

Chapter 4: Management of Information and Communication Technologies

TOPICS: CLOUD COMPUTING - VIRTUALIZATION - HYPE CYCLES

👑 Docker

👑 Virtual Machines

👑 Gartner Hype Cycle

Information Management

Managing Information Management

- IT Strategy
- IT Governance
- IT Processes
- IT HR
- IT Controlling
- IT Security

Management of the Information Economy

- Demand
- Supply
- Usage

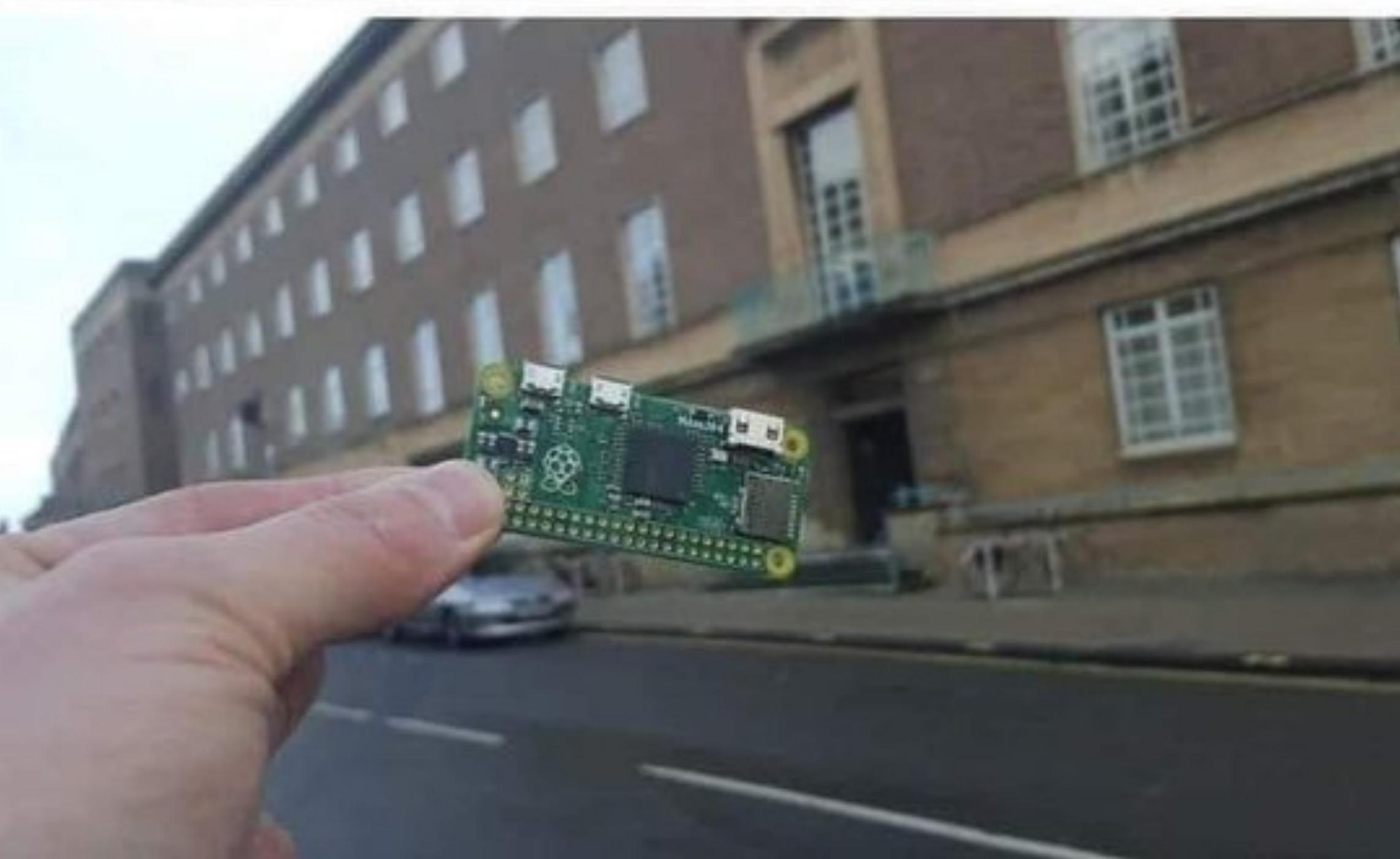
Management of Information Systems

- Application Life Cycle and Landscape
- Data
- Processes

Management of Information and Communication Technologies

- Storage
- Processing
- Communicating
- Tech Stacks





+ 58 years

spinellis.gr

Measure	Elliott 405	Raspberry Pi Zero
Year	1957	2015
Price	£85,000 (1957)	\$5
Instruction cycle time	10.71-0.918 ms (93-1089 Hz)	1 ns (1 GHz clock)
Main memory	16 kB drum store	512 MB LPDDR2 SDRAM
Fast memory	1280 bytes (nickel delay lines)	32 kB (16 kB I + 16kB D L1 cache)
Secondary memory	1.2 MB (300,000 word magnetic film)	8 GB (typical micro SD flash card - not included)
Output bandwidth	25 characters/s	373 MB/s (1080p60 HDMI)
Weight	3-6 tons	9 g
Size	21 cabinets, each 2m x 77cm x 77cm	65mm x 30mm x 5.4mm

Read and post comments.

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← → + ⌂ ...

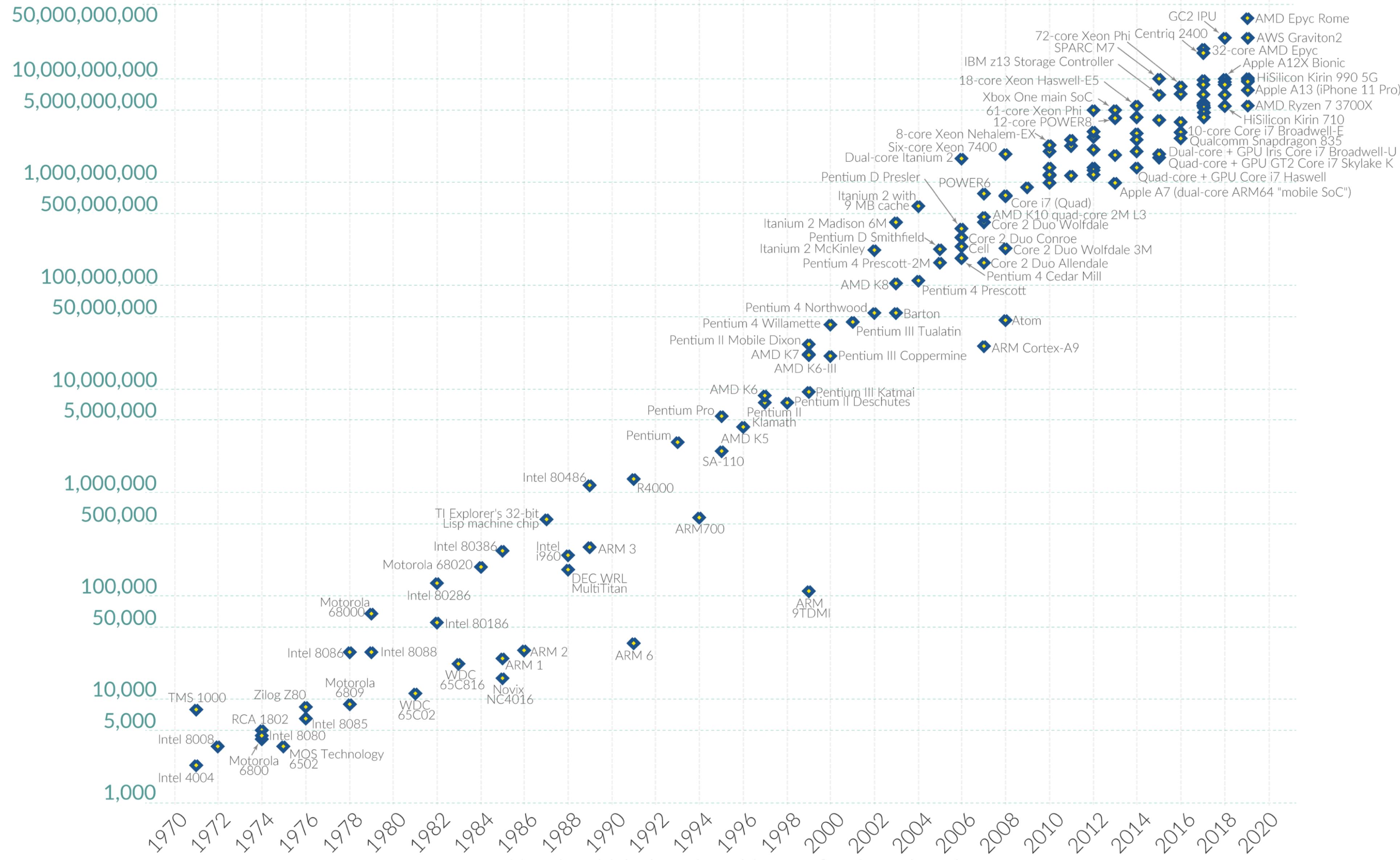


What's Moore's Law?

Moore's Law: The number of transistors on microchips doubles every two years

Moore's law describes the empirical regularity that the number of transistors on integrated circuits doubles approximately every two years. This advancement is important for other aspects of technological progress in computing – such as processing speed or the price of computers.

Transistor count



But: Proportion of hardware costs over
total IT costs stays constant.

20%



**Why does it stay constant?
Why does it matter for the CIO?**

Definitions

Let's get some terms straight.

- Duncan defined IT infrastructure as *a set of shared, tangible IT resources that provide a foundation to enable present and future business applications*
- She argues that these “tangible resources” can be structured in 4 groups (see right).
- Other definitions of IT infrastructure include also people, organizational themes, etc.

Hardware	Computer, server, printing, peripherals
Network and telecommunications	Cable, phones, video equipment
Data	Databases, data warehouses
Core data-processing applications	Core systems, e.g. ERP, CRM

Source: Duncan (1995)

Management of Information and Communication Technologies?

Here, the CIO has the following jobs:

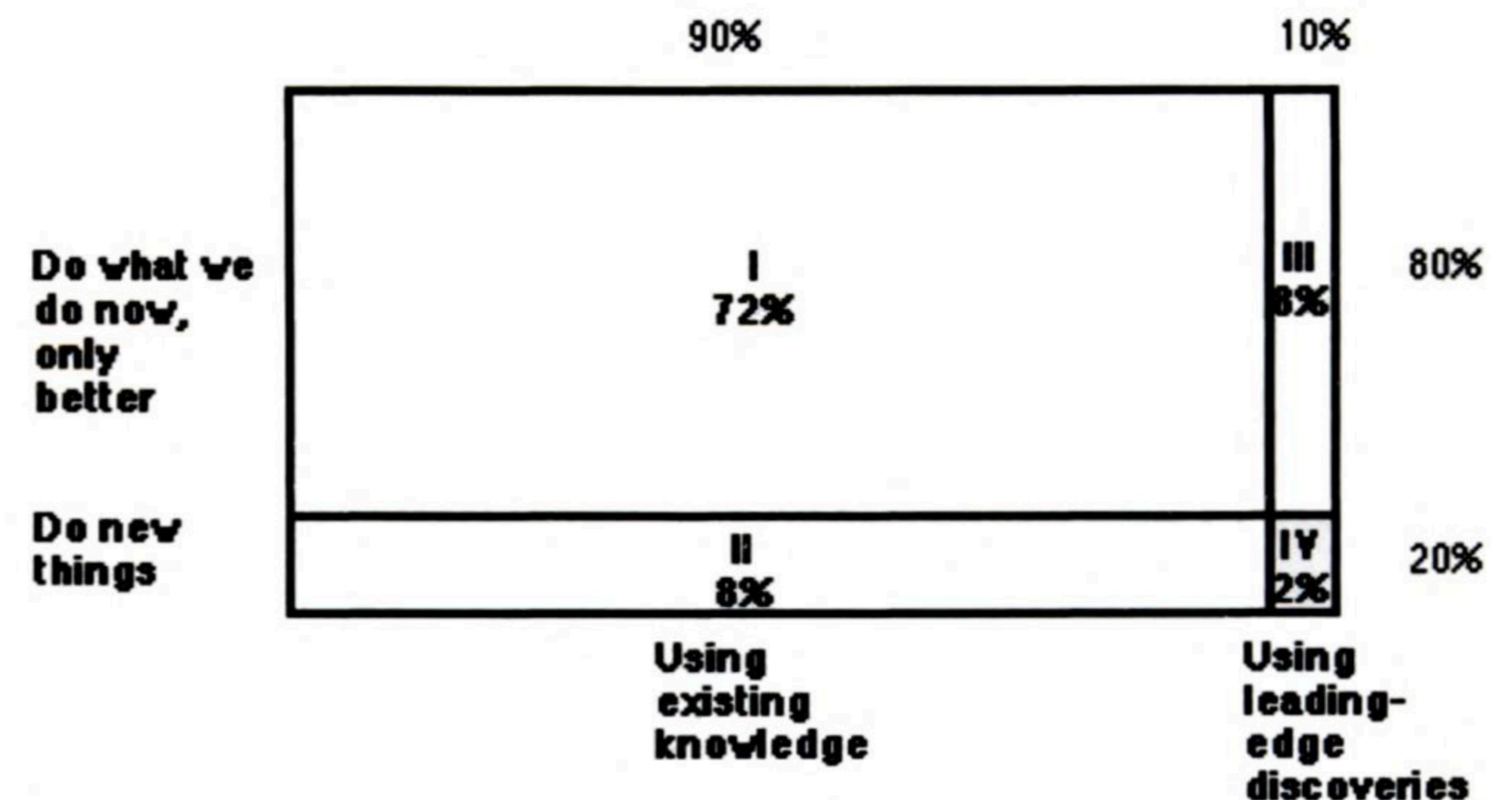
1. Observing and evaluating technological developments,
2. Strategic planning of technological decisions,
3. Development and protection of competitively relevant technologies, and
4. Internal and external exploitation of technological capabilities, e.g. licensing.

