Welcome to the Cloud

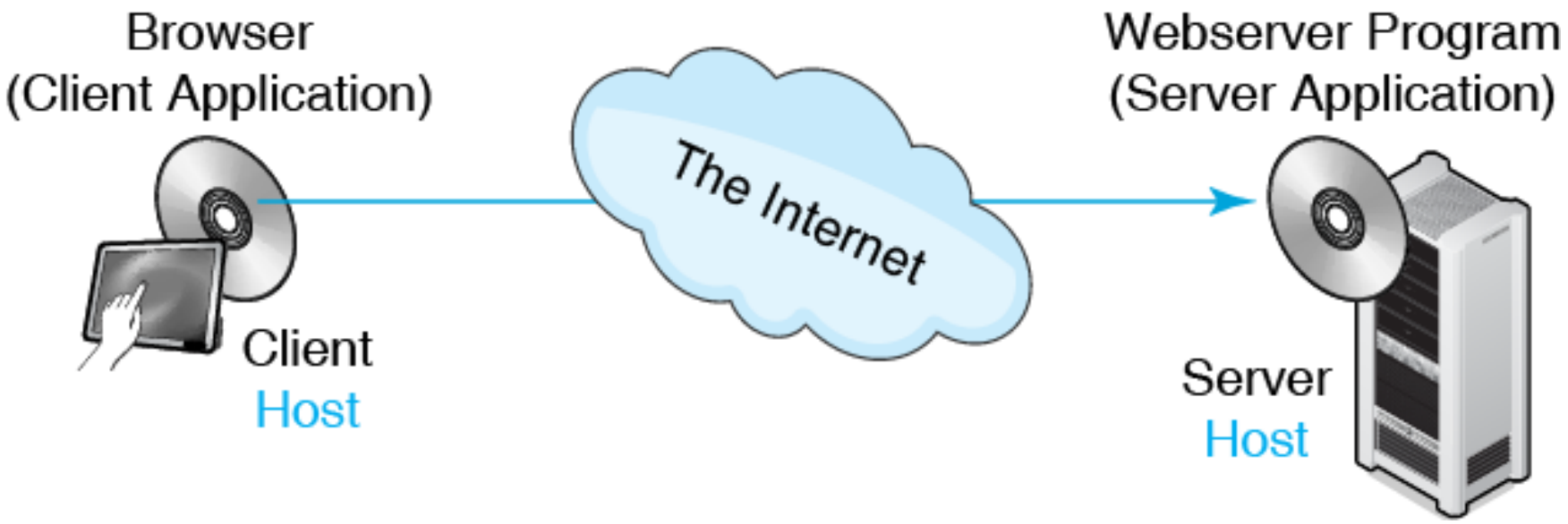
Chapter 1

Panko and Panko
Business Data Networks and Security, 10th Edition, Global Edition

How big is the Internet?

- 1958: Tom Watson, IBM chairman, *'I think there is a world market for about five computers.'* (furphy?)
- 2003: More internet-connected devices than humans on earth
- 2011-2016: global IP traffic triples to one zettabyte per year of data = 10^{21} bytes (Cisco, 2012)
- 2019: 2 zettabytes per year by 2019 (Cisco 2015)
- 2020: 50 billion devices connected (Ericsson, 2010)
- 2020: 30 billion devices (Aus Communications Alliance 2015)

