

ArcIMS sizing



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Lesson 5 goals

- Plan Internet connection bandwidth
- Performing *back of the envelope* calculations for feasibility checking
- Use the ESRI Systems Integration Hardware Sizing Charts
- Configure Virtual Servers
  - Setting the optimum number of instances

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Network bandwidth

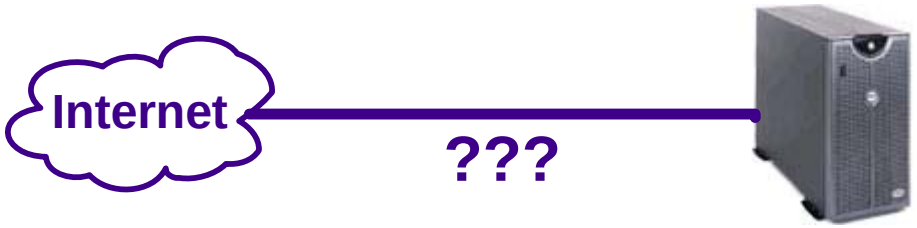
- Network bandwidth is measured in kilobits/second
  - 1 KB (kilobyte) = 8 Kb (kilobits)

Network Connection	Theoretical Bandwidth (Kb/s)
28K modem	28.8
56K modem	56
ISDN	128
DSL	768
T1	1,544
T3	45,000
Ethernet	10,000
Fast Ethernet	100,000
ATM (OC-3)	155,000
ATM (OC-12)	622,000

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Planning the capacity of a network connection

- I expect my image service to receive a peak load of 2,000 hits per hour. How much Internet bandwidth do I need?



Assumed average JPEG image size: 70 KB

70 KB x 8 bits/byte x 1024 bytes/KB = 573,440 bits

2,000 hits/hour ÷ 3,600 seconds/hour = 0.56 hits/second

0.56 hits/second x 573,440 bits/hit = 318,577 bits/second or 319 Kb/s

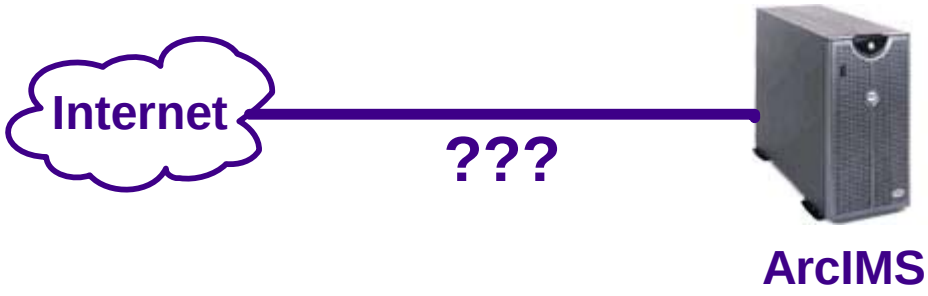
∴ The required bandwidth can be provided by a T1 connection

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Planning the capacity of a network connection

- **Peak ArcIMS requests/hour**

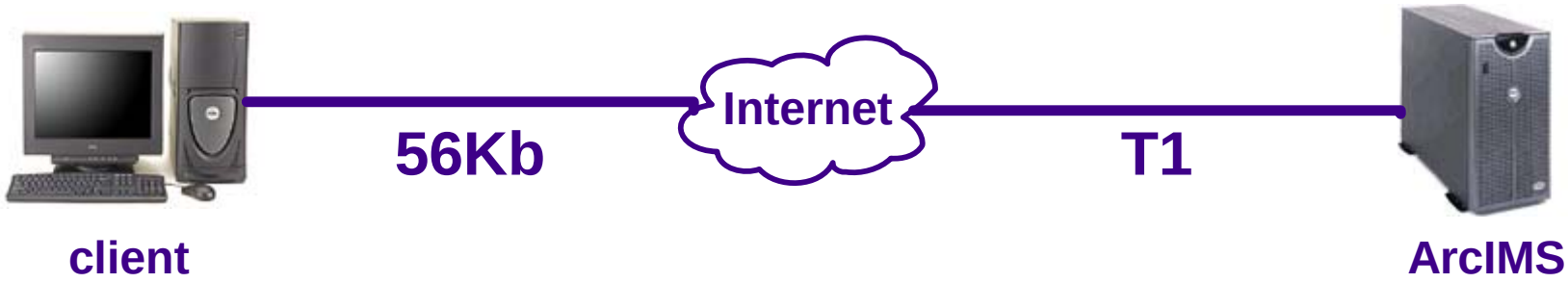
Bandwidth	Average Image Size				
	10 KB	30 KB	50 KB	75 KB	100 KB
56 Kbps Modem	1,344	448	269	179	134
1.54 Mbps T1	36,960	12,320	7,392	4,928	3,696
6.16 Mbps T2	147,840	49,280	29,568	19,712	14,784
45 Mbps T3	1,080,000	360,000	216,000	144,000	108,000
155 Mbps ATM	3,720,000	1,240,000	744,000	496,000	372,000



