

What SANs can learn from LANs

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What do the experts say

- **There will never be heavier than air flight**
 - Lord Kelvin
- **The total number of telephones needed in a city is one**
 - Conference of Mayors
- **There is no peaceful use of nuclear energy**
 - Albert Einstein
- **The world wide market for Supercomputers is 4**
 - William C. Norris - Founder of CDC
- **There will never be a reason to have a computer at home**
 - Ken Olsen - Founder of DEC
- **The total market for large tape robotic libraries is 100**
 - Ryal Poppa - STK.

Are you sure?

■ A Study on the relation of knowledge and confidence

- Top quartile (based on right answers)
 - ◆ Least confident of their answers
 - ◆ Assumed others were as smart or smarter
- Bottom quartile (based on wrong answers)
 - ◆ More confident about their answers
 - ◆ Assumed they were not at the bottom

What's in a name

- Storage - Area - Network
- Network - Attached - Storage

- Host Bus Adapter
- Network Interface Card

- Gigabaud Fibre Channel
- Gigabit Ethernet

Definitions

■ Network

- “an interconnected or interrelated chain, group, or system”
- “a system of lines or channels resembling a network”
- “Data goes in, data goes out, payday is every 2 weeks” Don Rog

■ Storage

- “to put or keep (things) in a special place for use in the future”
- “Data goes in, [really long pause] data goes out”

■ Protocol

- “a code prescribing strict adherence to correct etiquette and precedence”

What is constant?

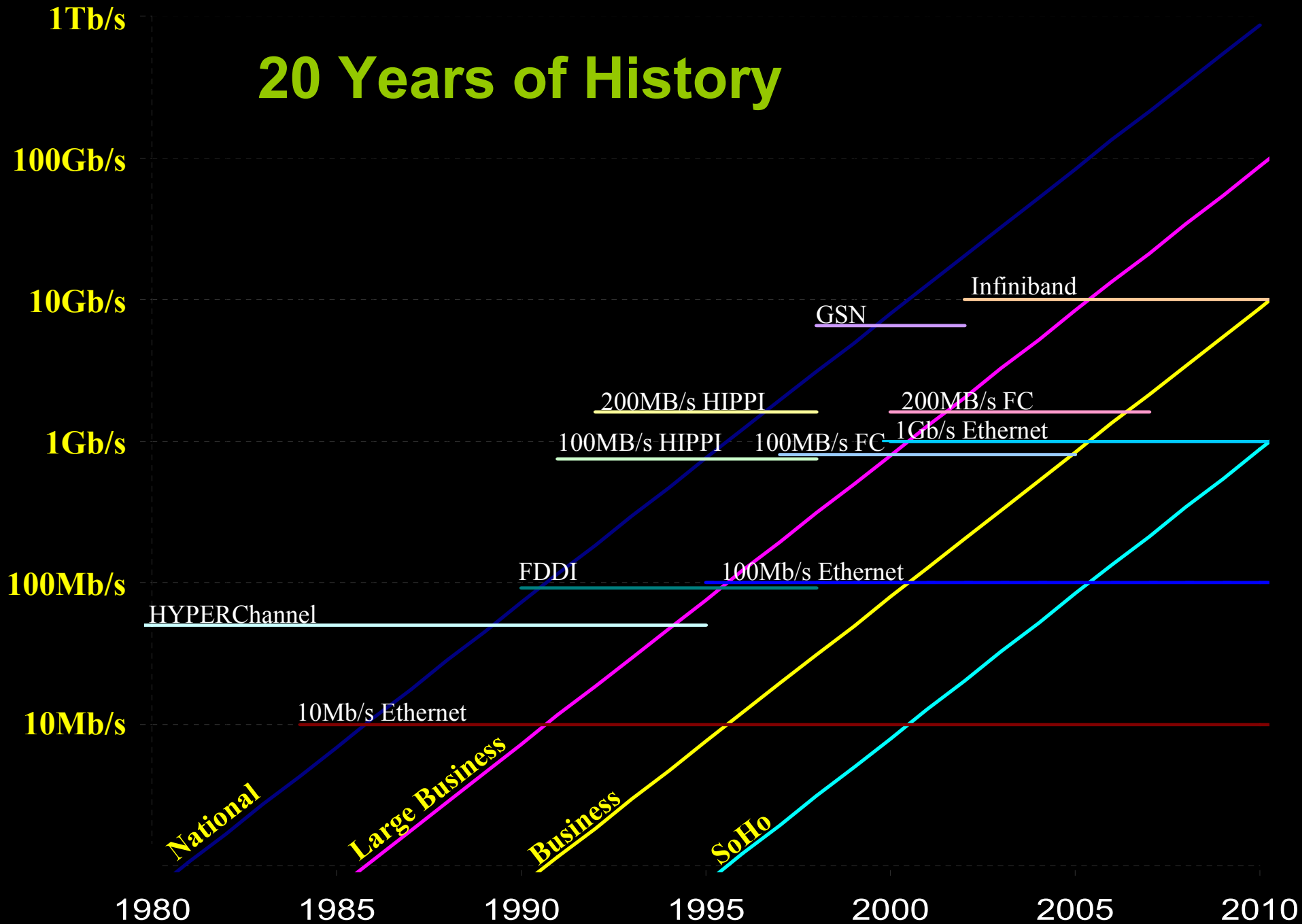
What is constant?

