**EDGE COMPUTING**

**Abstract:**

The increase of [IoT](https://en.wikipedia.org/wiki/Internet_of_things) devices at the edge of the network is producing a massive amount of data to be computed to [data centers](https://en.wikipedia.org/wiki/Data_centers), pushing network bandwidth requirements to the limit. Despite the improvements of [network](https://en.wikipedia.org/wiki/Telecommunications_network) technology, data centers cannot guarantee acceptable transfer rates and response times, which could be a critical requirement for many applications.Furthermore devices at the edge constantly consume data coming from the cloud, forcing companies to build [content delivery networks](https://en.wikipedia.org/wiki/Content_delivery_network) to decentralize data and service provisioning, leveraging physical proximity to the end user. In a similar way, the aim of Edge Computing is to move the computation away from data centers towards the edge of the network, exploiting [smart objects](https://en.wikipedia.org/wiki/Smart_objects), [mobile phones](https://en.wikipedia.org/wiki/Smartphone) or [network gateways](https://en.wikipedia.org/wiki/Gateway_(telecommunications)) to perform tasks and provide services on behalf of the cloud. By moving [services](https://en.wikipedia.org/wiki/Service_(systems_architecture)) at the edge, it is possible to provide content [caching](https://en.wikipedia.org/wiki/Cache_(computing)), service delivery, [storage](https://en.wikipedia.org/wiki/Data_storage) and IoT management, resulting in better response times and transfer rates. At the same time, distributing the logic in different network nodes introduces new issues and challenges.

### Privacy and security

The distributed nature of this paradigm introduces a shift in security schemes used in [cloud computing](https://en.wikipedia.org/wiki/Cloud_computing). Not only data should be encrypted, but different encryption mechanism should be adopted, since data may transit between different distributed nodes connected through the [internet](https://en.wikipedia.org/wiki/Internet) before eventually reaching the cloud. Edge nodes may also be resource constrained devices, limiting the choice in terms of security methods. Moreover a shift from centralized top-down infrastructure to a decentralized trust model is required.On the other hand by keeping data at the edge it is possible to shift ownership of collected data from service providers to end-users. IoT solutions are currently the perfect target for hackers, but edge computing can help to secure the networks by [increasing data Security](https://www.techiexpert.com/4-key-data-security-challenges-in-cloud-computing/).

### Scalability

Scalability in a distributed network must face different issues. First, it must take into account the heterogeneity of the devices, having different performance and energy constraints, the highly dynamic condition and the reliability of the connections, compared to more robust infrastructure of cloud data centers. Moreover, security requirements introduce further latency in the   
  
  
  
communication between nodes, which may slow down the scaling process. Reliability

Management of [failovers](https://en.wikipedia.org/wiki/Failover) is crucial in order to maintain a service alive. If a single node goes down and is unreachable, users should still be able to access a service without interruptions. Moreover, edge computing systems must provide actions to recover from a failure and alerting the user about the incident. To this aim, each device must maintain the [network topology](https://en.wikipedia.org/wiki/Network_topology) of the entire distributed system, so that detection of errors and recovery become easily applicable. Other factors that may influence this aspect are the connection technology in use, which may provide different levels of reliability, and the accuracy of the data produced at the edge that could be unreliable due to particular environment conditions.

## Applications

Edge application services reduce the volumes of data that must be moved, the consequent traffic, and the distance that data must travel. That provides lower latency and reduces transmission costs. [Computation offloading](https://en.wikipedia.org/wiki/Computation_offloading) for real-time applications, such as facial recognition algorithms, showed considerable improvements in response times as demonstrated in early research.and also used in automobiles etc…