

Business Case:

# Improve Overall Service Quality and Customer Experience





# Agenda

- Introduction
- Storage
  - Challenges
  - Opportunities
  - Solution
- Recap



# Introduction



# What is Squash Compression?

- Increases storage capacity
- Decreases cost
- Boosts productivity
- Improves customer satisfaction and loyalty
- Unique, patented technology
- Multiple uses for our Hamelin algorithm



# Increases Storage Capacity

- Increases capacity for images by 800% at 20% of the cost of buying hardware
  - DICOM, TIFF, BMP, GIF, JPG, PNG
- Configurable
  - From mathematically lossless – 84% reduction
  - To the desired level of visually lossless – 98% reduction



Storage







# Data's Role Has Changed

- Today's applications and regulatory requirements demand additional storage

The demand for storage has grown more than 50% annually... a rate faster than the rapidly decreasing unit cost of storage.<sup>1</sup>

Each TB of SSD storage carries a TCO of \$7,746 over 5 years.<sup>2</sup>

Each TB of HDD storage carries a TCO of \$3,713 over 5 years.<sup>2</sup>

The people and software to manage this has grown by 20% or more annually, even where IT budgets have barely budged.<sup>1</sup>

<sup>1</sup> [www.computerweekly.com/feature/Meeting-the-demand-for-data-storage](http://www.computerweekly.com/feature/Meeting-the-demand-for-data-storage)

<sup>2</sup> [www.snia.org](http://www.snia.org)

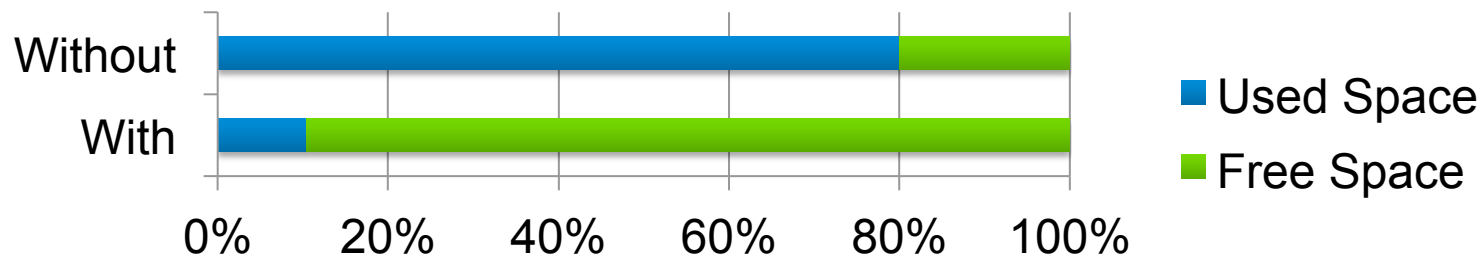


# Storage Opportunity

800% increase in capacity

Storage requirements of images reduced by up to 84% for:

- Single frame DICOM
- Single frame TIFF
- Single frame GIF
- BMP, JPG, PNG





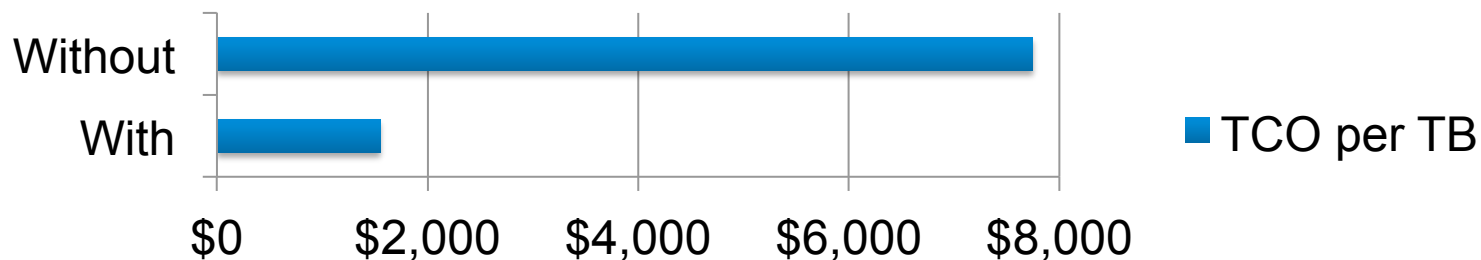


# Storage Opportunity

80% decrease in cost

Investment in software is 20% of the cost of hardware:

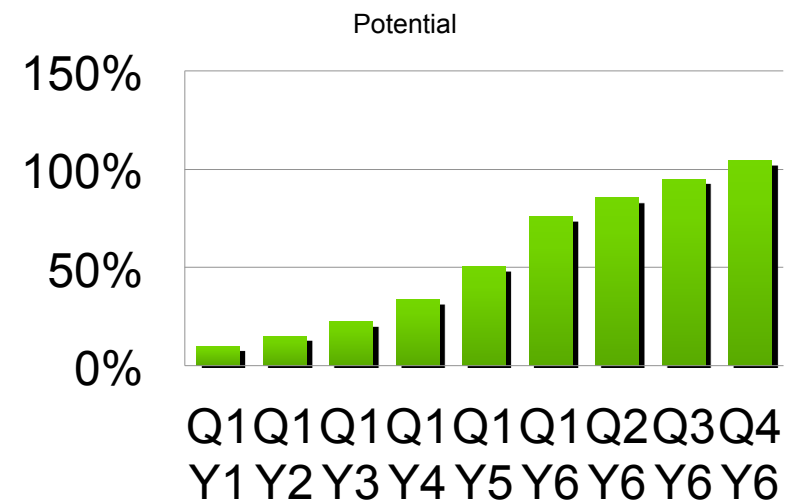
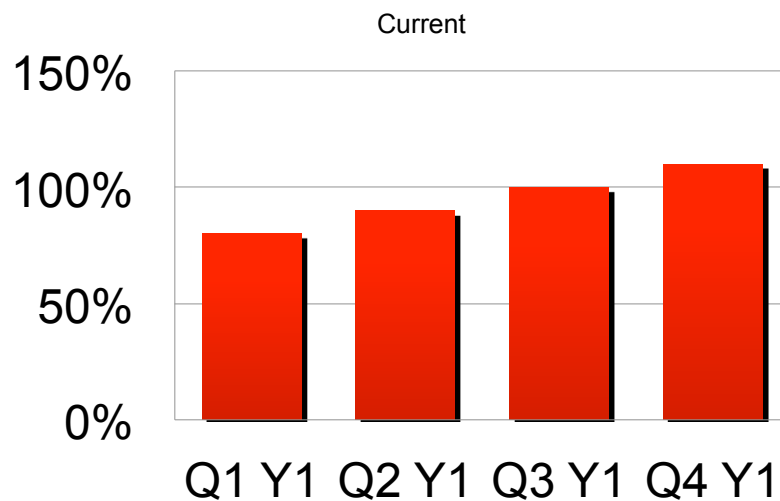
- Power and cooling cost
- Cost of enclosures and enclosures energy draw
- Drive cost
- Maintenance / warranty cost