- Mb/s

Is Moore's Law Economic?

- 1PB tape, 1GByte/s
 - Cost is based on market acceptance
- Is 60% per year a market acceptance rate?
 - Equal cost curve
- How did we get here
 - Where are we going?

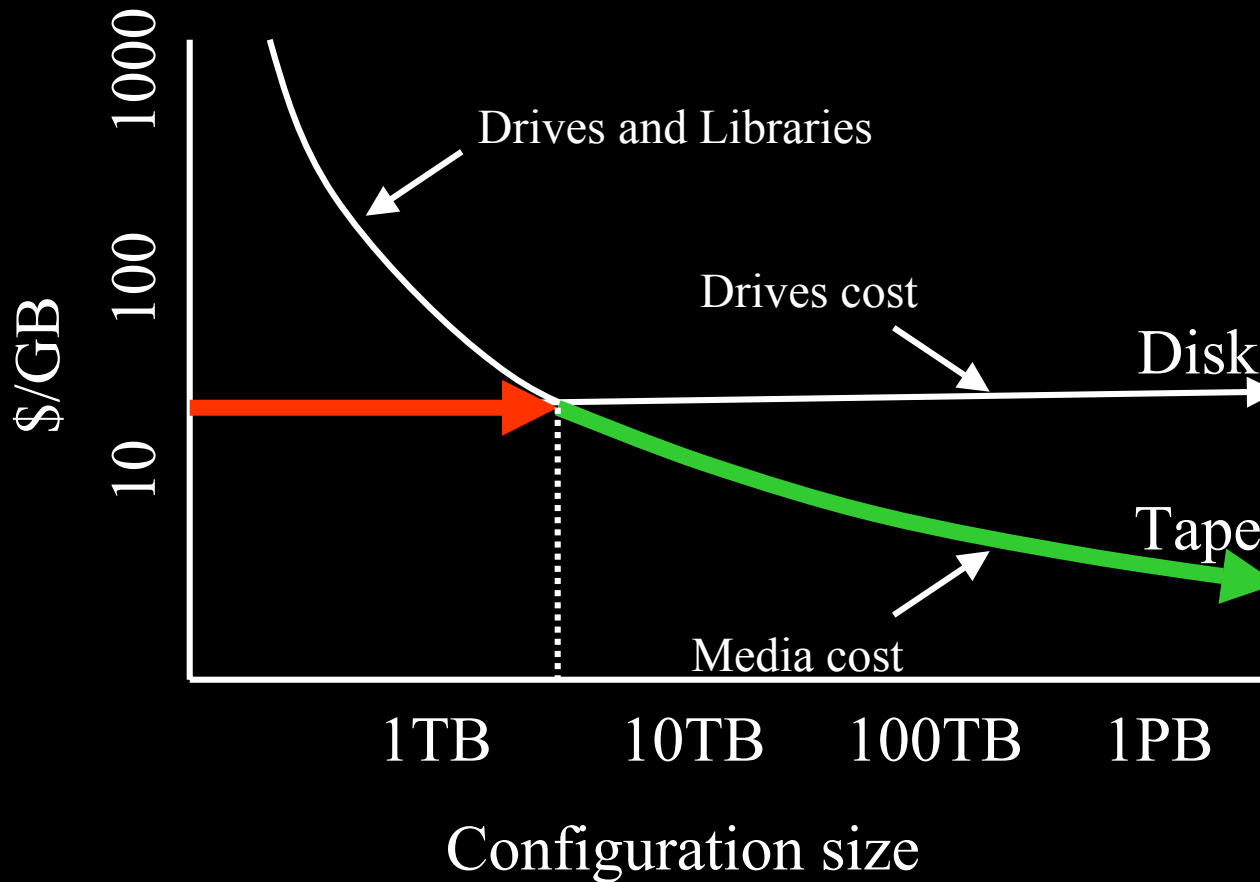
20 Years of History



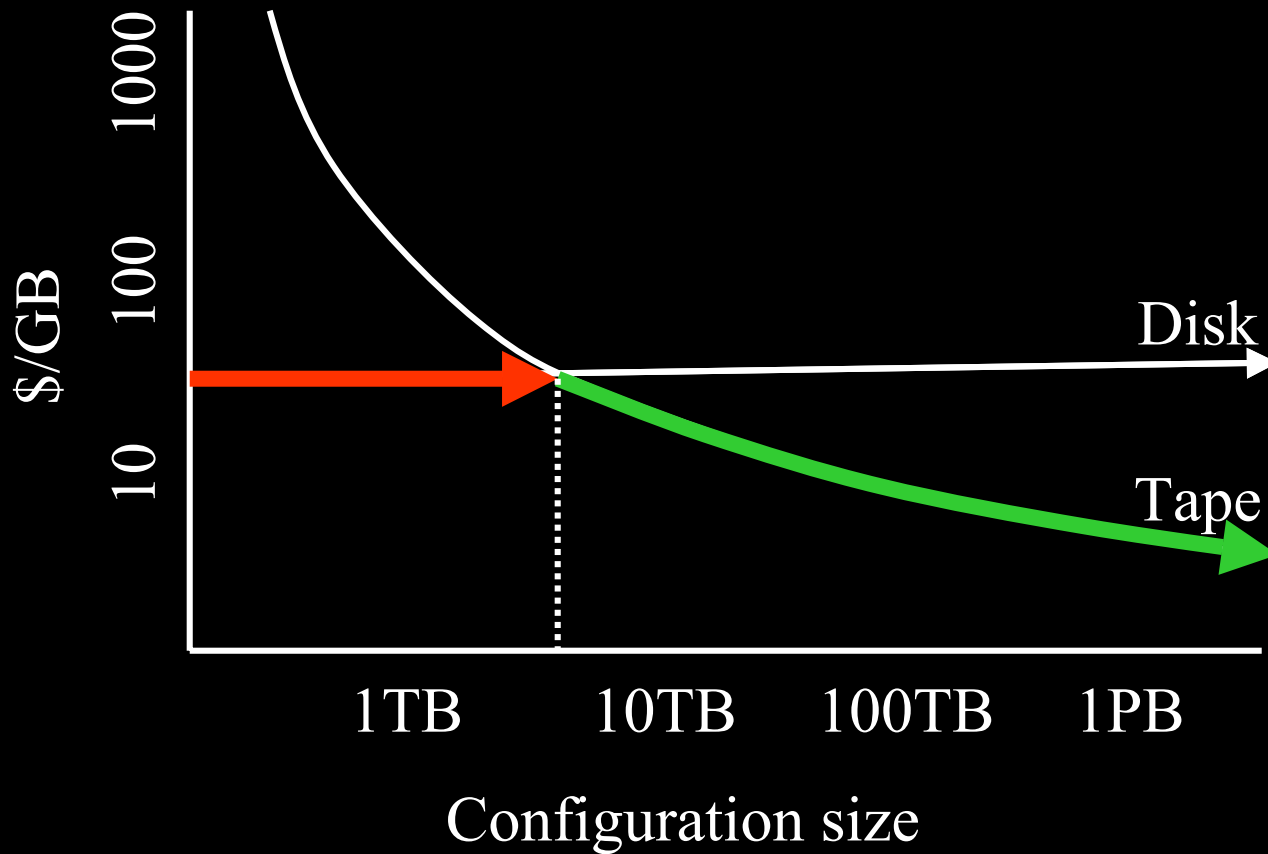
Tape will never die

- **What is tape**
 - “a long narrow strip of material [...]”
- **Tape is a 2d surface rolled up into a 3d structure**
 - Disk is a 2d surface, rigid substrate
 - Total surface area is 1000x, flexible substrate
 - Magnetic techniques are the same
 - Does not take power when sitting in a slot
 - Triple mirrored disk is not an archive
 - Same media can be used for multiple generations
 - RAIT exists and will grow

