

**SDC** 19

September 23-26, 2019  
Santa Clara, CA

# Opportunities for Storage in the Growing Global Markets for Video Games

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## Agenda

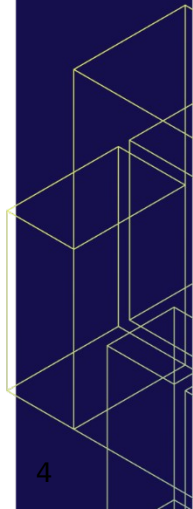
- Why talk about video games?
- Overview of historical trends
- Summary
- Q&A

## Why talk about video games?

- Playing games is fun.  
(Though making games is real work.)
- Big money, steady growth
- Opportunity through unmet need

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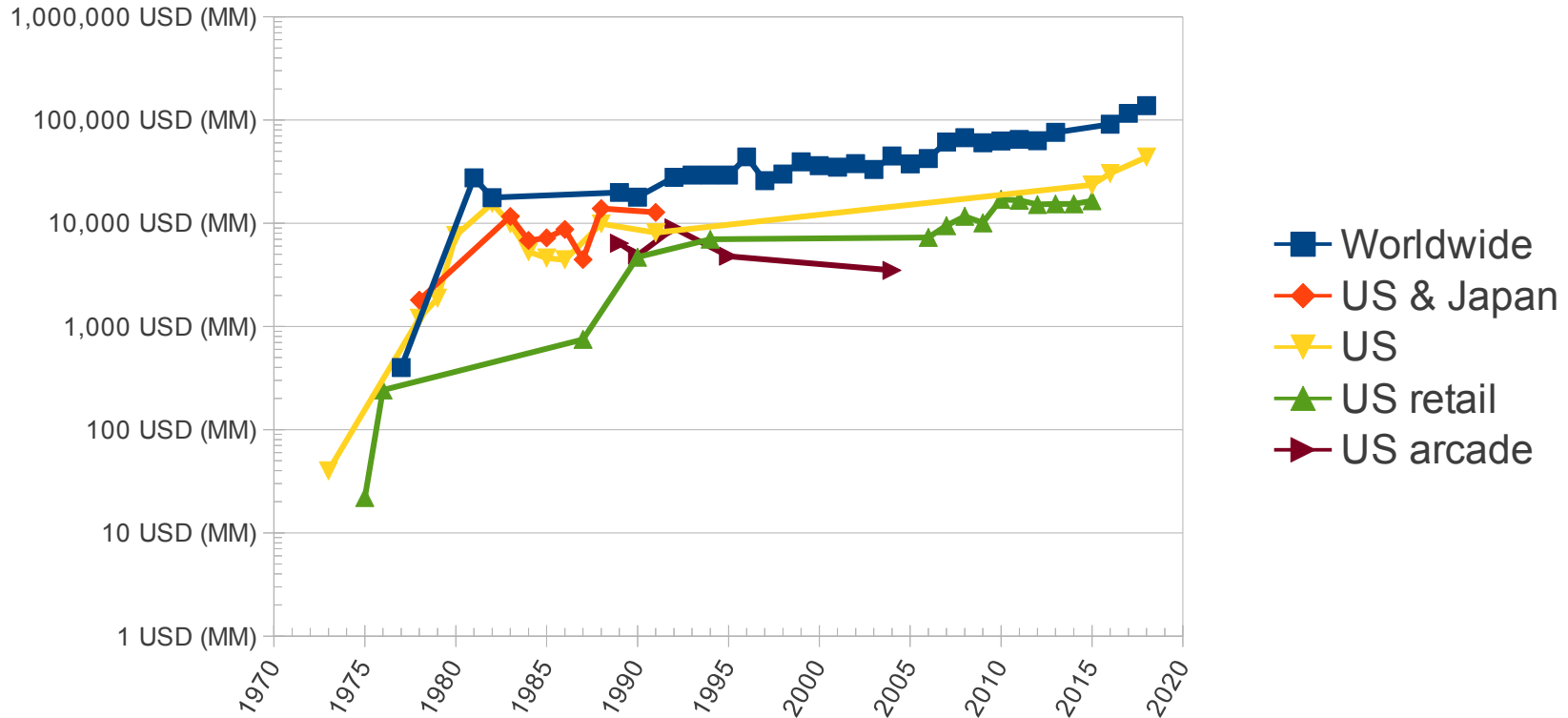
## How big is the market?



