BINARY SEARCH TREES

LECTURE 11-1

JIM FIX, REED COLLEGE CSCI 121

COURSE INFO

- **Project 4:**
  - due 4/28.
  - **adventure**: a text-based role-playing game
  - You can work with a partner if you like.

A (BINARY) TREE NODE CLASS

```
class BSTNode:
    def __init__(self,k,v):
        self.key = k
        self.value = v
        self.left = None
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>>> w = BSTNode("bob",22)
>>> x = BSTNode("abe",17)
>>> y = BSTNode("dog",5)
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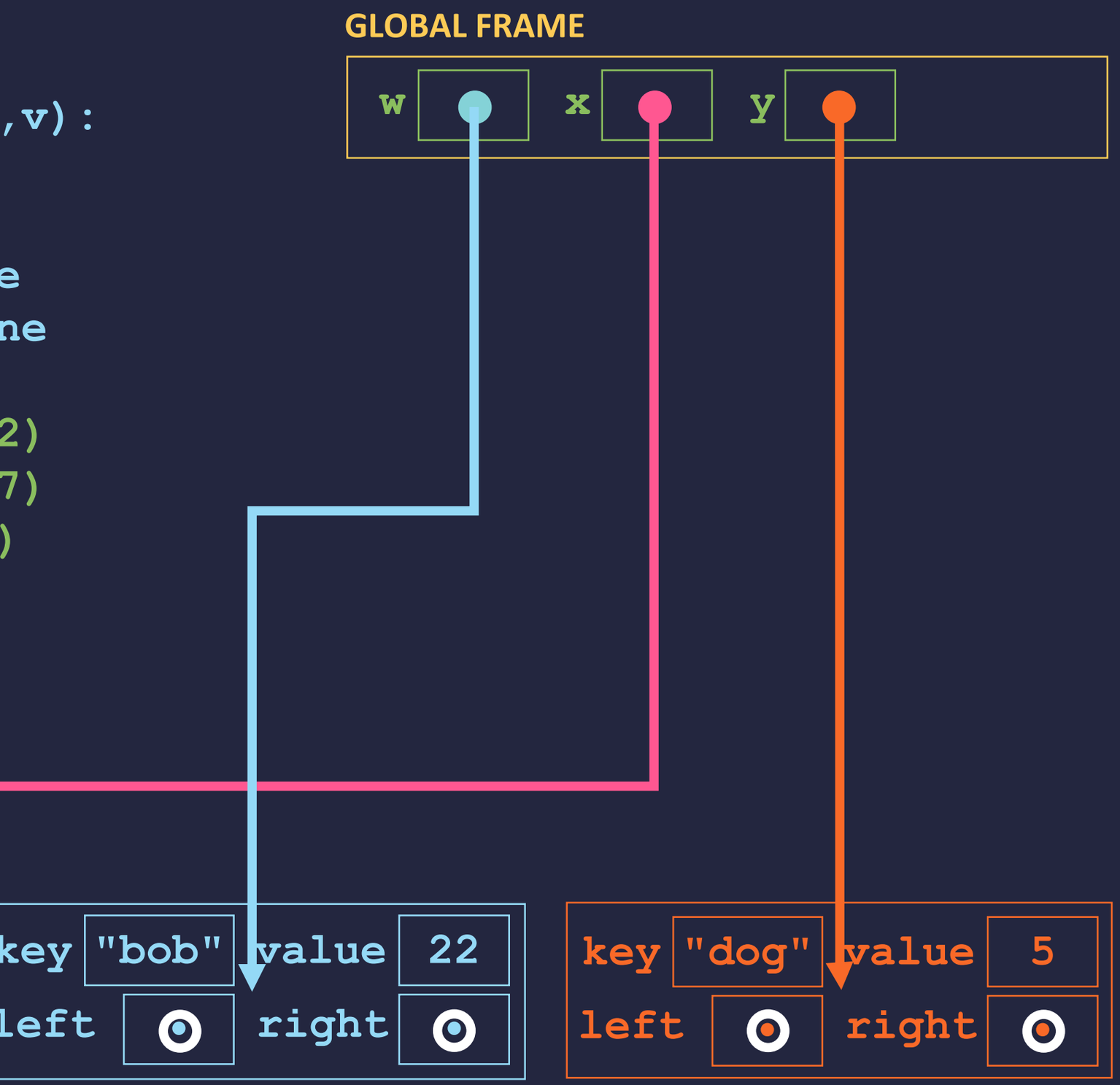

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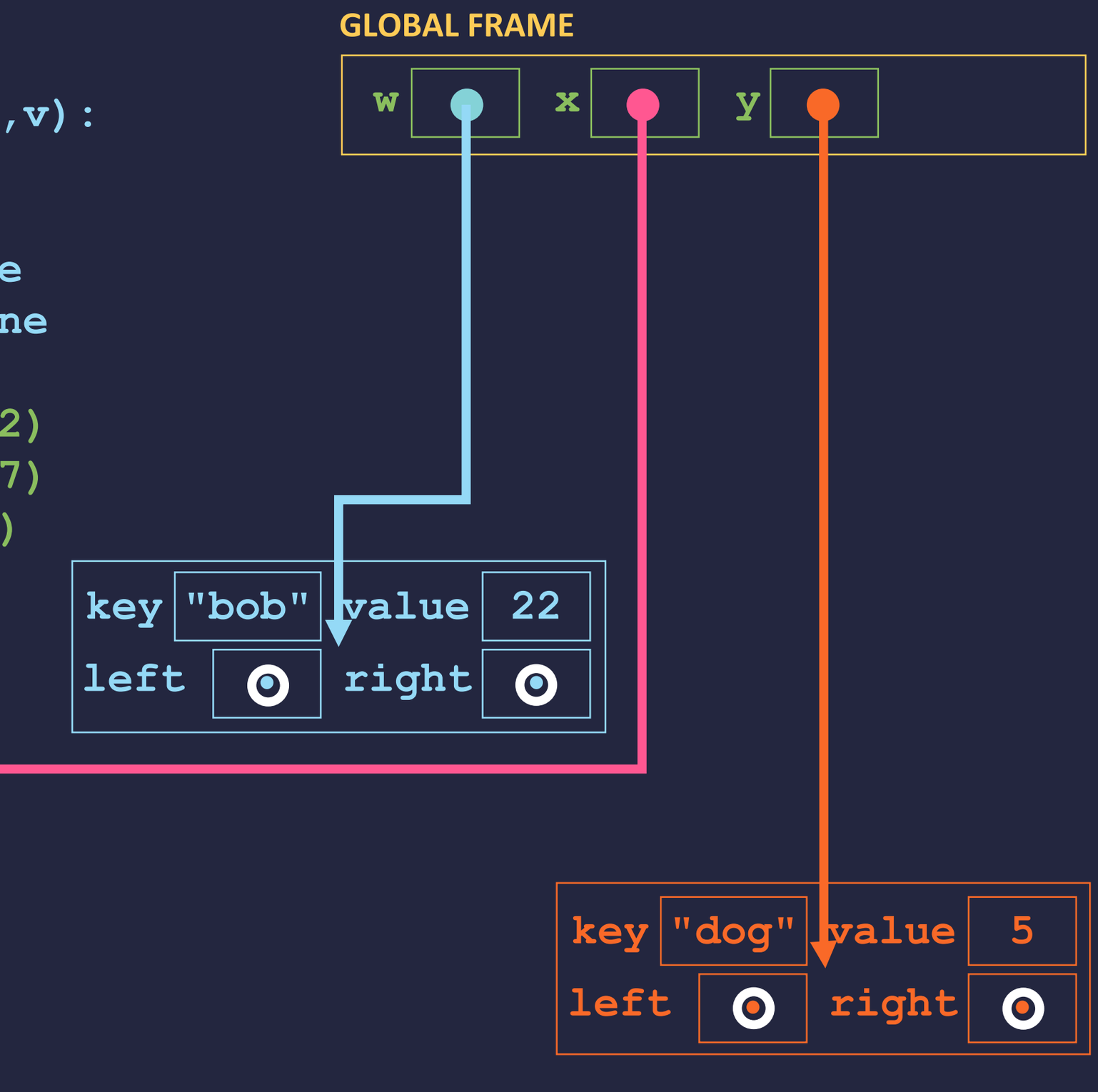

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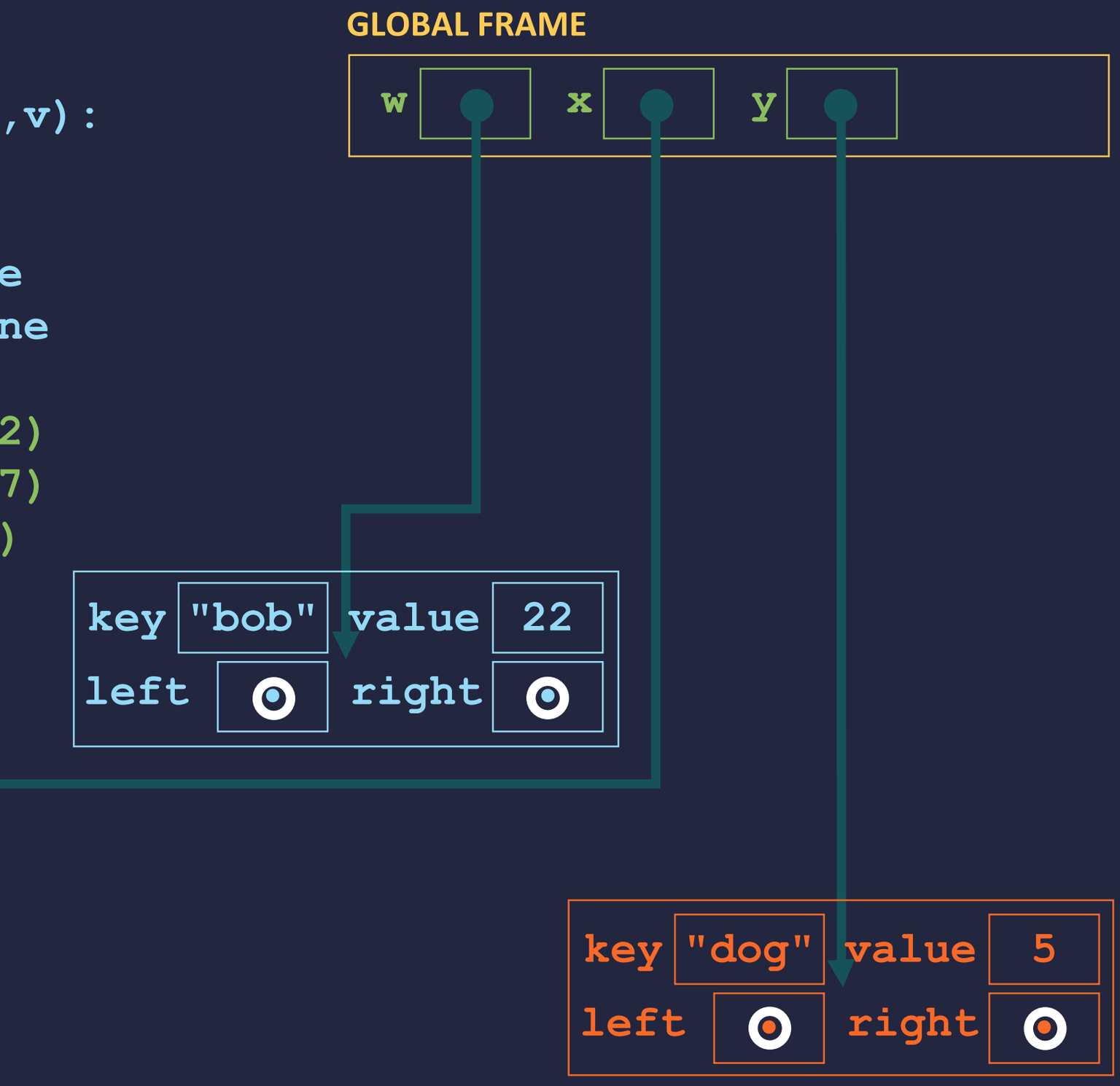