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Calculating download time

- **How long does it take to download the ArcIMS HTML Viewer with a 56 Kb dial-up connection?**



ArcIMS HTML Viewer: 139 files, 473 KB total file size

473 KB x 8 bits/byte x 1,024 bytes/KB = 3,874,816 bits

3,874,816 bits ÷ 56,000 bits/second = 69 seconds

NOTE: The above calculations do not take into account the overhead taken by the HTTP and TCP protocols (usually about 20%)

∴ 69 seconds x 1.2 = 83 seconds

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Calculating download time

- Image transfer time (seconds)

Bandwidth	Average Image Size				
	10 KB	30 KB	50 KB	75 KB	100 KB
19 Kbps Modem	7.9	23.7	39.5	59.2	78.9
28 Kbps Modem	5.4	16.1	26.8	40.2	53.6
56 Kbps Modem	2.7	8.0	13.4	20.1	26.8
1.54 Mbps T1	0.1	0.3	0.5	0.7	1.0
6.16 Mbps T2	< 0.1	0.1	0.1	0.2	0.2
45 Mbps T3	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
155 Mbps ATM	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

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How do you handle change?

- **Theory of Relative Performance**
  - **The relative performance of two servers is directly proportional to their compute capacity**

$$\frac{\textit{Performance of Server A}}{\textit{Performance of Server B}} = \frac{\textit{Clients of Server A}}{\textit{Clients of Server B}}$$

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Using standard industry benchmarks

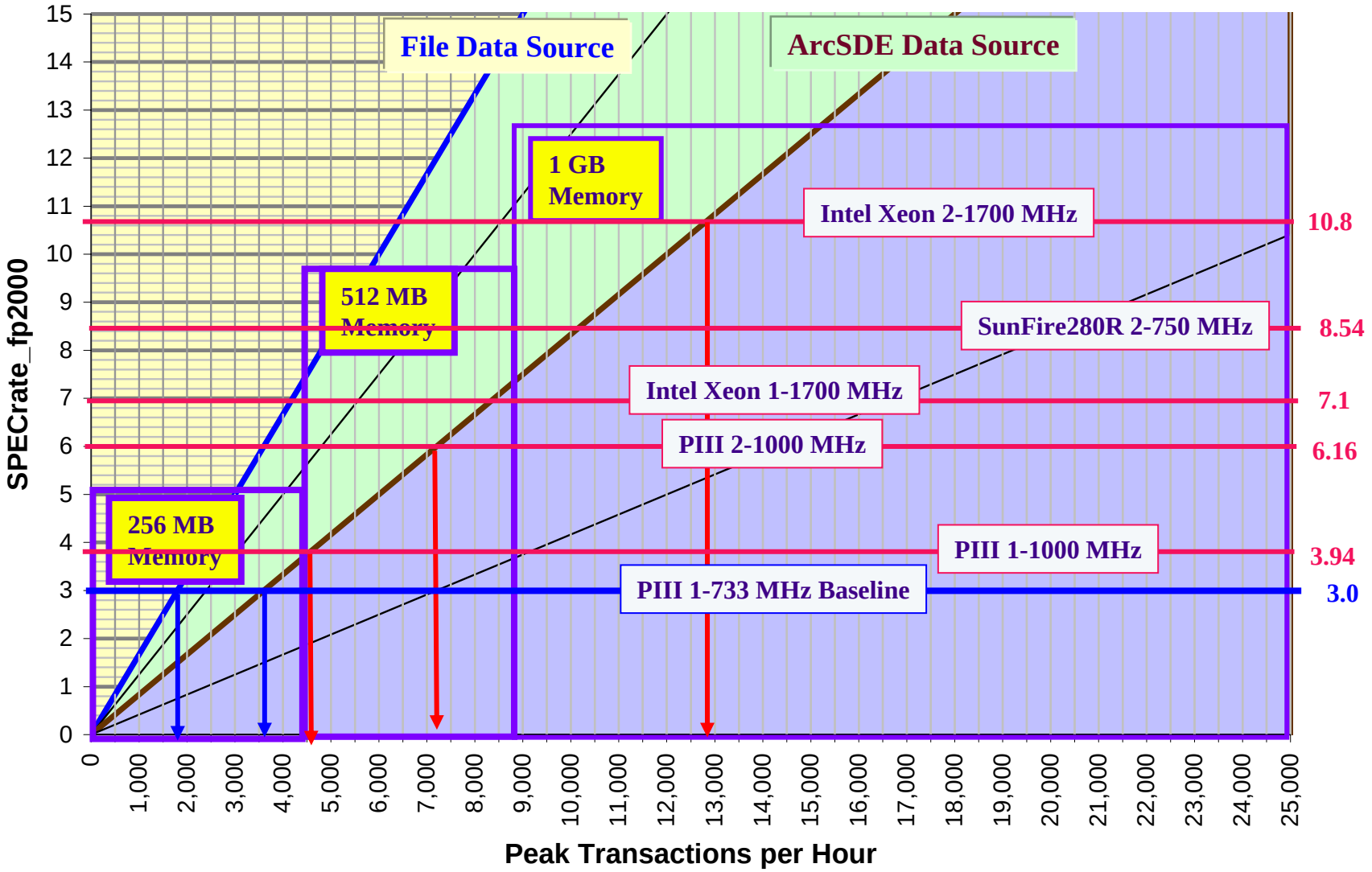
- Use benchmarks to compare the performance of different systems
- Standard Performance Evaluation Corporation (SPEC)
  - http://www.spec.org/

