**Student Name:** Joven Rosales  
**Course Name:** CS230  
**Instructor Name:** Barbara Hecker  
**Date:** 4/9/2025

Memory and Storage Management for *Draw It or Lose It*

**Memory Management**

The game application *Draw It or Lose It* requires efficient memory management to ensure fast performance and responsiveness. The game involves rendering 200 high-definition image files, each about 8 MB, totaling approximately 1.6 GB. Since each image must render smoothly during a timed round, memory must be managed carefully to avoid performance issues. To achieve this, the application should use strategies such as image compression (e.g., WebP format), preloading images before rounds begin, and lazy loading images only when needed. For example, only loading the next three images into RAM at once during a round reduces unnecessary memory usage. Additionally, GPU acceleration should be used to handle rendering instead of relying solely on the CPU, improving speed on low-resource devices. According to Silberschatz, Galvin, and Gagne, “Memory management is the act of managing system memory dynamically and efficiently, deciding which processes are to be kept in memory and which are to be swapped out” (*Operating System Concepts*, 8th ed., p. 357). This principle applies directly to how the application handles image data during real-time gameplay.

**Storage Management**

Storage refers to how permanent data—such as image files, user profiles, and game history—is saved and managed. In *Draw It or Lose It*, proper storage management ensures scalability and reliability across multiple game sessions and users. With 1.6 GB of image files alone, the application should store assets in cloud-based services like Amazon S3 or Google Cloud Storage. These services offer fast, distributed access while reducing local disk usage. Game data, like team configurations and user statistics, should be stored in cloud databases such as Firebase or PostgreSQL. For example, storing each player’s win/loss history allows the game to personalize user experiences and support competitive features. Metadata tagging of images (e.g., category or difficulty) can also improve retrieval speed. Silberschatz et al. explain, “Secondary storage provides the permanent storage of information, and proper file-system management ensures that data is stored and retrieved efficiently” (*Operating System Concepts*, 8th ed., p. 533), highlighting the importance of effective storage systems in software like this game.

**Comparison of Memory and Storage**

Memory and storage serve distinct but equally important roles in the application. Memory is temporary and supports the real-time performance of the game—such as rendering images and managing active gameplay—while storage is permanent and holds the actual game assets, user data, and game history. Memory management impacts speed and smooth user interaction, whereas storage management ensures data persistence and scalability across sessions. Together, they must be carefully balanced to ensure *Draw It or Lose It* can support multiple users and games simultaneously without lag or data issues.

**References**

Silberschatz, A., Galvin, P. B., & Gagne, G. (2009). *Operating System Concepts* (8th ed.). Wiley.