SCIENCES SORBONNE UNIVERSITÉ

Swift, memory management and consistency

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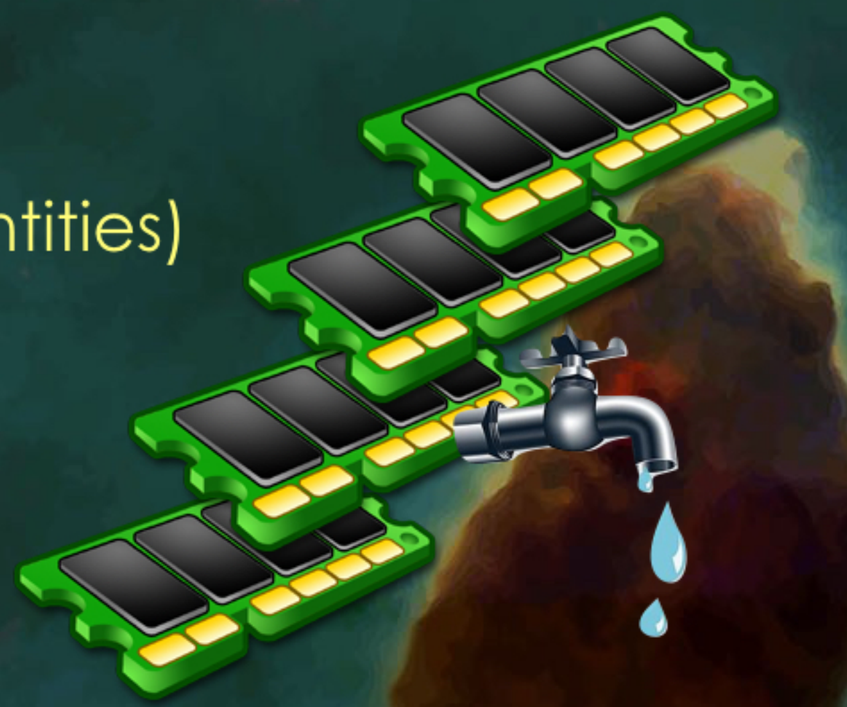
LIP6

As an introduction…

- **In Swift, memory is (almost) «for free»**

- **Safe memory management techniques**
  - Blocks (LIFO approach)
    - **E.g. function calls**
  - Classes (use of «classifiers» for entities)
    - **Mutable/immutable properties**
    - **Properties classification**
    - **Constructors/destructor**
  - Closures
    - **Management of the scope**



- **ARC always activated**
  - Impossible to «play manually» with memory

Object initialization (memory aspects)

Phase 1

- Invocation of an initializer
- Memory Allocation for he new instance
- Initializer confirms installation of properties
- Invocation of the super's initializer
  - **The memory allocated for he instance is valid**

Phase 2

- Finalizing initialization (self is available)
- Finalization of self via convenience init (when necessary)

Reminder about objet's liaisons

Strong

- Enclosed references must be «alive»
  - **Destroyed with the current object**
- Be aware of cycles that could hinder ARC's efficiency
- Default relation

Weak

- Enclosed reference may be «missing»
  - **Optional types**
- May «break» a cycle (and let ARC work)
- Keyword : weak

Unowned

- Like weak… but always have a value (like strong)
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Reminder about objet's liaisons

How to deallocate?

Assign «nil» to a reference

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Is ARC efficient?

