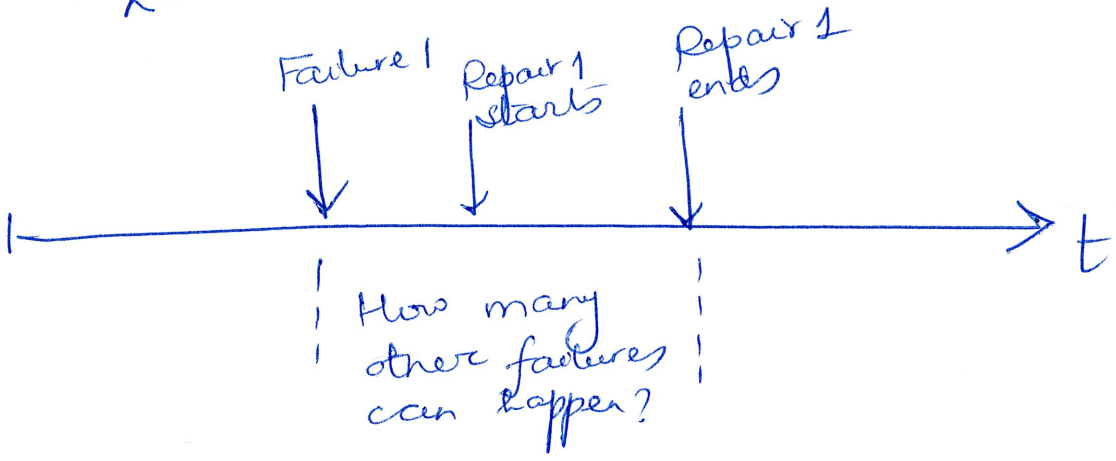
Distributed Protocol Primitives

Resilience of distributed protocol

quantified by

(# failures, types of failures)

concurrent

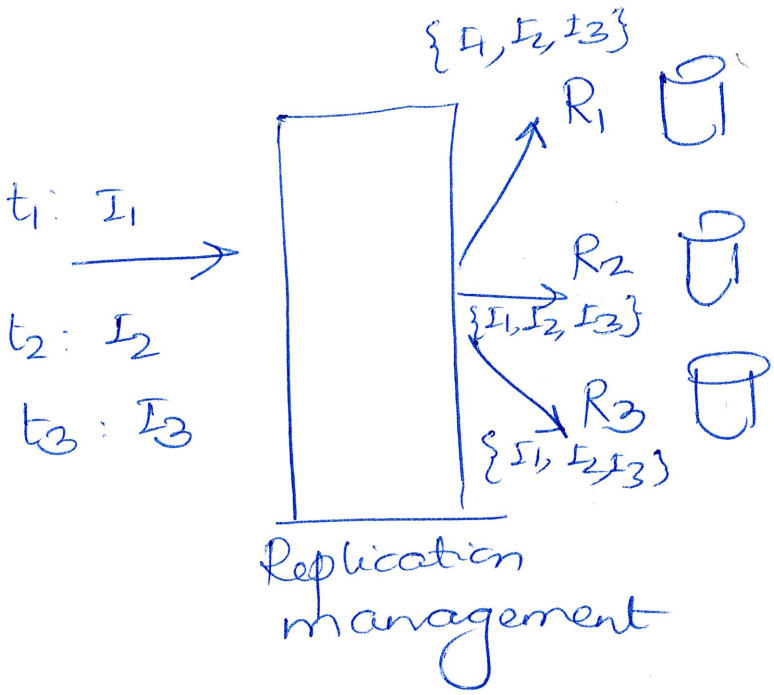


Concurrent failure $\leq f$

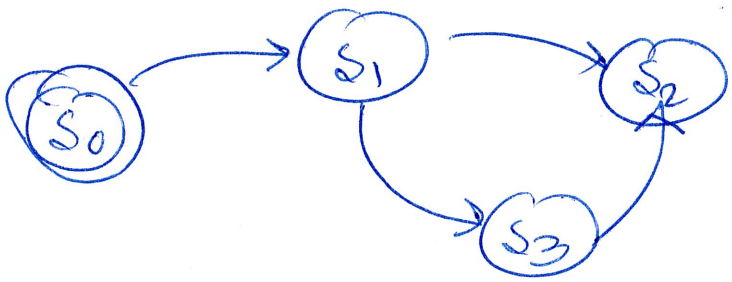
	Crash	Omission	Turing	Incorrect comput.
Min # processes needed to get an (correct) answer	$f+1$	$f+1$	$f+1$	$2f+1$

Communication model

- Asynchronous
- ✓ Synchronous
- ✓ Partially synchronous



Replica consistency



x

$x_1 = x + I_1$

$x_2 = x_1 - I_2$

$x_3 = x_2 + I_3$

Ordering of inputs to the three replicas would not matter (commutative operations)

