



Can Flash Be Mainstream Enterprise Storage – *Now?*

Dr. Radoslav Danilak

CEO

SKYERA INC

Once Upon a Time... There Were Hard Disk Drives

And Life was Good...

- 👍 Right cost
- 👍 Readily available



Once Upon a Time... There Were Hard Disk Drives

...sort of...

 **Low performance**

 **High power consumption**

What to do...

RAID-1

**Short
Stroking**

**15,000
RPMs**

**2.5"
Drives**

 **Performance**

 **Power consumption**

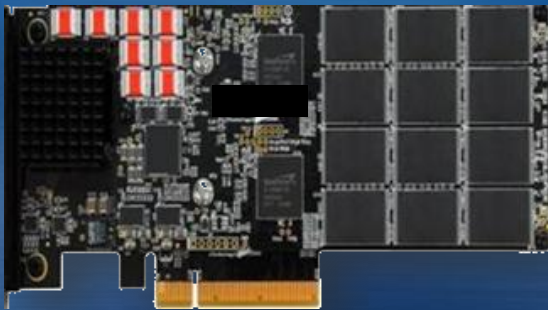
 **Cost!**

Enter NAND Flash

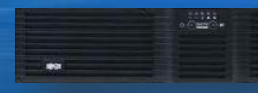
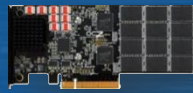
👍 100x performance

👍 1/10 power consumption

👎 10x cost (*ouch!*)