Object's liaisons must be well categorized…

Strong liaison, example


```
class Person {
    let name: String
    var atHome: Apartment?
    init(n: String) {
        name = n
    }
    deinit {
        print("\(name) is «deinitialized»")
    }
}

class Apartment {
    let number: Int
    var owner: Person?
    init(n: Int) {
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var him : Person? // value = nil
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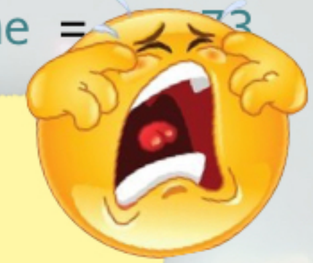

What is going on?

ARC does not catch this memory

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Close look at the example


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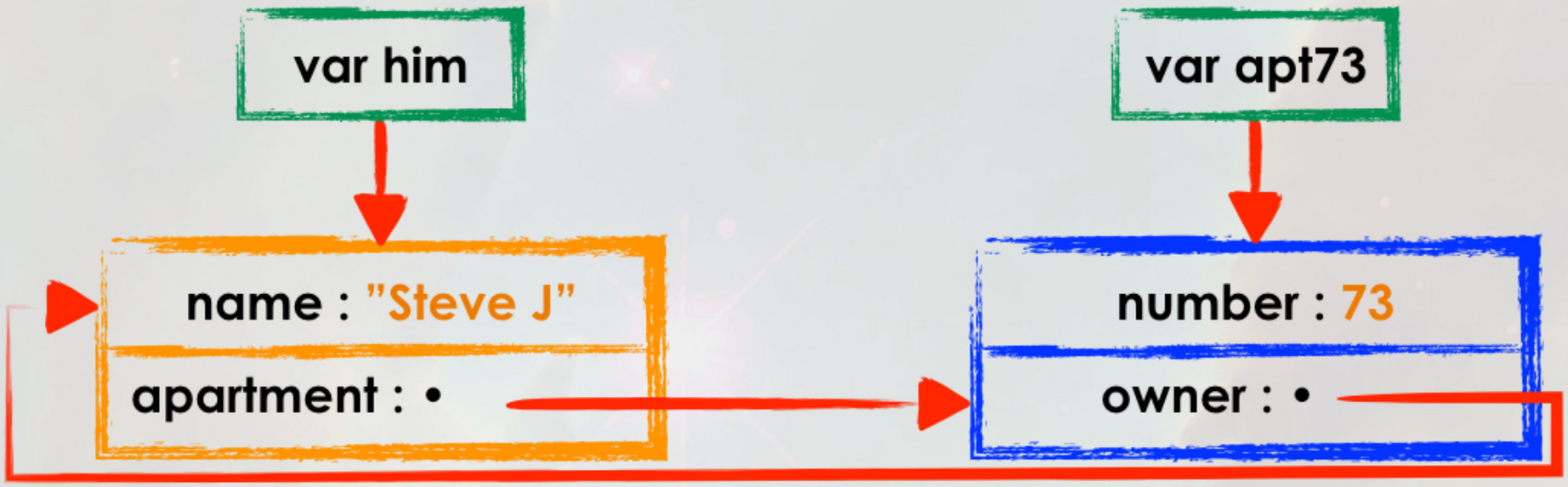

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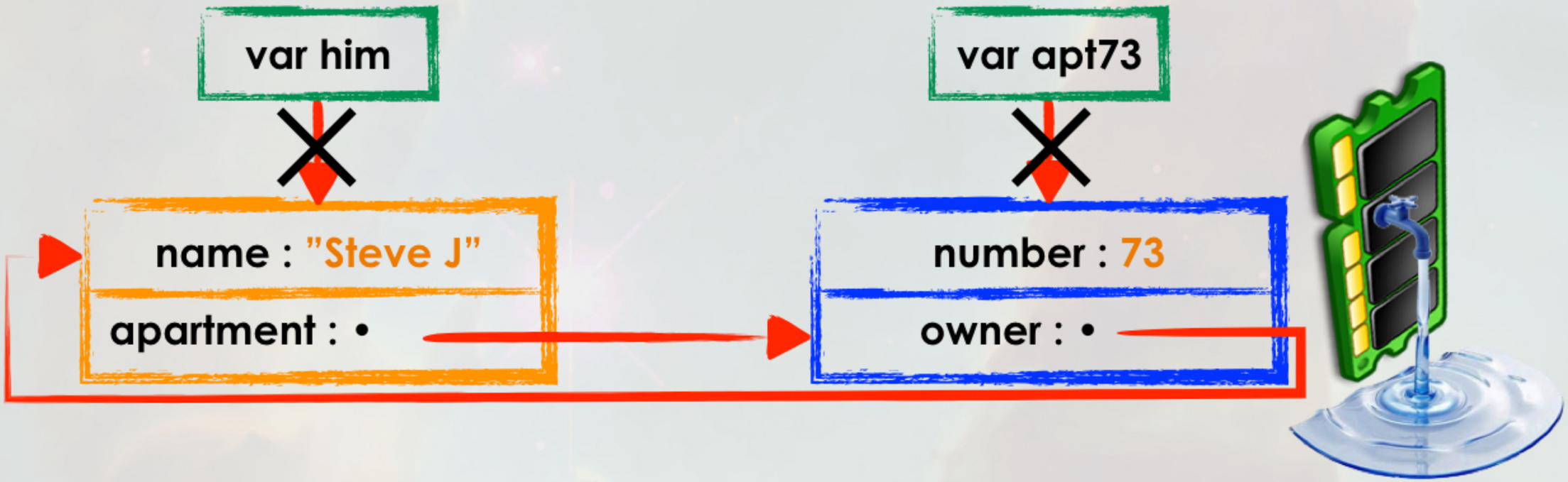

