

Let's start at 9:02 PM

L46

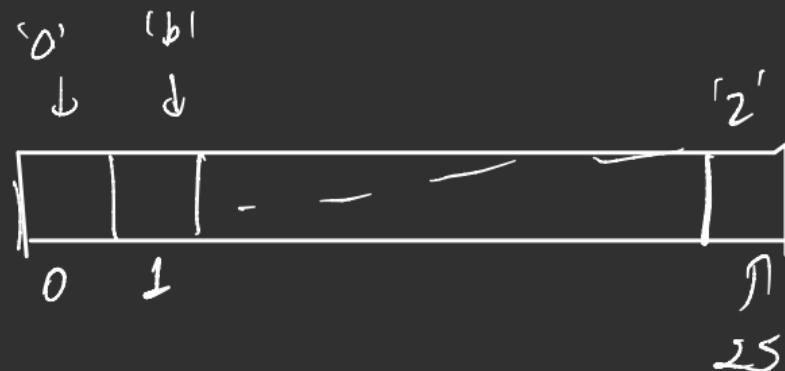
Hash Map : Intuition & Implementation

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RECAP

Remember the tricks we used to store
the frequency of characters in a string?

Character \Rightarrow 'a' to 'z'



Remember creating arrays of size 10^5
to store frequency/lastIndex/firstIndex
etc. for elements of integer arrays?

Hash Map is the saviour

Some more examples?

1. Contacts

Key { "Pulkit" → "7855354321",
 "Frag" → "999999999",
 "Mishchay" → "815864325" } Value-

<string, string> or <string, long>

4-digit
num
name
email
title

2. Employees' information?

```
{ 5217 : {  
    "name" : "Pulkit"  
    "email" : "pulkit@learnyard.com"  
    "title" : "Software Engineer" } }
```

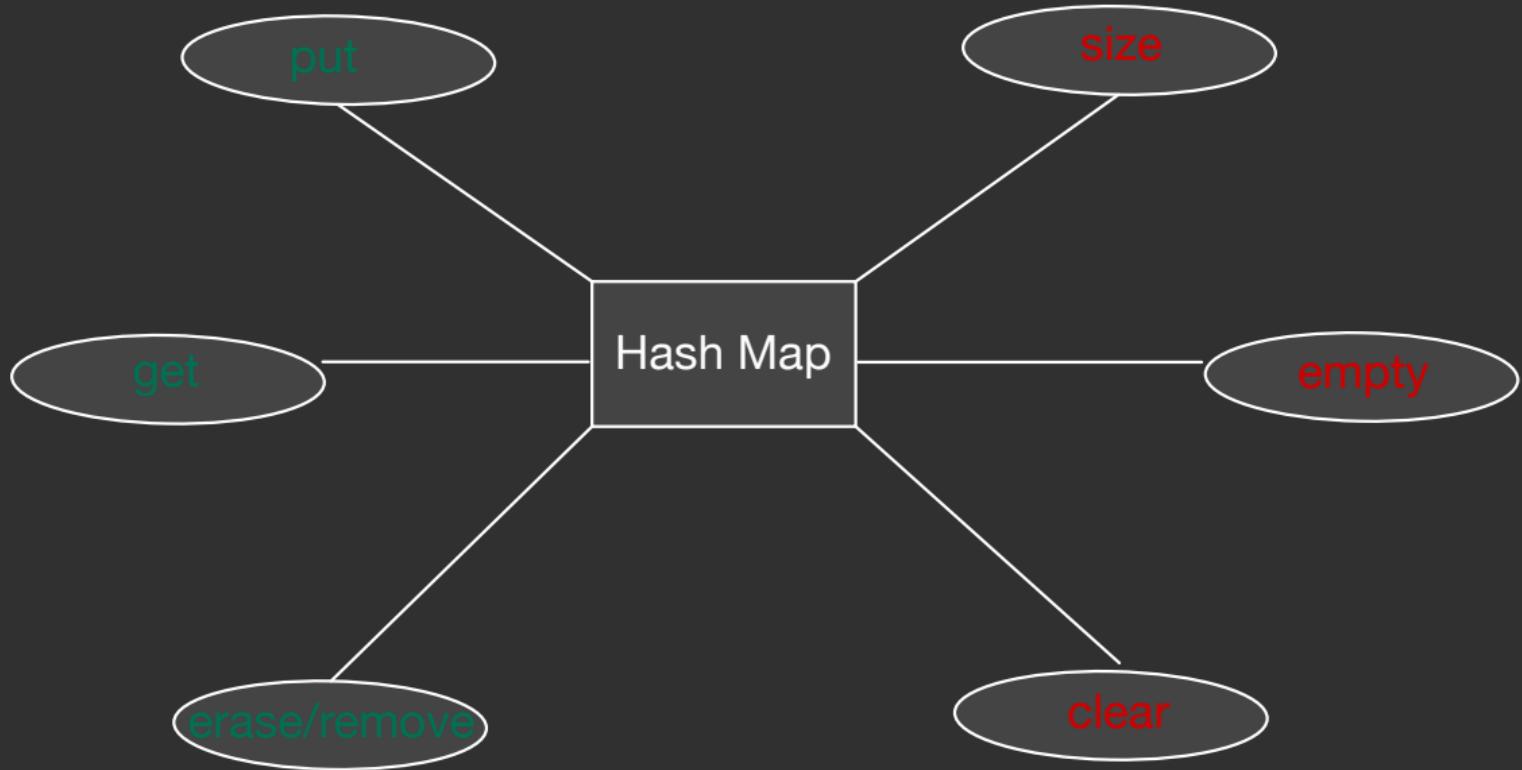
```
map < Intya, map<string, string>>
```

