9 Years of Media and Entertainment Digital Storage Surveys

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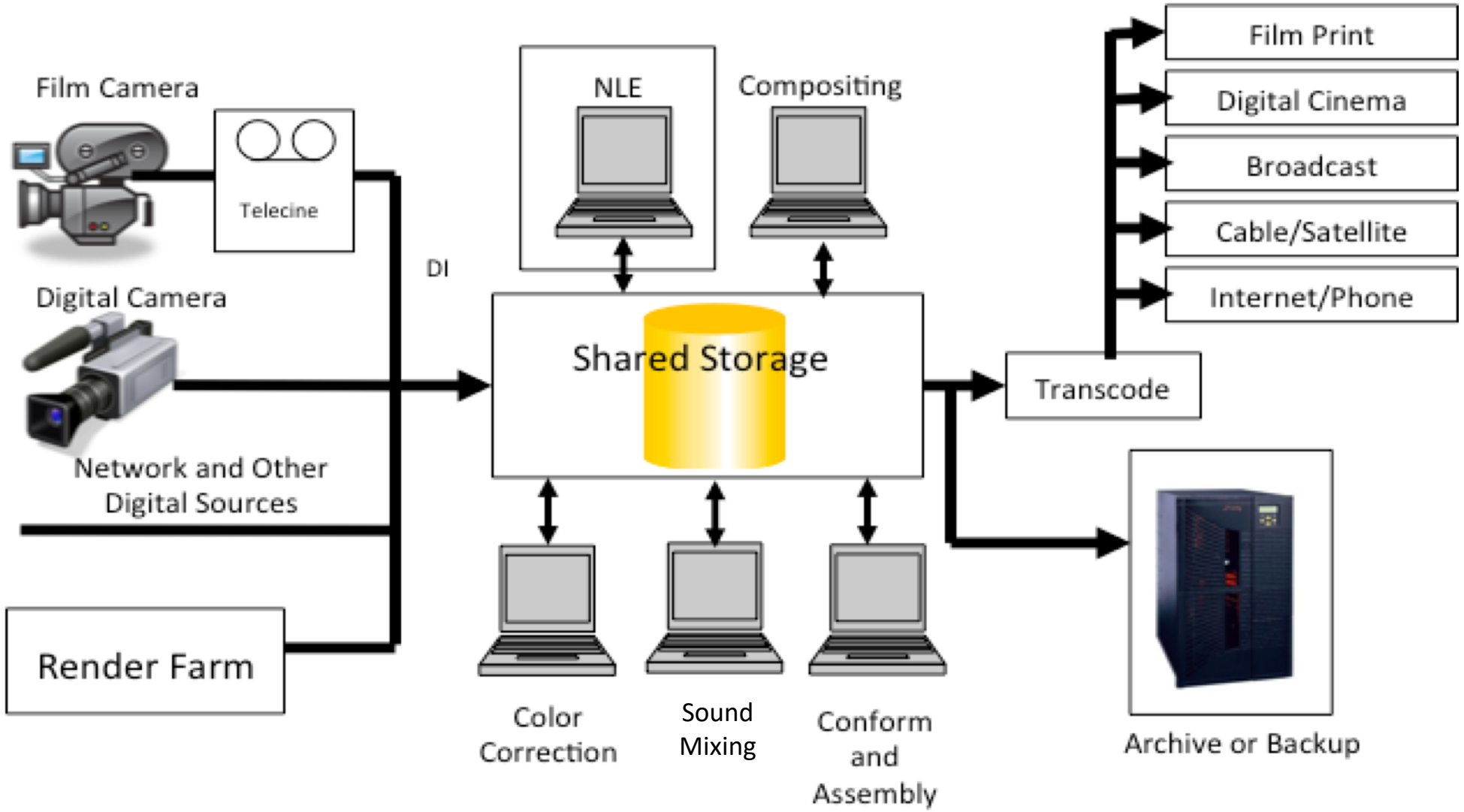
Outline

- Survey Demographics and Background
- Content Capture Survey Results
- Post-production Survey Results and Projections
- Content Delivery Survey Results and Requirements
- Content Preservation and Archiving Survey Results and Analysis
- Breakdown of Storage Capacity and Revenue for Media and Entertainment Applications
- Media and Entertainment Storage Trends