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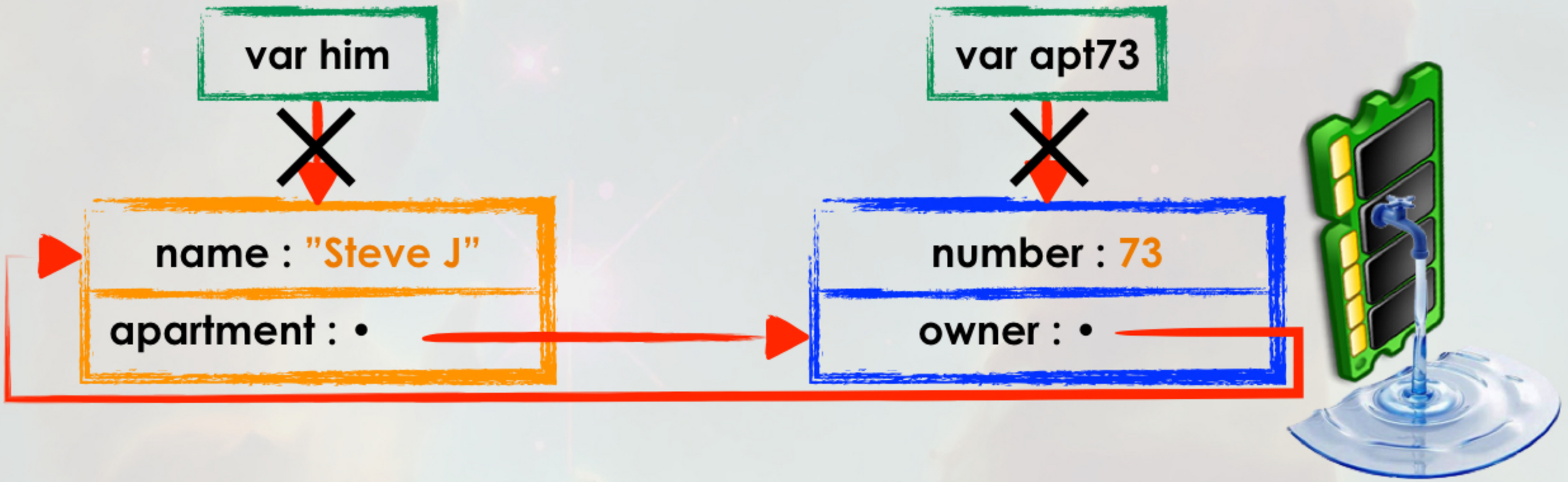
Cycle with strong liaisons...

ARC cannot deallocate



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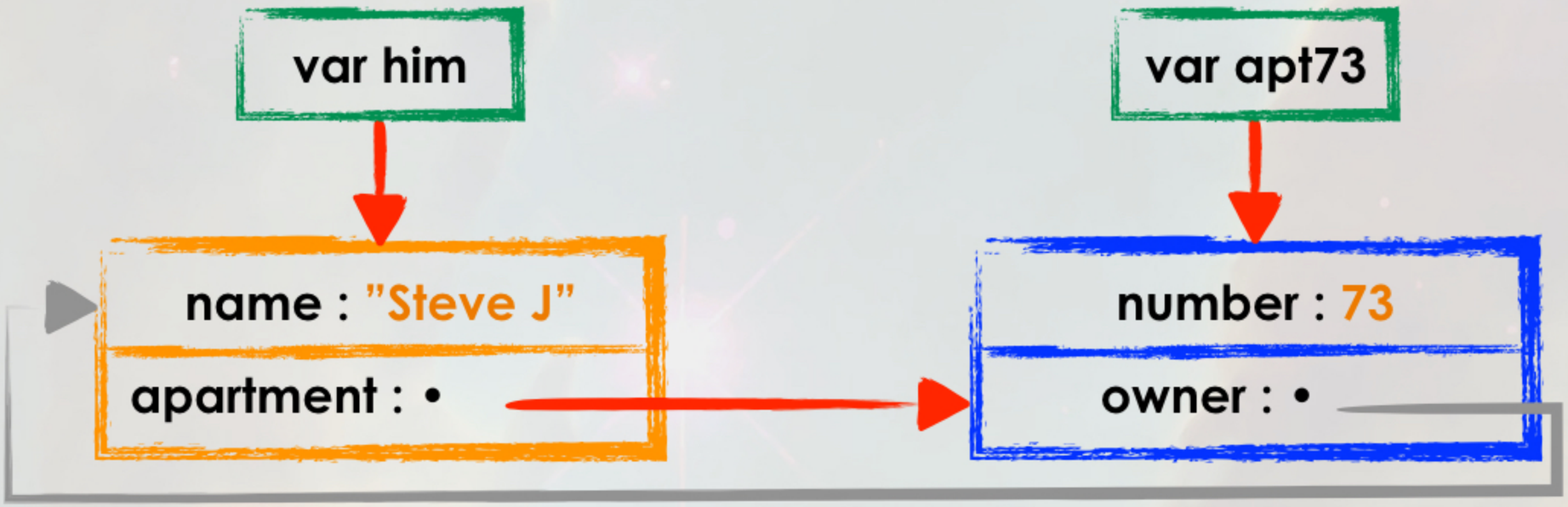

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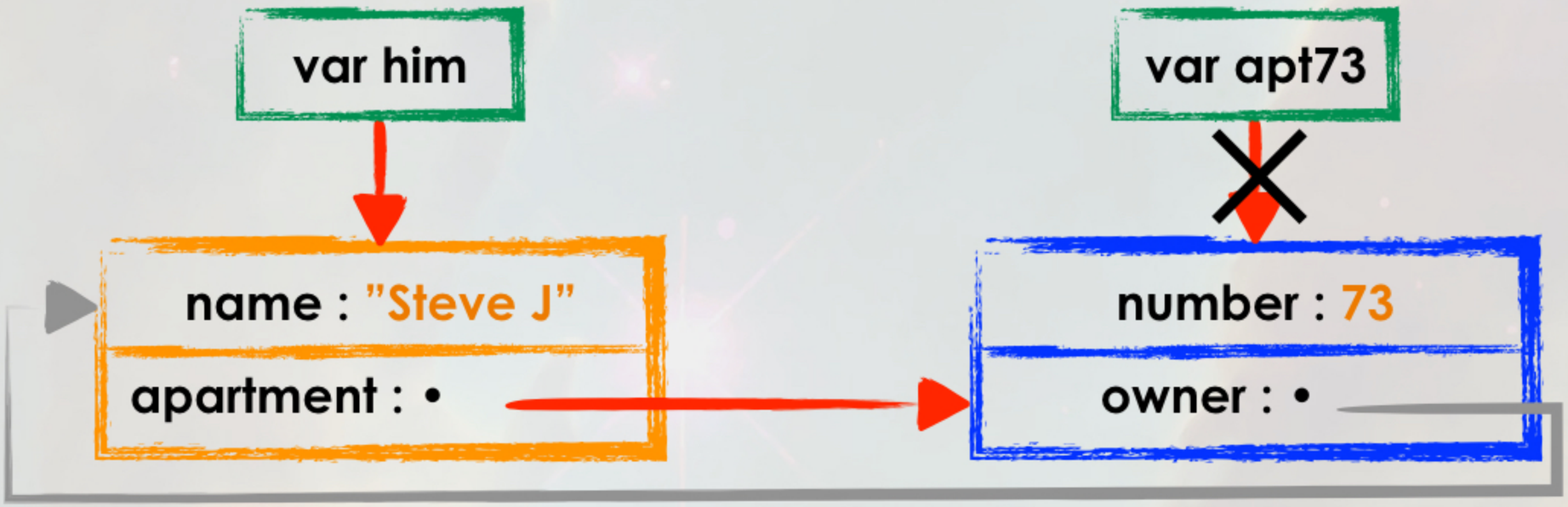

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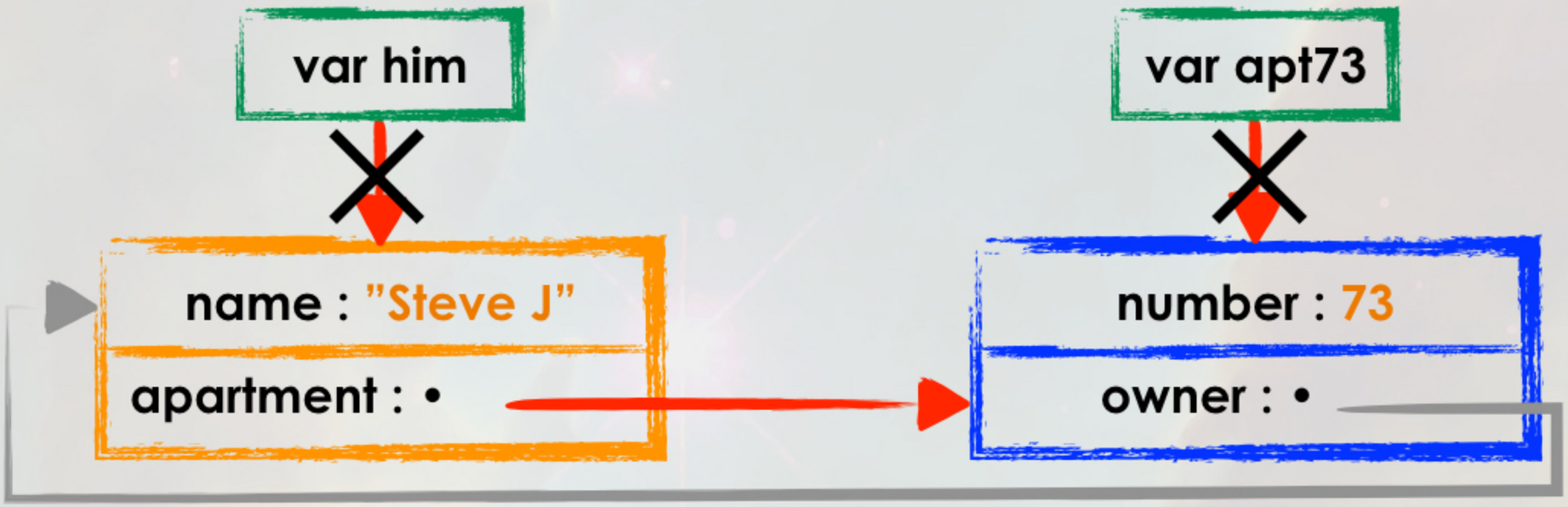

