Noowow Community

Javascript Bootcamp / Async code

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Séance 8

Async code

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Async code

- Single thread
- Synchronous execution
  - Execution context
  - Call stack
- Asynchronous execution
  - Callback
  - Promise
  - async / await

Javascript is a Synchronous single Threaded Language

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Async code

- Thread
  - Container(Place) where code is executed sequentially
- Single thread
  - Only one statement is executed at a time.
  - It has only one call stack

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Async code

- Synchronous execution
  - Execution of code sequentially
  - Program is executed in order, line by line, one line at a time
  - Each time a function is called, the program execution waits until that function returns before continuing to the next line of code.

Everything in Javascript happens inside an execution context.

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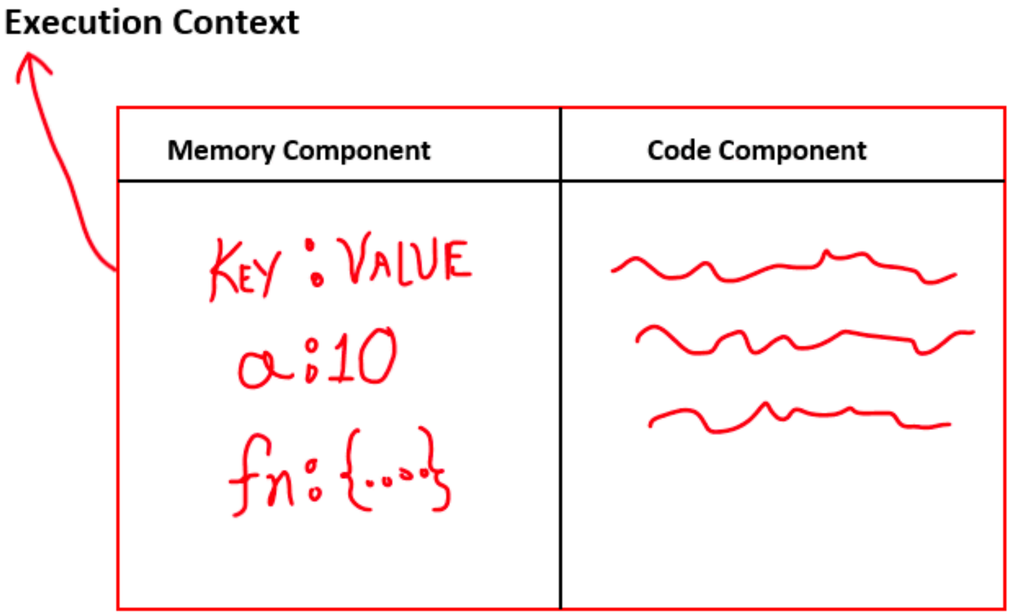
Async code

- Execution context
  - Container where whole javascript code is executed.
- Execution context components
  - Memory component / variable environment
  - Code component / Thread of execution



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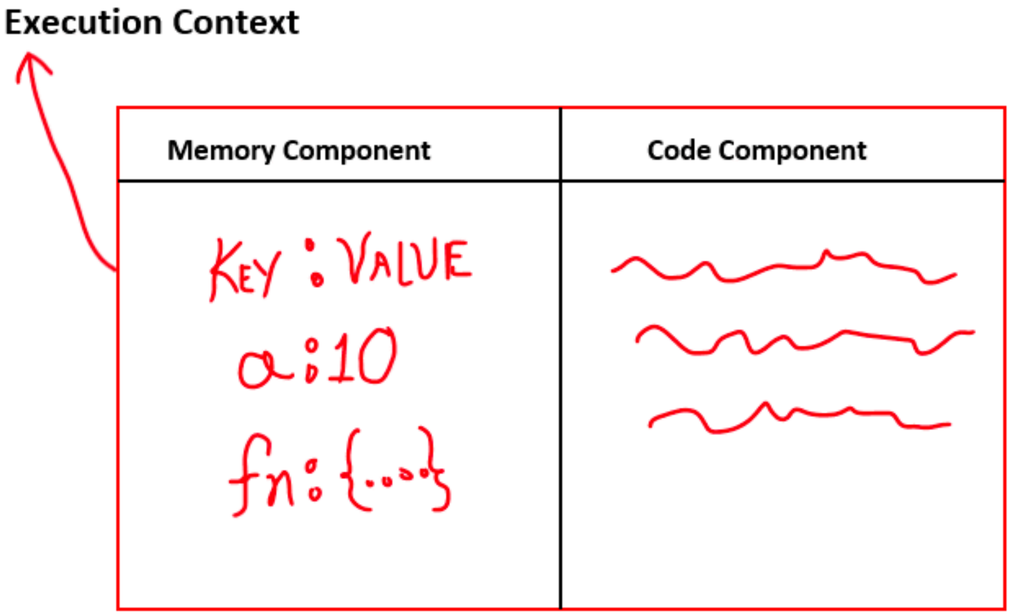
Async code

- Memory component
  - All the variables and functions are stored as a key-value pairs
- Code component / Thread of execution
  - Code are executed one line at a time.