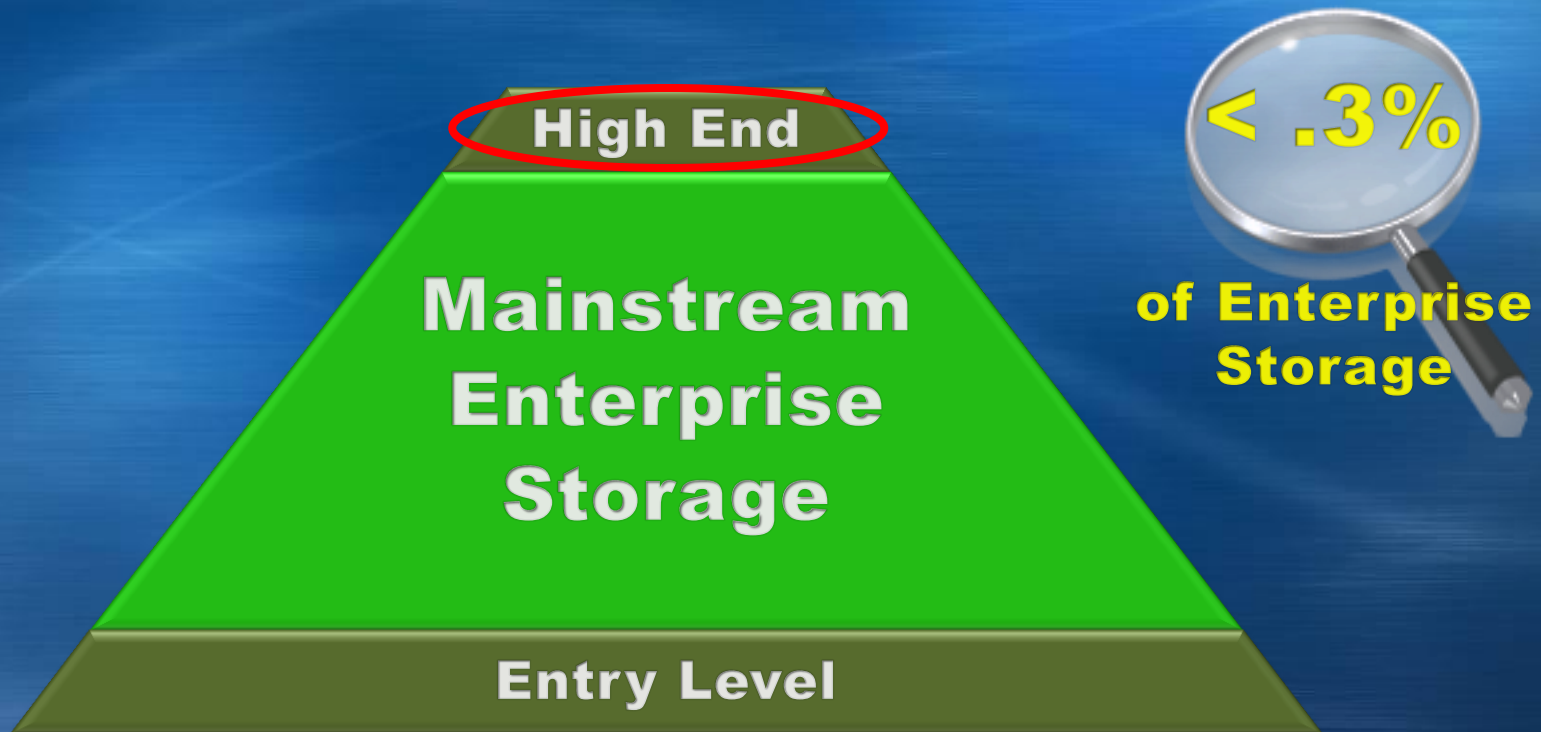


Evolution of NAND Adoption

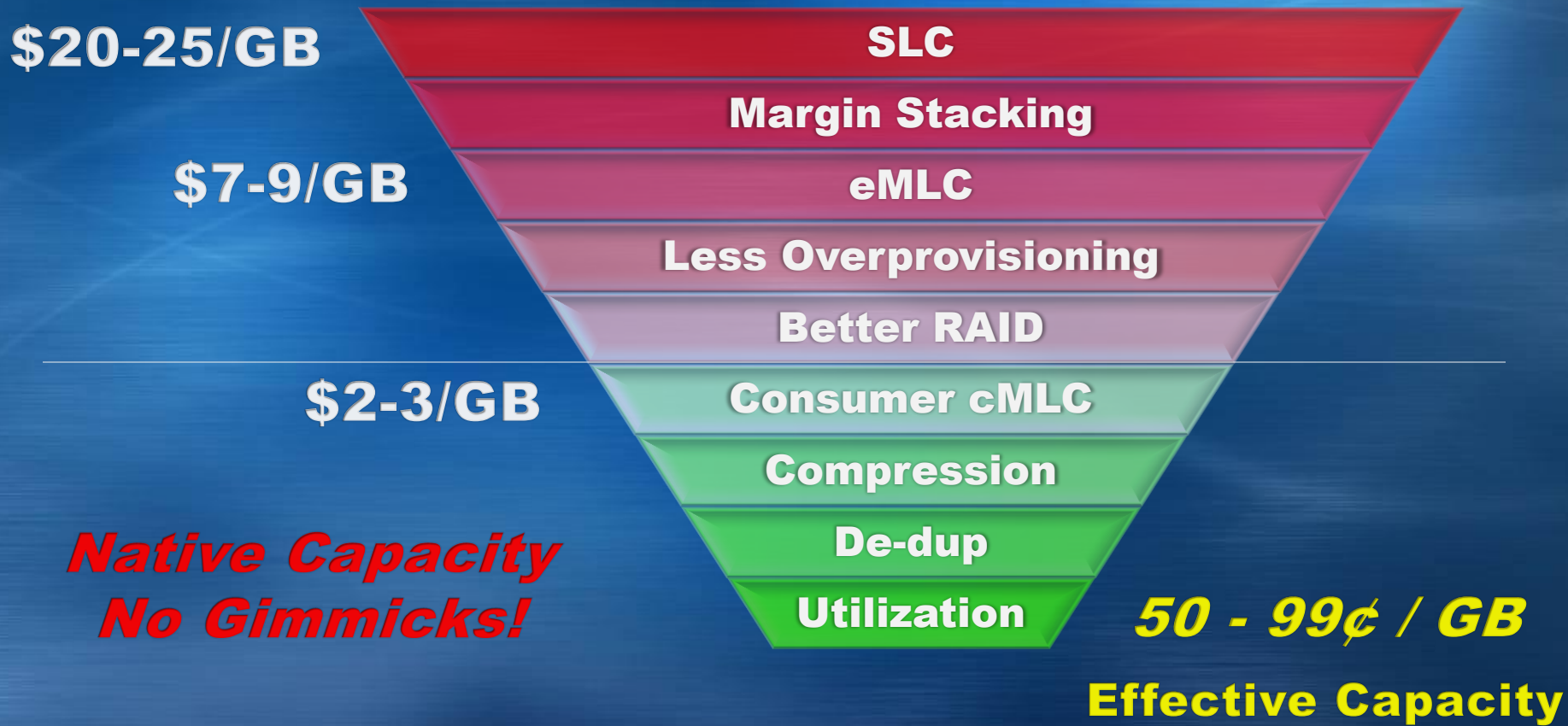


	SSD	Card	Appliance	Primary
Purpose	<ul style="list-style-type: none"> ▪ HDD replacement ▪ Plug and play 	<ul style="list-style-type: none"> ▪ Server cache 	<ul style="list-style-type: none"> ▪ High performance ▪ Special uses 	<ul style="list-style-type: none"> ▪ Shareable ▪ Scalable ▪ Affordable
Issues	<ul style="list-style-type: none"> ▪ Encumbered by HDD protocols 	<ul style="list-style-type: none"> ▪ Direct Attached Storage 	<ul style="list-style-type: none"> ▪ Doesn't scale ▪ Expensive to manage 	<ul style="list-style-type: none"> ▪ Built from ground-up

But Traction is Limited...



...Because of End-User Cost



***Native Capacity
No Gimmicks!***

Flash Storage Systems Must Break *\$3/GB Native & \$1/GB Effective* for Mainstream Enterprise Adoption



19/20 nm MLC Flash breaks the cost barrier

- Optimized for low cost: < 60¢/GB

But what about endurance?