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## Annual Sales (MM USD)

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## Key Ideas

- Digital storage is the canvas upon which game developers paint.
- In Silicon Valley, we are in the business of selling the future.
- “I know of no way of judging the future but by the past.” – Patrick Henry, 1775

## A Quick History of Video Games

- 1921-1929: Philo T. and Elma Gardner "Pem" Farnsworth invent electronic television
  - 1927: Patent issued while based in San Francisco
- 1958-1959: William Higinbotham creates oscilloscope-based game *Tennis for Two*
  - *Interesting, though few owned oscilloscopes*

~ A Vignette, About 50 Years Ago ~



## 50 Years Ago (1996 interview about 1969):

- Interviewer: The image dissector was used to send shots back from the moon to earth.
- Elma Farnsworth: Right.
- Interviewer: What did Phil think of that?
- Elma Farnsworth: We were watching it, and, when Neil Armstrong landed on the moon, Phil turned to me and said, "Pem, this has made it all worthwhile." Before then, he wasn't too sure.

## A Quick History of Video Games – 1970s:

- Ralph Baer invents video games
  - Creates Magnavox Odyssey using discrete logic
- Atari sees it and makes coin-operated Pong
  - Also using discrete logic
  - Made ASIC for Home Pong

## A Quick History of Video Games – 1970s:

- Microprocessors invented (4-bit i4004; 8-bit i8008, F8, MC6800, MCS6501, MCS6502)
- Games distributed on ROM cartridges
  - Also on audio cassette tapes and 5¼” floppy disks, if you could afford RAM to load programs into
- 16-bit CP1600 in Mattel Intellivision

## A Quick History of Video Games – 1980s:

- RAM gets cheap (so do floppy disks)
- 1983 North American Video Game Crash
- Games still distributed on ROM cartridges
  - Also on 5¼” and 3½” disks, though you quickly needed a hard disk drive to load programs into
- **16-bit MC68000 in Sega Genesis**

## A Quick History of Video Games – 1990s:

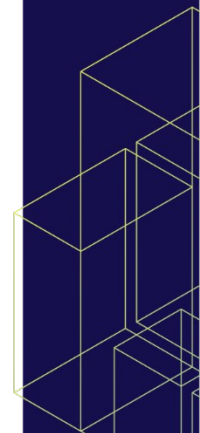
- Nintendo
  - Partners with Sony for Super Nintendo
  - Partners with Silicon Graphics for Nintendo 64
  - Makes first coin-operated game with a hard disk
- Sony PlayStation makes CD-ROM affordable

## A Quick History of Video Games – 2000s:

- Microsoft Xbox
- Optical Discs Get More Density and Layers
- HDDs Enable Network Downloads
- Nintendo adopts MEMS, releases Wii
  - Keeps it simple, takes 50% market share

## A Quick History of Video Games – 2010s:

- More of same
- Nintendo Switch





What does history teach us?

