

# Uma carreira consistente em Computação Distribuída

Lásaro Camargos

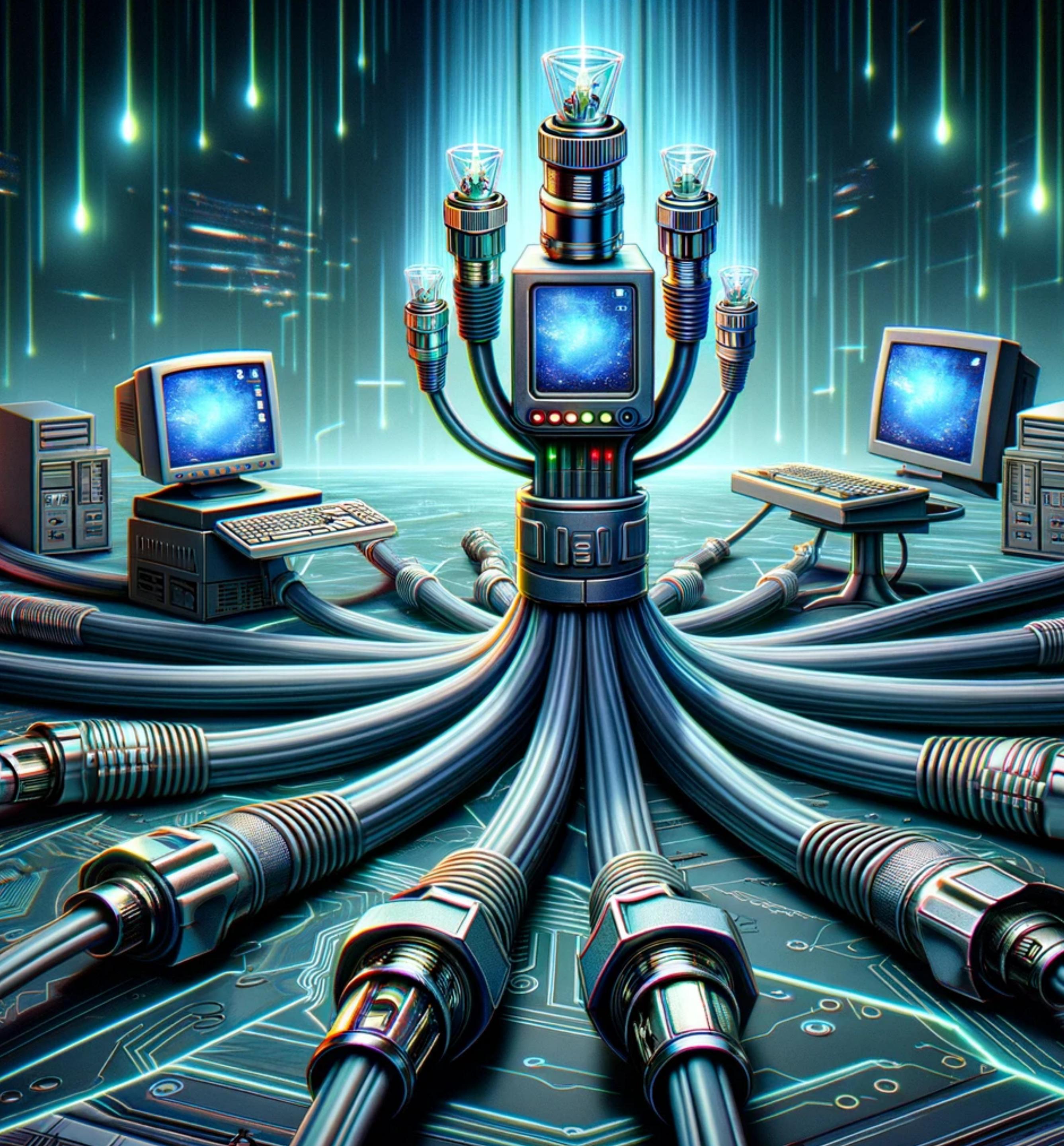
# Lições de insistente Uma carreira ~~consistente~~ em Computação Distribuída

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## Controle de ordens de serviço