Digital Entertainment Content Workflow

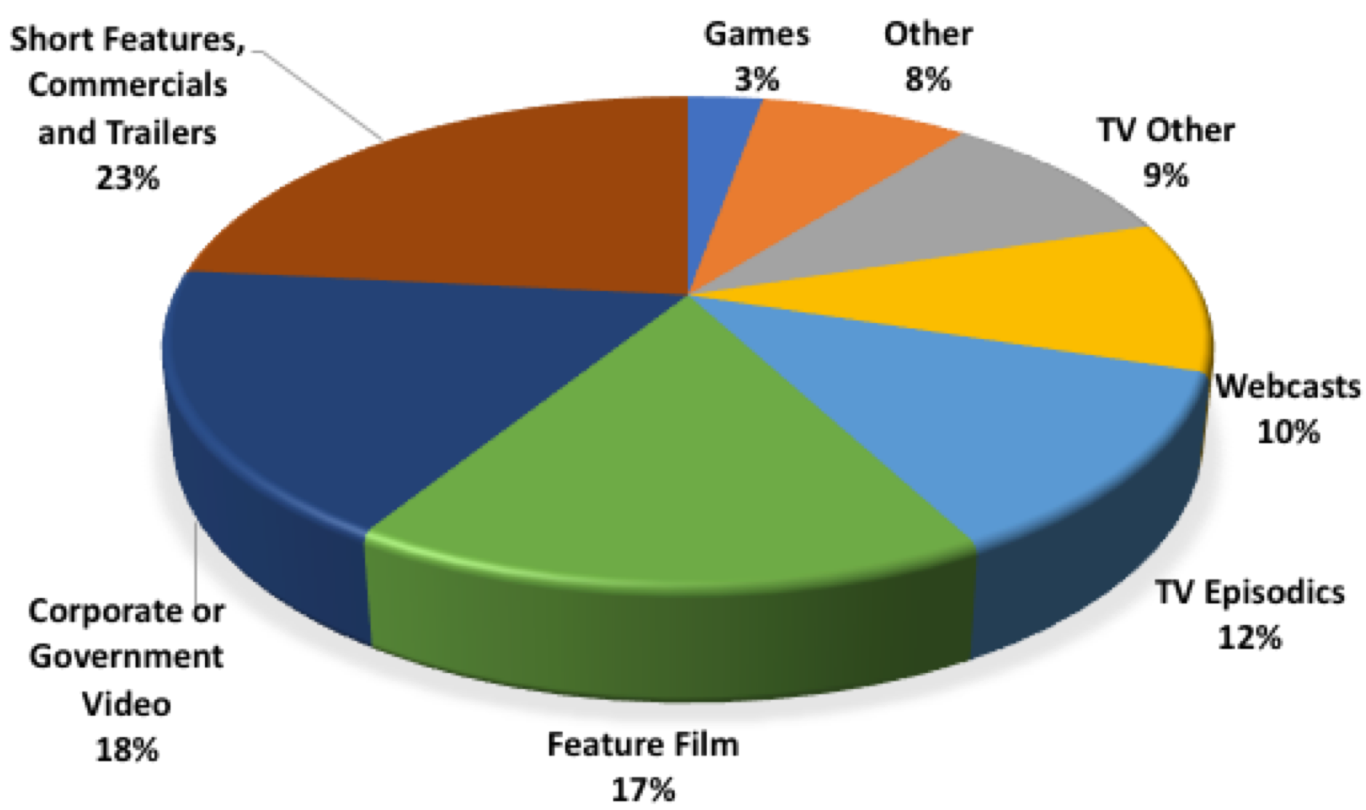


Some 2018 Survey Demographics

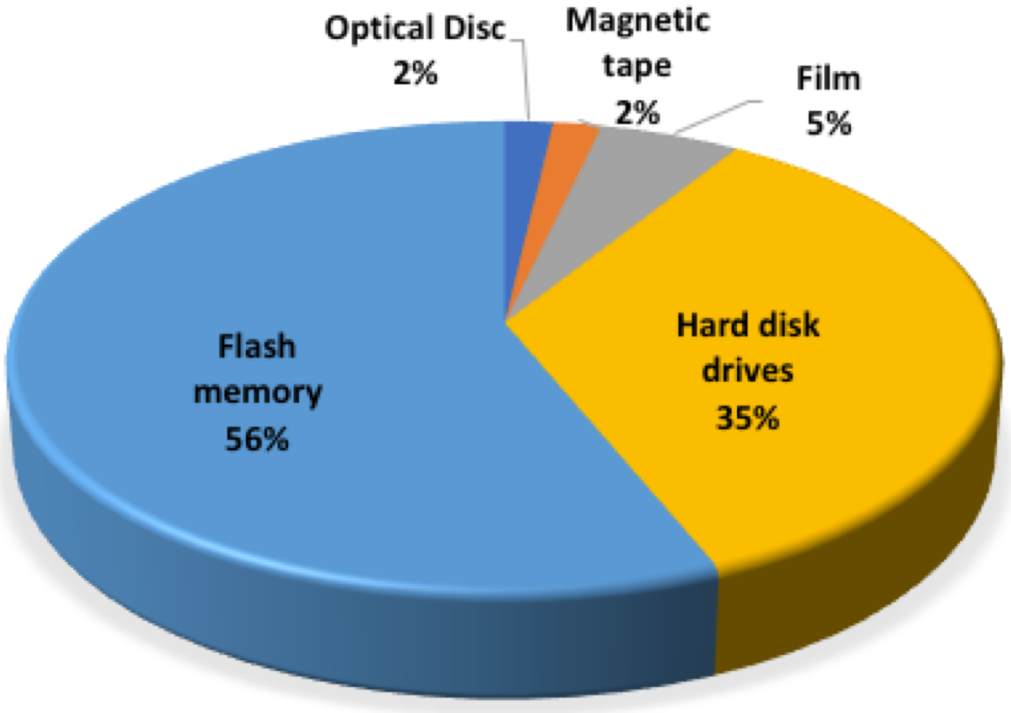
US or Canada	86.4%
Mexico or Latin America	0.0%
Europe	6.8%
Africa	1.1%
Japan or Korea	0.0%
China or Rest of Asia	4.6%
Australia	1.1%
Antartica	0.0%

Size of Professional Facility

1-10 people	66.4%
11-100 people	25.0%
101-500 people	6.2%
501-1000 people	2.5%
>1000 people	0.0%



Content Acquisition

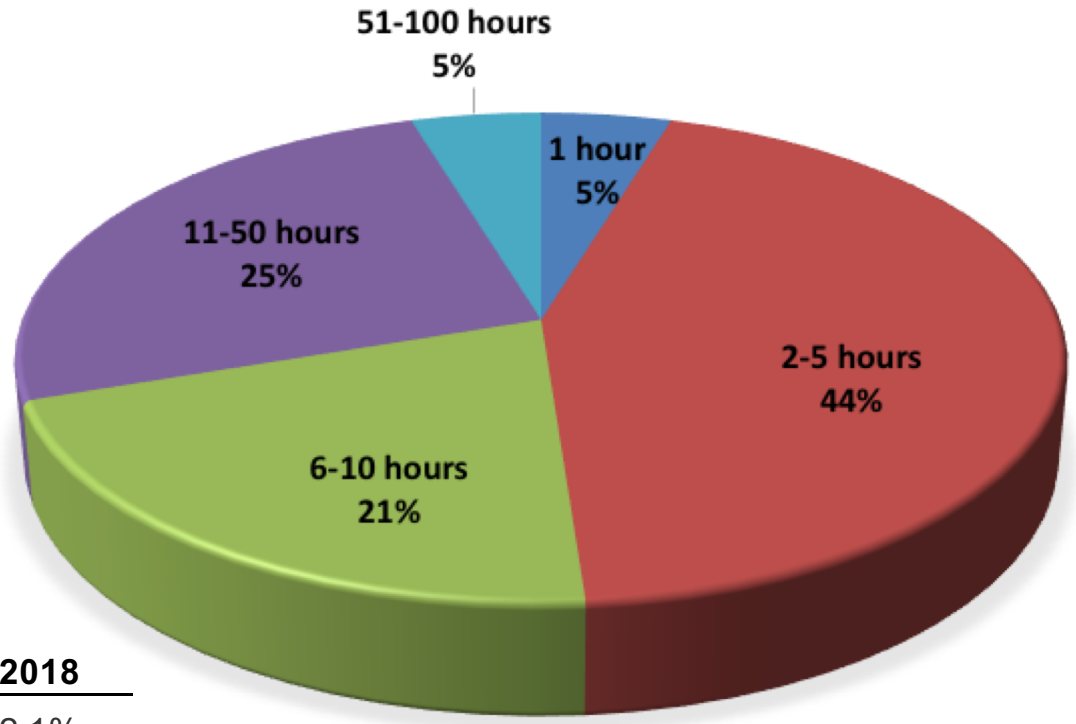


2018 Results

Year	Magnetic Tape	HDD	Optical	Flash Memory	Film
2009	34%	23%	9%	19%	15%
2010	25%	22%	17%	28%	8%
2012	20%	22%	12%	44%	2%
2013	15%	18%	7%	59%	1%
2014	7%	24%	10%	57%	2%
2015	4%	21%	8%	66%	1%
2016	2%	34%	8%	54%	2%
2017	5%	33%	3%	59%	0.16%
2018	2%	35%	2%	56%	5%

Content Acquisition (2)

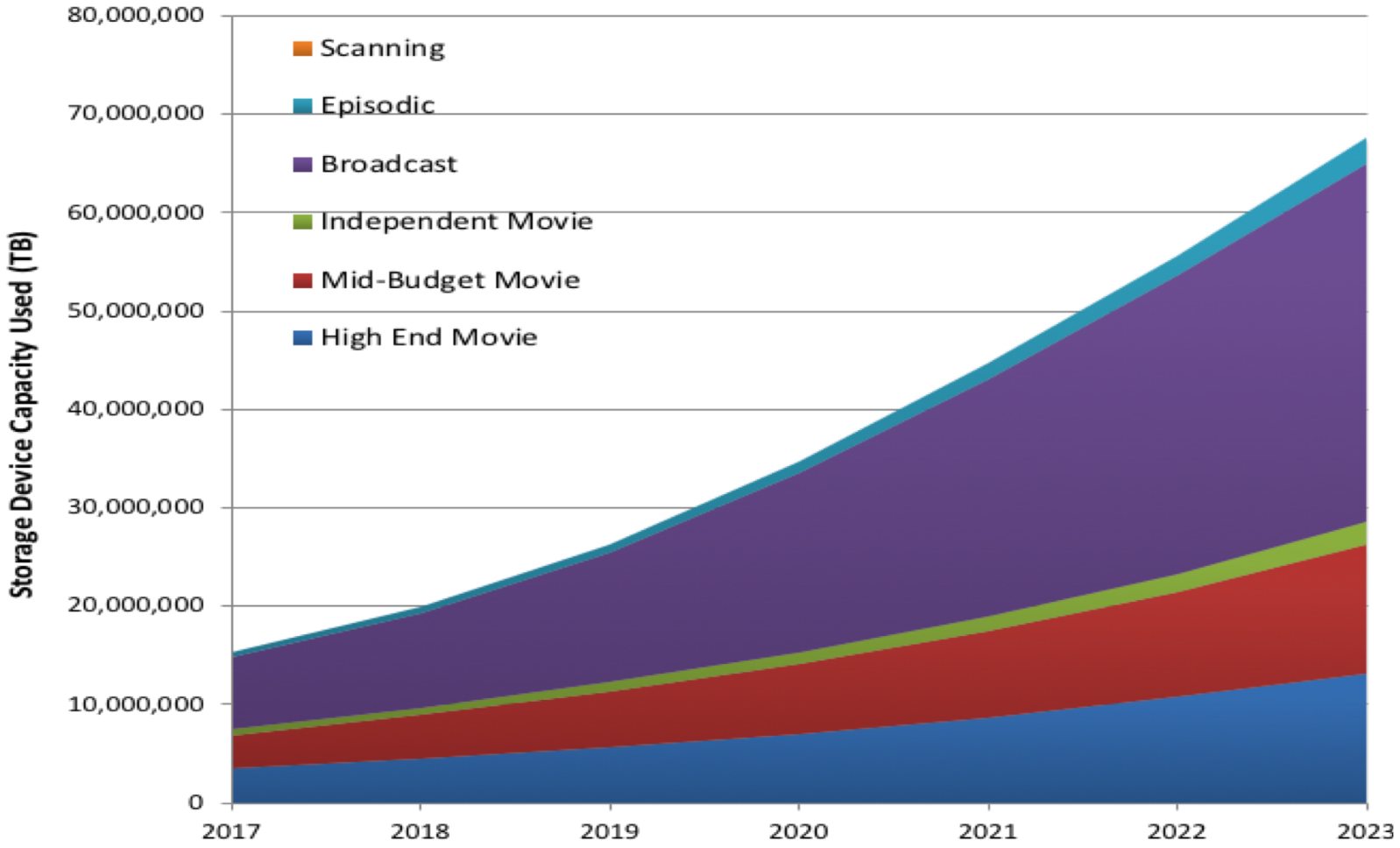
51% of Respondents said they capture 6 or more hours of content for 1 hour of finished work



