

# PRODUCTION SYSTEMS AS CLOUD-BASED APPLICATIONS

Christoph P. Neumann  
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**Keynote**



# Towards “Big Data and Cloud Computing for AI”

Prof. Dr. Christoph P. Neumann (c.neumann@oth-aw.de)



## 2013–2020: Big Data, BI/DWH, Cloud Transition

   SCHEMA

## 2008 – 2012: PhD: DBS, Workflows, Distributed Systems



  
★ INTERNATIONAL ASSOCIATION OF  
PROJECT MANAGERS

## ≥2021: Professorship: OTH-AW

## 2004 – 2007: Middleware

  
A Company of 

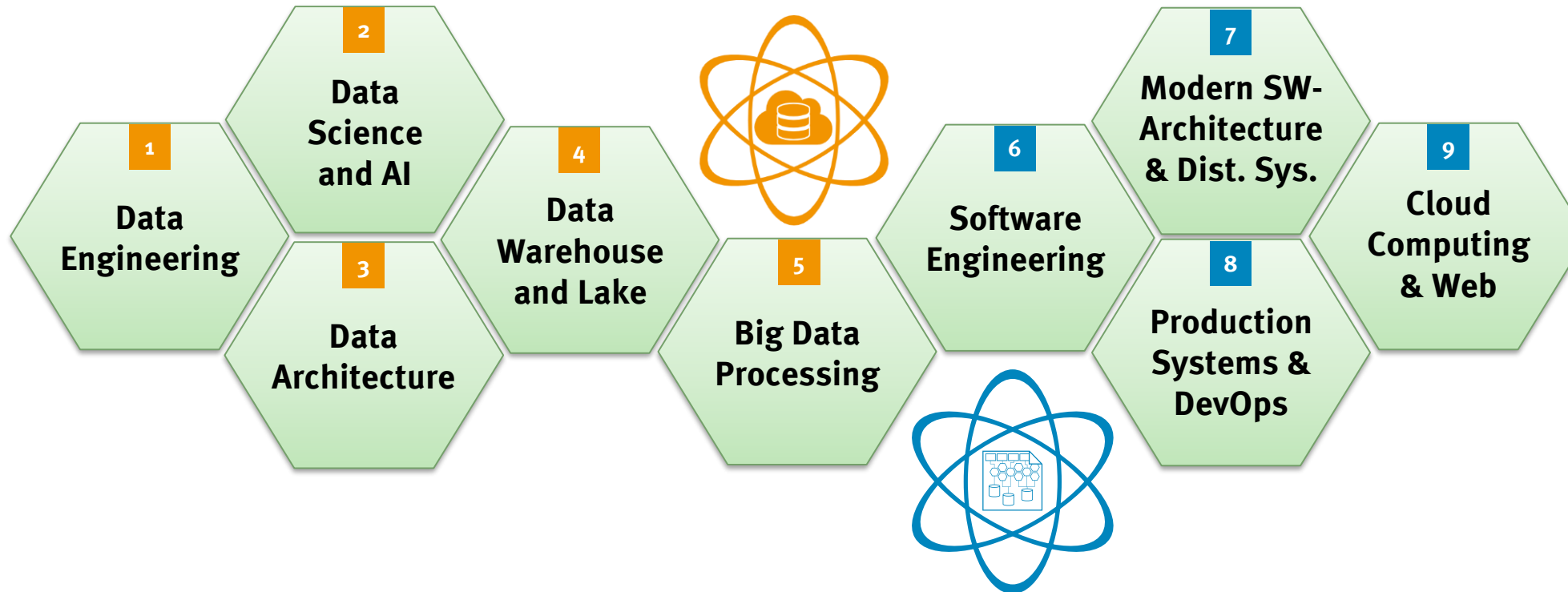


2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024

›10a: Software Architect / Solution Architect / Project Manager / Data Architect / Agile Coach

# Big Data and Cloud Computing for AI

Prof. Dr. Christoph P. Neumann (c.neumann@oth-aw.de)



