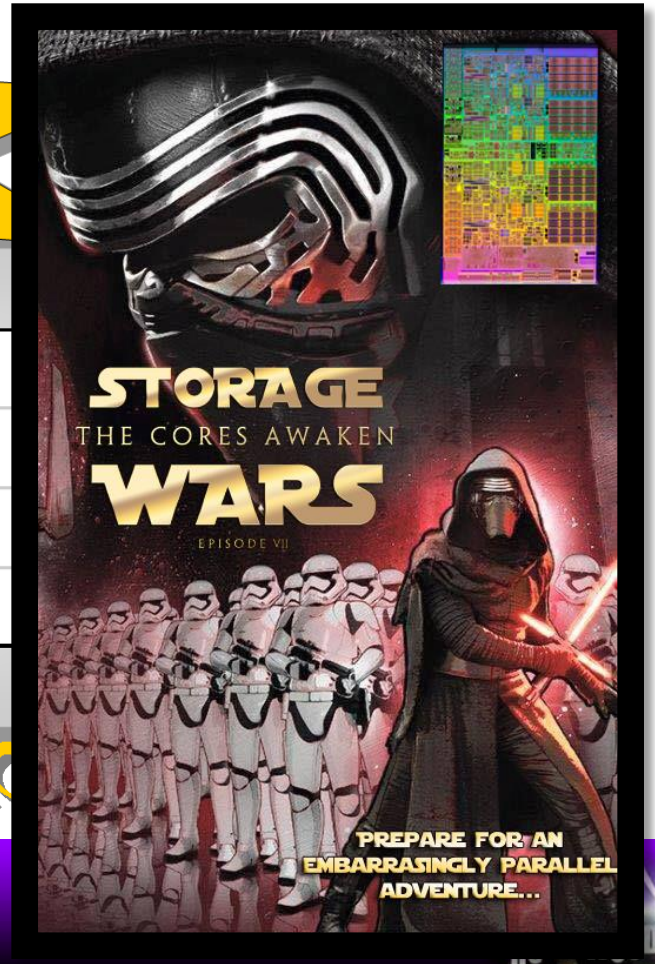
Welcome

- Thank you to Fujifilm for having me back again
  - My 6th (!) Global IT Executive Summit
  - Always a learning experience for me
- And thank you for letting me bend your ears for a little while on Friday morning
- These shows always have great signal/noise characteristics – which is why I keep coming back!

30 Minutes to Give My Take on Storage Trends

- *Hollywood style…*

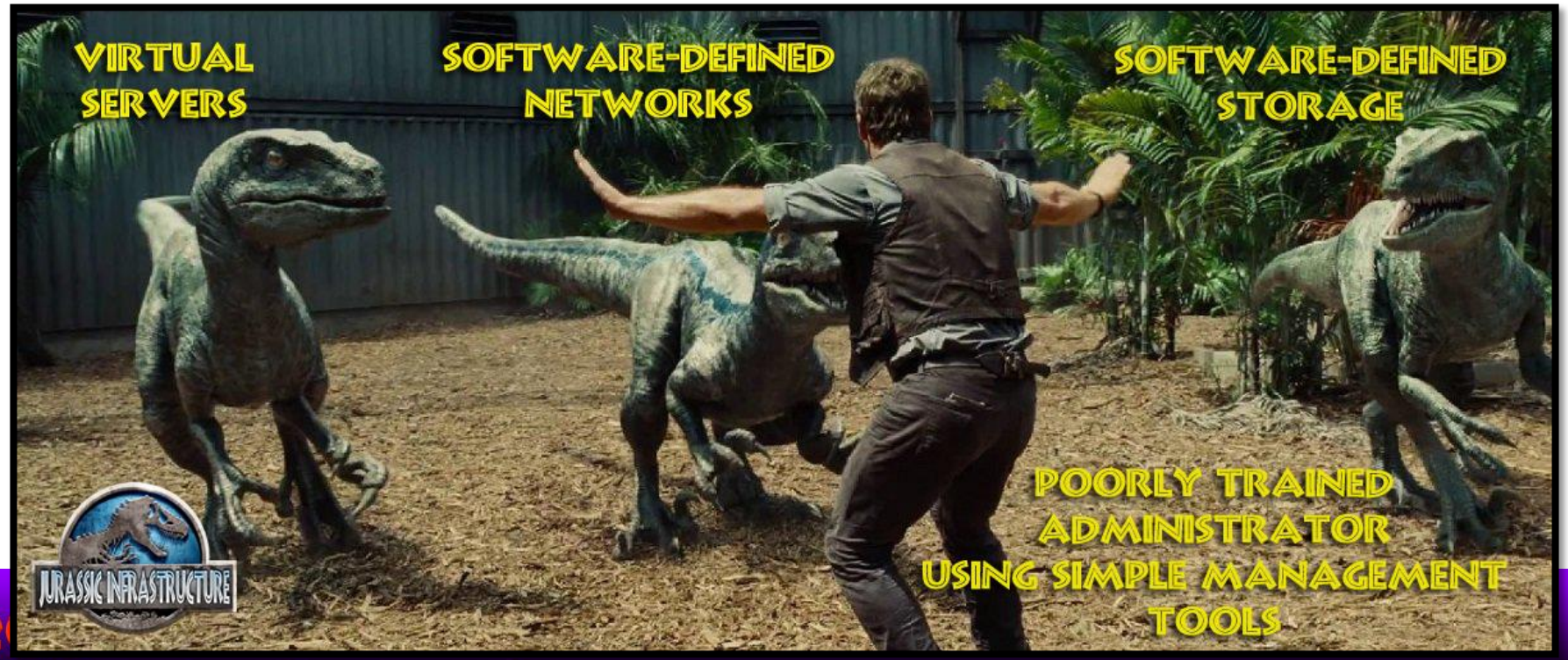


So let's kick things off with that Summer Blockbuster 65 million years in the making…

- *No, not you Arnold…*
- Right, that Summer Blockbuster…
  Jurassic Infrastructure

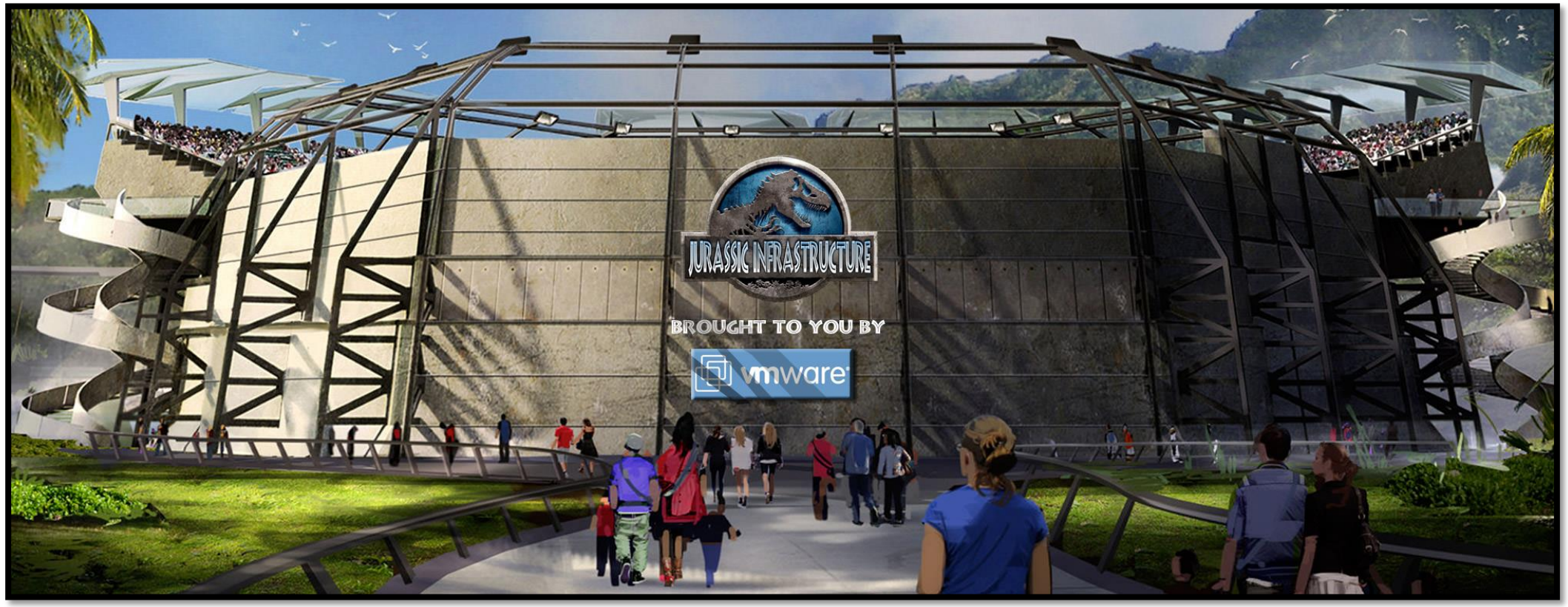
Jurassic Infrastructure: Not a Pointless Remake, *though it might seem so*…