Hours of Content Shot for 1 Hour of Completed Video (2018)

Percent Born Digital	2010	2012	2013	2014	2015	2016	2017	2018
<10%	3.9%	0.9%	1.1%	0.0%	0.0%	0.0%	1.2%	2.1%
11% to 20%	1.3%	0.4%	0.0%	1.1%	1.6%	3.4%	0.0%	2.1%
21% to 30%	3.2%	0.0%	0.0%	1.1%	1.6%	3.4%	1.2%	0.0%
31% to 40%	3.2%	2.6%	1.1%	2.1%	1.6%	0.0%	0.0%	2.1%
41% to 50%	5.2%	2.2%	3.3%	2.1%	0.8%	1.1%	3.6%	2.1%
51% to 60%	5.2%	1.7%	2.2%	1.1%	1.6%	3.4%	1.2%	0.0%
61% to 70%	5.8%	3.1%	6.5%	4.2%	1.6%	1.1%	0.0%	6.3%
71% to 80%	8.4%	8.3%	10.9%	7.4%	5.7%	4.5%	7.1%	2.1%
81% to 90%	16.1%	10.9%	15.2%	15.8%	7.3%	14.8%	13.1%	6.3%
91% to 100%	47.7%	69.9%	59.8%	65.3%	78.0%	68.2%	72.6%	77.1%

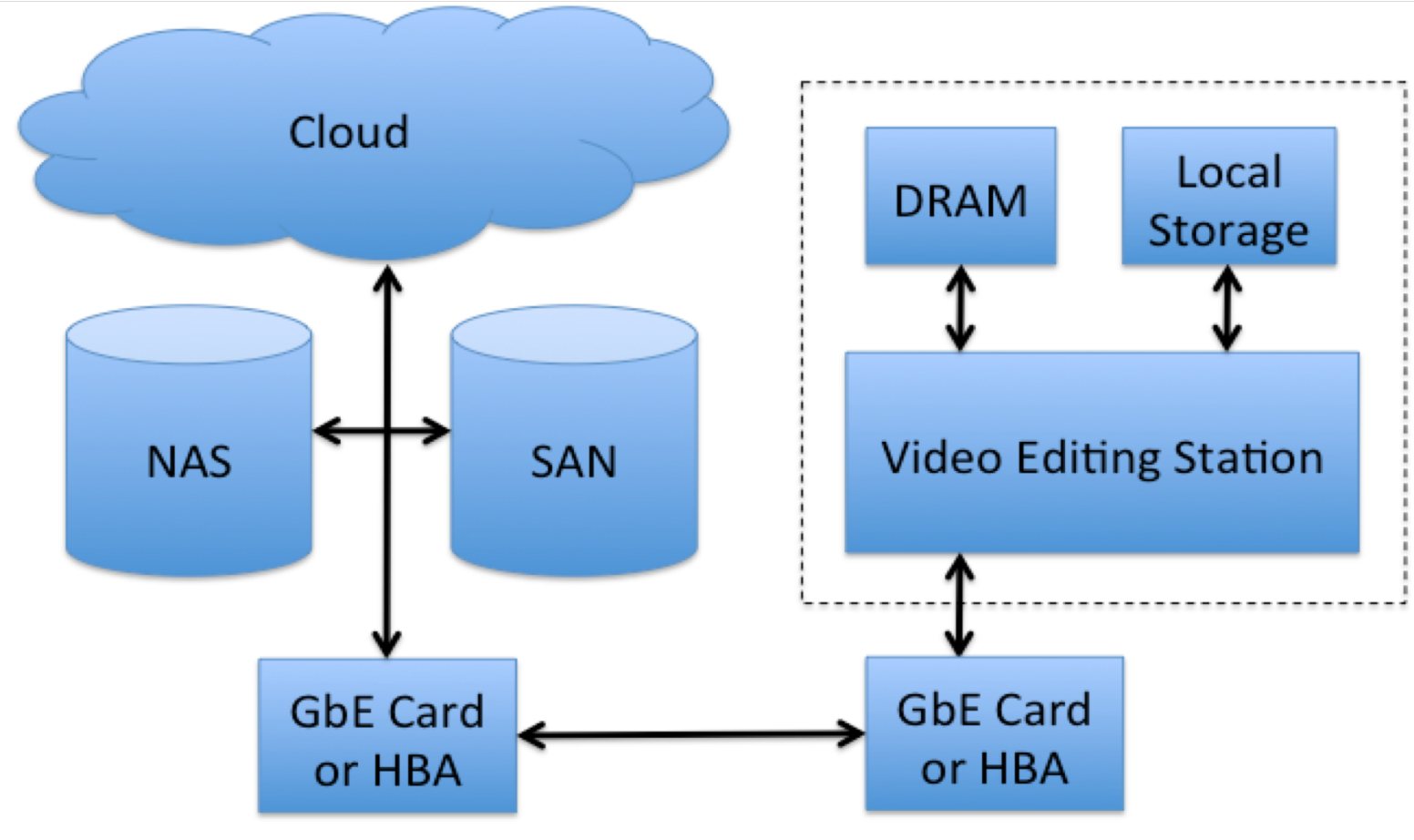
Annual storage system capacity growth for digital content acquisition



- Projecting approaching 70 Exabytes of storage capacity used for content acquisition and creation by 2023.

2018 Digital Storage in Media and Entertainment Report, Coughlin Associates

Professional Non-linear Editing Model System



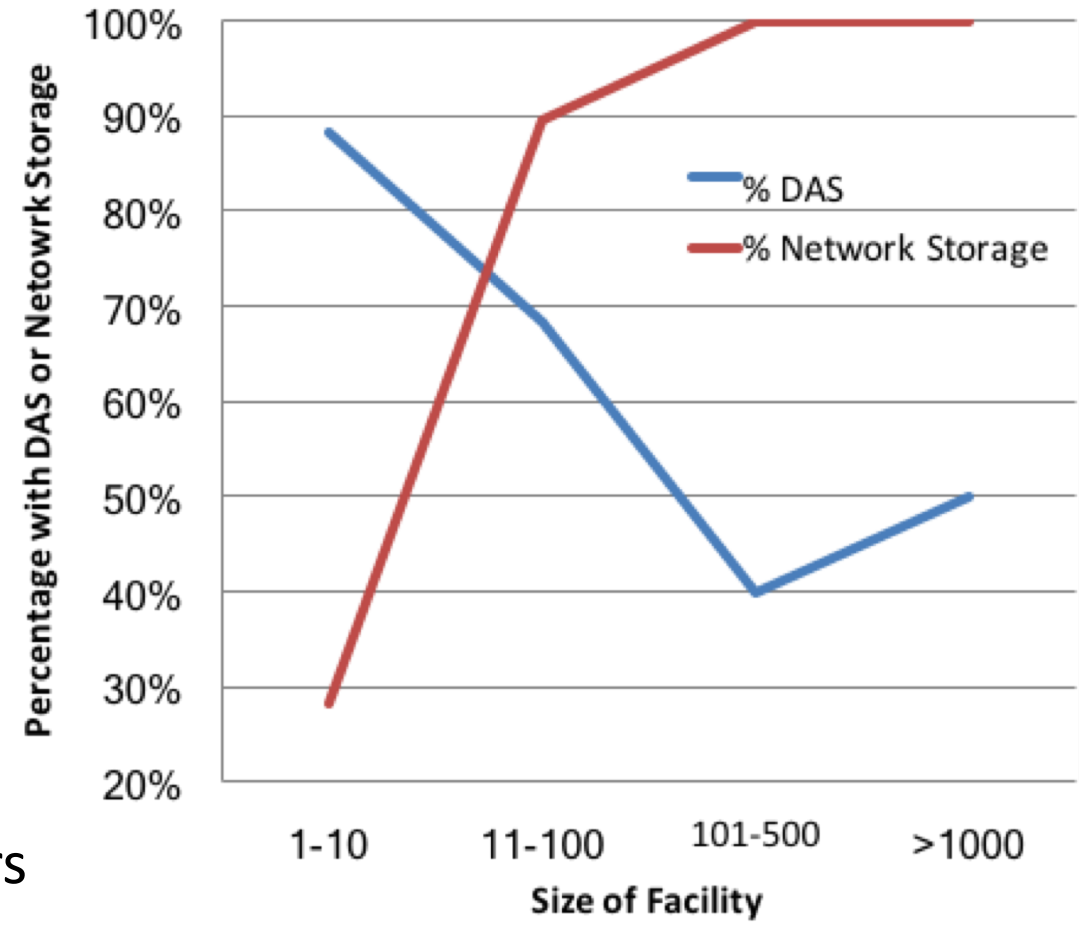
- Besides direct attached storage and traditional NAS and SAN, there is an increasing use of cloud storage to facilitate collaborative workflows.
- Flash memory, using NVMe interfaces is becoming a bigger factor in editing as resolution, frame rate and bits per frame increase

