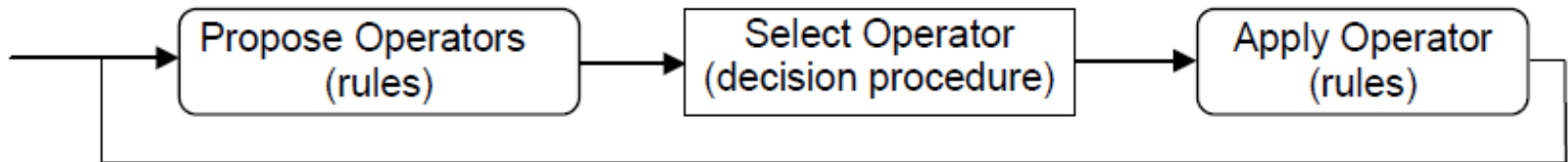


Soar Counter Agent Example

April 2014
Prepared by Jen Davis

Counter Example

- Desired behavior is to count from 2 to 7 and then stop
- Implemented in Soar via:
 - Initialization operator: set num = 2
 - Increment operator: num = num + 1
 - Detect goal achieved: num = 7 → HALT
- Each operator is implemented with two rules
 - Propose the operator
 - Apply the operator



Soar Architecture

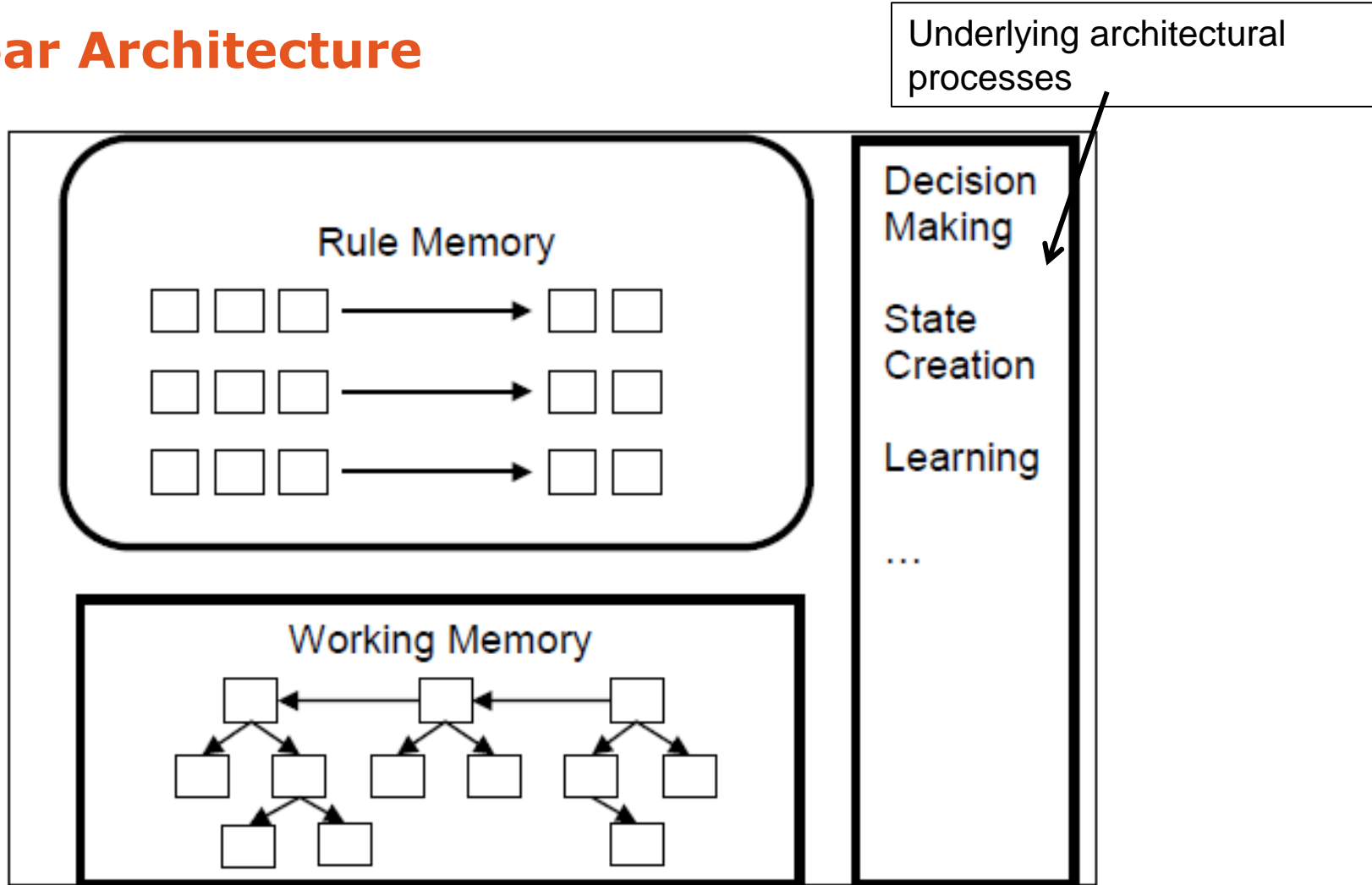
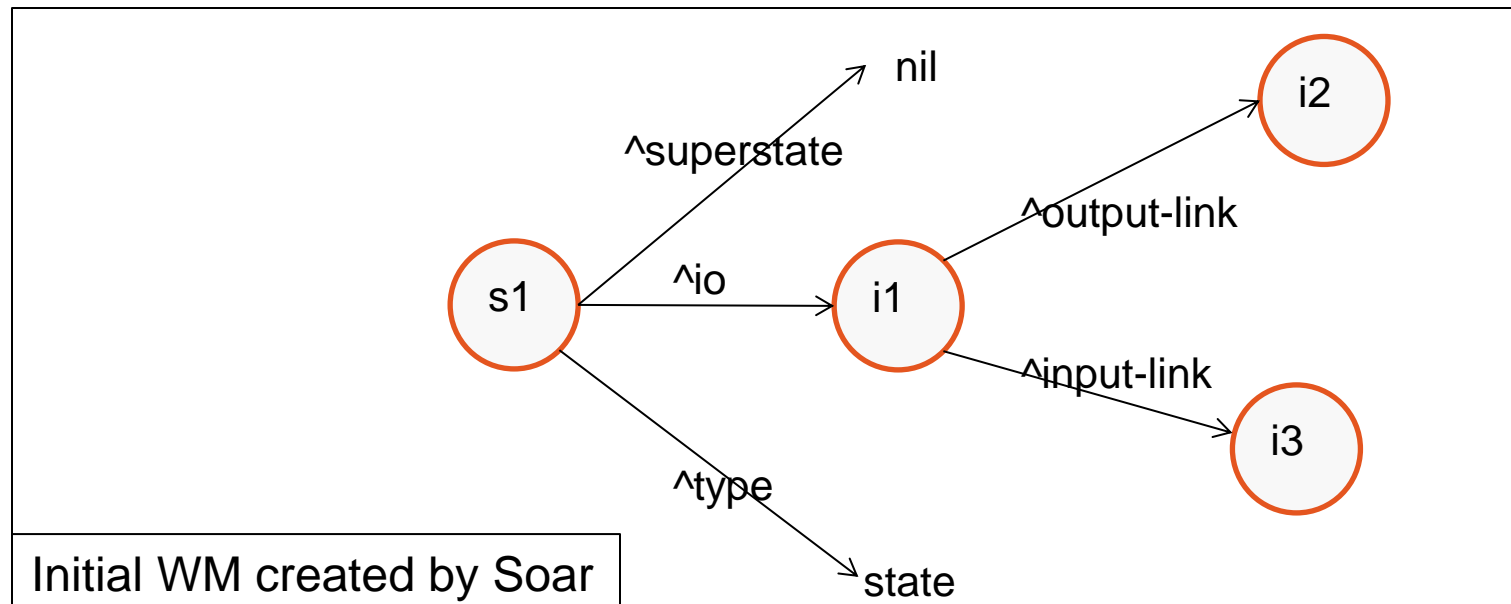


