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- Introdução
- Definições de Fog Computing
- Arquitetura
- Características
- Casos de Uso
- Plataformas
- Outros Paradigmas
- Resource Management
- Resource Allocation
- Desafios

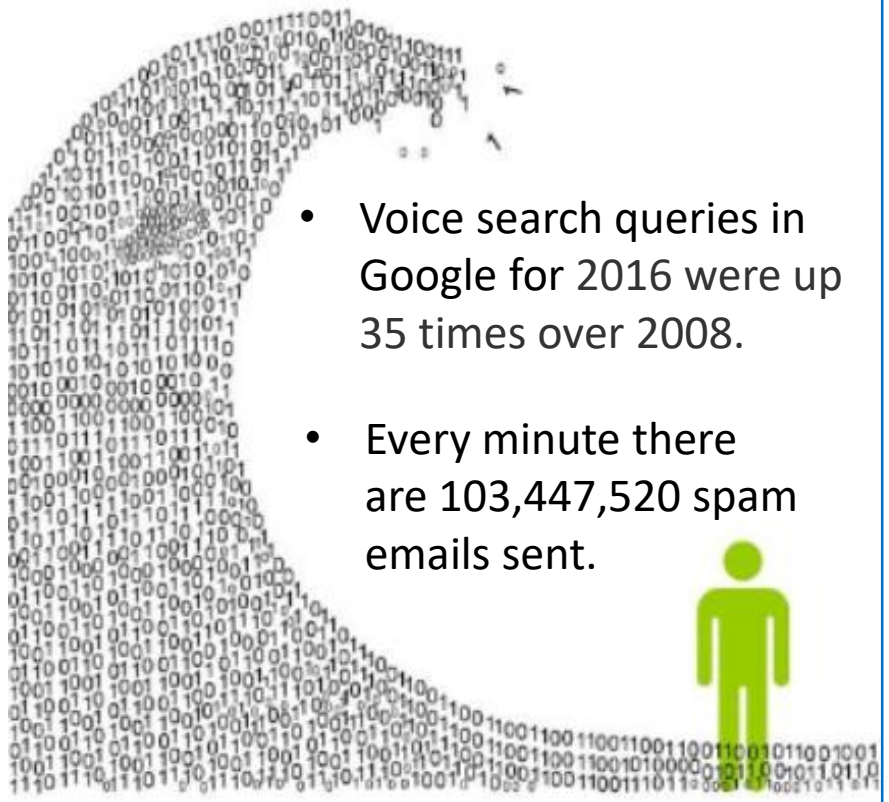
Evoluímos...

- We conduct more than half of our web searches from a mobile phone now.
- People took 1.2 trillion photos in 2017
- More than 3.7 billion humans use the internet (that's a growth rate of 7.5 percent over 2016).
- On average, Google now processes more than 40,000 searches. EVERY second (3.5 billion searches per day)!

Every minute:

- Snapchat users share 527,760 photos.
- More than 120 professionals join LinkedIn.
- Users watch 4,146,600 YouTube videos.
- 456,000 tweets are sent on Twitter.
- Instagram users post 46,740 photos.

- 2.5 exabytes of new data is generated each day since 2012
- Cisco estimates that there will be around 50 billion connected devices by 2020.



- Voice search queries in Google for 2016 were up 35 times over 2008.
- Every minute there are 103,447,520 spam emails sent.

- 1.5 billion people are active on Facebook daily.
- Europe has more than 307 million people on Facebook.
- There are five new Facebook profiles created every second!
- More than 300 million photos get uploaded per day.
- Every minute there are 510,000 comments posted and 293,000 statuses updated.

Mas...
Onde tudo isso é armazenado, processado, analisado????


Norway West
Norway East
West Europe
Germany West Central
UK South
Germany North
North Europe
Germany Northeast
UK West
Germany Central
France Central
Switzerland North
France South
Switzerland West
US Gov Iowa
Central US
Canada East
West US 2
Canada Central
West Central US
North Central US
West US
US DoD East
US Gov Arizona
East US
East US 2
South Central US
US Gov Texas
US Gov Virginia
US DoD Central
China North
China North 2
Korea Central
Korea South
Japan East
Japan West
China East 2
China East
East Asia
UAE North
UAE Central
West India
Central India
South India
Southeast Asia
Brazil South
South Africa North
South Africa West
Australia East
Australia Central
Australia Southeast
Australia Central 2
Available region
Announced region
Availability Zones

In order to address the issues of **high-bandwidth, geographically-dispersed, ultra-low latency, and privacy-sensitive applications**, there is a quintessential need for a computing paradigm that takes place closer to connected devices. Fog computing has been proposed by both industry and academia to address the above issues and to quench the need for computing paradigm **closer to connected devices**.