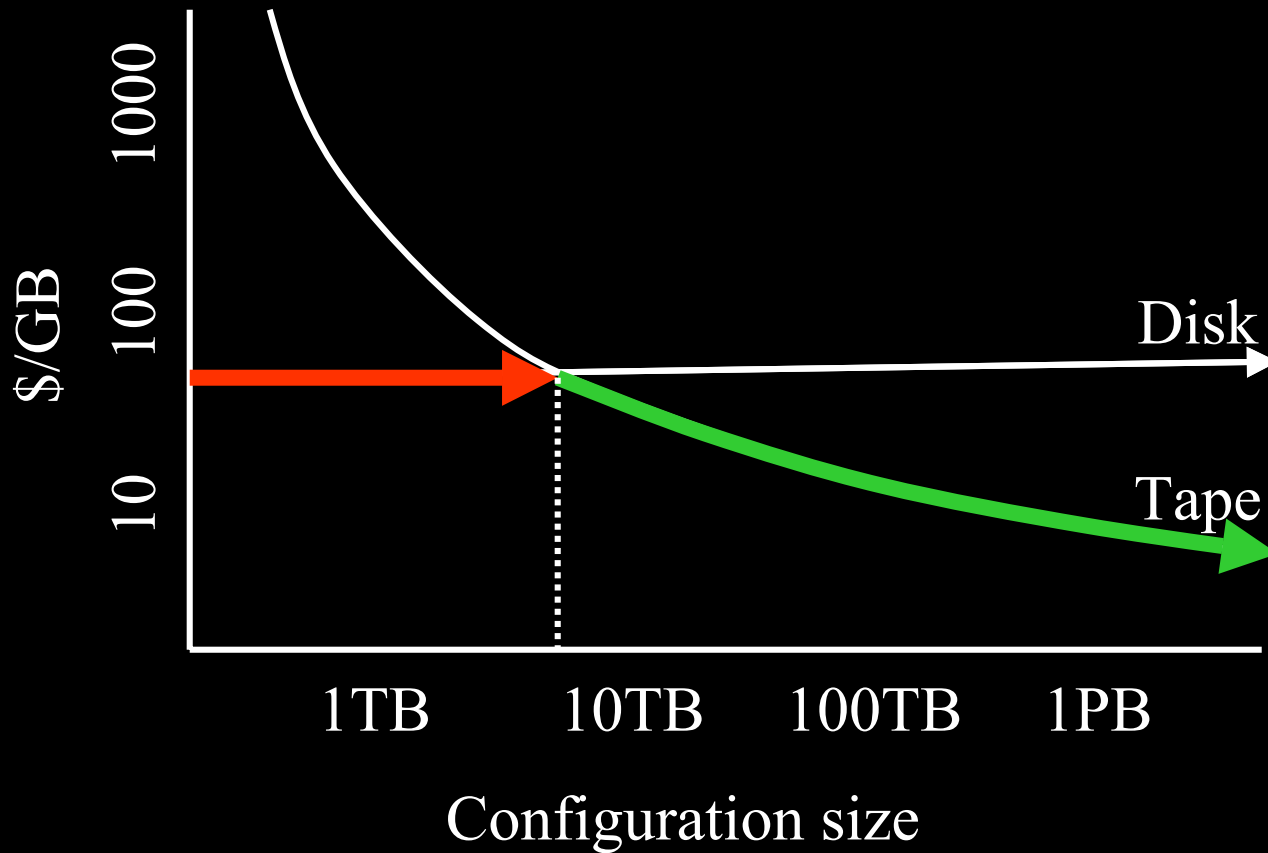
Cost Constrained Storage



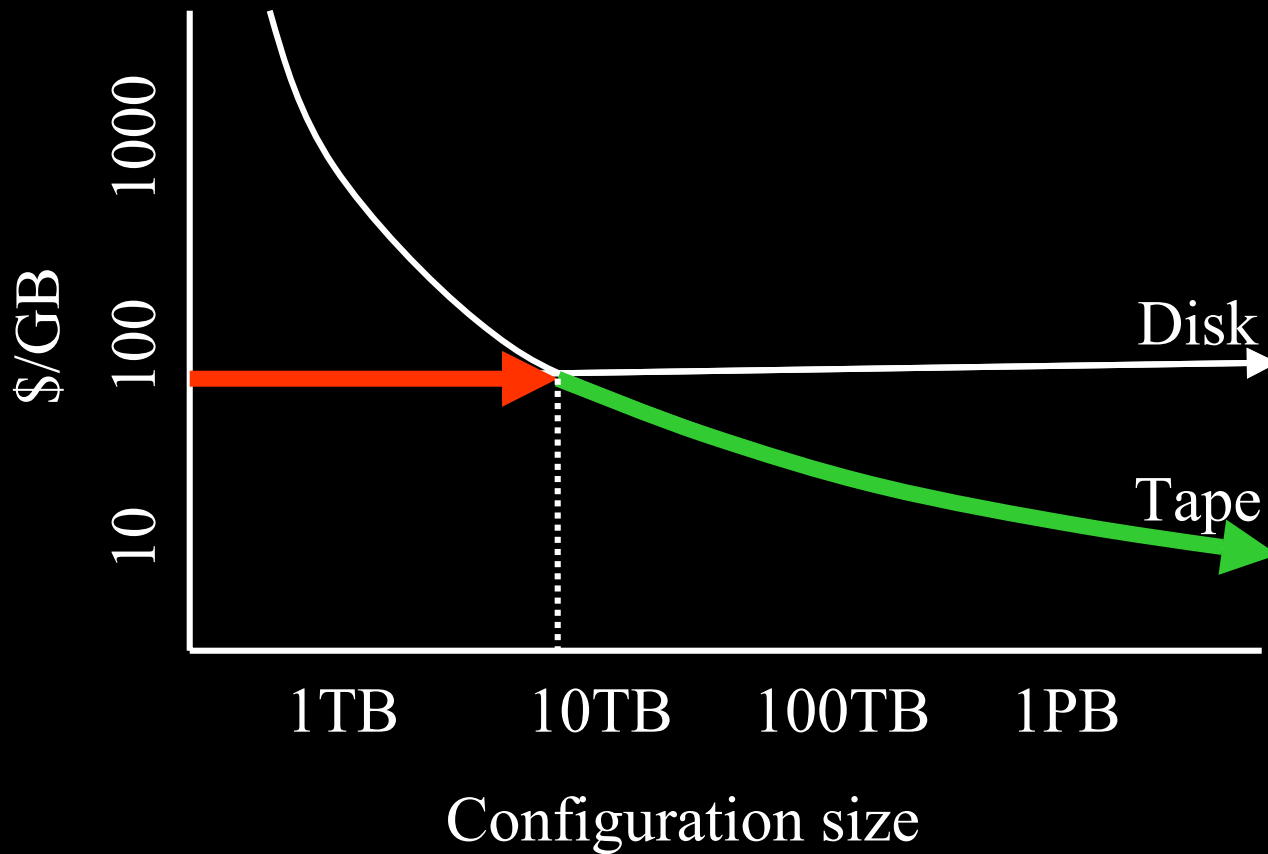
