Dependable Distributed Systems
Master of Science in Engineering in Computer Science

AA 2021/2022

Lecture 33 – Exercises
December 20th, 2021
(Estimated time to complete all exercises: 2 hours and half)

Ex 1: Assess the truthfulness of the following sentences and for each of them provide a justification of your claim:

1	Analytical and Simulation models can always be both adopted to properly make performance evaluation	T	F
2	The expected performance of a service depends only on the available resources in the system	T	F
3	It is always possible to perform vertical and horizontal scaling	T	F
4	Arrivals following an exponential distribution implies that the time between two consecutive arrivals will always increase over the time	T	F
5	Arrival following exponential distribution properly model highly burst workloads	T	F

Ex 2: The distributed service S is mainly composed by three types of component:

1. the load balancer
2. the application component
3. the database component.

The application and the database components are replicated, specifically 3 application replicas and 4 database replicas are deployed.
The service is available under the following constraints:

- the load balancer is available
- at least one application component is available and
- at least two database replicas are available.

Assuming the MTTF and the MTTR of the load balancer equal respectively to $MTTF_l$ and $MTTR_l$, and the availability of the single application and database units equal to A_{ap} and A_{db}, write the formula to evaluate the steady-state availability of the system.

Ex 3: Assess the truthfulness of the following sentences and for each of them provide a justification of your claim:

1	The steady-state availability of a component is only influenced by the MTTF and MTTR	T	F
2	Chaos Engineering is a standardized methodology to quantitively assert the dependability of a system	T	F
3	Any feasible experiment is valuable in Chaos Engineering	T	F
4	Chaos Engineering corresponds to continuous and automatic testing in production	T	F

Ex 4: Let us consider a distributed system implementing an active replication schema. All replicas may fail by crash and they have all the same expected MTTF and MTTR. Assuming that the client must have guaranteed an availability of 99%, compute the minimum number of replicas that you need to deploy in your system.