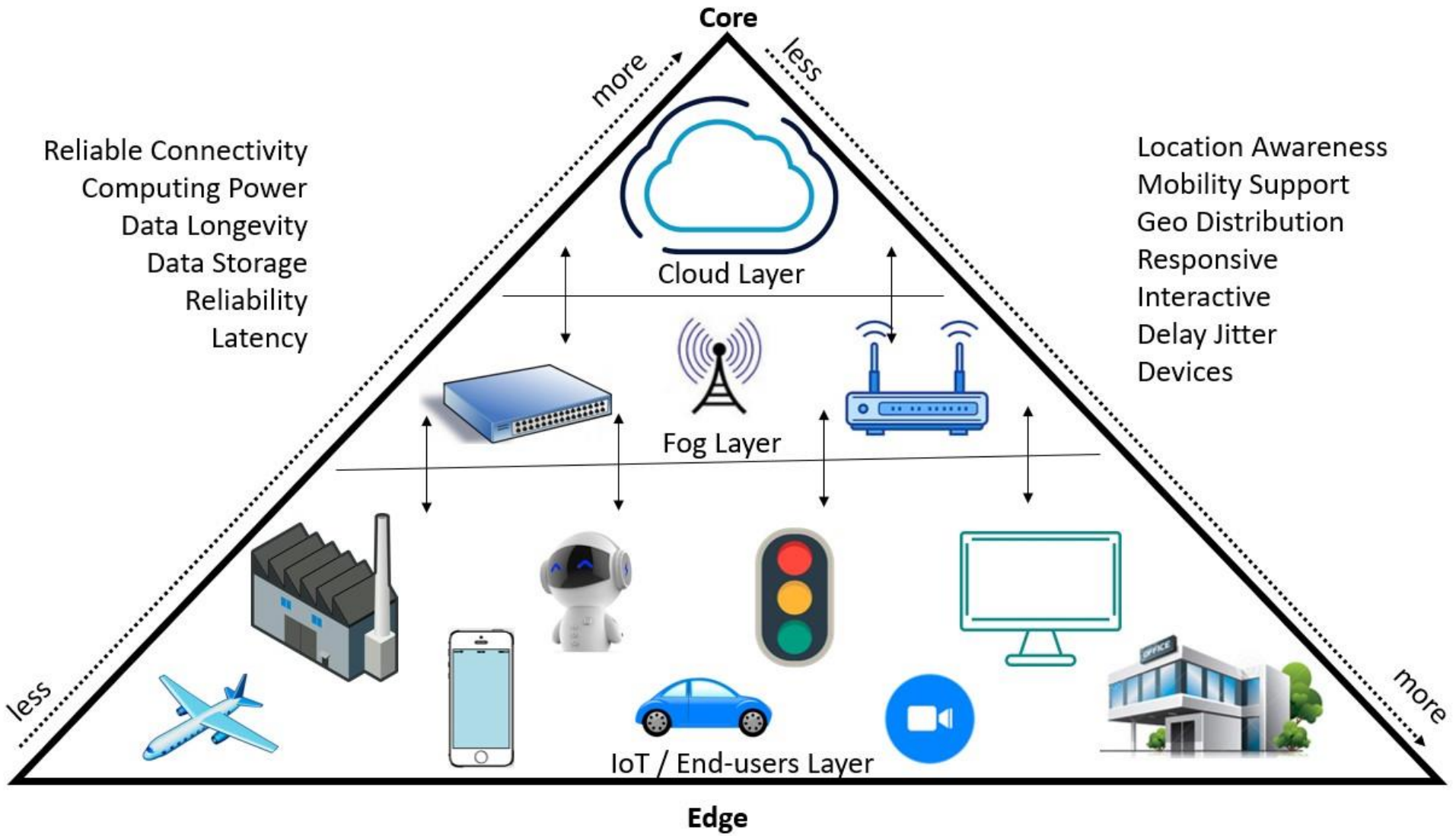

Atlantic
Ocean
AFRICA
Indian
Ocean
OCEANIA

The first definition for fog computing was presented by Bonomi et al. (2012), as a highly virtualized platform **that provides computing, storage, and networking services between end devices and traditional cloud computing data centers**, typically, but not exclusively located at the edge of network.