- Primeiro projeto “profissional”
- Clipper + DBase (in memoriam)
- GasPro



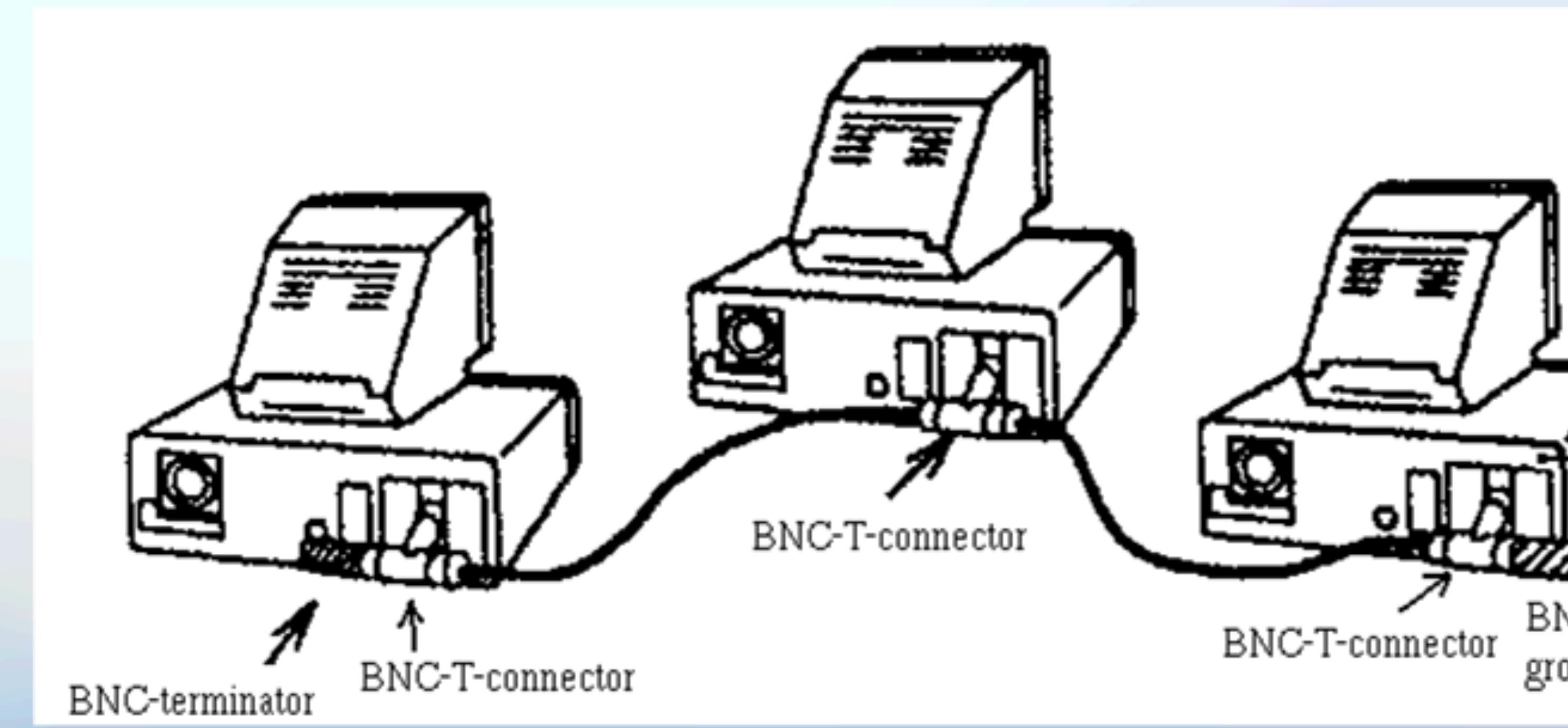
97

Lição 1

**Vibe coding já existe há muito tempo!**

## Controle de ordens de serviço

- Computador principal: .exe + DB
- Computador(es) secundário(s): telnet
- Múltiplas instâncias x único BD
  - Concorrência
  - Falhas



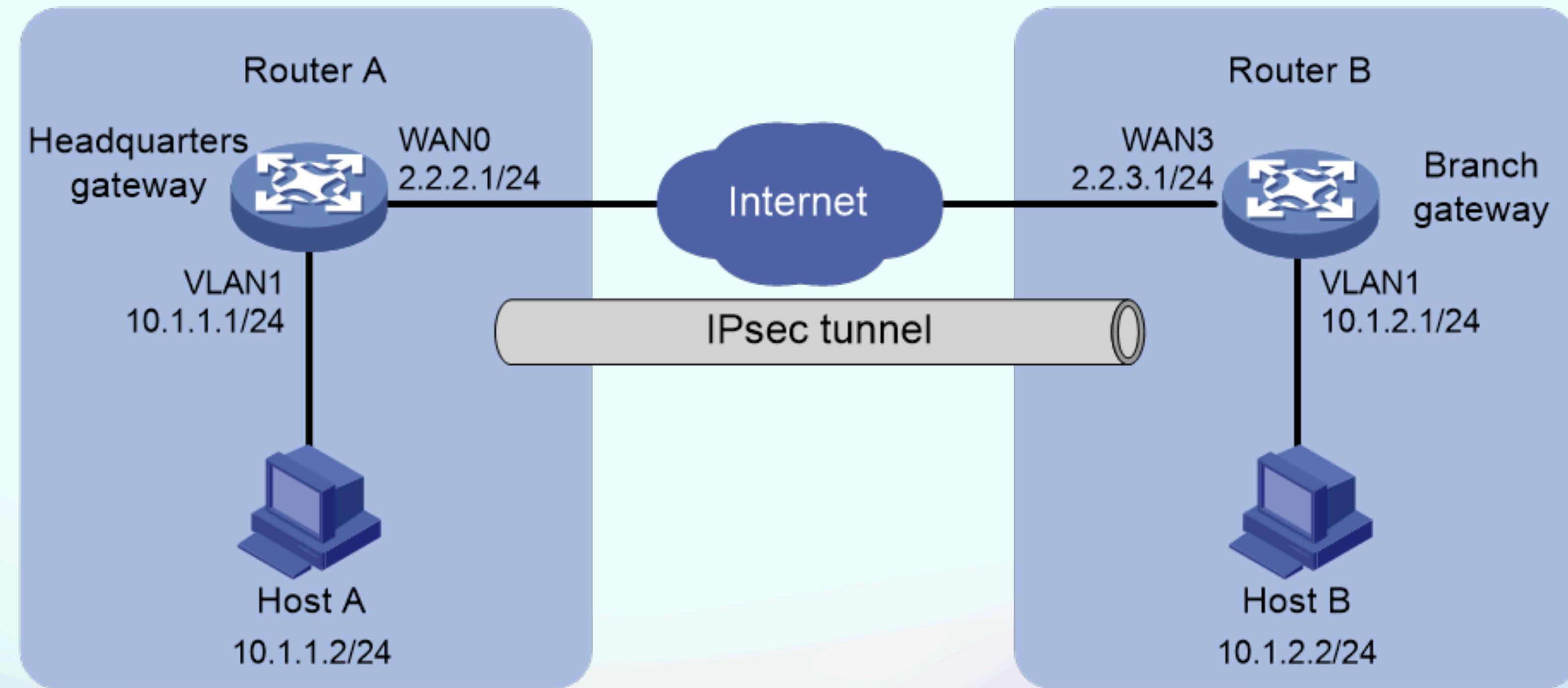
**Qualquer sistema minimamente útil, terá algum nível de distribuição, concorrência/parallelismo.**

- Lamport publica “The Part-time Parliament”, com o algoritmo Paxos



# 01

## IPSec



- [https://www.h3c.com/en/Support/Resource\\_Center/EN/Home/Routers/00-Public/Configure\\_\\_Deploy/Configuration\\_Examples/H3C\\_CE-16245-Long/04/202401/2009094\\_294551\\_0.htm](https://www.h3c.com/en/Support/Resource_Center/EN/Home/Routers/00-Public/Configure__Deploy/Configuration_Examples/H3C_CE-16245-Long/04/202401/2009094_294551_0.htm)