Digital Editing and Post Production

	2009	2010	2012	2013	2014	2015	2016	2017	2018
DAS %	91%	84%	92%	87%	88%	85%	74%	85%	83%
>1 TB	52%	96%	78%	88%	86%	89%	90%	87%	81.%
>50 TB				18%	22%	18%	17%	19%	12%
>500 TB				7%	7%	8%	3%	4%	4%

	2009	2010	2012	2013	2014	2015	2016	2017	2018
NAS/SAN %	81%	81%	54%	71%	75%	69%	68%	49%	58%
>16 TB	44%	58%	48%						
>50 TB				58%	49%	52%	57%	66%	58%
>500 TB				11%	11%	17%	15%	14%	15%

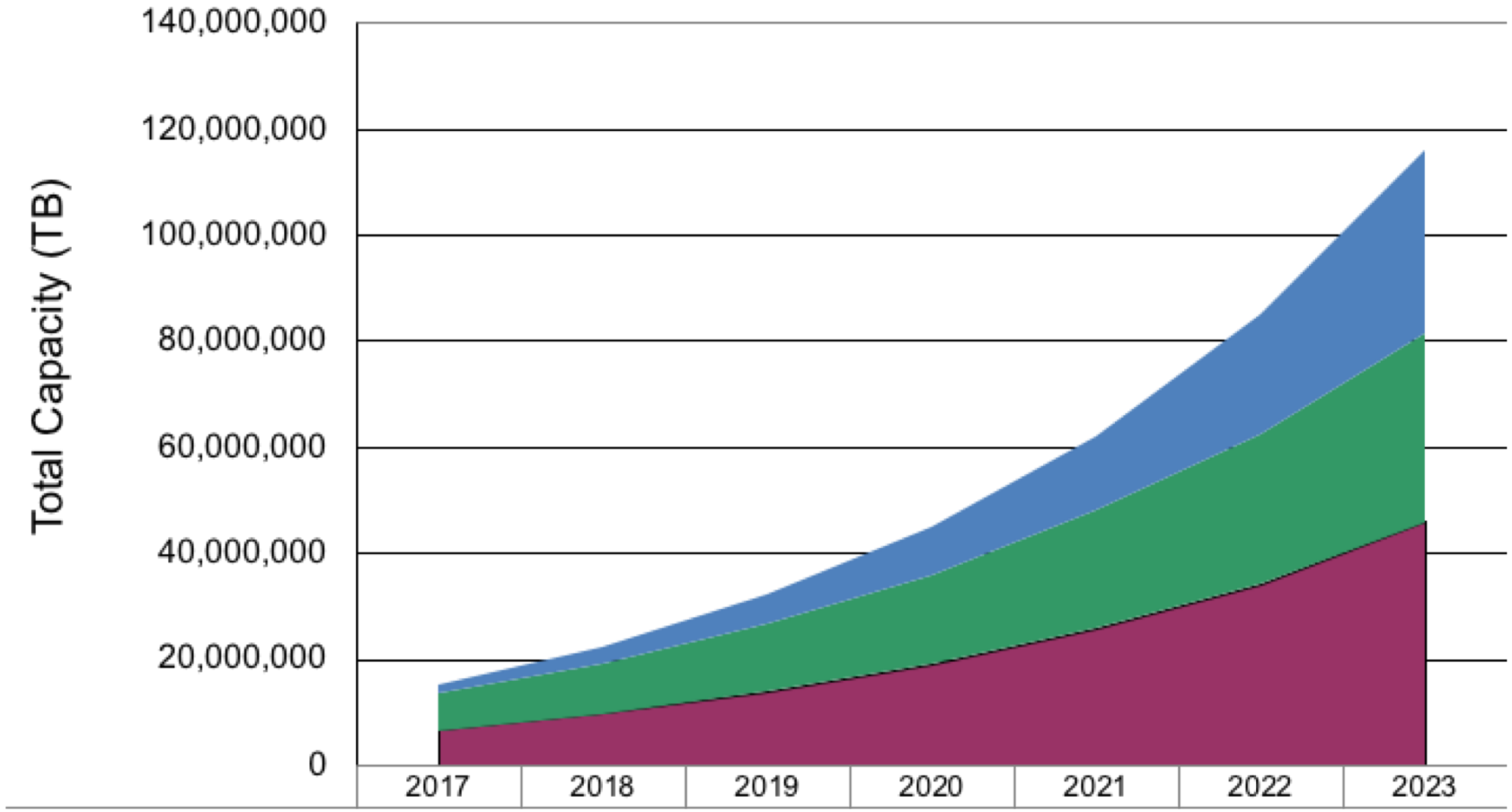
	2012	2013	2014	2015	2016	2017	2018
Use cloud %	15%	25%	26%	30%	23%	42%	48%
>1 TB	27%	23%	28%	33%	21%	44%	56%



- DAS and NAS/SAN have varied over the years
- Cloud storage is increasing with time

From 2017 Survey

Post production storage capacity annual demand (TB)



- In 2018 48% of responding participants said they used cloud-based storage for editing and post production
- In 2018 56% of the respondents said that they had 1 TB or more storage capacity in the cloud

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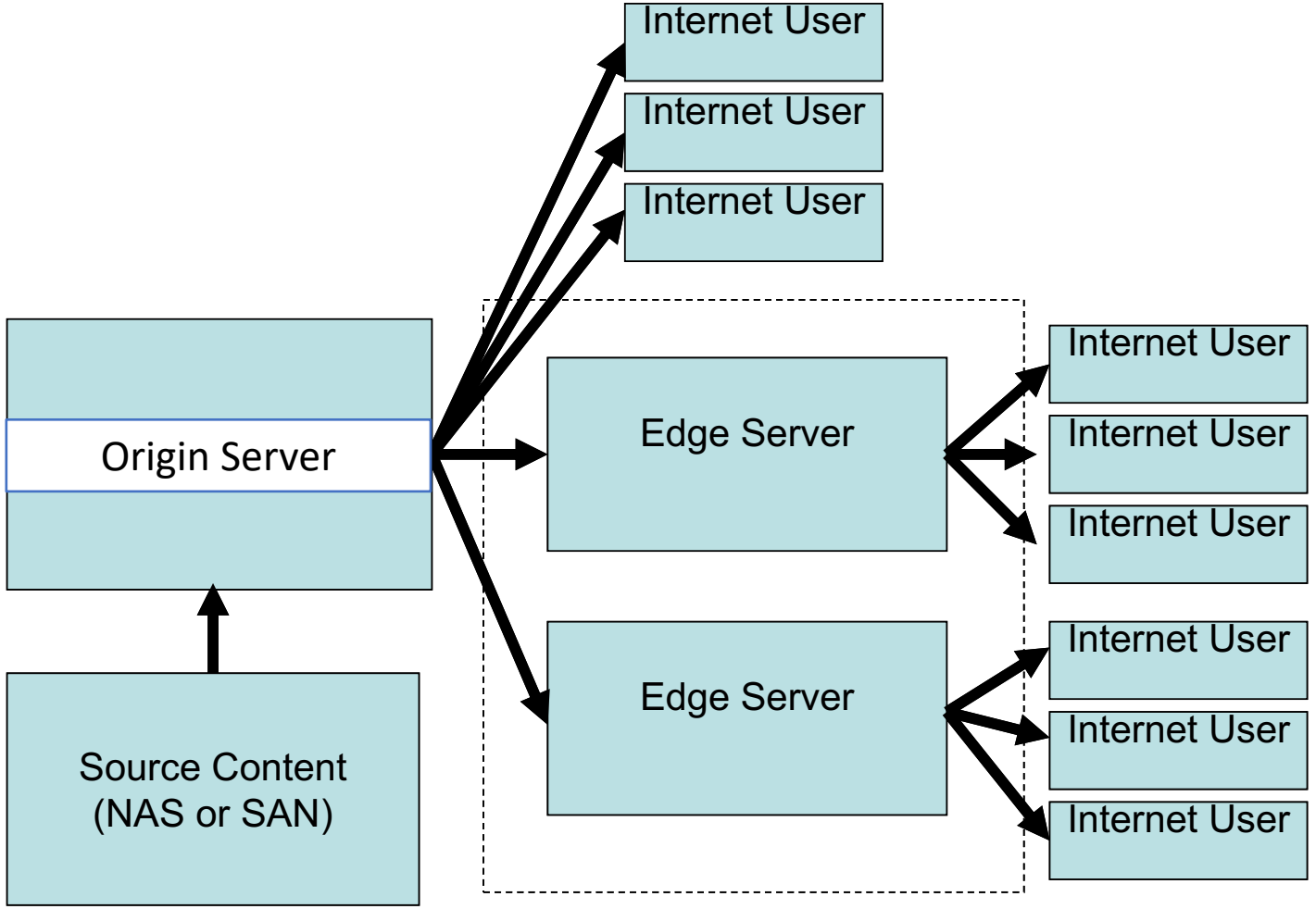
Conventional Internet content distribution system (CDN)



