MULTI-LEVEL MECHANISMS TO SUPPORT SPORADIC CLOUD COMPUTING MOBILE SERVICES BY RESOURCE-SHARING IN AD-HOC NETWORKS

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1. WORK MOTIVATION

► CMA is a Cloud-based Mobile Augmentation model that employs resource-rich clouds to enhance computing capabilities of mobile devices aiming at execution of resource-intensive mobile applications [1].

►We want to develop a new concept of ***sporadic CMA*** services, harnessing the largely underused resources of handled devices and on-board units mounted on vehicles.

- ***Sporadic*** → sharing resources during **occasional encounters** to carry out **context-aware, short-lived tasks**.
- Enabling a range of "XaaS" services [2]: Networking as a Service (NaaS), COllaboration as a Service (COaaS), SEnsing as a Service (SEaaS), etc.
- Building blocks for rich mobile applications in smart cities, concerning the safety and management of traffic, tourism, entertainment, etc.

2. OBJECTIVES:

Develop the mechanisms of Sporadic Cloud-based Mobile Augmentation (***S-CMA***) in a stack of protocols for ad-hoc networks.

►**OBJ1:** Turn the ad-hoc networks into reliable and stable communication environments.

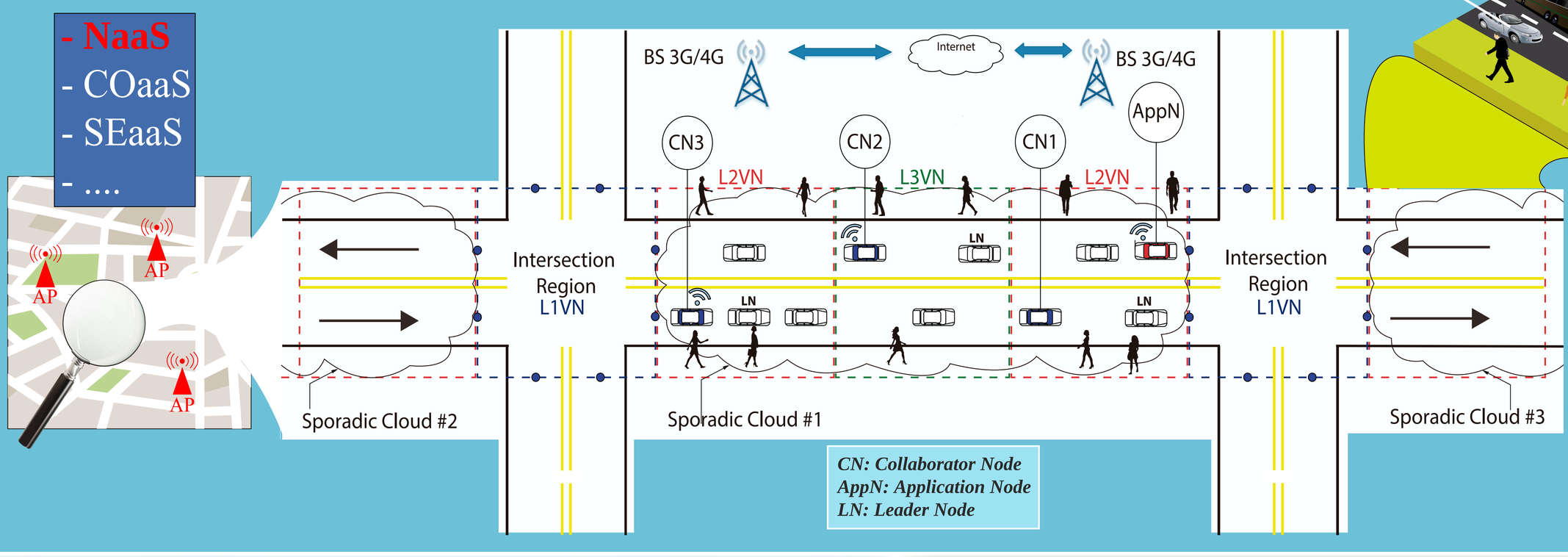
►**OBJ2:** Develop the mechanisms to enable an efficient sharing and allocation of the available resources.

►**OBJ3:** Implement and validate an enhanced NaaS model that allows the integration of several 3G/4G/Wi-Fi connections.

