

Distributed Systems

M2 MOSIG

2012-2013

Task 1

- Design and implement a single-threaded, round-based simulator of distributed systems
- Language : your favorite language
- Functionalities:
 - N processes (machines)
 - No crash
 - Each machine can send (up to) one message at the beginning of each round (unicast or multicast)
 - Each machine can receive (at most) one message at the end of each round

Task 2

- Check (using 4 processes) the behavior of your simulator using the three broadcast examples studied in the course (1 sender)
 - Basic: Latency = 3 ; Throughput = $1/3$
 - Trees: Latency = 2 ; Throughput = $1/2$
 - Pipe-line: Latency = 3 ; Throughput = 1

Task 3

- Design and implement two regular total-order broadcast protocols

Module 6.1: Interface and properties of regular total-order broadcast

Module:

Name: TotalOrderBroadcast, **instance** *tob*.

Events:

Request: $\langle tob, Broadcast \mid m \rangle$: Broadcasts a message m to all processes.

Indication: $\langle tob, Deliver \mid p, m \rangle$: Delivers a message m broadcast by process p .

Properties:

TOB1: Validity: If a correct process p broadcasts a message m , then p eventually delivers m .

TOB2: No duplication: No message is delivered more than once.

TOB3: No creation: If a process delivers a message m with sender s , then m was previously broadcast by process s .

TOB4: Agreement: If a message m is delivered by some correct process, then m is eventually delivered by every correct process.

TOB5: Total order: Let m_1 and m_2 be any two messages and suppose p and q are any two correct processes that deliver m_1 and m_2 . If p delivers m_1 before m_2 , then q delivers m_1 before m_2 .

Task 3 (bis)

- Assumptions:
 - No crash
 - Perfect links
 - Infinite memory
 - Perfect failure detector (if needed for some optimizations)
- Goal:
 - First protocol: good latency
 - Second protocol: good throughput (with N senders)

Task 4

- Write a report (10 à 15 pages)
 - Description of the simulator architecture
 - Description of the two protocols
 - Theoretical analysis of the two protocols
 - Latency
 - Throughput
 - Empirical evaluation of the two protocols (using the simulator)

Notes

- Work to be done in groups of two students
- Report and code to be sent on January 18th