The central question is: *Do you want to play the leader- or the follower strategy?*

***Management* of Information and Communication Technologies?**

But mainly:

1. Keep the services running.
2. Watch what's going on.



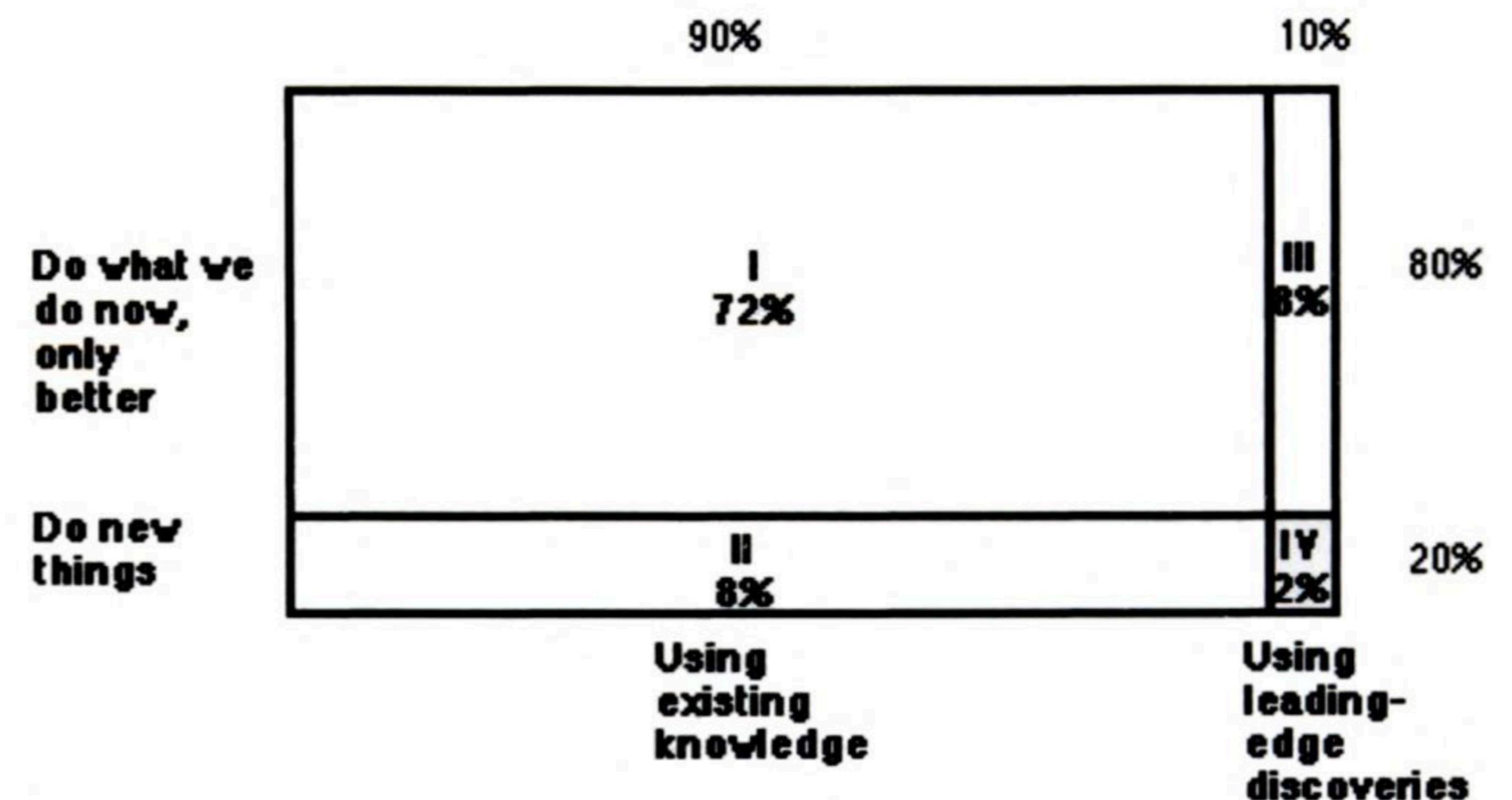
■ Phillips, F. Y. (2001). Market-Oriented Technology Management – Innovating for Profit in Entrepreneurial Times. Heidelberg: Springer-Verlag.

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Management of Information and Communication Technologies?

But mainly:

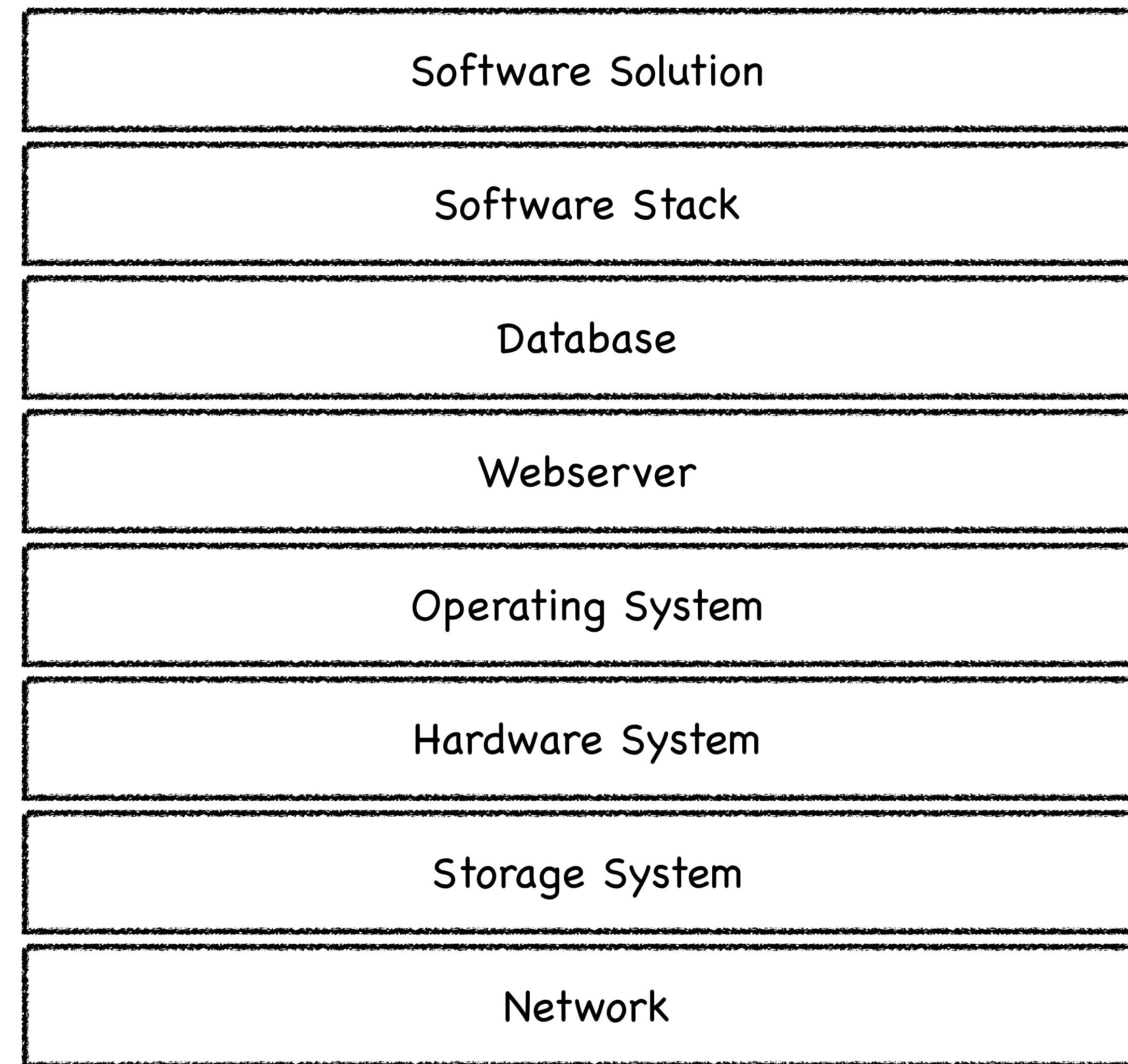
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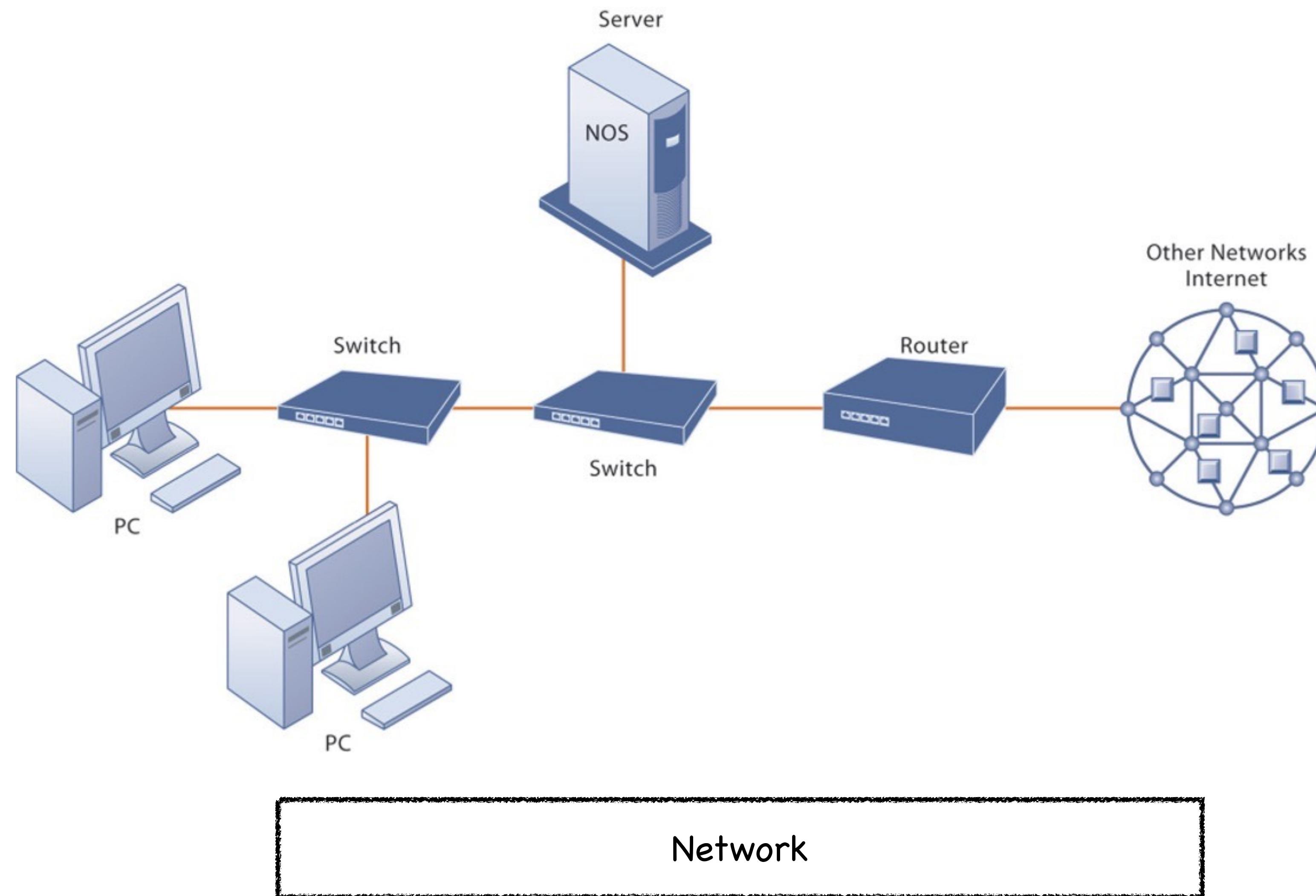
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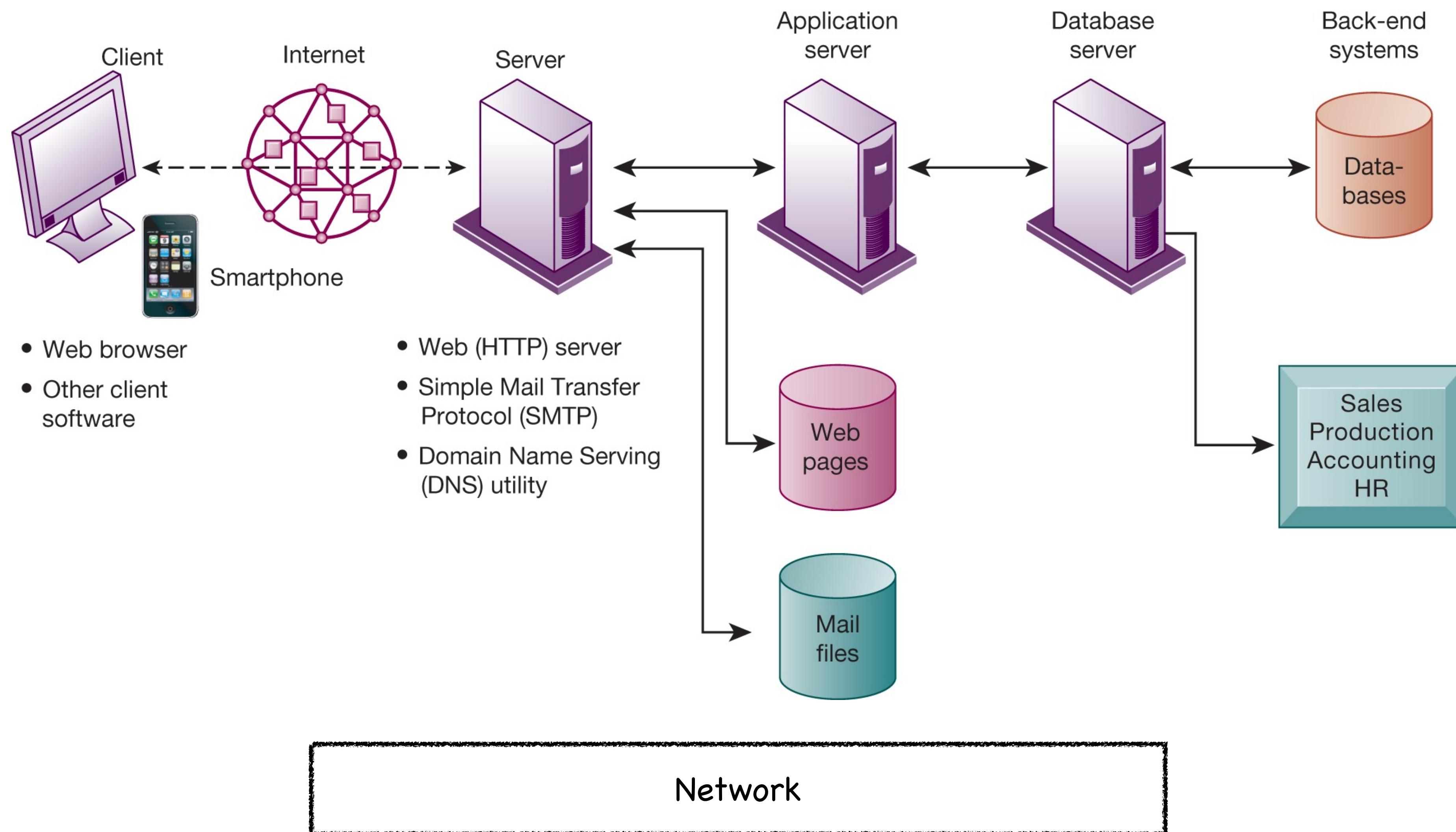
Computing Stack: What keeps your systems running?



Computing Stack: What keeps your systems running?