3. Dictionary

Map is actually
called a dictionary
in Python.

Words \Rightarrow keys
Meaning \Rightarrow value

"enthusiasm" \Rightarrow "Being in a lot of excitement."
"algorithm" \Rightarrow "Step-by-step guide to accomplish
a goal".



Let's look at the in-built
implementations first

Intuition

What if we use a LL?

Node ↴

key;
value;
next;

3

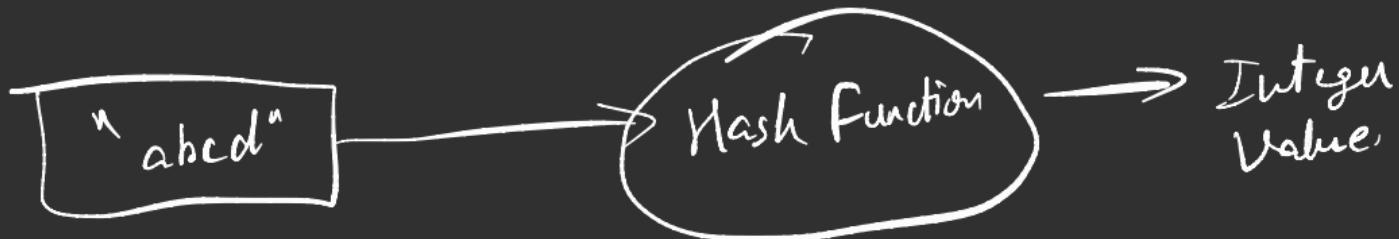
m.put(key, val)
m.get(key)



$O(N)$ time \Rightarrow Not good

How about a Dynamic Array?

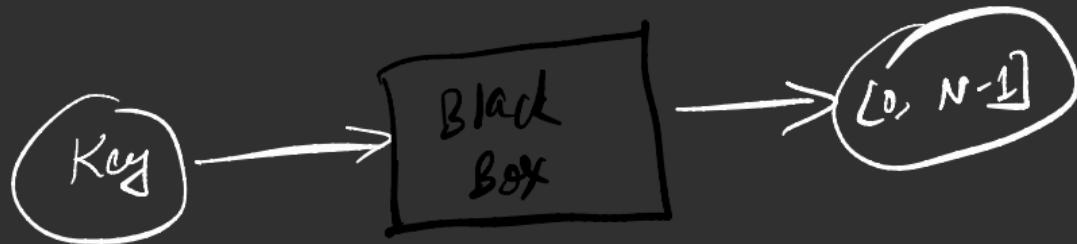
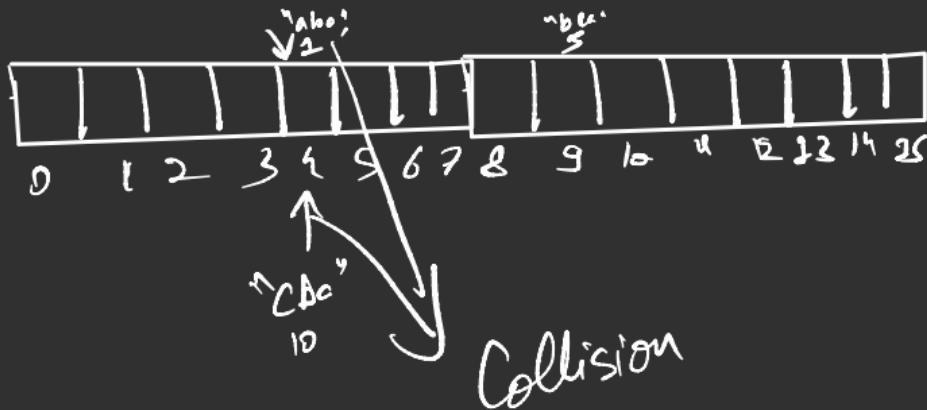
↳ How to convert the keys into indices