# “Production Systems” = PROD env

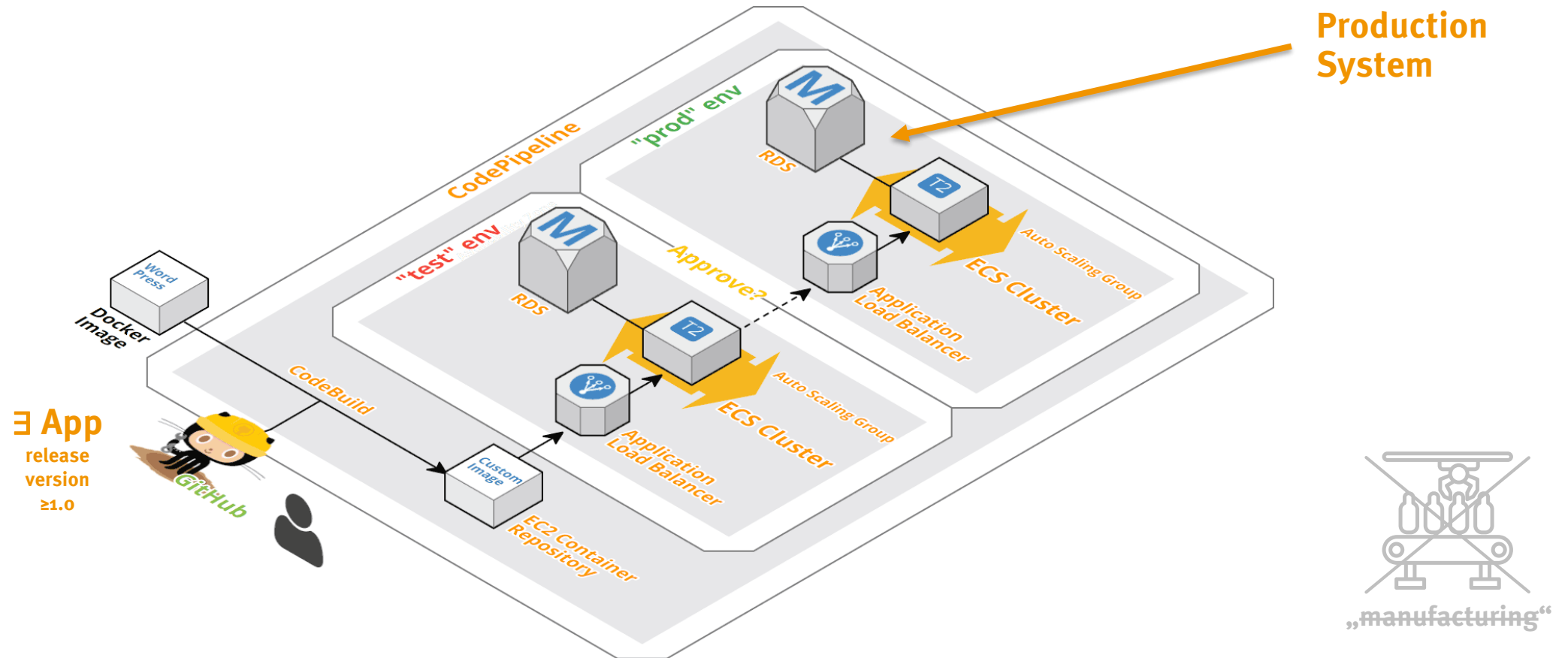


Image Source: <https://stelligent.com/2017/06/08/wordpress-mu-and-you/>

**Production Systems as Cloud-Based Applications**

# Getting to Know the Audience



①

“How many of you have or had carried out a **cloud deployment of a (prod) application?**”