SPEC Mission:

"To develop technically credible and objective benchmarks so that both computer designers and purchasers can make decisions on the basis of realistic workloads"

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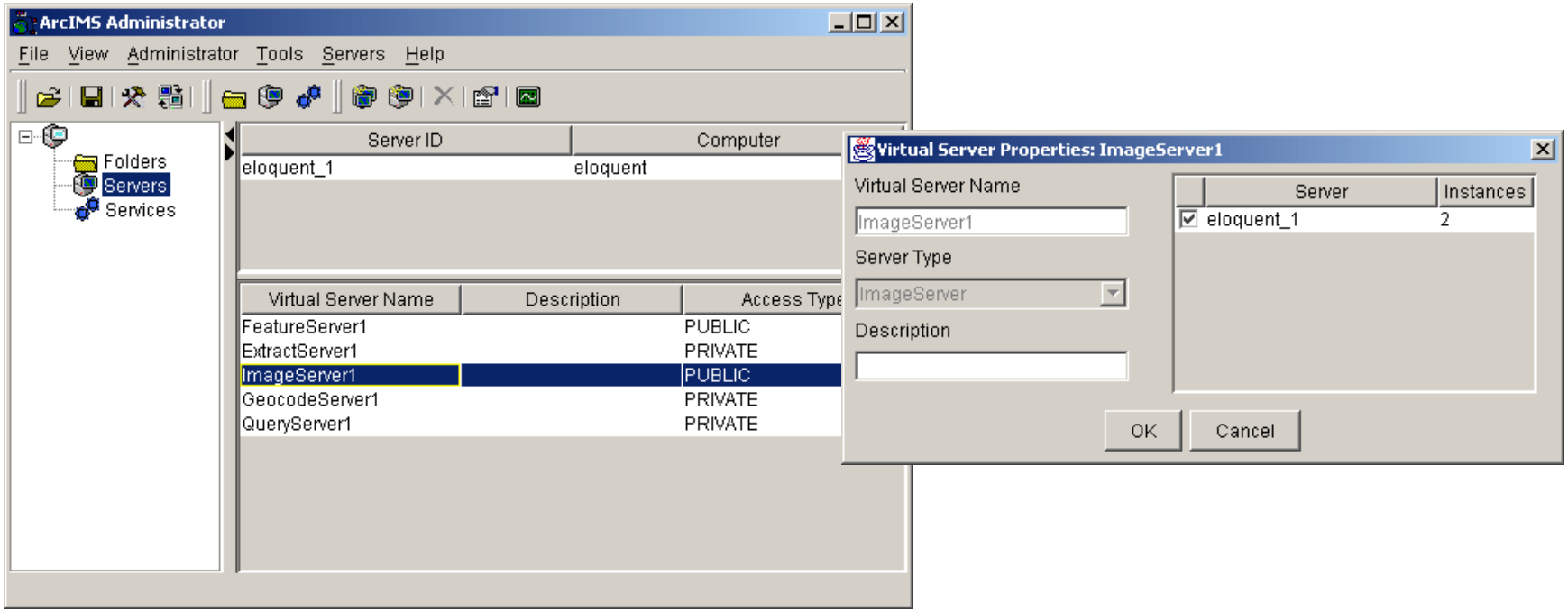
ArcIMS sizing chart