Image Source: SOAR Tutorial Part 1

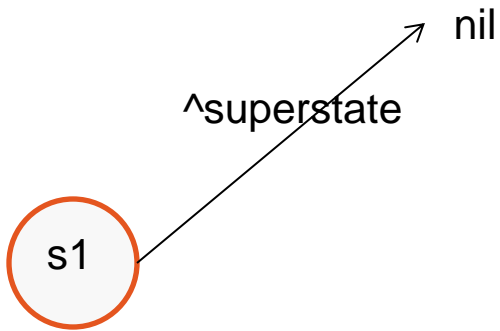
Working Memory

- Working memory (WM) is the short-term memory in Soar
- WM is a directed graph structure
- The elements of WM are triples: (identifier, attribute, value)
- Rules test, create, and modify the elements of WM
- Everything in WM is global



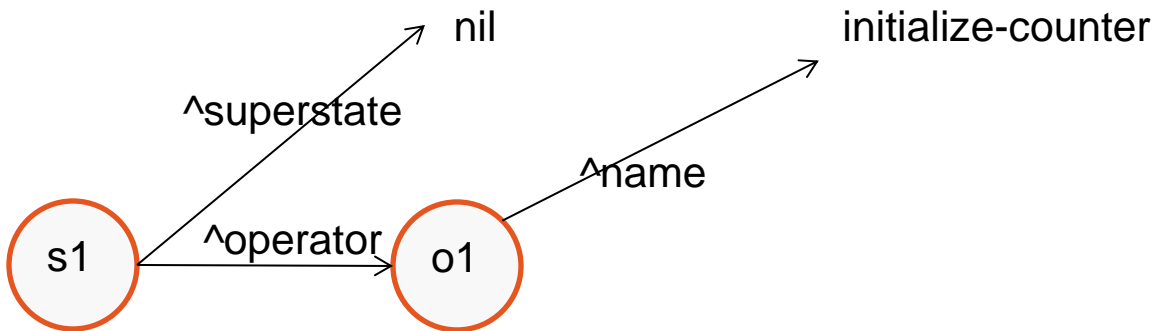
Working Memory (WM)

- This is the only part of the initial WM that we will use in this example.



Working Memory (WM)

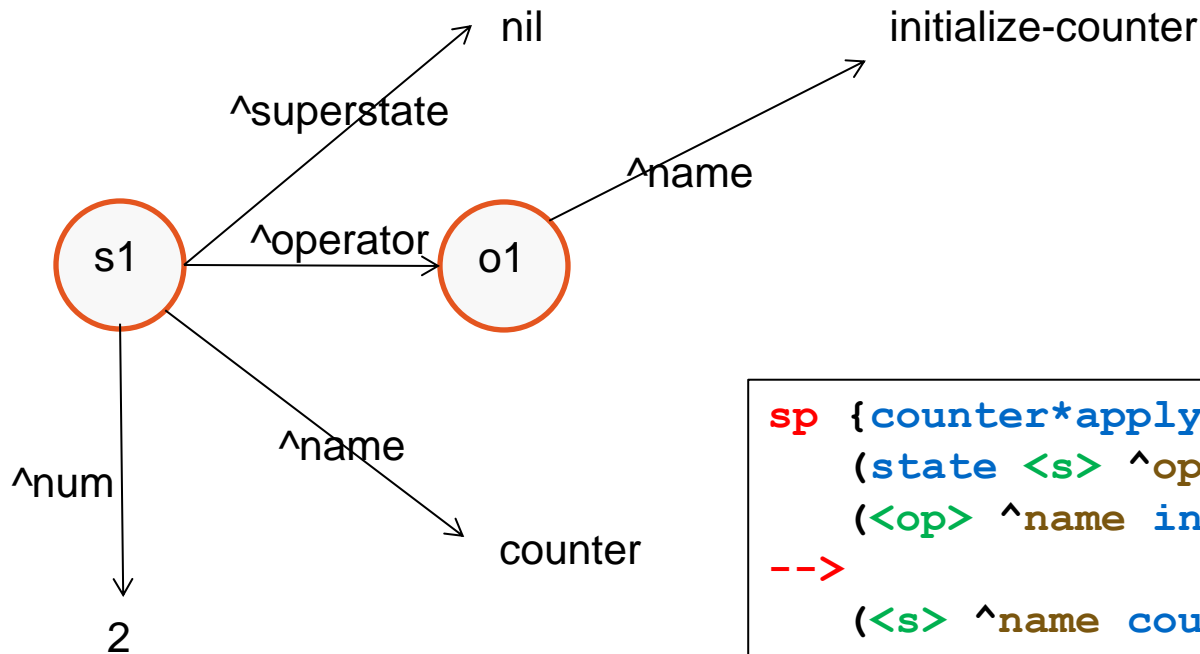
- Propose initialize-counter operator



```
sp {counter*propose*initialize-counter
  (state <s> ^superstate nil
    -^name)
-->
  (<s> ^operator <o> +)
  (<o> ^name initialize-counter)
}
```

