



Performance Modeling of Computer Systems and Networks

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Bounding Analysis

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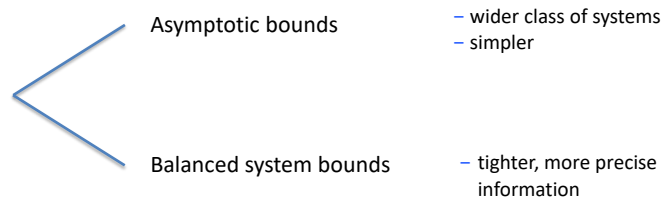


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Bounding analysis

Bounds on Performance

The simplest useful approach to computer system analysis using
QN models



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Bounds on Performance

Useful characteristics:

- ✧ provide valuable insight into the primary factors affecting the performance of computing systems
- ✧ can be computed quickly, even by hand; suitable as a “first cut” modeling technique useful to eliminate inadequate alternatives at an early stage of a study
- ✧ In many cases, a number of alternatives can be treated together, with a single bounding analysis useful information about them all

System sizing studies, based on preliminary estimates of system characteristic

Alternative upgrades to existing systems, to estimate the potential performance gain

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Asymptotic Bounds

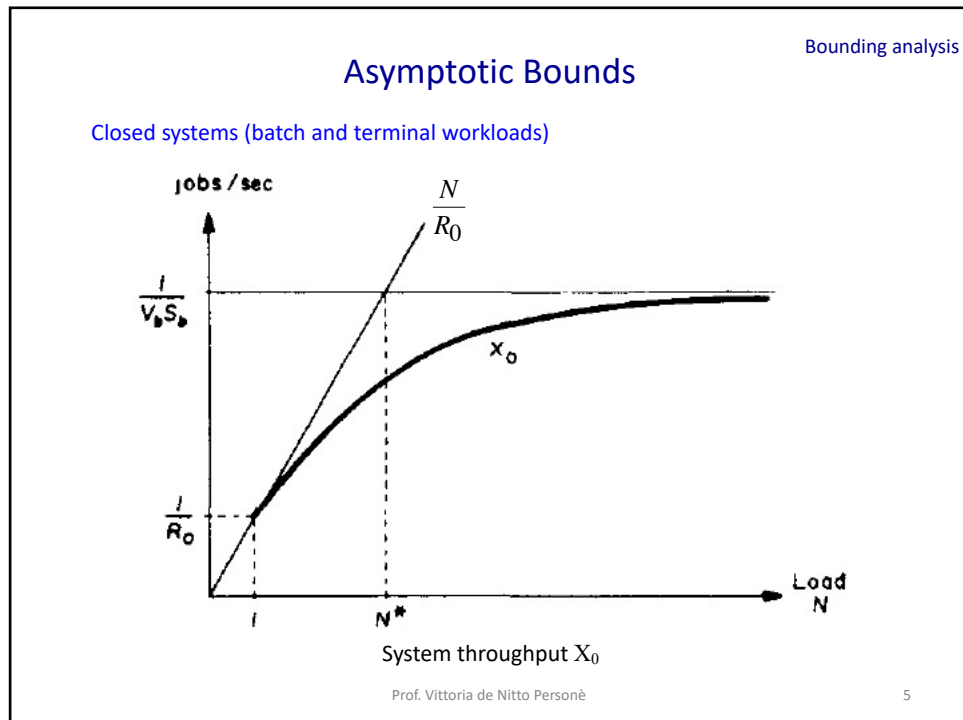
Only one assumption:

the service demand at a center does not depend on how many other customers currently are in the system, or at which service centers