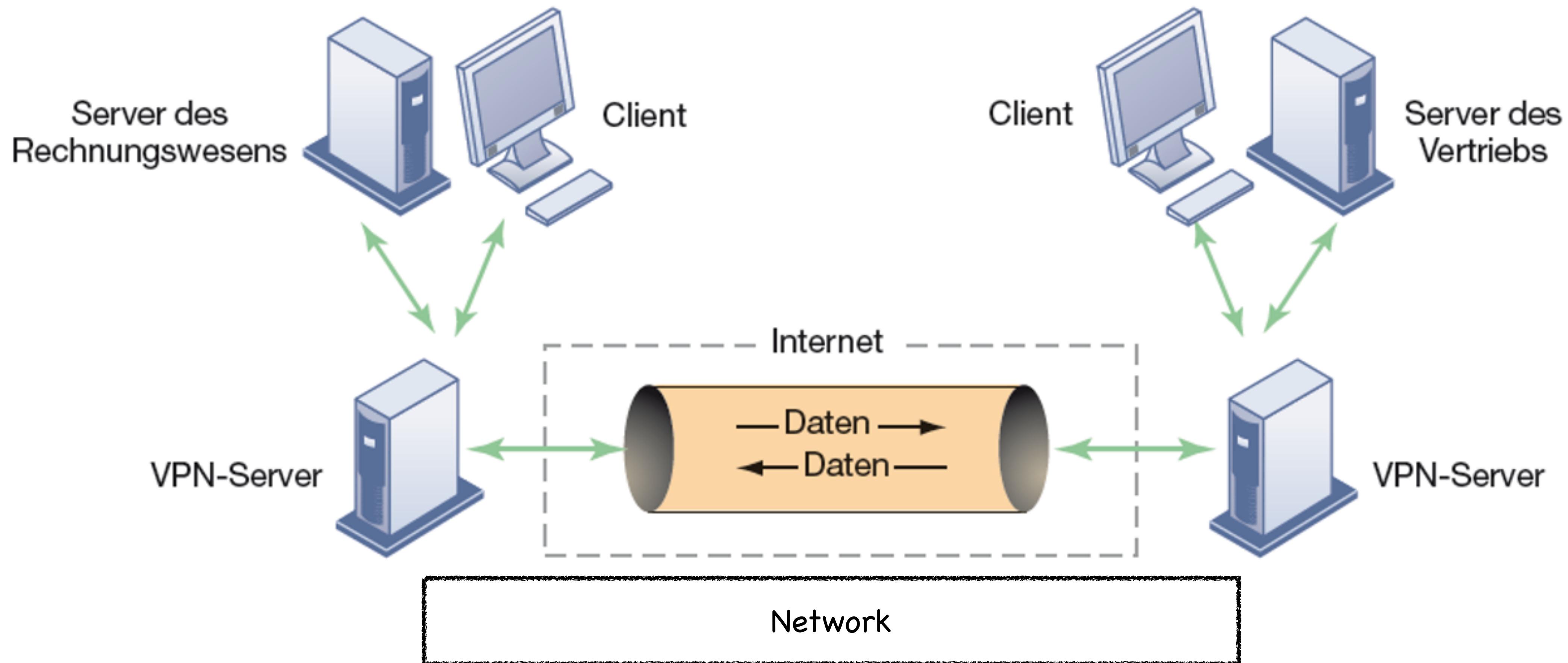


Computing Stack: Webservers + Application Servers

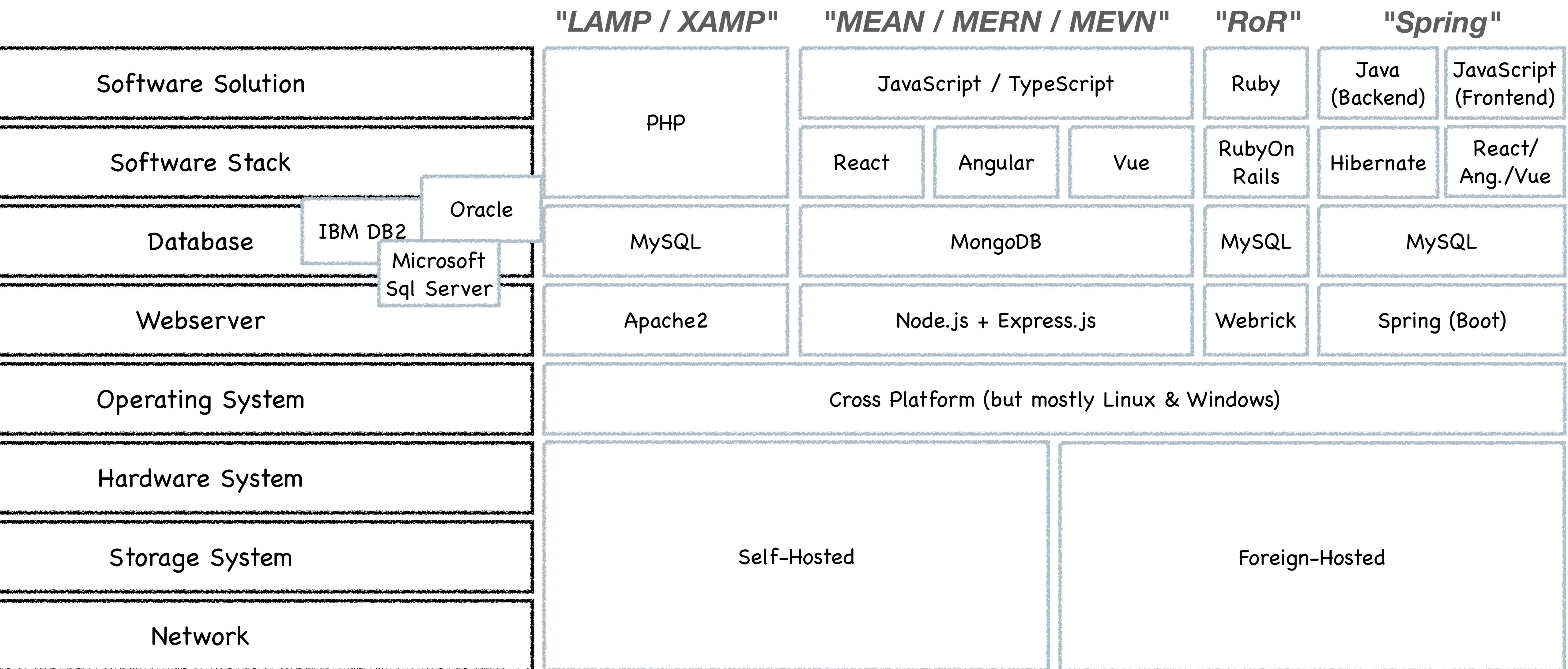


Definitions: VPN

Let's get some terms straight.

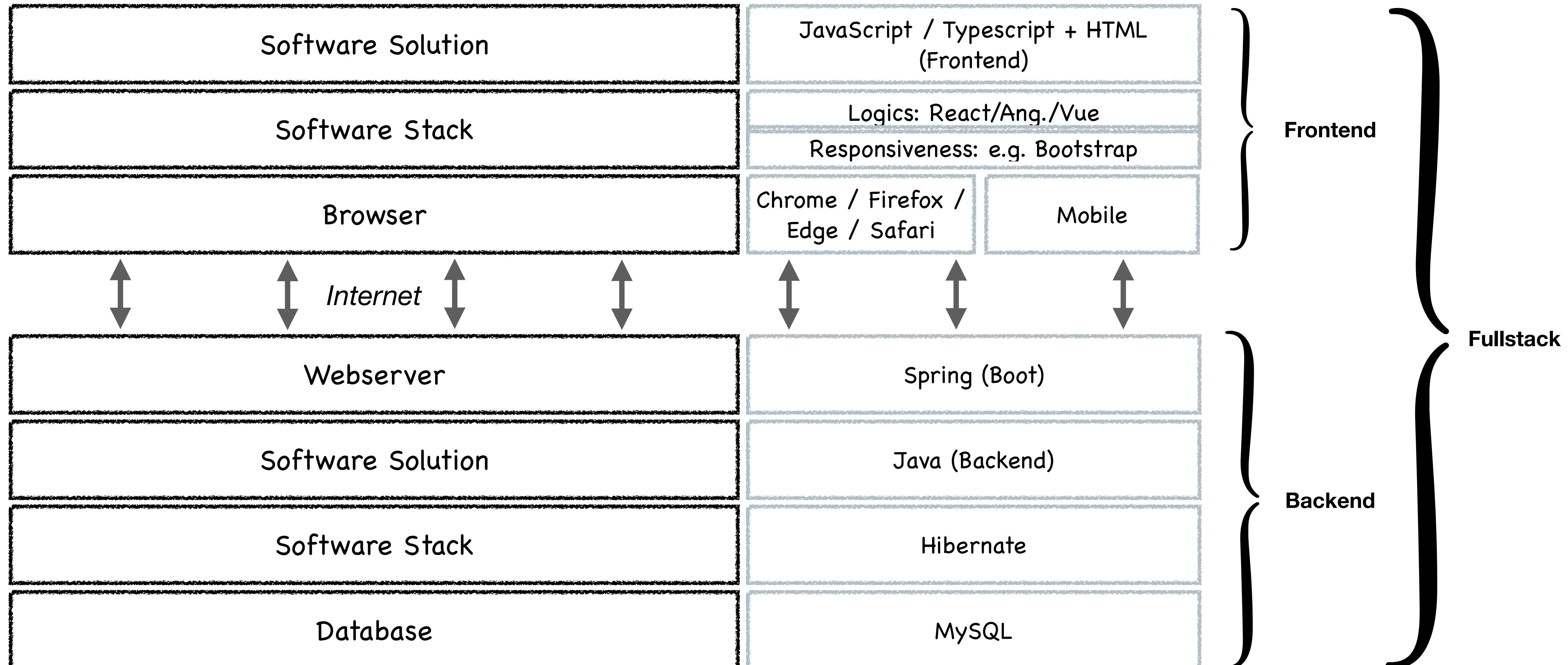


Computing Stack: What keeps your systems running?

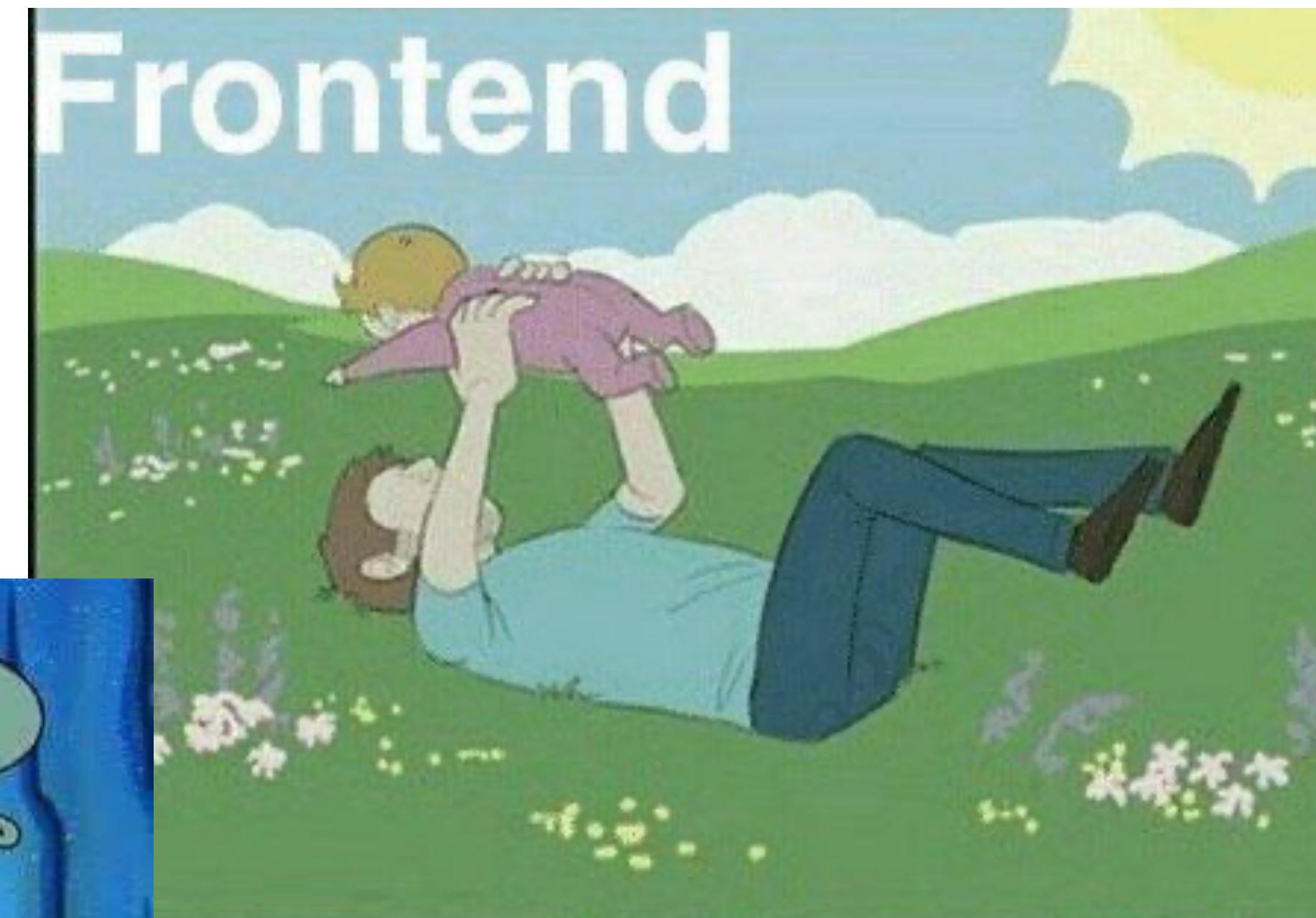
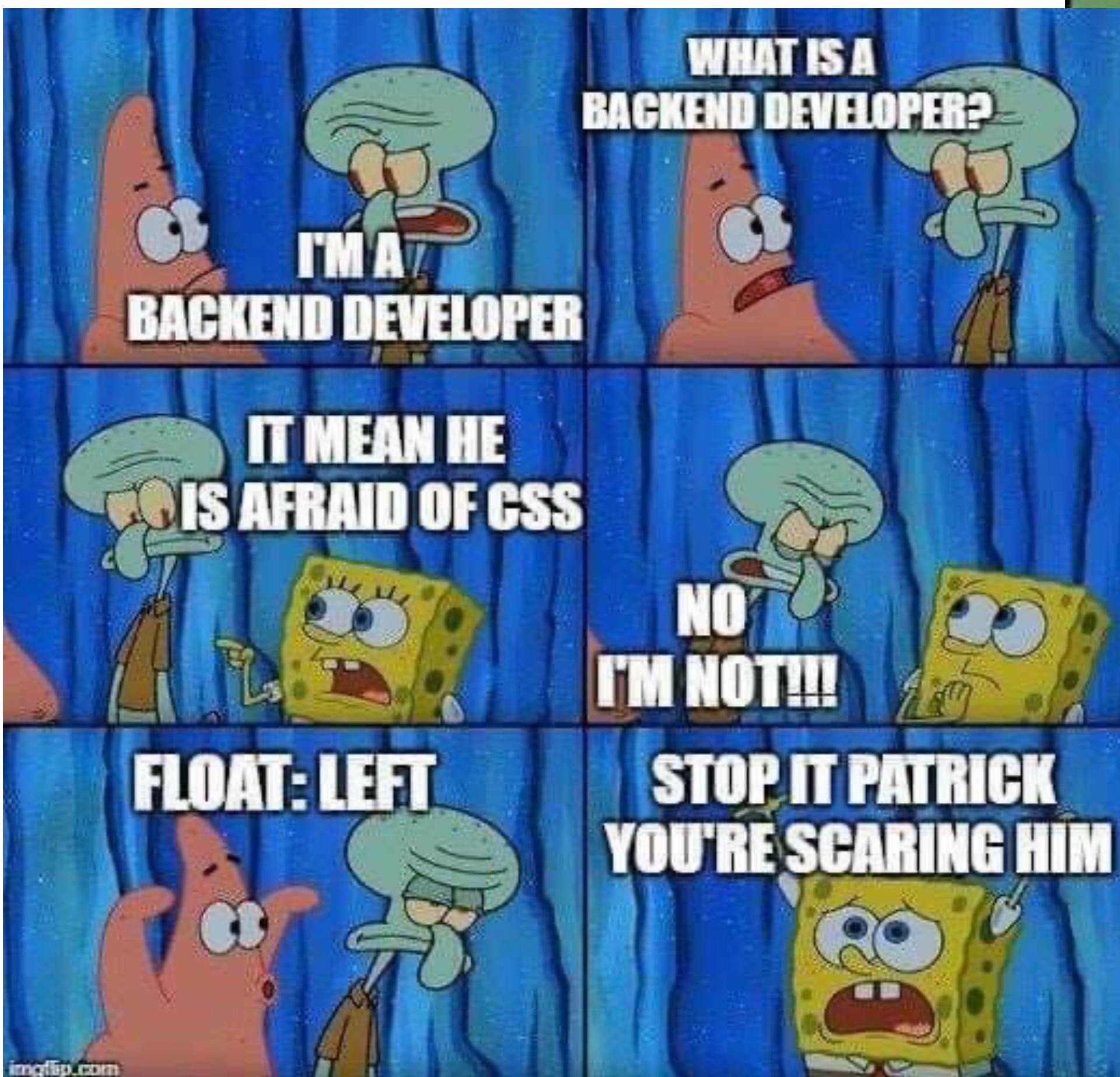