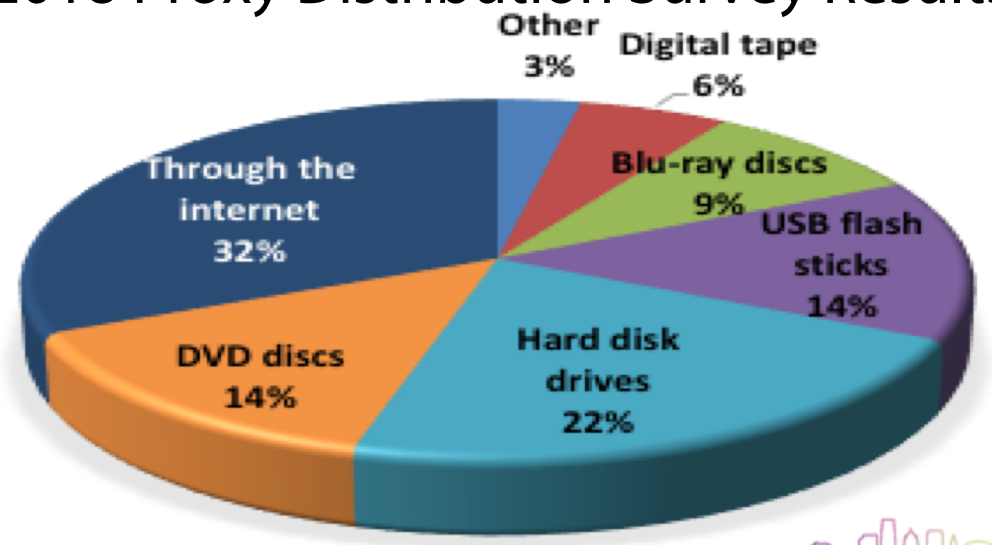
Content Distribution

- Note that in 2018 39% of survey respondents said that they used flash memory in their central delivery servers.
- High-speed enterprise solid-state drives (SSDs) and other solid-state storage technology for edge content delivery was 48% in 2018
- In 2018 internet distribution was the most popular way to view proxies

CDN Survey Results

	2009	2010	2012	2013	2014	2015	2016	2017	2018
Hrs on CDN	200	700	1,894	2,275	1,142	4,182	2,174	3,214	1,241
Avg Ingested/ Mo	150	200	500	837	668	492	427	296	372
>5% on Edge Servers			24%	42%	43%	43%	38%	35%	43%
Used Flash Memory on Edge Servers	20%	16%	14%	12%	21%	20%	31%	18%	48%

2018 Proxy Distribution Survey Results



Content Archiving Storage Media

Magnetic Tape

Optical Disc

HDD

Digital Archiving and Preservation

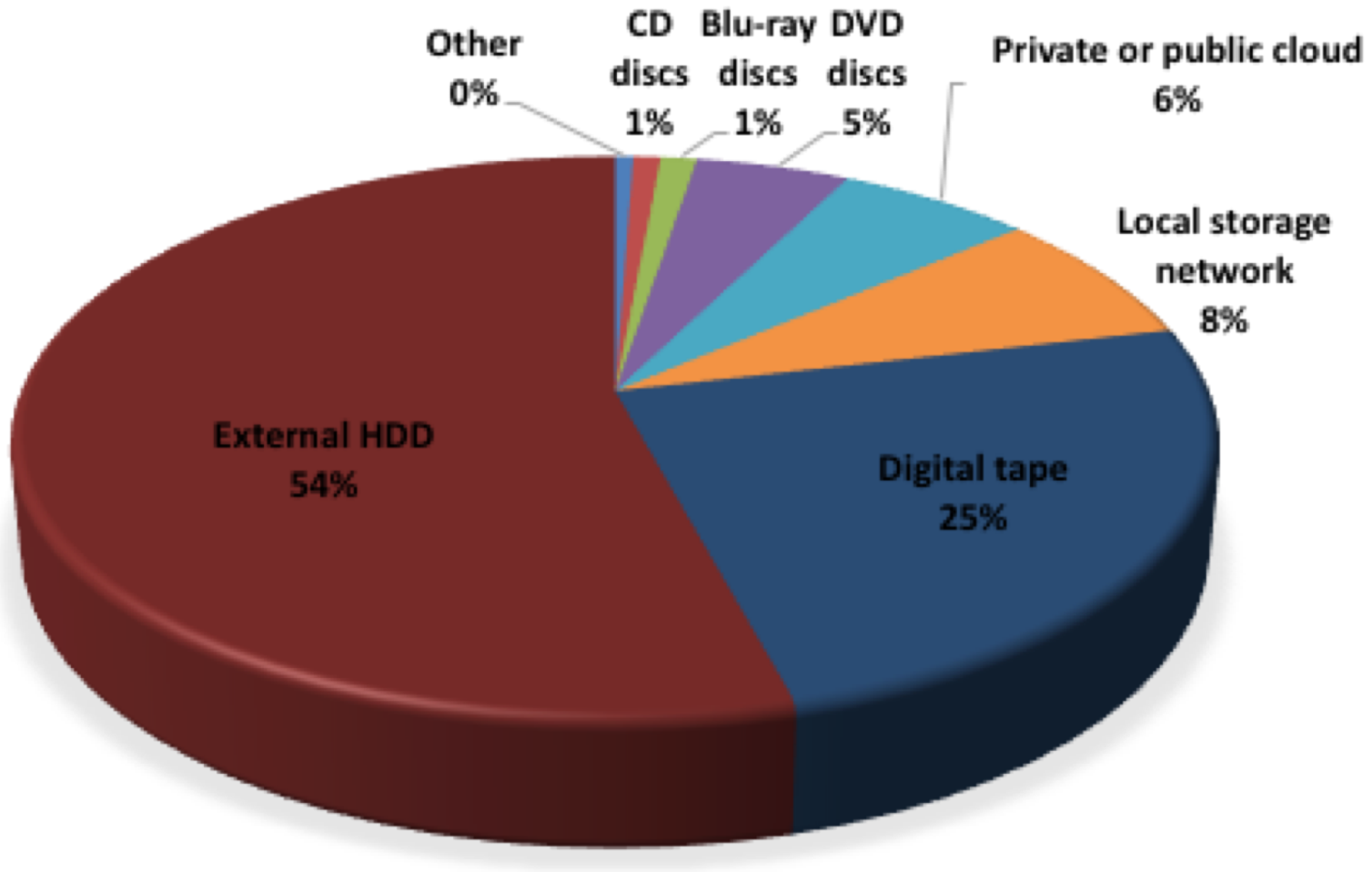
	2009	2010	2012	2013	2014	2015	2016	2017	2018
External HDDs (HDDS in 2009-2013)	25%	24%	28%	31%	18%	28%	23%	40%	54%
Digital Tape	33%	36%	23%	43%	40%	40%	49%	25%	25%
Public or Private Cloud			5%	4%	4%	5%	2%	11%	6%
Disk Based Local Storage Networks			12%	8%	21%	16%	16%	11%	8%
Optical Discs	23%	21%	28%	8%	12%	6%	8%	11%	7%
Other	18%	19%	4%	6%	5%	5%	2%	2%	0.6%

- In 2018 32% had more than 2,000 hours in a long term archive.
- Average annual analog conversion rate was 4%

