



# avl.tree vs map in Gno

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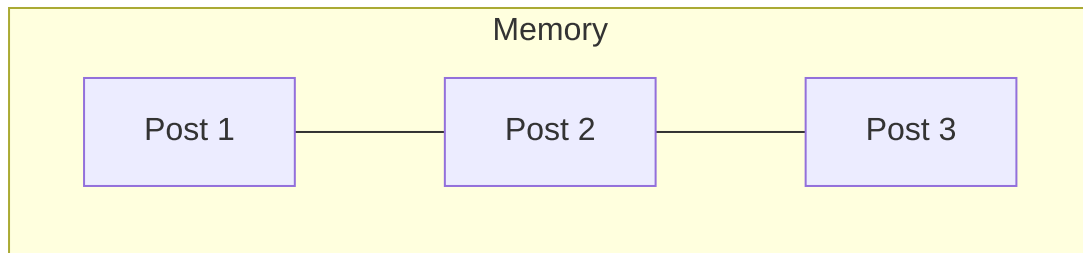
Why `map` is not suitable for efficient dynamic on-chain storage

How Gno's `avl.Tree` powers an efficient alternative

**Let's say we have a blog**

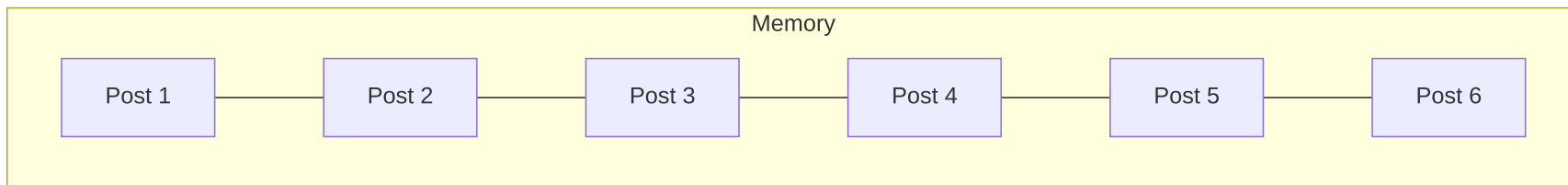


# Use Case: Blog Posts with `map`





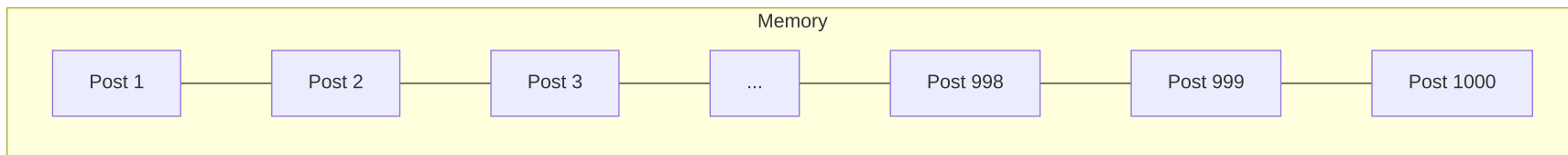
## Use Case: Blog Posts with `map`



! More memory usage = More gas usage !