Cost Constrained Storage



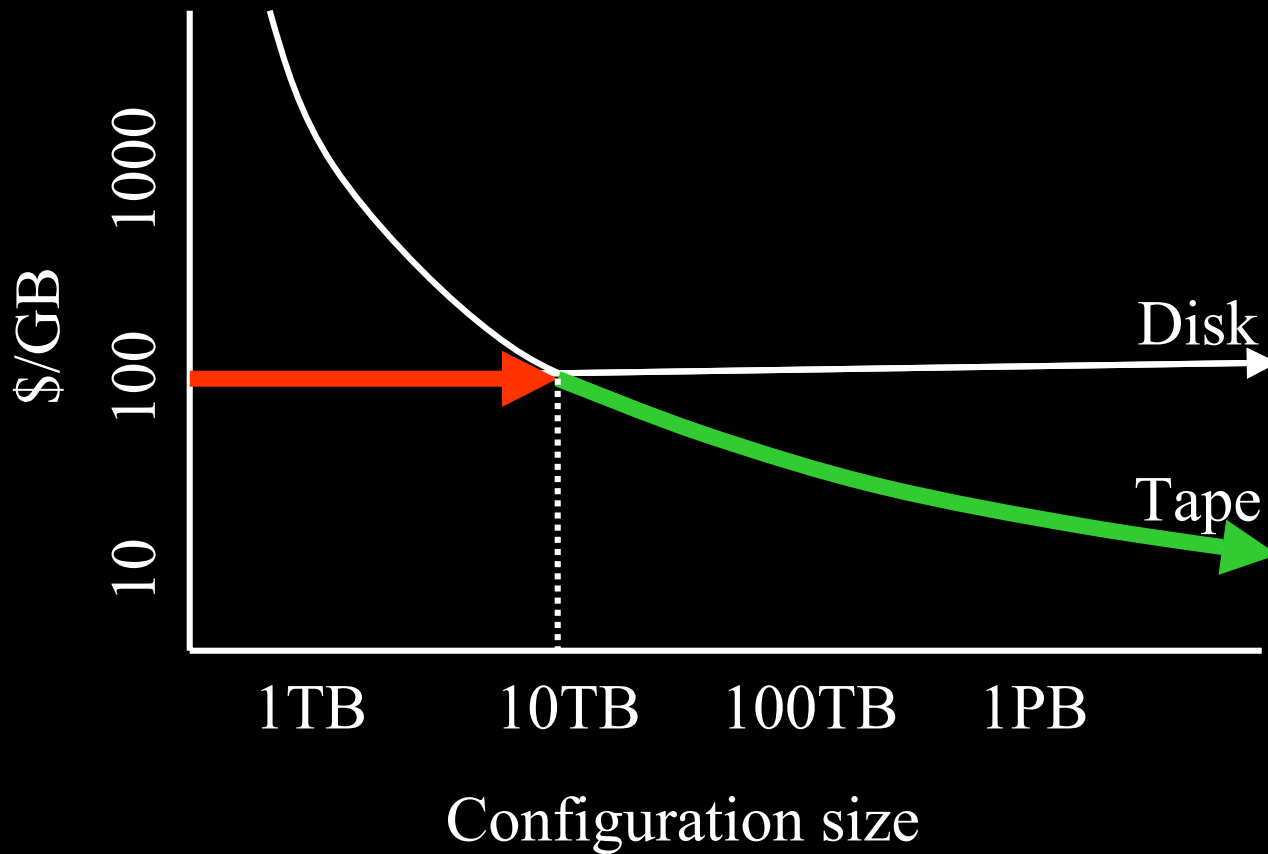