3. RESEARCH PLAN:

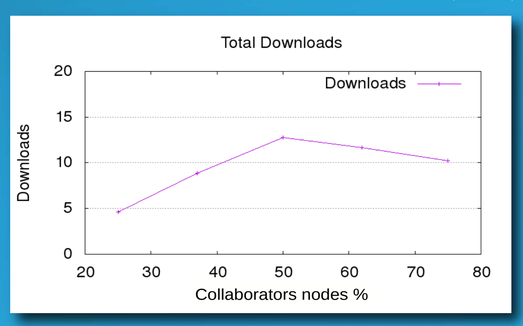
	State-of-the-art		*Contributions*
		Application layer	
3	**Lack of processes and mechanisms to enable an efficient sharing of available resources of the VNs**	Mobile Cloud layer S-CMA	- Formation of sporadic clouds between intersections. - State-keeping and roaming procedures. - Common mechanisms to deploy "X"aaS services [5]. - Implementation of NaaS through two simulation models. — Individualized content download (ICD); Popular content download (PCD)
2	**Lack of a message exchange protocol among VNs to support S-CMA approach**	Network layer (VNIBR)	- Routing protocols that do most of the decision-making at the intersections (Level 1 Virtual Nodes).
1	**High mobility of pedestrians and vehicles implies constant topological changes**	Virtualization layer (VaNetLayer)	- Creation of a network of static ***Virtual Nodes*** (VNs) supported by physical ones [3,4]. - Stable repositories of information on an intersection-based layout.
		Link layer (IEEE 802.11p)	

Done

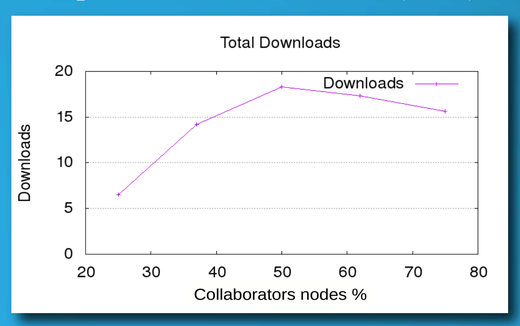


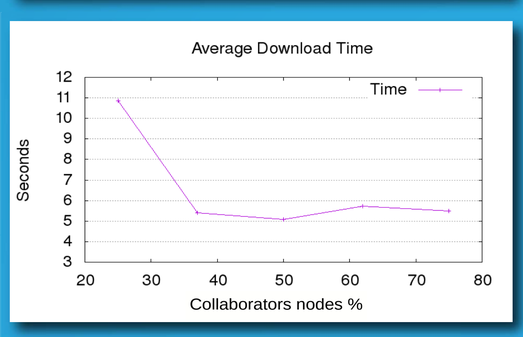
4. RESULTS:

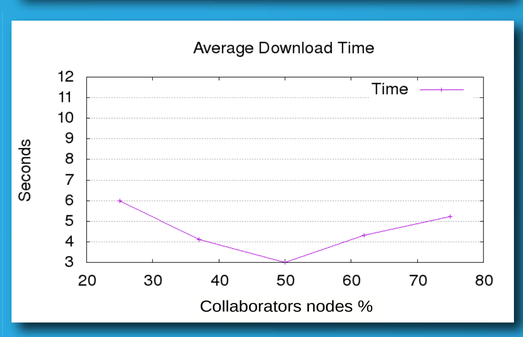
Individualized content download (ICD)

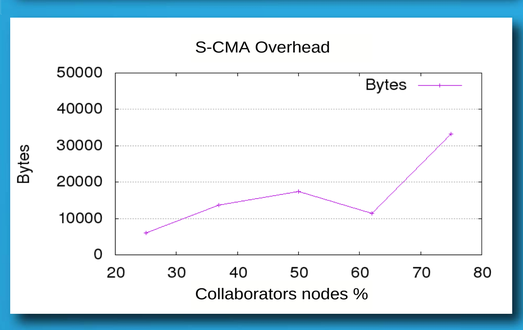


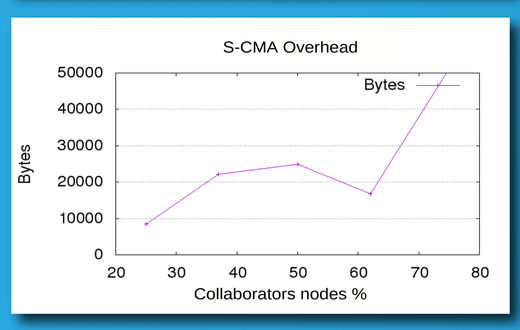
Popular content download (PCD)