Computing Stack: Common Terms

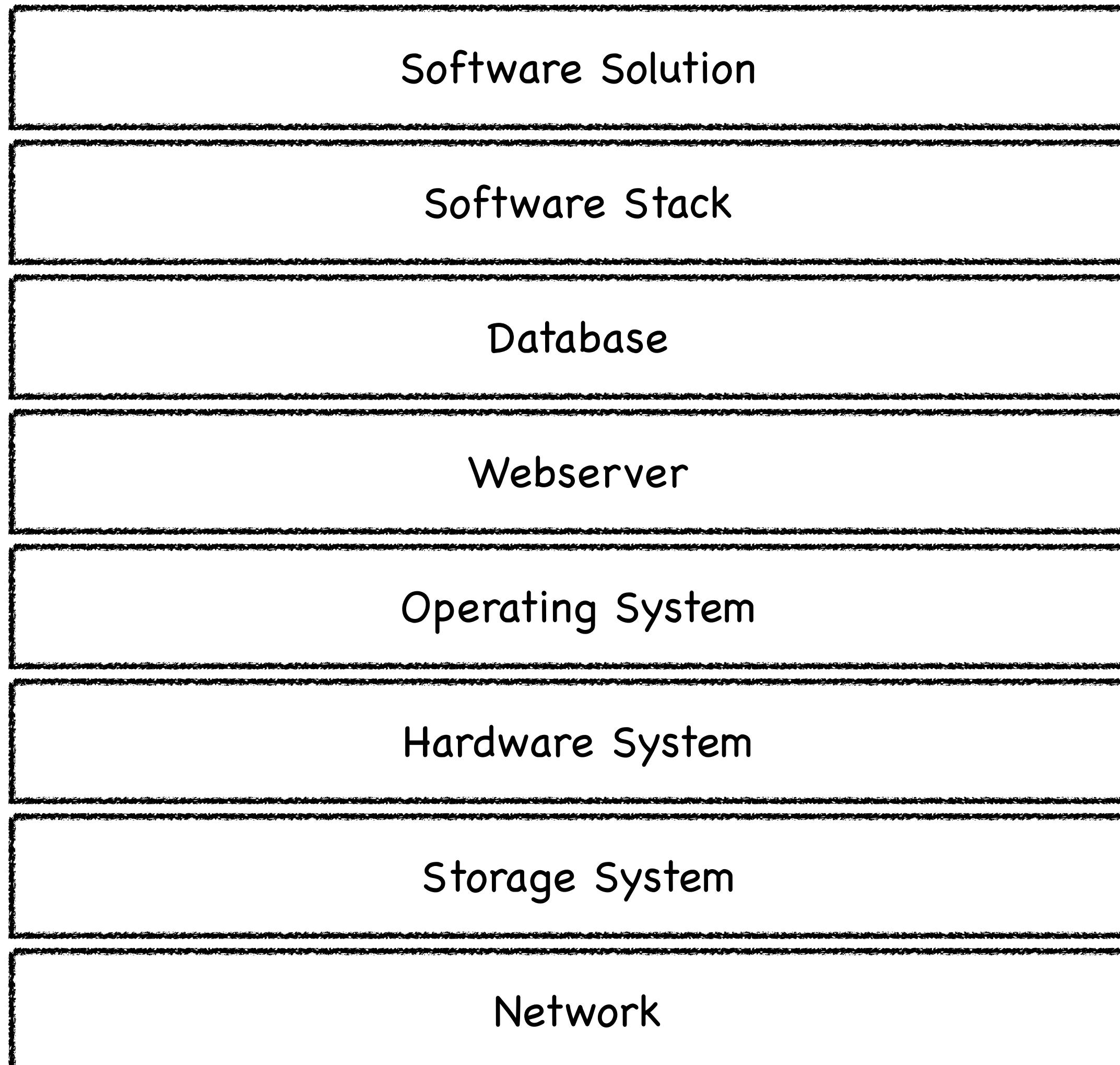
For example with Spring



Frontend and backend developers



Computing Stack: Where we're coming from



Challenges:

- Takes forever to set up
- Time & effort for maintenance of each level
- "We're not security experts."
- Scaling & switching environments

Computing Stack: Today

Core Idea:

Abstraction (again!) + Virtualization + Outsourcing

Cloud Computing

Definition

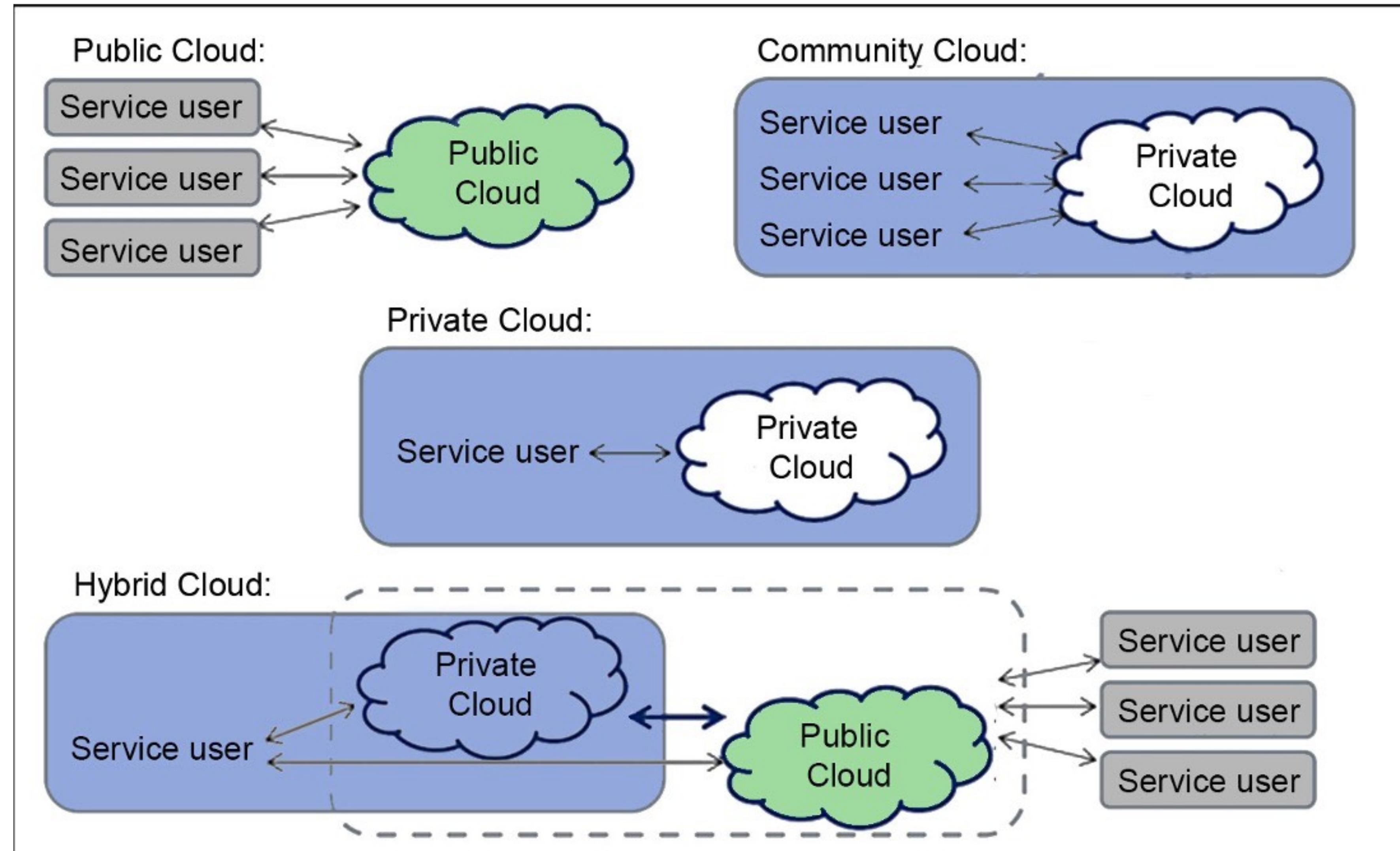
1. On-demand self-service
2. Ubiquitous network access
3. Location independent resource pooling
4. Rapid elasticity
5. Measured Service

Mell, Peter, and Tim Grance. "Effectively and securely using the cloud computing paradigm." NIST, Information Technology Laboratory 2.8 (2009): 304-311



Cloud Computing

Access



Cloud Computing

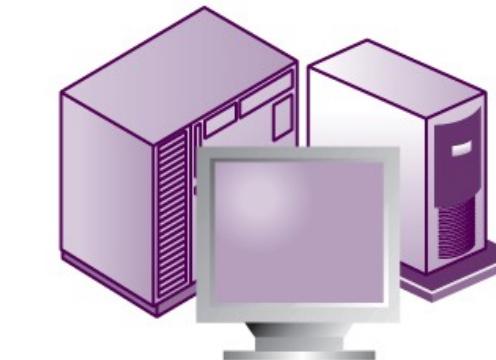
Types & Examples

Software as a Service (SaaS): Renting a fully serviced software.

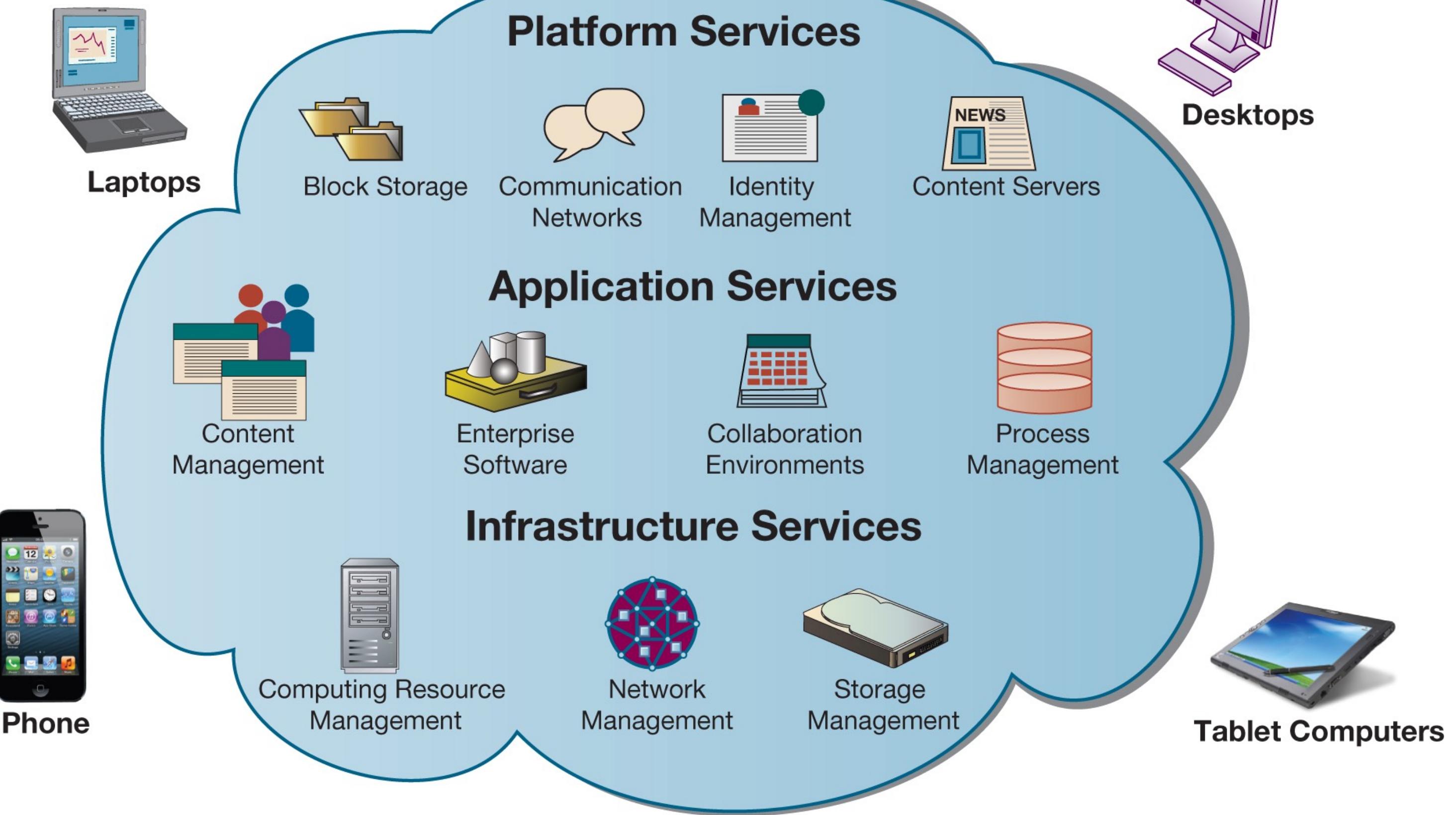
Platform as a Service (PaaS): Renting e.g. a fully-serviced computer system where to run your service or your container.