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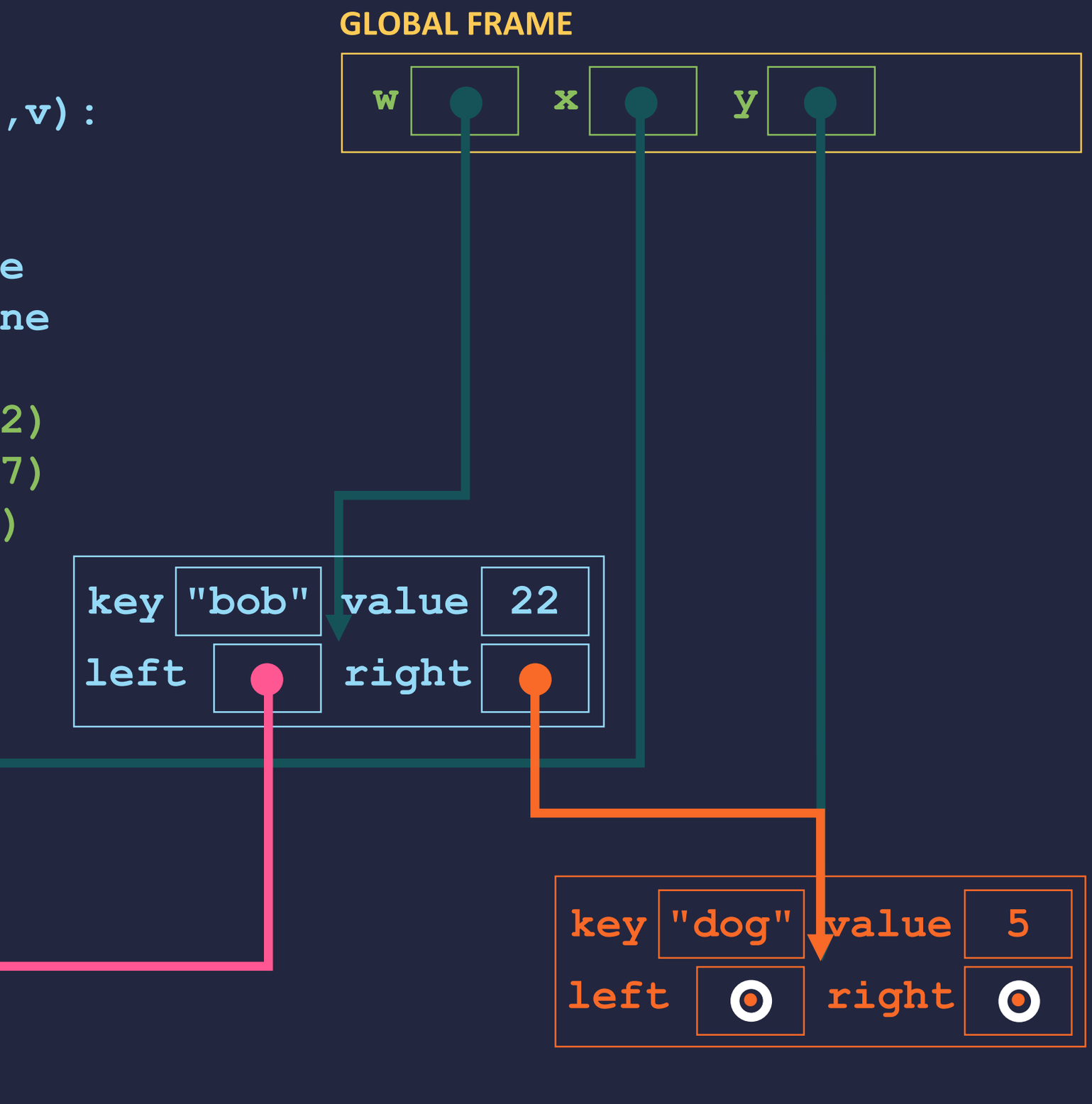

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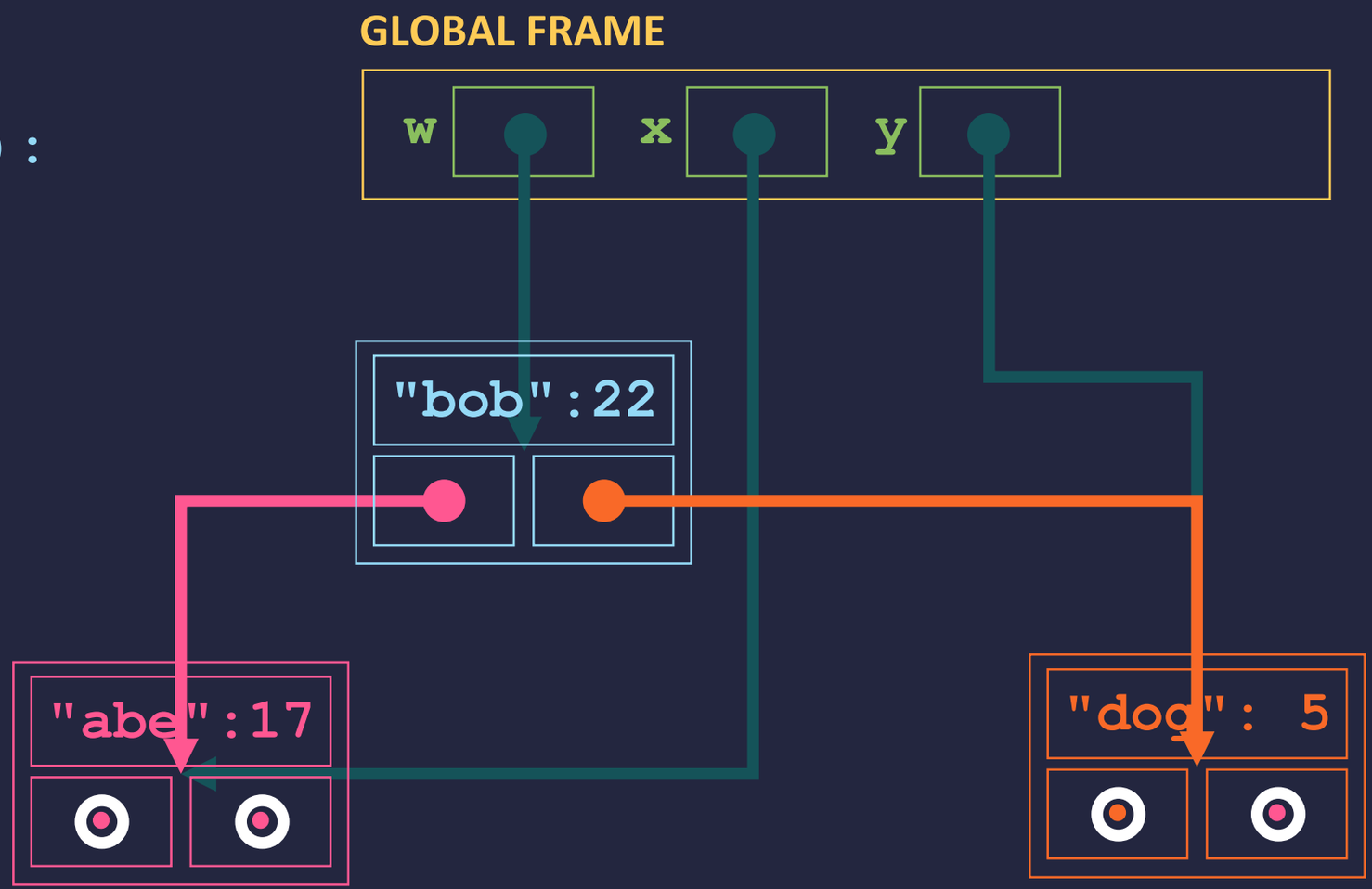

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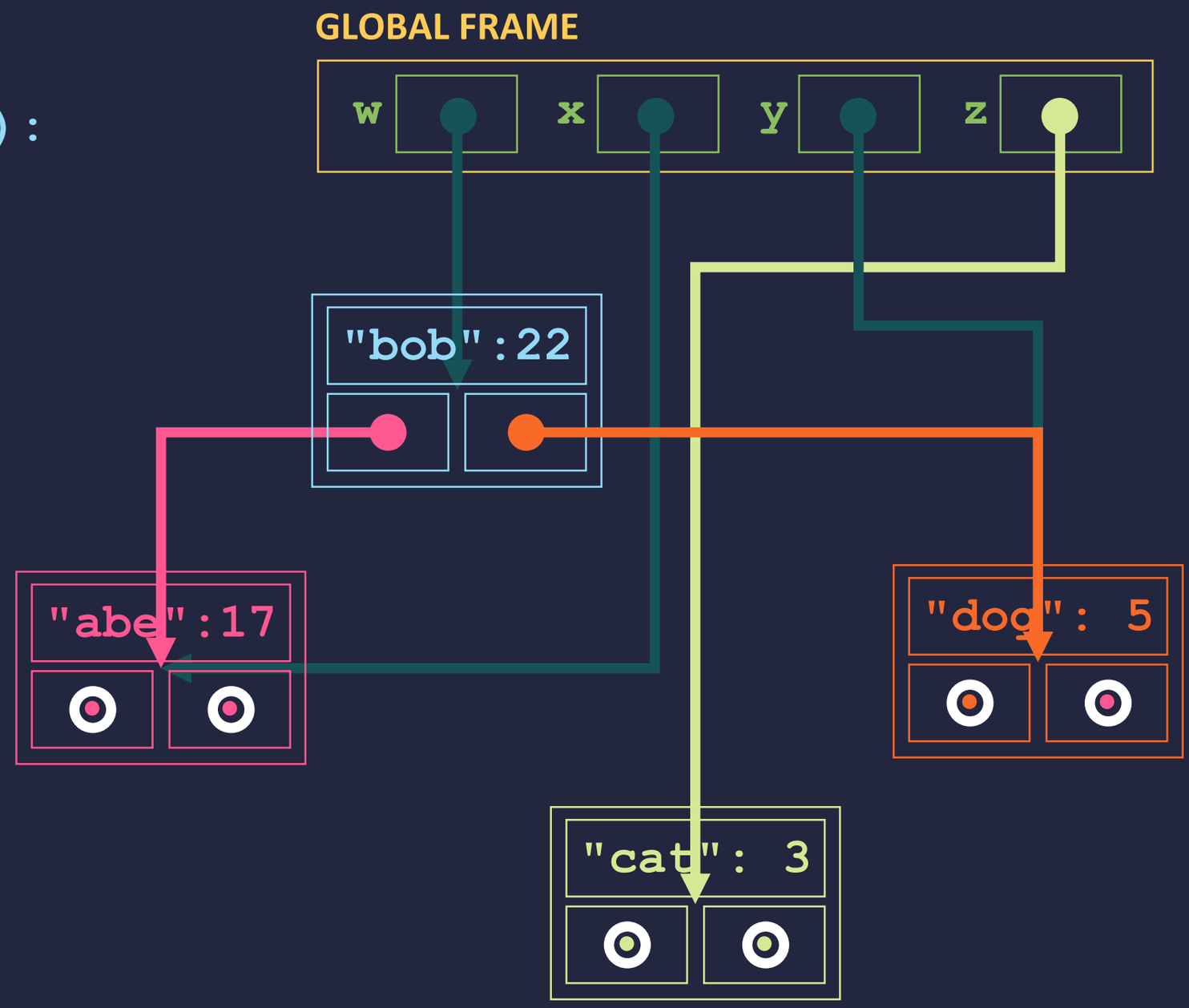

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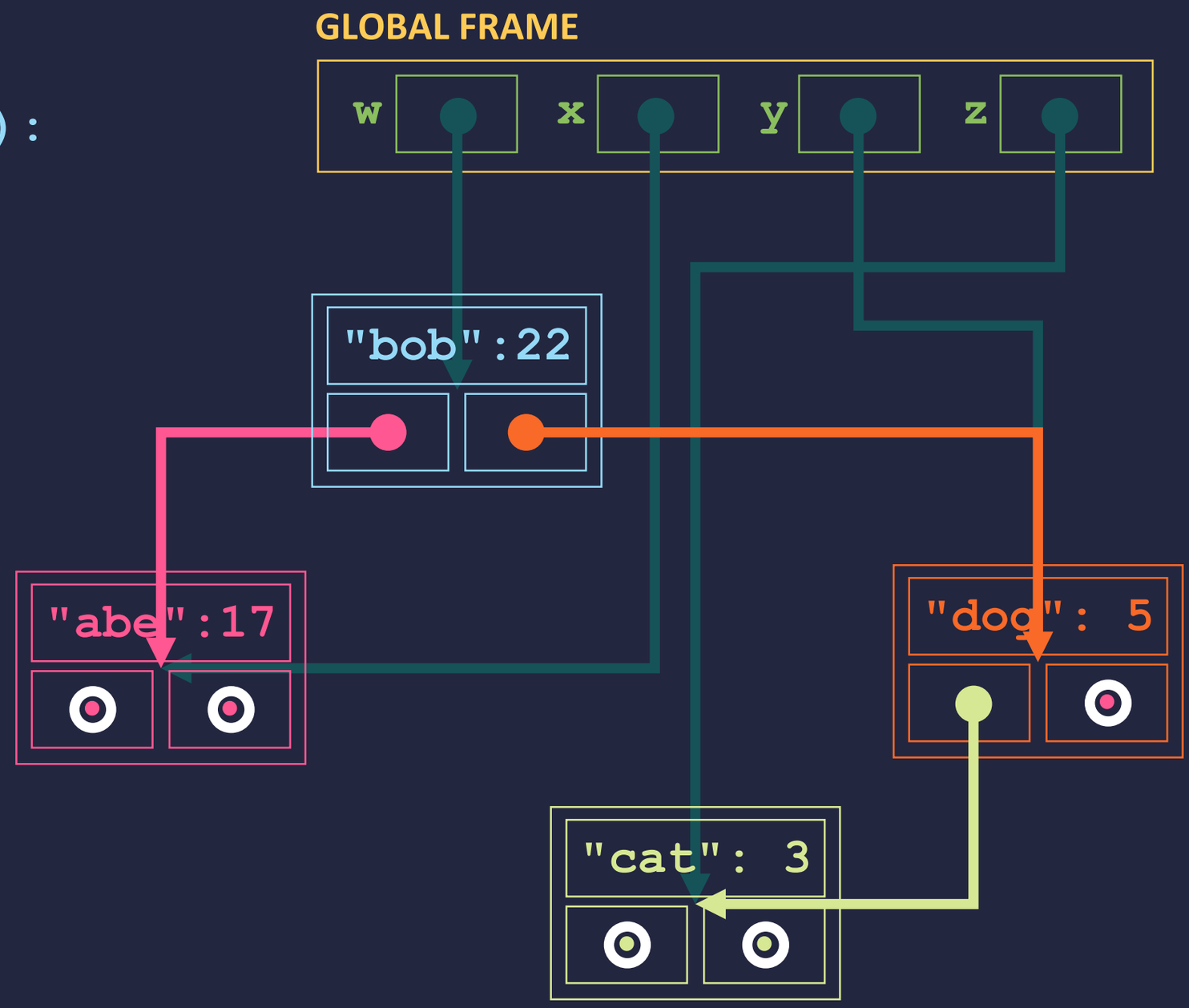

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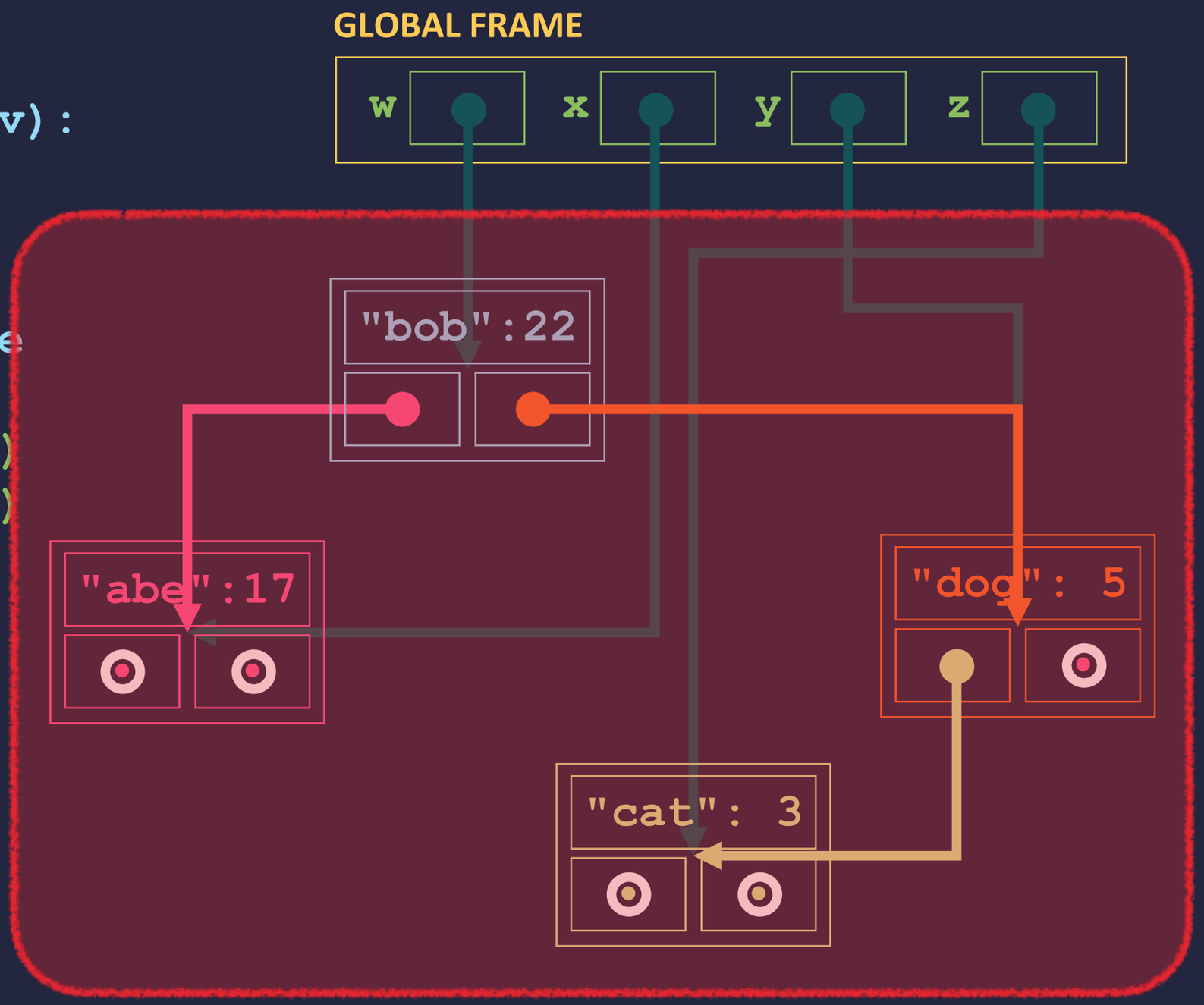
