

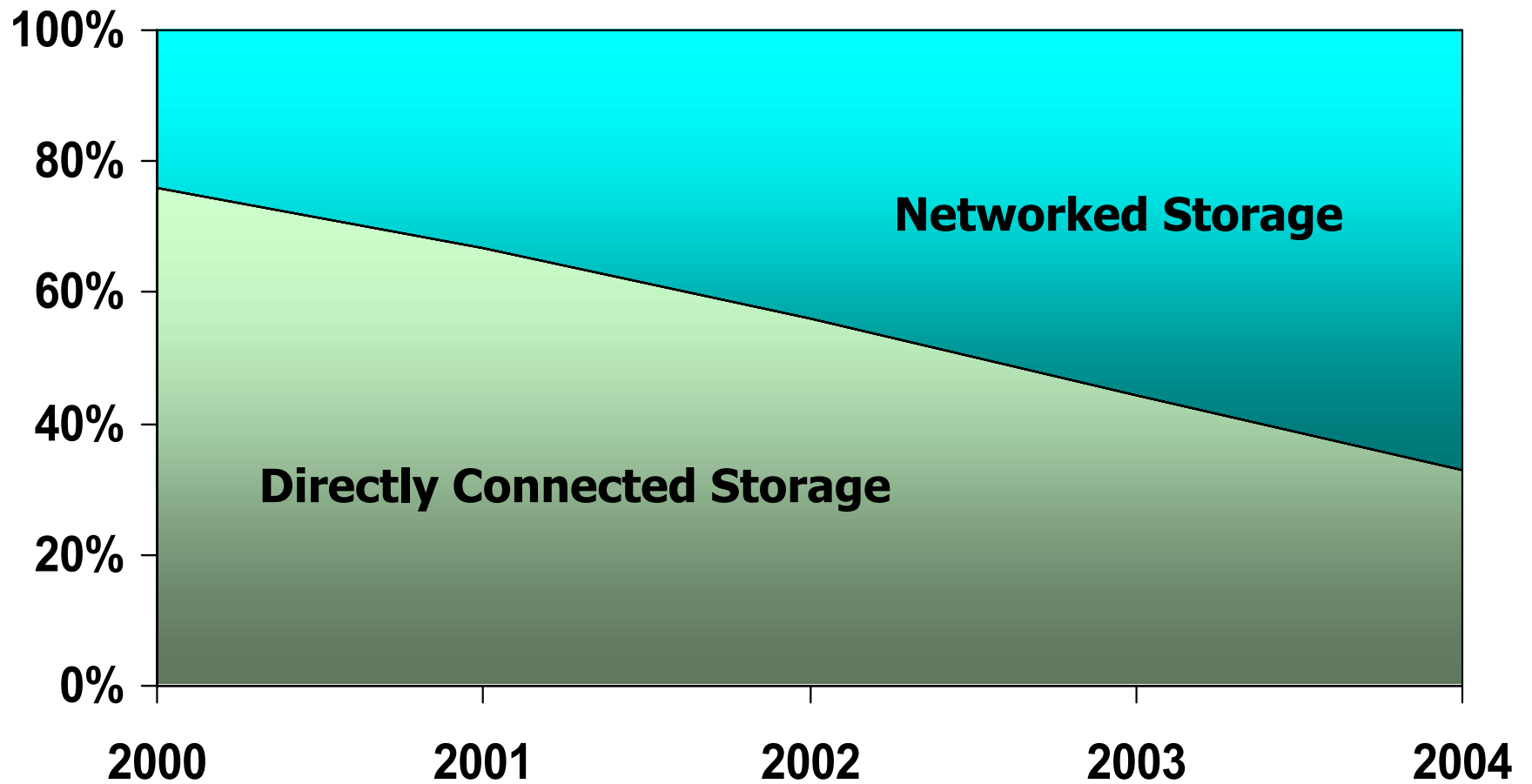
From Pockets to Packets

Electronic Transfer for Data Protection

Dr. Kevin C. Daly
CEO
Avamar Technologies
Irvine, CA

- **Within the IT center data traffic has moved from a directly-connected model to a local networked model**
- **Distributed networks support transaction-level communication and limited amounts of data transfer and synchronization**
- **Available external bandwidth is typically less than 1% of available internal bandwidth**
- **Both technical (latency and bandwidth) and economic considerations limit the convergence of local and distributed network capabilities**
- **... but adoption of IP networking promises tighter integration between local and distributed networks**
- **... and bandwidth costs are declining faster than storage costs**