Infrastructure as a Service (IaaS): Renting fully serviced hardware, e.g. a VM.

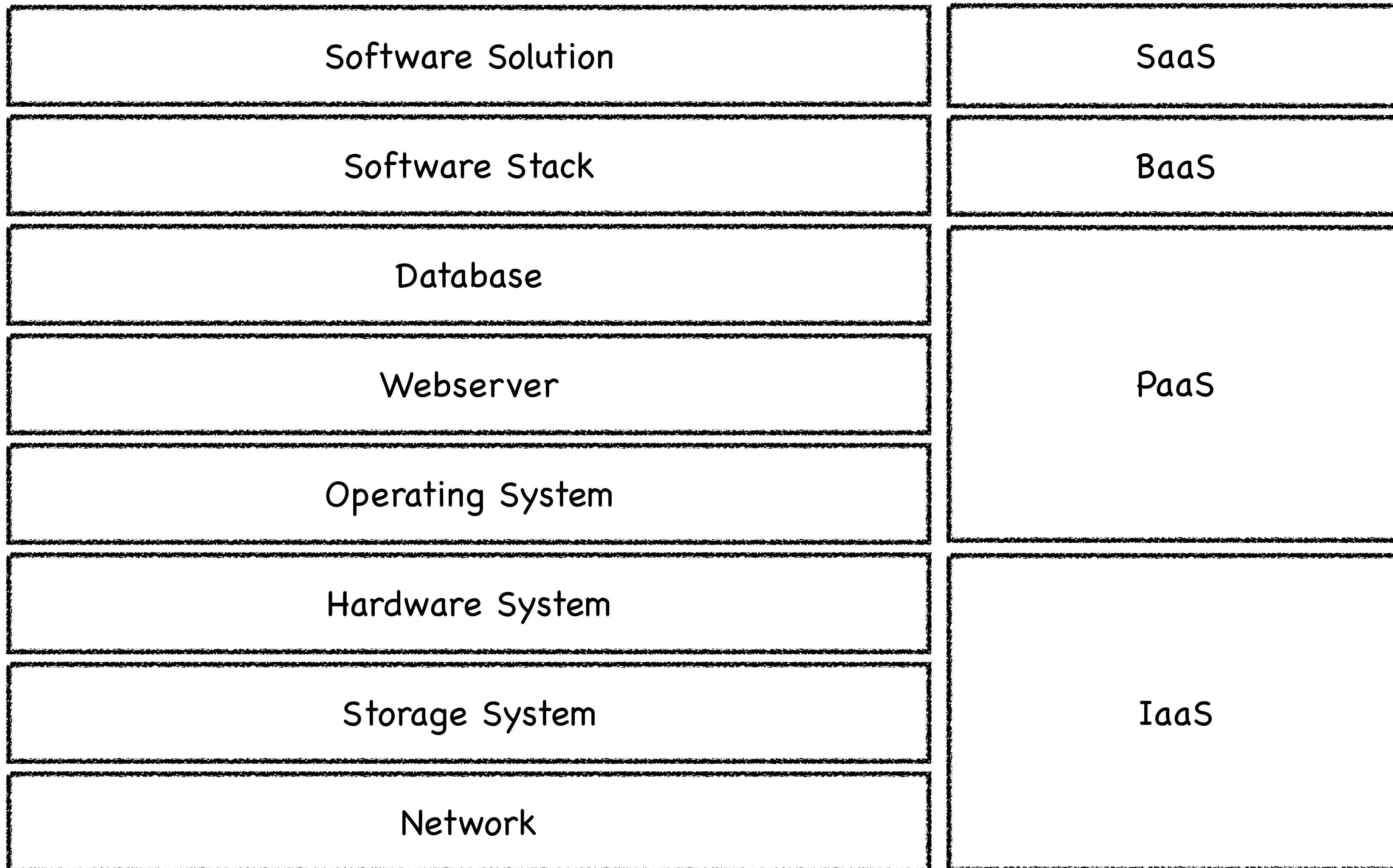
Cloud Computing



Servers



Computing Stack: Clouds Everywhere!





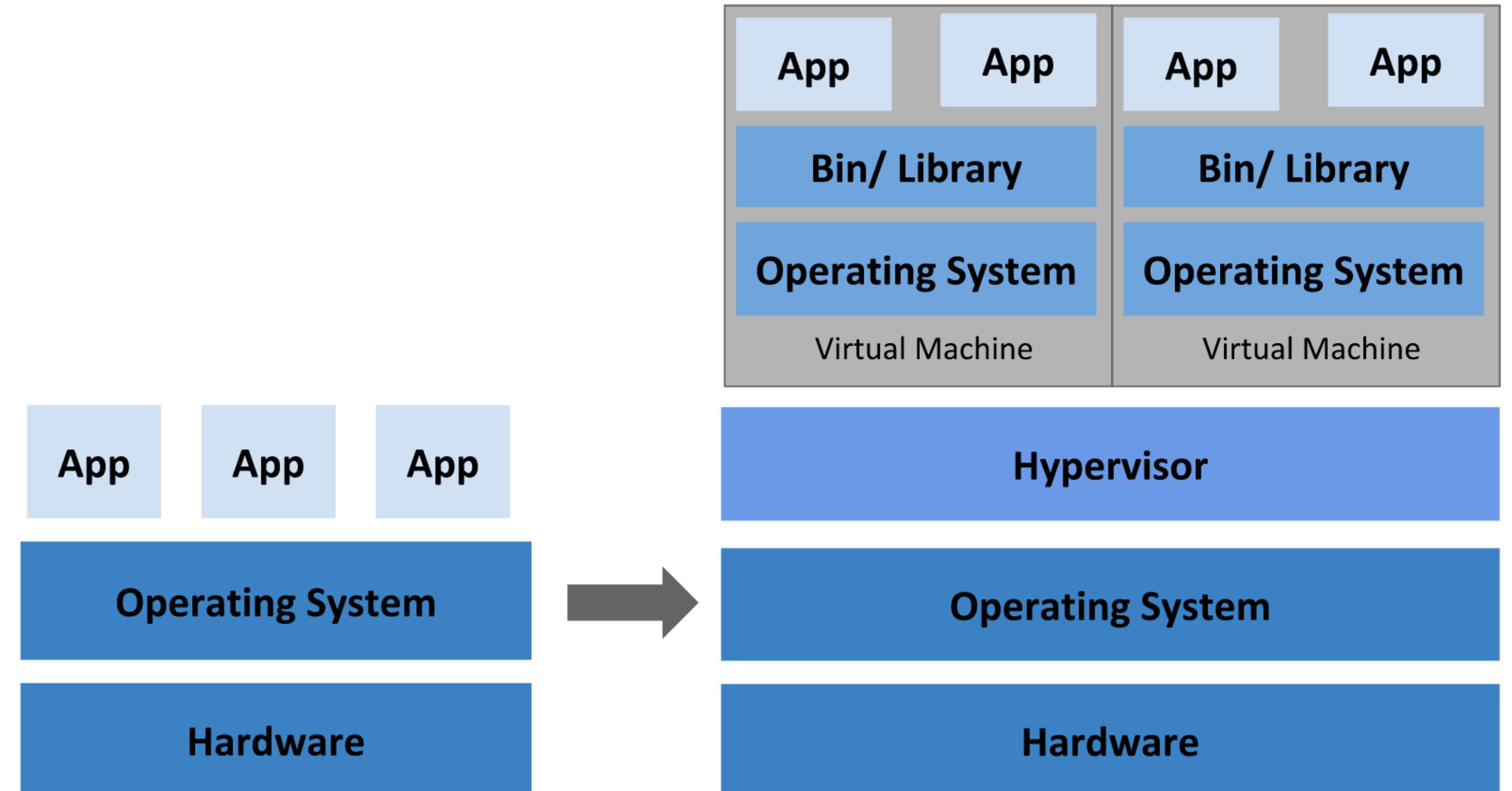
Which other Cloud Services do you know?

[https://miro.com/app/board/uXjVP1LvW8Q=/?](https://miro.com/app/board/uXjVP1LvW8Q=/?share_link_id=925530864347)
share link id=925530864347

Computing Stack

Virtualization

- Instead of **one real machine** for one hardware, **multiple virtual machines** (VM) for one hardware.
- The *virtual hardware* for each VM can change, we can move resources between VMs depending on demand of each VM.
- VMs are isolated (no file access from VM A to VM B), just as regular systems.
- VMs can be exchanged between multiple hypervisors.



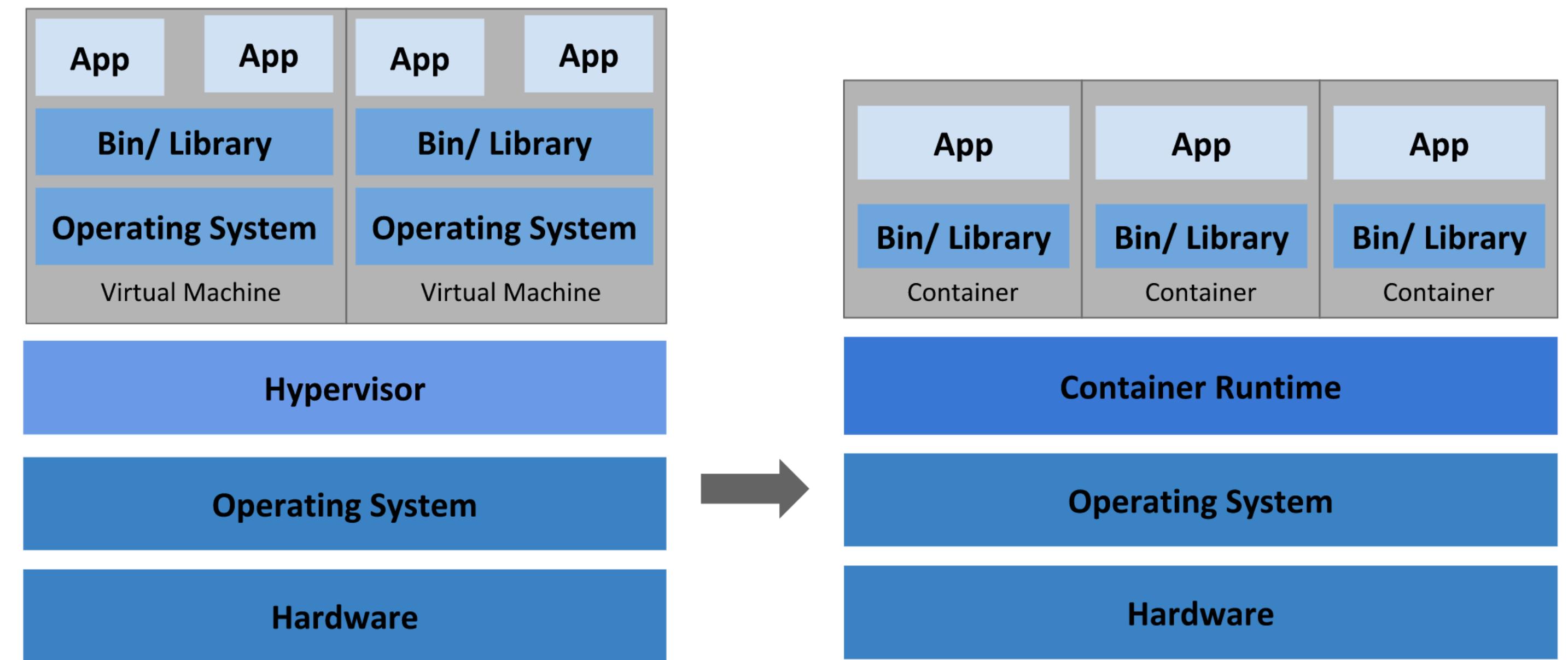
Traditional Deployment

Virtualized Deployment

Computing Stack

Containerization

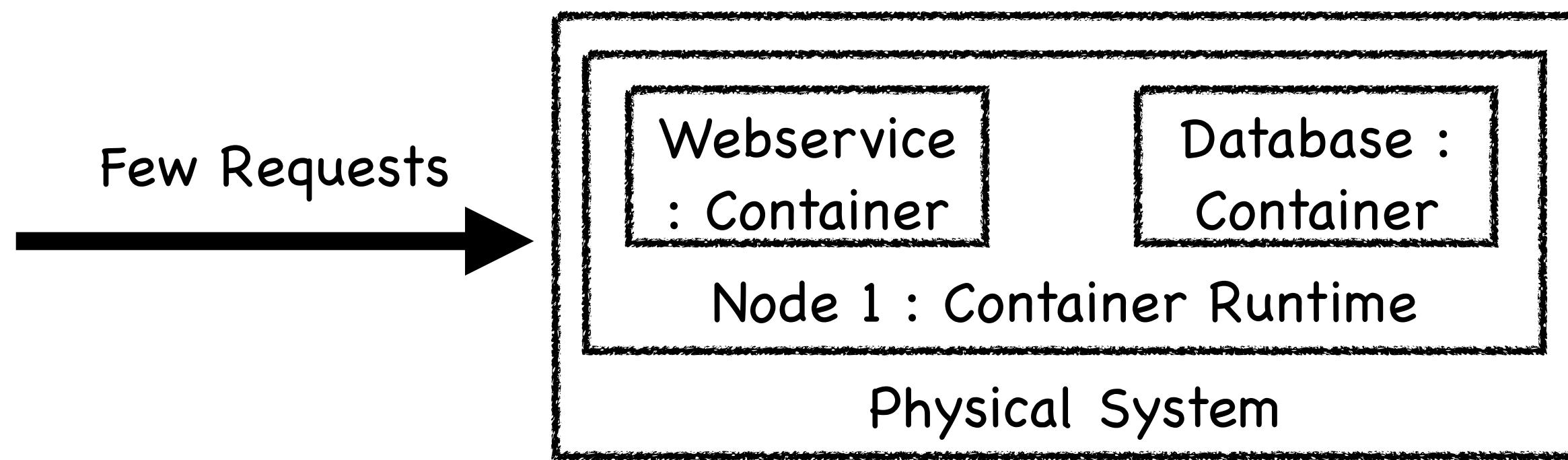
- Containers are similar to VMs as there are **multiple containers** per **system**, all running on one container runtime.
- Instead of isolated VMs, containers are lightweight and are designed to be easily coupled.
- Containers focus on smaller services, e.g. database-service, website service, ..., that might need to interact with each other.