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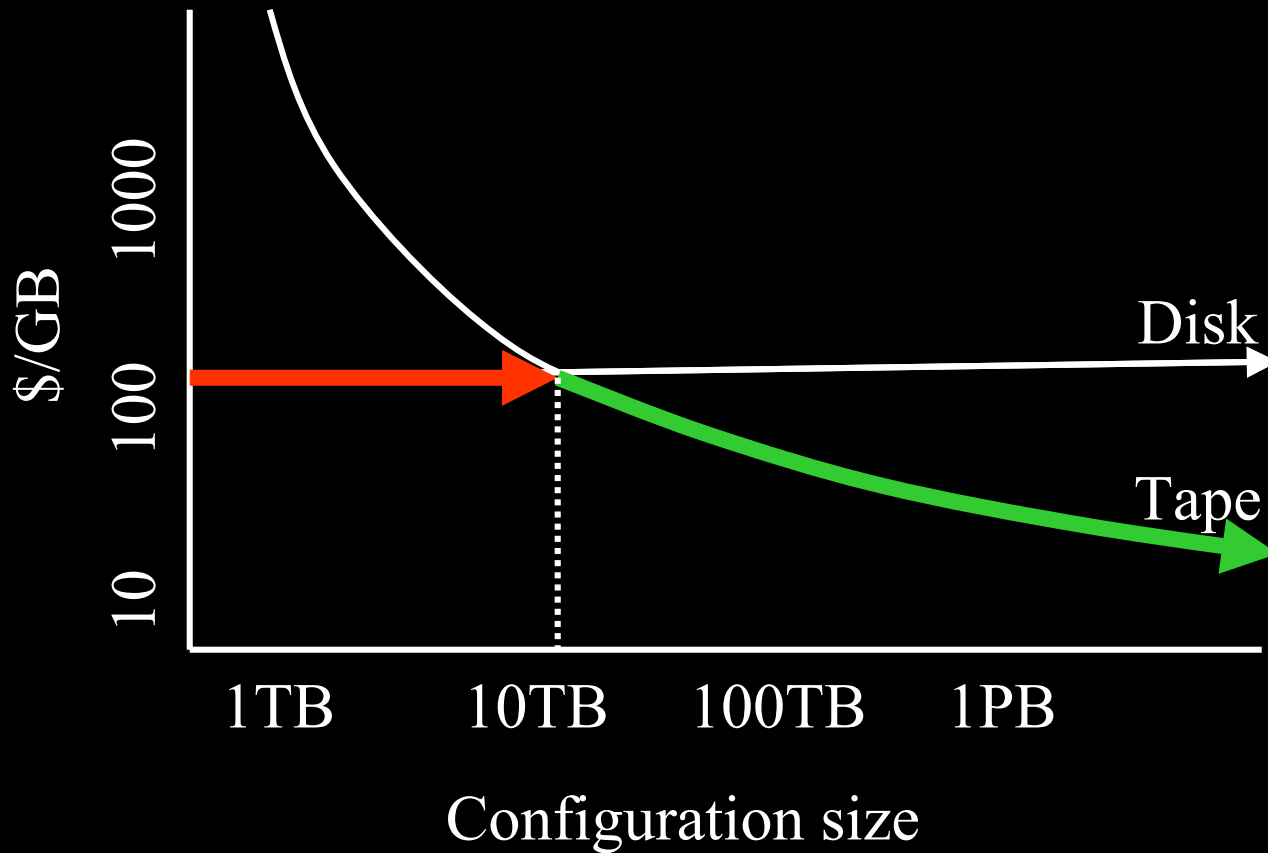