1.1 Internet Communications



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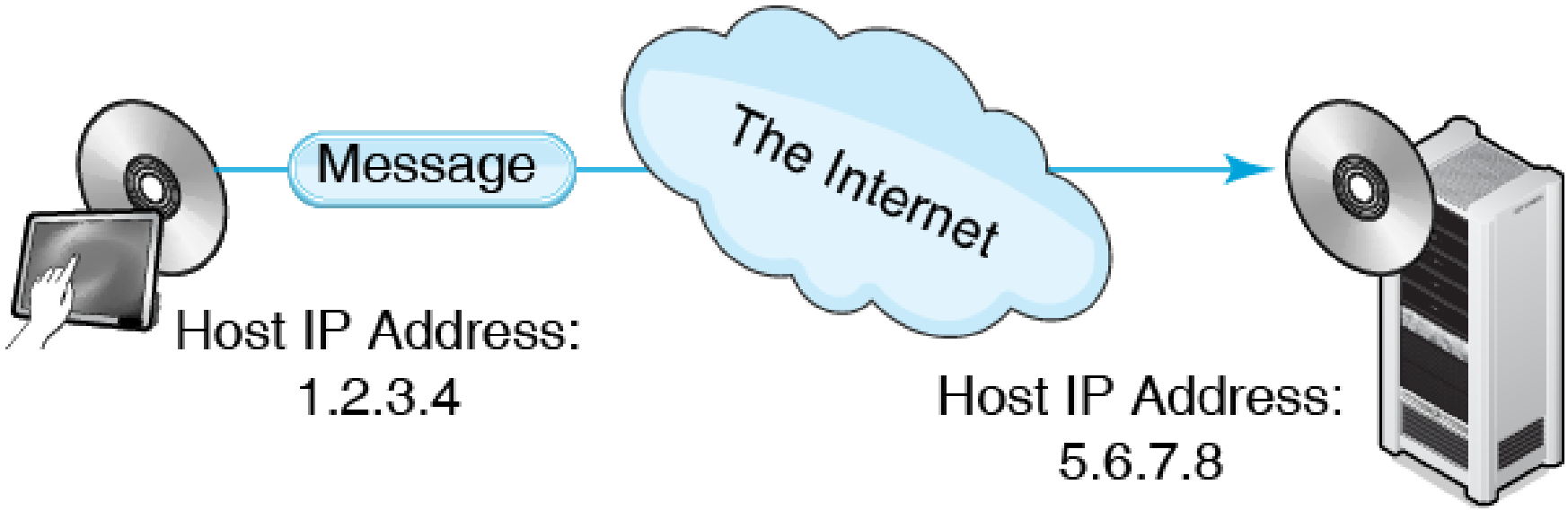
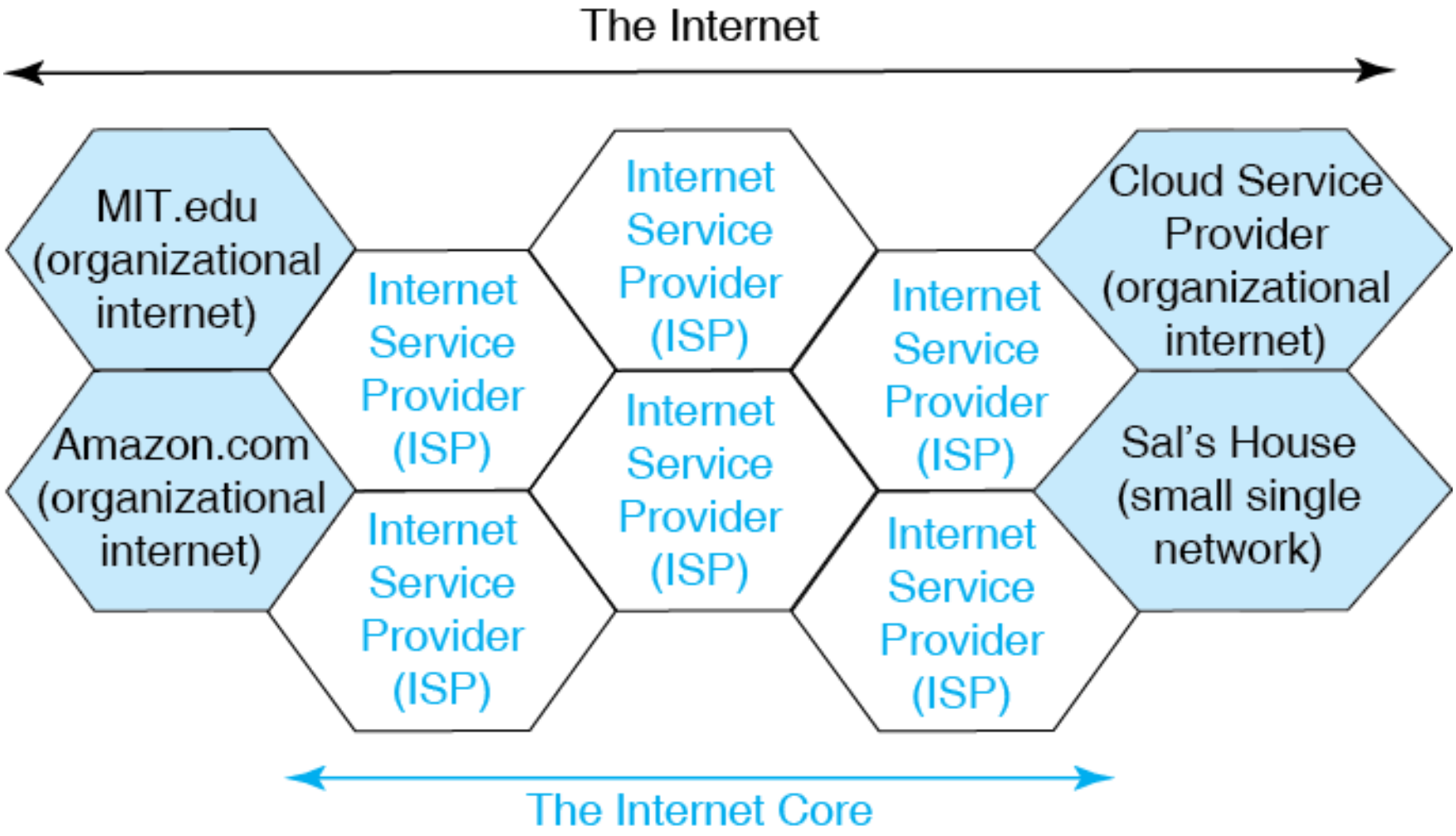