Working Memory (WM)

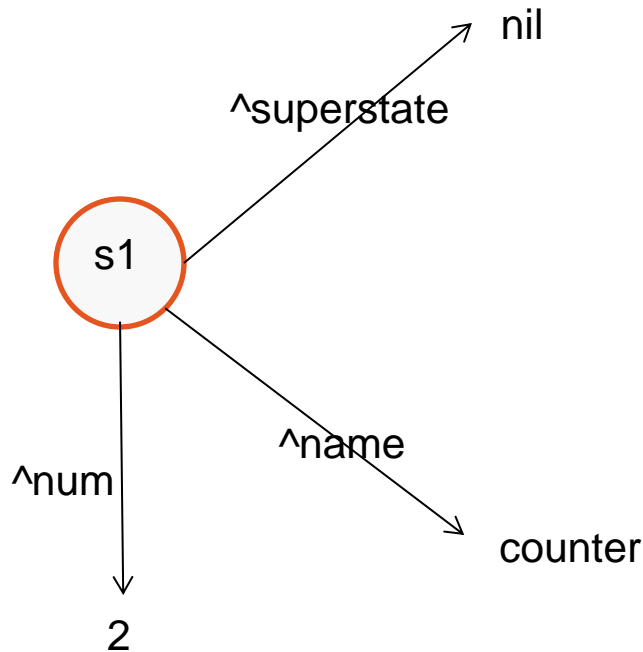
- Apply initialize-counter operator



```
sp {counter*apply*initialize-counter
    (state <s> ^operator <op>)
    (<op> ^name initialize-counter)
-->
    (<s> ^name counter
        ^num 2)
}
```

Working Memory (WM)

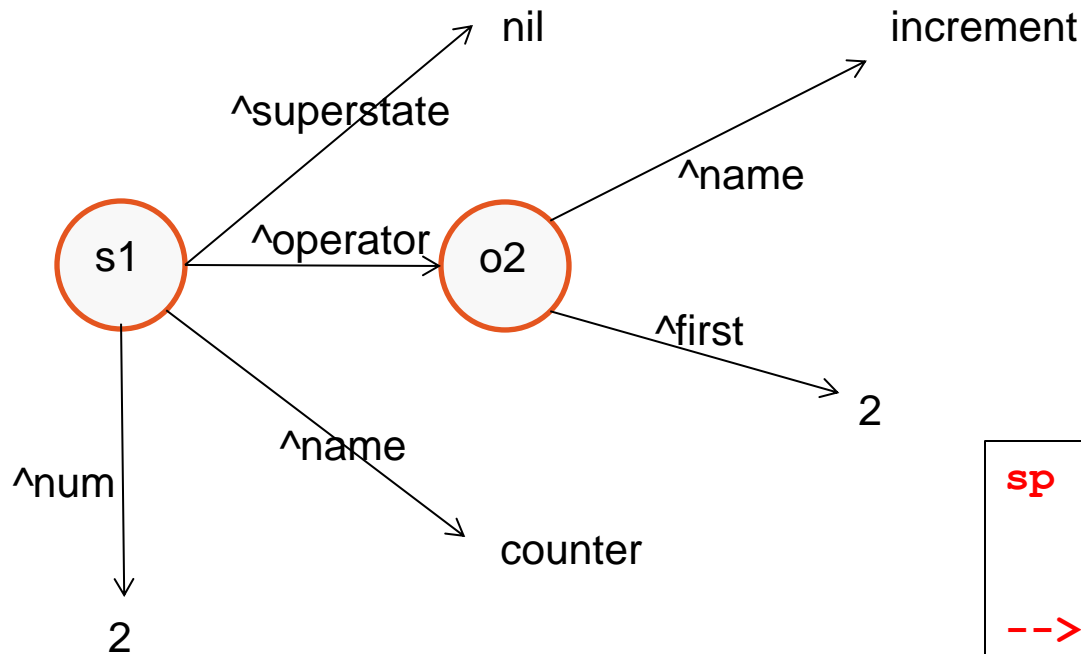
- Retract propose initialize-counter operator since conditions are no longer true (there is a ^name attribute).



```
sp {counter*propose*initialize-counter  
  (state <s> ^superstate nil  
    -^name) ←  
-->  
  (<s> ^operator <o> +)  
  (<o> ^name initialize-counter)  
}
```