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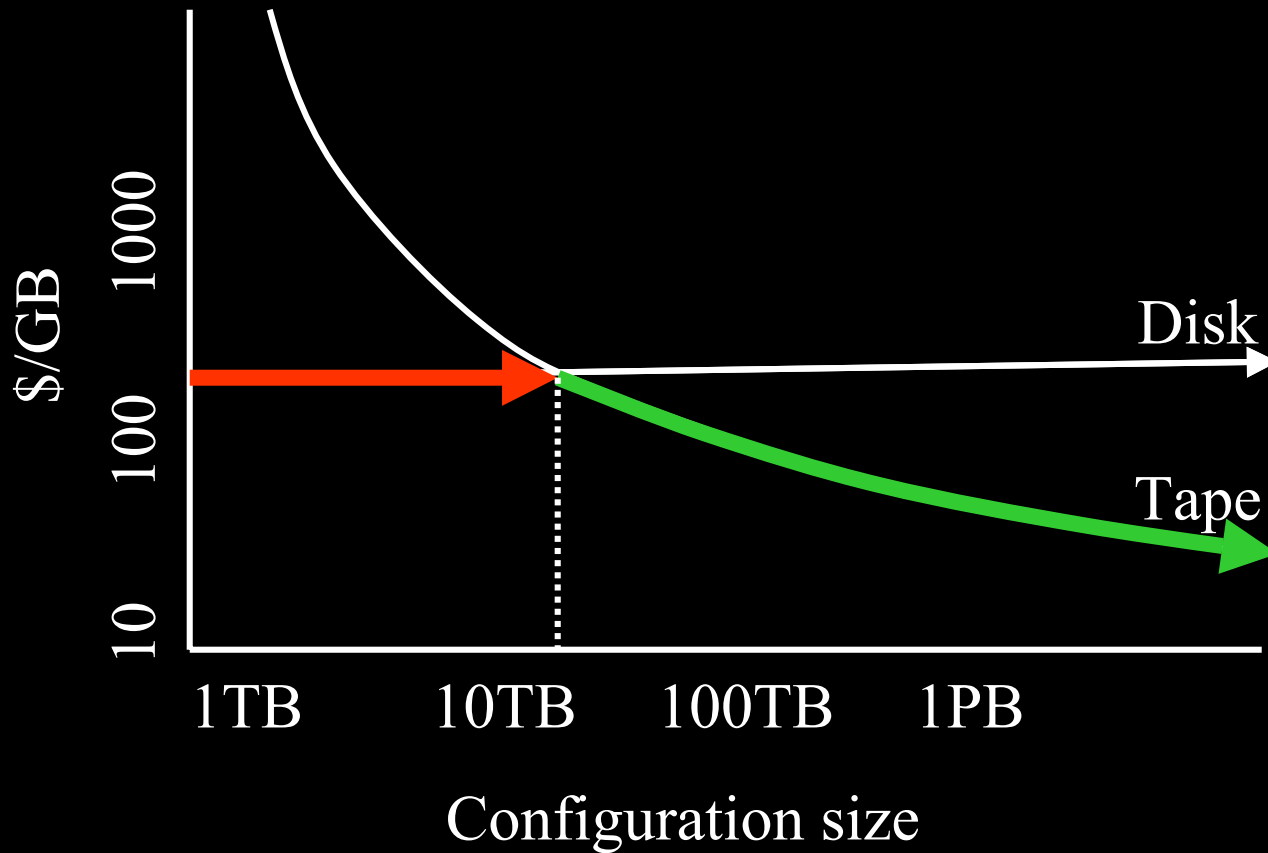
Cost Constrained Storage