Cisco (2012) defines that the fog extends the cloud to be closer to the things that produce and act on IoT data. **Any device with computing, storage, and network connectivity can be a fog node**.

The Open Fog Consortium (2017) states that fog computing is a decentralized computing infrastructure which **considers the best place between data source and cloud** to distribute storage, computation and applications. **It is both complementary to, and an extension of, traditional cloud-based models.**

NIST (2018) defines fog computing as a layered model for enabling ubiquitous access to a shared continuum of scalable computing resources. **Fog computing minimizes the request-response time from/to supported applications, and provides, for the end-devices, local computing resources and, when needed, network connectivity to centralized services**.


Core
more
less
Reliable Connectivity
Computing Power
Data Longevity
Data Storage
Reliability
Latency
Location Awareness
Mobility Support
Geo Distribution
Responsive
Interactive
Delay Jitter
Devices
Cloud Layer
Fog Layer
IoT / End-users Layer
less
more
Edge

- Heterogeneidade;
- Escalabilidade;
- Baixa Latência;
- *Real-time;*
- Interoperabilidade e Federação;
- Distribuição Geográfica;
- Predominância de Wireless;
- Suporte à Mobilidade.

- Assistência Cognitiva;
- Body Area Networks (BANs);
- Processamento de Fala e Linguagem;
- Sensores IoT e Wireless;
- Realidade aumentada;
- Video Streaming;
- Veículos e trafégo;
- Smart Cities;
- Smart Buildings;
- Segurança de ambientes.