# Storage Opportunity

## Network capacity extended from Q3 Y1 to Q4 Y6



Gain 800% more capacity from existing infrastructure

Require 800% less new infrastructure to support future growth

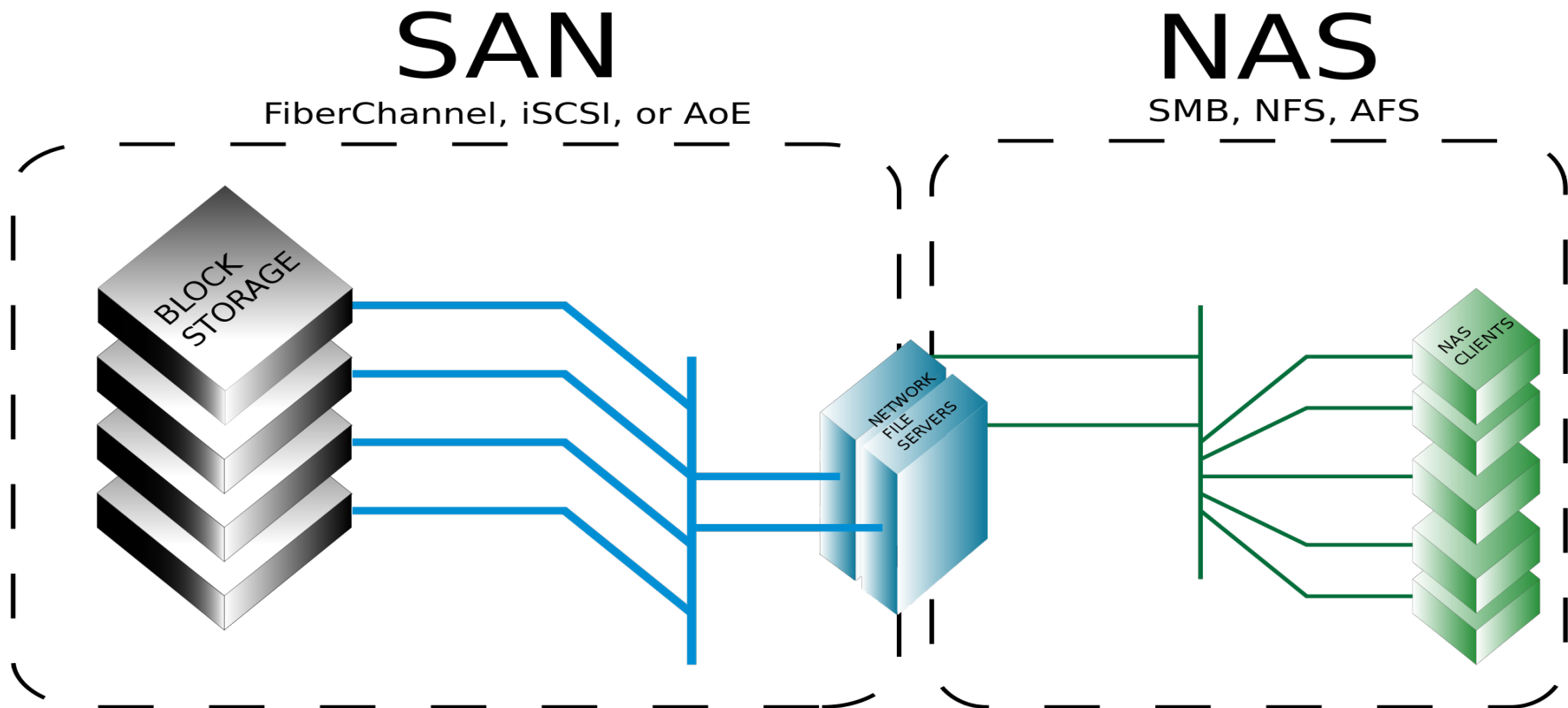
Assuming storage at 80% capacity in Year 1 and a 50% Compound Annual Growth Rate<sup>1</sup>

<sup>1</sup> [www.ericsson.com/res/docs/2012/traffic\\_and\\_market\\_report\\_june\\_2012.pdf](http://www.ericsson.com/res/docs/2012/traffic_and_market_report_june_2012.pdf)



# Storage Solution

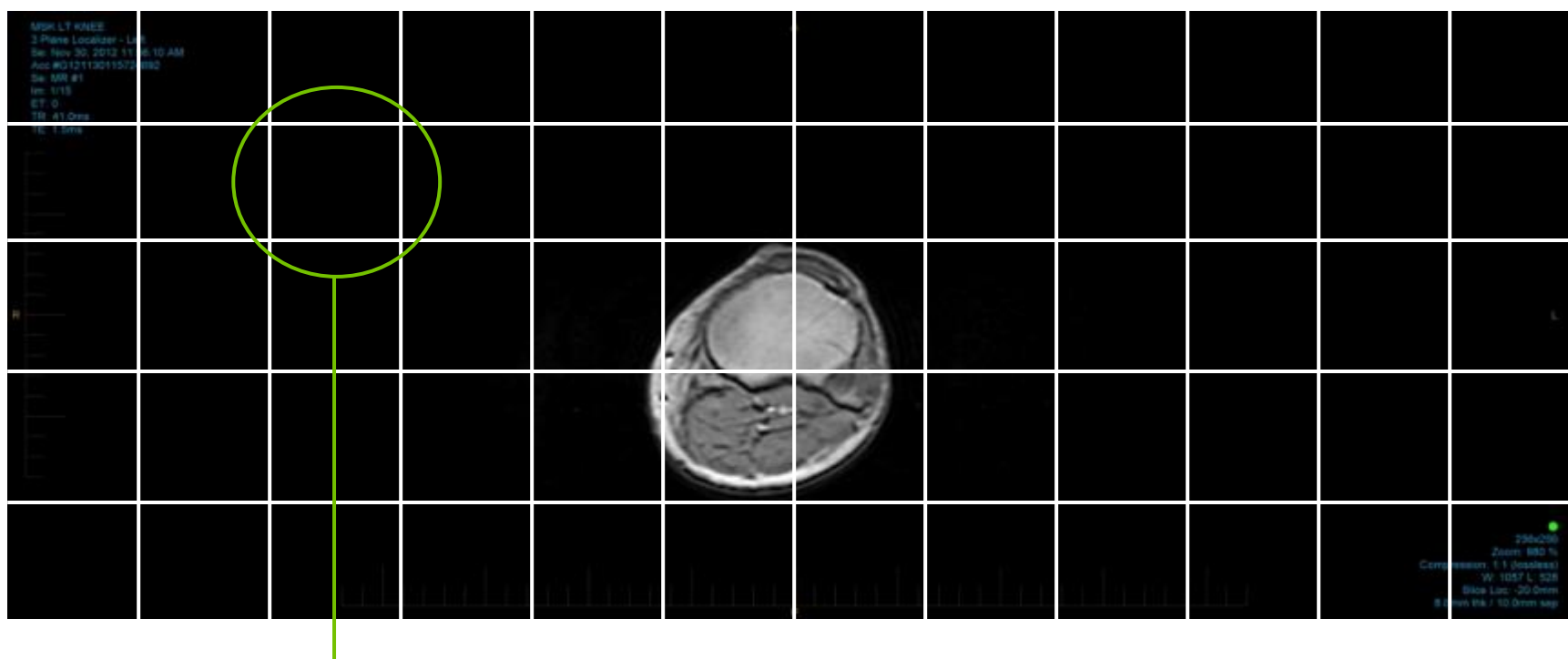
Provides a file system optimized for images