- The story of a young man and his pet mission to tame those primal velociraptors of the data center…



His dream is, what else, “Greater IT agility!”

Creating a new, more elastic, more resilient, IT service with a new(ish) lead vendor…

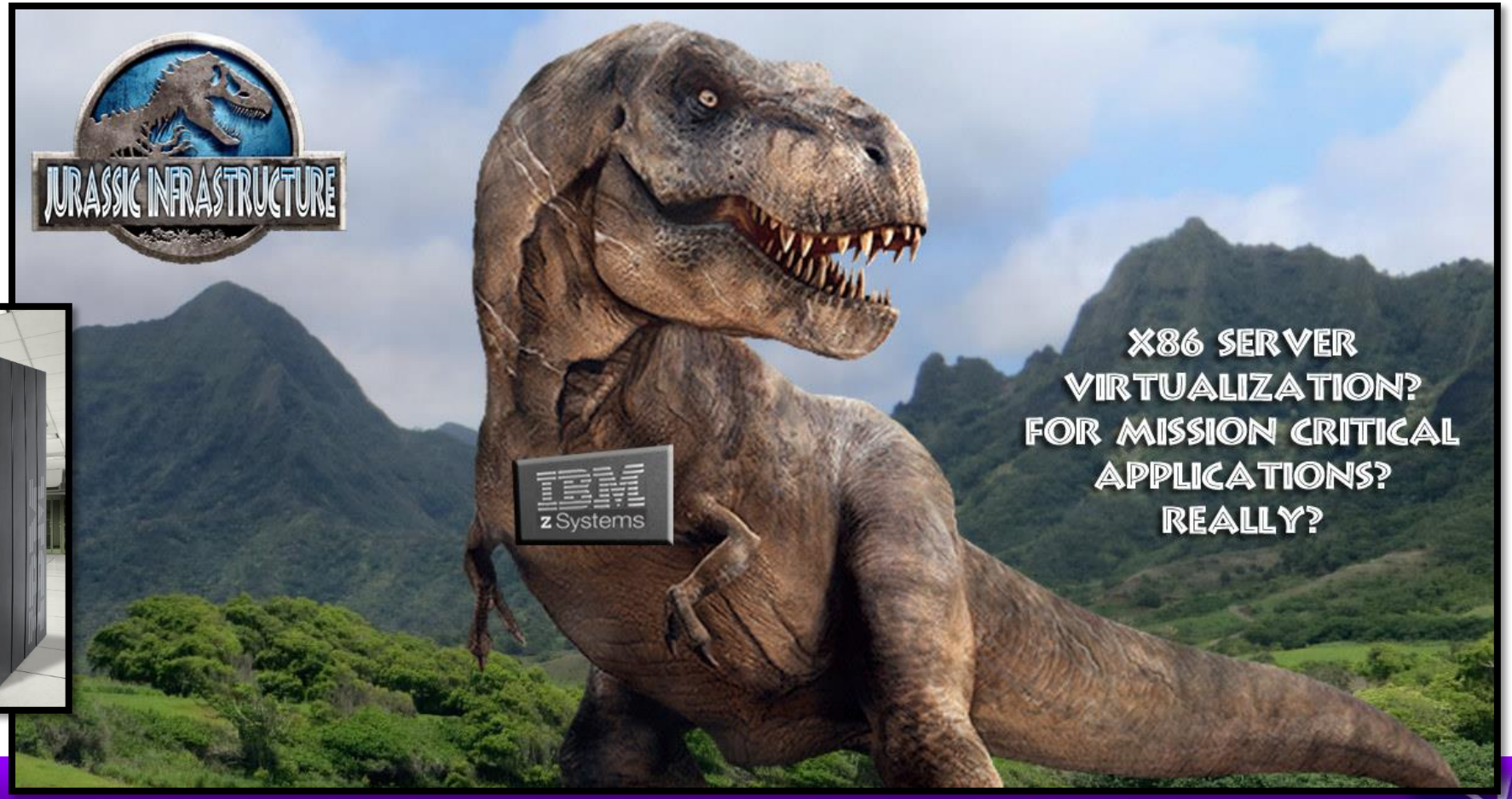


A shy, behind-the-scenes, type of vendor…

- Working to simplify operations
  - Consolidate servers
  - Virtualize applications and workloads
  - Eliminate disaster recovery requirements
  - Reduce CAPEX costs
- Reduce the IQ demands of staff
  - Automate provisioning
  - Automate availability and failover
- Prepare for “cloudification”

Oh, you mean a certain *mainframe* vendor?

The z13 is a remarkable accomplishment, rivaling x86 virtualization platforms…



But no. We need a bigger, louder vendor with more teeth…

- No, *not you, Arnold*…
- We are talking a next generation technology provider, one that will resonate with kids who have the memory retention of SnapChat and the attention span of a Tweet…
- We are talking about…

Powered by

vmware

But this is Hollywood, so we need some drama…

- How about this plot twist:
  - Our hero's "data center assets" stop following his architectural vision
  - At the same time, his primary technology vendor ceases to behave like a "trusted partner" and makes a bid to become the new "Alpha" – calling the shots on all infrastructure design…

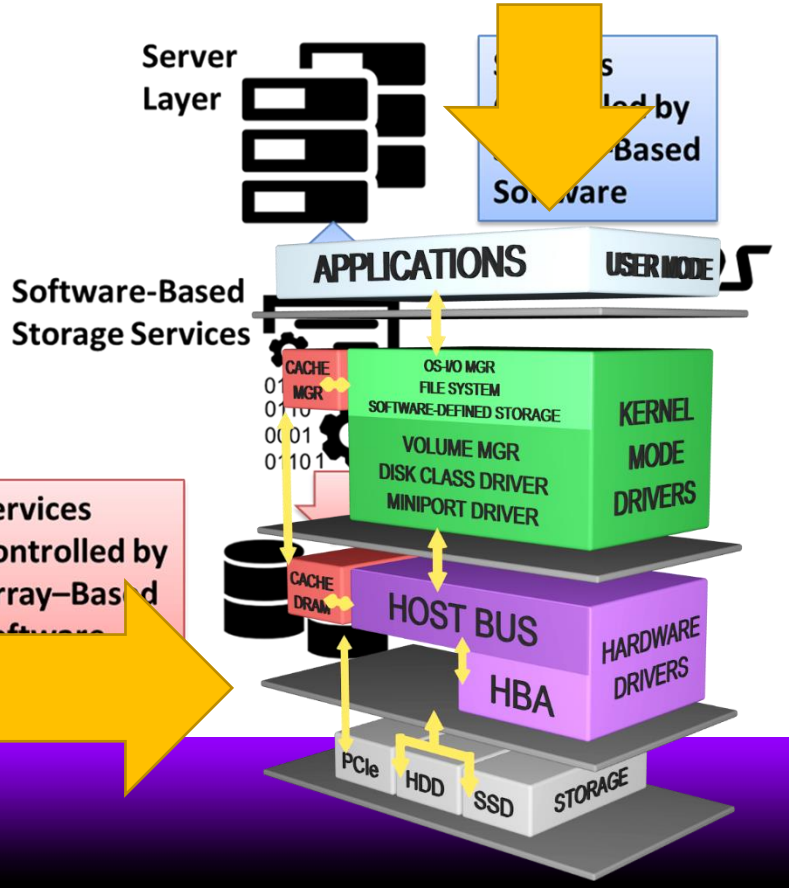
Seems like storage is the big stumbling block…