Cost Constrained Storage



Cost Constrained Storage (+5 years)



What's going to happen

- **SANs have performance and focus**
 - Glass SCSI
 - Closed area
 - Limited applications
 - Like LANs before Internetworking
 - ◆ Has 10 years of growing up to do
- **Advantage?**
 - Clean slate
 - Storage Protocols implementations have speed
 - Free interfaces
 - Eliminate hosts
 - Directly drive devices

IP has Scalability

- Plug and play
 - Billions and Billions of end points.
 - Huge compatibility issue
 - Universal connectivity
 - Inertia
-
- The number 1 problem in internetworking today are
 - *Ancient* Implementations
 - ◆ 128 byte mbufs
 - Need to get back to the basics, focus on the protocols

SCSI over TCP/IP?

■ Framework

- Allowing SCSI to run over Internetworking hardware
 - ◆ No more glass walls!

■ Why?

- "If at first the idea is not absurd, then there is no hope for it"
 - ◆ Albert Einstein
- To carry *all* the data

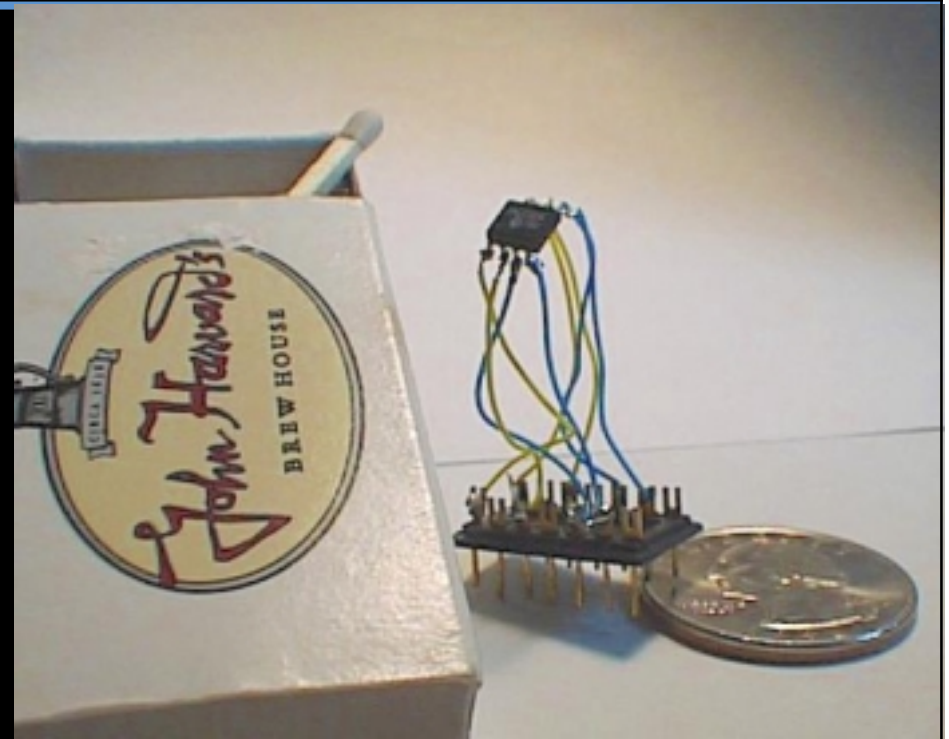
■ iSCSI

- Reliable delivery
- Single network
- SCSI over TCP/IP
 - ◆ TCP too slow?

■ <http://www.ece.cmu.edu/~bassoon/ips/>

TCP is Tiny!

- Existence proof.
- Out of 512 instruction RAM
 - 256 are used for TCP/IP
- Fully compliant,
 - on the internet
 - RFC-1122
- How?
 - Created an implementation focused on the protocol, not other implementations.
- <http://www-ccs.cs.umass.edu/~shri/iPic.html>



Area not being addressed

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 - Single name space, Single mount point
 - Truly Global in scale
 - 100 GB/s accessibility
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- ***Information Security***
 - The security of the information at ALL times.
 - ◆ From Information Producer to Information Consumer
 - ◆ across everything and forever
 - It's the *Information* that has value
 - IS is the praetorian Guard
 - ◆ "I have seen the enemy and it is us", Pogo

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- **<http://securefs.org>**

Solution

- **“The secret to innovation is hiding your sources”**
 - The good engineers will understand and steal ideas
- **SANs will learn from IP**
 - Scalability, routing, plug and play
- **IP will learn from SAN**
 - values of lean implementations
 - Value of driving devices (not hosts)
- **Storage over IP will happen**
- **Don't agree? Good!**
 - “Keep your friends close, enemies closer”, Julius Caesar

Short Term

- **Today and for the next 5 years**
 - SANs have an advantage for Speed
 - SANs have the advantage for capacity

- **SAN will enable distributed NAS**
 - High Performance
 - Distributed servers
 - Single mount point

- **Tape is a tool**
 - Short term and long term

Long Term

- **We [can, must, will] cross pollinate SAN, LAN, NAS**
 - Don't dismiss anything
 - learn it, plagiarize it, beat it
 - ◆ this will converge

- **Storage must have Access**
 - Putting it away
 - Getting it back
 - From anywhere, to everywhere, before we thought of it

- **“Make it so”**

Thank You

Copies at <http://www.network.com/~hughes>