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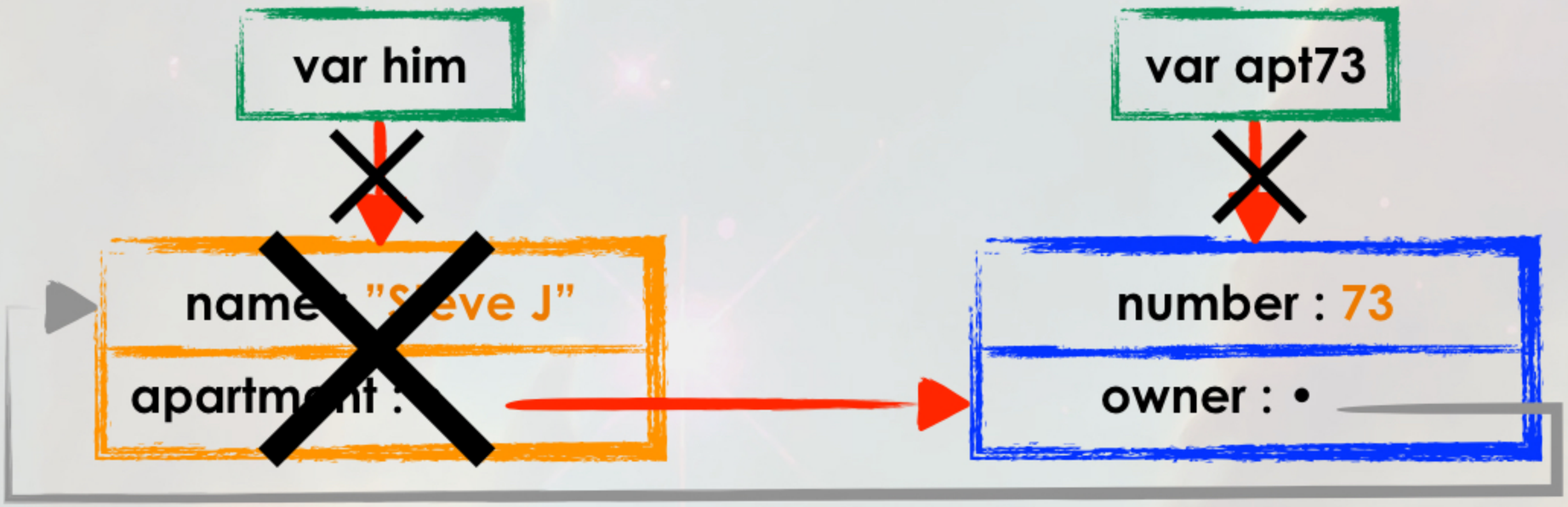

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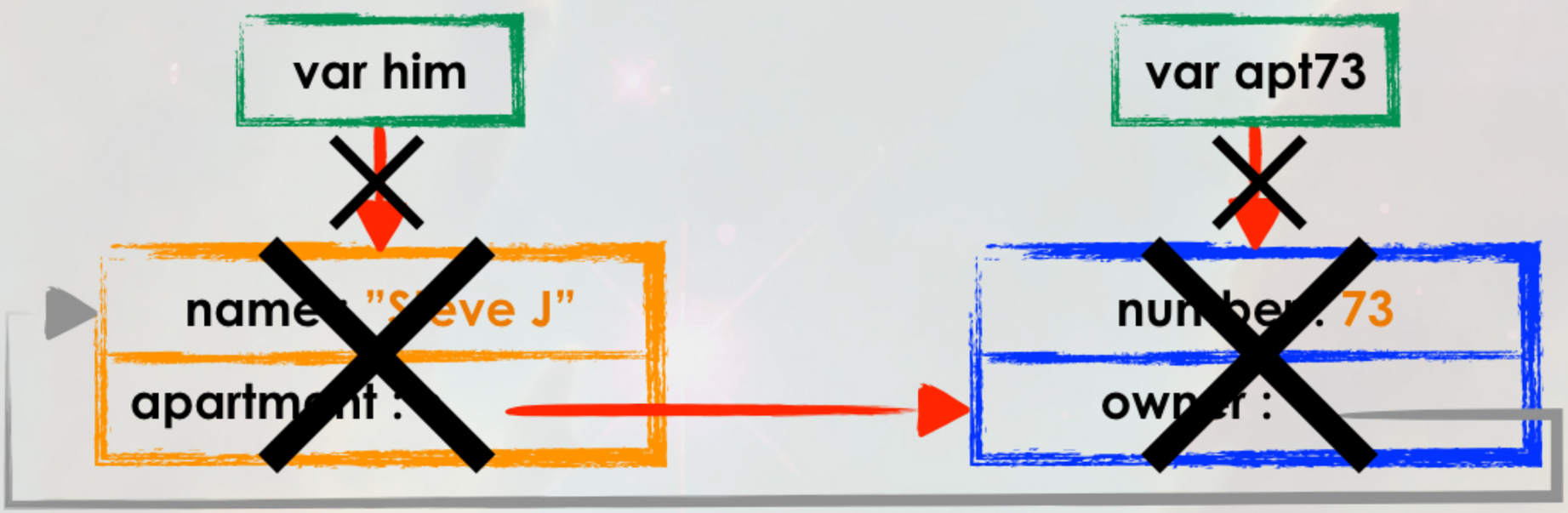

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Steve J is «deinitialized»
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What if him deallocated first?

Memory of the «orange object» would have been caught first