THE LINUX FOUNDATION PROJECTS

EDGE X FOUNDRY™

www.edgexfoundry.org

AWS Greengrass

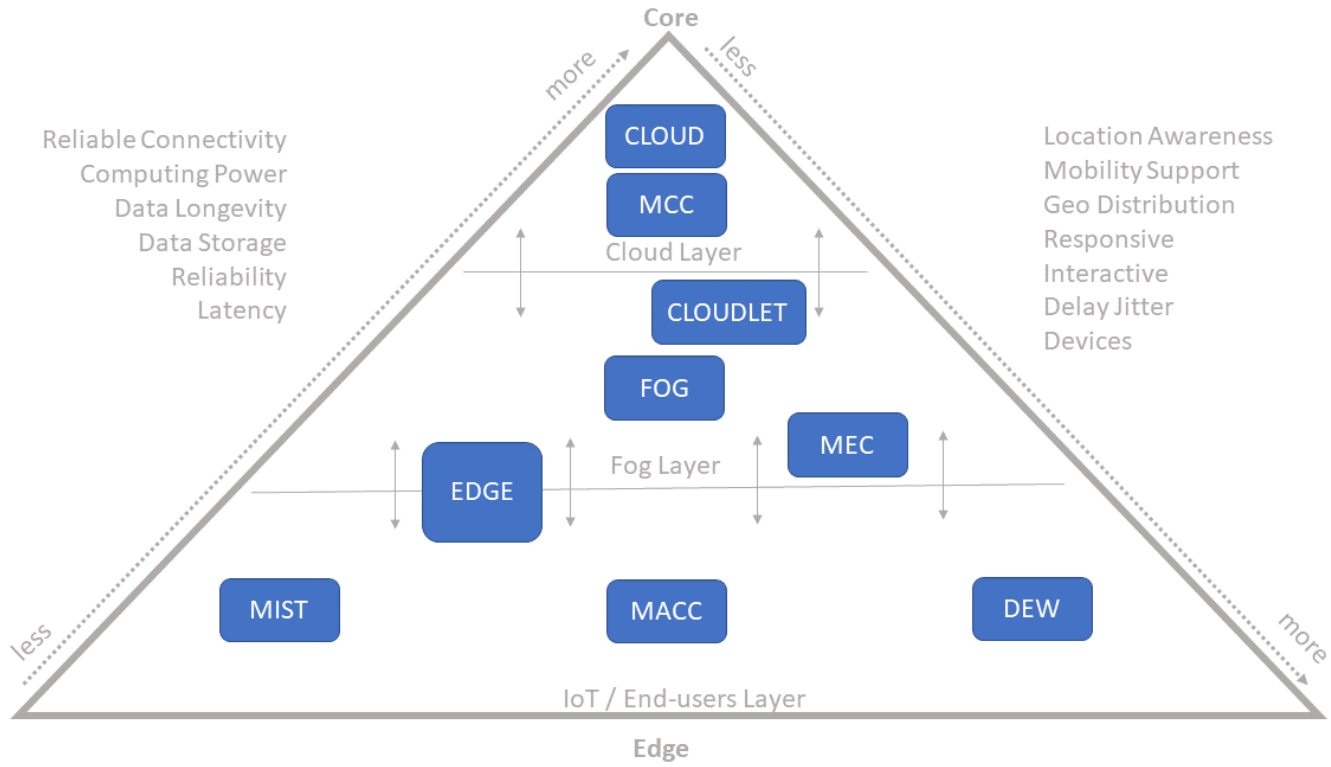
https://aws.amazon.com/pt/greengrass/

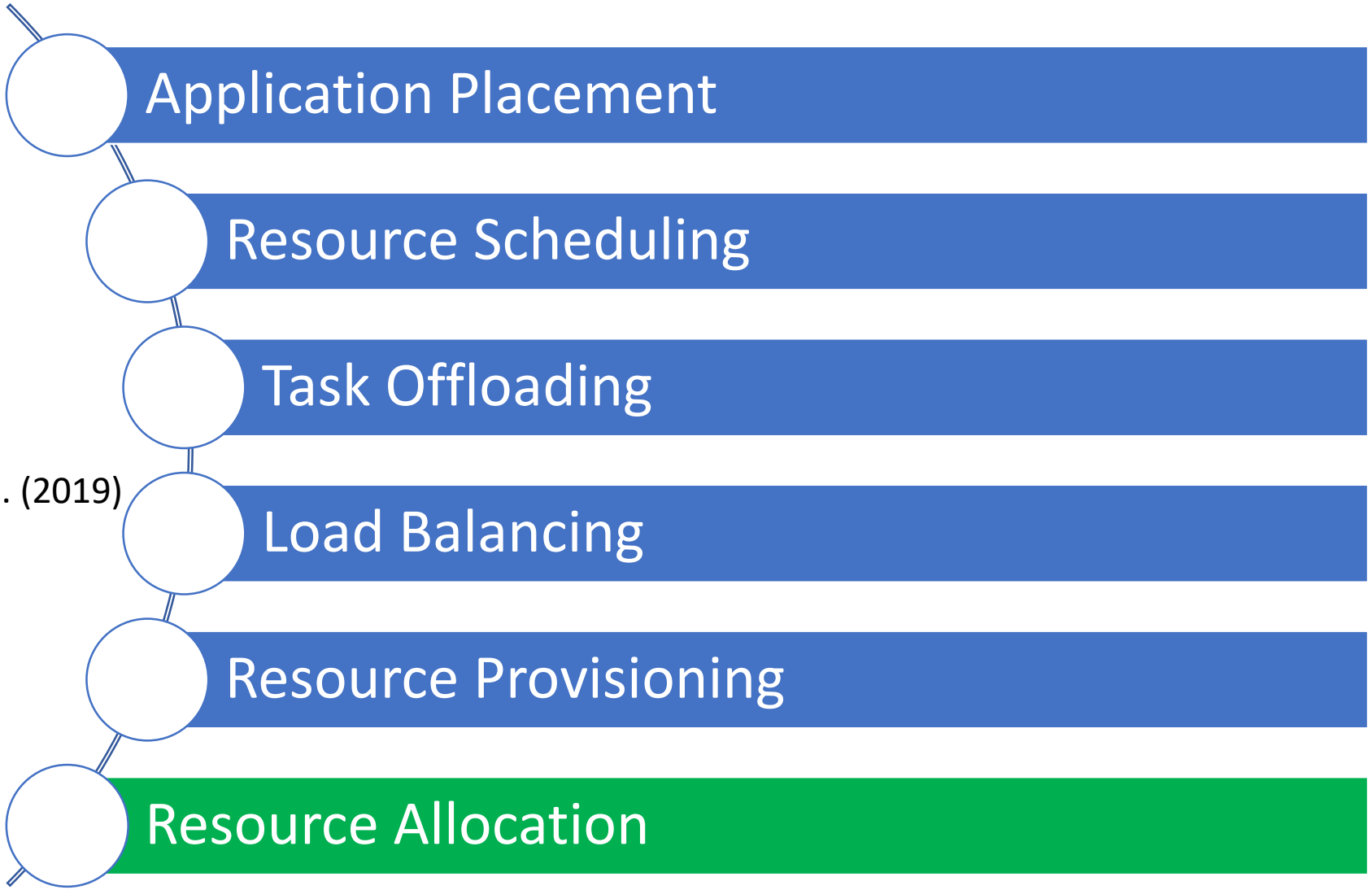
https://azure.microsoft.com/pt-br/services/iot-edge/