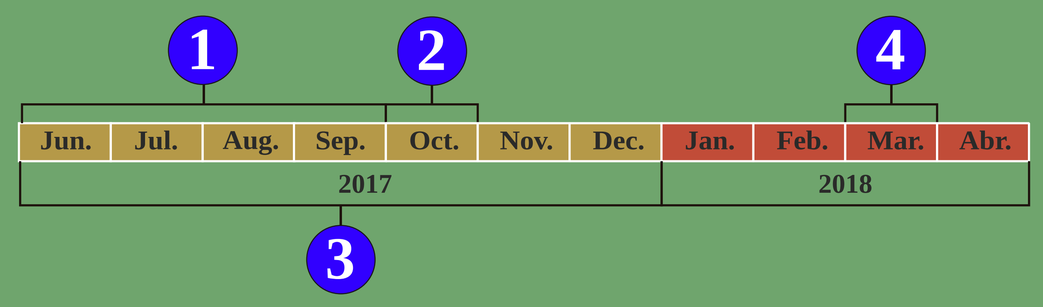
DISCUSSION:

► With more than 50% of CNs the performance of ICD and PCD is slightly reduced by the congestion of the Ad-hoc network.

► Average download time is lower in PCD than in ICD, because as the time progresses more CNs acquire more content and do not need to download it.

► A greater number of downloads with a lower average download time means less lifetime of the clouds; this implies a higher number of clouds created and therefore greater overhead in PCD.

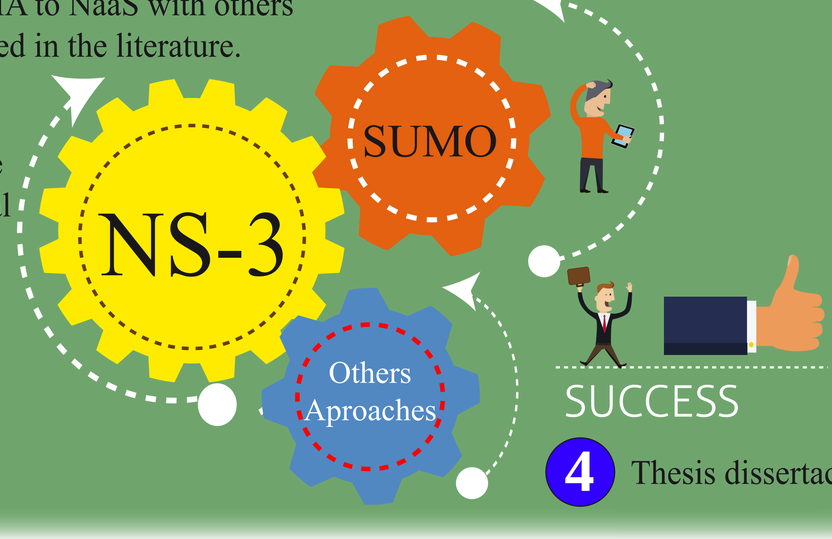
5. NEXT YEAR PLANNING



1 Compare our S-CMA to NaaS with others approaches described in the literature.

2 Submit at least one international journal (indexed in JCR).

3 Thesis writing



4 Thesis dissertacion

6. Bibliography

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[3] S. Dolev, S., et al. Virtual mobile nodes for mobile ad hoc networks, in: Proceedings of 18th Annual Con-ference on Distributed Computing (DISC), Amsterdam, The Netherlands, 2004,pp. 230–244.[16] Q. Binbin, W.

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[5] Ordoñez Morales, E. F., et al. "S-CMA: Sporadic Cloud-based Mobile Augmentation supported by an Ad-hoc Cluster of Moving Handheld Devices and a Virtualization Layer". In 5th International Conference on Innovative Computing Technology (INTECH 2015).