1.3 The Internet



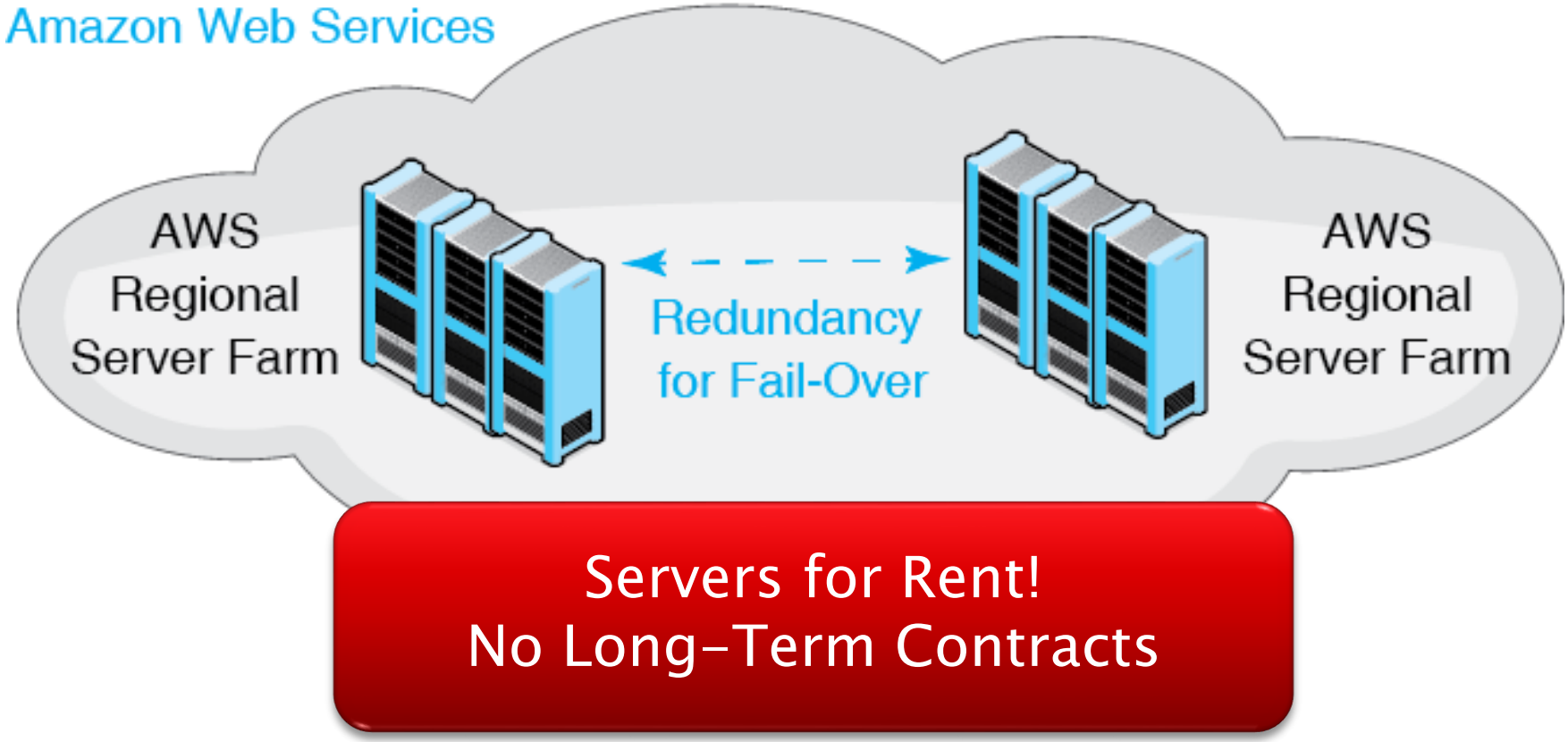
Netflix Jumps Into the Amazon

- Messages
- Single Networks
- Internets
- Standards Layers

Netflix requirements

- 2 hour HD movie = 9Gb (Gigabytes, volume) at 5 Mbs (Megabits per second, rate)
- Need constant, reliable rate
- The internet is a *best effort* delivery system
- Needs compute power for transcoding into streaming formats and personalisation.

1.4 Netflix and Amazon Web Services



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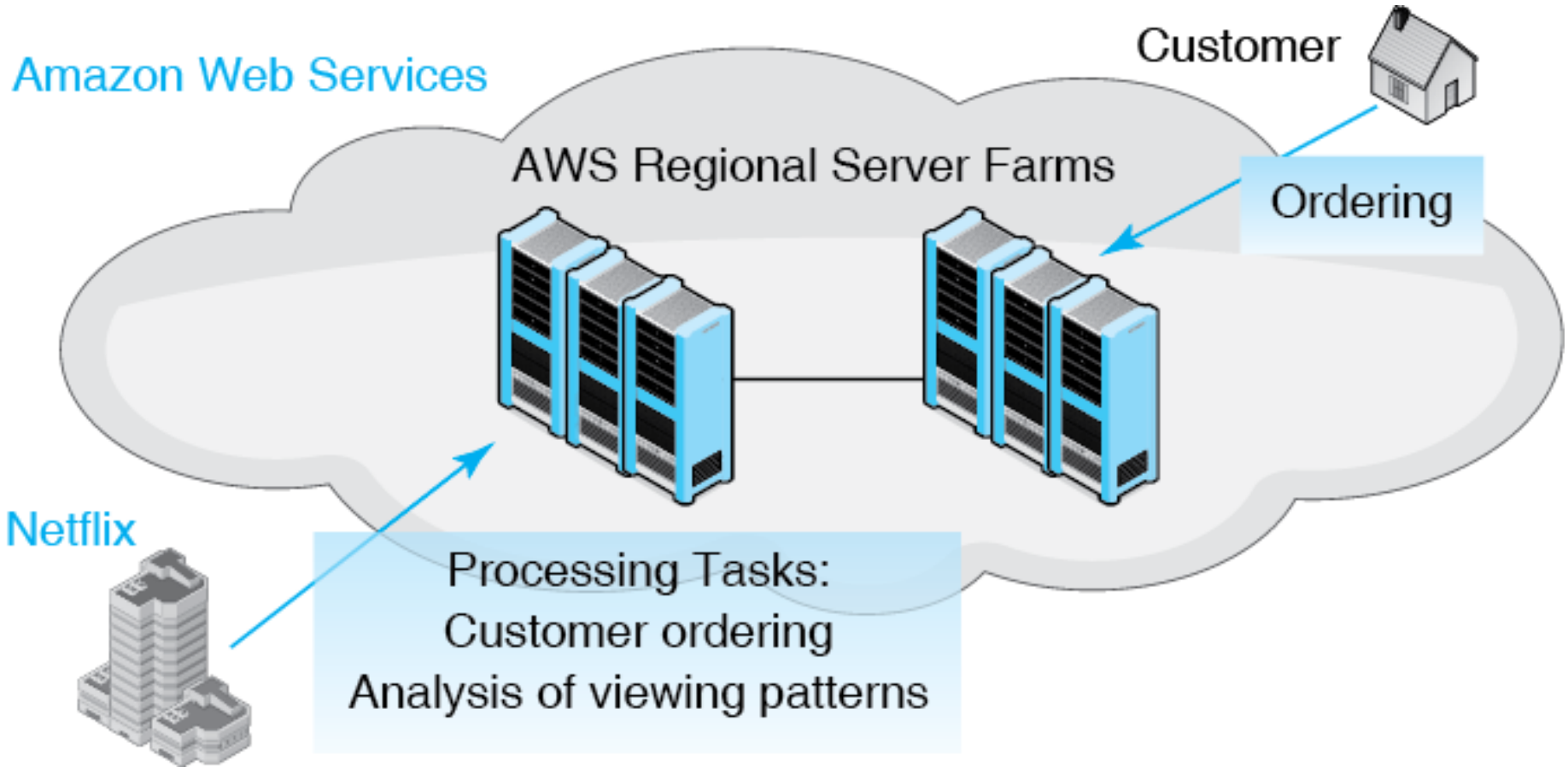