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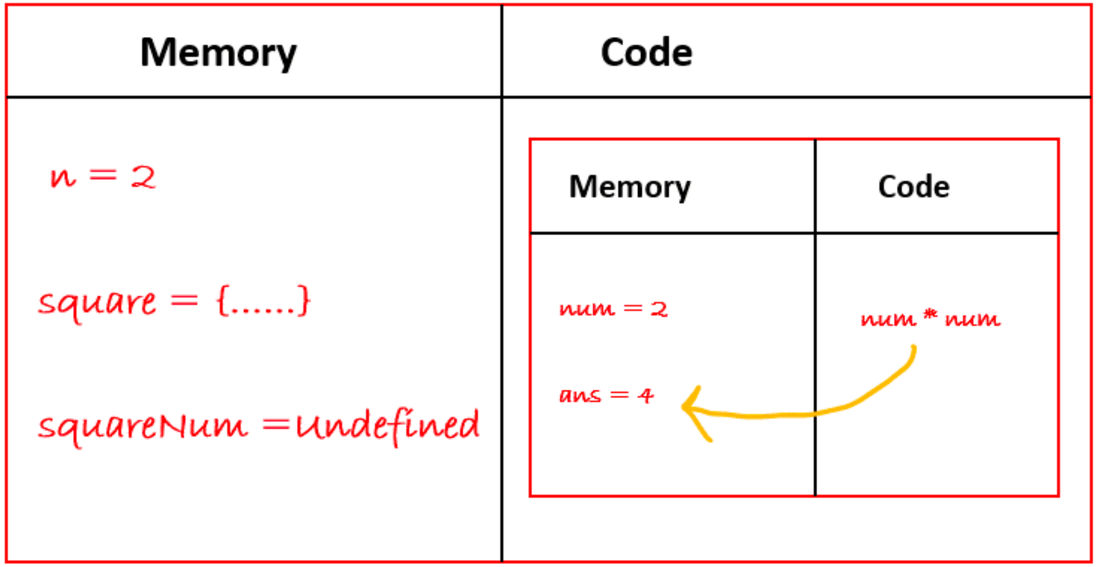
Async code

- Two types of execution context
  - Global execution context
  - Function execution context
- Function call
  - New execution context in created for each function call
  - For each execution context, there is a scope chain coupled with it.



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Async code

- How Javascript Code is Executed
  - When the javascript code is run, a global execution context is created.
  - Execution is created in two phases
    - Memory Creation phase
    - Code execution phase

```
1  var n=2;
2  function square(num)
3  {
4      var ans=num*num;
5      return ans;
6  }
7  var squareNumber=square(n);
8
```

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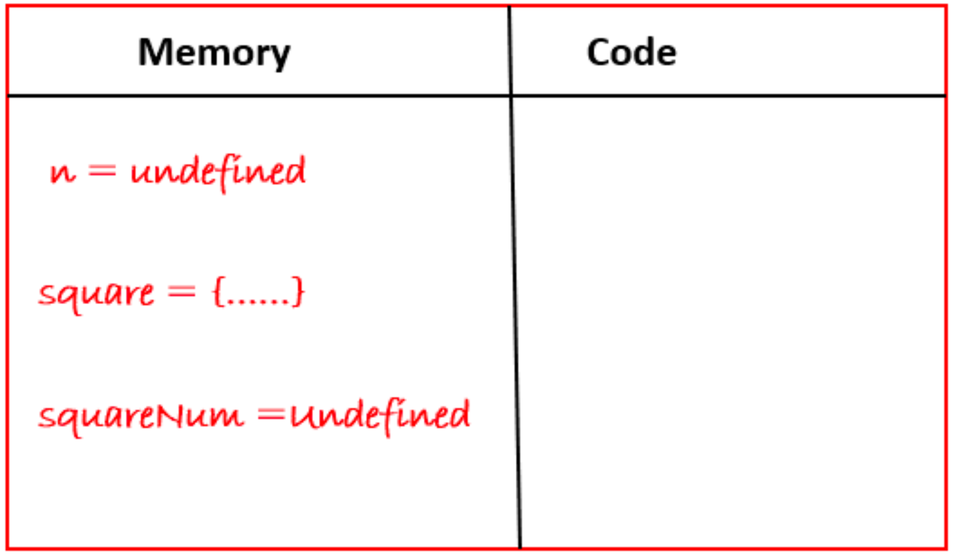
Async code

- Memory Creation phase
  - Allocate memory to all the variable and functions
  - Set undefined as variable value
  - For function it stores whole code of the function in memory space.



