

Colloquium de Nancy Lynch

Thursday 12 September 2019

<http://www.lip6.fr/colloquium/>

Program

Master classes from 14:00 to 15:40 (Room 24-25/405)

- 14:00–14:25 Ilyas Toumlilt
Highly-Available and Consistent Collaborative Groups at the Edge with EdgeAnt
- 14:25–14:50 Mathieu Lehaut
Synthesis for Parameterized Systems
- 14:50–15:15 Saalik Hatia
Specification of Persistent Storage for a TCC Database
- 15:15–15:40 Giovanni Farina
Tractable Reliable Communication in Dynamic Compromised Networks

Cocktail at 17:15 (in front of Amphi 44)

Colloquium at 18:00 (Amphi 44)

A Theoretical View of Distributed Systems

Master classes – Abstracts

- **Highly-Available and Consistent Collaborative Groups at the Edge with EdgeAnt**

Ilyas Toumlilt

Collaborative work requires both availability and consistency, which are conflicting goals for geographically-distributed, mobile users prone to disconnection. Transactional Causal Consistency Plus (TCC+) is a viable compromise; however, it typically suffers from high overhead, due to order-tracking metadata and to concurrent multi-versioning, and exhibits some external anomalies. In order to improve both overhead and user experience, our EdgeAnt system federates a number of consistency zones, where each zone maintains total-order consistency (TOC, a.k.a. strong consistency) internally, and TOC zones communicate with each other with TCC+. In particular, each group of collaborating users at the edge constitutes a TOC zone. This paper reports on the design, protocols, implementation and performance of the EdgeAnt system.

- **Synthesis for Parameterized Systems**

Mathieu Lehaut

The aim of this work is to synthesize programs in the setting of distributed systems with an unknown number of participating processes. Each of those processes interacts with an unpredictable environment, and must be controlled so that the system as a whole satisfy a specification given either as an automaton or a logic formula. We use games to model the possible behaviors of the system and search for a winning strategy against the uncontrollable environment.

- **Specification of Persistent Storage for a TCC Database**

Saalik Hatia

In the context of the CAP theorem Transactional Causal Consistency (TCC) is a transactional model that provides availability with the strongest possible consistency model. TCC means that: (1) if one update happens before another, they will be observed in the same order (causal consistency), and (2) updates in the same transaction are observed all-or-nothing.

In a database implementing TCC, data is persisted as a journal of operations. This journal must be pruned or it will grow without bound. In order to do so safely, the database needs to safely store checkpoints. The specification of this mechanism must ensure that checkpoints are a TCC cut of the data store, and that all updates that are truncated are available through a checkpoint store.

The objective of this work is to present this specification.

- **Tractable Reliable Communication in Dynamic Compromised Networks**

Giovanni Farina

A reliable communication primitive guarantees the correct message exchange between parties. In a distributed system where the communication network is not complete and some processes could be Byzantine faulty, it ensures the authorship and delivery of exchanged messages. Although many reliable communication primitives have been defined for static distributed systems, the literature is still poor of practically employable contributions that assume a dynamic communication network and are digital signatures free. We review the Byzantine fault tolerant solutions implementing a reliable communication primitive both in static and dynamic distributed systems. We focus on their practical employment, seeking for solutions with reasonable message complexity and delivery complexity. We analyze dynamic network conditions that allows to implement such a reliable communication primitive.