- Leading to a number of experiments by the Alpha vendor…
  - 2010: vStorage API for Array Integration (VAAI) introduced in vSphere 4 – 9 non-standard primitives enabling unapproved SCSI commands to offload storage chores from inefficient ESX servers
  - 2011: "Enhanced" and Reissued in vSphere 5, expanding support for thin provisioning, NAS
  - 2011: VMware vSphere Storage Appliance – neither a SAN nor NAS, but a repository for VMDK files exclusively…
  - 2014: "Virtual SAN" – Enter SDS and HC-I

SDS = Software-Defined Storage
HC-I = HyperConverged Infrastructure

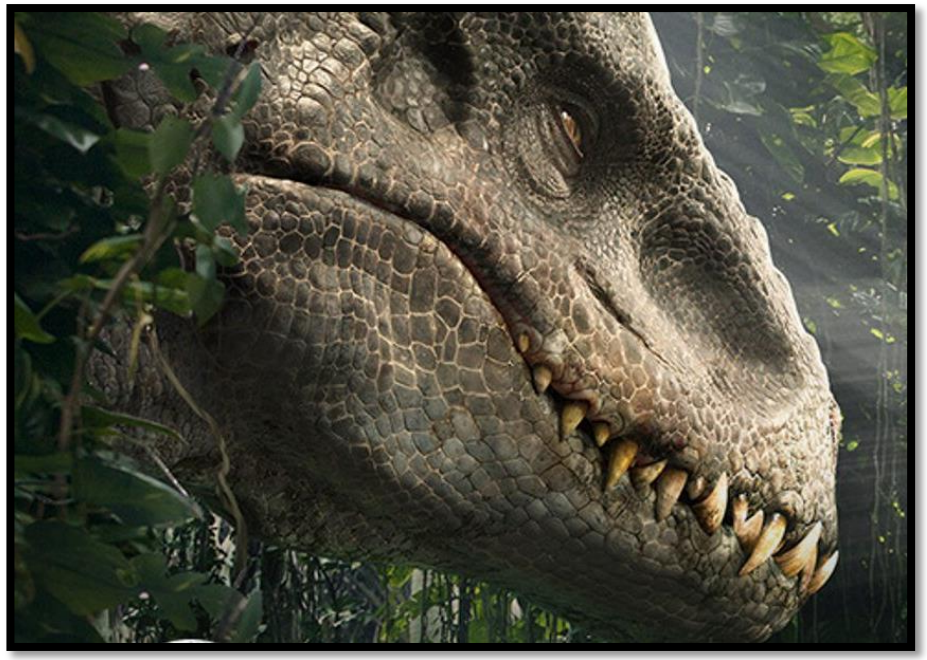
What is SDS?

- A marketing term for the most part…
  - No consistent definition, but
  - *You know it when you see it!*



As many ways to implement as there are vendors…

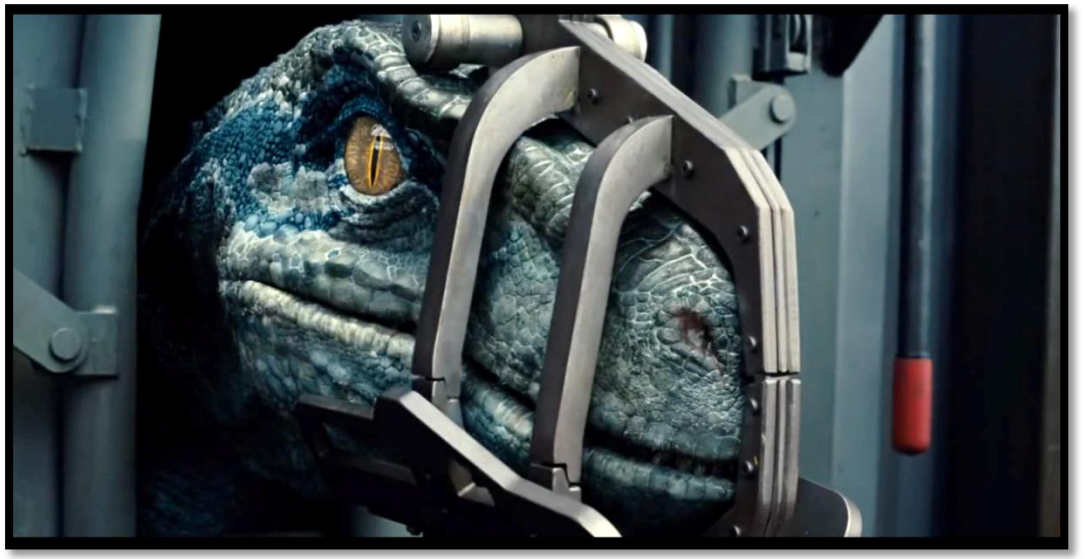
- In the case of the Alpha vendor…the *Virtual SAN*

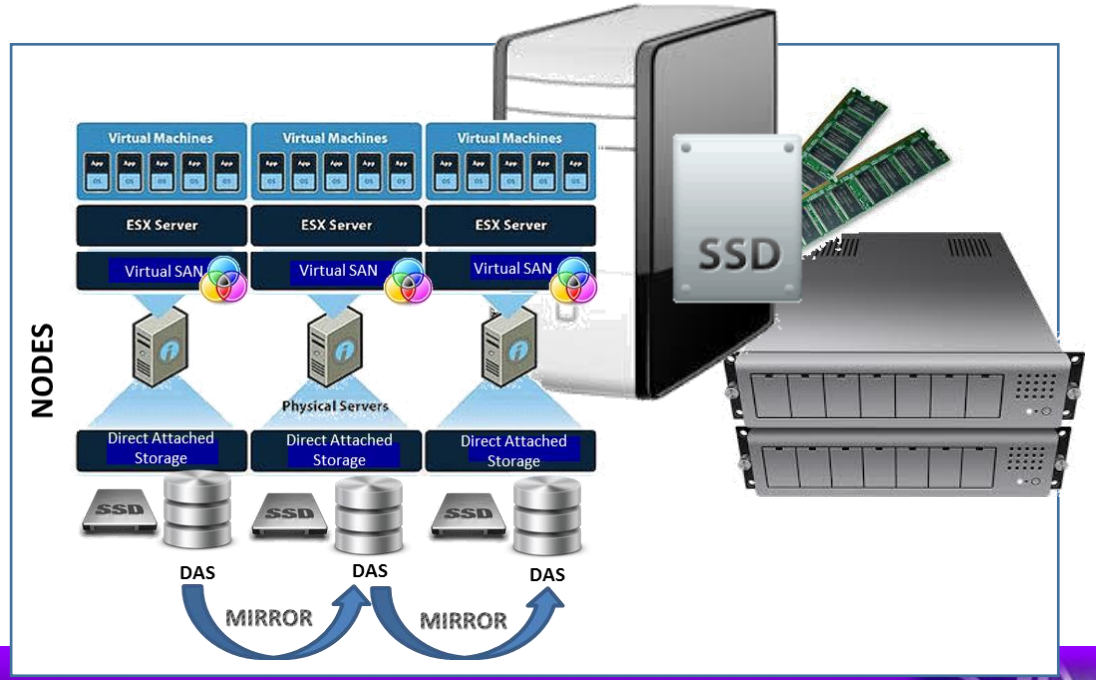


- Hypervisor software layer
- Minimum 3 node cluster
- Identical complement of flash and disk JBOD per node, scaling oriented toward disk, flash primarily for cache
- Components must be pre-certified to work with Virtual SAN
- Data synchronized via mirroring controlled by Virtual SAN software – VAAI not supported
- Storage not accessible to non-VMware workload

Clustering storage?