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ArcIMS multiprocess tuning

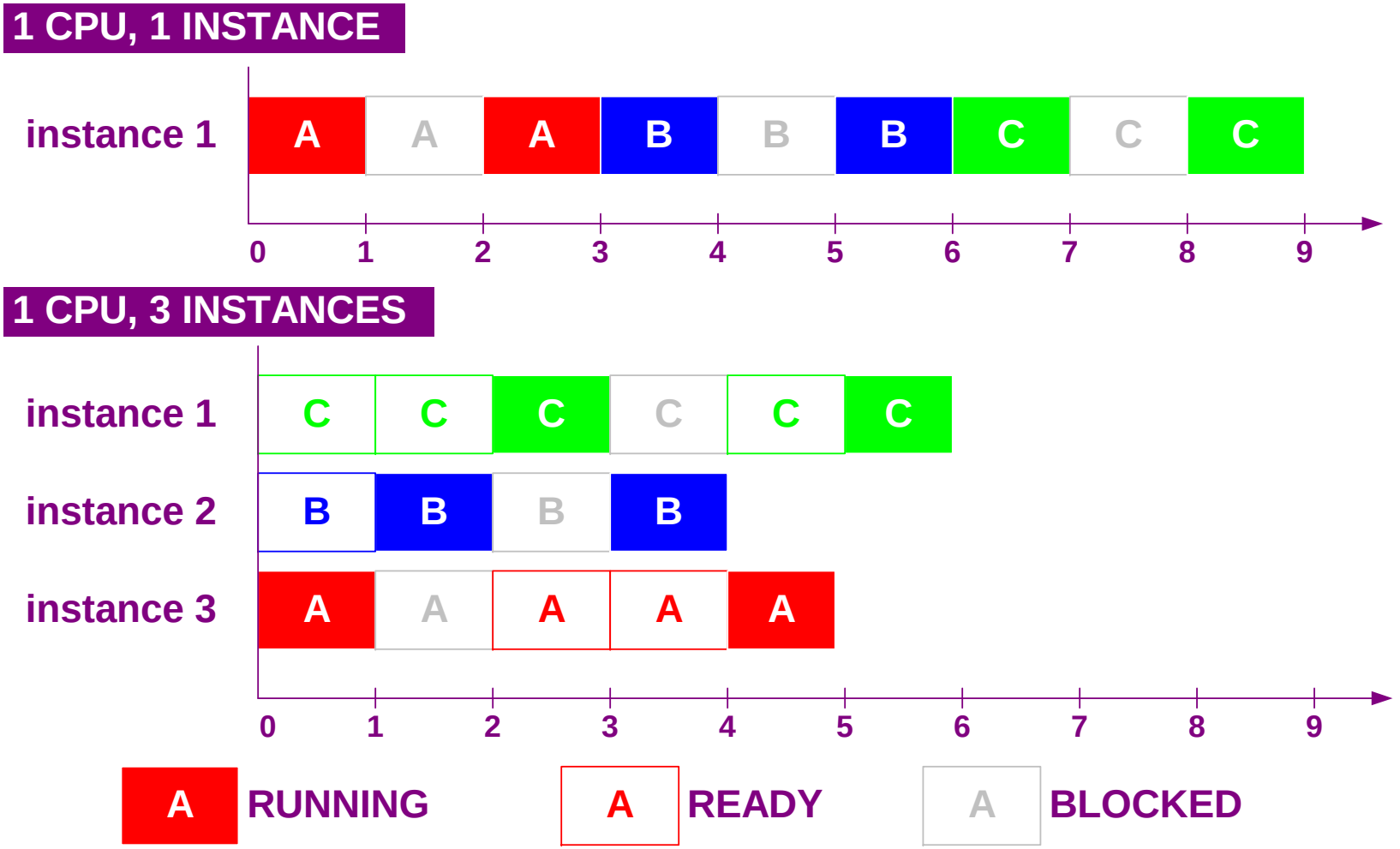
- ArcIMS is a multiple process server
  - Windows—Multithreaded
    - One aimsserver.exe process with one thread per instance
  - UNIX—Multiprocess
    - Many aimsserver.exe processes with one process per instance