01

Lição 2

- **Há menos escovação de bits nas camadas de abstração superiores.**

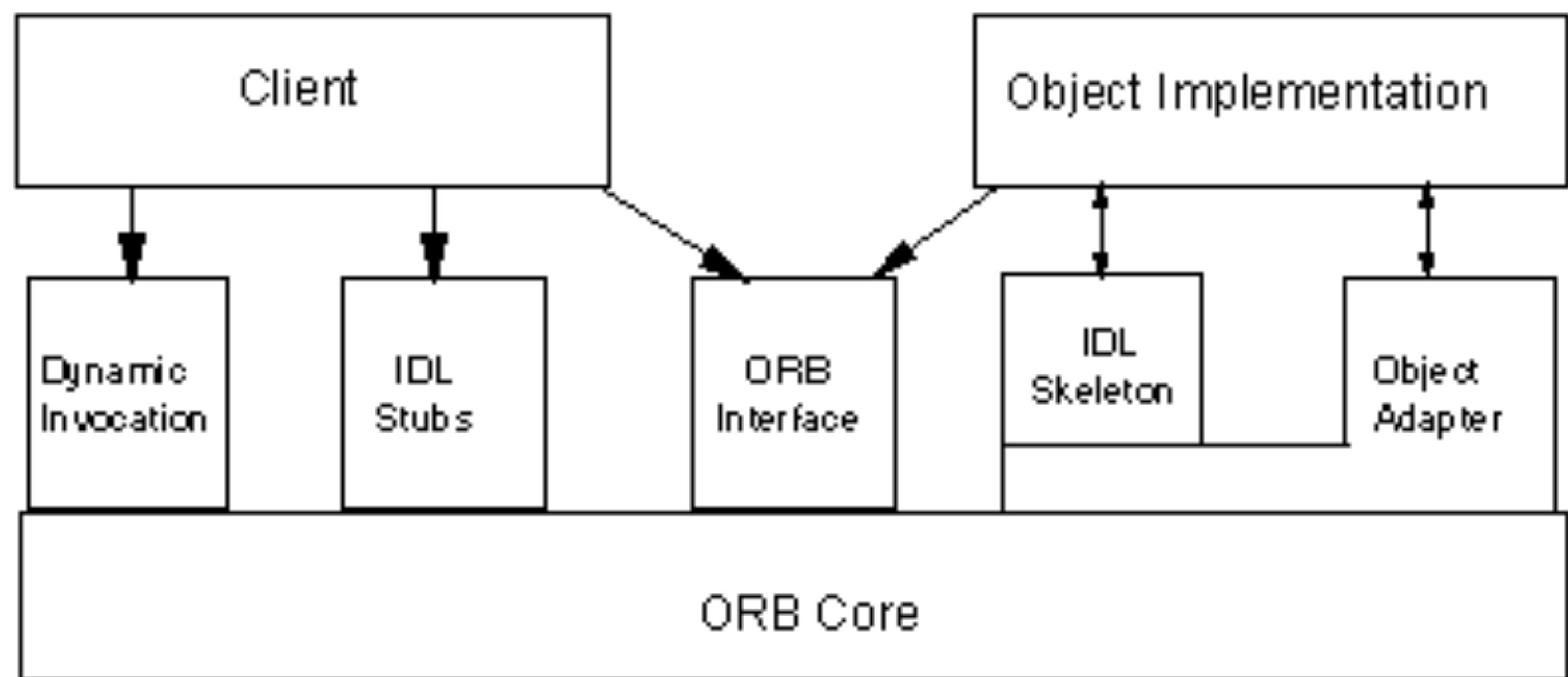


01

Mestrado

- CORBA & FT-Corba
- Chandra&Toueg

## CORBA Architecture



01

## Lição 3

- **Você provavelmente nunca usará UML na prática.**

Mapping the proposed architecture to an object oriented model is straightforward. The UML class diagram [1] in Fig. 2 presents our modeling.