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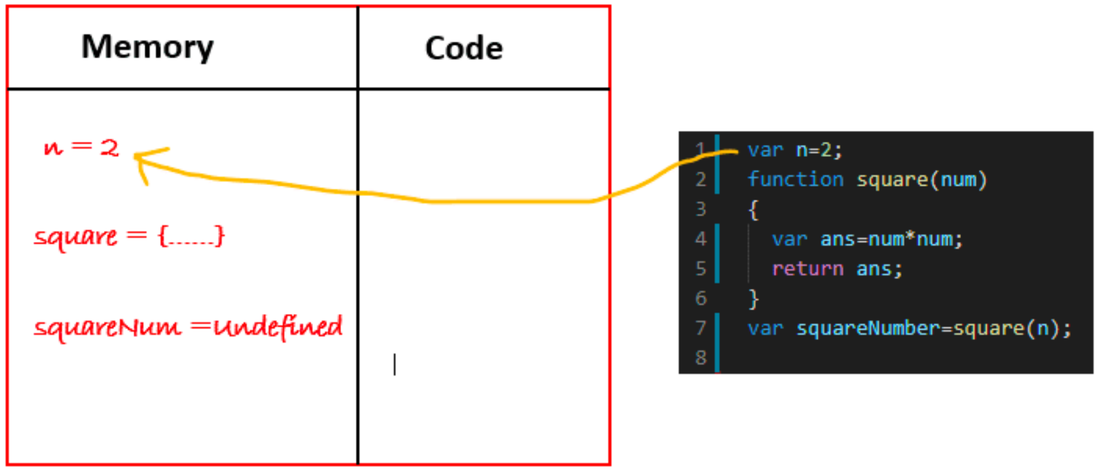
Async code

- Code execution phase
  - Make variables affectation
  - Make computation



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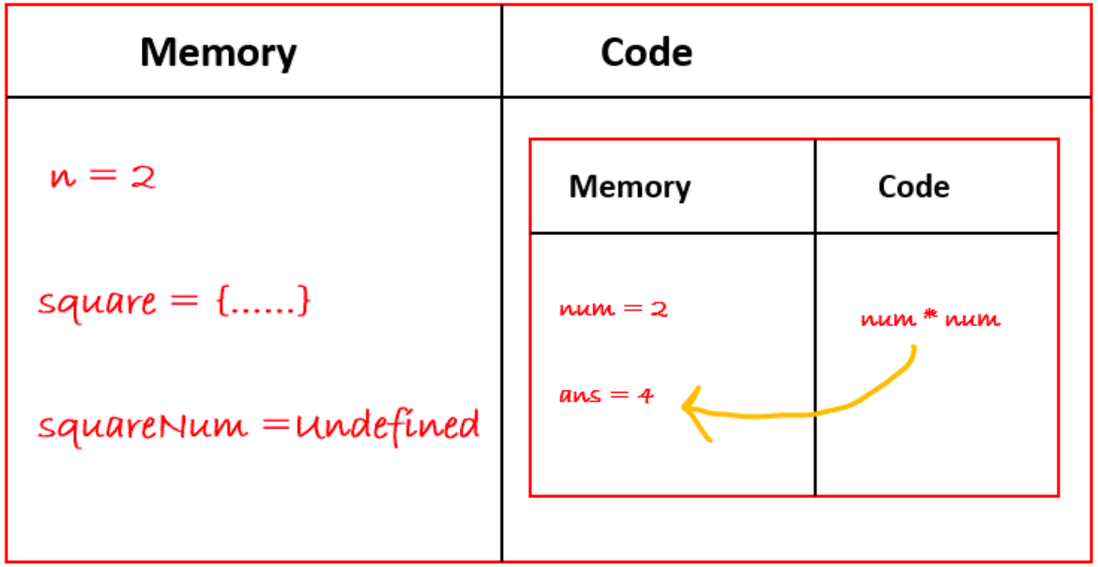
Async code

- Function invocation
  - Each function invocation in a code execution phase create a new context related to the function being invoked
  - Because functions are like mini programs
  - And goes through all the phases



