

Cloud Deployments of 5G Private Networks: the Athonet Connectivity Platform

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Abstract— Athonet has brought a breakthrough in the design of mobile network technologies, developing a compact, software-based mobile core network called PriMo, with the aim of making available a complete mobile network to customers at very low access fees, with superior technical capabilities, very low operating expenses, and simple network management. The PriMo concept has recently been complemented by BubbleCloud, which enables the deployment of micro-4G/5G private networks directly from the public cloud of Amazon. This innovation was recognized with a record 4 GLOMO Awards in 2019 (CTO'S CHOICE – Outstanding Mobile Technology, Best Innovation for Enterprise, Best Mobile Technology Breakthrough, Best Network Software Breakthrough).

Keywords—5G, Private Network, Cloud, BubbleCloud

I. PROBLEM STATEMENT

One of the major problems that public and private organizations had when they first tried to deploy a private LTE network was the complexity of the technology. LTE networks were originally designed for national scale operators to serve vast national audiences. A particular barrier was the complexity associated with the mobile core, the brain of the network, which controls all the main functions of the cellular network. The original mobile cores were designed as monolithic, hardware centric solutions much like mainframes, that cost millions or tens of millions of euros before even connecting a single radio. They also needed a large number of specialized telecom engineers to deploy and operate the core network. An organization or enterprise had to pick a standard commercial operator cellular radio to build up their private network, facing the cost, complexity and operational resources needed to operate the core network adapted to run a private cellular network.

II. INTRODUCTION

At Athonet we believed there was a different way to cope with the above issues. In 2005, we decided that we would build a product that could bridge the gap between the IT world in which enterprises operated and the world of cellular technology. We identified the problem in the cost and complexity of the mobile core and start addressing it. We had three novel key design criteria for the core network:

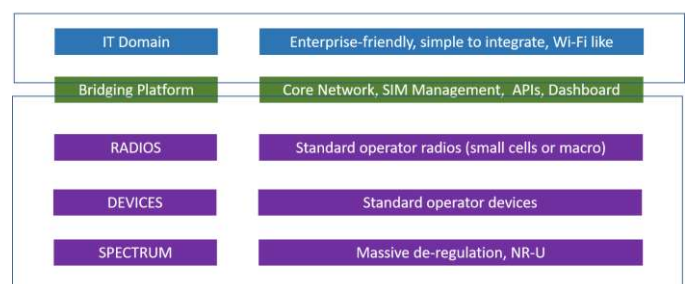
- Make it extremely IT friendly so that any IT professional could deploy and manage a network with minimal training;
- Build it completely in software to make it agile, simple to use and affordable; and
- Allow it to run on enterprise IT infrastructure whether bare metal servers, virtualized datacenters or the evolving idea of cloud computing.

We called this product PriMo (short for Private Mobile) and deployed it in 2010 to cover the AREA Science Park in Trieste, Italy. Not long after, in 2010, we created the world's first LTE private network deployment for Enel, an Italian multinational manufacturer and distributor of electricity and gas, to cover smart grid applications.

A. PriMo

As shown in the diagram below, PriMo bridges the worlds of IT and cellular technology by combining the functions of a mobile core with Subscriber Identity Module (SIM) management, Application Programming Interfaces (APIs) and alarms to integrate with enterprise applications and monitoring systems. It also features an extremely user-friendly Graphical User Interface (GUI) that allows any IT professional to attach standard cellular radios and devices to create a fully functioning cellular network, fully integrable into an enterprise's IP network.

What do we need for a million private networks?



Since 2010, this solution has seen widespread adoption and won the GSMA Global Mobile Awards in 2015.

III. CLOUD-BASED PRIVATE NETWORKS

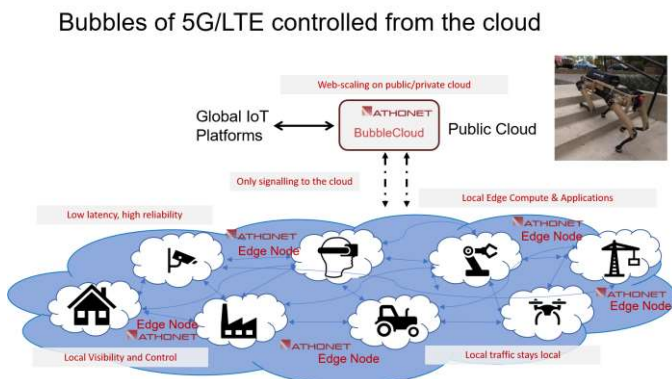
The inescapable pull of the cloud came very soon in our forecasts. Thus, we started reasoning how it could support our vision of rapidly deploying millions of distributed networks. What we understood from customers is that they had three main requirements:

- Keeping data local for security,
- Keeping traffic local for low latency, and
- Keeping traffic costs low by exchanging data externally only if necessary.

Hence, we saw the opportunity to streamline deployments even further by bringing all the complex workloads to the cloud while keeping all traffic local and offloading it to the enterprise firewall. We deployed this solution on the Amazon Web Services (AWS) cloud and demonstrated it at the Mobile World Congress 2018. The solution consists of an “edge node”, which is a small formfactor Commercial Off-The-Shelf (COTS) hardware containing the user plane function. It simply requires two physical connections – one to the Radio Access Network (RAN) and transmission network, and another to the enterprise firewall. The entire installation can be completed in less than an hour from bootstrap to the first call. We soon added the capability for users to subscribe to the service by swiping a credit card on AWS [1] – a world first! This allowed enterprises to create local “bubbles” of LTE that were connected to the cloud – the BubbleCloud [2].

A. The BubbleCloud

The BubbleCloud opened up private LTE to an entirely new class of users that was emerging with the appearance of lightly regulated spectrum such as Citizens Broadband Radio Service (CBRS) in the USA [3]. It enabled even a school in the USA to deploy its own private network with minimal effort. The BubbleCloud combines the reliability of the onsite solution with the automation and convenience of the cloud, as shown below.



The BubbleCloud is unique not just for its hybrid-cloud

solution, but also for the level of automation it brings. It meets the needs of Industry 4.0, which demands rapid and simple deployment of networks to facilitate digitalization. In recognition, The BubbleCloud was awarded 4 GSMA Global Mobile Awards, the “Oscars of the Mobile Industry” at Mobile World Congress 2019, a record for a single product in the event’s 20-year history.

B. The 5G BubbleCloud

As interest in the cloud continues to grow, Athonet has made its 5G core available on AWS so that industries and academics with a 5G radio can connect to it via a VPN and create a 5G end-to-end ecosystem. This implementation, named Open5G [4], meets the demands of the evolving 5G standalone ecosystem for a simple way to test interoperability for radios and devices against a highly featured core network product. Local user planes can be added to create the next generation of the 5G BubbleCloud.

IV. CONCLUSIONS

In this paper we highlighted the main steps of the journey that brought from the very first private network back 10 years ago using the previous 4G technology, up to world-wide recognized 5G private network arena. We focused on the easiness to build up from sketch a brand new private mobile network leveraging the innovative cloud-based solution designed by Athonet.

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REFERENCES

- [1] <https://aws.amazon.com/marketplace/pp/B07GTB9XB4>
- [2] <https://athonet.cloud/>
- [3] <https://ongoalliance.org/>
- [4] <http://www.open5g.cloud/>