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ANIMATION SCRIPT

STORAGE SOLUTIONS: CAN WE REIMAGINE THE TRADE-OFFS THAT LIMIT FLASH STORAGE DEVICES?

DR BRYAN S. KIM

TO MAKE THE MOST OUT OF THIS SCRIPT, YOU COULD:

• Stick it in your book as a record of watching Bryan's animation

• Pause the animation and make notes as you go

• Add your own illustrations to the sheet

• Create your own animation to accompany it

• Add notes from classroom discussions

• Make notes of areas you will investigate further

• Make notes of key words and definitions

• Add questions you would like answered – you can message Bryan through the comments box at the bottom of his article: **www.futurumcareers.com/storage-solutions-can-we-reimagine-the-trade-offs-that-limit-flash-storage-devices**

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SCRIPT:

In today's technology-driven world, the amount of data that each of us generates is increasing rapidly. Every photo you take on your phone, every save you make in a video game and every word document you create for school needs to be stored somewhere.

There is a high chance that most of your devices use something called flash storage to store all your information.

Flash storage, also known as solid-state drives (SSDs), is a type of electronic data storage that keeps its data persistently. This means that when you turn the storage device off and back on again, all the data will still be there.

Hard disk drives store information using a combination of magnetic and mechanical parts that make them bulkier and susceptible to damage from vibrations and physical disturbances like being dropped.

In contrast, SSDs are completely electronic, allow computers and devices faster access to information stored in them and consume less power than HDDs. However, SSDs are significantly more expensive than HDDs.

Most of the cost-reduction efforts require making some trade-offs in the three aspects of data storage, which are the capacity (cost per byte), reliability (error rate) and performance (how fast data can be accessed). Getting the right balance in the trade-off is a challenge engineers and scientists are trying to solve.

Dr Bryan S. Kim, an assistant professor at the College of Engineering and Computer Science at Syracuse University in the US, is researching flash storage systems to discover innovative methods that may improve their efficiency.

Bryan's research shows that attempts to increase the capacity of flash storage by increasing its density result in increased error rates and reduced reliability. Meanwhile, techniques that attempt to improve reliability cause a reduction in performance, thus highlighting the trade-off between capacity, reliability and performance

Indications that a system is failing because of its age and the wearing out of its components are called fail-slow symptoms. These are observed as slower processing speeds and higher rates of errors. One solution to combat the deteriorating systems involves spreading the failing cells equally around the drive.

Bryan argues that doing that encourages an all-or-nothing failure state. He proposes a capacity-variant model that would allow a system to sacrifice capacity to maintain performance and reliability.

Bryan and his team have collected and analysed lots of data that highlight the problems with wear levelling, which they hope will strengthen their argument for capacity-variant systems.

Bryan believes this could help significantly improve the reliability of flash drives and our modern technological devices.

What could you achieve as a computer engineer?