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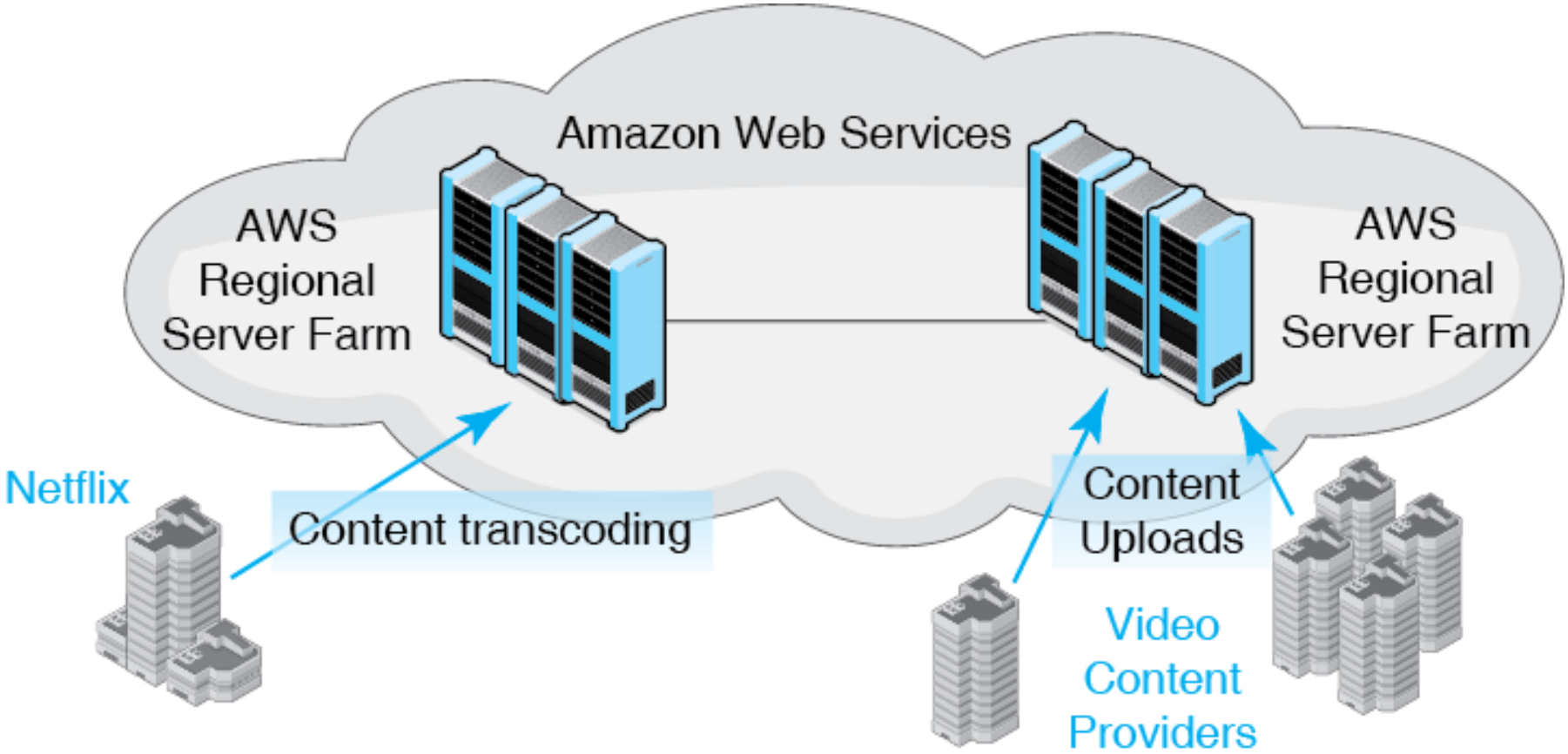
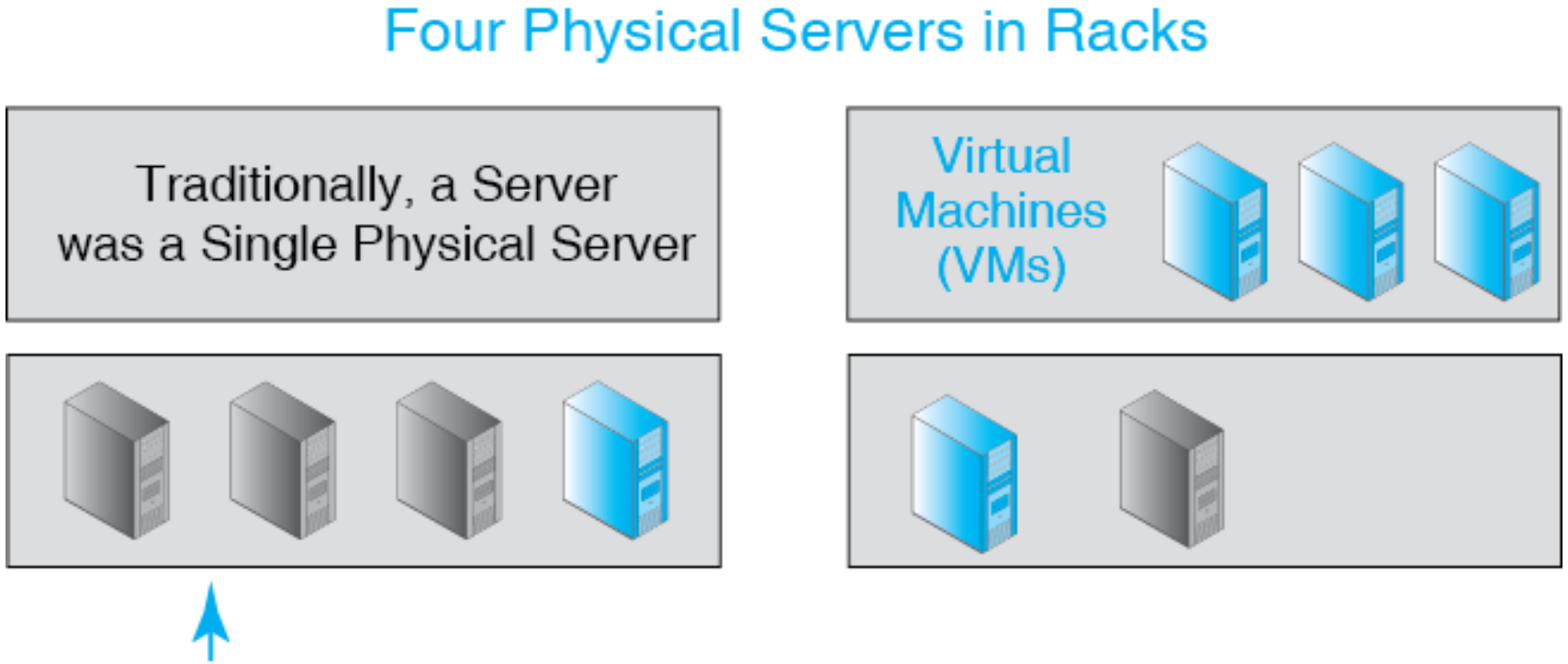