Working Memory (WM)

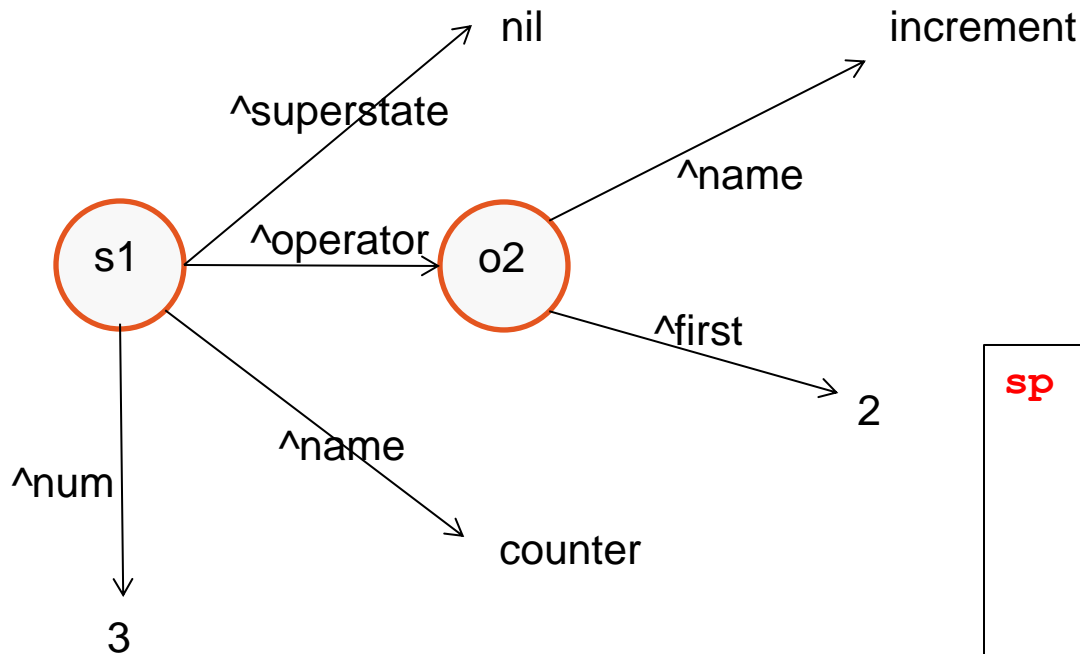
- Propose increment operator



```
sp {counter*propose*increment
    (state <s> ^name counter
      ^num <c>)
-->
    (<s> ^operator <op> + =)
    (<op> ^name increment
      ^first <c>)
}
```

Working Memory (WM)