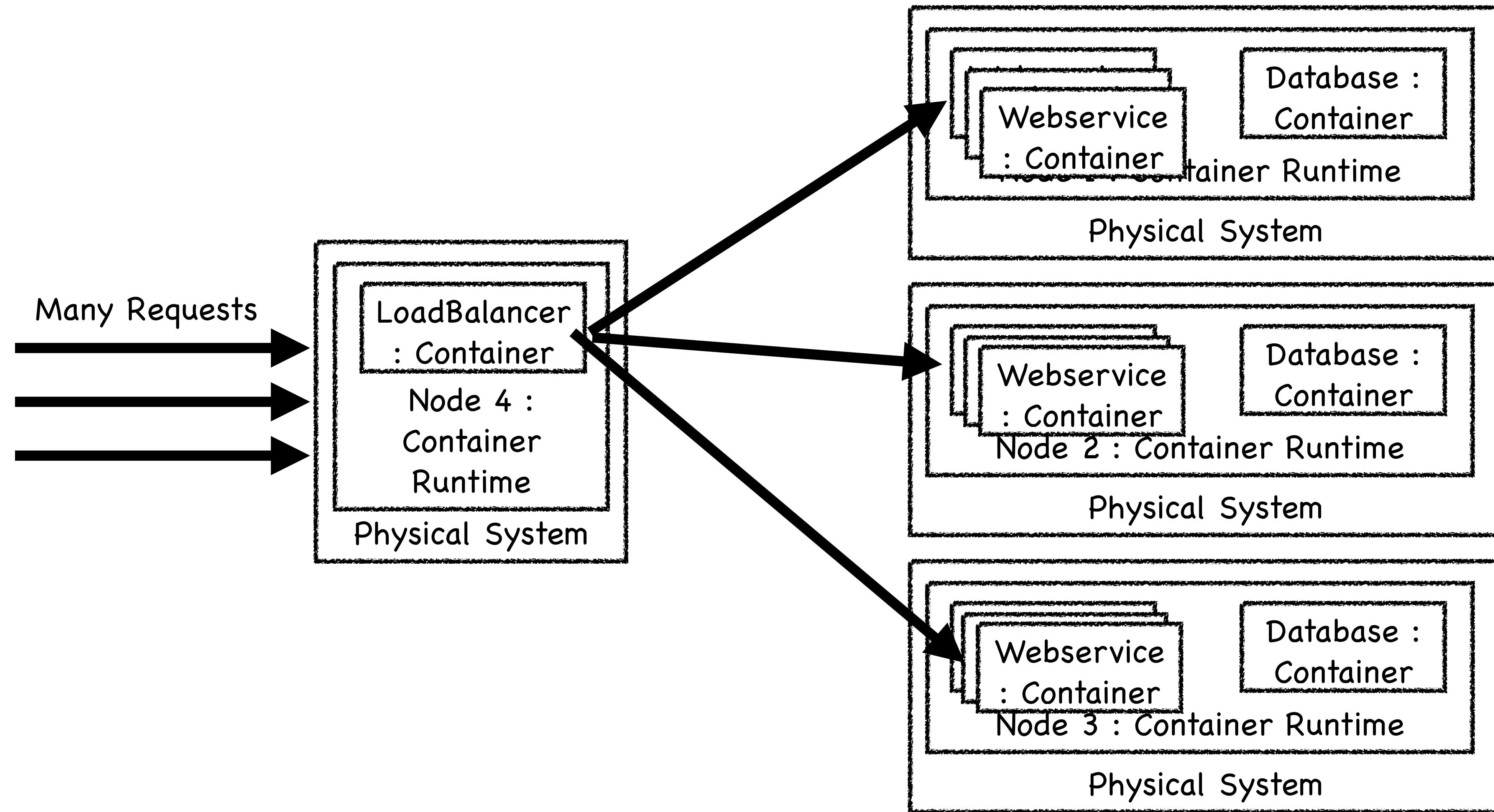
Virtualized Deployment

Container Deployment

Example: Scaling with Docker Swarms

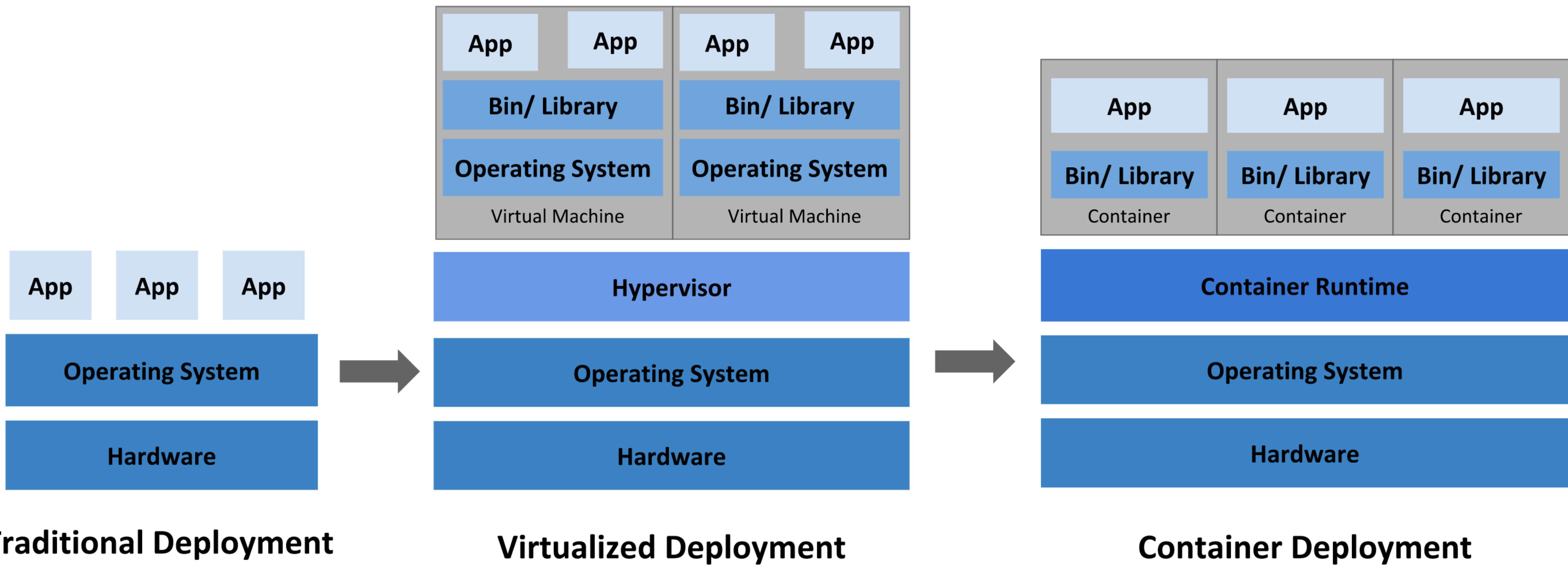


Example: Flexible Scaling



Cloud Computing

Traditional vs. virtual vs. container deployments



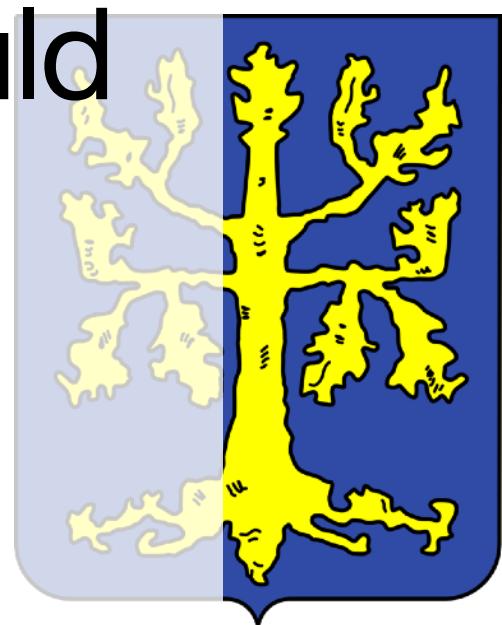
**"A distributed system is one in which the failure
of a computer you didn't even know existed
can render your own computer unusable."**

Leslie Lamport, 1987

Consider the current level of IT expertise and the IT headcount at your case:

1. Create one slides defining a cloud strategy for your case **company** considering **Cloud Services**: Which strategy would you recommend?

Choose your fighter:

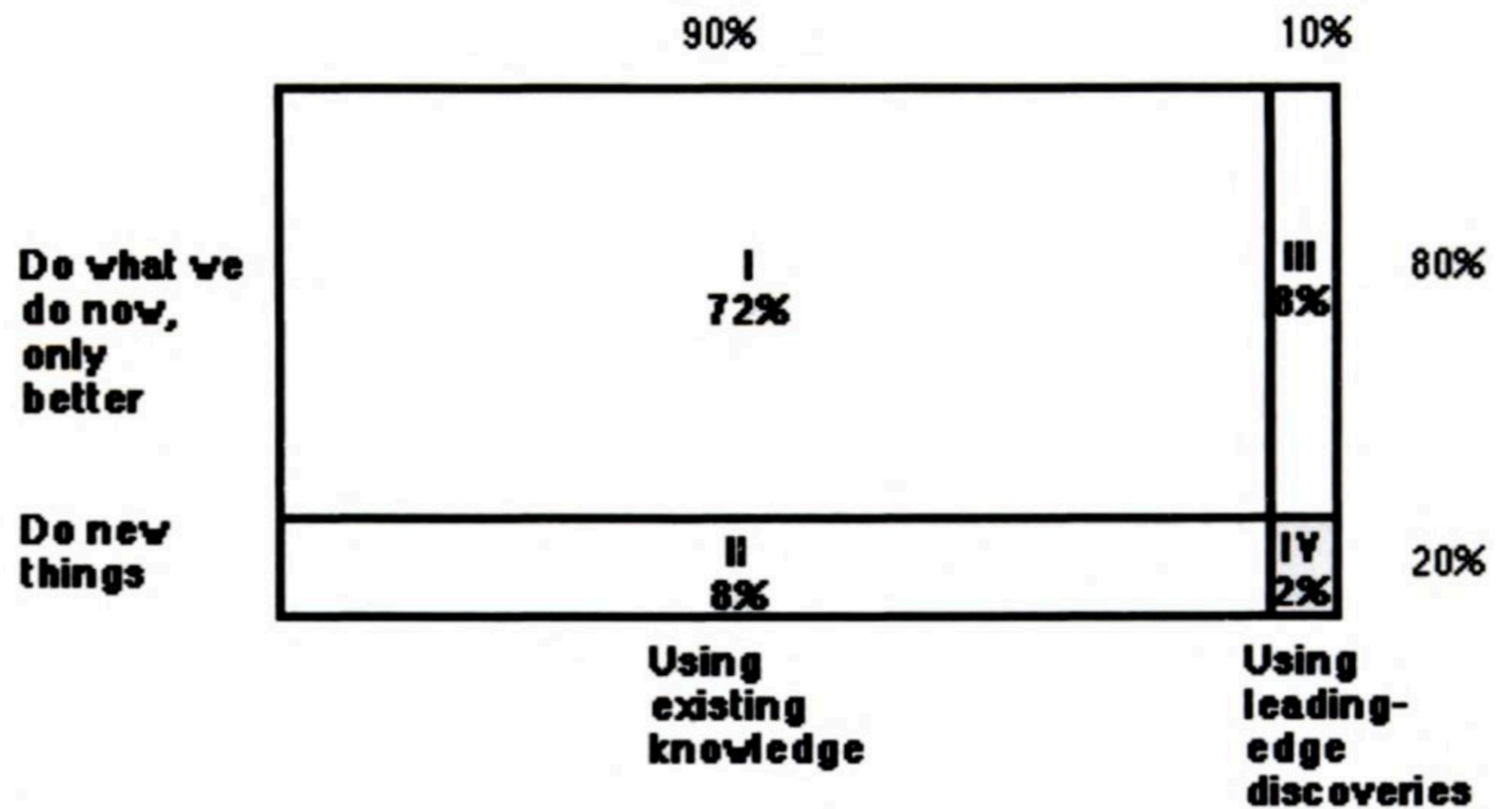


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Management of Information and Communication Technologies?

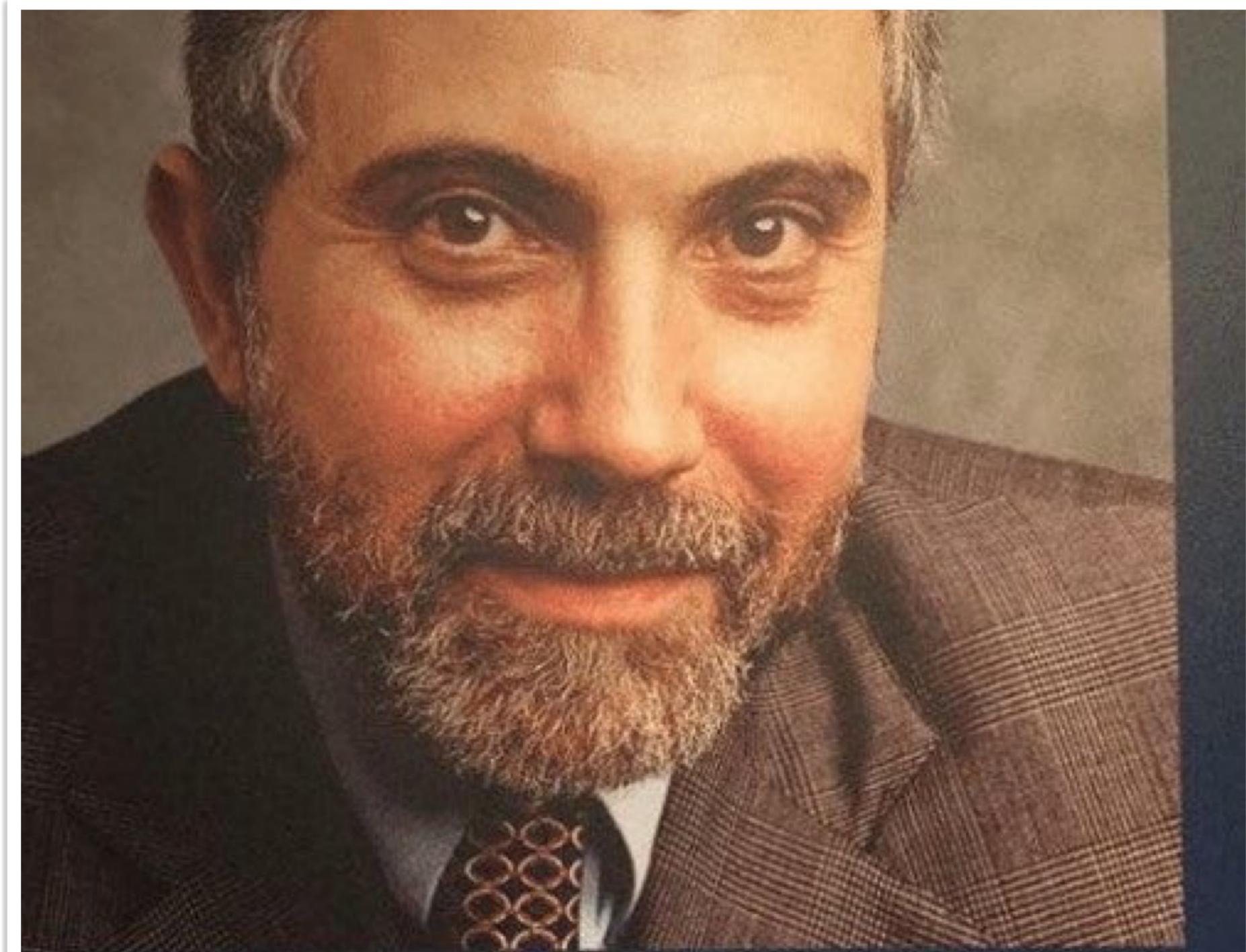
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"By 2005 or so, it will become clear that the Internet's impact on the economy has been no greater than the fax machine's."