```
Steve J is «deinitialized»
Appartment #73 is «deinitialized»
```

Weak versus unowned?

- **Unowned behave like weak**
  - Useful to break a cycle
- **Weak liaison**
  - May have no value
- **Unowned liaison**
  - Must always have a value
    - **After initialization**

deinit, more than a deallocator

At most one deinit per class

- Goal : appropriately «terminate» the object

Example

- Monopoly game
  - **Each player has a portfolio**
  - **when a player loose, its portfolio goes to the bank**

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Anytime in the game

$$portfolio(bank) + \sum_{p \in Players} portfoliot(p) = K$$

deinit, more than a deallocator


```
class Bank {

    func getMoney(val: Int) -> Int {...}
    func putMoney(val: Int) {...}

}

class Gamer {
    var theBank : Bank?
    var inPortfolio: Int // my money

    init(value: Int, myBank : Bank) {
        theBank = myBank
        inPortfolio = theBank!.getMoney(val : value)
    }
    func gangnerArgent(value: Int) {
        inPortfolio += theBank!.getMoney(val : value)
    }
    deinit {
        theBank?.putMoney(val : inPortfolio) // Return my money to the bank
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A way to preserve consistency

More powerful than the Objective-C dealloc

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As a conclusion…

You might find retain/release/autorelease easy

- Because ARC is no «totally free»
  - **You still need to think a bit**

Obviously, ARC need some data to run

- Objective-C rely on conventions
  - **alloc/init/copy & counter's value**
  - **autorelease**
  - **etc.**
- Swift strongly relies on a classification of liaisons

By the way

- Remind that optional variables default is «nil»

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