

The concept of caching can be described using a metaphor of a plumber driving to work with their various tools in the van and toolbox. Another convenient metaphor that can be used to explain caching is the job of a magician. Similar to the plumber, the magician will have certain props in hand before they perform their act, just like how the plumber has a small toolbox nearby to begin their work. In this metaphor, the magician needs to arrive at his/her performance location with the prepared equipment and props for the act. In this scenario, the main memory represents the leftover props the magician would leave in the car that he/she doesn't think they would need for the act but has just in case. Since these props are in the car which is far away from the performing magician, it would take a lot of time for the magician to walk back to the parking lot to retrieve his/her leftover props, just like how retrieving data from main memory takes more time. In a similar way the plumber has tools in the back of the van for use that is closer in proximity compared to back at the shop, the magician keeps certain props backstage that are looked after and prepped by the magician's hired helpers. These backstage props represent the processor cache because it is faster to retrieve the props backstage than compared to walking all the way to the parking lot. For the plumber, the register represents the tools directly beside the plumber that are in reach and ready to use, signifying the speed it takes to grab those tools. Similarly, the magician has props hidden inside their jacket or hat that can easily be accessed. In caching, the data in the ALU is responsible for actually performing the action, so the hands of the plumber perfectly represents this. This also mirrors perfectly with the magician metaphor as the magician's sleight of hand dictates the performance. A cache miss in the magician metaphor would be the scenario in which the magician asks the helpers backstage to bring in a certain prop where the requested prop is not backstage. Upon realizing it's not backstage, the helpers make their way to the magician's car to retrieve the prop and walk back to the magician. In a cache hit scenario, the magician requests his helpers backstage for the tampered deck of cards and the helpers successfully retrieve it and hand it to the magician. Spatial and temporal locality contribute to cache efficiency as it relates to retrieving the data that's either always in use or are nearby. This can be represented using the magician metaphor. For spatial locality, the props that are hidden inside the magician's outfit during the act are likely to be used soon in the performance. The concept of temporal locality can be described in a scenario where the magician specifically specializes in sleight of hand. In this situation the magician has certain go-to props such as the deck of cards and coin. This sleight of hand magician will always have certain techniques to execute with these objects in their performances, such as slipping the coin into the sleeve or swapping the deck of cards underneath a table. These specific actions represent temporal locality because it is likely for the magician to continue executing these techniques with those props.