The optimal approach

Array

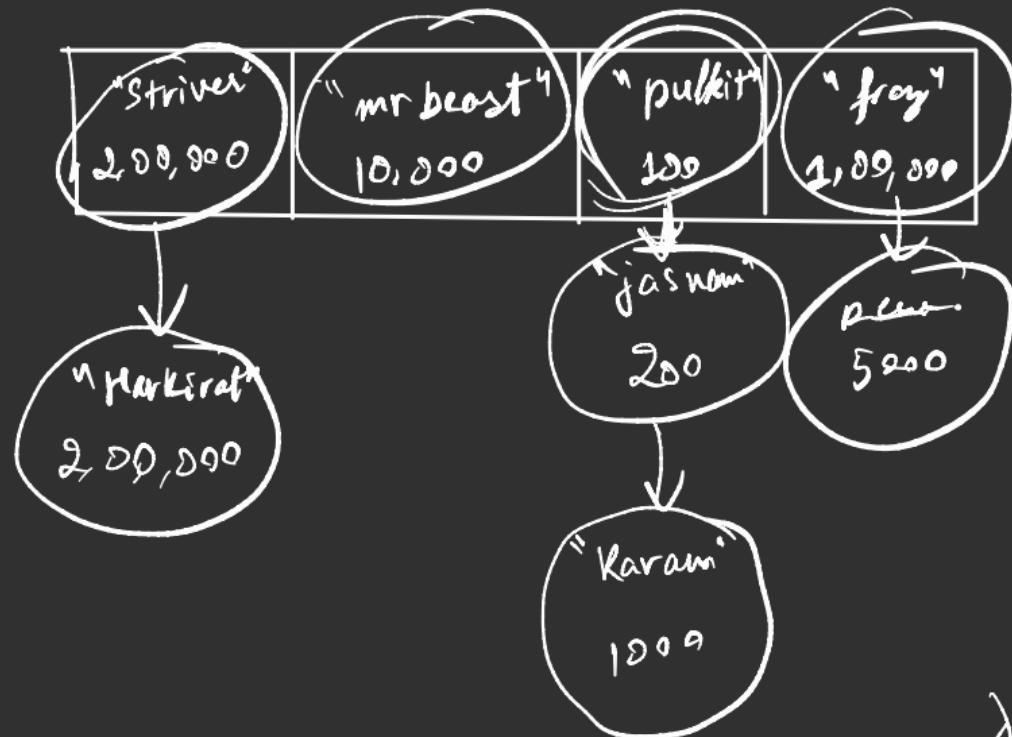
$N = 16$



"abc" $\rightarrow 1$
"cba" $\rightarrow 10$
"bca" $\rightarrow 5$

Steps to add a (key value) pair to Hash Map:

- 1) Hash the key & find the resultant index
- 2) Check if the key is already present in the linked list at that index?
Yes \Rightarrow Just update the value.
No \Rightarrow Add the key-value pair to flat LL



$$\lambda - \frac{8}{4} = 2$$

$$\text{Load Factor } (\lambda) = \frac{\text{no. of nodes}}{\text{no. of buckets}}$$

↓

Average number of nodes per Bucket

Aug. Time Taken $\Rightarrow O(\lambda)$

$$\max LF = 1$$

$$avgLF > \max LF$$



Double the capacity
& rearrange the nodes.

Let's implement

Let's do some practice

Most Frequent
Even Element

Thank You!

Reminder: Going to the gym & observing the trainer work out can help you know the right technique, but you'll muscle up only if you lift some weights yourself.

So, PRACTICE, PRACTICE, PRACTICE!