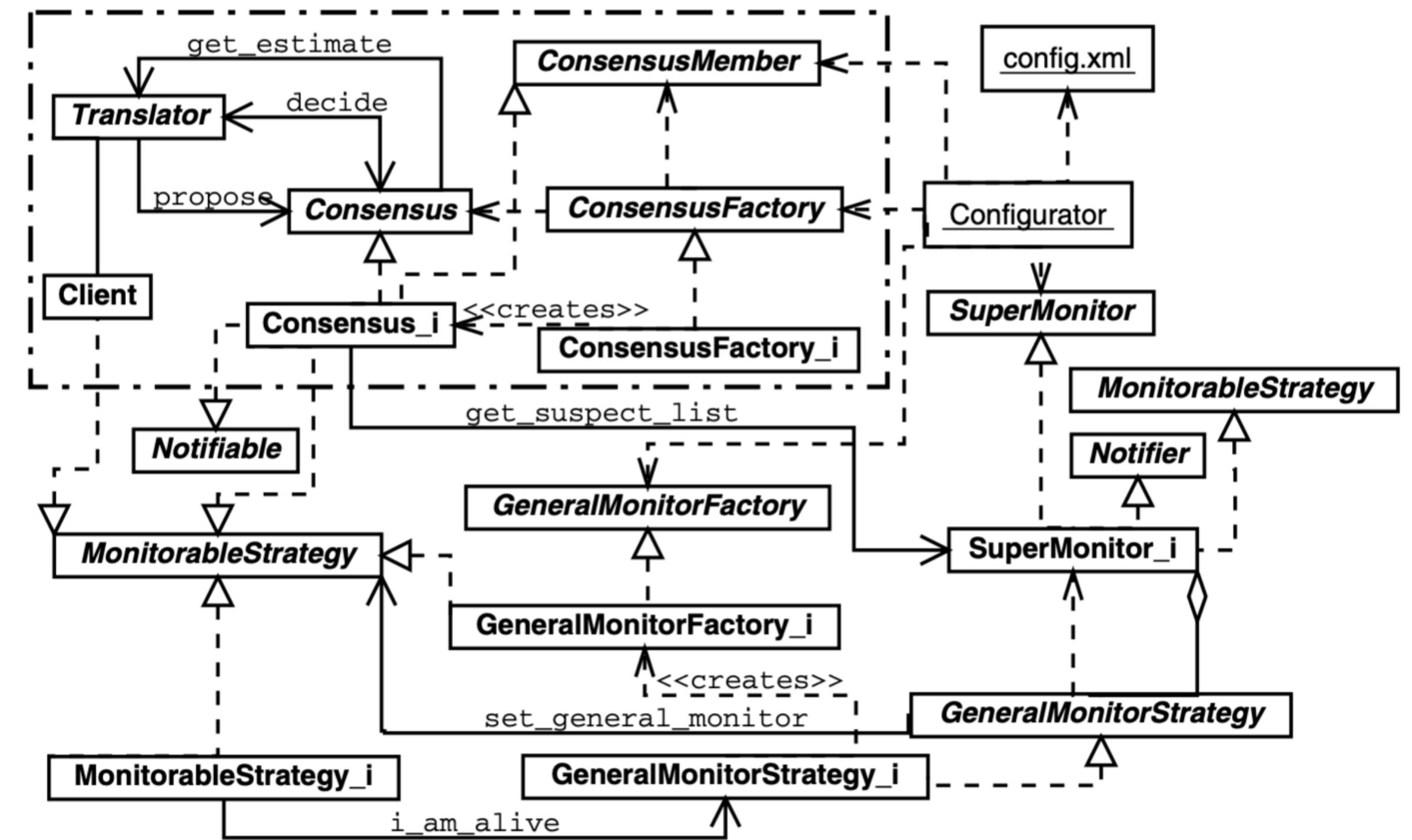
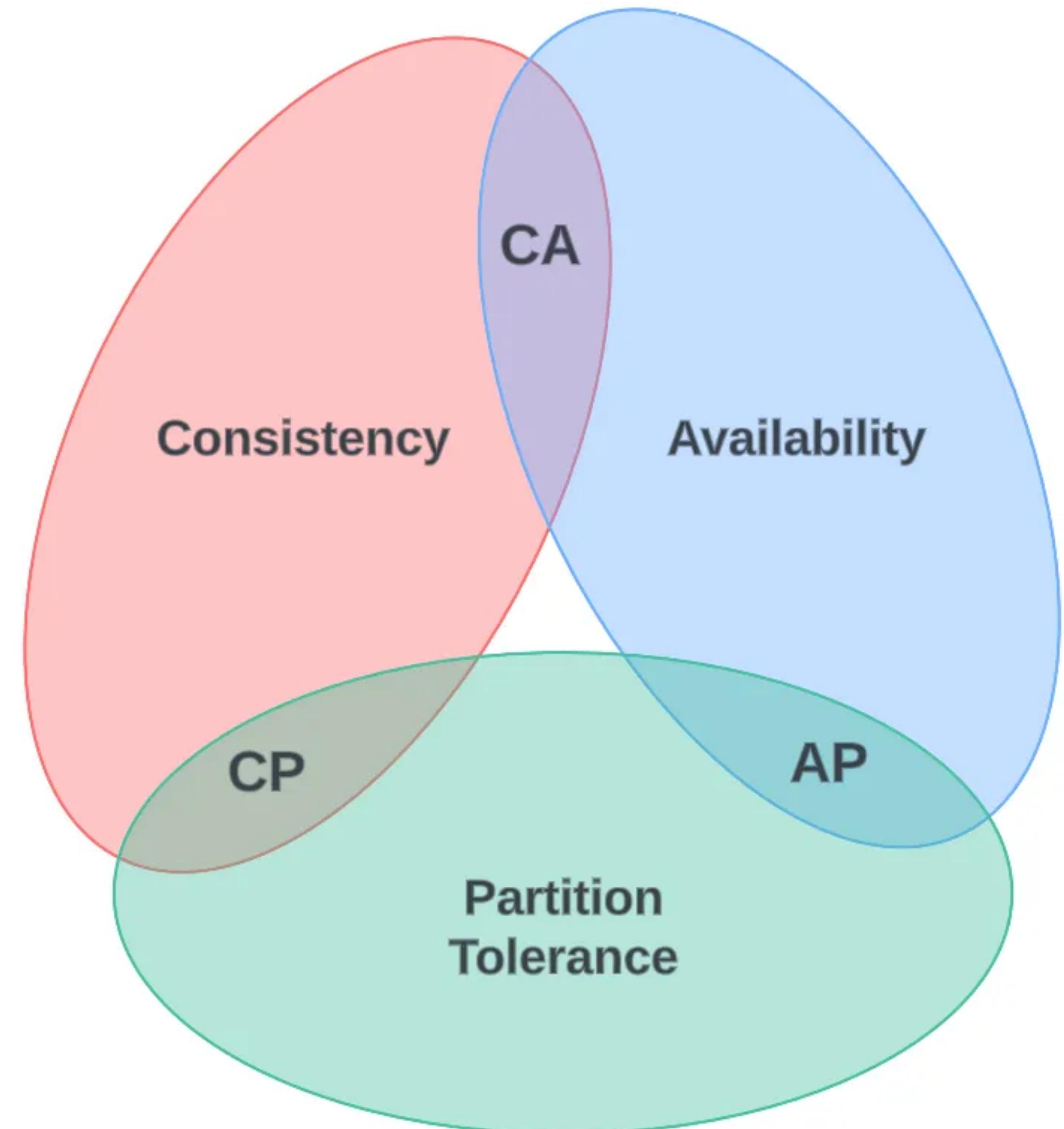


Fig. 2. The proposed model.

00 (+2)

CAP

- Consistency: Every read receives the most recent write or an error.
  - Availability: Every request receives a (non-error) response, without the guarantee that it contains the most recent write.
  - Partition tolerance: The system continues to operate despite an arbitrary number of messages being dropped (or delayed) by the network between nodes.
- 
- <https://martin.kleppmann.com/2015/05/11/please-stop-calling-databases-cp-or-ap.html>



01

Lição 3

- **Nunca haverá transparência total de distribuição.**

# 04

## Sprint

- Replicação de Bancos de Dados
- Protótipo
- Versão 1: Classes + Polimorfismo + Herança
- Versão 2: função *main* e *byte buffers*



