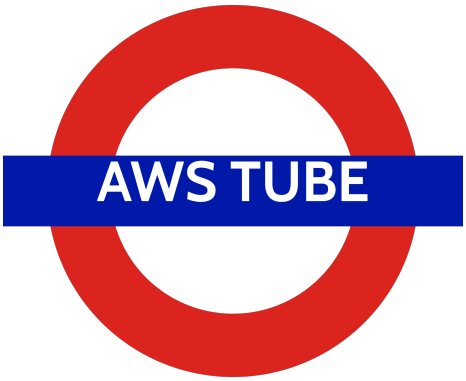

Figure 1: CLICK HERE TO ENTER STATION

Recovery Sheet 6

SJ Green

This sheet is all about storage on AWS. We're recovering from the session delivered on the night of **Wednesday 19th February 2025**. You can view the recovery sheet for the previous week here.

1 Active-Active

Description

1. **Object storage**. Object storage is "a computer data storage approach that manages data as "blobs" or "objects", as opposed to other storage architectures like file systems, which manage data as a file hierarchy, and block storage, which manages data as blocks within sectors and tracks." [Wikipedia 2025].

2. **Amazon S3**. If you place an object in an S3 bucket today, and intend it to last, there is a strong chance the object will still exist once everybody moving about on earth as you read this sentence has completely decomposed.

   Amazon Simple Storage Service (which is SSS, or S3), is the main storage service on AWS. Introduced in 2006 (the formal year of the beginning of

AWS), S3 helps a vast multitude of other products to run; Amazon Inspector can place vulnerability reports in S3, AWS CloudTrail can place records of API calls in S3, snapshots of EBS volumes can be placed in S3, and so on.

S3 is "a service offered by Amazon Web Services (AWS) that provides object storage through a web interface" [Wikipedia 2025] Objects are stored in *buckets*, which act like folders.

3. **Block storage**. "Block storage is technology that controls data storage and storage devices. It takes any data, like a file or database entry, and divides it into blocks of equal sizes. The block storage system then stores the data block on underlying physical storage in a manner that is optimized for fast access and retrieval" [Amazon web page, What is block storage? 2025].

4. **File Storage**. "File storage, also called file-level or file-based storage, is a hierarchical storage methodology used to organize and store data on a computer hard drive or on network-attached storage (NAS) device" [IBM Web Page 2025]

5. **Amazon EFS**. Description goes here.

6. **Amazon FSx**. This product name, with the x being a variable, so that it can stand for lots of different file systems, was unveiled by Amazon in 2018. There was FSx for Lustre, FSx for Windows File Server, and FSx for NetApp ONTAP.

7. **Instance store volumes**. Description goes here.

8. **EBS**. Description goes here.

9. **Glacier**. Description goes here.

10. **S3 Event Notifications**. Description goes here.

2 Warm Standby

1. **Object storage**. Object storage is "a computer data storage approach that manages data as "blobs" or "objects", as opposed to other storage architectures like file systems, which manage data as a file hierarchy, and block storage, which manages data as blocks within sectors and tracks."

[Wikipedia 2025].

In 1995, research by Garth Gibson on Network-Attached Secure Disks first promoted the concept of splitting less common operations, like namespace manipulations, from common operations, like reads and writes. This is in order to optimise the performance and scale of both (of the less common operations, and also the common operations) [Wikipedia 2025].

2. **Amazon S3**.

3. **Block storage**"Block storage is technology that controls data storage and storage devices. It takes any data, like a file or database entry, and divides it into blocks of equal sizes. The block storage system then stores the data block on underlying physical storage in a manner that is optimized for fast access and retrieval" [Amazon web page, What is block storage? 2025].

   In the background here is the notion of a *block device*. The Open Group give a definition for a *block special file*, writing: " A block special file is normally distinguished from a character special file by providing access to the device in a manner such that the hardware characteristics of the device are not visible." So, it seems that an important property of the notion of block storage is that the physicality of the storage is kept hidden; the hardware characteristics are "not visible".

   Wikipedia adds that there is buffered access to the device, presumably meaning that you wait when you want to access the storage - multiple accesses are queued up and then performed at once. The article entitled "Device file" goes into block devices, saying: "Block special files or block devices provide buffered access to hardware devices, and provide some abstraction from their specifics" [Wikipedia 2025] Unfortunately, the Wikipedia article is not properly referenced, so I cannot verify these claims.

   The ambitious author of the Wikipedia article continues: "Unlike character devices, block devices will always allow the programmer to read or write a block of any size (including single characters/bytes) and any alignment. The downside is that because block devices are buffered, the programmer does now know how long it will take before written data is passed from the kernel's buffers to the actual device, or indeed in what order two separate writes will arrive at the physical device". Clarification is needed here, of why buffering results in unpredictability, and also of why block devices, seemingly defined by fized sized blocks, allow writing a block "of any size". Still, this is enough for now. This *block device* is basic. From it, we get the idea of block-level storage. When AWS refer to "block storage", they are talking about technologies that emulate *block devices*. A hard drive is a traditional example of a block device [Amazon Web Services in Action, Wittig 2015].

