Demo: Edge-based IPFS in a Disaggregated Mobile Core

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The demo presented in this work shows the integration of IPFS intelligence with the CN, more specifically in the desirable UPF, and it also approaches the idea of an Application Function (AF). This work focuses on the architecture for 5G networks with Multi-Access Edge Computing (MEC) to be used in smart cities. By using User Plane Function (UPF) selection, the Control User Plane Separation (CUPS) concept has enabled the disaggregation of the Core Network (CN). Thus, a CDN was deployed in the private 5G network using the InterPlanetary File System (IPFS) protocol, to evaluate the proposed approach.

Platform Description

Access Network

•Testbed designed considering smart city scenarios, with a set of small cells deployed.

•UERANSIM was used to allow a more flexible and controlled environment.

•This way the UE configuration can be easily changed for each use case, in fields such as APN and S-NSSAI. Same for the gNB, in parameters such as TAC and S-NSSAI.

Core Network

•Open-source core network Open5GS SA 5G network functions deployed in a fully containerized environment.

•The CUPS practice was implemented physically separating the edge user plane from the control plane.

UPF Selection

•Various selection modes: APN/DNN, TAC, Cell-ID, S-NSSAI and Round-robin.

•With the UPF as the focal point of this demo, the SMF was configured to differentiate traffic and select UPFs according to the DNN. Differentiating the service, as well as the location, such as cloud or edge.

IPFS on the Edge

•IPFS protocol as a video CDN, offering a high throughput content-addressed block storage approach.

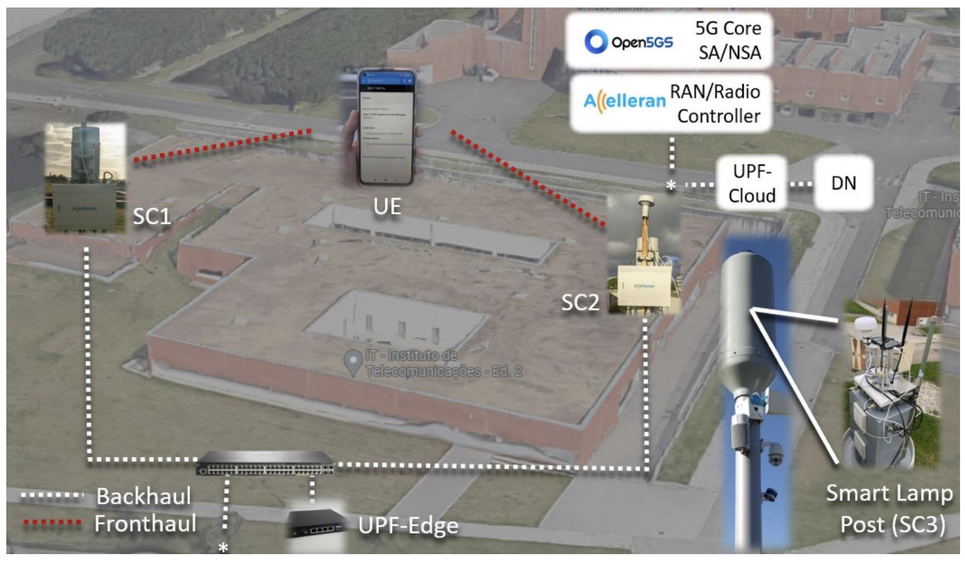
•UEs receive content directly from IPFS and data can adhere to data governance norms.

•Each node stores IPFS objects locally and based on a Content ID, data can be collected from numerous nodes at once. This saves bandwidth on the backhaul network and enables extensive data's rapid and duplicate-free distribution.

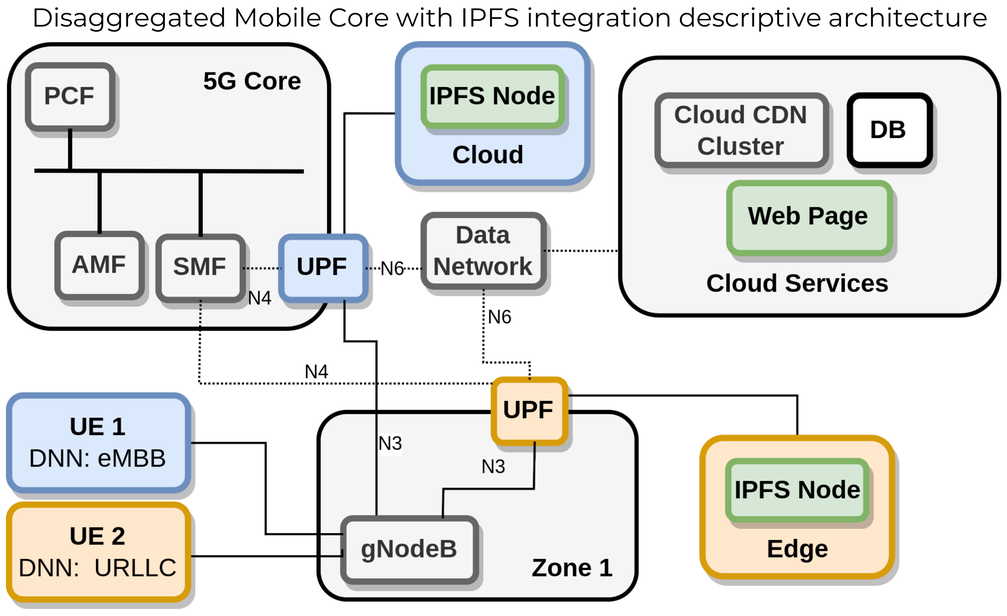
ATCLL Map in Aveiro

Edge node with a radar and small cell

Platform's real testbed presented in detail, with three small cells, the 5G Core, and the edge devices