- Degrades rapidly with geometry
- Consumer flash – few thousand writes

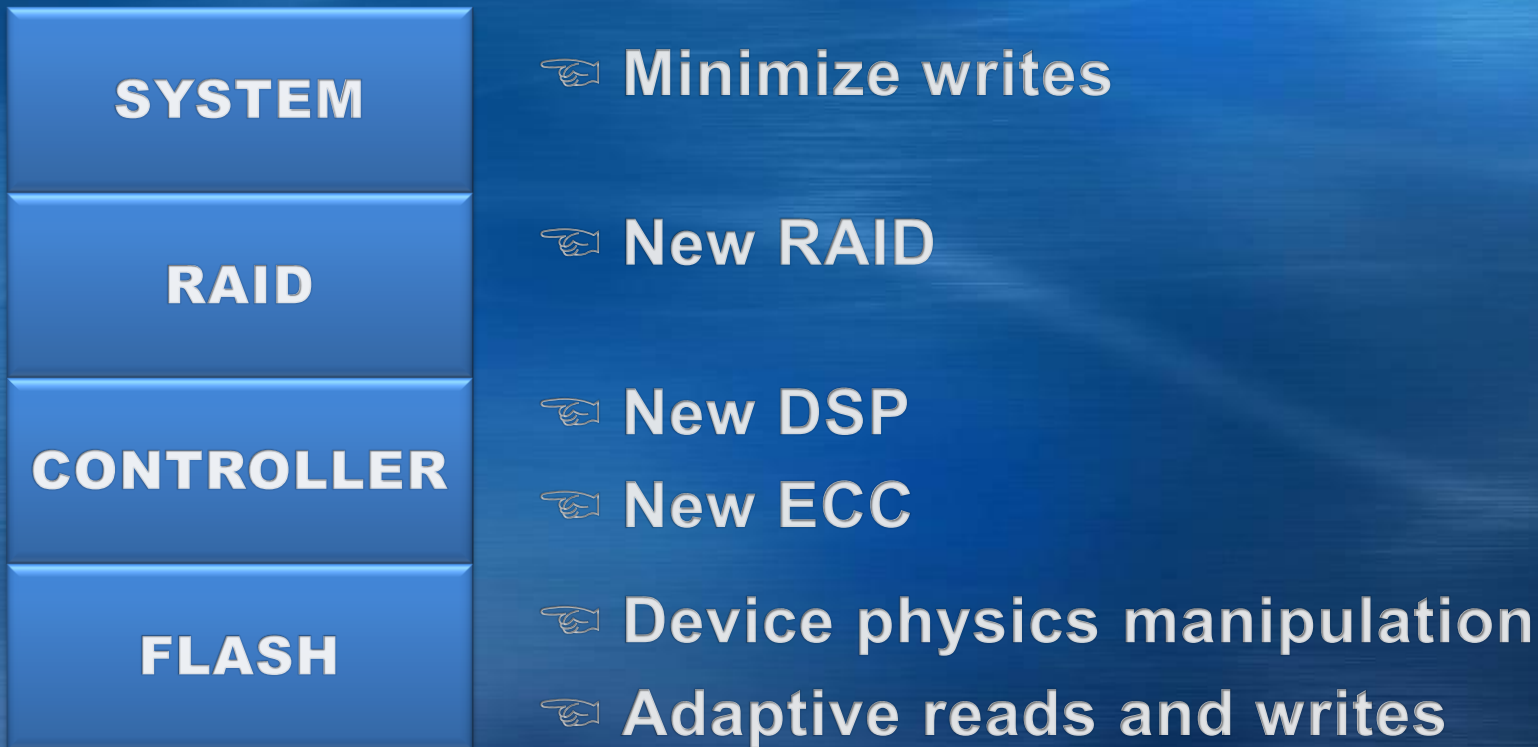
Enterprise requires 100x more write endurance

Exceeding Enterprise *Reliability & Endurance* with Consumer MLC



Must optimize every
layer of the stack.

100X Life Amplification



Reliability



☞ Hot spare storage node

☞ Tolerate simultaneous block failures

☞ Adaptive retries

Are we there yet?

Cost?



Endurance?



Reliability?



