Proposta de Projeto de Doutoramento a Desenvolver no Âmbito do 1º Concurso para Atribuição de Bolsas de Investigação na Área de Engenharia Informática

1. Título do projeto

Título: Named Data Networking based Internet of Things in Delay/Disruptive Tolerant Networks Contexts

Palavras-chave: Delay/Disruptive Tolerant Networks (DTN), Named Data Networking (NDN), Internet of Things (IoT)

Referência: CEE_EI_UMINHO3

2. Instituições envolvidas

Instituição onde o doutoramento será realizado: EEUM

Outras instituições participantes no projeto de investigação: Universidade Católica de Angola (UCAN); Universidade Técnica de Angola (UTANGA); e Instituto Superior Técnico Militar (ISTM)

3. Equipa de Orientação

Orientador: Joaquim Melo Henriques de Macedo

Coorientador: (a preencher, se aplicável)

4. Descrição do Projeto

In last years, Angola has seen a very large number of equipment such as smartphones, tablets, desktops and even high-end cars and other modern equipment fully equipped with terminals and digital sensors arriving. However, in most places, the network infrastructure provided cannot yet be called broadband.

Take Luanda, the capital of Angola, as an example. In addition to the old city that existed in colonial times and some new neighborhoods built for the middle class (Talatona, Centralities, dozens of condos, …), the majority of rest does not have any type of order, which prevents the assignment of a police number. This situation prevents the existence of associated services, such as postal services, basic sanitation, water, energy, and the broadband Internet. This situation occurs in many African countries, where people living in the suburbs do not even have a home postal address. Fortunately, we can now assign an electronic postal address [1].

In addition to the problem of planning, there is a large concentration of houses and people in some parts of the city, which translates into a lack of energy, lack of water and congestion on basic sanitation for various infrastructures. This situation was caused by the civil war with a large number of refugees from the countryside to the largest cities.

Only urbanized locations, either because they have a minimal infrastructure or because they are inhabited by

people with greater purchasing power, are desirable for network operators.

The situation we find in Luanda is similar to the rest of Angola's cities, large or small. Even the digital telephone network (GSM/LTE) [2] needs electricity generators with maintenance teams that, in addition to resolving faults, need to periodically bring in diesel.

The vastness of the territory makes land coverage very difficult. Thus, the most viable coverage is via satellite (preferably low altitude due to latency). So, we can find a satellite antenna in the most remote village.

With the growing objective of distributing and collecting content from the most diverse types of data in the most diverse and remote locations without any network connection, the most appropriate is the use of mules for physical transport of data. In this context, the physical transport of data can be done by pedestrians, cyclists, motorcycles, cars, among others. The other alternative is to use of data networks no matter how incipient (in terms of bandwidth and faults). Anyway, the suitable network technology is the delay/disruptive tolerant one [5].

Another important aspect is the use of a network technology that allows for the massive distribution and collection of data, both from the environment and from the available sensors and its concentration in data centers. The Named Data Network [4] can be such a network architecture for both sensors and data centers.

We will have to deal with challenge of exchanging information between heterogenous things, with the most diverse types of sensors and with different storage capacities (ephemeral and persistent), processing, communication, energy, and mobility. This Internet of Things (IoT) [5] can also use an NDN-based architecture to be tolerant to delay and disruption.

5. Referências Bibliográficas

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[3] Fall, K. (2003, August). A delay-tolerant network architecture for challenged internets. In Proceedings of the 2003 conference on Applications, technologies, architectures, and protocols for computer communications (pp. 27-34).

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[5] Xia, F., Yang, L. T., Wang, L., & Vinel, A. (2012). Internet of things. International journal of communication systems, 25(9), 1101.