Rack Servers and Equipment Rack

1.6 Server Virtualization



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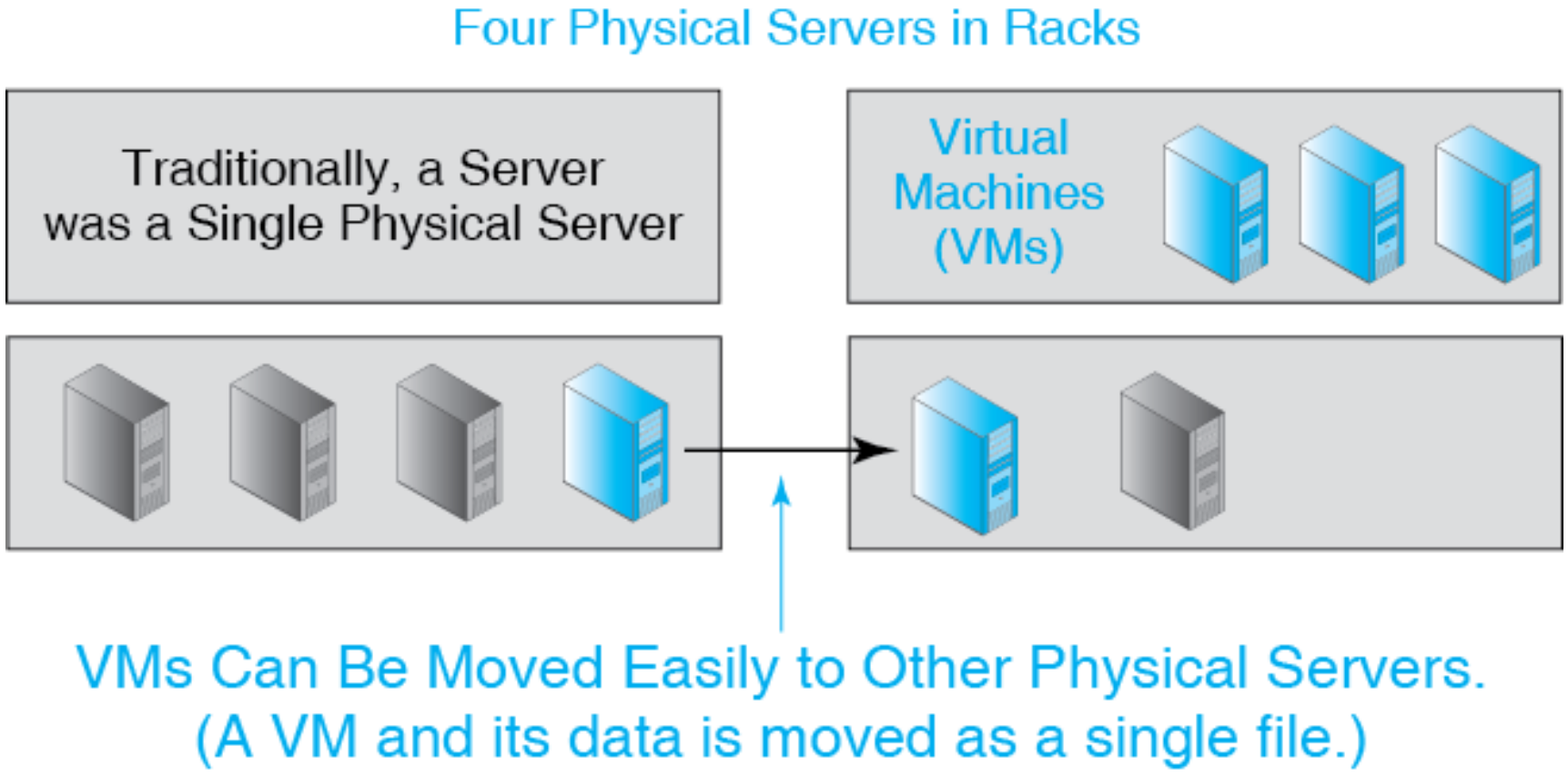