Nobel Prize-winning economist
Paul Krugman

1998

Observation:

IT is strongly driven by innovation.

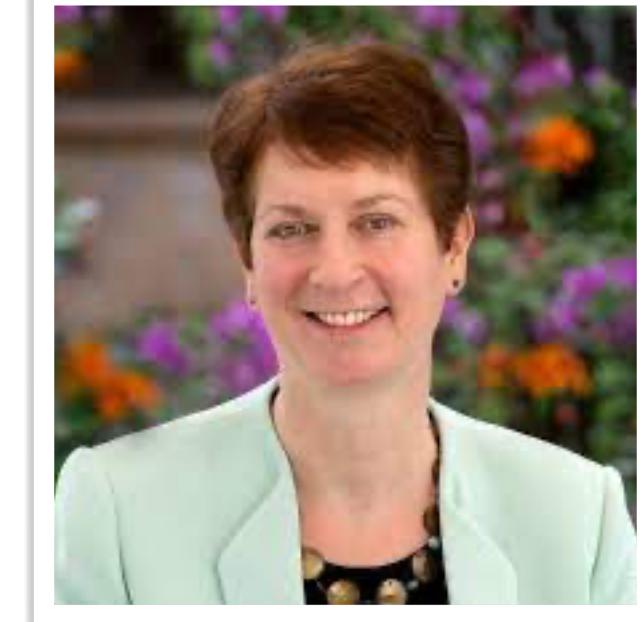
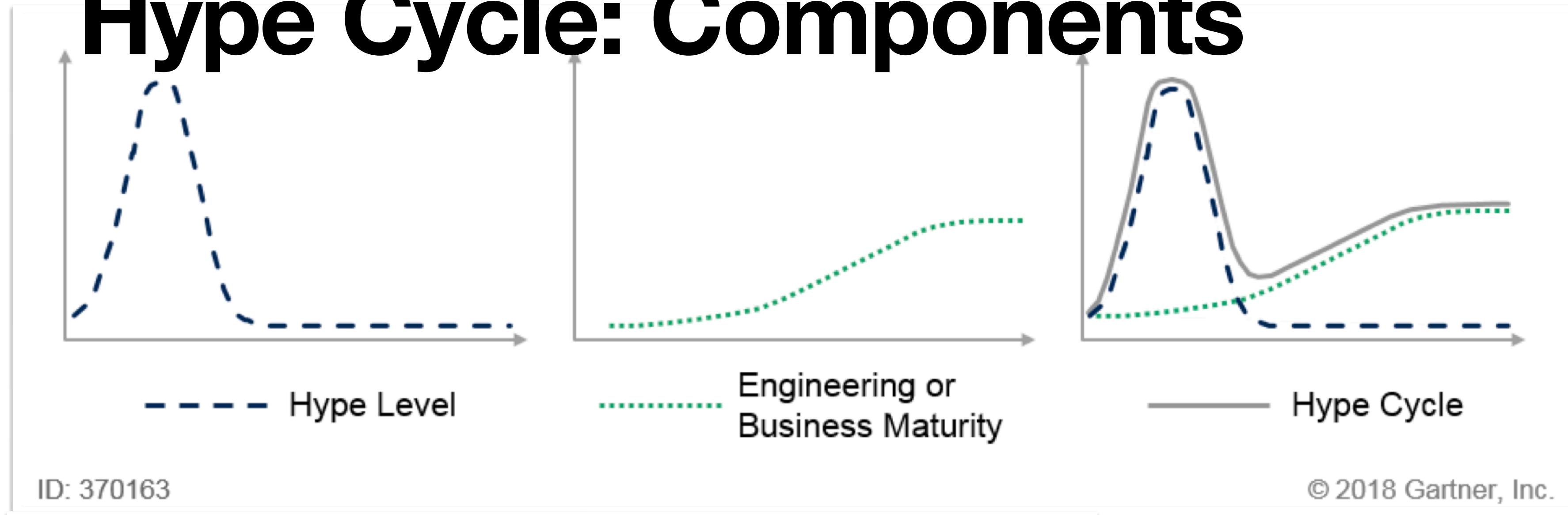
Challenge:

As a CIO, when to jump on which technical innovation?

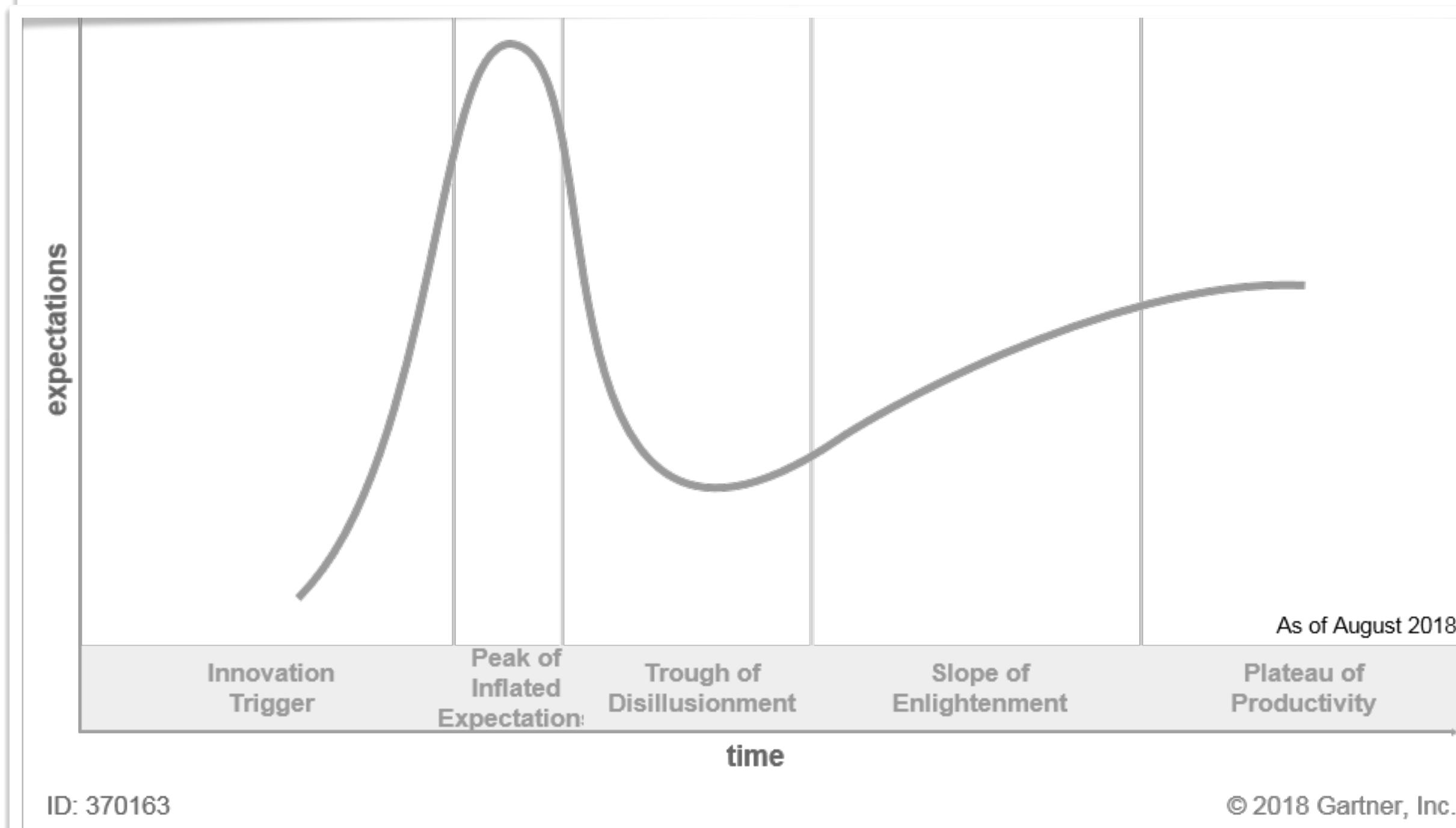
Tool:

The Hype Cycle

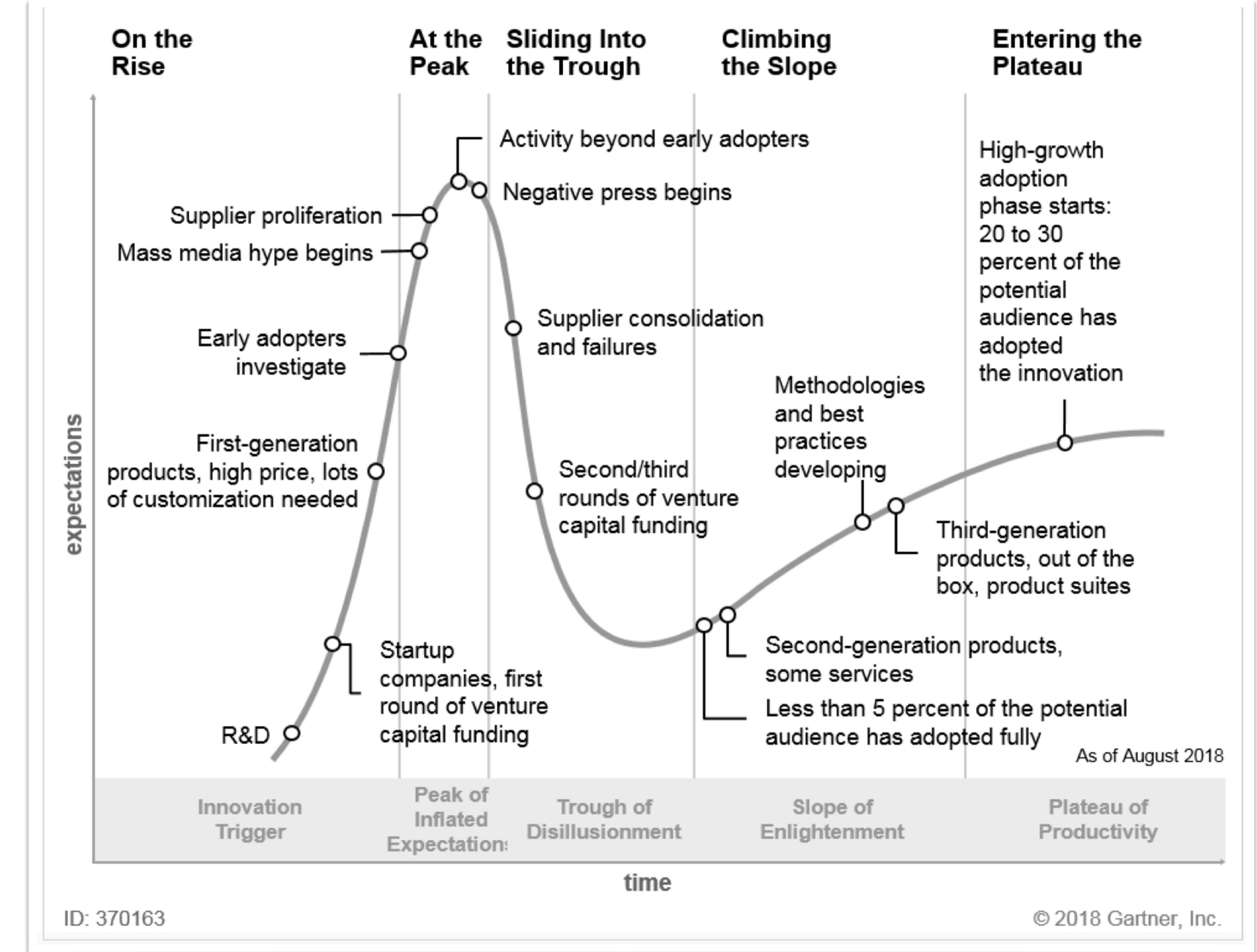
Hype Cycle: Components



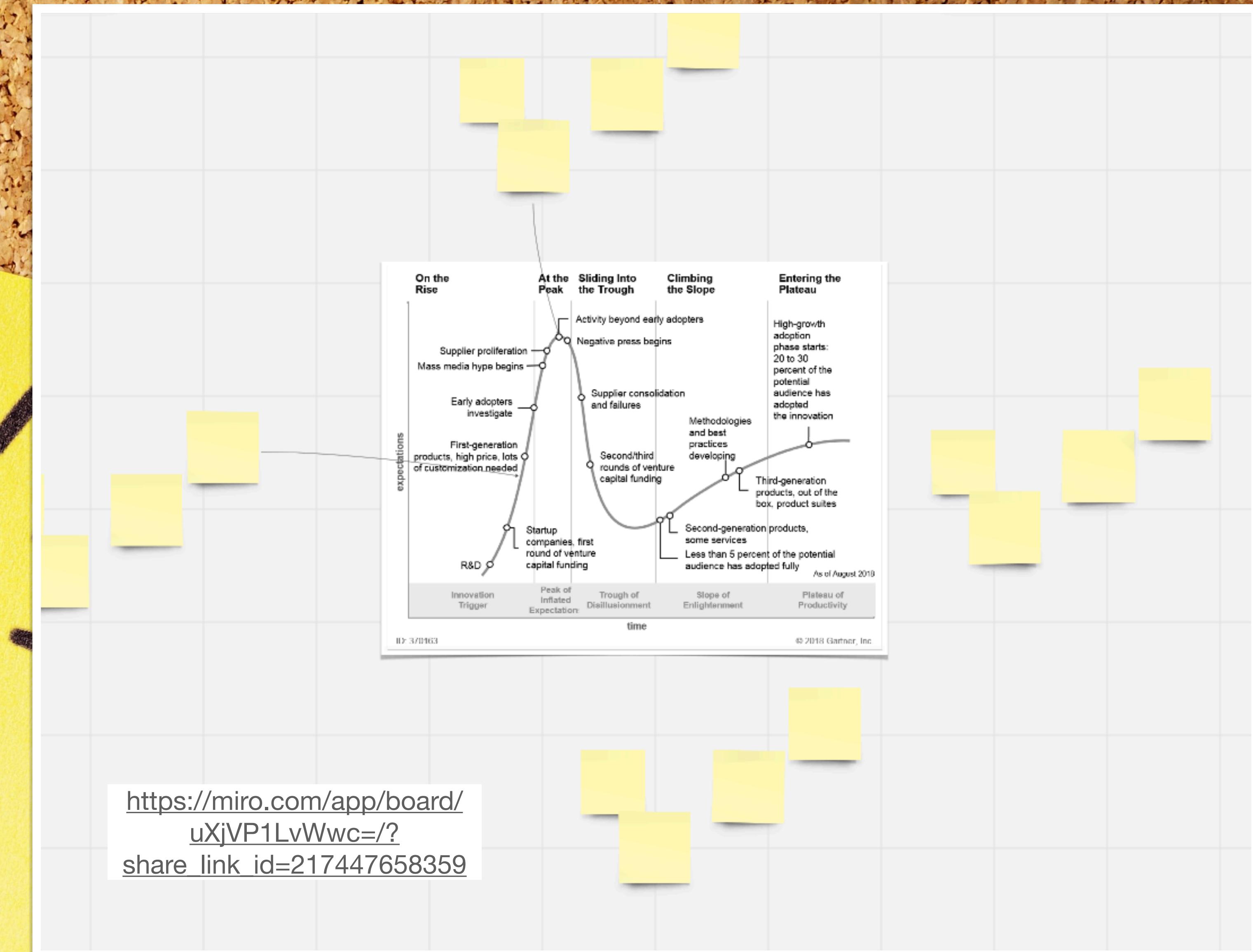
Jackie Fenn



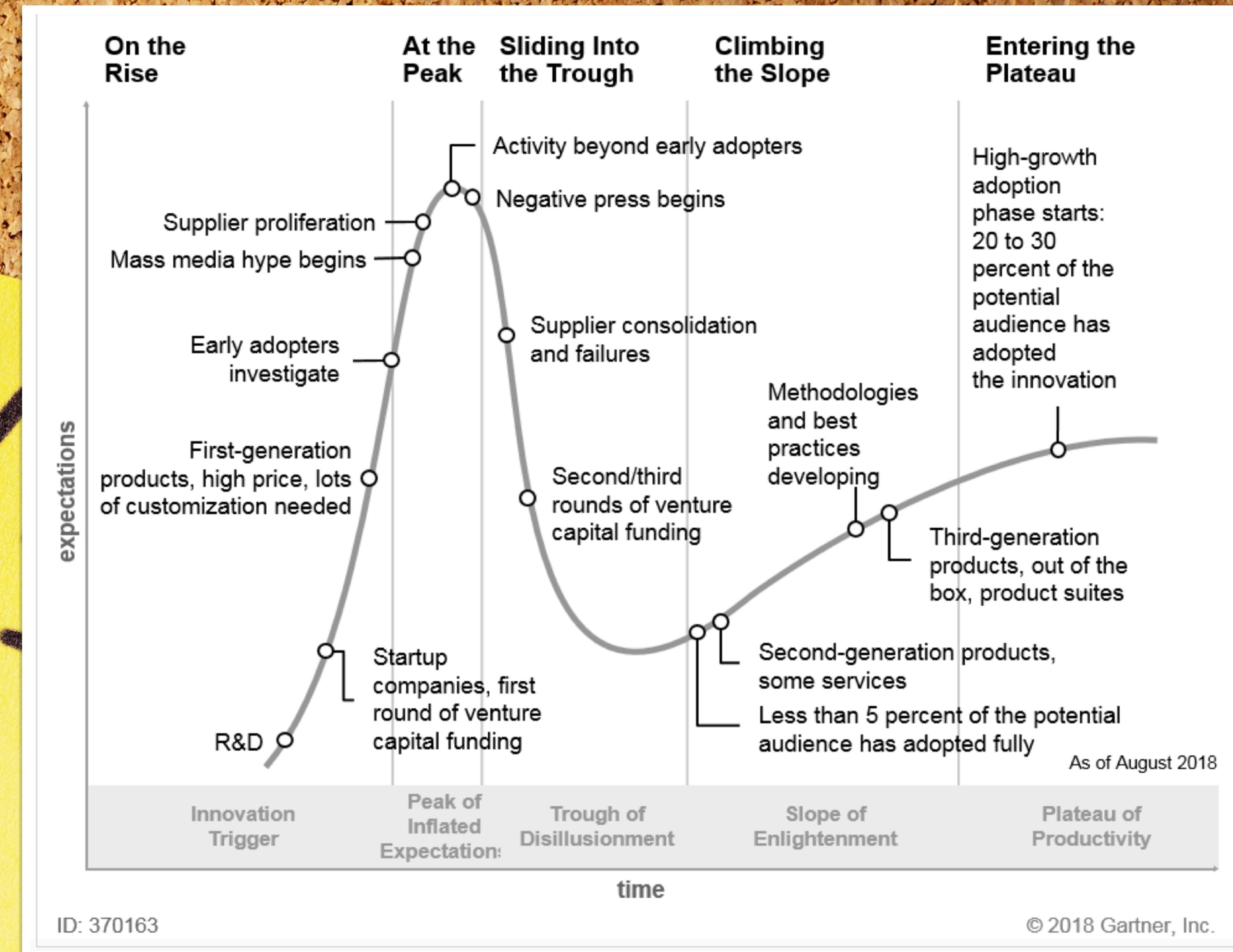
Hype Cycle: Phases



In your opinion:
Which recent
technology is in
which phase?

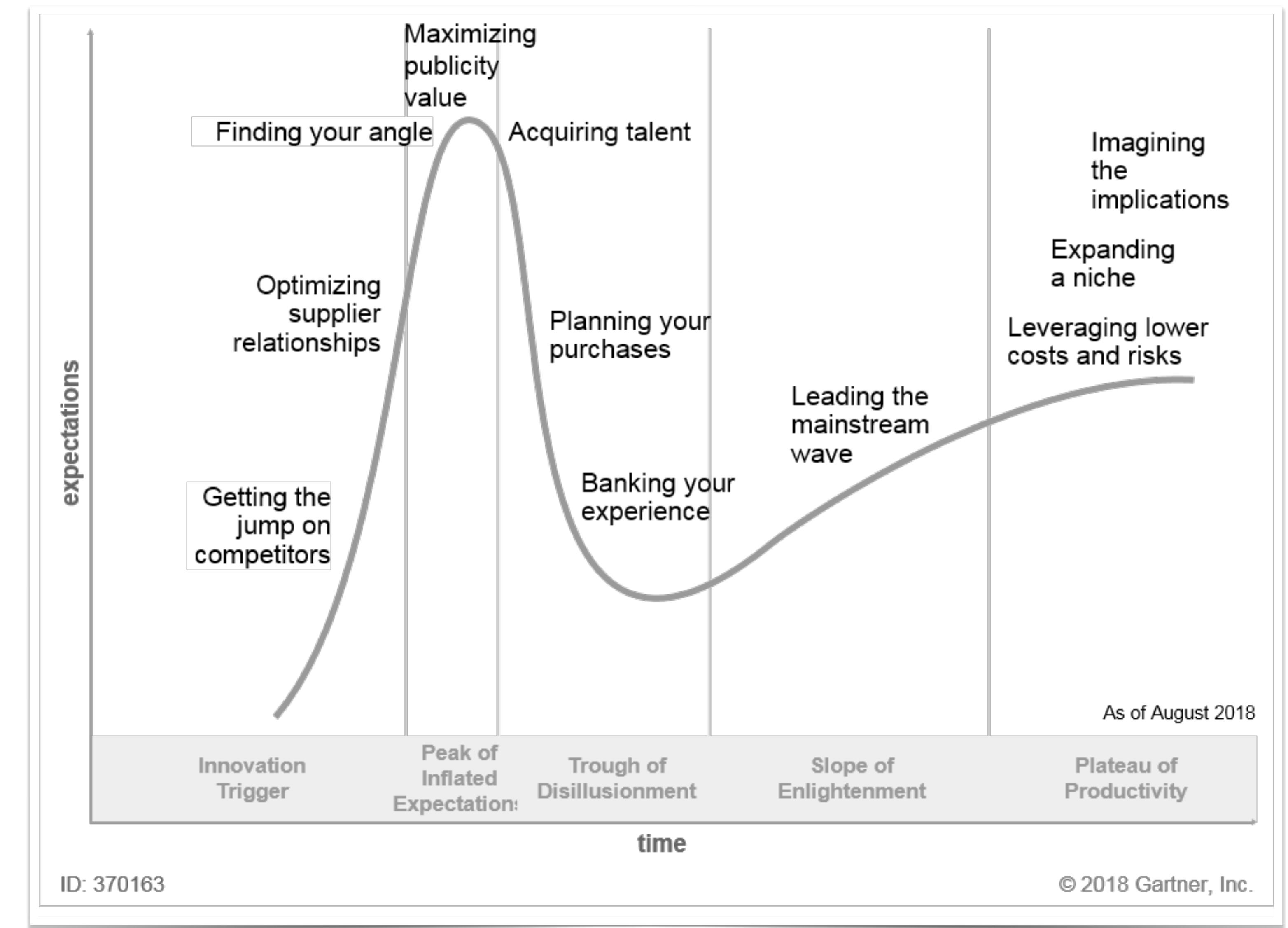


As a CIO of a SME,
what do you think
with technology at each
phase?



<https://www.computerwoche.de/g/gartner-hype-cycle-for-emerging-technologies-2005-bis-2023>

Hype Cycle: Applications



Hype Cycle: Gartner Methodology



- "We position innovation profiles on the Hype Cycle based on a **consensus assessment** of hype and maturity. We **select** a variety of market signals and proxy indicators to establish the level of expectations. Some of these inputs may be quantitative but, overall, the Hype Cycle is a structured, qualitative research tool. During the first part of the Hype Cycle, many uncertainties exist regarding an innovation. At this stage, its position on the curve is guided **more by its hype levels and market expectation than by its maturity**. At the later stages, as more information about maturity, performance and adoption becomes available, hype plays a lesser role in determining the innovation's position on the Hype Cycle."
- "**Q. Is the Hype Cycle based on empirical science?**
A. The Hype Cycle is a structured, qualitative analytical tool. (...) The Hype Cycle is a working management decision tool, **not an academic endeavor.**"

Management of Information and Communication Technologies?

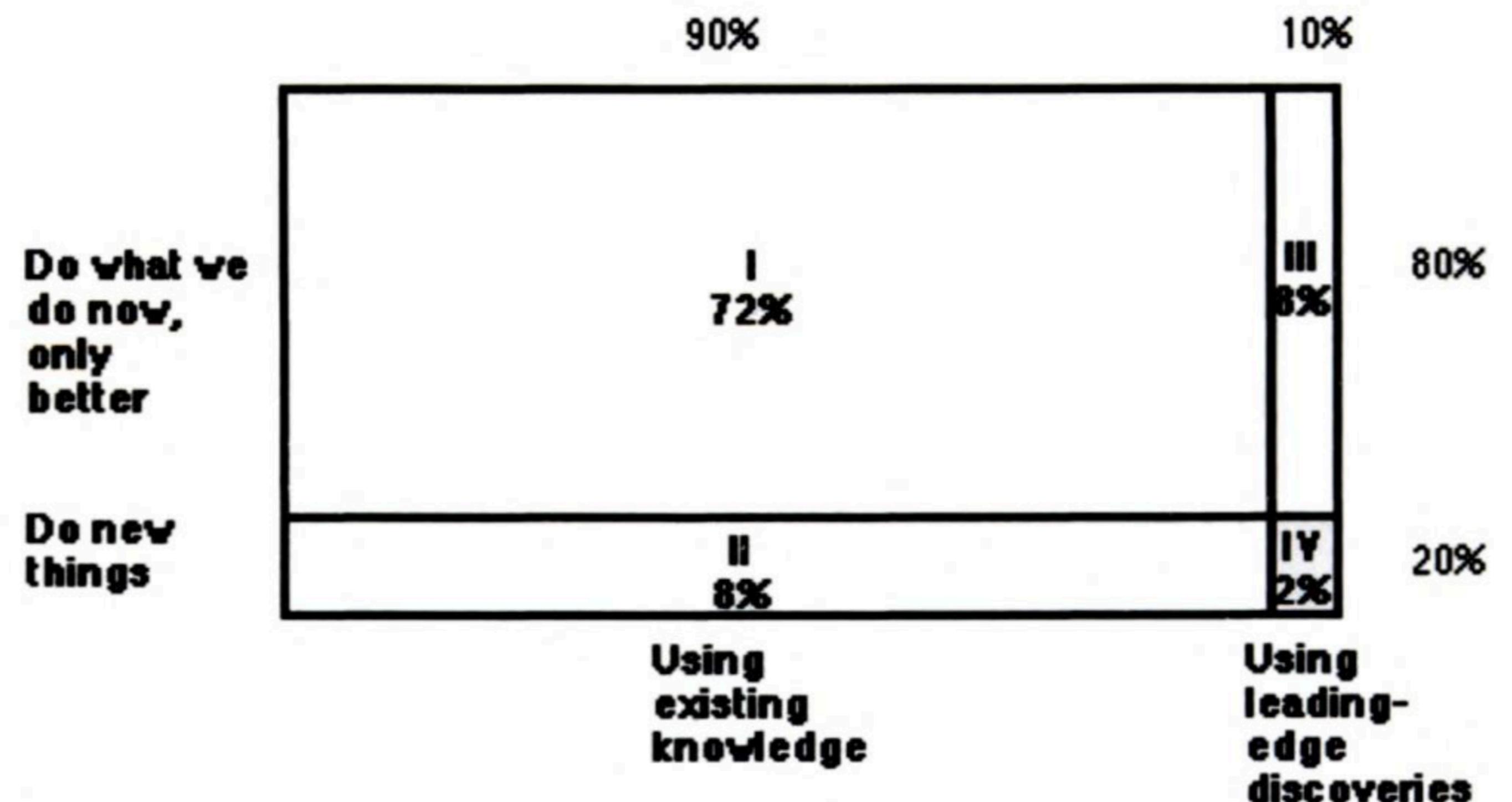
But mainly:

1. Keep the services running.

- Virtual & Cloud Infrastructure
- Tech Stacks

2. Watch what's going on.

- Try out what's new.
- Apply *leader-strategy* for USP-relevant technologies, apply *follower-strategy* everywhere else.



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Sam Altman

@sama

...

the first day of openai, seven years ago today

4:56 PM · Jan 4, 2023 · 3.3M Views

ChatGPT creator OpenAI is in talks to sell shares in a tender offer that would double the startup's valuation to \$29 billion

Lakshmi Varanasi Jan 5, 2023, 11:07 PM



Sam Altman is the co-founder of OpenAI, the startup behind platforms like ChatGPT and Dall-E 2. Drew



<https://chat.openai.com>

<https://openai.com/blog/chatgpt/>

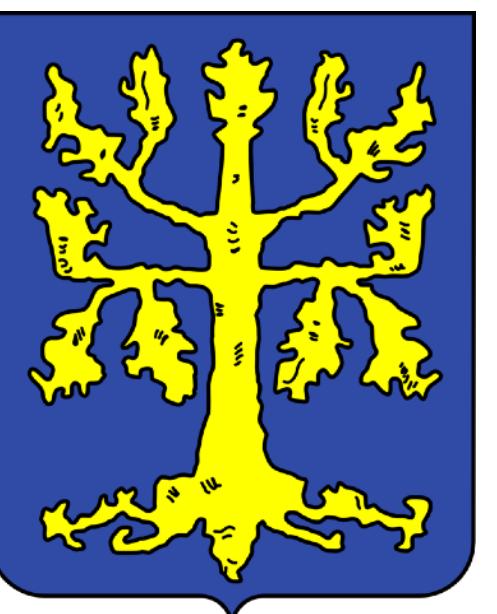
Play around
with ChatGPT
and evaluate
options:

How this can
provide a
business
advantage to
your case?
(Or: *why not?*)

Create an
elevator
pitch (no
slides or max.
1 slide).



Choose your fighter:



WAEZHLZ

?

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