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NATIVE AMERICAN HERITAGE MONTH

Tara Astigarraga

Enterprise Storage, Failure Prediction, and a Career Built on Curiosity

Engineering for Reliability

Tara Astigarraga is a citizen of the Choctaw Nation of Oklahoma, born and raised in Arizona. She graduated from the University of Arizona with a double major in communication and Spanish linguistics — not computer science. She joined IBM as an intern at its Tucson site during her senior year and was hired full-time after graduation, learning engineering on the job in IBM's systems and storage organization.

Her first patent, granted in 2008, addressed **end-of-life prediction for flash memory**. NAND flash stores bits as charge trapped in memory cells. Every **program/erase cycle** slightly degrades a cell, so each has a finite endurance. Storage controllers track wear, apply **wear leveling** to distribute writes, and reserve spare blocks. Predicting when a device will exhaust its endurance turns a sudden failure into a scheduled replacement — critical in **enterprise storage**, where one array may hold a hospital's records or a bank's transactions.

Astigarraga went on to earn more than 70 patents spanning storage, server and networking systems, security, and blockchain. IBM recognized her as a Master Inventor and a Distinguished Engineer, among the company's most senior technical titles. Her work in systems assurance centers on testing how complex systems behave when components fail.

Alongside her technical work, she has served as vice president of the Tucson Native American Diversity Network and has built mentoring programs connecting IBM's Native American employees with Native American students. She has spoken publicly about overcoming impostor syndrome early in her career, and about the role her first patent and her mentors played in that.

Part 1 • Comprehension & Analysis

1. Why does NAND flash have a finite lifespan, and what engineering techniques extend it?

2. Explain how failure prediction changes the cost and risk of a storage failure in an enterprise setting.

3. Astigarraga's degrees were in communication and Spanish linguistics. Identify two ways that background could be an advantage in engineering and patent work.

4. What is systems assurance, based on the passage, and why is it important for systems that hold critical data?

Part 2 • Quantitative Challenge

Projecting Drive End-of-Life From Wear Data

Example data: a solid-state drive reports its remaining endurance. On day 0 it shows 100% life remaining, on day 200 it shows 92%, and on day 400 it shows 84%. Assume wear is linear unless told otherwise. Show your work.

- 1 Calculate the wear rate in percent of life used per day.

- 2 At this rate, on what day will the drive reach 0% remaining? About how many years is that?

- 3 The administrator wants a warning when 10% life remains. On what day will that happen, and how many days after day 400 is it?

- 4 Starting on day 400, the workload doubles, so the wear rate doubles. On what day will the drive now hit the 10% warning?

- 5 Give one reason a straight-line projection might be wrong for a real drive.

Part 3 • Discussion & Extension

Astigarraga has spoken about overcoming impostor syndrome and about the mentors who helped her. Many talented students never enter technical fields because they do not believe they belong. What specific actions could schools, companies, or communities take to change that — and which do you think would matter most?
