuration of components;
 - Self-Healing: Automatic discovery, and correction of faults;
 - Self-Optimization: Automatic monitoring and control of resources to ensure the optimal functioning with respect to the defined requirements;
 - Self-Protection: Proactive identification and protection from arbitrary attacks.
- An example of an autonomic system: the human body

What is Storage to Information Technology?

Isn't it the Foundation?

The State of Storage

The storage industry has done a valiant job of accommodating the exponential growth and complexity of data, despite an underlying storage framework that hasn't changed significantly since the advent of SCSI discs and arrays, over 20 years ago!

However, the *ongoing explosion of storage demands coupled with frozen/limited budgets, limited IT resources, and the urgent need to lower power and cooling consumption suggests a true overhaul of storage architectures is overdue.*

Considerations for Autonomic Storage

- *Service on storage would be the exception vs. the norm.*
- *“After the Sale” costs would no longer dominate government IT budgets.*
- *Automation based upon a new foundation would enable accelerated scale and more efficient human interaction.*
- *Entire data centers could be built on such a foundation, enabling NEW solutions that take advantage of advances in server, OS, and application intelligence.*

The next major problem

We are stuck in the current generation.

- Most data is still being stored centrally, and as a consequence of additional data sources (e.g. email) is growing at a rate that is increasing exponentially.
- *Storage creates or influences 80% of I.T. service events.*
- Universities & IT programs have fallen woefully behind the ability to provide the necessary number of skilled professionals that can manage storage.
- It's getting worse.

The next major problem

The workforce is changing.

- As 70 M Baby Boomers exit the workforce in the next 15 years, 40M people will enter the workforce.
- Generation Y is entering the workforce
 - They want to start at the top.
 - They believe that they deserve the position they want, whether experienced or not.
 - This is not a lazy generation, just one that expects immediate gratification, due to a childhood of receiving it.
 - Parents aren't encouraging children to pursue an IT career because of dot-com failures and overblown media reports about IT-related jobs going overseas.

The Solution

Where do we get the people to solve the problem?

- Obviously, not from the incoming workforce.
- *There are NO people to solve the problem*
 - Even if there were – you cannot hire them because most districts cannot afford them, given private sector salaries.
- With Technology, we cannot create people to solve the problem.
- With Technology, we can create the capability to automate many tasks and self-heal.

What We Don't Want

We don't want technology that makes it easier for IT personnel to manage and replace discs in arrays.



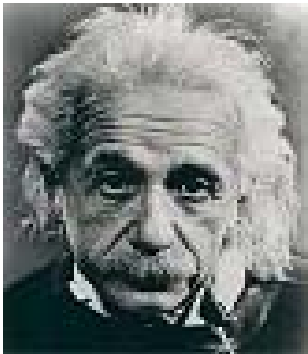
We don't want discs inside of servers. Why not? Because servers do not and cannot manage discs, and if the server is down, the data is unavailable!

Technology must be applied to move the responsibility to perform these tasks ***into*** the storage device ***and make it autonomic***

Why is no one addressing a solution?

- Many ignore it – on purpose - to make \$\$\$ on service & maintenance from government!
- Many substitute – falsely – efficient complexity instead of simplicity
- Users fall in love with cheaper entry cost... and then pay forever for maintenance/service, licenses for everything, help desks for everything.
- Cheaper does not mean better or even good enough to solve storage issues in government.
- Cheaper is not better, better is better!

How do We Resolve these Issues Without Collapsing the IT “House” We've Built?



“Insanity: doing the same thing over and over again and expecting different results.”

Albert Einstein

Simply put, we must start doing things differently!

New IT – Start at the Foundation

- To Solve Issues for IT, all foundational issues must be addressed as a *whole*, not just point by point.
- Taken point by point, items such as post-sale maintenance costs, ongoing (lifetime) performance, and/or data integrity & reliability will suffer.
- New 'clouds' are examples of trying to use the current foundation to solve 'some' of the IT issues, while downplaying service and maintenance, among other things.
 - Multiple copies of data duplicates costs, defeating the purpose of using commodity hardware.

New Foundation Requirements

- Failure Avoidant, Service Avoidant Storage with efficient redundancy.
- Achieve *useful* life of 10 years or more
- Guaranteed Availability/No Service Events for 5 years.
- No maintenance costs for 5 years.
- Efficient, Balanced, “Performant”, Storage
 - Move Caching, Device Mgmt, and ‘RAID’ to the foundation enabling balanced performance for a group of devices.
 - All the attributes necessary for autonomic storage are present
- Based on this, utilize foundational intelligence to safely and securely move data between foundation elements according to government policy and workload.

- A new foundation element provides *self-healing* storage that does not resemble 'JBOD' (Just a Bunch of Discs) managed with software or servers with a bunch-of-discs inside.
- A new foundation element enables autonomic storage systems that are
 - Extremely cost-efficient – reduced FTE workload
 - Power efficient
 - “Performant” for any application workload
 - Complementary to Virtual Server Environments and to applications such as databases and e-mail.
- A new foundation enables government to not have to rely on 'cloud storage' in the future in order to minimize ongoing costs.

Thank you!

- Q&A