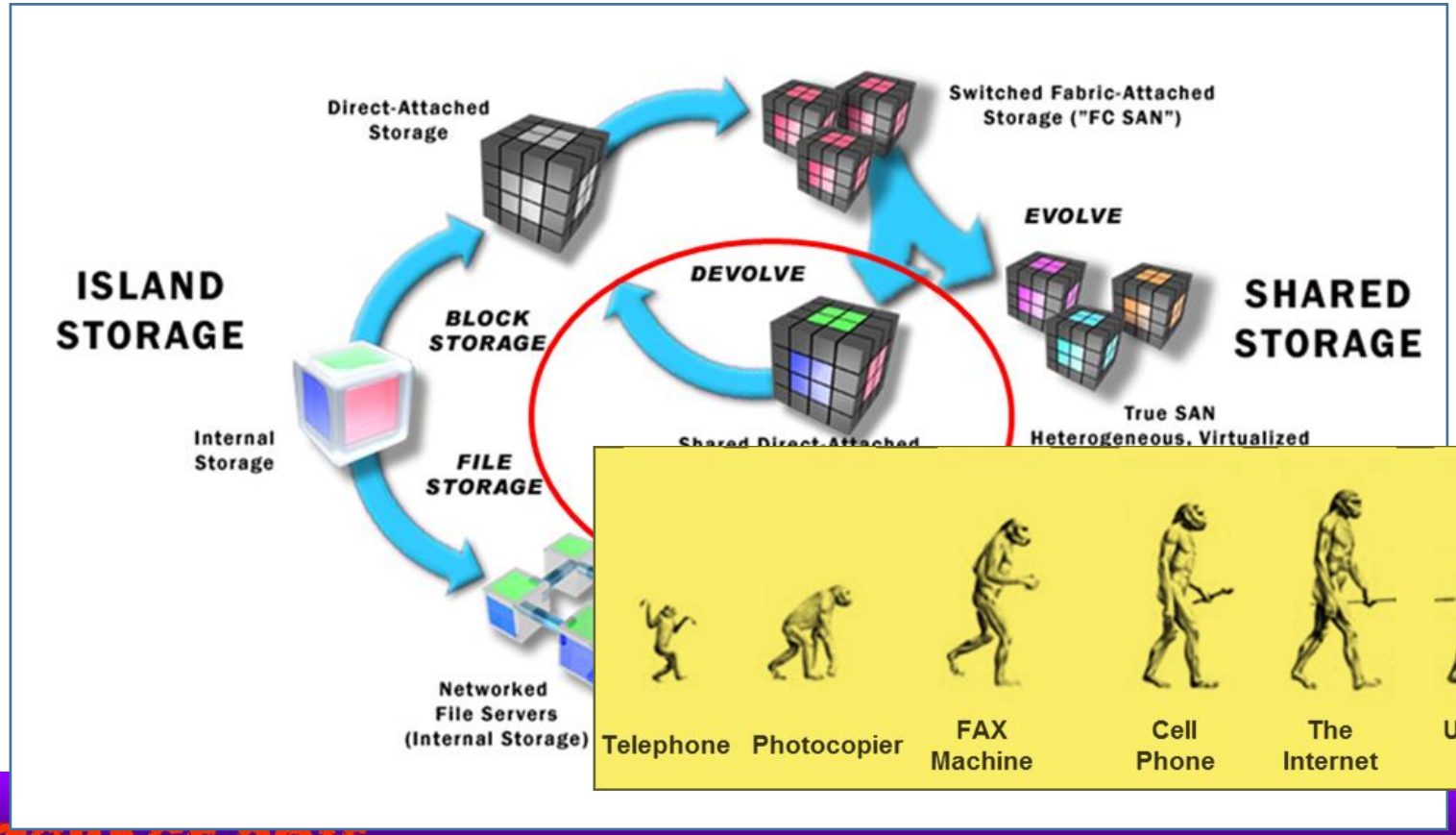
- You know, for availability and stuff…
  - No hardware deviation between nodes
  - Only approved gear (control imposed by driver availability, node pre-certification)
- Clustering for HA, but why *three* nodes?
  - Adds cost: $16 to $26K per node for licenses and hardware
  - That's money in the bank
- *It's good to be the king*

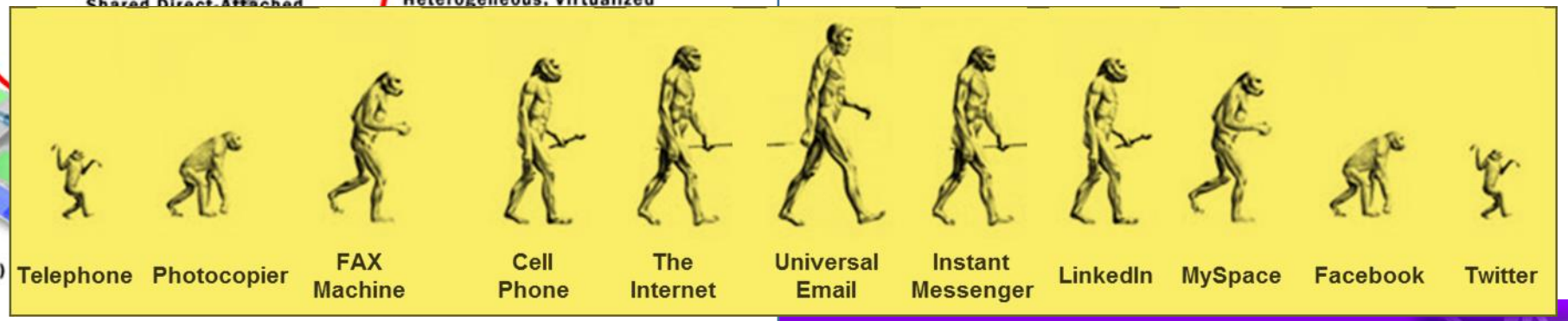




But is that evolutionary or de-evolutionary?