4. **File Storage**. "File storage, also called file-level or file-based storage, is a hierarchical storage methodology used to organize and store data on a computer hard drive or on network-attached storage (NAS) device" [IBM Web Page 2025]

   "Cloud File Storage is a method for storing data in the cloud that provides servers and applications access to data through shared file systems. This compatibility makes cloud file storage ideal for workloads that rely on shared file systems and provides simple integration without code changes" [What is Cloud File Storage, AWS 2025]

   You may get confused between NAS and DAS, like me. It may help to remember that NA stands for Network-attached. So, there is some distance involved. The storage is separate, and accessible only over the network. What entities are great for sharing with other persons? *Files*. It is *files* that you share with friends. Therefore, NAS is for files. It's SAN which we associate with block storage; you have a whole big area for the whole big block (as it were...).

   Examples of file systems include NTFS (New Technology File System) and the Common Internet File System (CIFS). There are some **communication protocols** that you may come across, such as Server Message Block, developed by Microsoft.

5. **Amazon EFS** EFS stands for Elastic File System. The "Elastic" term is common in Amazonian products (think of Elastic Block Store, Elastic Cloud Compute, and Elastic Network Interfaces). Physicists describe collisions in which no energy is given off (think of two atoms bouncing off one another without making a sound) as *elastic collisions*. *Everything is as it was before*. No changes are permanent, or *plastic*. This is a filesystem which you'll find "growing and shrinking automatically as you add and remove files". [EFS User Guide]

   Please note that Elastic File System tends to be used with Linux, and not Windows, operating systems. This is because EFS supports NFS, and NFS tends to be used on Linux. This is NFS, the Network File System, spluttering into existance the year Zuckerburg, creator of the social network, emerged from the womb. The rays of of the sun pierced the sky like never before on the first day of *that* year. The network of magnificient solar rays formed across the sky in 1984, as **NFS** came onto the scene, has nothing to do with NTFS, or *empty*FS as I call it, becaus it pales into the magnificent NFS, which stands for Network File System and was developed by Sun Microsystems in 1984.

   AWS wrote in 2016, as they released this product: "Today, companies of all sizes are moving their critical workloads to the AWS Cloud. Many

of these workloads depend on Network Attached Storage (NAS). Traditionally, it has been costly and time consuming to operate shared file systems because file growth if unpredictable, procurement times are long, and monitoring and patch management are administrative burdens. Now, with Amazon EFS, customers can create and use shared file systems that are simple, scalable, and reliable". Notice how *shared* file systems are being introduced here. [AWS 2016]

6. **Amazon FSx**.
7. **Instance store volumes**. Description goes here.
8. **EBS**. Description goes here.
9. **Glacier** Description goes here.
10. **S3 Event Notifications** Description goes here.

3 Pilot Light

The pilot comes aboard ships in unfamiliar waters to sort out shit.

1. **Object storage**.
2. **Amazon S3**.
3. **Block Storage** Description goes here.
4. **File storage**. Description goes here.
5. **Amazon EFS** Description goes here.
6. **Amazon FSx**. Description goes here.
7. **Instance store volumes**. Description goes here.
8. **EBS**. Description goes here.
9. **Glacier** Description goes here.
10. **S3 Event Notifications** Description goes here.
11. **Term 10**. Description goes here.

4 Backup

1. **Object storage**. Description goes here.

2. **Amazon S3**.

3. **Block storage**.

4. **File storage**

   What is file storage? Accessed June 18th 2025. Available at: `https://www.ibm.com/think/topics/file-storage`

   Server Message Block. *Wikipedia*. Available at: `https://en.wikipedia.org/wiki/Server_Message_Block`

5. **Amazon EFS**.

   Morris, Gina (2018). Your Virtual Data Center. Reinvent 2018 [Conference]. Available at: `https://www.youtube.com/watch?v=jZAvKgqlrjY&t=71s`

6. **Amazon FSx** Description goes here.

   Barbaschow, Asha (2018). Amazon rolls out FSx for Windows File Server. ZDNet.com. Available at: `https://www.zdnet.com/article/amazon-rolls-out-fsx-for-windows-f`

   Network File System. *Wikipedia*. Available at: `https://en.wikipedia.org/wiki/Network_File_System`

7. **Instance store volumes**.

8. **EBS**

   Seymour, Steve (2018). Introducing AWS Transit Gateway. *Reinvent*

2018 [Conference]. Available at: https://www.youtube.com/watch?v=yQGxPEGt_-w

9. **Glacier** Description goes here.

   Introducing Amazon VPC Lattice. Dec 8th 2022. *Reinvent* [Conference]. Available at: https://www.youtube.com/watch?v=fRjD1JI0H5w

   Davies, Justin (2023). Amazon VPC Lattice architecture patterns and best practices. Available at: https://www.youtube.com/watch?v=zQk9AIPVdXs

10. **Term 10** S3 Event Notifications