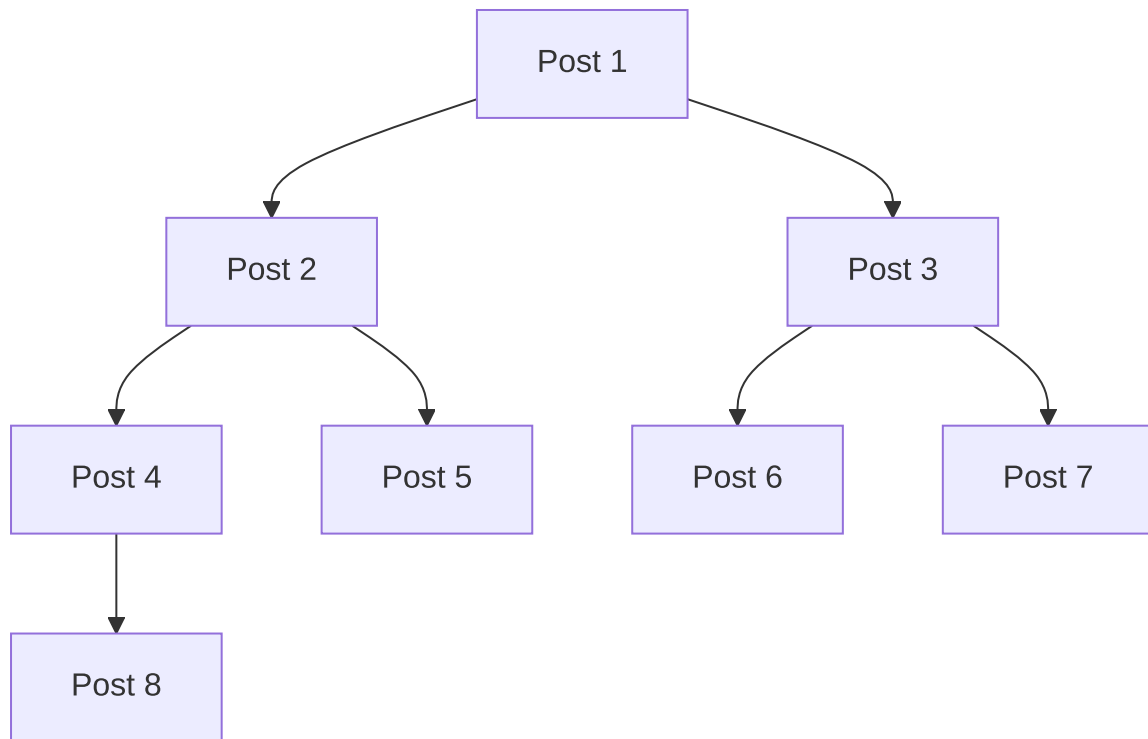
# Use Case: Blog Posts with `map`



Unlimited gas usage

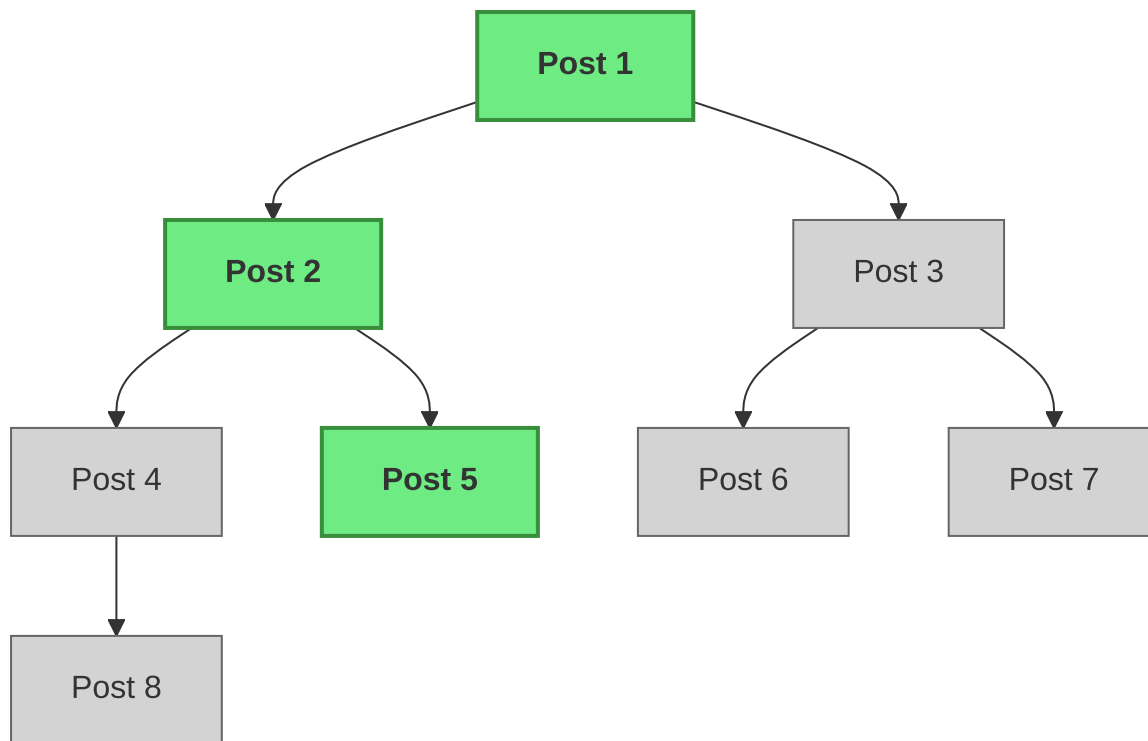


# Use Case: Blog Posts with `avl.tree`



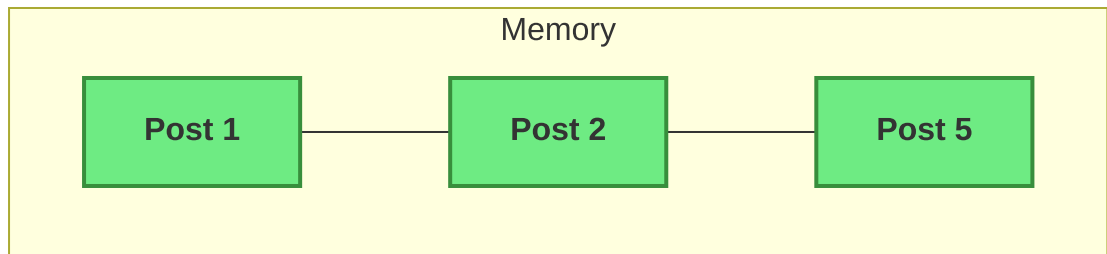


# Use Case: Blog Posts with `avl.tree`





# Use Case: Blog Posts with `avl.tree`







## Maps

# In-memory key/value structure



## Pros

- Good for small, fixed-size data
- Simple syntax



## Cons

- Not scalable: All data is kept in memory

```
var data = make(map[string]string)
data["key"] = "value"
```

## AVL Trees

# Self-balancing binary search tree



## Pros

- Efficient memory usage
- Suitable for large datasets



## Cons

- $O(\log n)$  access times

```
import "gno.land/p/demo/avl"

var tree avl.Tree
tree.Set("key", "value")
value := tree.Get("key")
```





# Comparison: `Map` vs `avl.Tree`

Operation	<b>Map</b> (Small Data)	<b>AVL Tree</b> (Large Data)
Lookup	$O(1)$	$O(\log n)$
Insert	$O(1)$	$O(\log n)$
Delete	$O(1)$	$O(\log n)$
Scalability	Poor	Excellent



# When to Use What?

-  **Use Maps when:**
  - Working with small constant datasets
-  **Use AVL Trees when:**
  - Dealing with dynamic datasets
  - Scalability and efficiency are required



## Further Reading

- Why use AVL Trees in Gno
- Gno AVL Tree Documentation
- Effective Gno