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ArcIMS multiprocessing

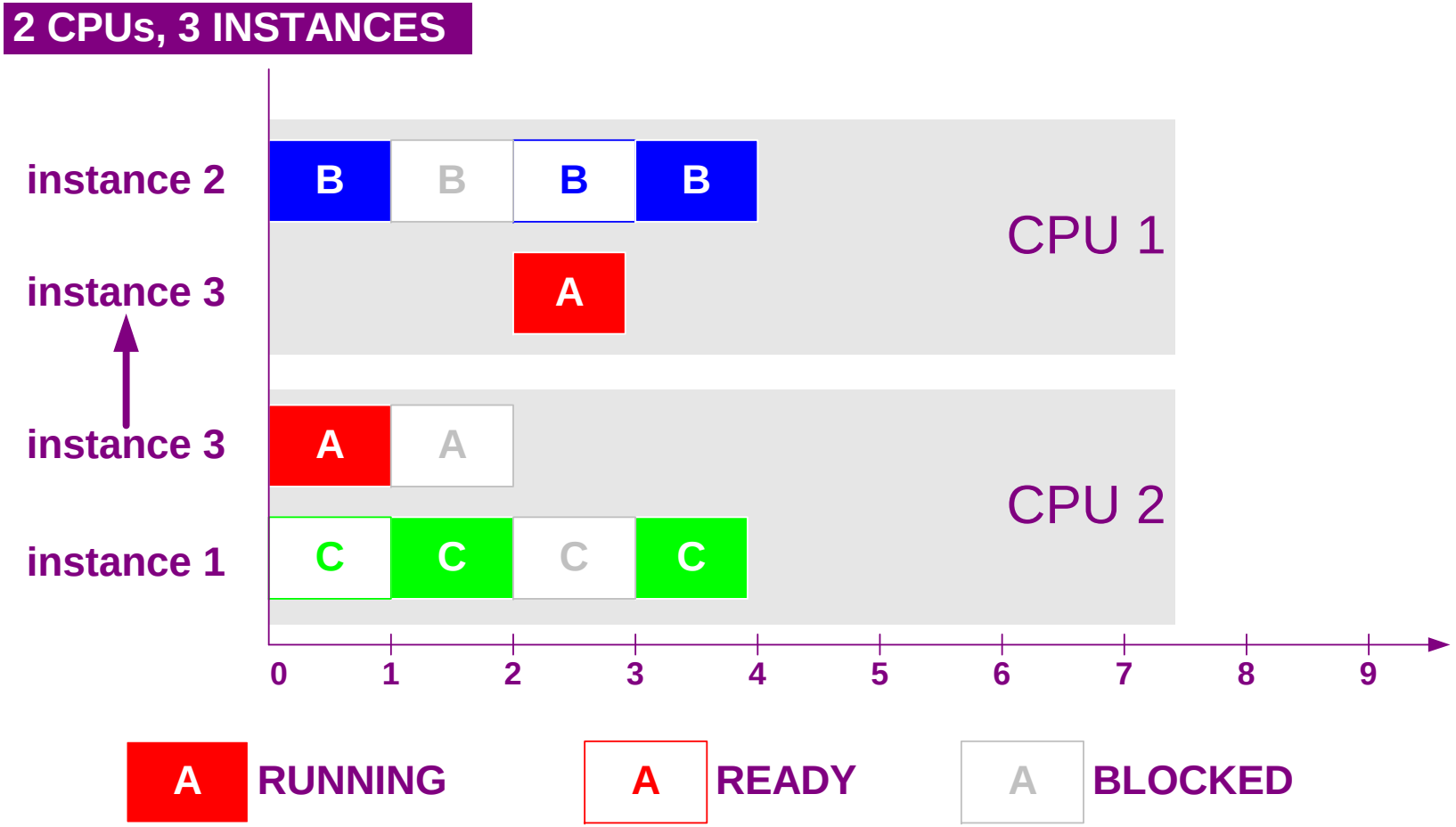
- **Requests A, B, and C arrive simultaneously**