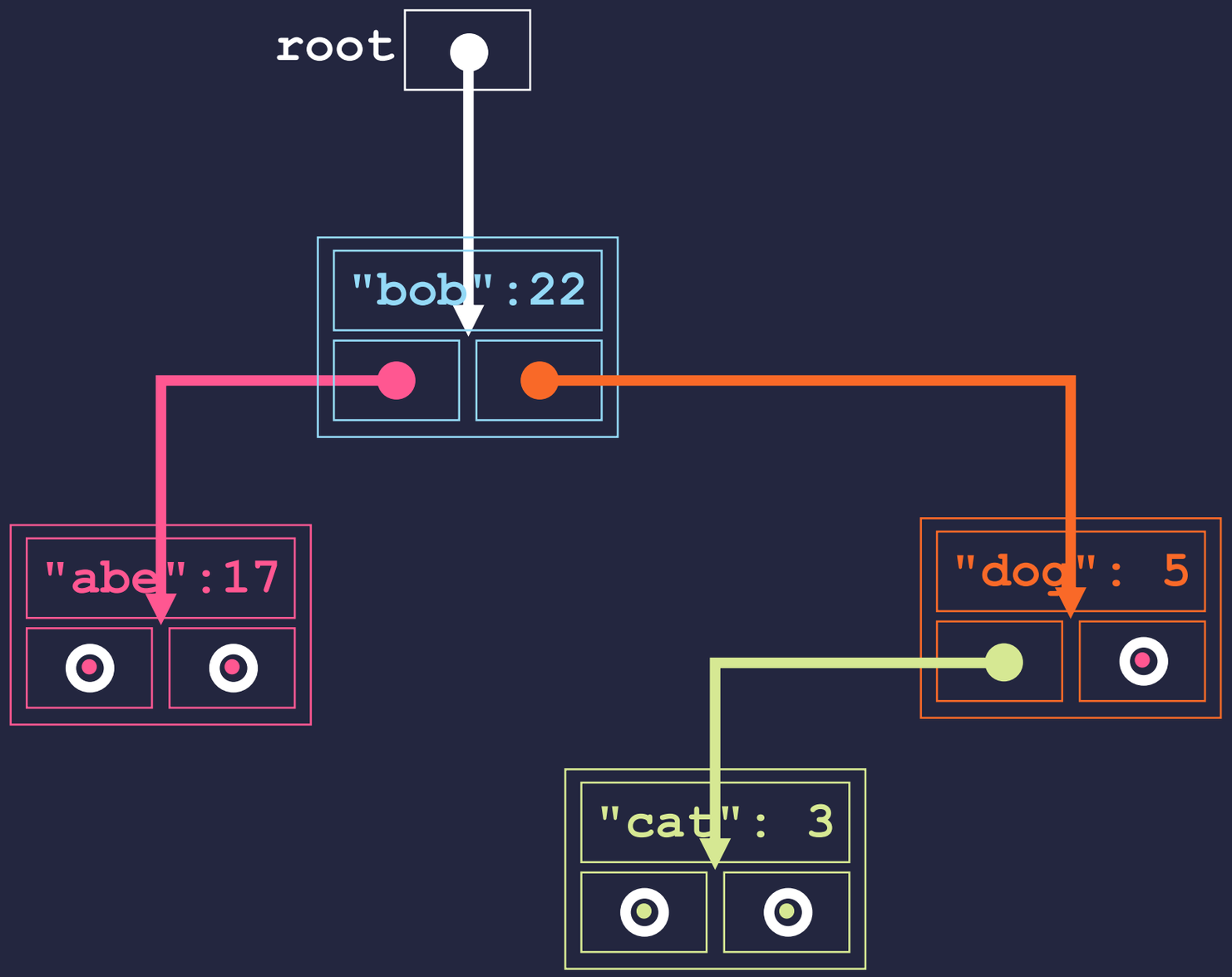
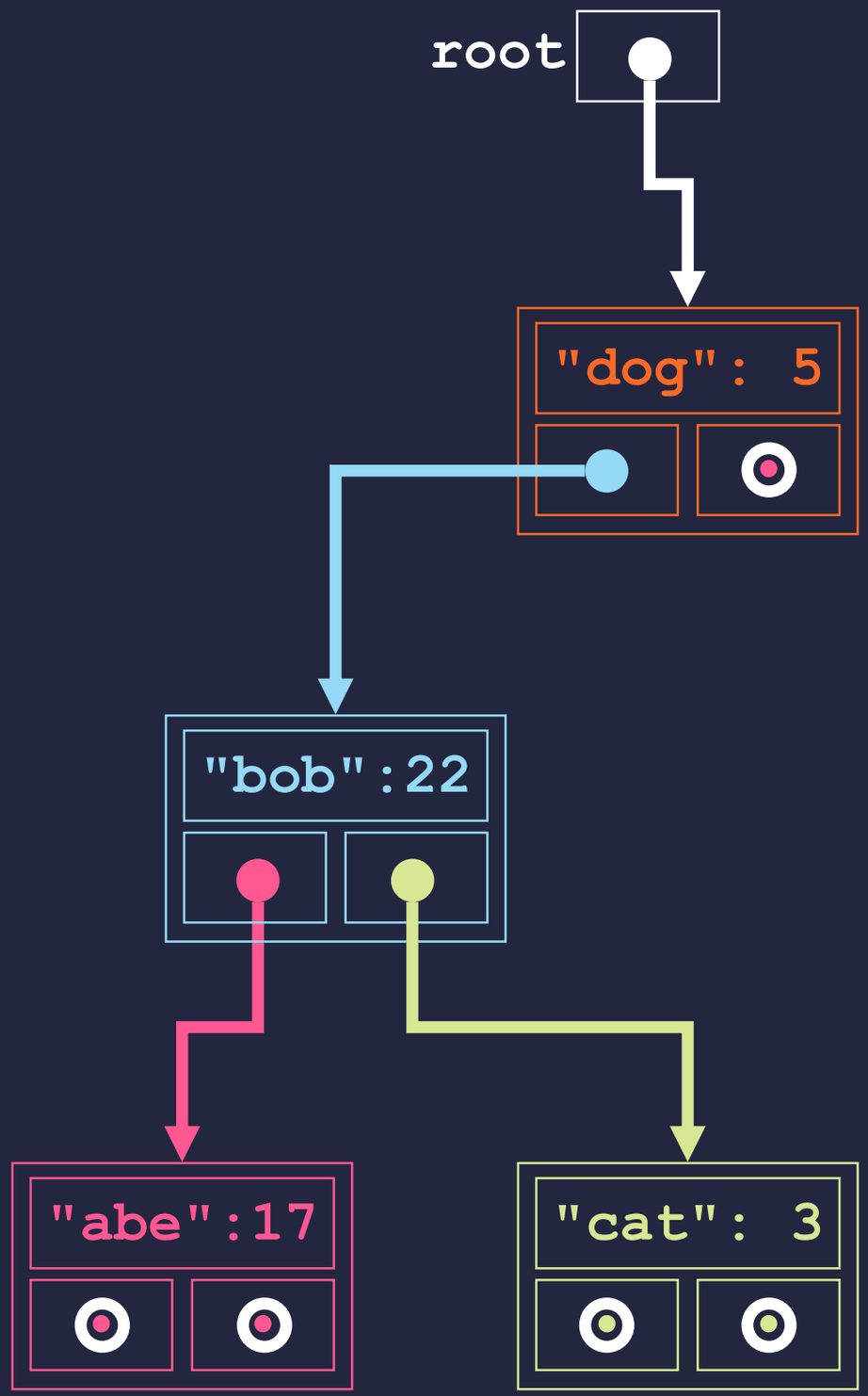


THIS STRUCTURE IS CALLED A BINARY SEARCH TREE

A BINARY SEARCH TREE



ANOTHER BINARY SEARCH TREE



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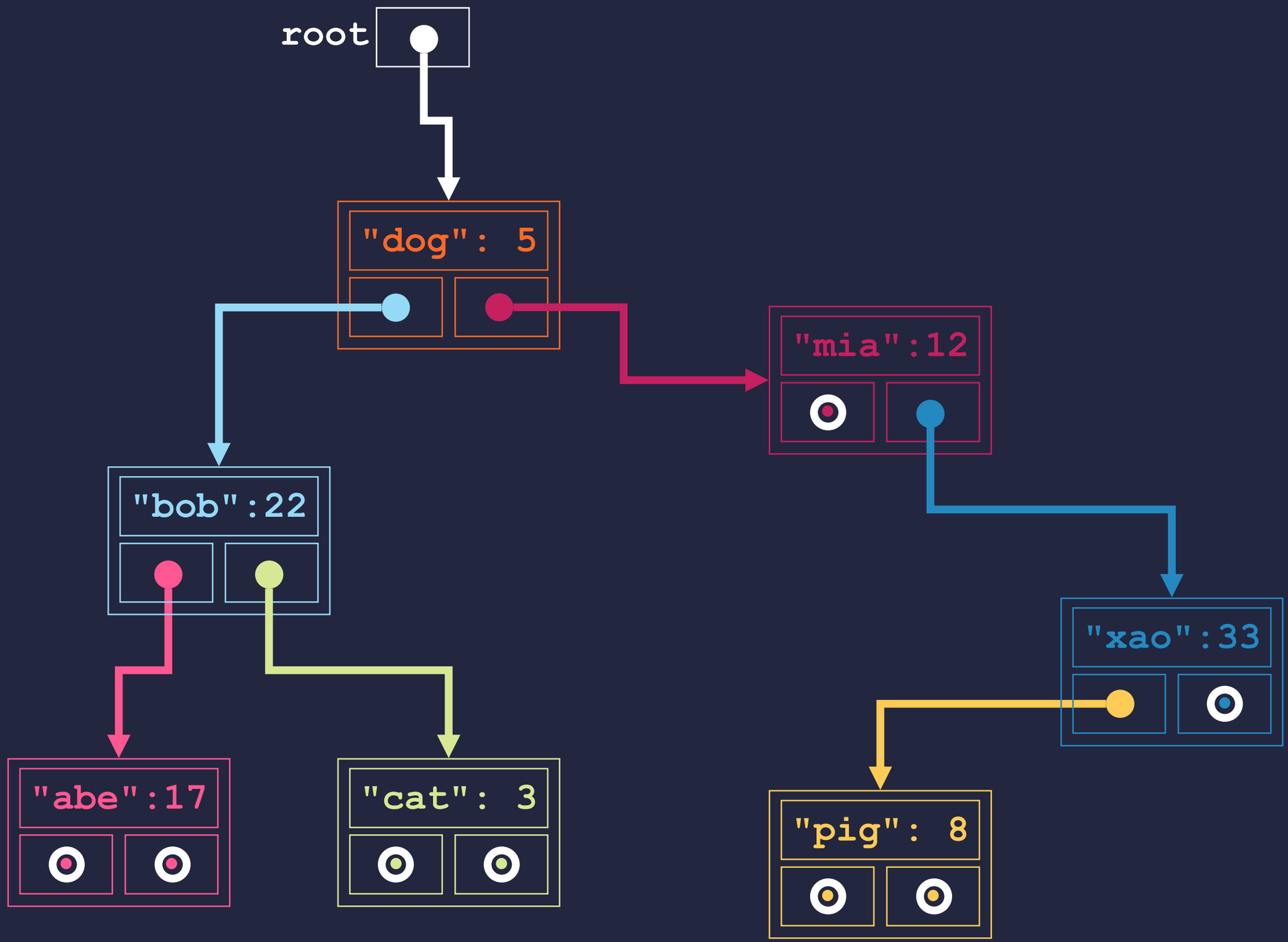
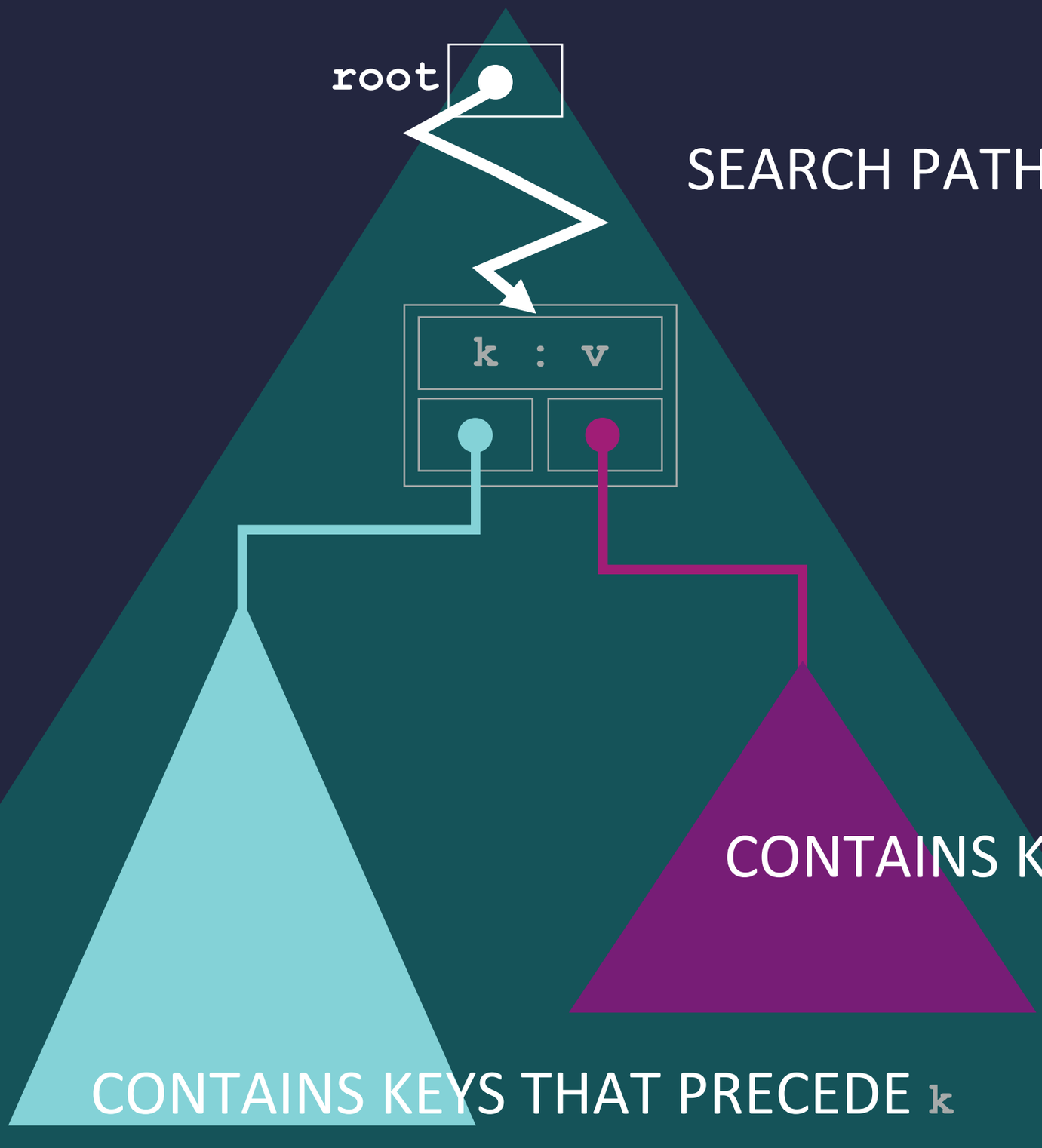


PROPERTIES OF A BINARY SEARCH TREE