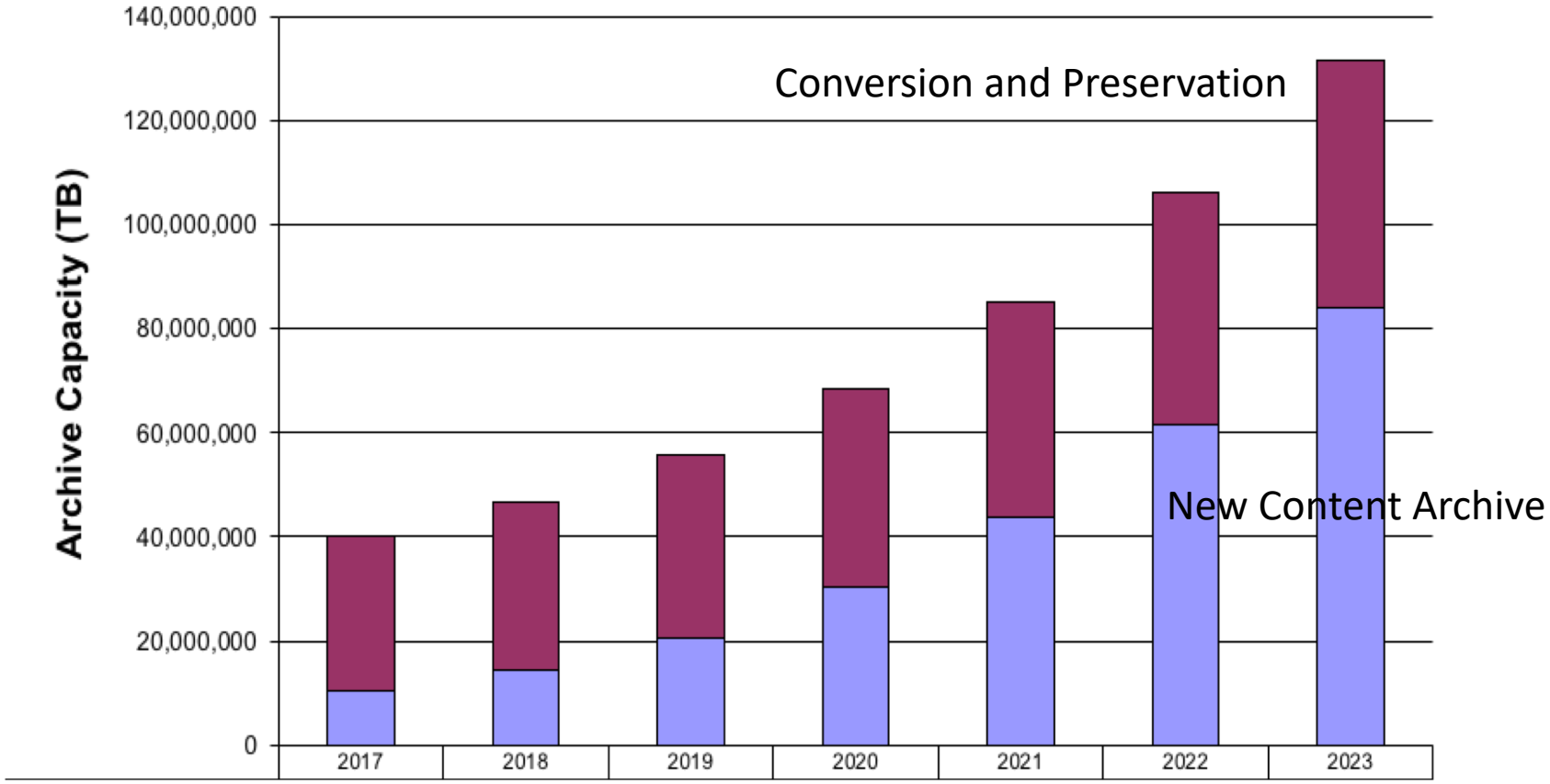
	2009	2010	2012	2013	2014	2015	2016	2017	2018
>2,000 Hrs in Long Term Archive	44%	52%	18%	44%	42%	34%	41%	32%	31.6 %
Archived all content from cameras	40%	34%	63%	49%	47%	58%	57%	61%	53%
Archived copies of content in all distribution formats	55%	57%	71%	57%	69%	63%	54%	68%	76%
Archived all content from dailies		24%	40%	38%	44%	46%	36%	40%	54%
Archived all content from rough cuts		23%	46%	47%	41%	38%	31%	34%	51%
Archived all content captured from intermediaries		30%	8%	46%	39%	37%	37%	28%	38%
Annual archive growth rate >6%				65%	67%	48%	51%	44%	35%
>1,000 hours added annually to archive		39%	9%	34%	35%	27%	31%	24%	24%
>1,000 hours of unconverted analog content	48%	54%	18%	24%	33%	33%	29%	18%	19%
>5,000 hours of unconverted analog content				3%	14%	16%	17%	9%	6%
Annual analog conversion rate				5%	6%	4%	3%	4%	4%

Percentage of Digital Long-Term Archives on Various Media

- For the last two years the survey has shown HDDs percentage higher than magnetic tape
- LTO is the biggest percentage of tape storage at 74%
- Growth in archiving content in the cloud among survey participants



Annual digital storage projections: archiving and conversion & preservation



- Over the next few years content that will be digitized will start to diminish
- Increasing size of new content will drive archive growth

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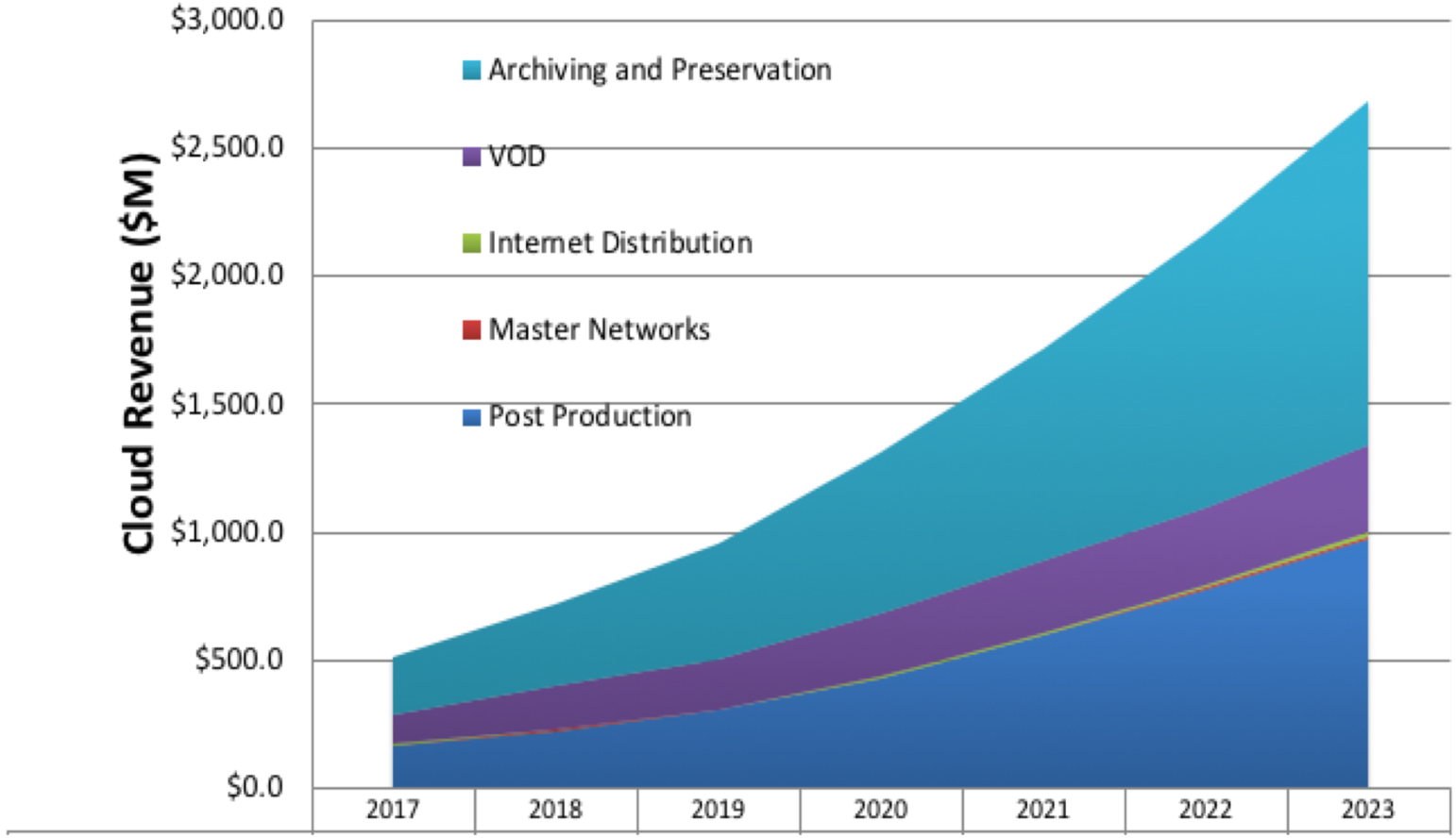
The Cloud in Media and Entertainment