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ArcIMS multiprocessing

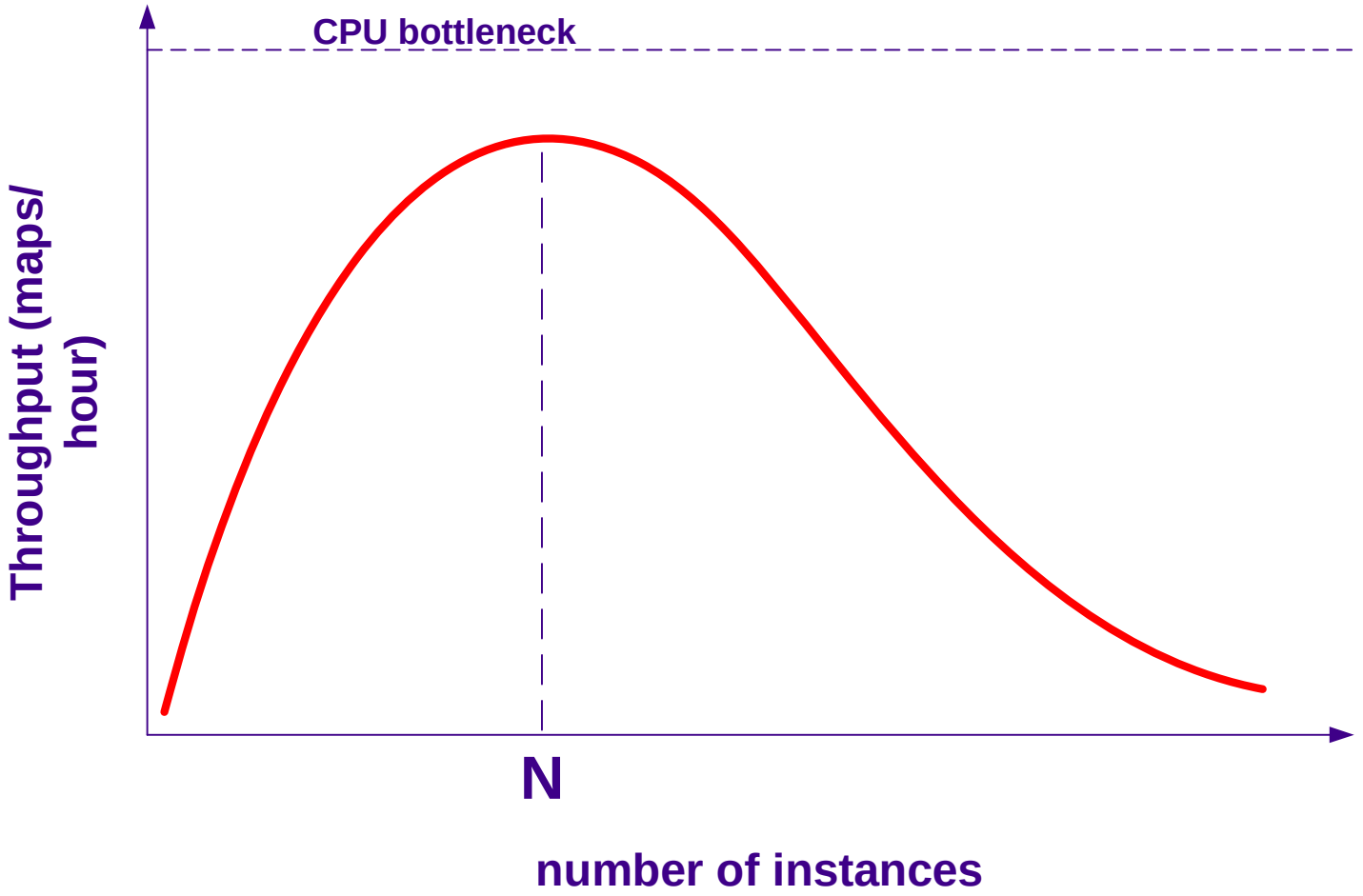
- **Requests A, B, and C arrive simultaneously**



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Choosing the optimum number of instances

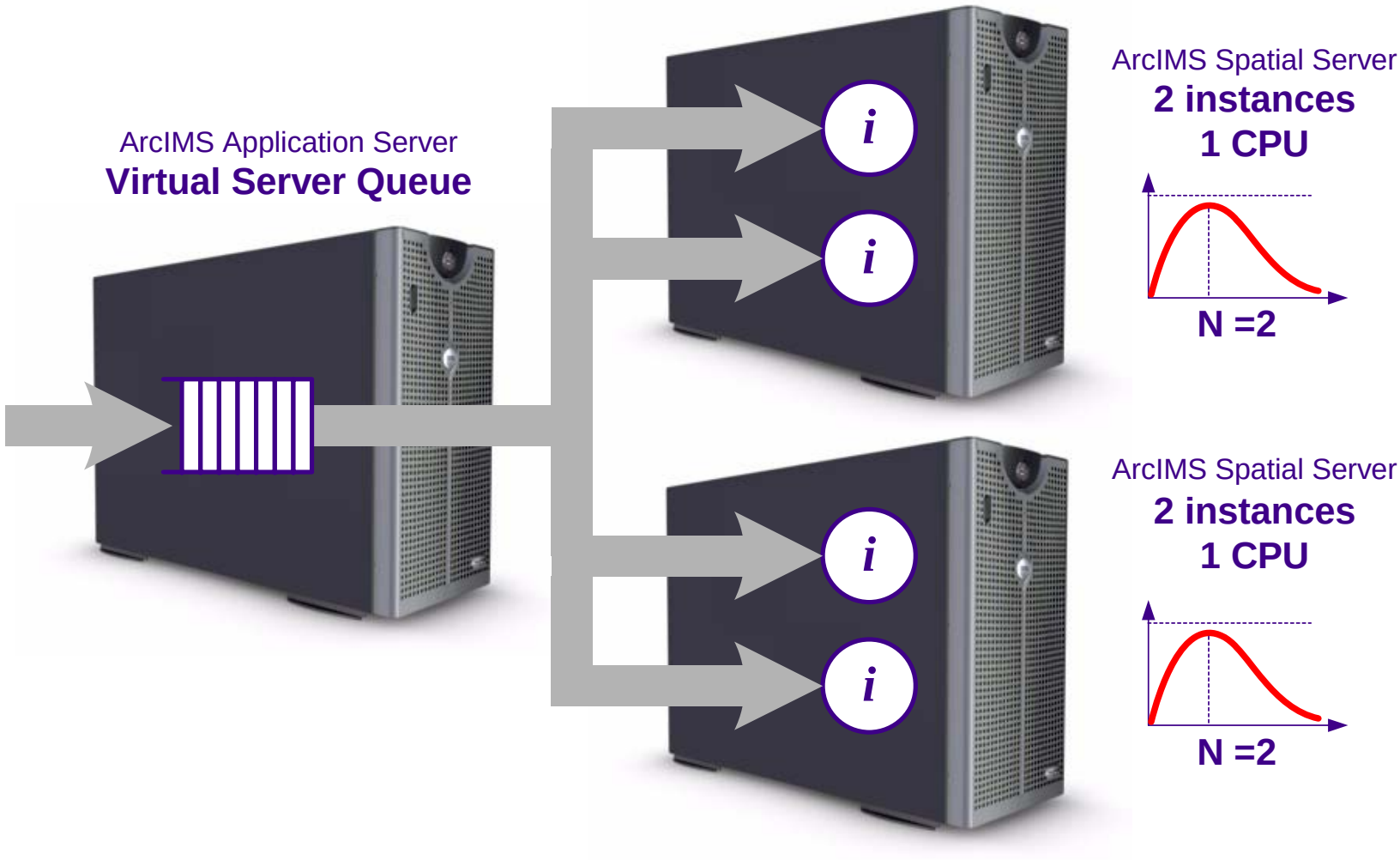
- **Set instances to level where maximum throughput occurs (usually between 2 and 4)**