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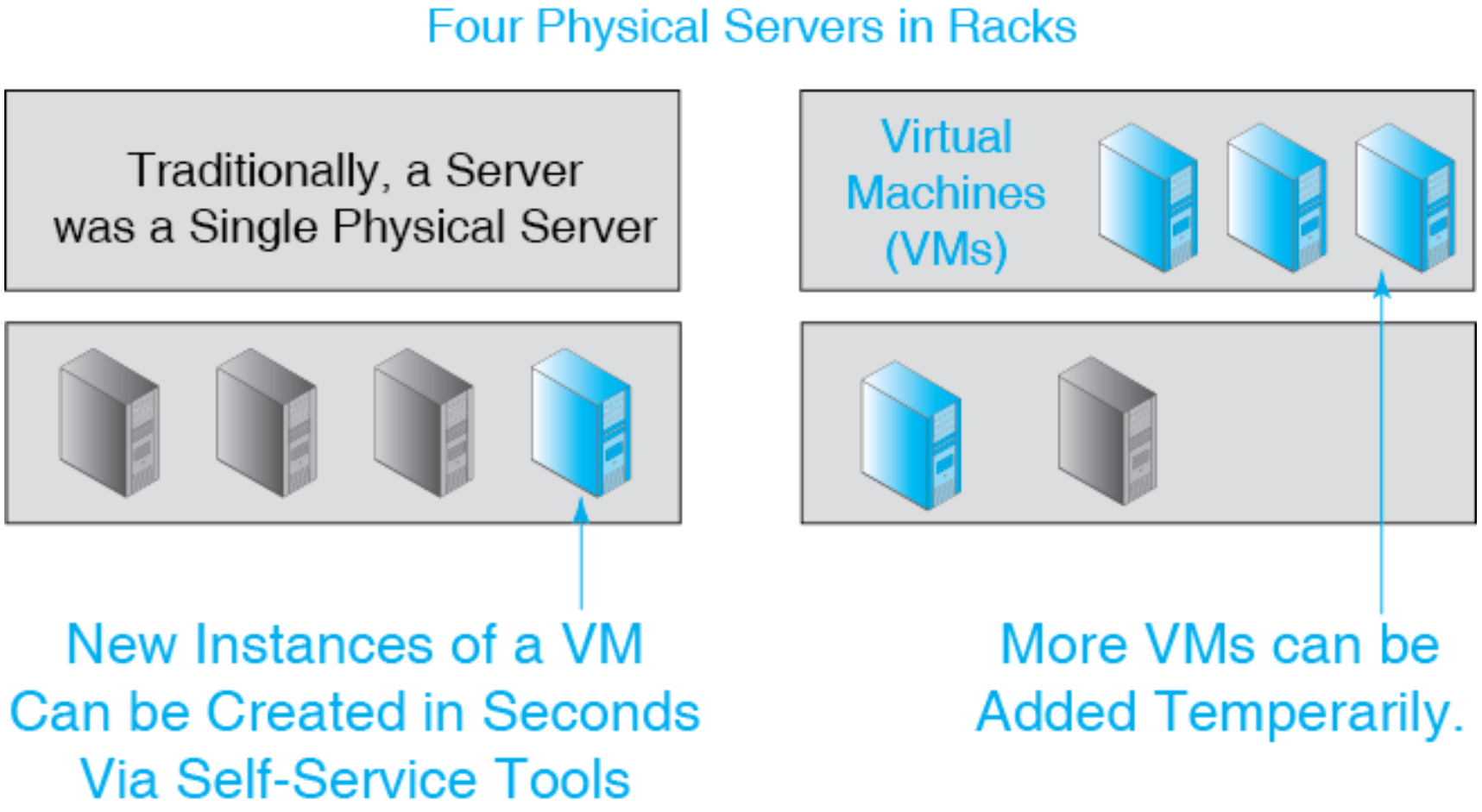
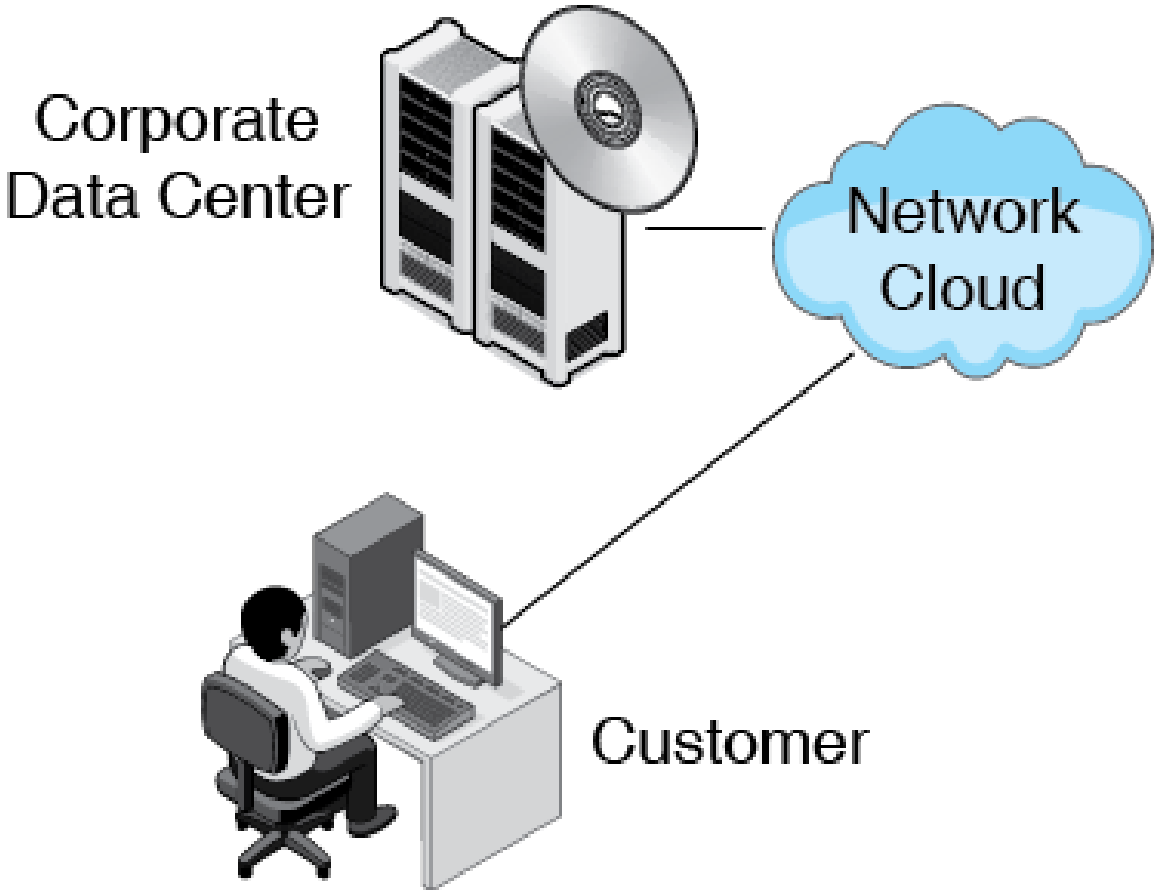