Data Moves to the Network

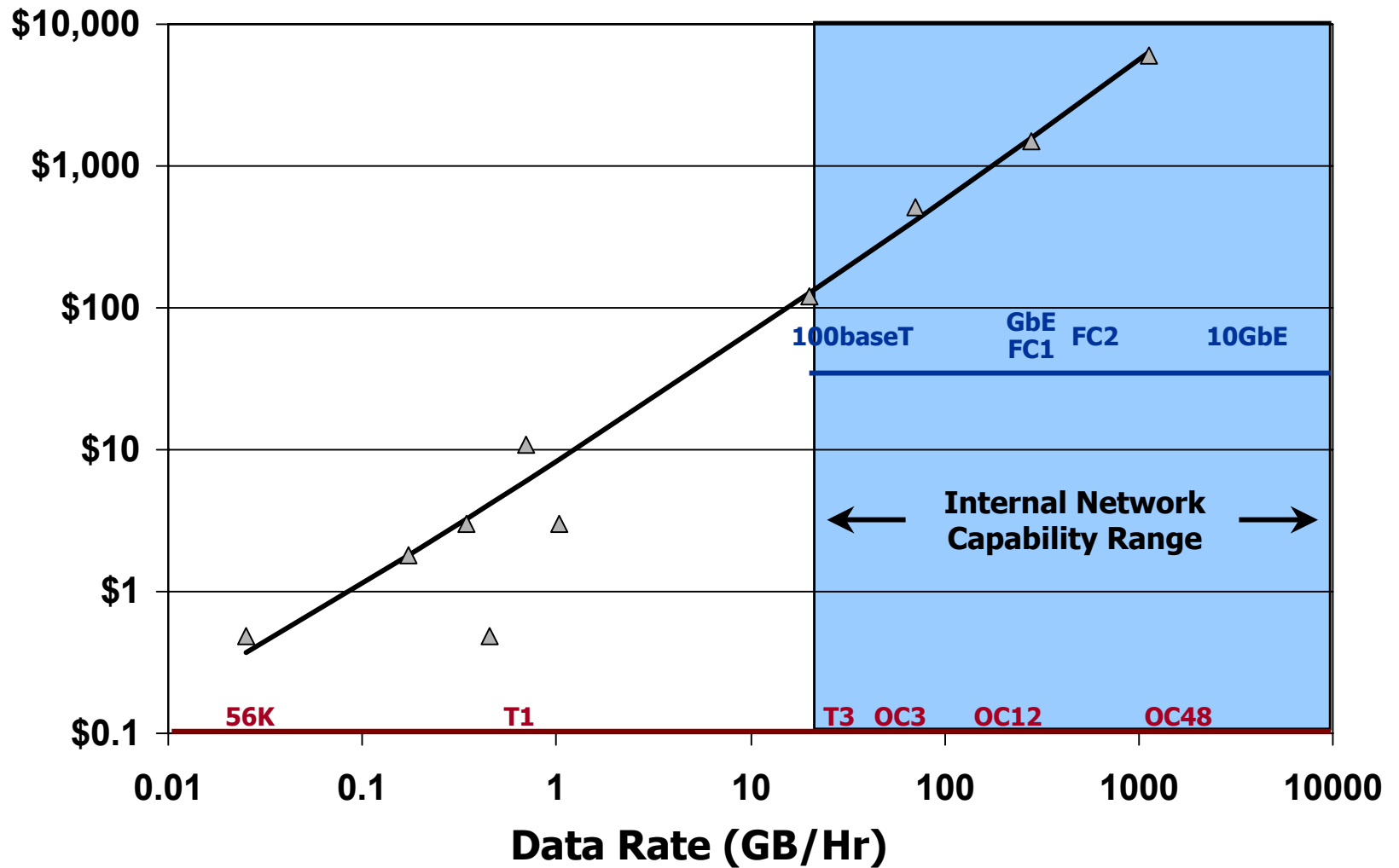


Source: IDC, 2001

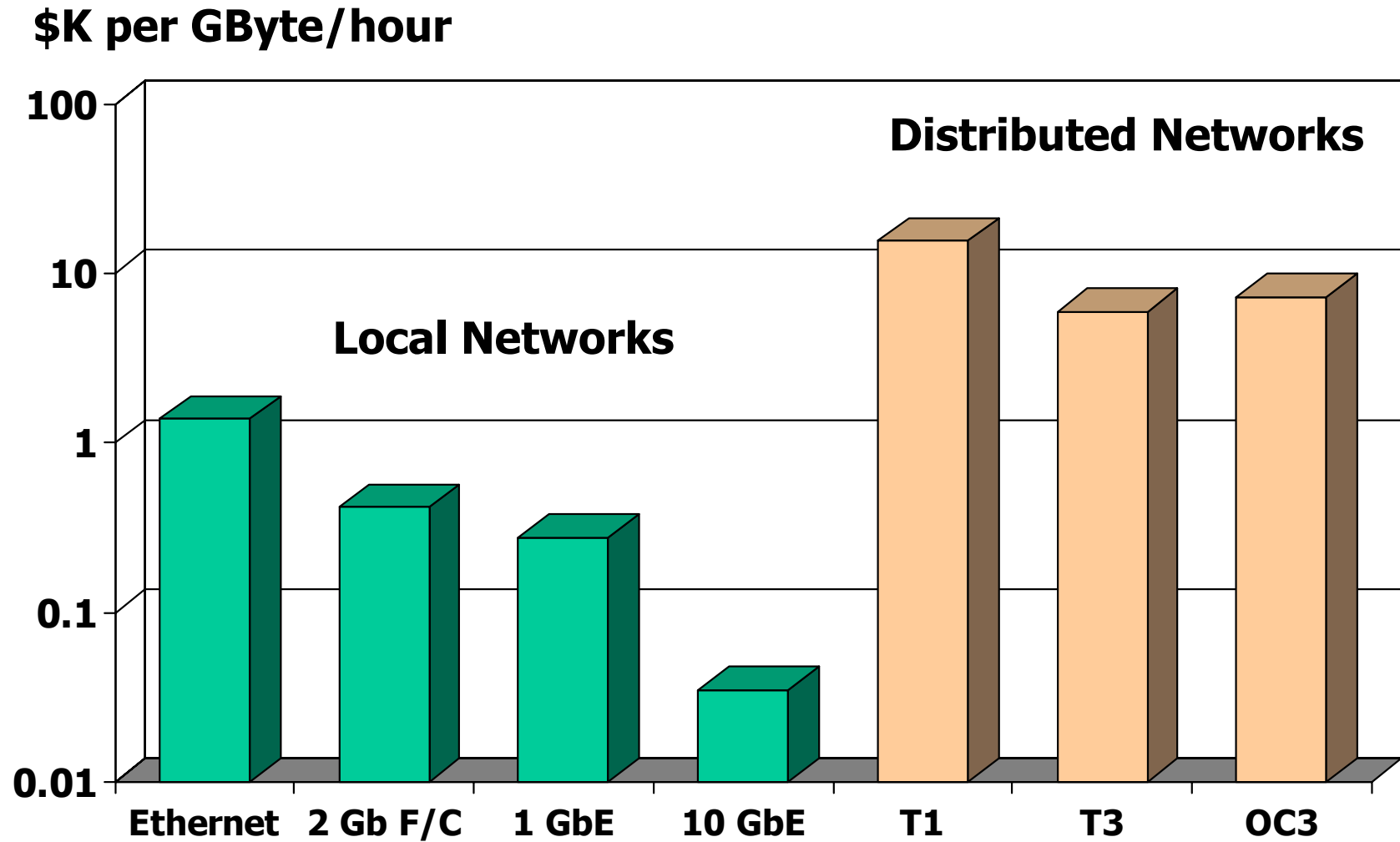
External Network Communication Costs



Cost (\$1,000/Year)



Annual Networking Costs



- **Business Continuance** requires electronic transfer of data at bandwidths and latencies equivalent to storage networks
- **Disaster Recovery (DR)** requires transferring very large amounts of data (typically Terabytes) over great distances (Docket No. R-1128: >300 mi)

