

MAB Learning in IoT Networks

Learning helps even in non-stationary settings!

Lilian Besson Rémi Bonnefoi
Christophe Moy Émilie Kaufmann Jacques Palicot

PhD Student in France
Team SCEE, IETR, CentraleSupélec, Rennes
& Team SequeL, CRIStAL, Inria, Lille

20-21 Sept - CROWNCOM 2017



We want

A *lot* of IoT devices want to access to a gateway of base station.

- Insert them in a possibly **crowded wireless network**.
- With a protocol **slotted in time and frequency**.
- Each device has a **low duty cycle** (a few message per day).

Goal

- Maintain a **good Quality of Service**.
- **Without** centralized supervision!

How?

- Use **learning algorithms**: devices will learn on which frequency they should talk!

Experimental setting

Simulation parameters

- $N_c = 10$ channels,
- $S + D = 10000$ devices in total,
- $p = 10^{-3}$ probability of emission,
- horizon = 10^5 time slots ($\simeq 100$ messages / device),
- The proportion of dynamic devices $D/(S + D)$ varies,
- Various settings for (S_1, \dots, S_{N_c}) static devices repartition.

What do we show

- After a short learning time, MAB algorithm are almost as efficient as the oracle solution.
- Never worse than the naive solution.
- Thompson sampling is even more efficient than UCB.

Dependence on $D/(S + D)$

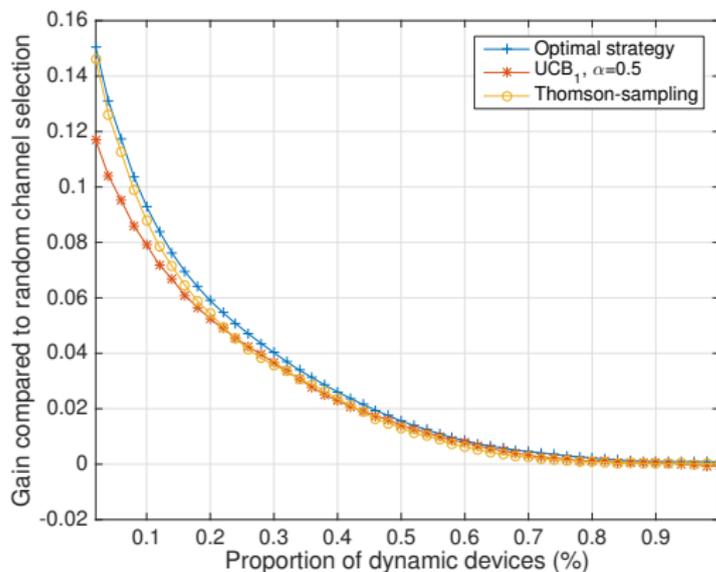


Figure 4: *Almost optimal, for any proportion of dynamic devices, after a short learning time. Up-to 16% gain over the naive approach!*