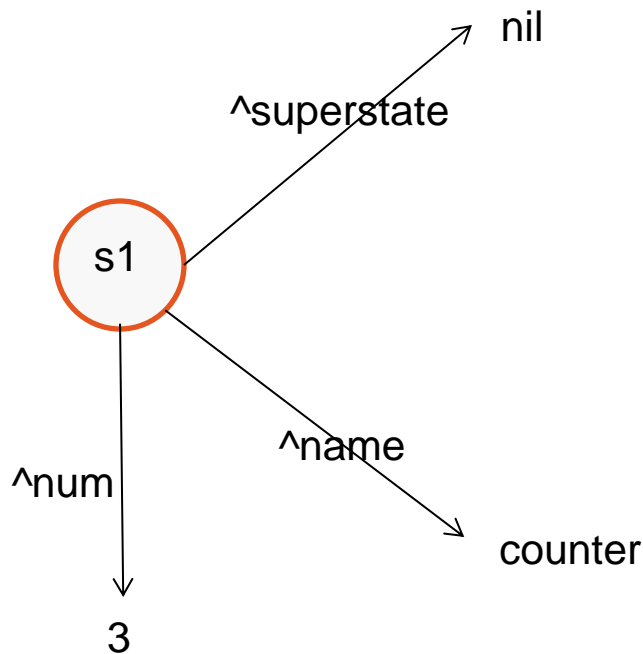
- Apply increment operator



```
sp {counter*apply*increment
  (state <s> ^name counter
    ^operator <op>
    ^num <c>)
  (<op> ^name increment
    ^first <c>)
-->
  (<s> ^num (+ <c> 1)
    ^num <c> -)
}
```

Working Memory (WM)

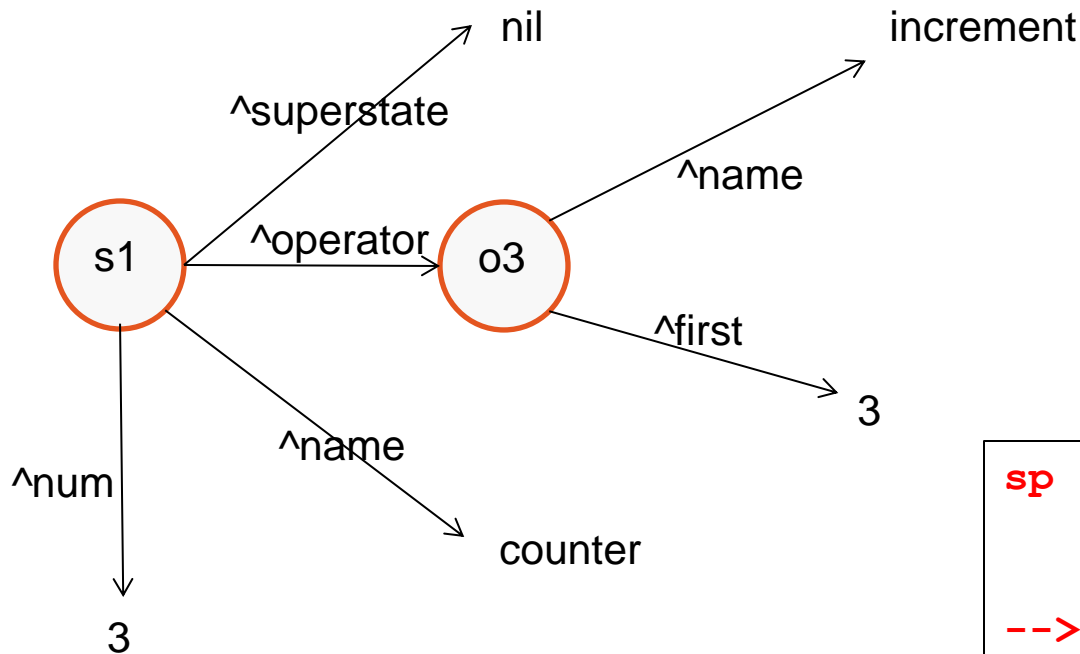
- Retract “propose increment operator” O2 because a WM element that matched in the condition has changed



```
sp {counter*propose*increment  
  (state <s> ^name counter  
    ^num <c>)  
-->  
  (<s> ^operator <op> + =)  
  (<op> ^name increment  
    ^first <c>)  
}
```