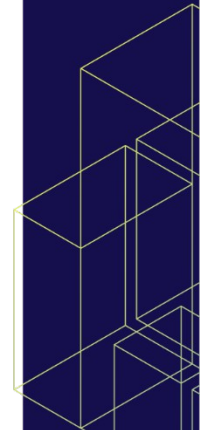


## The costs of developing for new media:

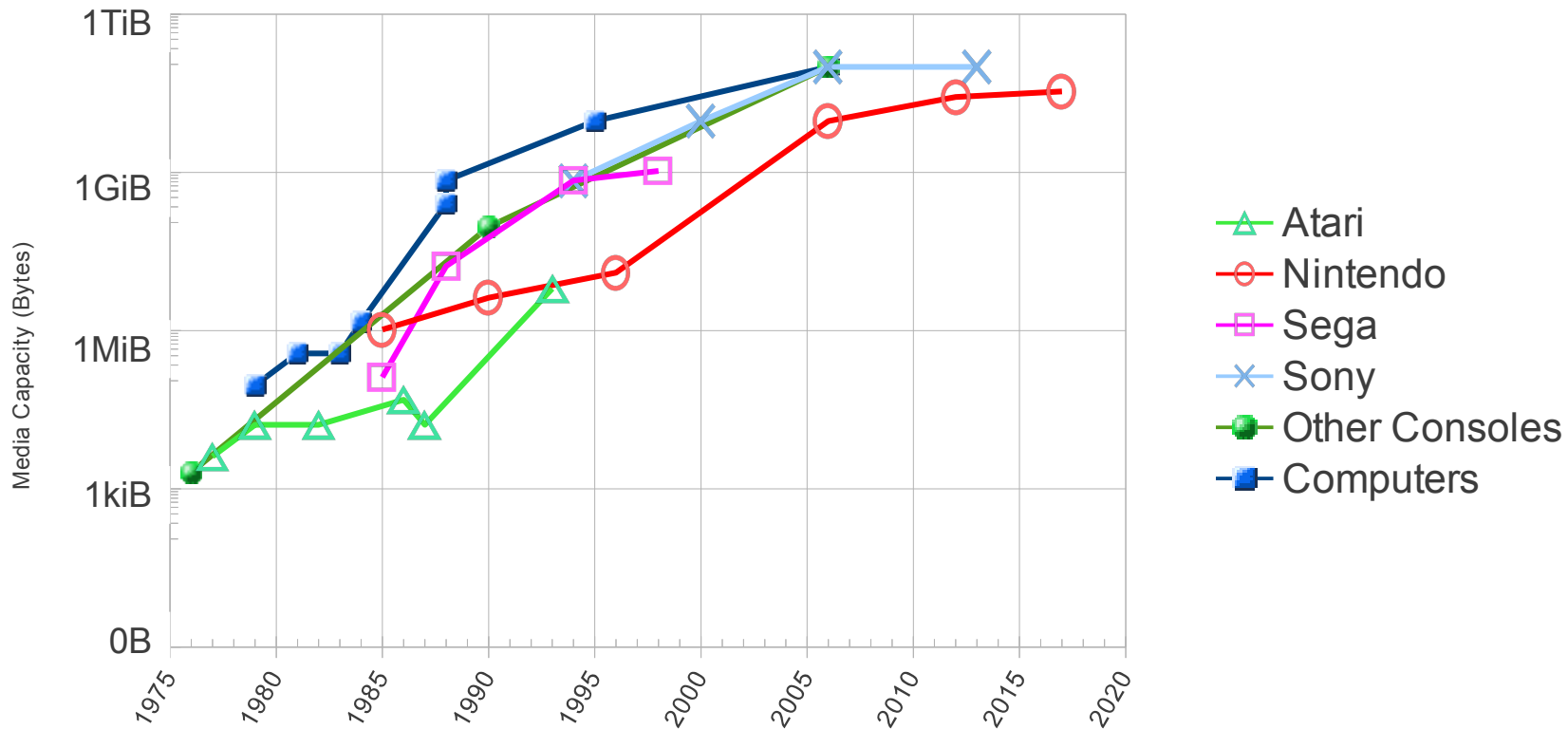
- Super Nintendo programming tool
  - \$60k in 1990, \$15k in 1991
- CD-ROM mastering tool: \$25k in 1991
- Nintendo 64 programming tool (SGI Onyx):
  - \$100k+ in 1995 (plus building wiring)

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## Network-based delivery doesn't keep up

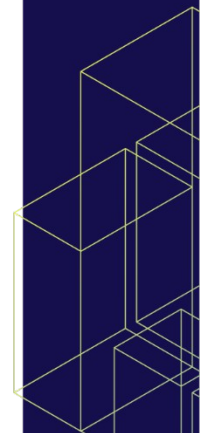


## Size of Distribution Media by Year



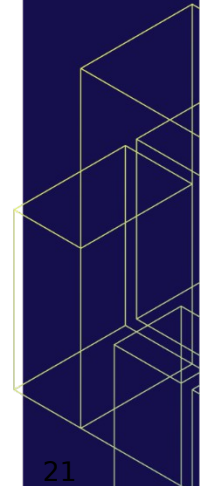
## Summary

- More media = more game
- If using ROM, need to emulate in situ



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## Questions and discussion?





Thank you

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