# 04

## Lição 4

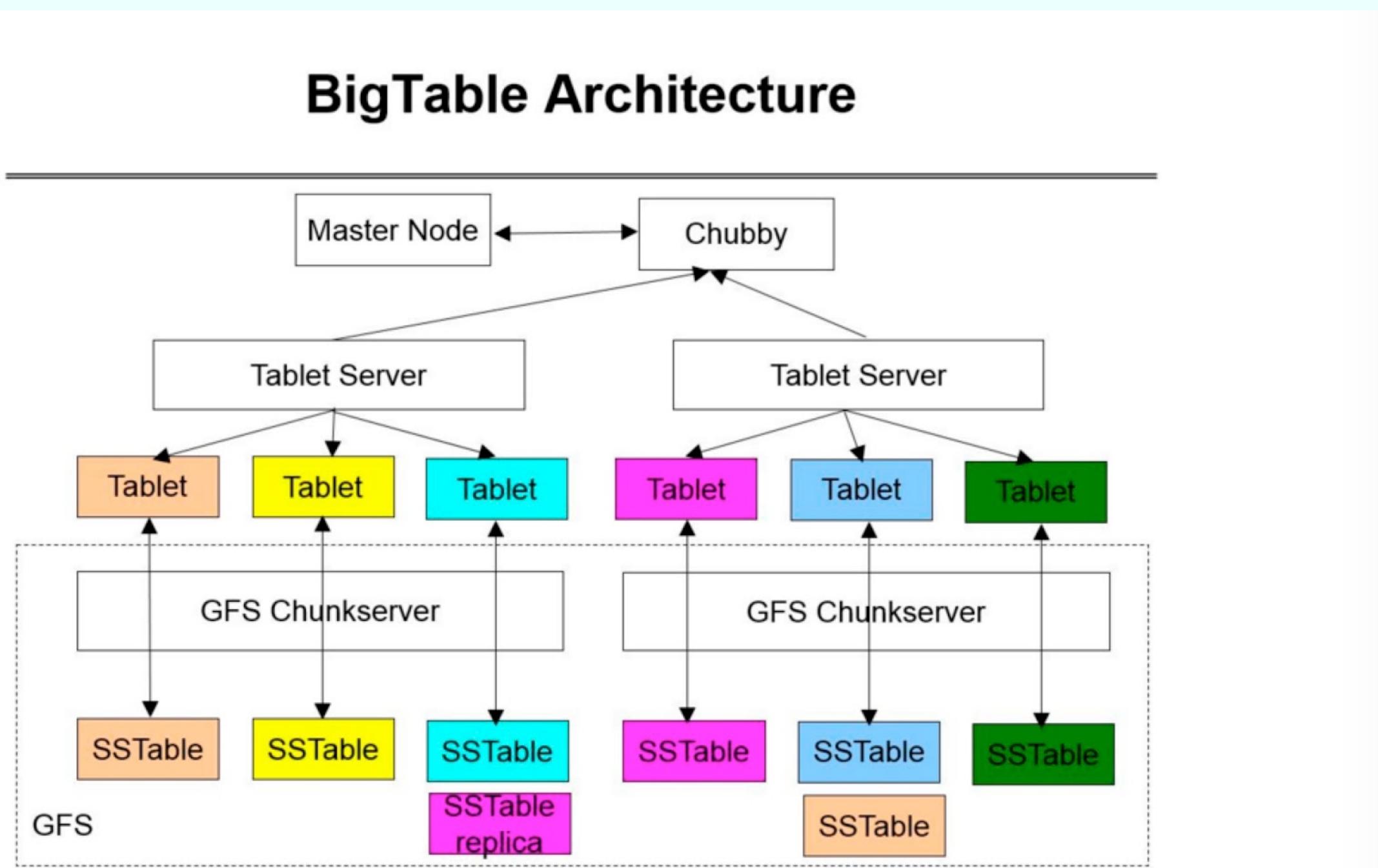
- **O que importa é ter bons números!!!**
- **Academia e indústria tem objetivos distintos.**



# 04

## Bigtable - Google

- +2 Chubby Lock Service



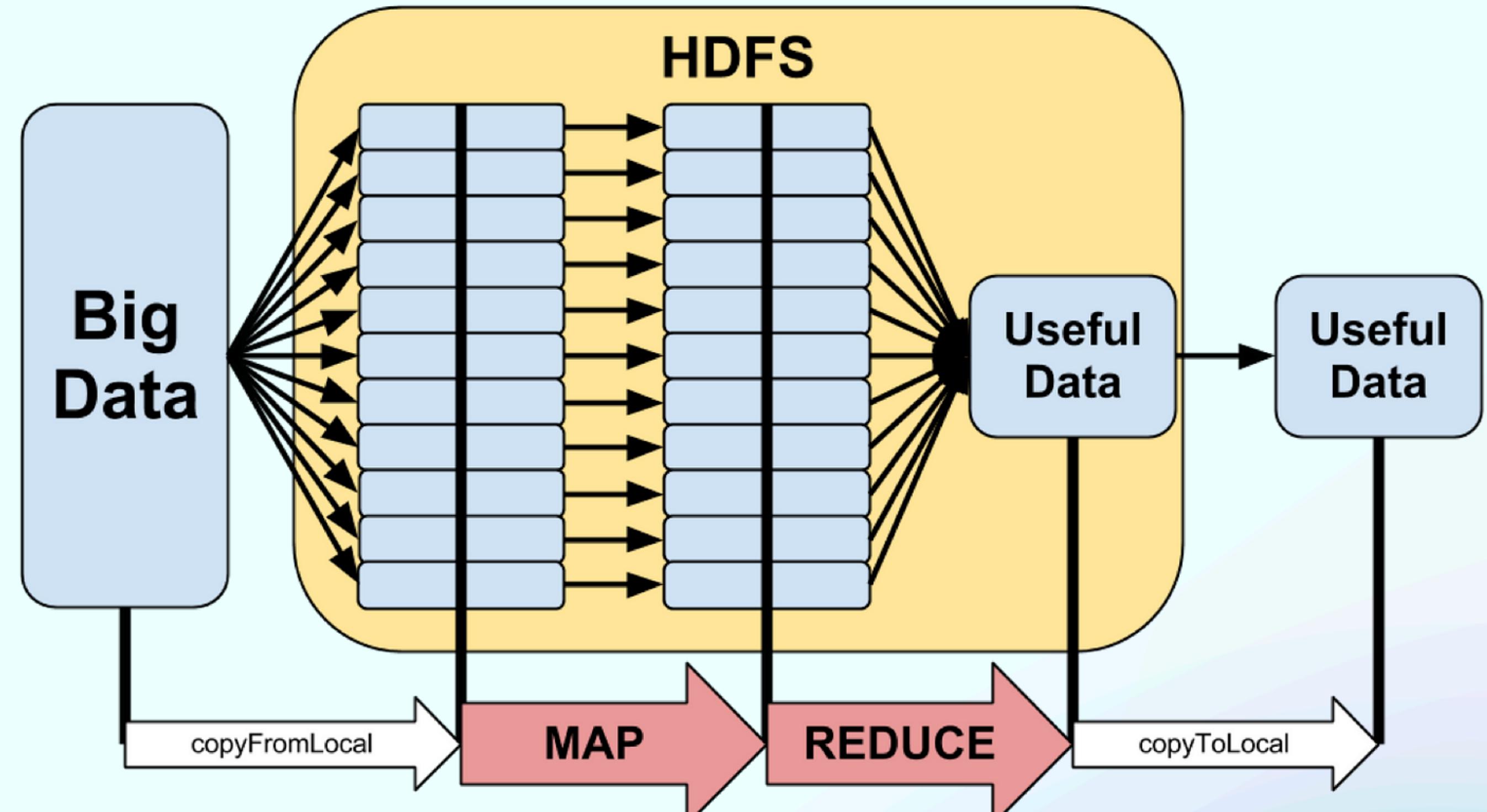
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# 04

## Map-Reduce - Google

- Spark (Berkeley)
  - Melhorias no modelo
  - "A indústria mostra o que é possível e a academia mostra o que é ótimo"



04

- Hadoop (MapReduce) + Zookeeper (~= Chubby)



# 04

## Lição 4

- ~~O que importa é ter bons números!!!~~
- ~~Academia e indústria tem objetivos distintos.~~
- **A academia e indústria tem *timing* diferente, mas o objetivo é o mesmo: resolver problemas.**



# 05

## AWS, antes da AWS

- Roundabout (RIP)
- DynamoDB
  - Logical (Vector) Clocks
  - Consistent hashing
    - Chord



# 05

## AWS, antes da AWS

- DynamoDB
  - NoSQL
  - Cassandra
  - CouchDB
  - MemCached
  - MongoDB
  - Redis
  - Raven
  - Arango
  - ...