②

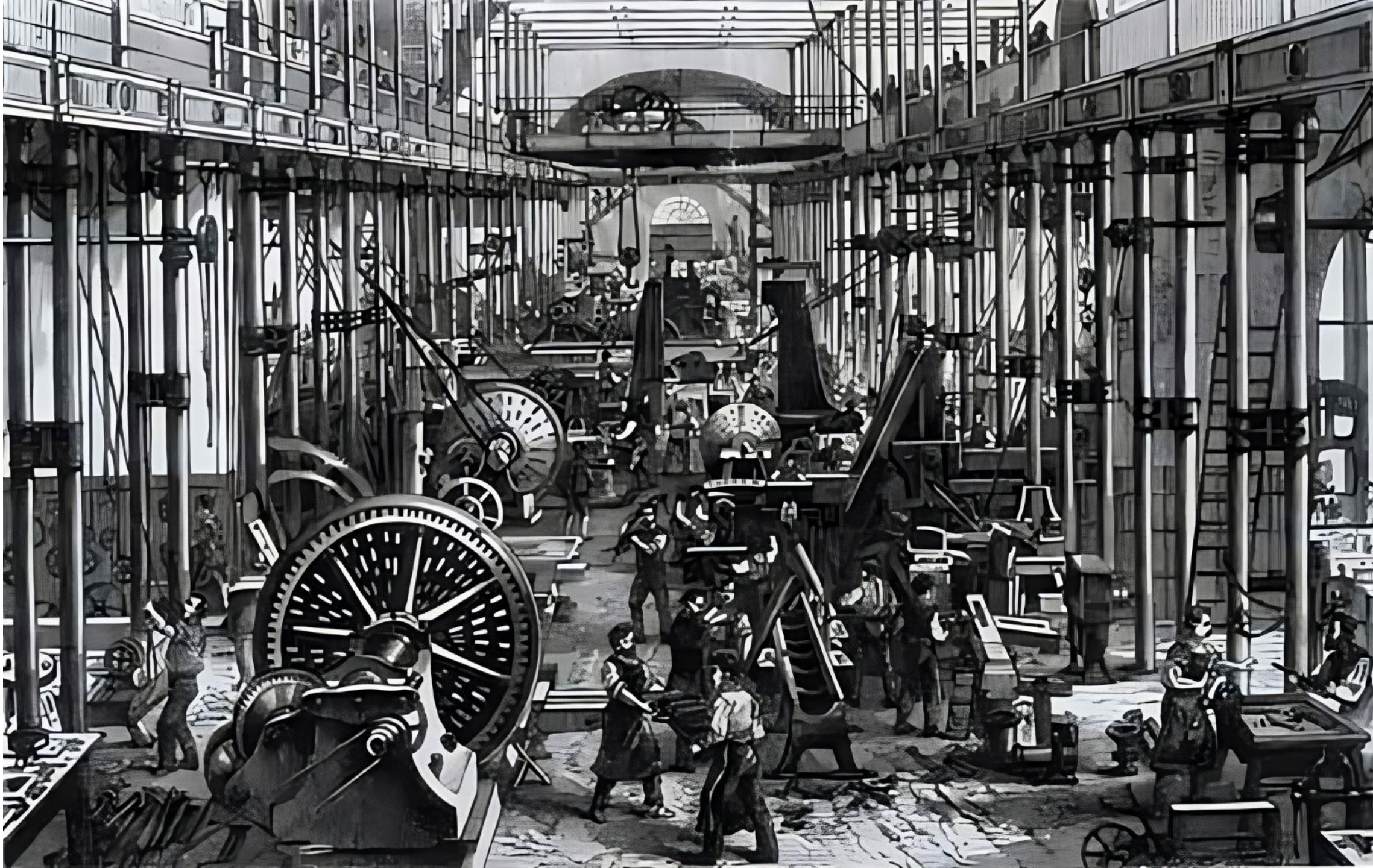
“How many of you have or had  
tasks in **2<sup>nd</sup>** or **3<sup>rd</sup>** level support?”