1.7 Cloud Service Providers



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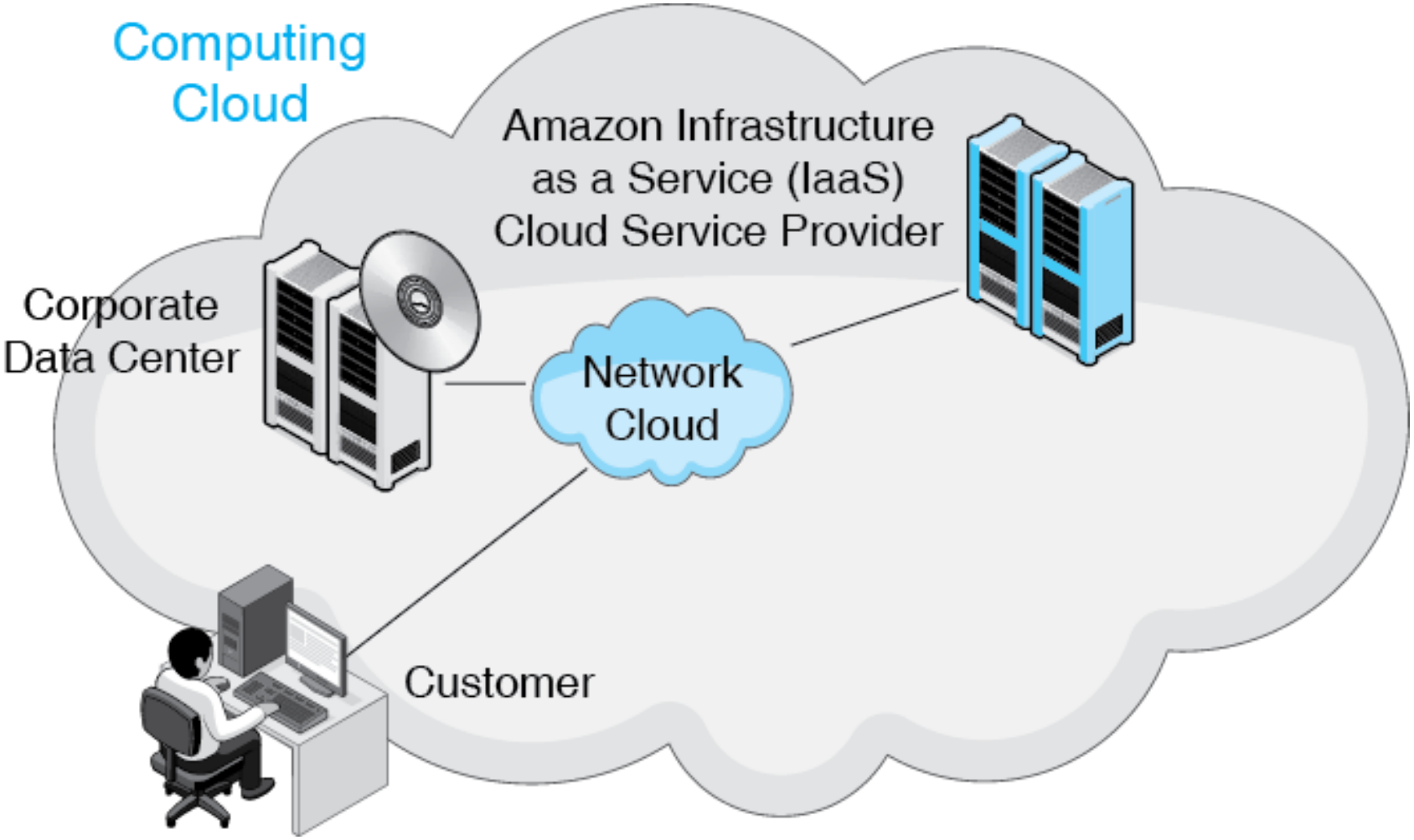