05

## Lição 5

- **A indústria se alimenta da academia.**

# 05

## Especificação e Verificação formal de protocolos

- Exemplos de brinquedo
- Explosão de estados
- Status quo

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# Especificação Verificação formal de protocolos

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## How Amazon Web Services Uses Formal Methods

Engineers use TLA+ to prevent serious but subtle bugs from reaching production.

By Chris Newcombe, Tim Rath, Fan Zhang, Bogdan Munteanu, Marc Brooker, and Michael Deardorff

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Introduction Key Insights Precise Designs Formal Methods for Real-World Systems Side Benefit More Side Benefits



Since 2011, engineers at Amazon Web Services (AWS) have used formal specification and

DOI 10.1145/2699417

April 2015 Issue Published: April 1, 2015

- <https://github.com/ligurio/practical-fm>

## A List of companies that use formal verification methods in software engineering

If you see a company on the list that doesn't exist anymore, or does not use formal methods anymore, please send a pull request with an explanation. The same goes if you're currently working at, or know a company that uses formal methods but is not on the list. Please include the website, github (if applicable), locations, and sector. If the company is hiring please include a link to the ad.

Name	Location	Sector	Source
<a href="#">Amazon</a>	USA	eCommerce, Cloud computing	TLA+ <a href="#">How Amazon Web Services Uses Formal Methods</a> , <a href="#">Use of Formal Methods at Amazon Web Services</a> , <a href="#">CBMC Model Checking Boot Code from AWS Data Centers</a> , <a href="#">Dafny</a> <a href="#">AWS Encryption SDK</a>
<a href="#">Airbus</a>	France		Astree : "In 2003, Astrée proved the absence of any runtime errors in the primary flight-control software of an Airbus model. The system's 132,000 lines of C code were analyzed completely automatically in only 80 minutes on a 2.8GHz 32-bit PC using 300MB of memory (and in only 50 minutes on an AMD Athlon 64 using 580MB of memory). Since then, Airbus France has been using Astrée in the development of safety-critical software for various plane series, including the A380.", Coq ( <a href="#">Interview with Xavier Leroy</a> ), CAVEAT , a C-verifier developed by CEA and used by <a href="#">Airbus</a> ., Frama-C ( <a href="#">Industrial use of a safe and efficient formal method based software engineering process in avionics</a> ).
<a href="#">Altran</a>	France, Paris		SPARK <a href="#">SPARK contributors</a>
<a href="#">Apple</a>	Santa Clara Valley, California, USA	Hardware and Software	
<a href="#">Arm</a>	Austin, Texas, & San Jose, California, USA	Hardware	ACL2 <a href="#">Verification of Arithmetic Hardware</a> , <a href="#">Verifying against the official ARM specification</a> , TLA+ <a href="#">Linux Kernel</a>
<a href="#">AdaCore</a>	USA, New York	?	?
<a href="#">Alacris</a>	?	Blockchain	
<a href="#">BAE Systems</a>			Coq <a href="#">Reddit</a>
<a href="#">BedRock</a>	Boston & Bay Area, USA: Berlin	Systems Security, Trustworthy	Coq C++ <a href="#">github</a>

05

Lição 5

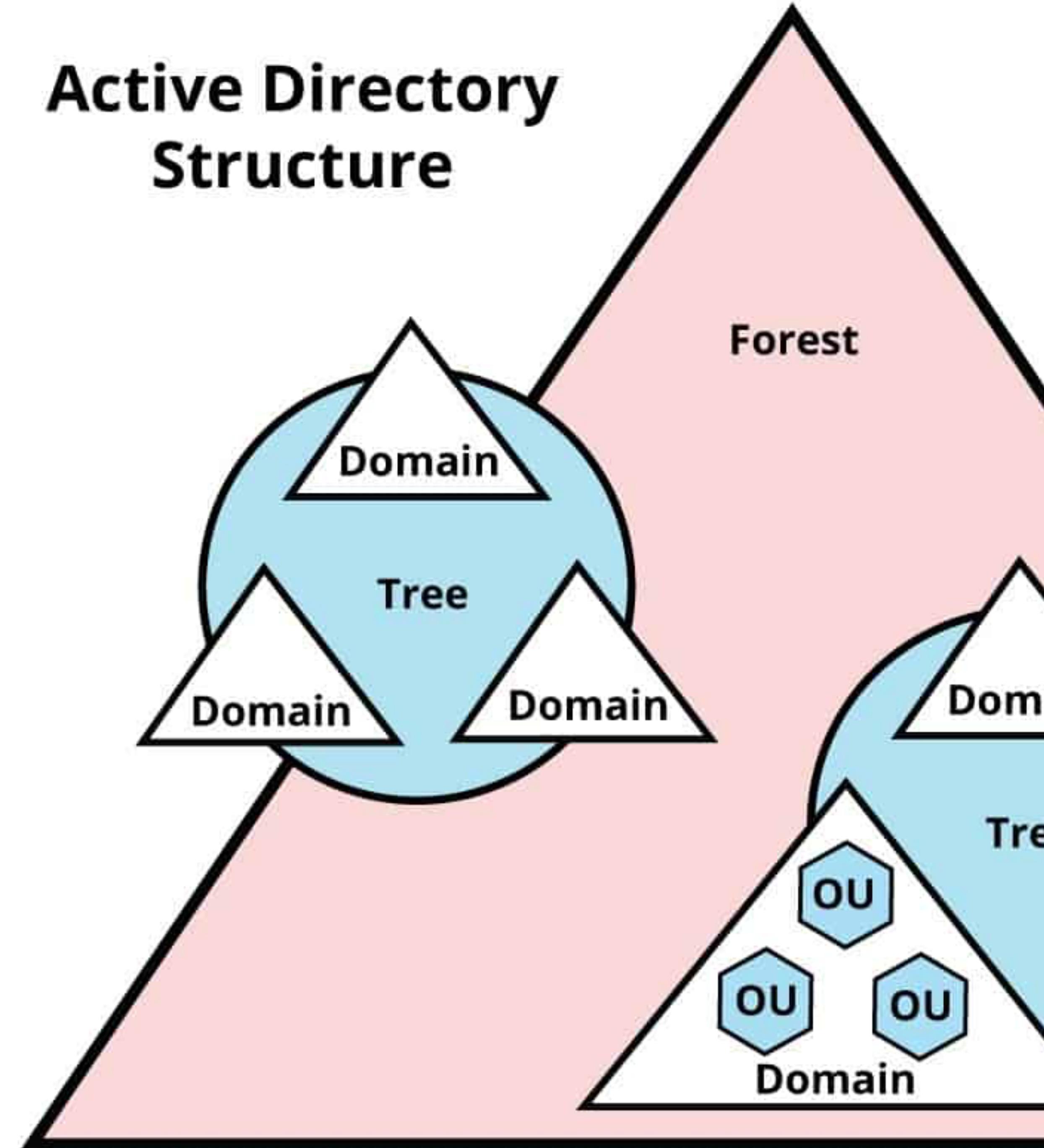
- **A indústria se alimenta da academia.**