GitHub

https://github.com/Cloudslab/iFogSim

- Edge Computing
- Cloudlet Computing
- Mobile ad hoc Cloud Computing
- Multi-access Edge Computing
- Mist Computing
- Dew Computing
- Mobile Cloud Computing





252 artigos

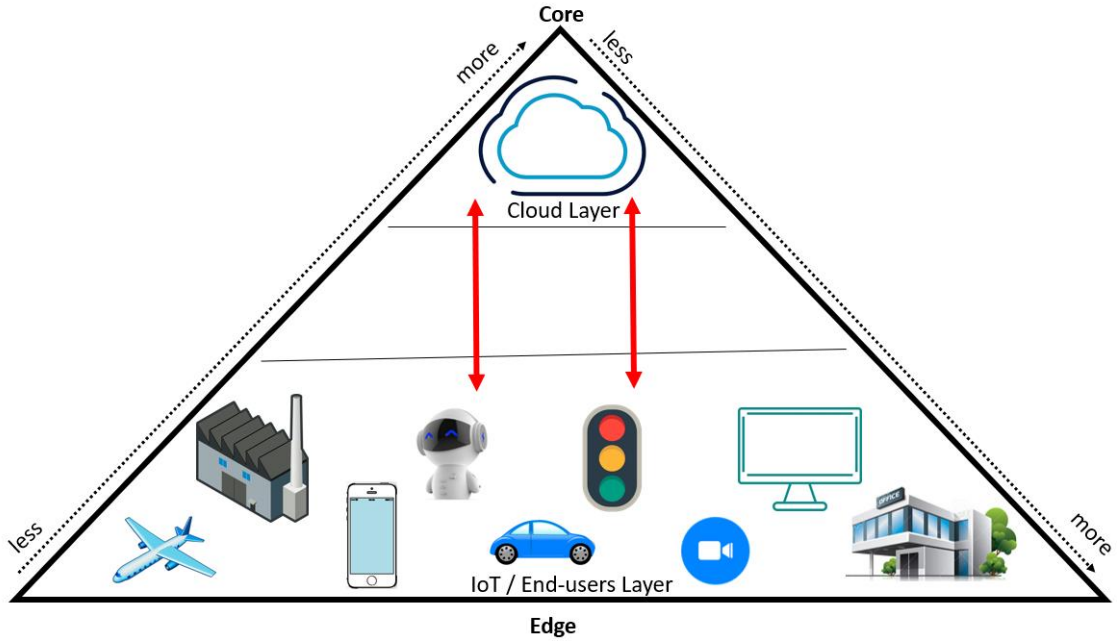
Ghobaei-arani et al. (2019)