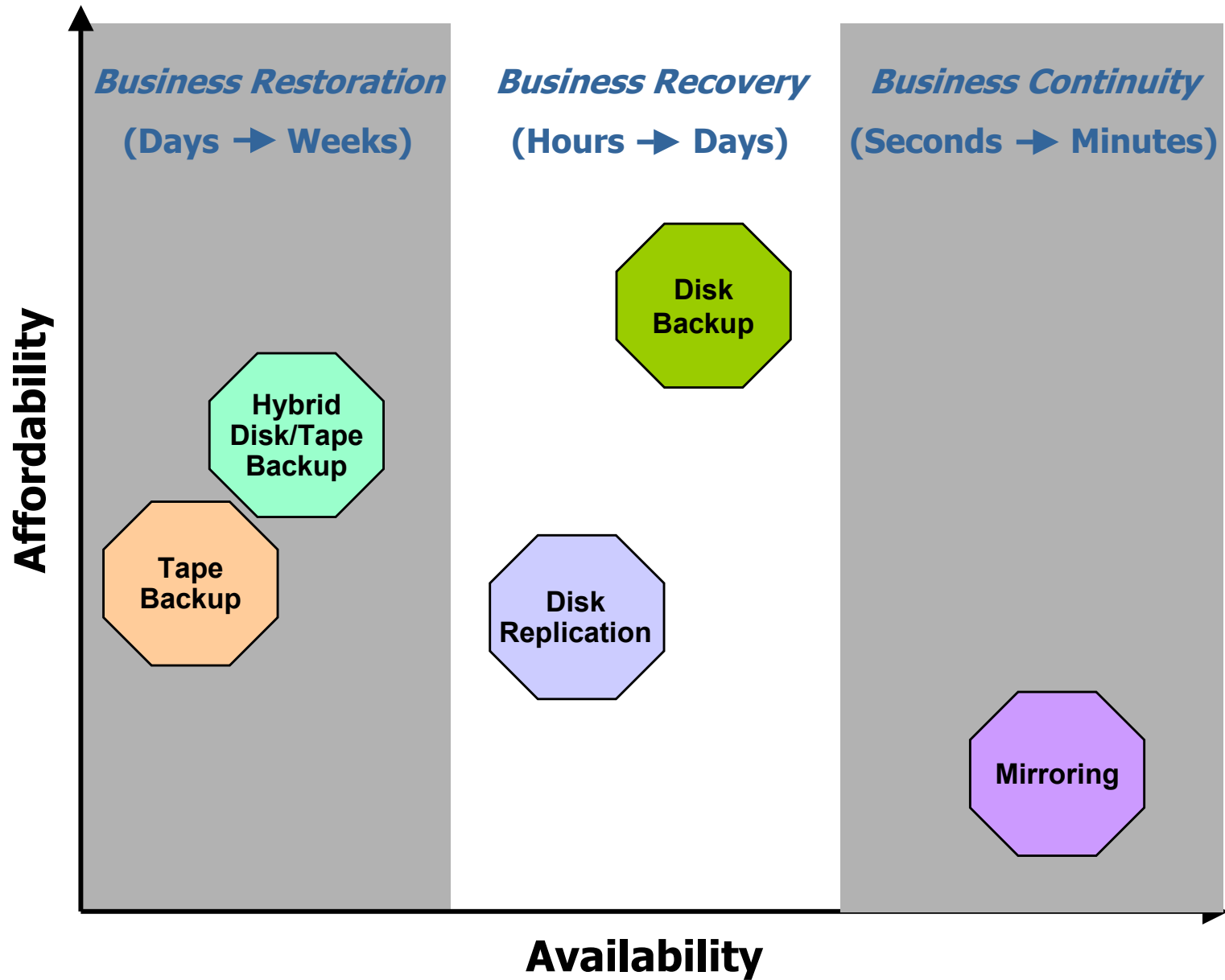
Traditional DR requirements have been met by physically transporting data on removable media

- **High density tape cartridges**
- **Effective FedEx data rate: 250Mb/sec (112 GB/Hr)**

New DR Hierarchy

	Business Continuity	Business Recovery	Business Restoration
System	Dedicated Redundant Configuration	Shared Resources	Spare Resources <i>or</i> Rapid Reconfiguration
Information	Synchronous Mirroring	Asynchronous Mirroring <i>or</i> Replication	Point-in-Time Copy
Communication	Internal Network Bandwidth	External Network Bandwidth	External Network Bandwidth
Personnel	2x Staff	1.5x Staff & Crosstraining	1x Staff & Crosstraining

Data Protection Market Segmentation



- **New emphasis on data protection will require more extensive use of external data communications**
 - **Synchronous mirroring for Business Continuity**
 - **Asynchronous mirroring for Business Recovery**
 - **Electronic Vaulting for Business Restoration**

- **New technologies within the data center will enhance the integration with external communications**
 - **Network storage**
 - **IP SANs**
 - **Disk-based backup**

- **Multiple approaches to integrating SCSI data blocks over IP networks**
 - **FCIP – Tunnel Fibre Channel over IP networks to interconnect FC SAN islands**
 - **iFCP – Support FC-4 over TCP/IP networks from FC gateway to FC gateway**
 - **iSCSI – Encapsulate SCSI commands into TCP and transport them over IP networks**

Protocol	Devices	Transport	Network
FC	FC	FC	FC
FCIP	FC	FC	IP
iFCP	FC	TCP	IP
iSCSI	iSCSI	TCP	IP

- **Effective IT operations will require tighter integration of local and distributed data networks**
- **Electronic data transfer can replace physical transport of media for at least some data protection functions**
- **Data storage and data communication are becoming very tightly interrelated**
 - **Costs for both approaching \$1/GB**
- **Data protection represents a significant market opportunity for data communications: 10x to 100x more data than transaction activity**