# 08

## Active Directory - Microsoft

- LDAP mais usado no mundo
- Servidores mantem Version Vectors
  - (DC1: X, DC2:Y, DC3:Z)
- Logical clocks
- Replicação

# Active Directory Structure

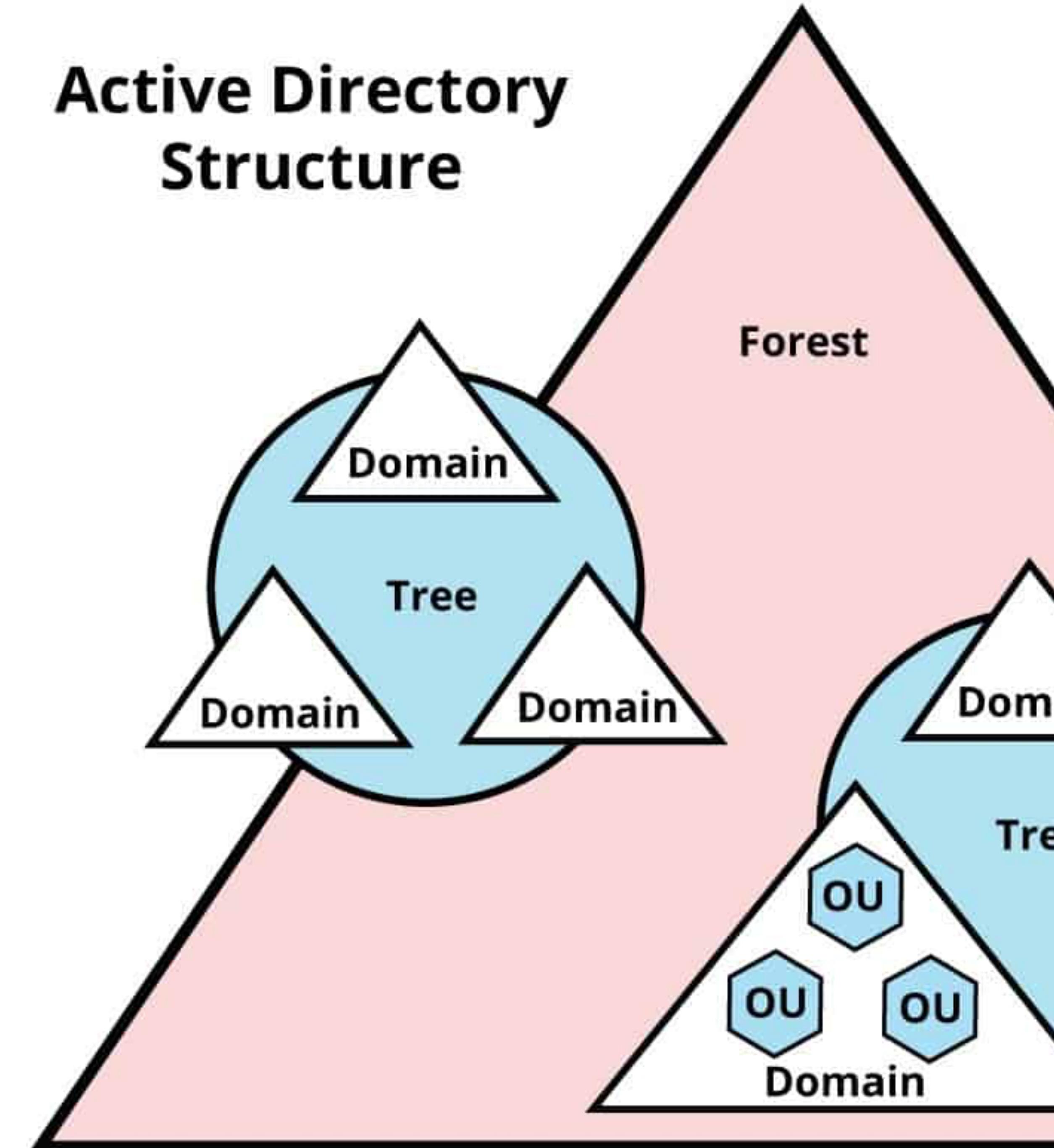


08

Lição 6

- **Não dá para fugir da escovação de bits para sempre.**

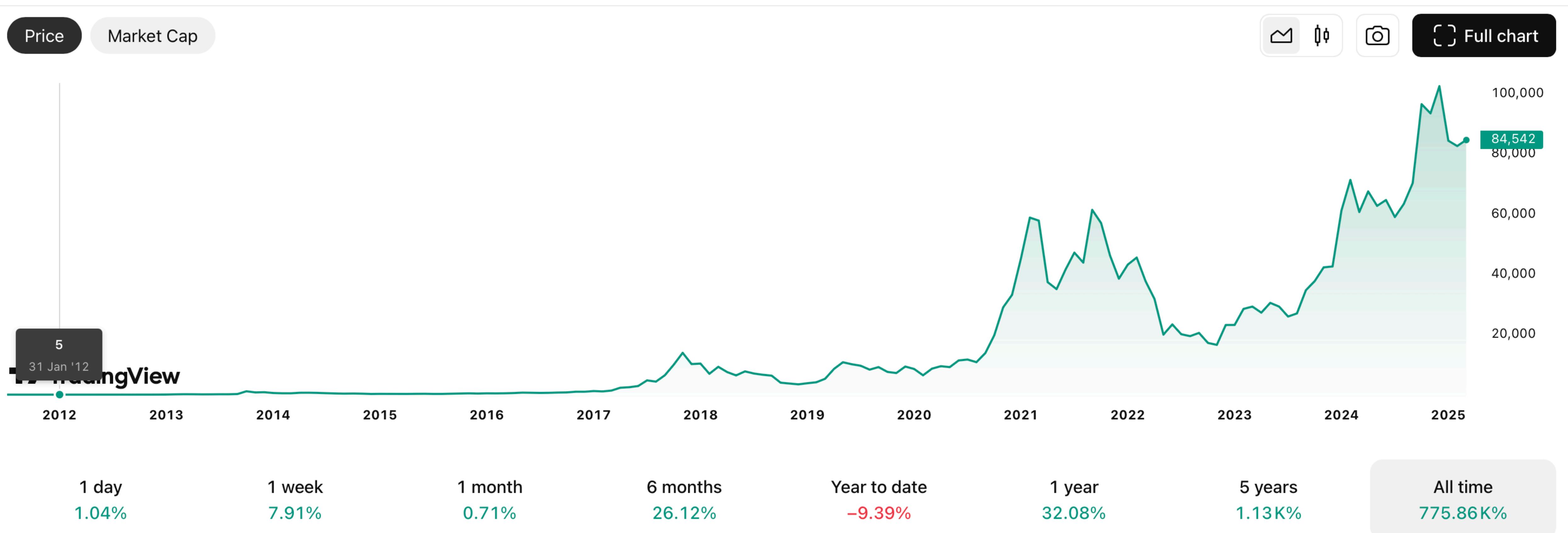
## Active Directory Structure



11

U.F. Uberlândia

- Bitcoin white paper - 2008



11

Lição 7

- **Os professores não sabem de tudo!**

ou

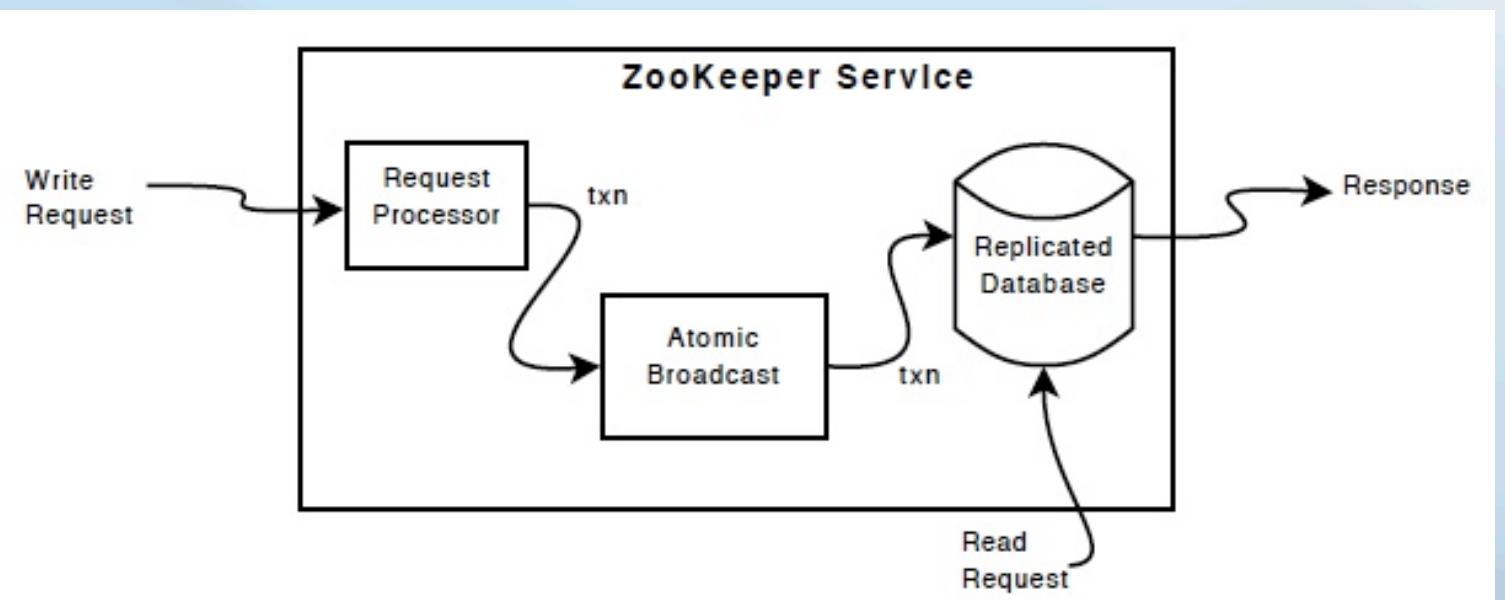
**Sejam persistentes!**



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## Storage Distribuído - ~~Hedwig~~Hedvig

- Meio Cassandra
- Meio Bigtable



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## Lição 8

- **Se não conseguir eliminar a complexidade, esprema-a num cantinho.**



## CometBFT - Informal Systems

- Web 3.0!
- Indústria jovem
- Centenas de empresas
- Especificação formal
- Novos algoritmos, com e sem academia
  - P2P
  - Consenso

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## Lição 9

- **A academia se alimenta da indústria.**

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## Lição 10

- **Há boas oportunidades, por aí, mas algumas são tão voláteis quanto as cripto-moedas**

On Thu, 06 Mar 2025 at 14:30

Hi Lasaro - I am representin

Could this be interesting?

- Libp2p, gossip protocol
- Vision is to build TCP/IP for Web3
- Just came out of stealth with \$10M funding
- Up to \$300k base + % of future token allocation