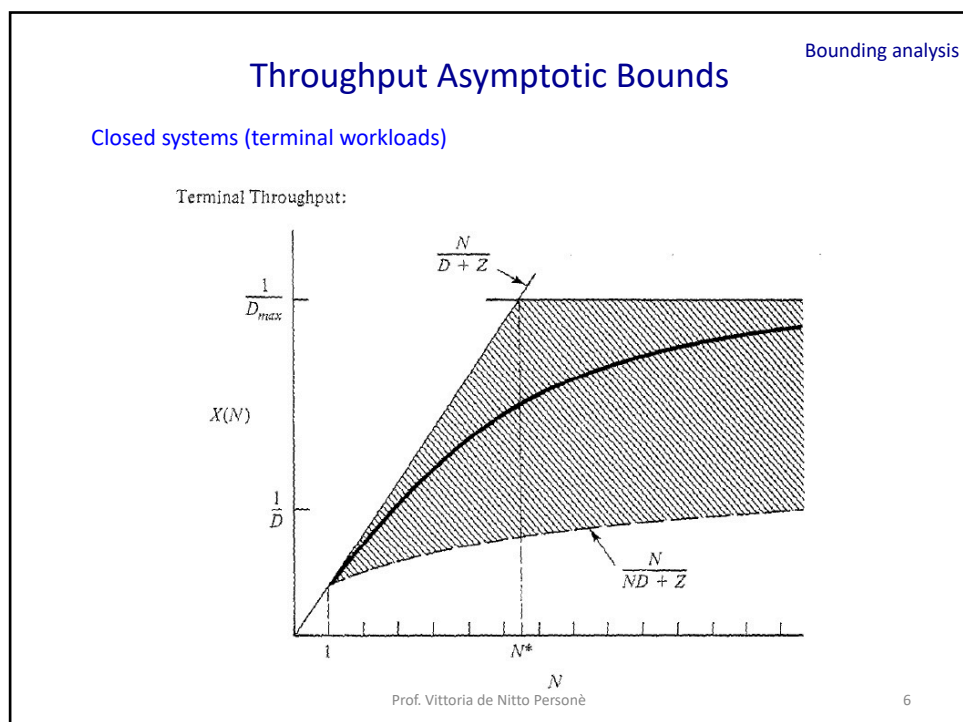
Open systems (transaction workloads):

the throughput indicates the maximum possible arrival rate that the system can process successfully

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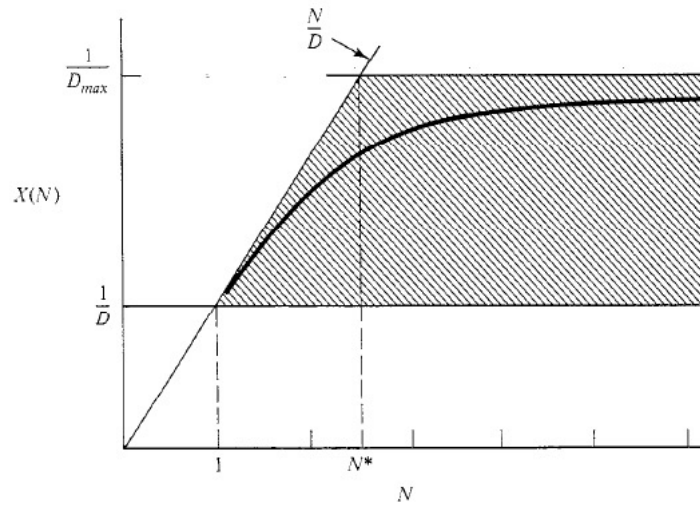
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Throughput Asymptotic Bounds

Closed systems (batch workloads)



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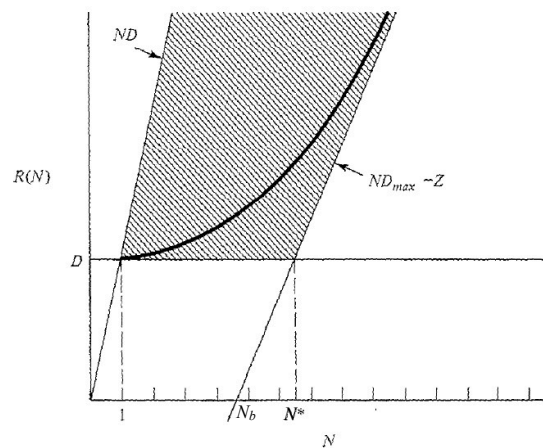
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Response Time Asymptotic Bounds

Closed systems (terminal workloads)

Terminal Response Time:



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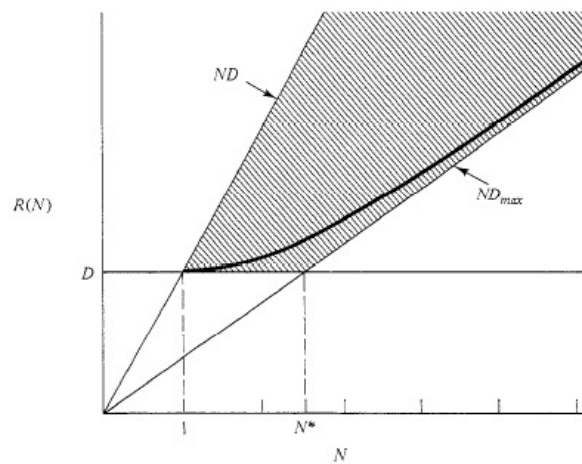
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Response Time Asymptotic Bounds

Closed systems (batch workloads)

Batch Response Time:



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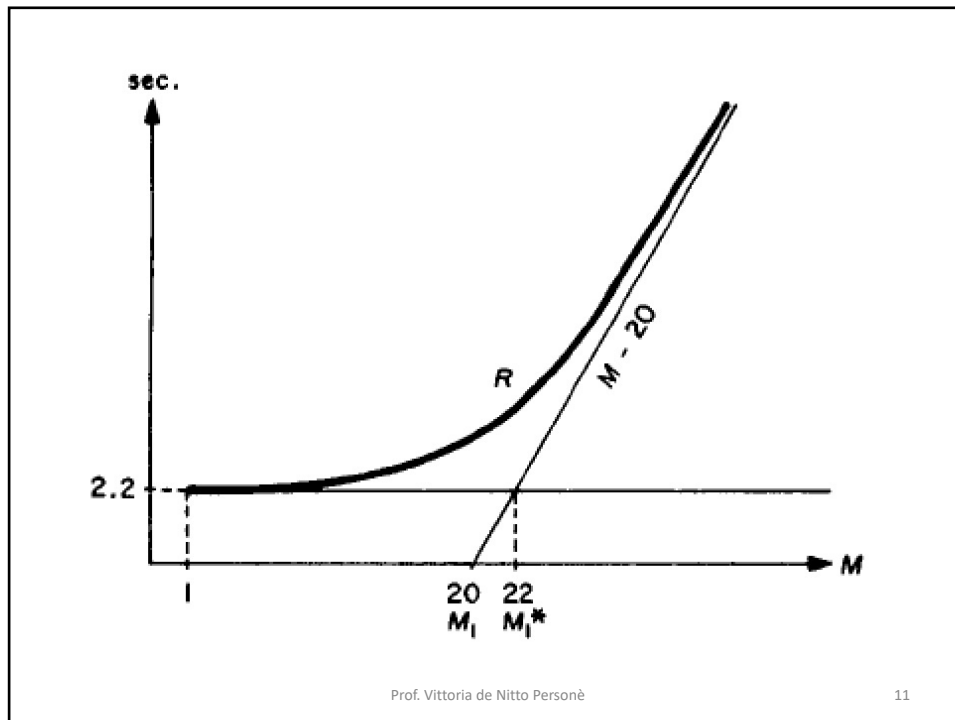
Asymptotic Bounds: conclusion

- ✧ Gross guidance on effects of proposed changes
- ✧ reducing V_i or S_i for a device which is not the bottleneck will not affect significantly the throughput \rightarrow just a minor change in D
- ✧ Reducing $V_i S_i$ for all the bottleneck devices remove the bottleneck and the improvement will be noticed until the bottleneck will move elsewhere

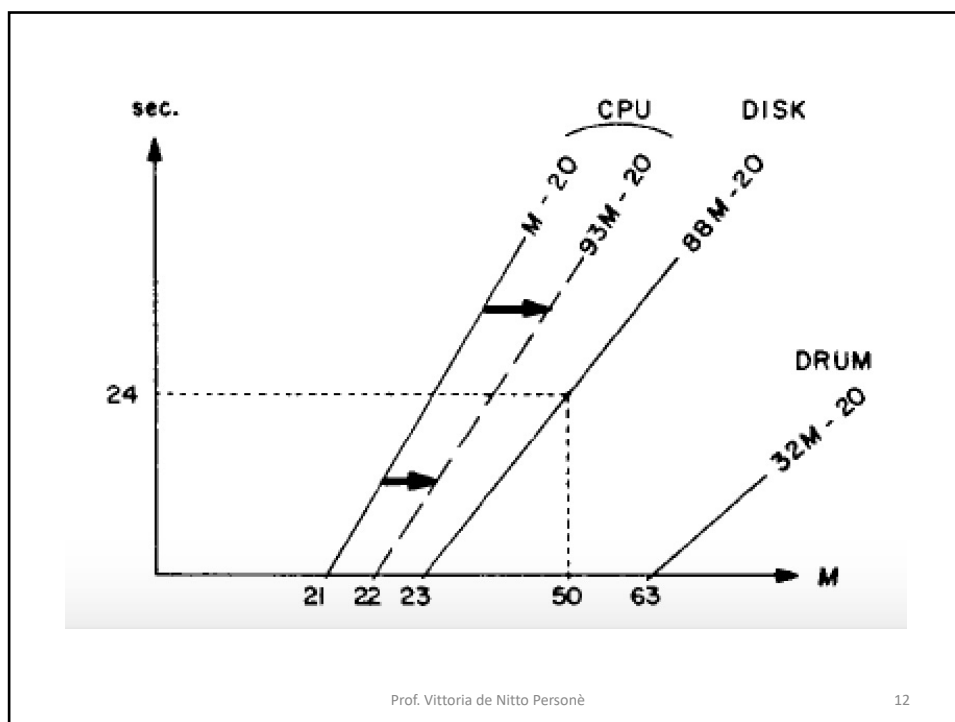
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