**Production Systems as Cloud-Based Applications**

# **5 Steps Back ... and the Future of Cloud**



Steam machine, belts transmitting motor power



Each business: engineer mechanics

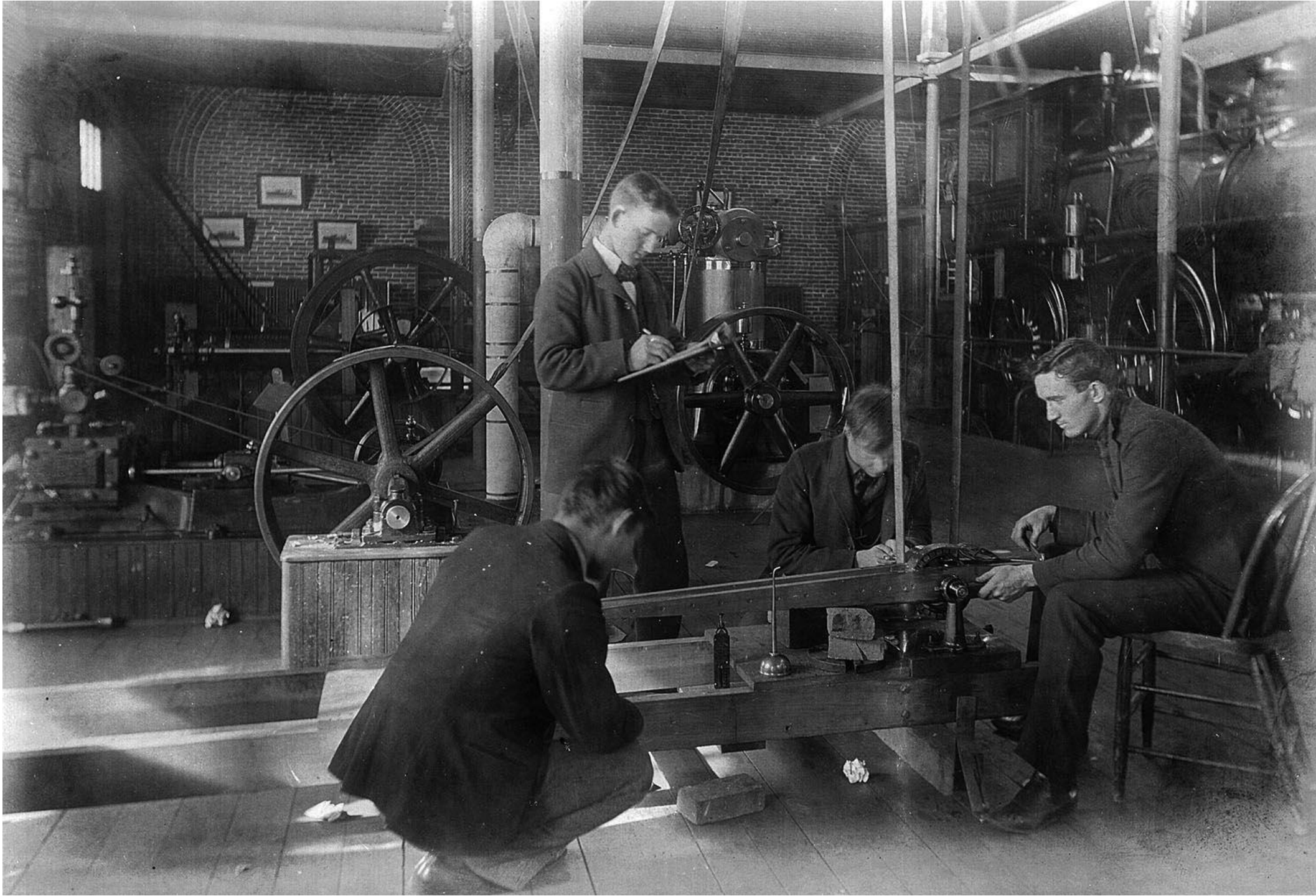