- Who cares? If it works…



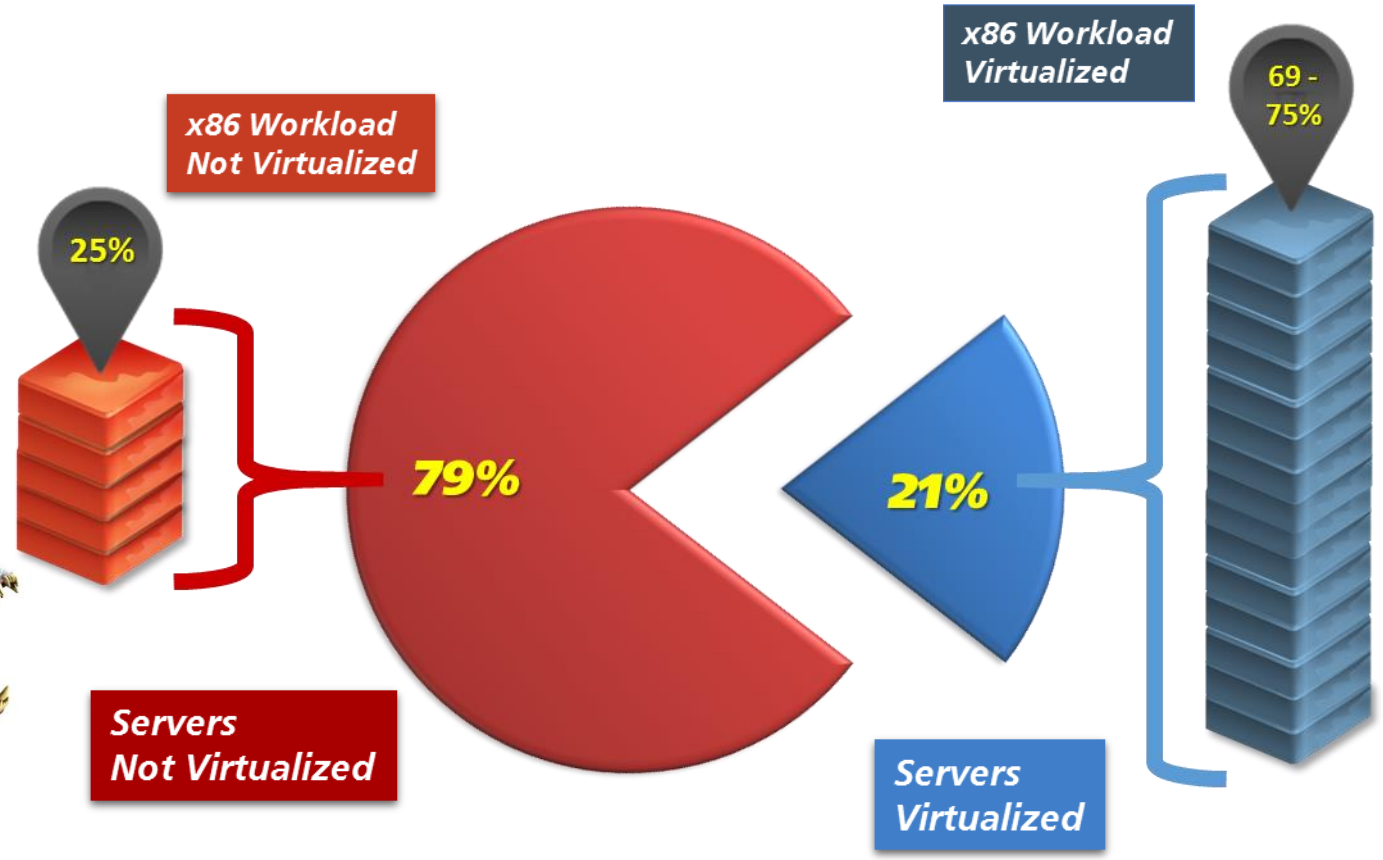


(*Call me cynical, but haven't we seen this movie before…)*

But what about workload diversity…

- We don't all use hypervisors…
- We sometimes have multiple hypervisors…
- We still have mission critical workload that isn't virtualized…

Simple. Get rid of all the non-VMware stuff, duh!



Or maybe, select a different software-defined storage kit…

	SINGLE HYPERVISOR WORKLOAD SUPPORT	MULTI-HYPERVISOR WORKLOAD SUPPORT	MULTI-HYPERVISOR & NON-VIRTUALIZED WORKLOAD SUPPORT
FIXED HARDWARE MODEL	• *Dedicated to single hyper…ualized workl…* • *Design…dware for server/storage deployments*	• *Shareable infrastructure for multiple …or workloads* • *Designa…vare for server/s…ployments*	• *Shareable …cture for multiple h… workloads and non-… workloads* • *Designate… re for server/sto… oyments*
FLEXIBLE HARDWARE MODEL	• *Dedicated to single hy…ed w…* • *Fl…ge hardware choices in predefined storage deployment model*	• *Shareable infrastructure for multiple hypervisor workloads* • *…ardware choices and support for mixed deployment models*	• *…s and …vare …d*

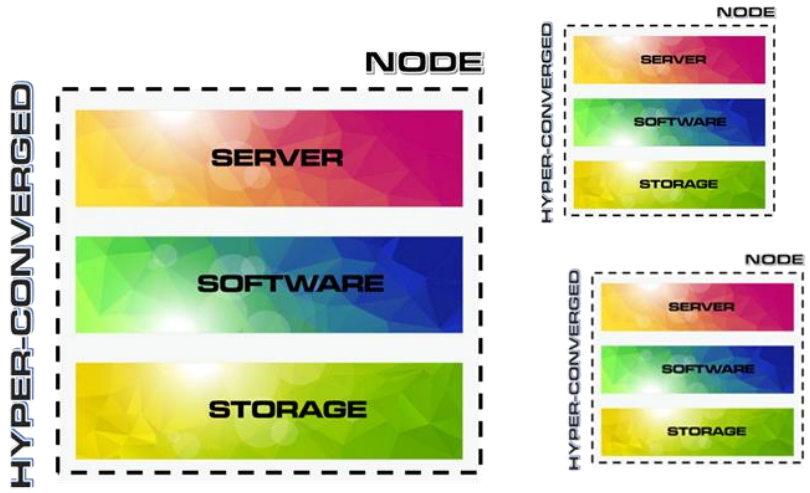
The outcome may be decided by HC-I

- Joining a hypervisor and SDS software stack to generic server and storage hardware to create an "atomic appliance of compute," aka HyperConverged Infrastructure (HC-I) appliance…
- Hmm. Chimeric gene splicing? What could possibly go wrong?

** Contact my agent to license this script idea…*

HyperConverged Infrastructure takes two forms…

- Hardware-centric cobble:
  - Nutanix, Tintri, Scale, EVO:RAIL, etc.
  - Sell hardware that you must buy only from them
- Hardware-agnostic cobble:
  - DataCore Software, and some hypervisor-agnostic SDS vendors
  - Partner with any/all server and/or hardware vendors



A Unified Hardware Appliance

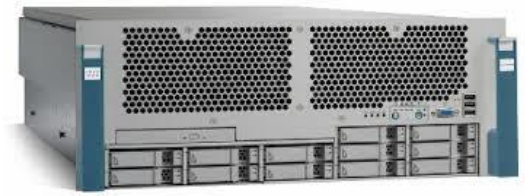
- Components pre-integrated
- 1 box = 1 node
- Plug and play
- Easy clustering with identical nodes
- One throat to choke

I only mention DataCore because…

- They seem to be the darling of the appliance market at present

DataCore™ SOFTWARE

Currently, leading the industry in hyper-converged appliance enablement…

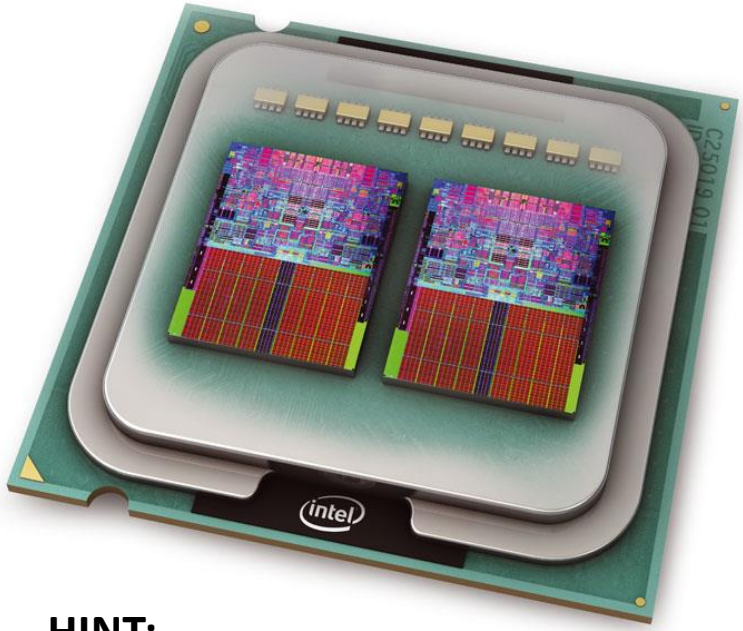


Plus, it helps me transition to the next movie meme…

- *Not yet, Arnold.*
- That's it. The long awaited 7th installment in one of the highest grossing film franchises in history…
- Spoiler alert: nobody knows what this movie is really going to be about…

