Hes·so
Haute Ecole Spécialisée de Suisse occidentale
Fachhochschule Westschweiz
University of Applied Sciences and Arts Western Switzerland

Master of Science HES-SO en Business Administration
Orientation en Management des systèmes d'informations

Scalability and mass deployment of IoT

François Steiner

Professor : **Yann Bocchi**

HES-SO Valais // Wallis

In collaboration with **Hosei University, Japan**

DESCRIPTION

Given the growth of the IoT and the new perspectives of communication and optimization, the data transfer need to follow the increasing trend. This is especially necessary for helping large companies select the best solutions for their architectures, security and for the availability of data over the network. The main goal of this study is to analyse the total of packets transmitted for a single transaction sent from the hub (where many objects (e.g. sensor) are connected) to the service (the Cloud or the blockchain). In addition, security is discussed for information purposes.

This study compares the Cloud and the Blockchain by using two prototypes of a hub transferring a certain amount of data on the network. This comparison allows us to answer this problematic question: What is the ideal context for using one or the other of the technologies at the time of implementation/cost/security?

This studies are aimed at reducing or optimizing the constantly increasing traffic.

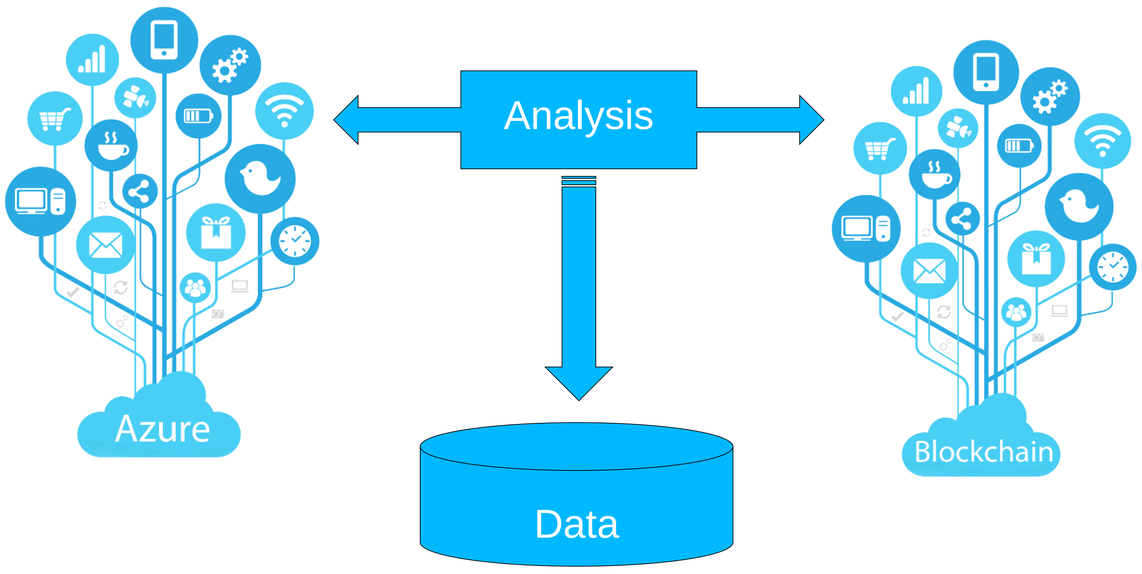
Based on all this information, different ways can be explored to produce an analysis of how to manage the future evolution of data transmission. The Institute of Information Systems at the University of Applied Sciences and Arts in Western Switzerland and the Department of Advanced Science at Hosei University in Japan have decided to collaborate in the context of this thesis to compare the two technologies introduce in this paper and get more information about them.

OBJECTIVES

This work analyses and compares two emerging technologies in the field of information transmission which are capable of being used in the communication of connected objects (IoT). The optimization, security and scalability of each of these technologies must make it possible to select the most relevant technology for a specified scenario.

Three main objectives are defined for this thesis:

1. **Development of PoC**: The development of PoC will allow us to analyze the results obtained and acquire statistics that facilitate the comparison of the two technologies.
2. **Data analysis**: This part employs raw information from the developed PoC and thereby makes it possible to establish results for each technology.
3. **Development of the results and opportunities**: This part makes recommendations and identifies difficulties concerning both technologies and their future opportunities.



RESULTS

Our choice to use a "nonstandard" methodology by using recommendations from Gartner generated a challenge. This choice was interesting especially because it was a proof of concept and so added another challenge to the thesis. Indeed, the result was sufficient: We have been able to show that the recommendation matches our objective.

Gartner recommandations

The Cloud needs 348.71 Mo of data transfers per week.

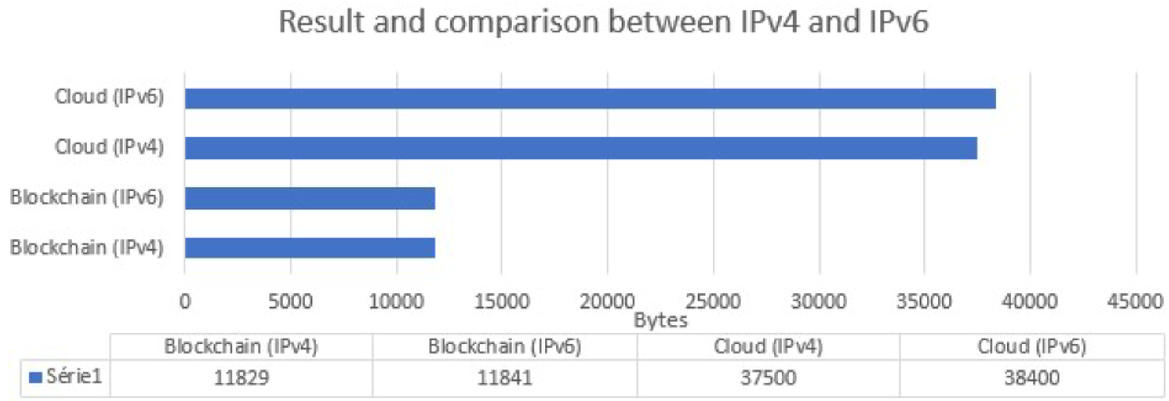
The blockchain's average block size in our example is 11,829 bytes, takes 75 transactions and needs 109.99 Mo per week. To go deeper, we can say that one block, send every 30 second will contains 43 transactions. That's mean we can scale the number of transaction contains in a block to send only a block every 50 seconds or one minute. By doing this, it's possible to optimize the transaction because a block can contain a random number of transaction and 43 is under the average.

	Duration	Size	Sync	Nb Transactions
Cloud	0.38 sec	500 bytes	Every transaction	1
Blockchain	1.61 sec	11'829 bytes	~ 30 secs	~75

Analysis summary consumption

The first objective has been achieved and the results obtained show that blockchain, within the framework of the scenario established, is the technology that uses less networks bandwidth.

By implementing IPv6, we see that the increase is exponential for the Cloud. As shown for 75 transactions, the addition of 12 bytes is required for the blockchain, while 900 bytes are required for the cloud because of the number of transaction.



Comparison between IPv4 and IPv6 for 75 transactions

The underlying question about security is also reached. The security is strong enough for our scenario. Using SSL encryption provides a high level of protection for the Cloud. However, we found that the blockchain gives the best security ratio for the data itself by storing the data in the chain and they are unalterable around the network.