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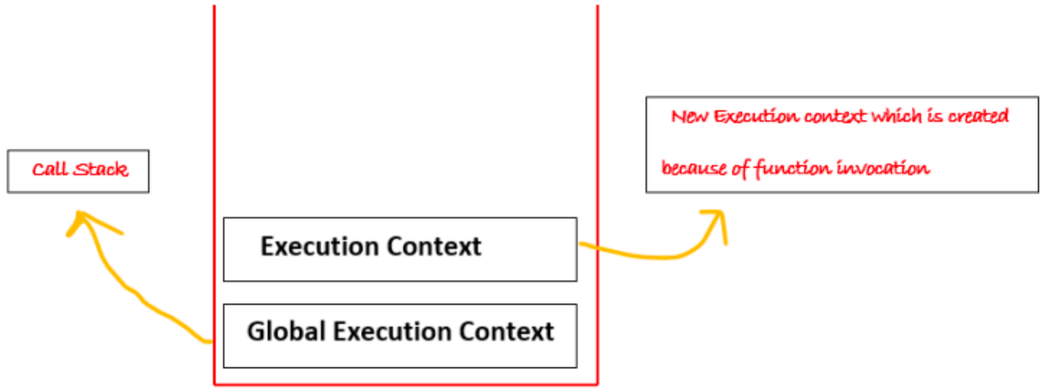
Async code

- Call stack / Pile d’execution
  - Tracks the current function in execution
  - Maintains the order of execution of Execution Context
  - LIFO: Last in first out
  - Add function to the stack when invoked
  - Remove function from the stack when completed



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Async code

- Call stack / Pile d’execution
  - Is empty before running the code
  - Is empty after running the code
  - Other names (Execution context stack, Program Stack, Control Stack, Runtime Stack, Machine Stack)

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Async code

- In summary
  - Codes in javascript are executed in order, one at a time
  - When you run a code, a global execution context is created
  - The global execution context is added to the call stack to keep track of it and to execute it in a sequential order.
  - A new execution context is created for each new function invocation and this context is added to the stack for the same purpose
  - When a function execution is complete the context is removed from the stack
  - Each context as a scope chain coupled with it
  - At the end, after all codes are executed, the stack becomes empty

Asynchronous code

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Async code

- Asynchronous
  - Code execution not occurring at the same time or sequentially
  - As single thread language how does it handle asynchronous code?
  - Two group of async operation
    - **Browser API/Web API** events or functions. These include methods like setTimeout or event handlers like click, mouse over, scroll, and many more.
    - **Promises**. A unique JavaScript object that allows us to perform asynchronous operations.

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Async code

- Callback
  - A function passed as argument to another that will be execute in the futur
  - Browser APIs like setTimeout, setInterval and event handlers rely on callback functions. A callback function executes when an asynchronous operation completes.

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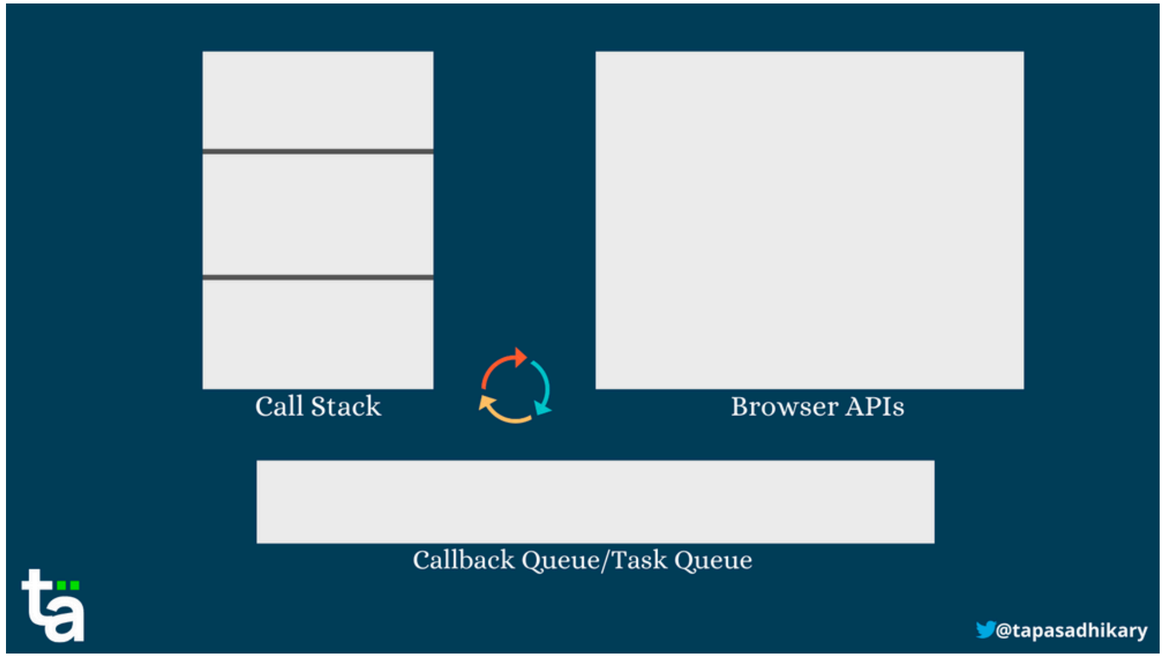
Async code