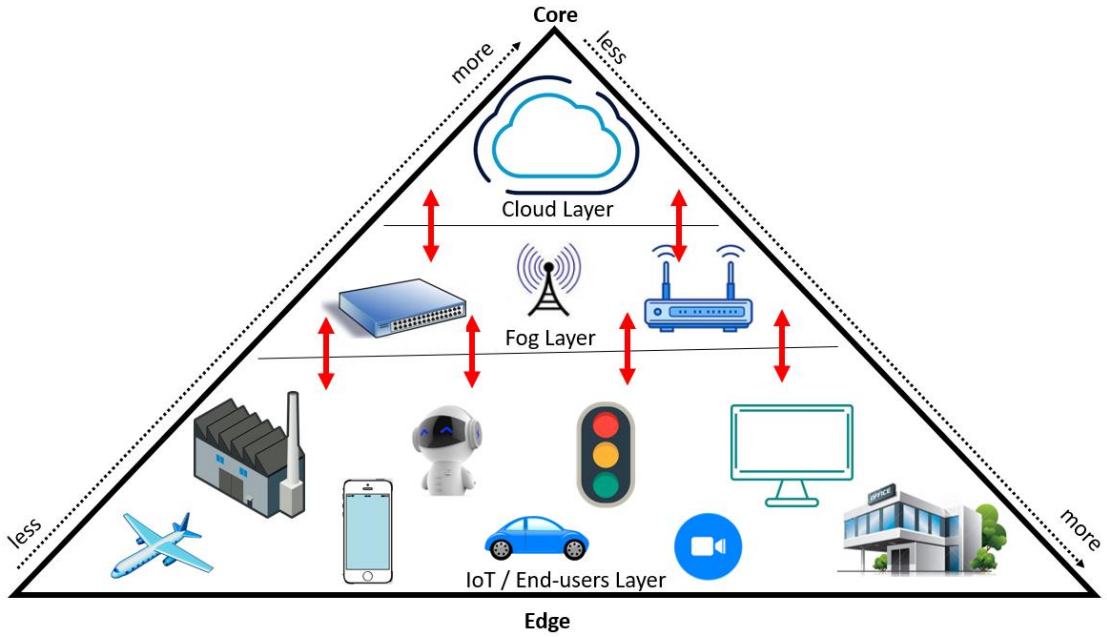
<<< 34 artigos

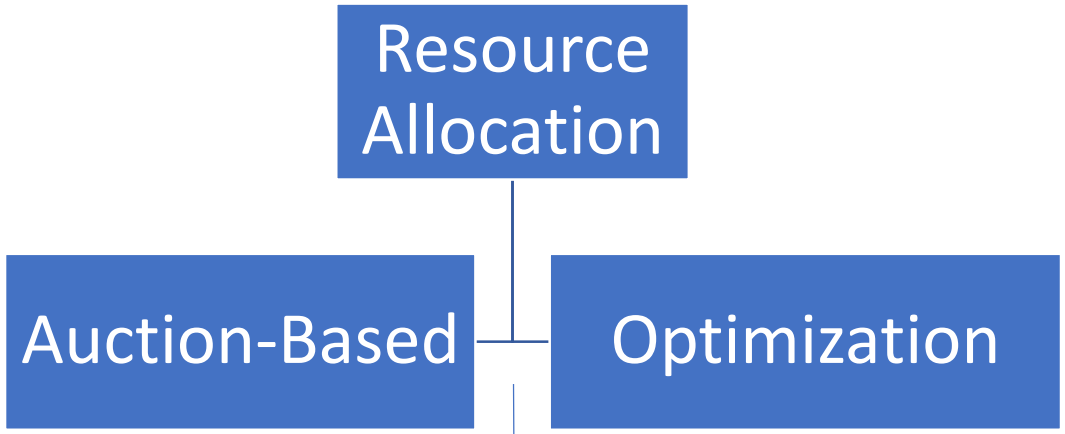
The resource allocation problem seeks to find an optimal allocation of a fixed amount of resources to activities so as to minimize the cost incurred by the allocation (1953).

The resource allocation in fog computing paradigm has some differences when compared with cloud computing. The resources in a fog computing environment are resource constrained with limited computational resources, heterogeneous using processors with different architectures, and, also, dynamic once their workloads change, and applications compete for the limited resources.

The resource allocation problem in fog computing networks is formulated as a double-matching problem so that cloud servers and fog nodes are coupled for IoT users while fog nodes and IoT users are coupled for cloud servers.







Market-based pricing approaches to expand and leverage the demand and supply fog nodes by offering them up for bid and then **selling the fog node to the highest bidder**.

Petri net / Game Theory

The double-matching resource allocation problem is considered as an NP-hard problem **to find an optimal solution** for allocating the fog nodes properly to perform the IoT services with different QoS requirements.

Heuristic algorithms

- Como ter segurança nos fog nodes e na comunicação?
- Blockchain pode ser utilizado?
- Como fazer a alocação de recursos rapidamente?
- Como utilizar machine learning/IA para otimizar a alocação de recursos?
- É possível economizar energia?
- Tem contingência? E se falhar?

Obrigado!

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