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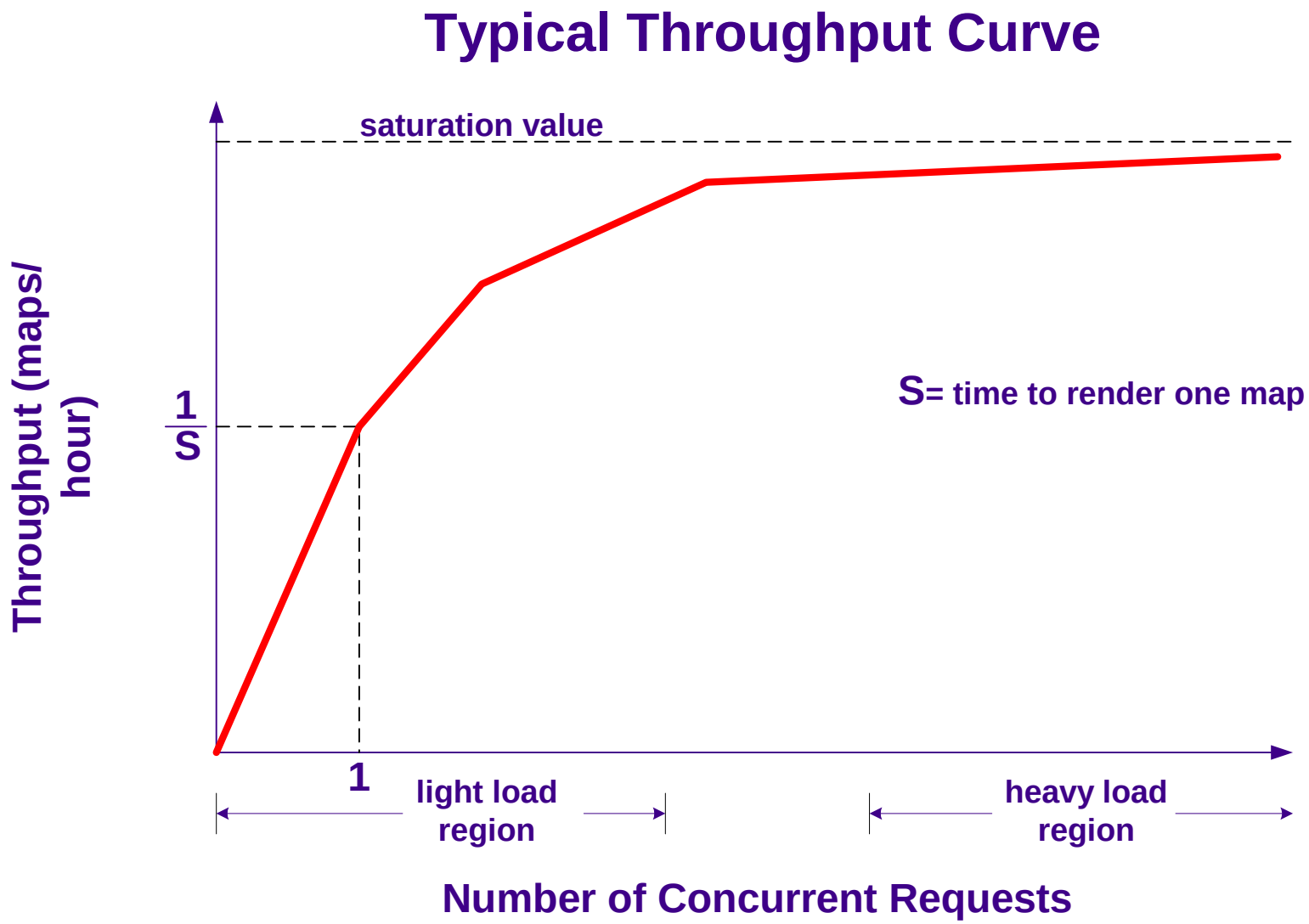
Multiple instances in Virtual Servers