- Backed by GSR, 1kx & Angels from Jump, Polychain, Pyth, Espresso, Polygon
- World-class team hired from Protocol Labs, Interchain, Polysign & Meta
- Uses an advanced encoding technique that transforms data into encoded fragments, allowing nodes to recover information efficiently
- Also building a decentralized Random Access Memory (deRAM)

Could this be interesting?

pr 4, 2025, 10:48 AM (10 days ago)

Hi Lasaro - I represent the world's first

- libp2p, Golang, Distributed systems, Consensus Algorithms
- Their vision is to build TCP/IP for Web3
- They enable low latency, high-throughput, parallel data read/write through network coding.
- Backed by 1kx & GSR
- Up to \$240k base
- Fully remote
- Advisors include Prof Nancy Lynch, CSAIL, MIT.

I am representing a well-funded start-up that is building the world's

- Libp2p, gossip protocols, Transport protocols (QUIC/UDP)
- The vision is to build TCP/IP for Web3
- Up to \$200k base + % of future token allocation
- Just came out of stealth with \$10M funding
- World-class team hired from Protocol Labs, Interchain, Polysign & Meta
- Uses an advanced encoding technique that transforms data into encoded fragments, allowing nodes to recover information efficiently
- Also building P2P and decentralized Random Access Memory (deRAM)

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Weilliptic

- ??

- Computação distribuída sempre esteve e sempre estará ligada aos avanços tecnológicos na indústria
- Há uma via de mão dupla entre academia e indústria.