I think it may answer the long pondered question…

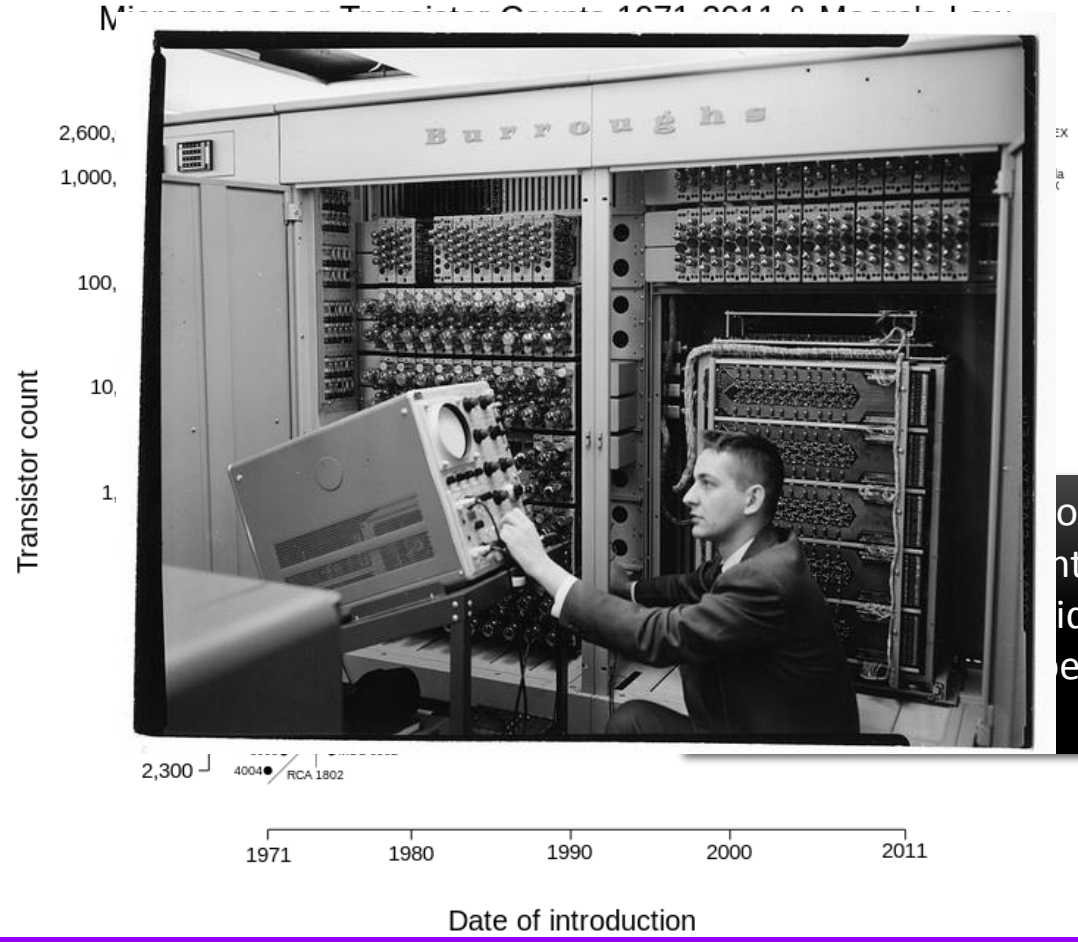
- How did the Millennium Falcon manage to make the *entire* Kessel Run in only 12 parsecs?



HINT:
Could it be *The Power of the Cores?*

A long time ago in a galaxy not so far away…

- The industry was working diligently on ways to orchestrate multiple CPUs into a parallel architecture for increased processing power…
- But, Intel's uni-core processor changed the trajectory and introduced a new *tick-tock* described by Moore's Law and House's Hypothesis…



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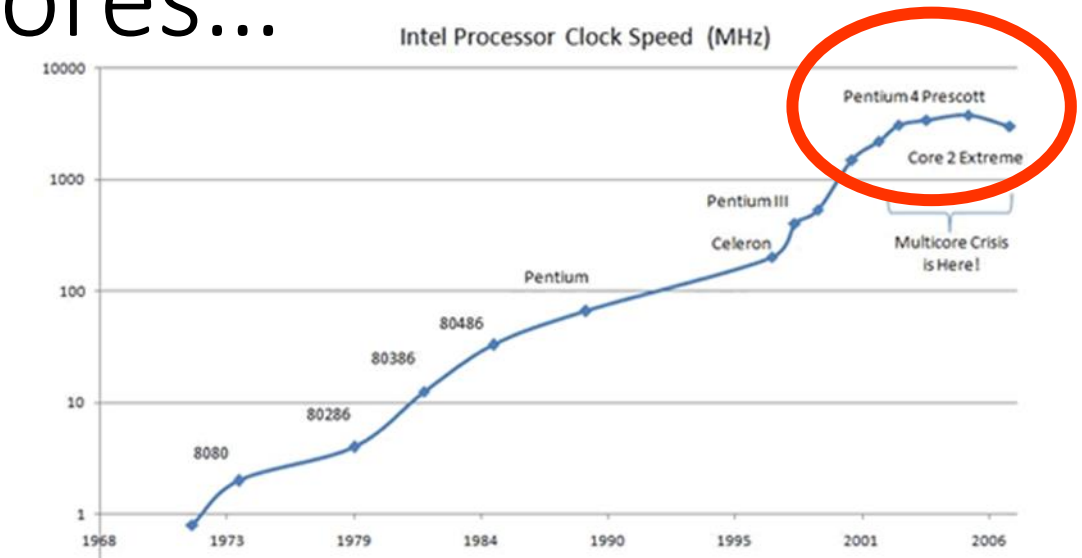
Ramifications…

- Computer designs based on sequential processing and unicore chips drove the PC and server revolution…
- Innovations and speed improvements occurred too fast for the parallel processing engineers to keep pace…leading to some inherently limited thinking…

Han Solo: *Hokey religions and ancient weapons are no match for a good blaster at your side, kid.*
Luke Skywalker: *You don't believe in THE CORES, do you?*
Han Solo: *Kid, I've flown from one side of this galaxy to the other. I've seen a lot of strange stuff, but I've never seen anything to make me believe there's a SYMMETRICAL PARALLELIZATION OF LOGICAL CORES controlling everything. There's no mystical energy field that controls my destiny.*

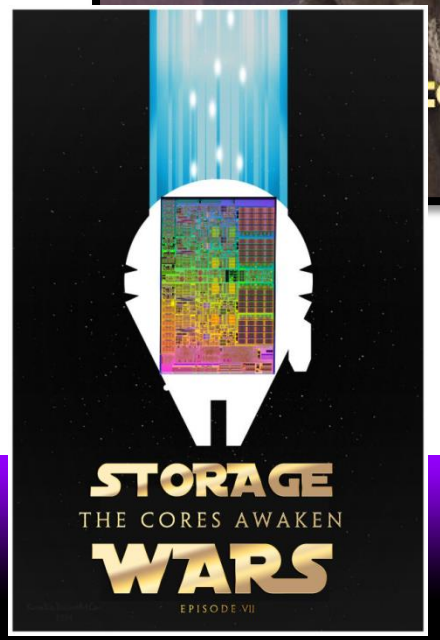
Then something happened that created a great disturbance in The Cores…

- House's Hypothesis hit a wall
  - Power and heat dissipation among other things
  - Clock speeds stopped improving every 18 months
  - Moore's Law continued
- Result: Multi-core chips
  - Lots of physical cores
  - Lots of threads
  - Lots of logical cores



Fortunately, Yoda and a few others are still around who remember how to do parallel I/O

- (Here's that other DataCore tie-in: Chief Scientist Ziya Aral as Yoda)
  - While apps may not be ready to fully exploit parallelization, I/O is tailor-made for it
  - An abundance of I/O operations, every one atomic: don't process requests sequentially, do them in parallel using an allocation of available logical cores
- Result is among the fastest IOPS measurements ever submitted to the Storage Performance Council…using all low-cost commodity gear (like the Falcon) producing the lowest $ per IOPS in the market today! (SPC-1 certified benchmark pending…)