Working Memory (WM)

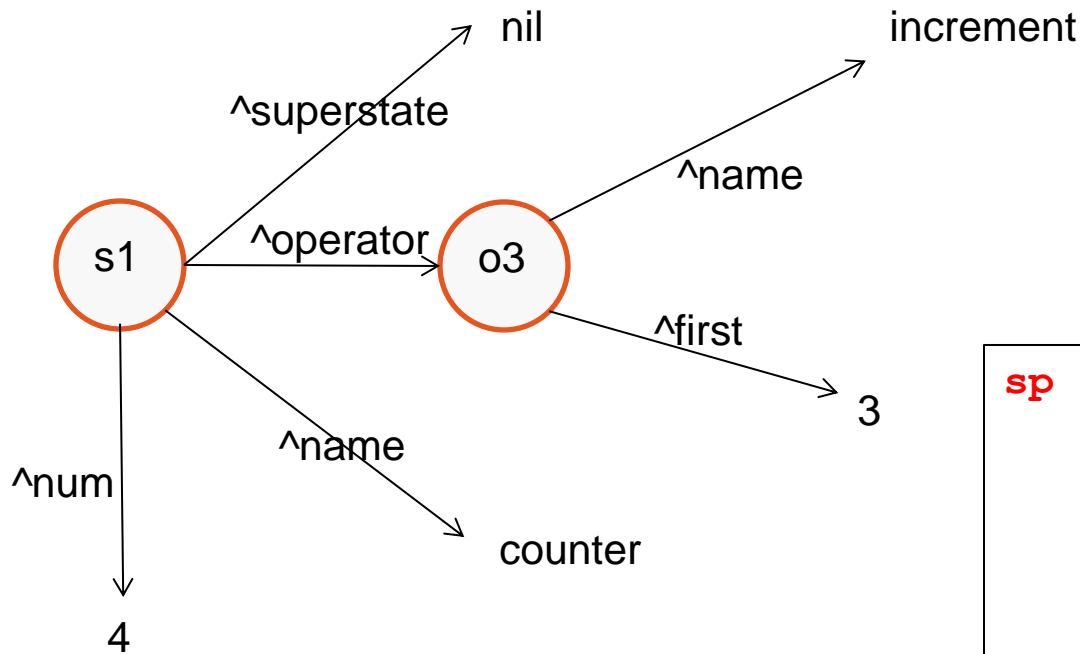
- Propose increment operator



```
sp {counter*propose*increment
    (state <s> ^name counter
        ^num <c>)
-->
    (<s> ^operator <op> + =)
    (<op> ^name increment
        ^first <c>)
}
```

Working Memory (WM)

- Apply increment operator



```

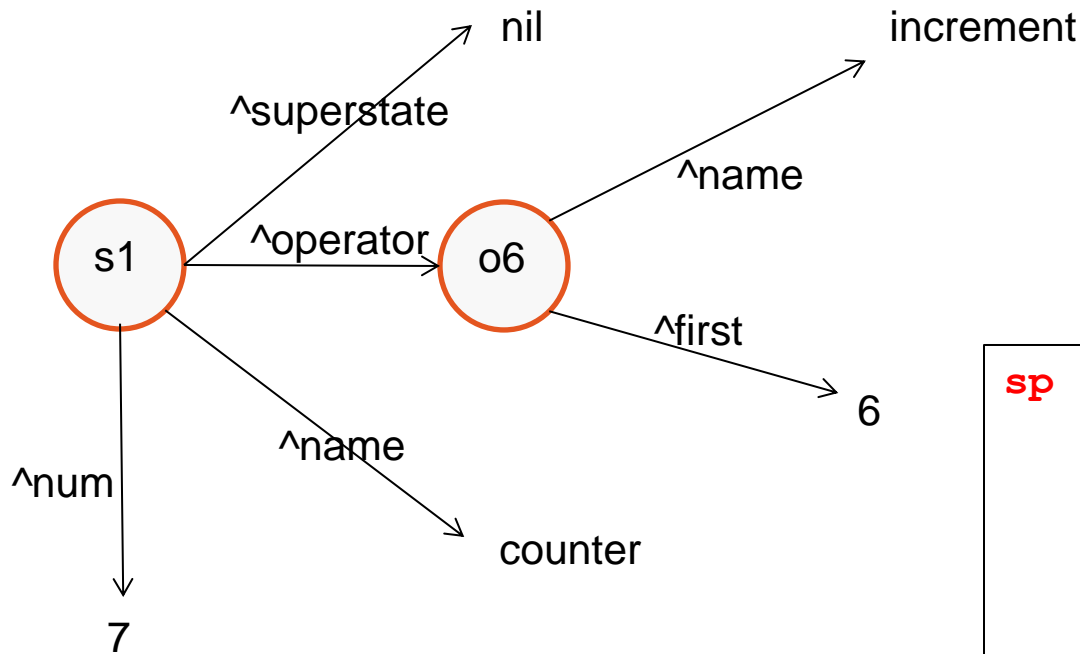
sp {counter*apply*increment
  (state <s> ^name counter
    ^operator <op>
    ^num <c>)
  (<op> ^name increment
    ^first <c>)
-->
  (<s> ^num (+ <c> 1)
    ^num <c> -)
}