SEARCHING FOR AN ENTRY IN A BST

```
class BSTNode:
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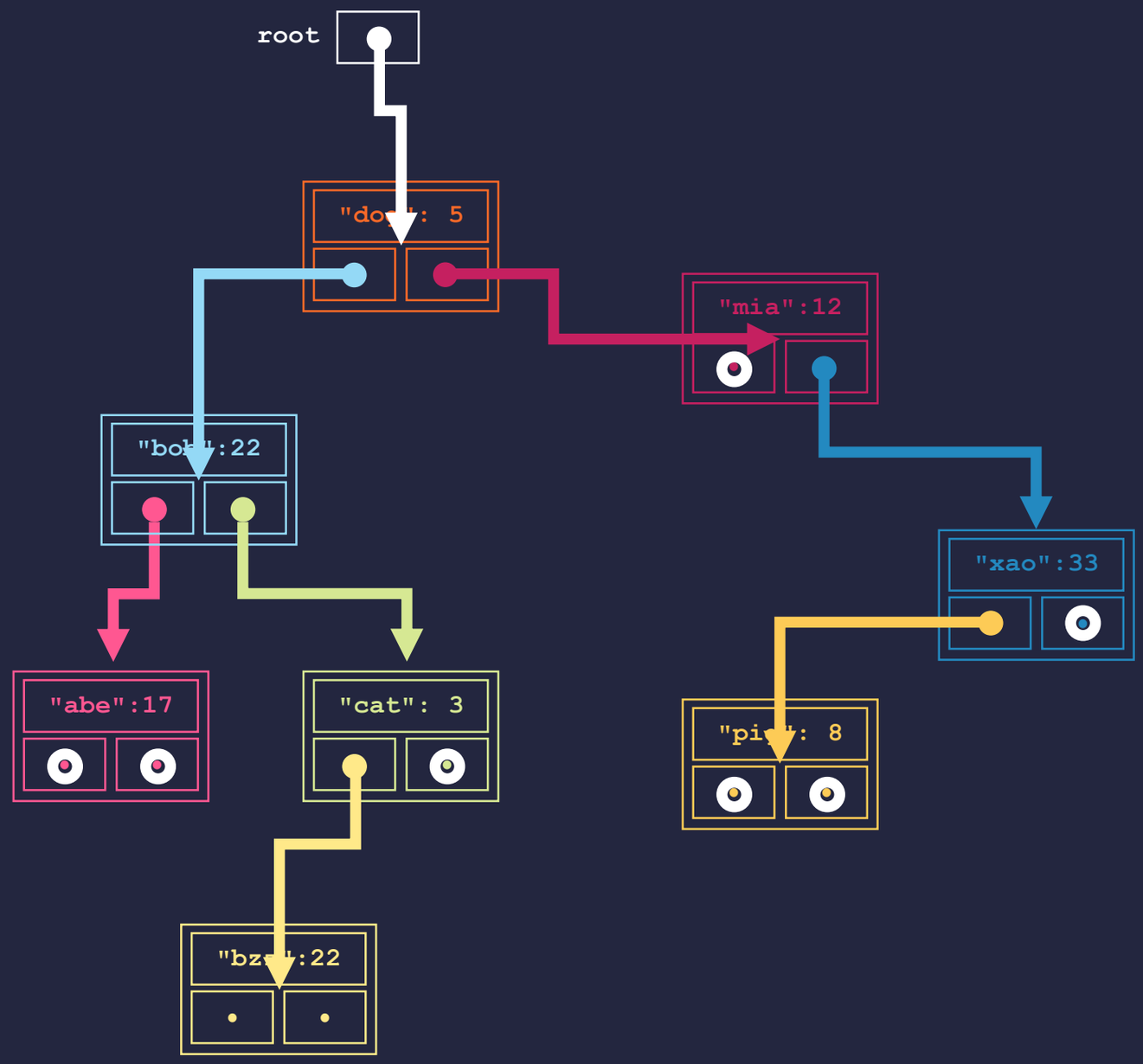
```

```
def search(root,k):
    curr = root
    while curr is not None:
        if k == curr.key:
            return curr.value
        if k < curr.key:
            curr = curr.left
        if k > curr.key:
            curr = curr.right
    return None
```



BINARY SEARCH TREES

- Binary search trees are a way of keeping track of a ***sorted*** collection.
- Here, we are using them as an *ordered dictionary*.
- For our dictionaries, there is at most one entry per key.
- The link structure sorts the entries; maintains a sorted order.
  - The keys are usually organized alphabetically when strings.
  - The keys are usually sorted smaller/larger if numbers.
- (Generally, in binary search trees, keys might appear more than once; have multiple entries.)
- (Generally, in binary search trees, the nodes might only contain keys without associated values.)

A BST CLASS

- **Operations:**
  - Adding an entry, ordered according to key.
  - Searching for an entry by key.
  - Removing an entry.
  - Visiting/traversing all the entries in sorted order.
- The first three operations rely on a *search*.
  - This works from the root, moving left or right.
- An *in-order traversal* is a recursive method. Example: printing all the entries
  - You print all of the entries left of the root entry.
  - Then you print the root entry.
  - And then you print all of the entries right of the root entry.

A TOUR OF THE BST CLASS CODE

- **Look at `BSTree.py`**