- **Example: Virtual Server with four instances**



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Virtual Server throughput curve



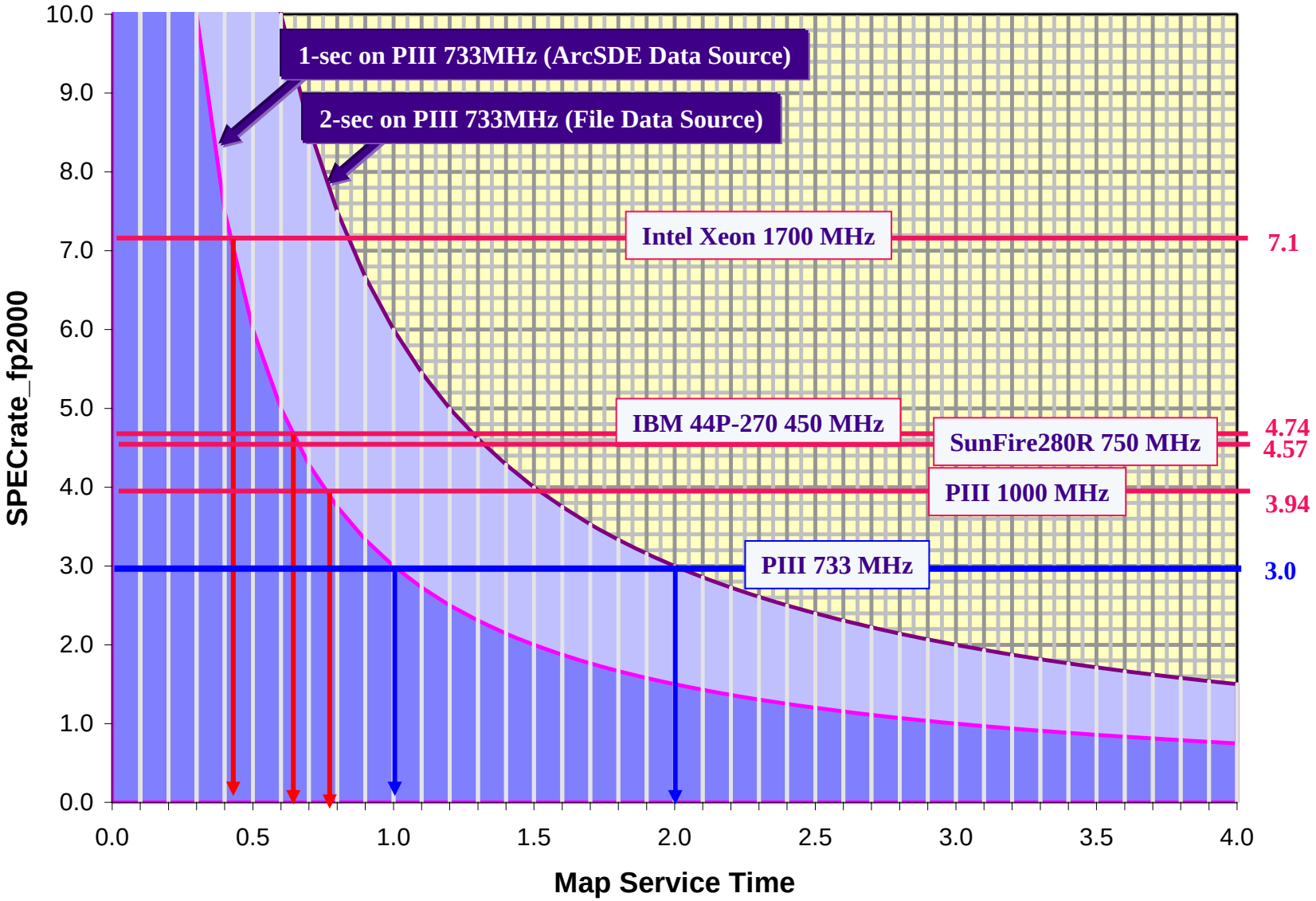
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ArcIMS multiprocessing summary

- CPU processes one instruction at a time but can execute instructions from any active instance
- Adding instances accelerates the throughput of the system by efficiently using the CPU time
  - Different hardware (CPU, disk) may benefit from more instances
  - Map content affects optimum number of instances

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Baseline service rates



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Exercise 5 overview

- Determine internet bandwidth
- Size the Spatial Server platform

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