# File System Save

“Chops” an image into 128 x 128 pixel tesserae

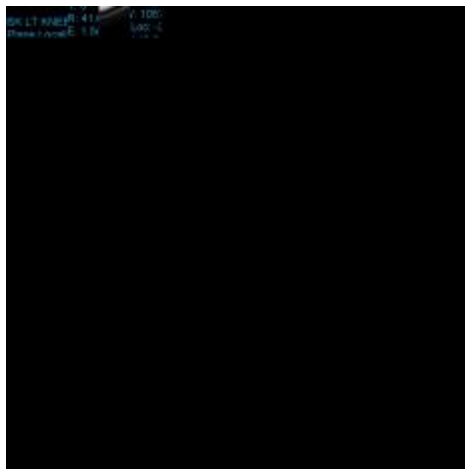


Calculates each tessera's frequency in 2D space;  
uses the root mean square (e.g.,  $RMS=0$ )

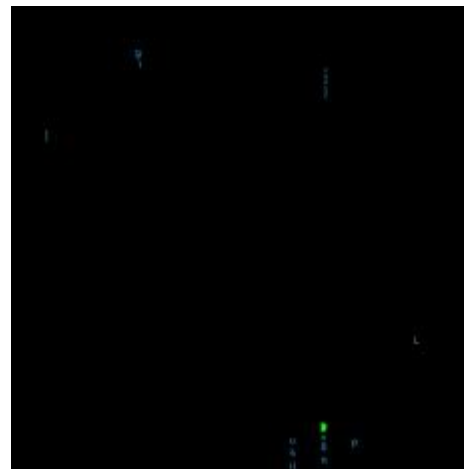


# File System Save

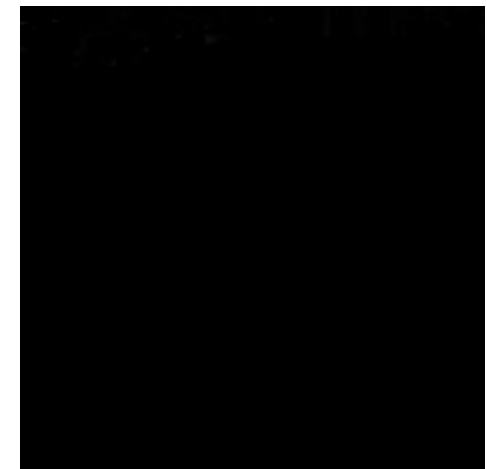
Adds the tessera to a mosaic with the same RMS (e.g., 0) and color palette



RMS = 2



RMS = 1



RMS = 0

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And, for JPEG, the same number of components (8/16/24 bits), same vertical and horizontal sample factors, and same quantization tables