```

And so on....

Working Memory (WM)

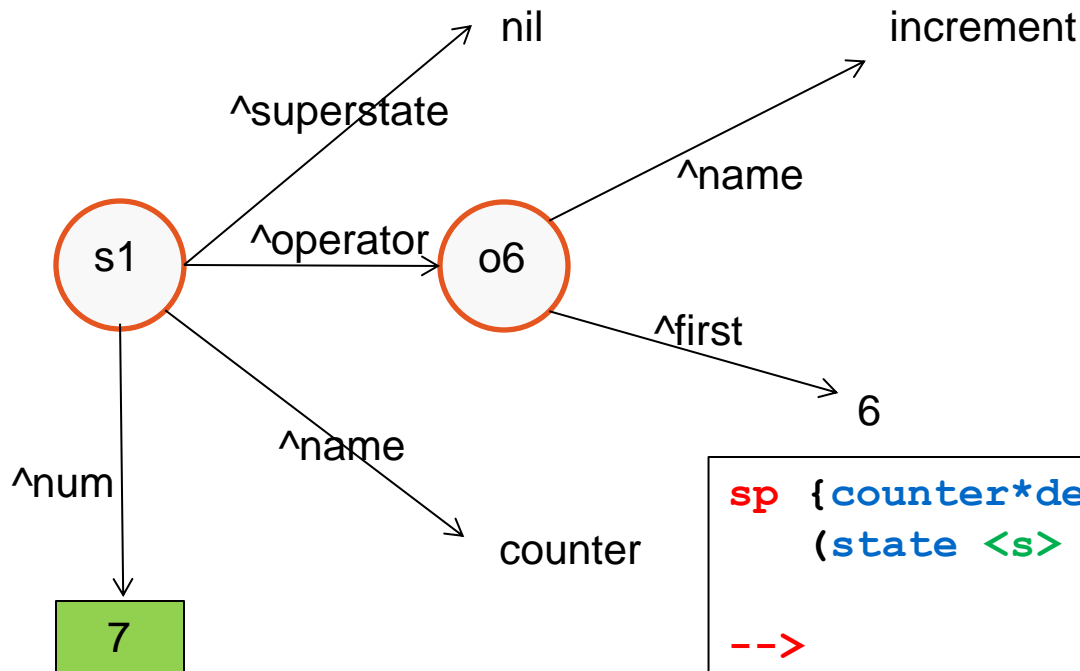
- Apply increment operator



```
sp {counter*apply*increment
  (state <s> ^name counter
    ^operator <op>
    ^num <c>)
  (<op> ^name increment
    ^first <c>)
-->
  (<s> ^num (+ <c> 1)
    ^num <c> -)
}
```

Working Memory (WM)

- Goal detected! Halt.



```
sp {counter*detect*goal*achieved
  (state <s> ^name counter
    ^num 7)
-->
  (write (crlf) |
    The number 7 has been reached.|)
  (halt)
}
```