Bad news: the power of the Cores can be weaponized…

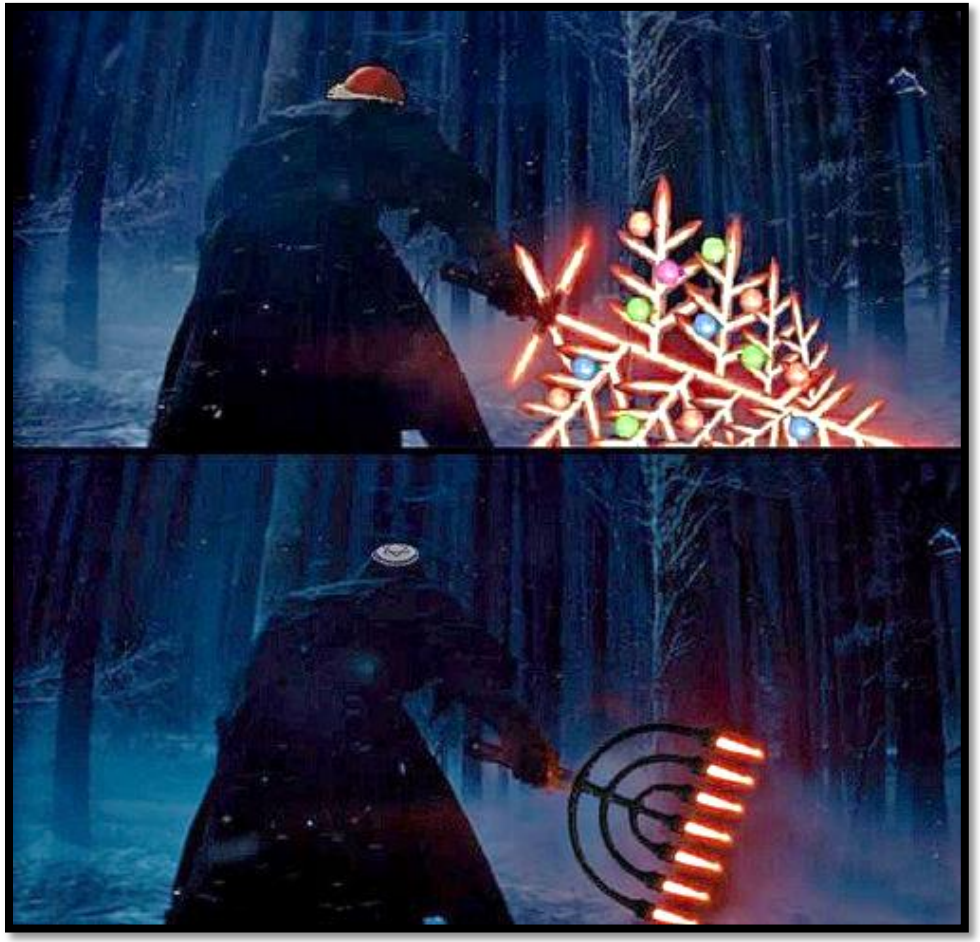
- The current trailer for the film shows simple *parallelism* applied to the output of a lightsaber…
- The lightsaber now has a cross guard (like a sword), requiring “parallel beam emitters”…

What's next?

Embarrassingly Parallel Lightsabers

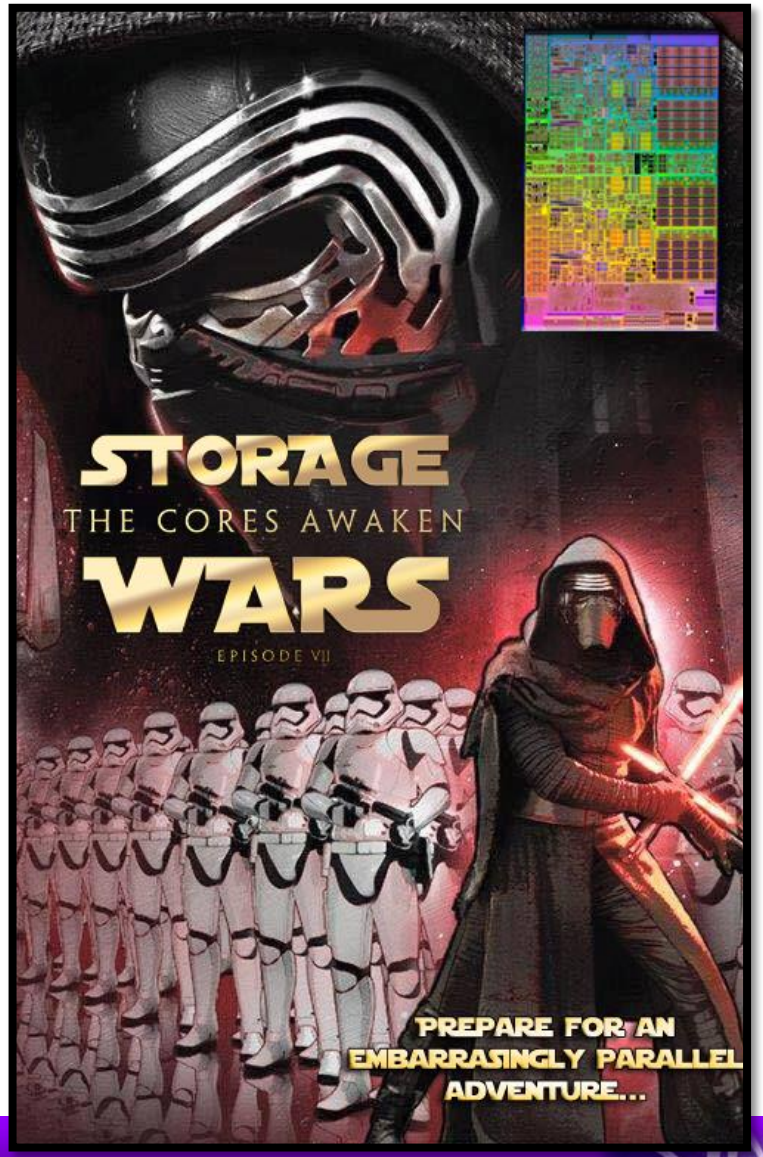
Ridiculously Parallel Lightsabers

Just in time for the Holidays…



But enough silliness…

- Key takeaway
  - A New Tick-Tock: With the application of parallel I/O technology to storage, the throughput of virtually all disk/flash storage infrastructure – even inexpensive kit – will be accelerated to embarrassingly fast speeds at ridiculously low cost
    - As the number of cores on a die increase, so does the throughput
    - Technology is extensible to multi-CPU server boards too!
- May The Cores be with you…always