# File System Read

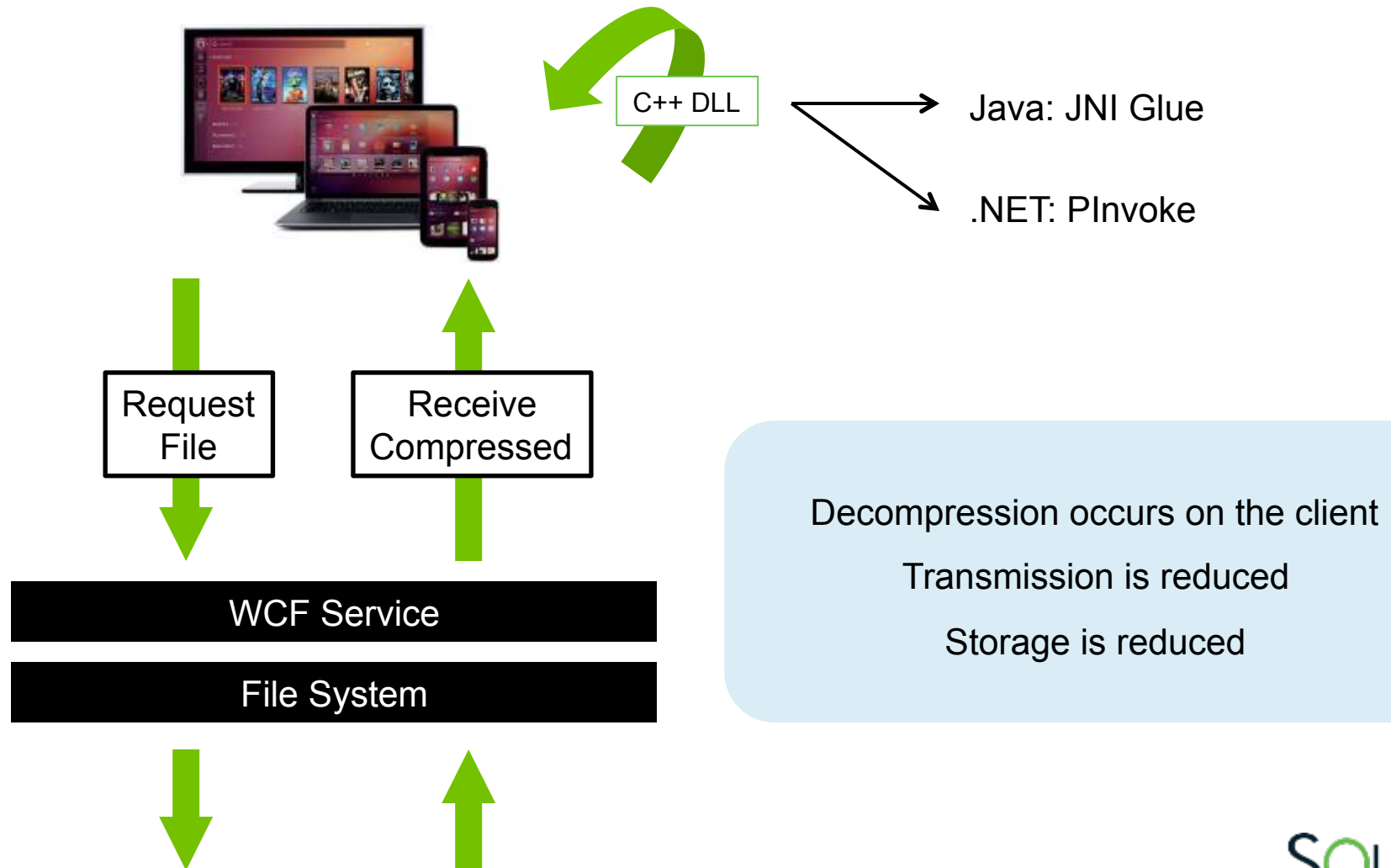
The image is reconstructed from the tesserae



It is important to note that what is saved is what is read. The solution is agnostic of transport mechanisms such as PACS.



# Alternate Implementation







# Competitive Differentiators

Why is Squash Compression different?

Factor	Compression Ratio	
	Leading Competitor	Squash Compression
24-bit color	1.1:1	2.5:1
16-bit gray	1.4:1	3.2:1
8-bit gray	2.2:1	5:1



Recap



# We Discussed...

- Storage Capacity
  - Increase capacity for images by 800% at 20% of the cost of buying hardware
- Extranets / Intranets
  - 7X faster page load time
  - 50% decrease in bandwidth
  - 90% decrease in latency