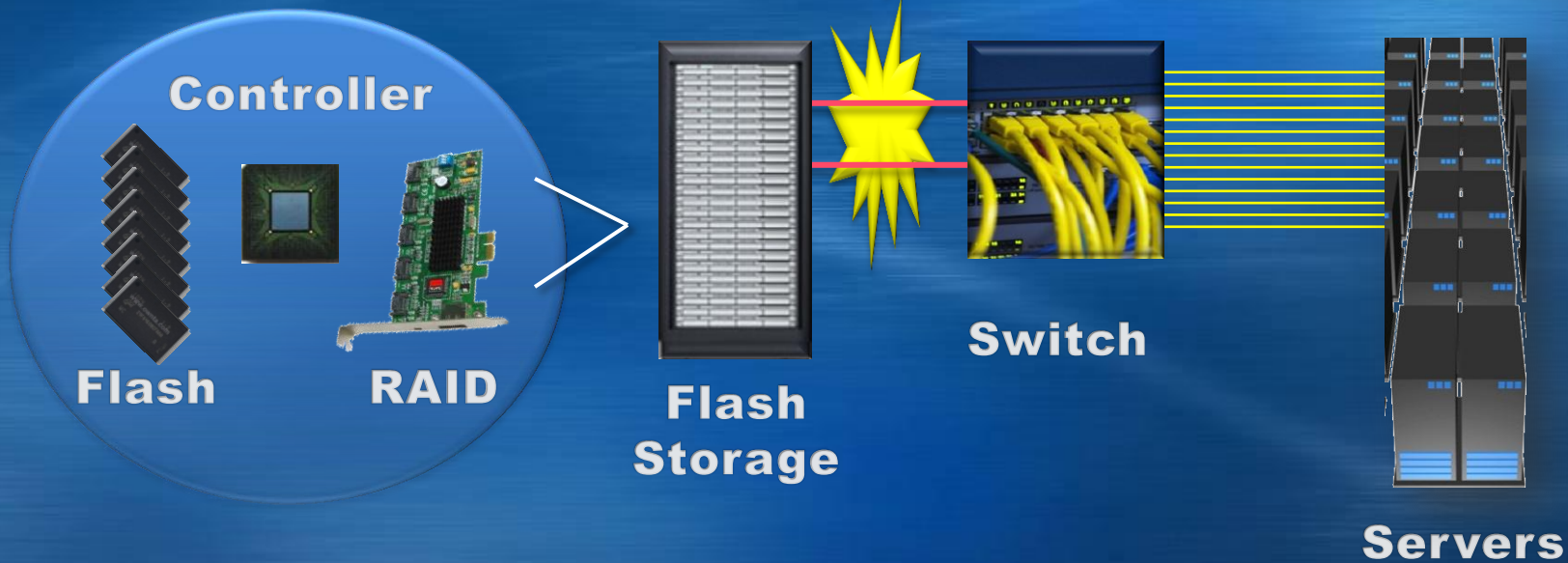
***But what about
the network?***



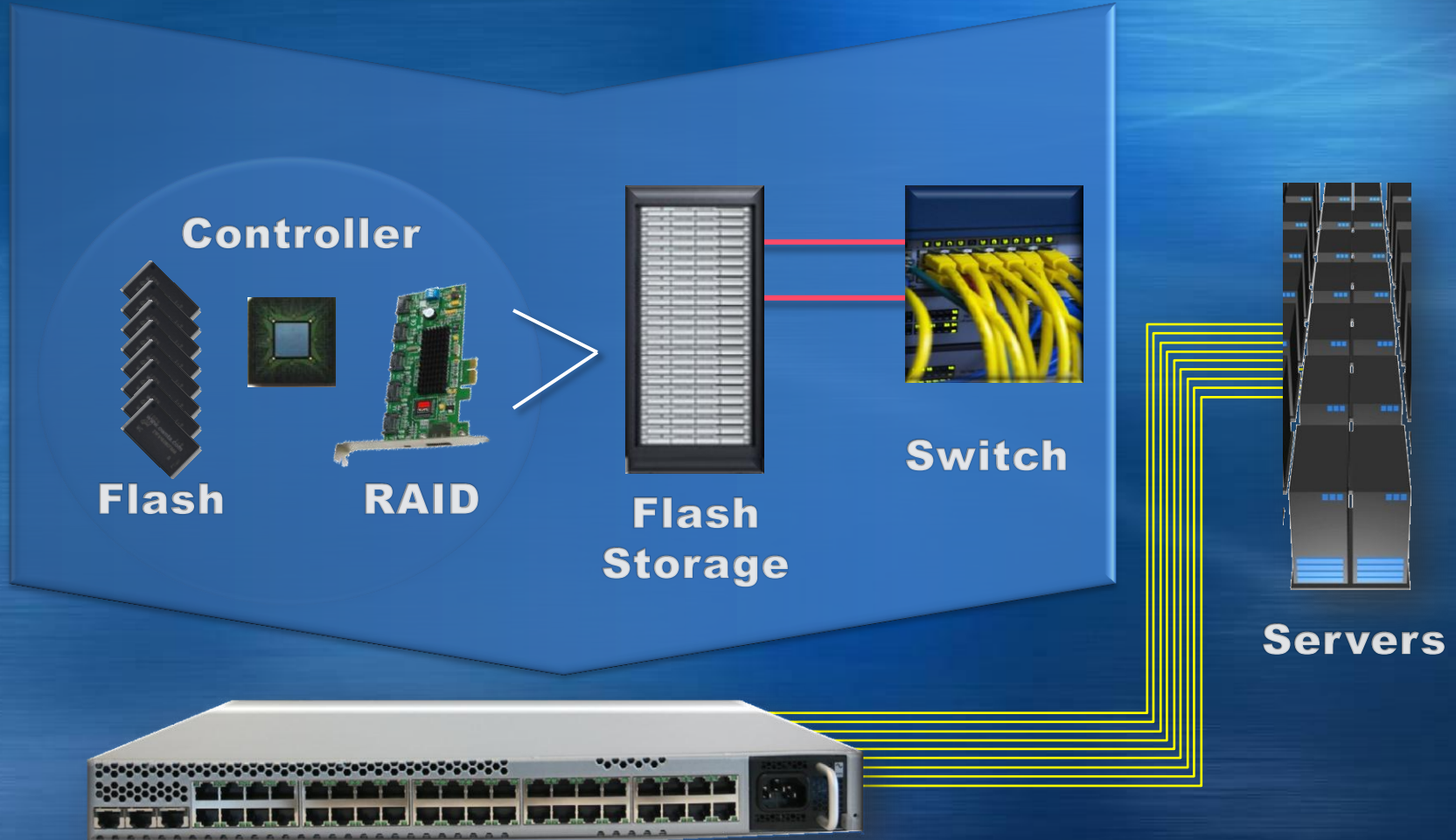
Flash storage system can easily saturate
10G Ethernet and FibreChannel networks

