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3rd Open Call
FLAME infrastructure in Bristol

DESCRIPTION OF FLAME INFRASTRUCTURE IN BRISTOL

In order to explore and validate the deployment of 5G in an architecture that combines existing technologies and innovations, University of Bristol have deployed a rich testbed comprised of several networking and computing technologies, interconnecting a significant area in the Bristol city centre. This testbed aims to provide a managed platform for the development and testing of new solutions delivering reliable and high-capacity services to several applications and vertical sectors here referred to as FLAME.

The University of Bristol's 5G testbed is a multi-site network connected through a 10km fibre with several active switching nodes. The core network is located at the High-Performance Network (HPN) laboratory at the University of Bristol and an extra edge computing node is available in another central location, known as Watershed. As shown in Figure 3, the access technologies are located in two different areas in the city centre: Millennium Square for outdoor coverage and "We The Curious" science museum for indoor coverage.

A summary of the testbed constituent equipment and capabilities available for FLAME platform is:

- Multi-vendor software-defined networking (SDN) enabled packet switched network
  - Corsa switch (Corsa DP2100)
  - Edgecore switch (Edgecore AS4610 series & AS5712-54X)
- SDN enabled optical (Fibre) switched network
  - Polatis Series 6000 Optical Circuit Switch
- Multi-vendor Wi-Fi
  - SDN enabled Ruckus Wi-Fi (T710 and R720)
- Cloud and NFV hosting
  - Datacentre for Application/VNF hosting, built upon
    - 11x Dell PowerEdge T630 compute servers 700+ vCPU cores, 1TB+ RAM and 100TB of HDD storage.
- Advanced fibre optics FPGA convergence of all network technologies enabling considerable flexibility, scalability and programmability of the front/back-haul, to provide experimentation with -
  - Elastic Bandwidth-Variable Transponders
  - Programmable Optical White-box
  - Bandwidth-Variable Wavelength Selective Switches (BV-WSS)

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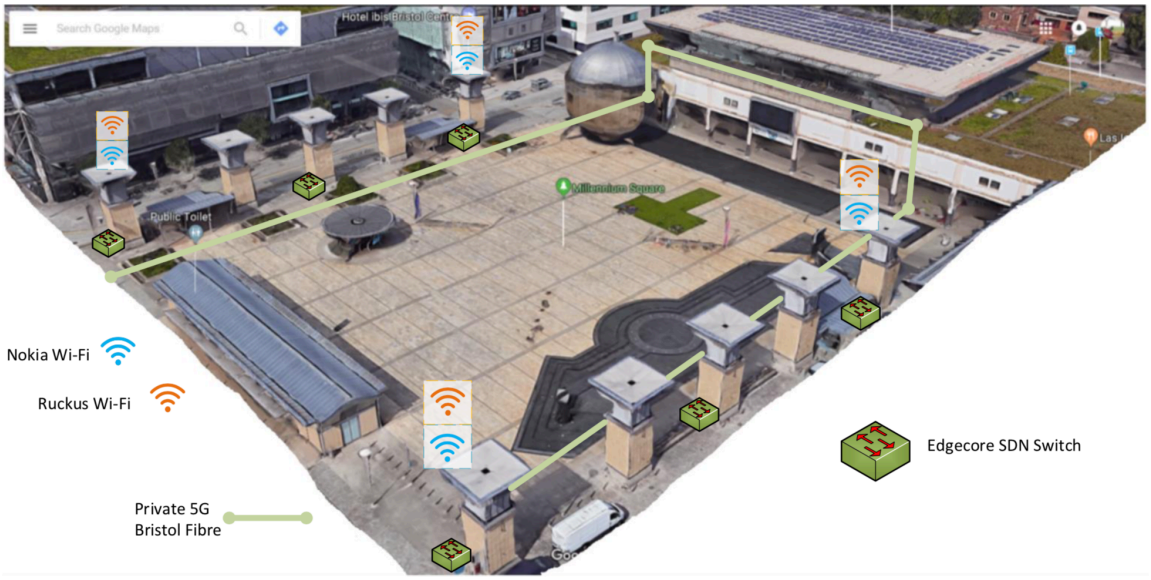

Figure 1: Distribution of the testbed access technologies

The diverse range of access technologies are interconnected in sharing the same underlying system while being used by FLAME framework to provide connectivity for the demonstrators, showcasing seamless integration between heterogeneous network components, an important concept in 5G. Additionally, the alternative and innovative technologies available, such as pureLiFi for fixed access, can be used to demonstrate the principle of access-agnosticism, also important for the 5G vision.

The state of the art radio access technologies deployed in Millennium Square will deliver high-bandwidth, high-bitrate and high-reliability connections to the user equipment, therefore enabling the usage of the network-intensive distributed applications developed by FLAME demonstrators.

The high performance and edge computing capabilities will power resource-intensive applications developed by FLAME demonstrators. In these applications, hardware acceleration and GPU-processing will be used to deliver enhanced performance and enable low-latency/real-time user interaction.

Finally, University of Bristol 5G testbed will deliver an automated and programmable environment, that will be used by FLAME southbound interface to create fully integrated orchestration for both application components and network services.

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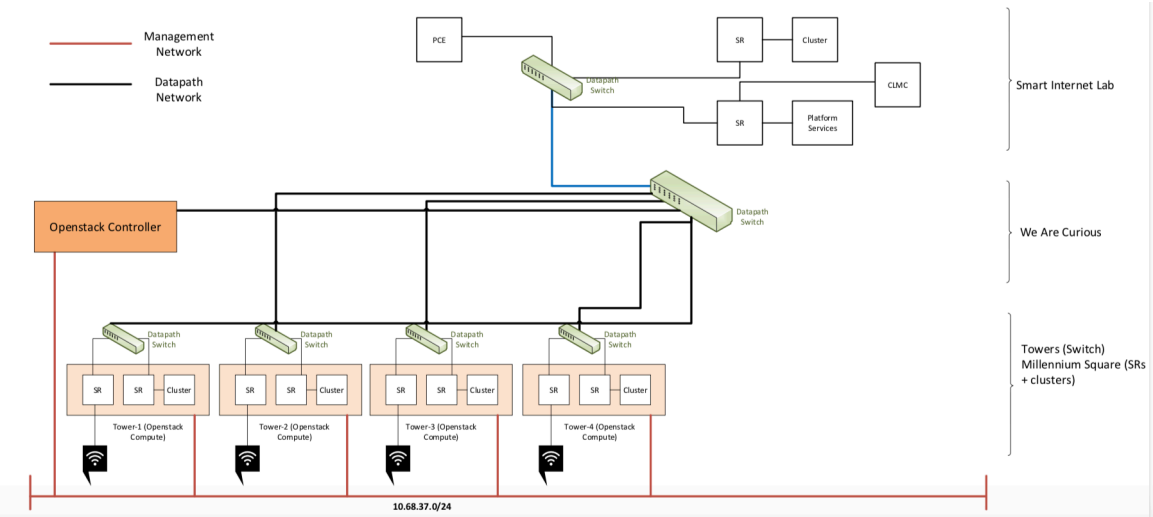

Figure 2: Bristol-FLAME logical infrastructure

Figure 4 shows the logical FLAME platform architecture deployed at Millennium Square in Bristol. A set of four towers has been allocated to host FLAME Mobile Edge Computing nodes. Each tower has a compute node based on OpenStack Ocata NOVA. Each compute node is connected to an EdgeCore SDN switch that is connected to a single SDN switch located at We The Curious (WTC). The four compute nodes and the edge core SDN switches are connected to the SDN controller based on FloodLight also located at the WTC.

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