**what are all the types of hash table implementations and what all followed in python and what all in java**

There are several types of hash table implementations; Python and Java use different strategies tailored to their design goals and typical usage scenarios.[[1]](#fn1)[[2]](#fn2)

**Types of Hash Table Implementations**

* **Open Addressing:**  
  All entries are stored directly in the array; collisions are resolved by probing for another available slot (can be done via linear probing, quadratic probing, or double hashing).[[2]](#fn2)[[1]](#fn1)
* **Closed Addressing (Separate Chaining):**  
  Each slot in the main array holds a linked list (or other structure), where all elements hashing to that index are stored together.[[3]](#fn3)[[2]](#fn2)
* **Cuckoo Hashing:**  
  Uses multiple hash functions and possible table relocations to ensure constant-time search (not used by Python or standard Java libraries, but seen in some advanced implementations).[[1]](#fn1)
* **Hopscotch Hashing:**  
  Hybrid technique combining open addressing, list-based chaining locality, and neighbourhood management for concurrency and load resilience.[[1]](#fn1)
* **Robin Hood Hashing, Dynamic Hashing, and others:**  
  Specialized schemes for specific needs (less common in standard libraries).[[2]](#fn2)[[1]](#fn1)

**Python**

* **Built-in Dictionary (dict):**  
  Uses **open addressing** with a variant of double hashing for collision resolution, and several memory/chaining optimizations.[[4]](#fn4)
* **Separate Chaining (Custom/User):**  
  Custom implementations (not the default) often use separate chaining for educational purposes or specialized behavior.[[3]](#fn3)

**Java**

* **Hashtable (Legacy):**  
  Uses **separate chaining** (linked lists at each bucket).[[5]](#fn5)[[6]](#fn6)
* **HashMap:**  
  Uses separate chaining; since Java 8, when chain length at a bucket exceeds a threshold, chains are converted to balanced trees for optimal worst-case time.[[6]](#fn6)[[5]](#fn5)
* **ConcurrentHashMap:**  
  Also based on chaining, with segmented locking for parallelism.[[6]](#fn6)

**Comparative Table**

|  |  |  |
| --- | --- | --- |
| Type | Python (default) | Java (default) |
| Open Addressing | ✅ (dict) [[4]](#fn4) | ❌ |
| Separate Chaining | ❌ (dict), ✅ (custom)[[3]](#fn3) | ✅ (Hashtable, HashMap, ConcurrentHashMap)[[5]](#fn5)[[6]](#fn6) |
| Balanced Tree Chaining | ❌ | ✅ (HashMap, since Java 8)[[6]](#fn6) |
| Other: Cuckoo, Hopscotch | ❌ | ❌ |

* **Python’s standard object:** dict uses open addressing.[[4]](#fn4)
* **Java’s standards:** HashMap, Hashtable, and ConcurrentHashMap use separate chaining, with HashMap switching chains to binary trees for long chains.[[5]](#fn5)[[6]](#fn6)
* **Custom/educational** Python hash tables may use chaining but are not standard.[[3]](#fn3)

This covers all the main types and the ones followed in Python and Java.[[2]](#fn2)[[5]](#fn5)[[4]](#fn4)[[6]](#fn6)[[1]](#fn1)[[3]](#fn3)

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1. <https://www.geeksforgeeks.org/java/hashtable-in-java/>

1. <https://www.scaler.com/topics/hashtable-in-java/>

1. <https://leetcode.com/explore/learn/card/hash-table/>

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