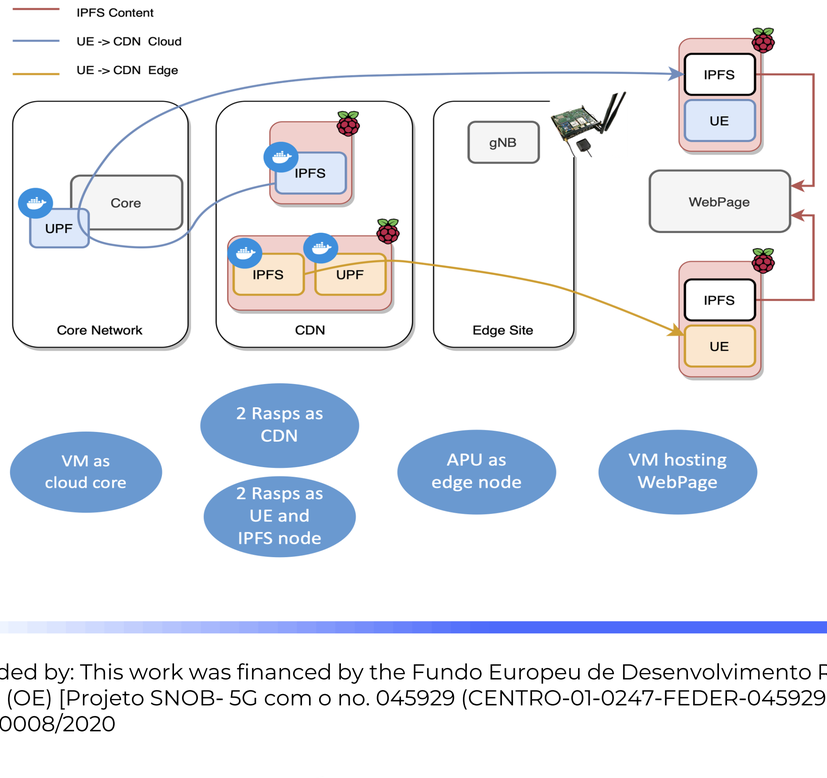


Disaggregated Mobile Core with IPFS integration descriptive architecture

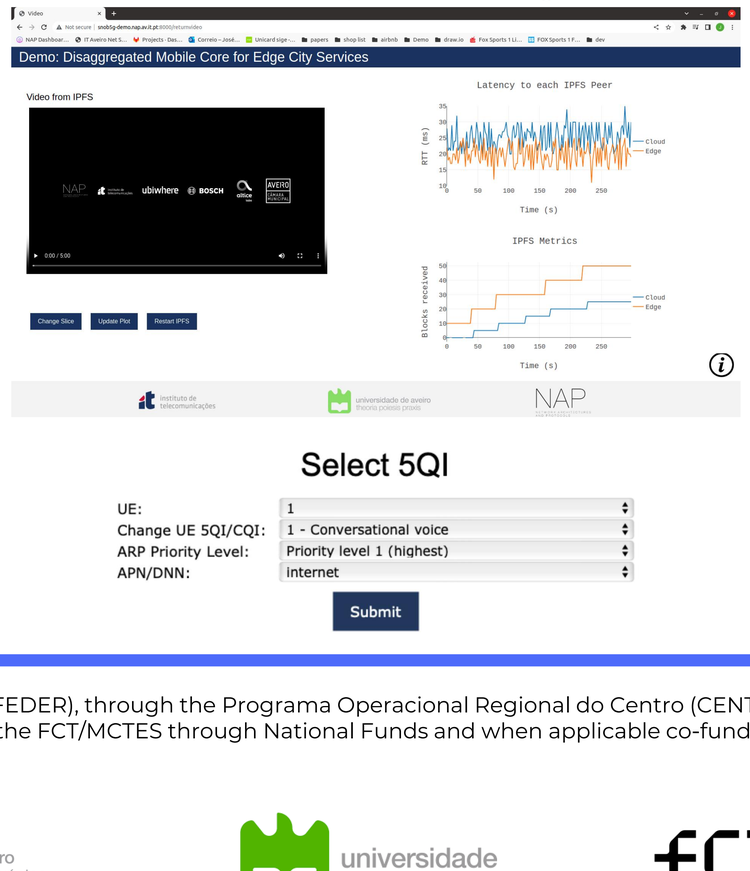


Demo description and interaction

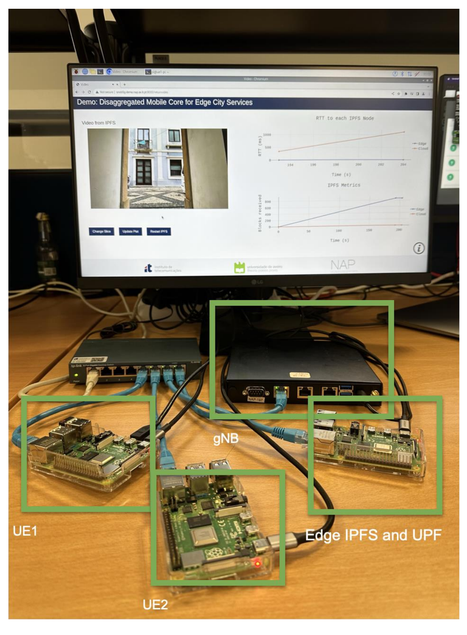
Demo's physical architecture with traffic paths (Cloud vs Edge)



CDN interface with metric plots and configurable slice



Testbed



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