- 77% said that they did proxy distribution through the Internet
- 6% said that they archived on a private or public cloud in 2018
- 66% said they would use a private or public cloud for archiving in 2018



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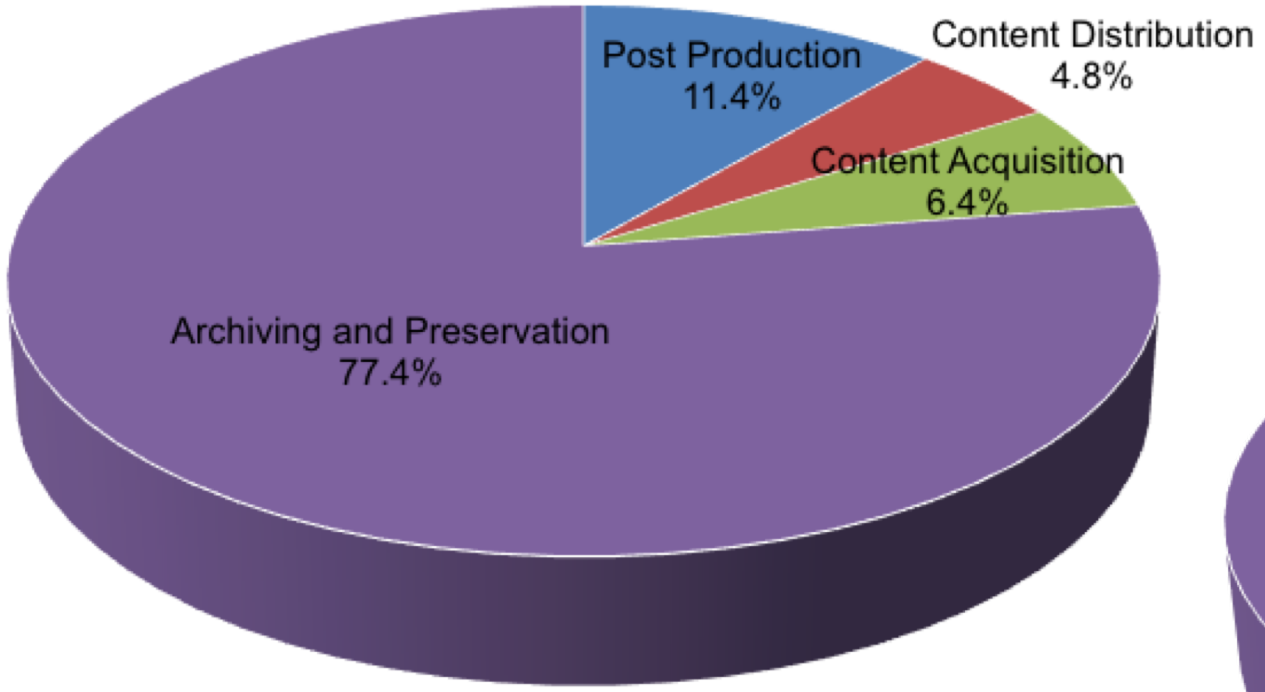
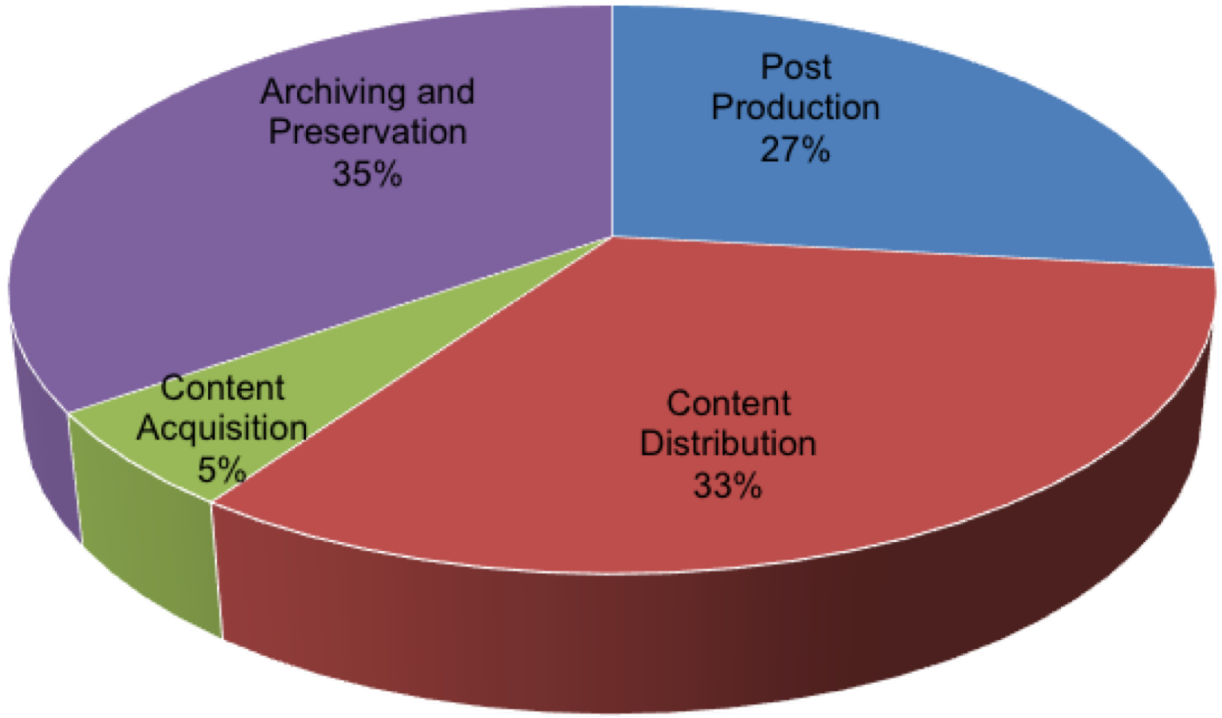
2017 Media and Entertainment Storage



Distribution of Storage Capacity

Storage Revenue Share by Segment



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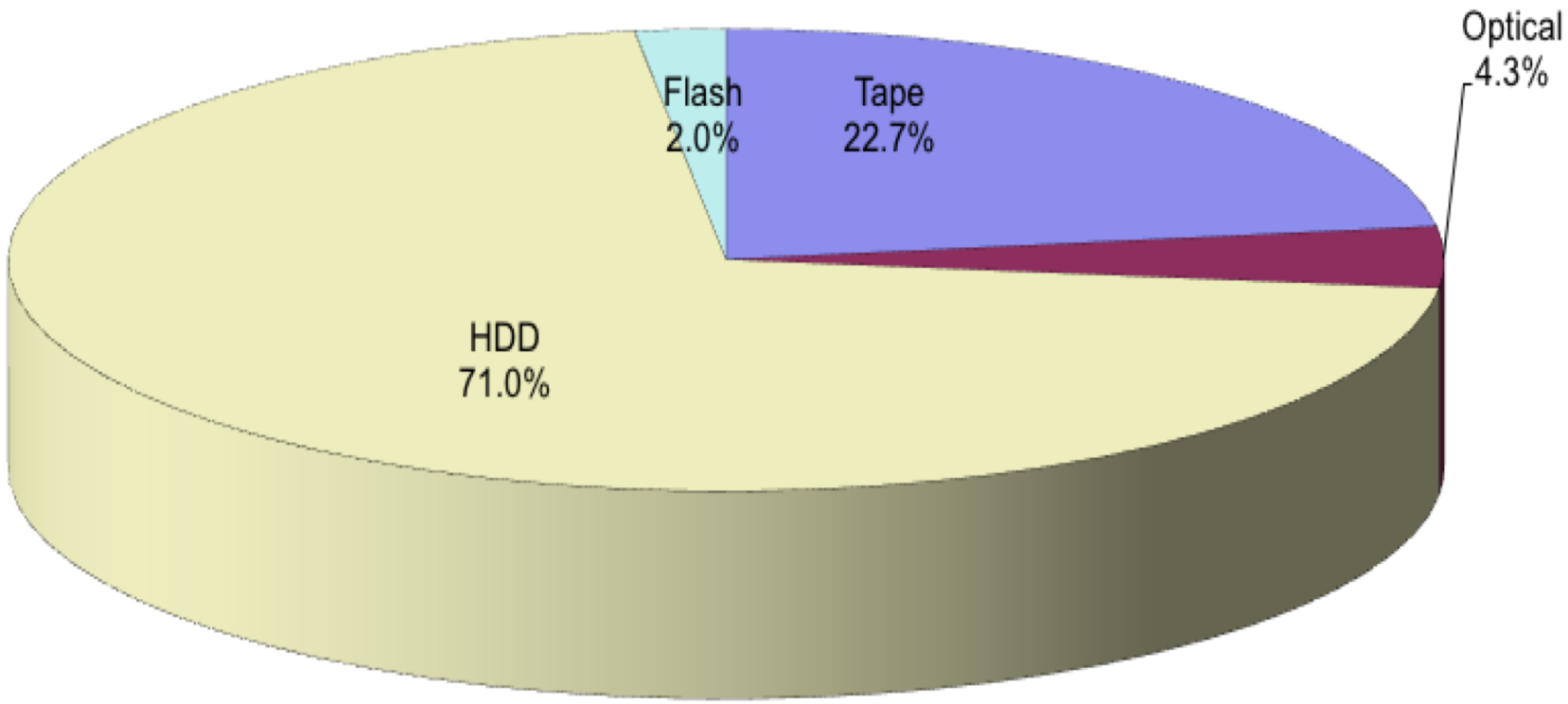
2018 Market Share of Storage Media by Storage Capacity Shipped