- Callback Queue / Task Queue
  - FIFO
  - Stock all the callback functions invoked by the Browser API
- Event Loop
  - Created by the engine to look into the queue periodically to find what it needs to pull from there. It pulls a callback function from the queue to the call stack when the stack is empty.



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Async code

- **Promise**
  - Special objects that help you perform asynchronous operations.
  - Executor function
    - Resolve
    - Reject
  - Thenable
    - Then
    - Catch
    - Finally

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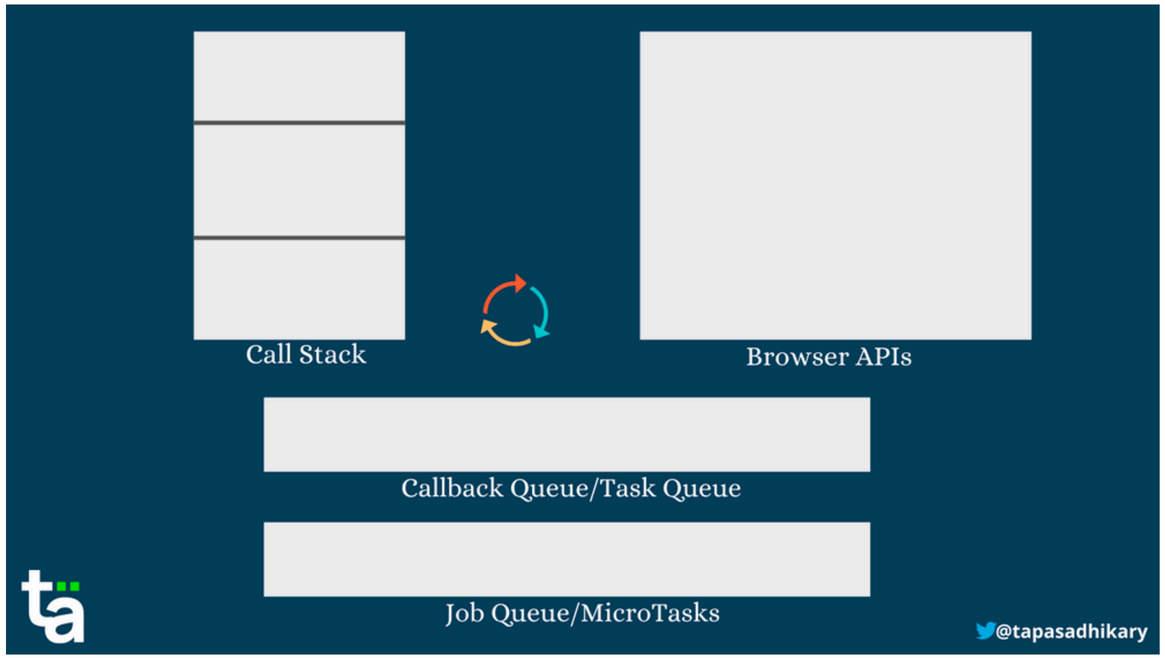
Async code

- Promise / Job Queue
  - FIFO
  - Stock all the executor functions each time a promise occurs
  - The event loop gives priority to the job queue items over the callback queue items when the stack is free
- Item in the callback queue is called a macro task, whereas the item in the job queue is called a micro task.



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Async code

- **Async - await**
  - Async
    - Declares an asynchronous function
    - Automatically transforms a regular function into a Promise.
    - Async functions enable the use of await.

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Async code

- **Async - await**
  - Await
    - Pauses the execution of async functions.
    - When placed in front of a Promise call, await forces the rest of the code to wait until that Promise finishes and returns a result.
    - Await works only with Promises, it does not work with callbacks.
    - Await can only be used inside async functions.

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Async code

- **Async - await**
  - Handing error