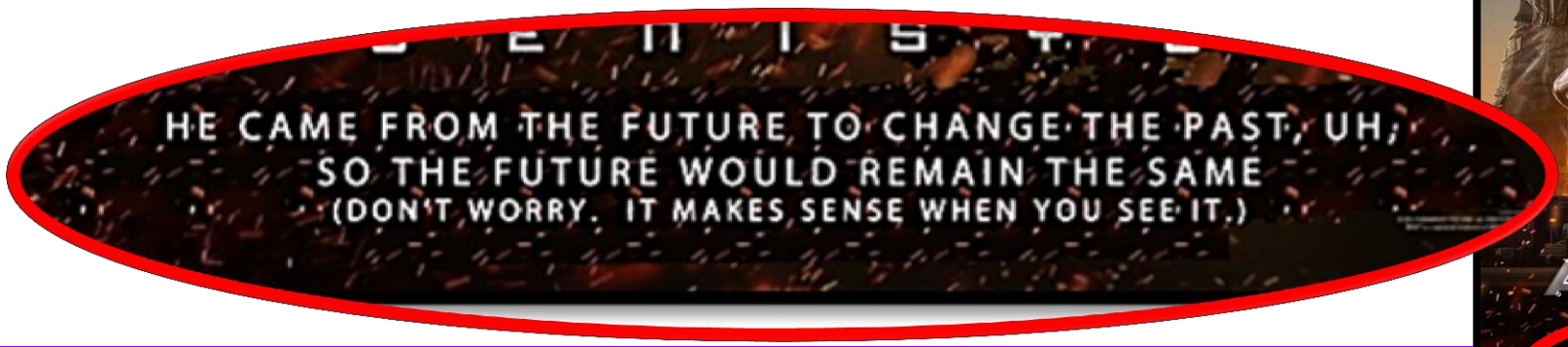


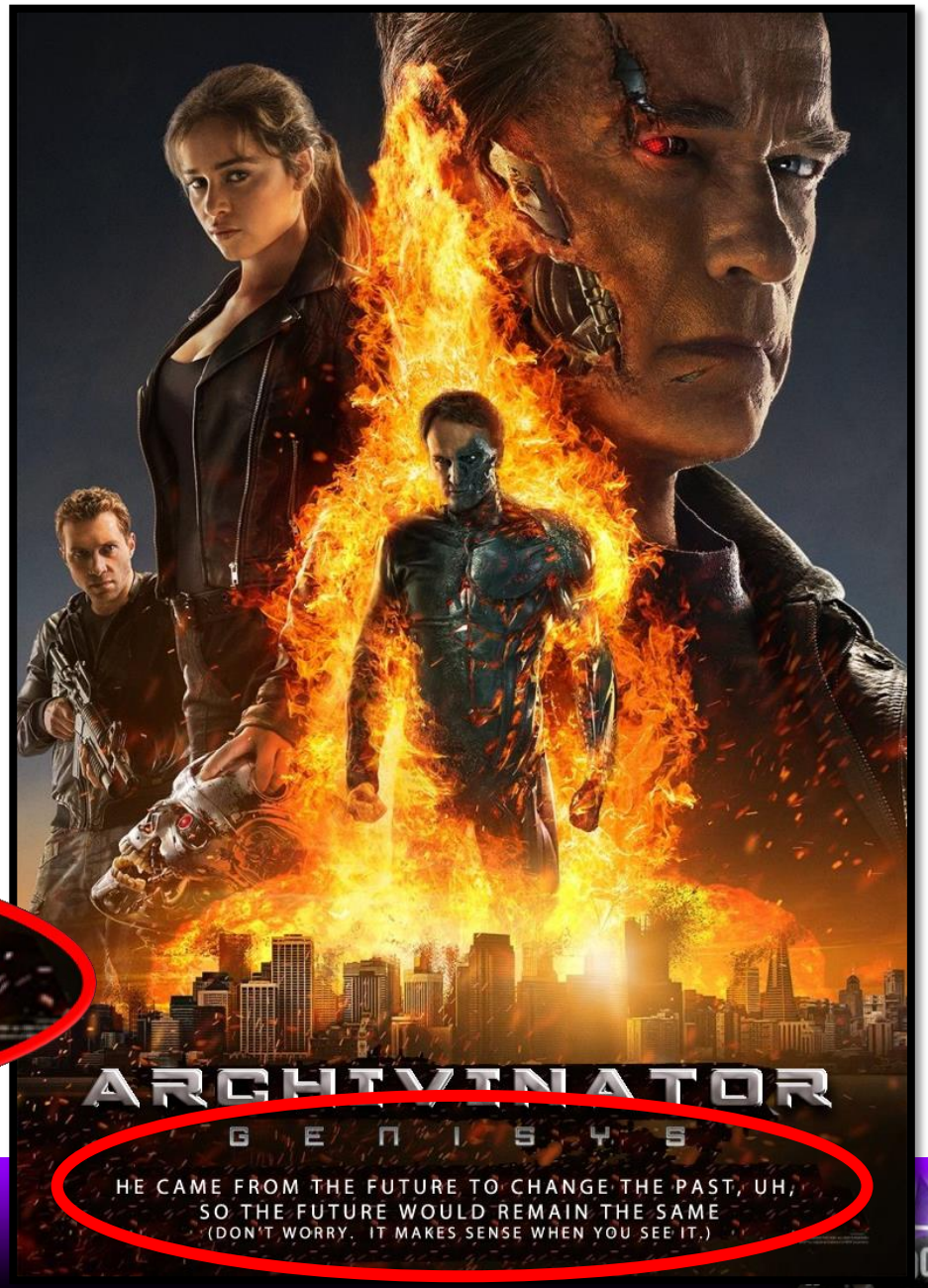
Of course, faster flash and disk is not the complete storage infrastructure story…

- Yes, Arnold, *now*.

In case you missed it…

- A reboot of the Terminator franchise came to theatres this Summer, doing so-so numbers in the USA, but great business worldwide…
- We saw a slightly different movie
- THE ARCHIVINATOR





On the surface, your typical Hollywood scifi romcom with show-stealing special effects…

- Continuing the improvement of hostile robots (as in tape library technology!)

Cyberdyne Systems

From a **T-800** (metal endoskelton with skin), to a **T-1000** (mimetic polyalloy shape changer), to a **T-X** (hybrid endoskeleton with mimetic polyalloy covering), to a **T-3000** (nanotechnology-based metal particulate android)

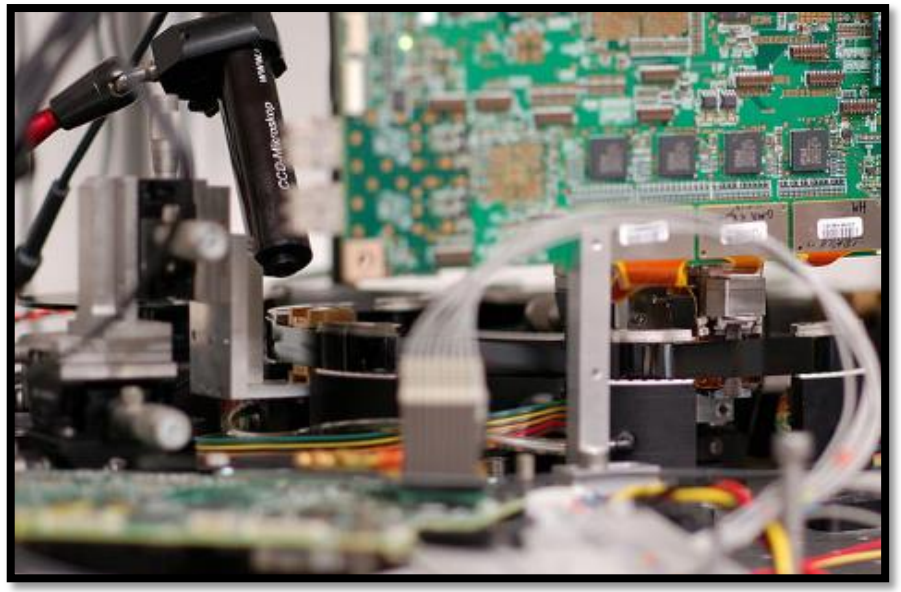
Nathan: Is this why Spectra Logic calls all of its tape library products T-XXX?

But beneath it all…

- A chilling tale of archiving gone wrong…
  - Data needs to be archived and preserved to portable media that can be retained in a protected manner for an extended future…
  - Entrusting it all to disk based cloud networks (think SKYNET) – not so good…
- Tape is still a valid storage medium and much preferred to disk for archiving data…and preserving human memory and existence!

In 2015, tape technology has advanced a lot…

- BaFe coatings demonstrate capacity improvement of 123 billion bits per square inch on LTO cartridge: 220TB
- Track density of 181,300 tracks per inch with advanced servo control technologies, improved write field head technology and improved signal processing algorithms
- LTFS technology expanding to include object storage standards such as OpenStack SWIFT



Today, it is entirely feasible to build an enterprise-class storage infrastructure using

- Parallel I/O-enhanced commodity disk and flash RAM for about $1.5M per PB with throughput in excess of 450K IOPS per second (accelerating shortly to 1.2M IOPS per second) to host very active data…
- A tape subsystem using LTO 7 and a 12u, 160-slot library front-ended by a NAS-like gateway appliance running as a virtual machine that delivers a PB of storage capacity for about $40K to host archive data (with potentially improving metrics from the deployment of deep archive data to tape based cloud services)…

"I am old, but not obsolete," the Guardian (Arnold's terminator character in Genisys)

With that, I'm Out of Time…

- Thanks!
- Keep in touch:
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