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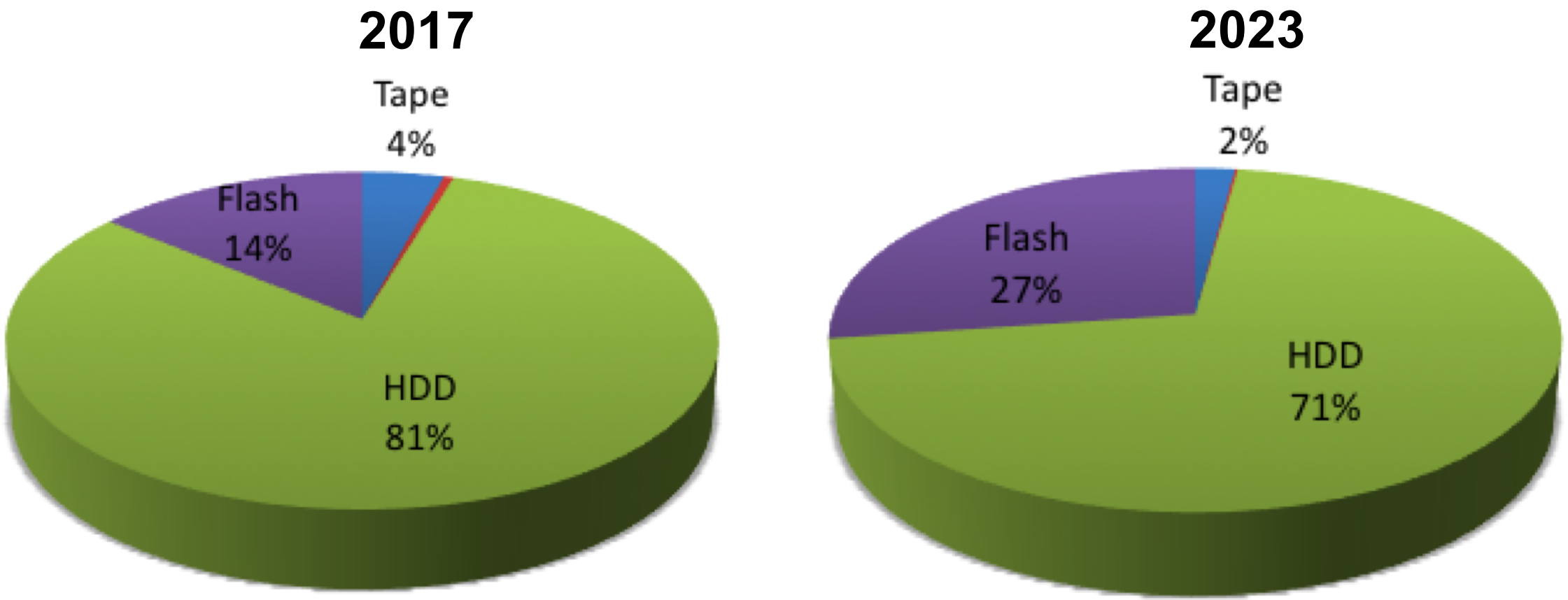
Flash Revenue Share Growing in Media & Entertainment (Revenue by Media Type)



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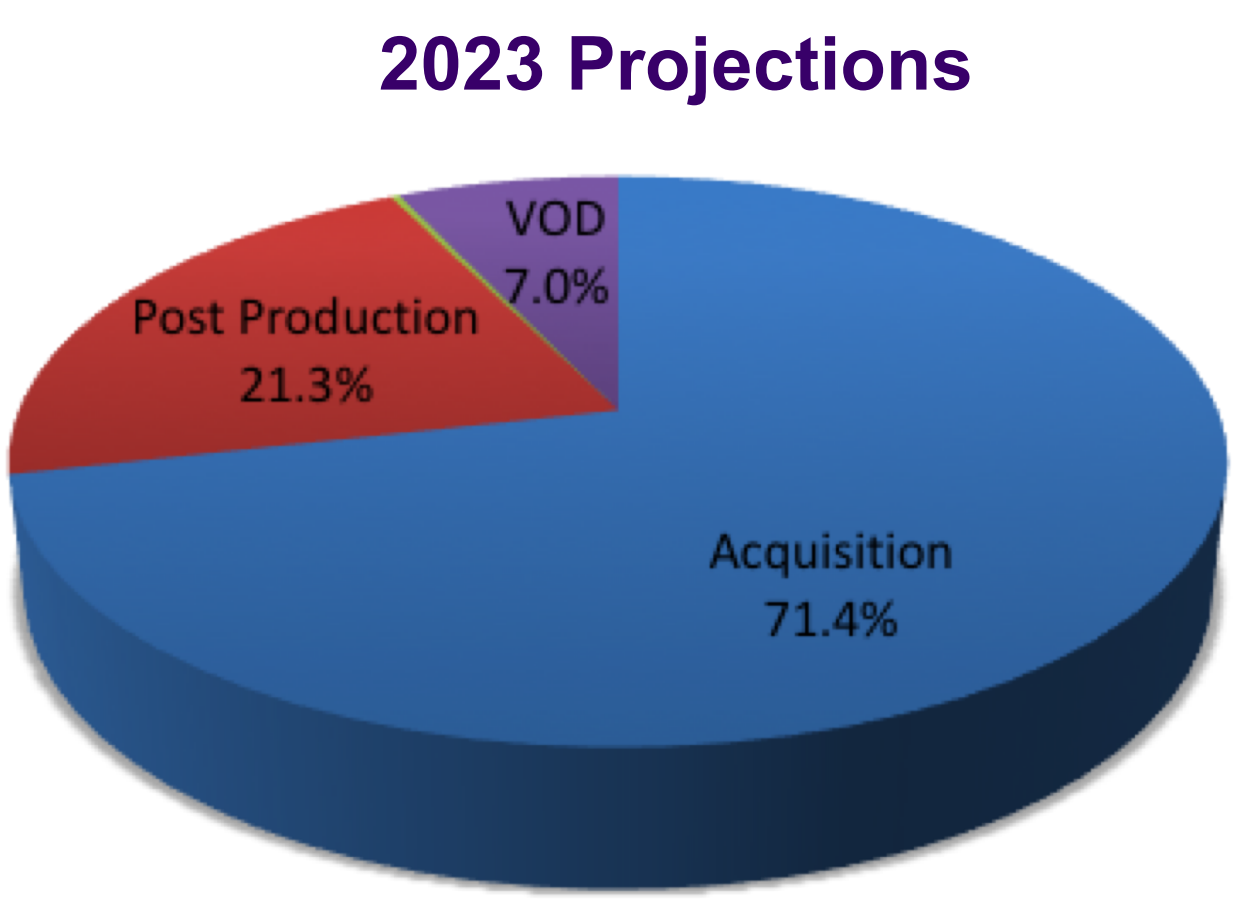
Where Will This Flash Be Used?



- Flash memory used in professional video camera media by 56% of survey participants in 2018
- Use of flash in post production is expected to grow
- For CDN content delivery about 39% used flash memory on their edge servers in 2018

2018 Digital Storage in Media and Entertainment Report, Coughlin Associates

Media and Entertainment Storage Trends

- Media and entertainment workflows have many different storage requirements.
- The best combination of performance and cost can often be attained by a combination of various storage technologies in a storage system.
- Over these nine years M&E professionals have moved to greater use of flash memory in many applications, particularly content capture and content delivery and more recently in post-production.
- Cloud storage (public and private) will play an increasingly important role in all aspects of professional media and entertainment.
- Active archives, often using HDDs rather than tape as well as cloud storage are becoming more popular

References

- T. M. Coughlin, “2014 Survey Summary for Storage in Professional Media and Entertainment,” 2014 SMPTE Annual Technical Conference and Exhibition
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