For flash, the network = ***not-work***

Network Bottleneck



Solved!

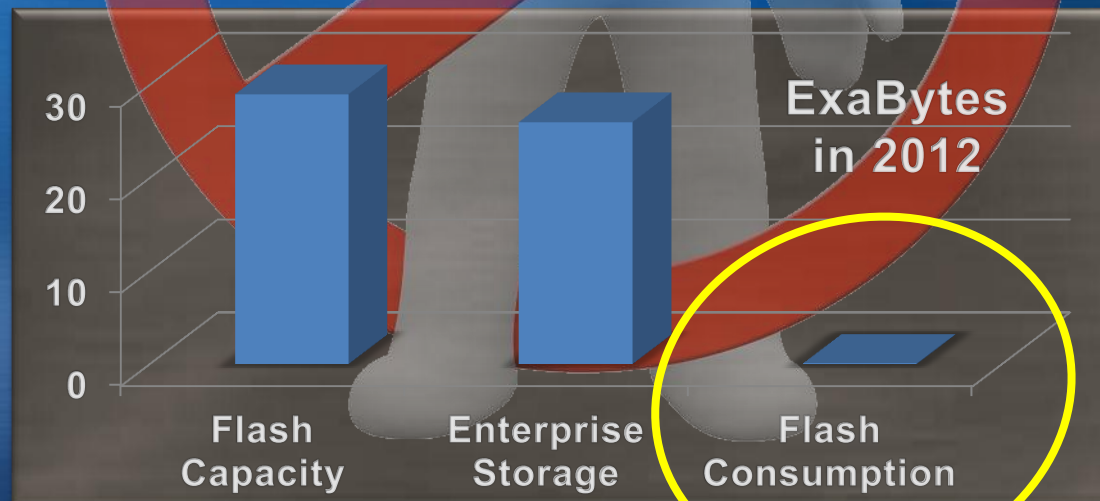


Debunking the myths....

19/20 nm cMLC isn't reliable for enterprise

Flash can never get to HDD price parity

Not enough Flash to support Enterprise market



Can Flash Be Mainstream Enterprise Storage – ***NOW?***



yes

SKYERA INC
www.skyera.com