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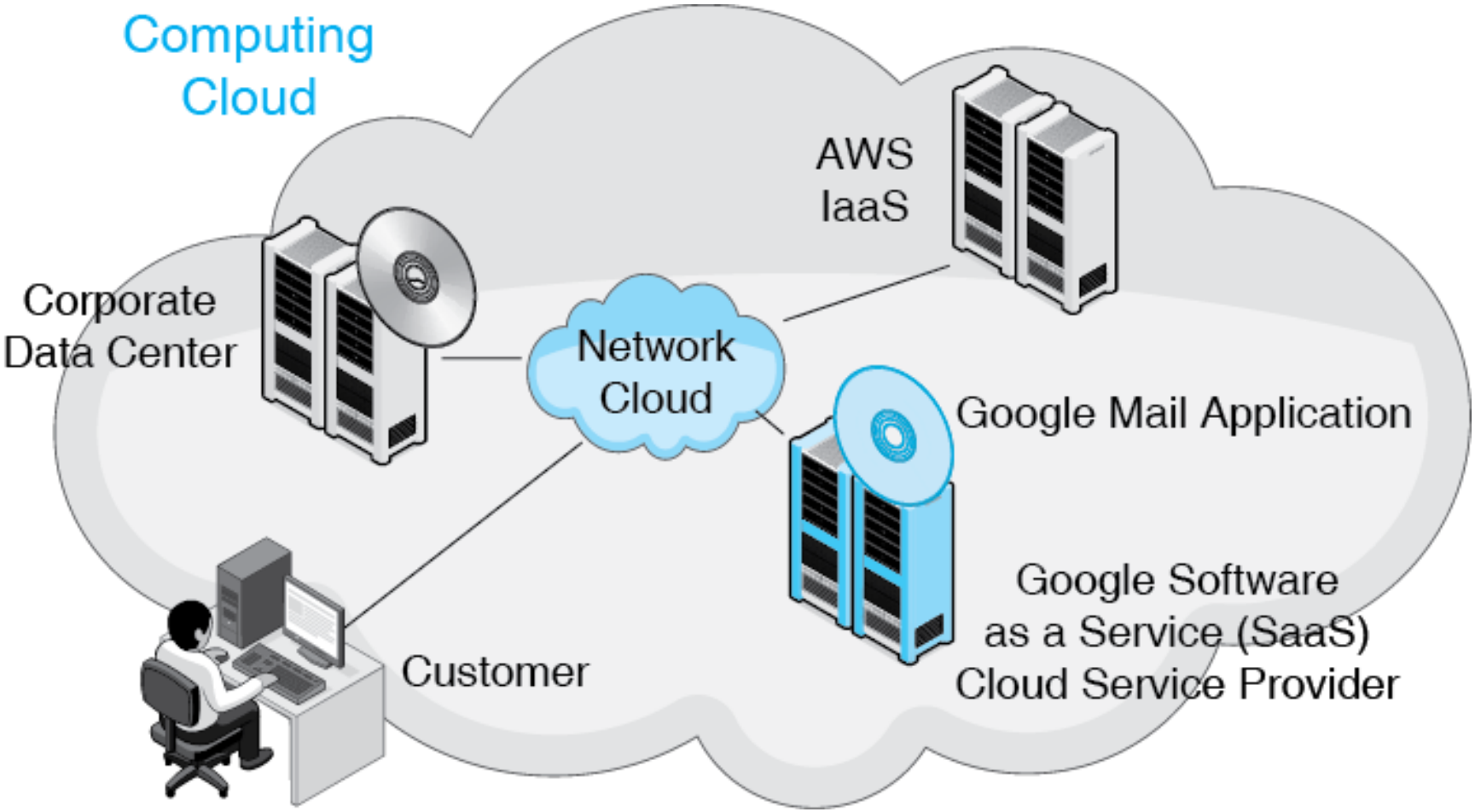

Corporate Data Centers, IaaSs, and SaaSs

	Server Owner	Application Owner
Corporate Data Center	User (Organization)	User (Organization)
IaaS	IaaS CSP	User (Organization)
SaaS	SaaS CSP	SaaS CSP

As a Service

- Traditionally,
  - The organization owned and operated its own servers and application programs
  - It purchased them
  - This was Infrastructure and software as a *product*
- Cloud Services
  - No purchase for servers, applications, or both
  - Pay by amount of use, like electrical service
  - This is Infrastructure and software as a *service*
- Service Level Agreements define terms of service, especially speed

1.9 Application Download Times

Application / Speed	100 kbps	1 Mbps	10 Mbps	100 Mbs	1 Gbps
E-mail Message (250 words)	0.02 sec	—	—	—	—
Photograph (2 MB)	3 min	16 sec	2 sec	—	—
1-Hour HDTV Program (7 Mbps)	3 days	7 hr	42 min	4 min	25 sec
Backup 500 GB hard drive	16 yrs	1.9 mo	5.8 da	14 hr	2 hr

1.10 Metric Speed Designations

Metric Prefix	Meaning	Unabbreviated	Example
kbps	1,000 bps	kilobits per second	33 kbps is 33,000 bps 43,700 bps is 43.7 kbps
Mbps	1,000 kbps	megabits per second	3.4 Mbps is 3,400,000 bps or 3,400 kbps 523,750,000 bps is 523.75 Mbps

1.10 Metric Speed Designations

Metric Prefix	Meaning	Unabbreviated	Example
Gbps	1,000 Mbps 10^9 bps	gigabits per second	62 Gbps is 62,000,000,000 bps or 62,000 Mbps or 62,000,000 kbps
Tbps	1,000 Gbps 10^{12} bps	terabits per second	1.5 Tbps is 1,500,000,000,000 bps

SI Prefixes

Name	Symbol	10^n	English	Decimal
yotta	Y	10^{24}	septillion	1000000000000000000000000
zetta	Z	10^{21}	sextillion	1000000000000000000000
exa	E	10^{18}	quintillion	1000000000000000000
peta	P	10^{15}	quadrillion	1000000000000000
tera	T	10^{12}	trillion	1000000000000
giga	G	10^{9}	billion	1000000000
mega	M	10^{6}	million	1000000
kilo	k	10^{3}	thousand	1000

A day made of glass

- https://www.youtube.com/watch?v=6Cf7IL_eZ38

- 2011 5 minutes