$x_1 = x * I_1$

$x_2 = x_1^{I_2}$

$x_3 = x_2 / I_3$

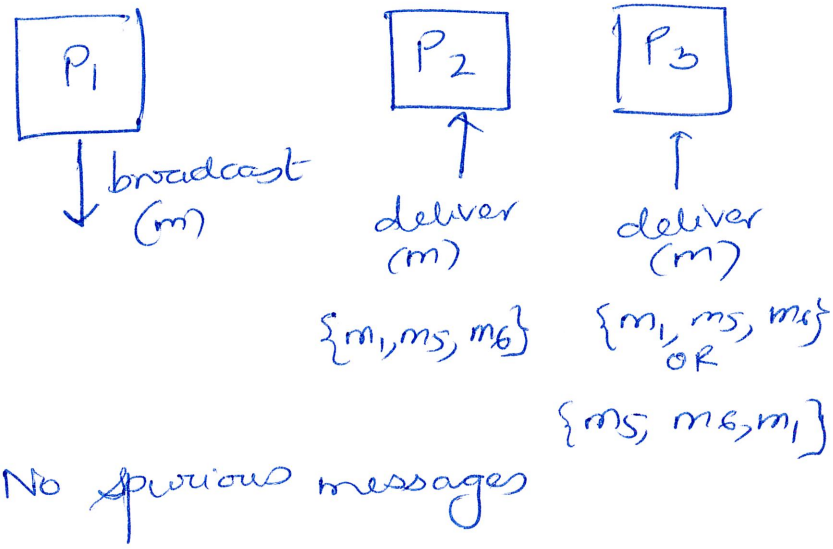
Ordering of inputs has to be consistent across the three replicas (Non-commutative operations)

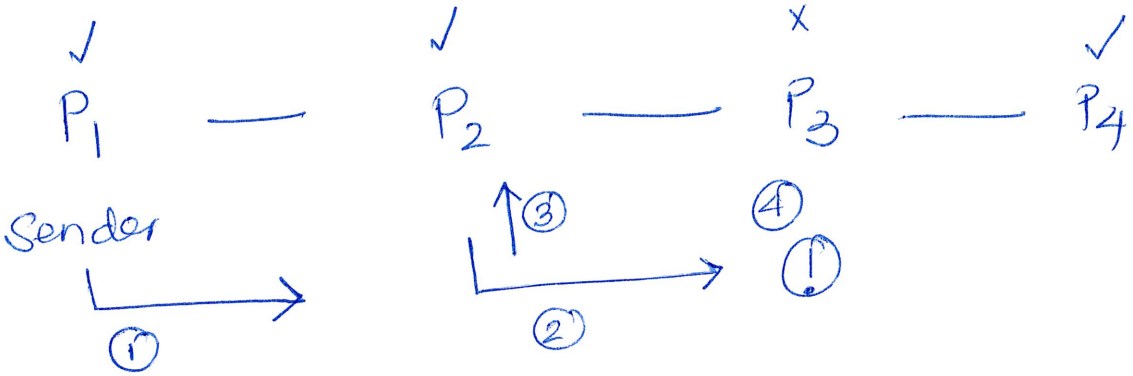
Reliable broadcast

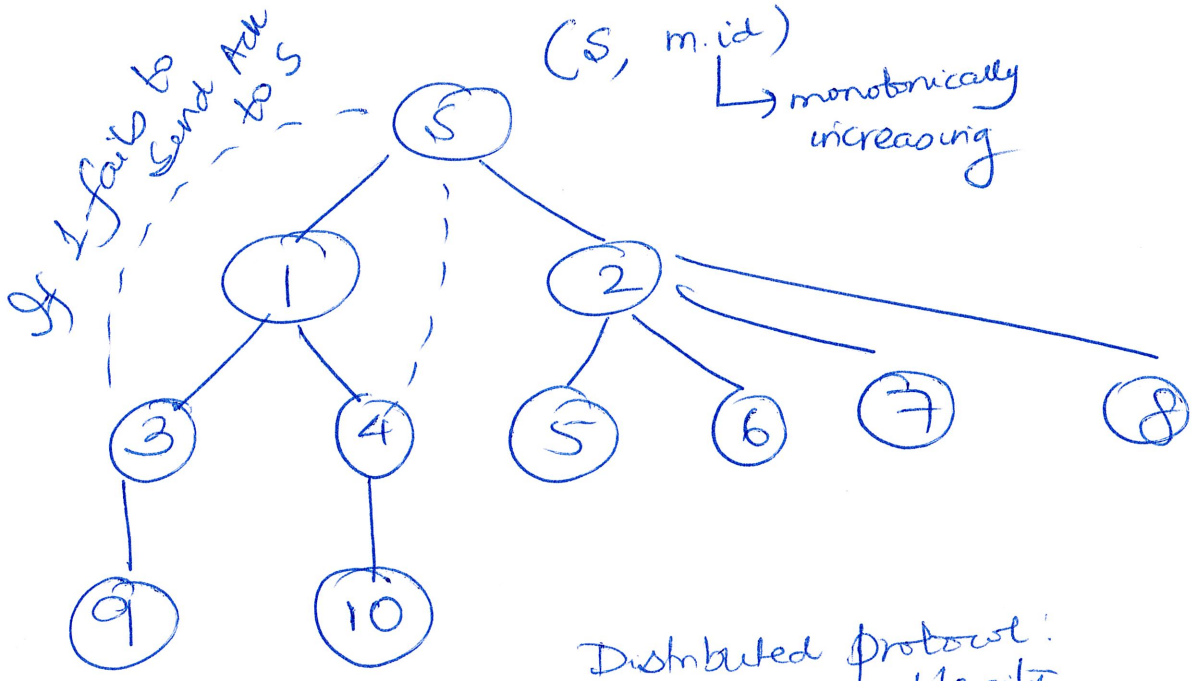
Validity

Agreement

Integrity → No spurious messages







Distributed protocol:
- Time complexity
- Message complexity
- Storage/state maintenance