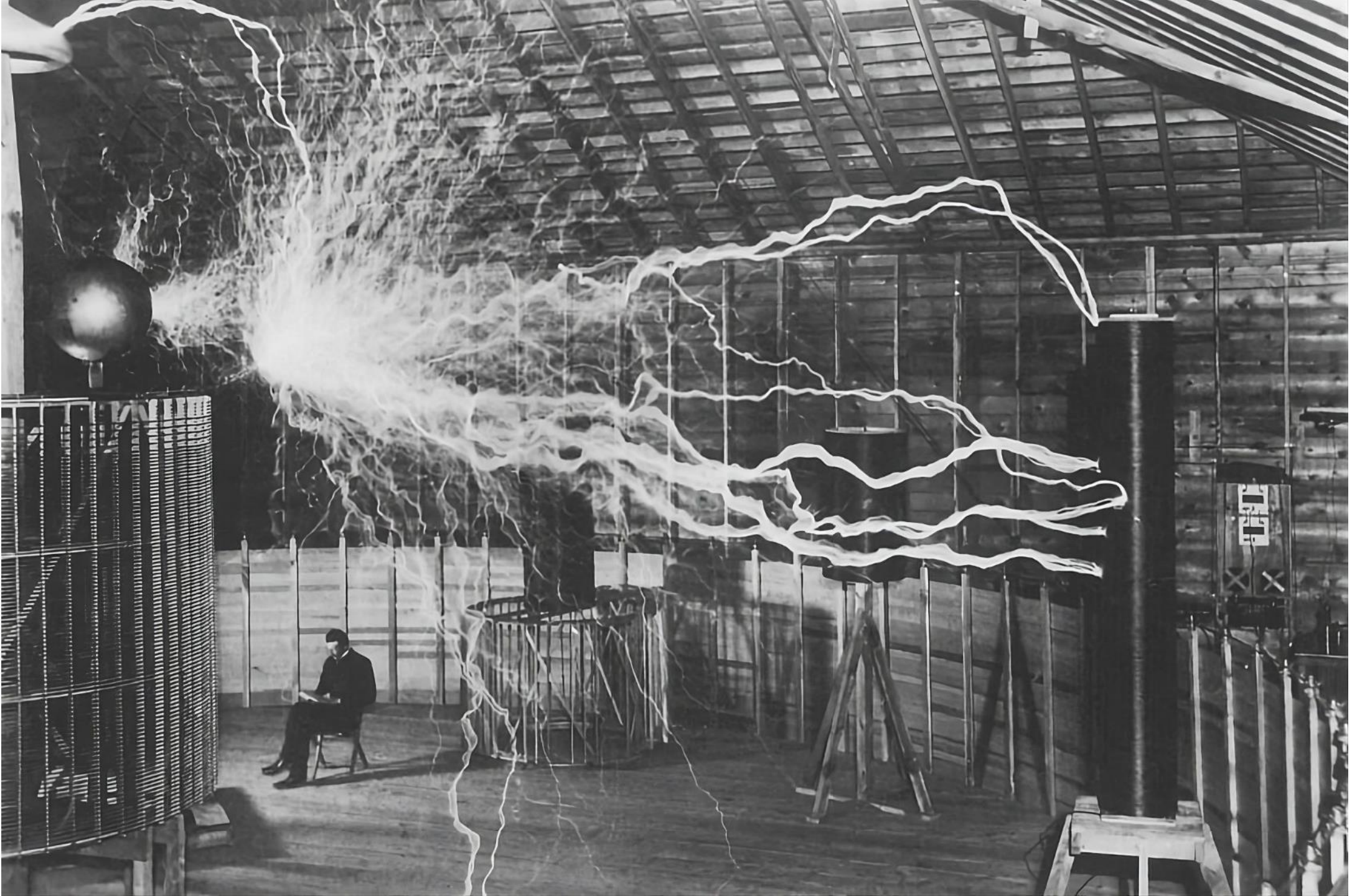


Image Source: <https://engineering.purdue.edu/ME/News/2023/boiler-up-restoring-an-original-1915-purdue-steam-engine/oldlab.jpg>

# Electricity



# We Fear Change

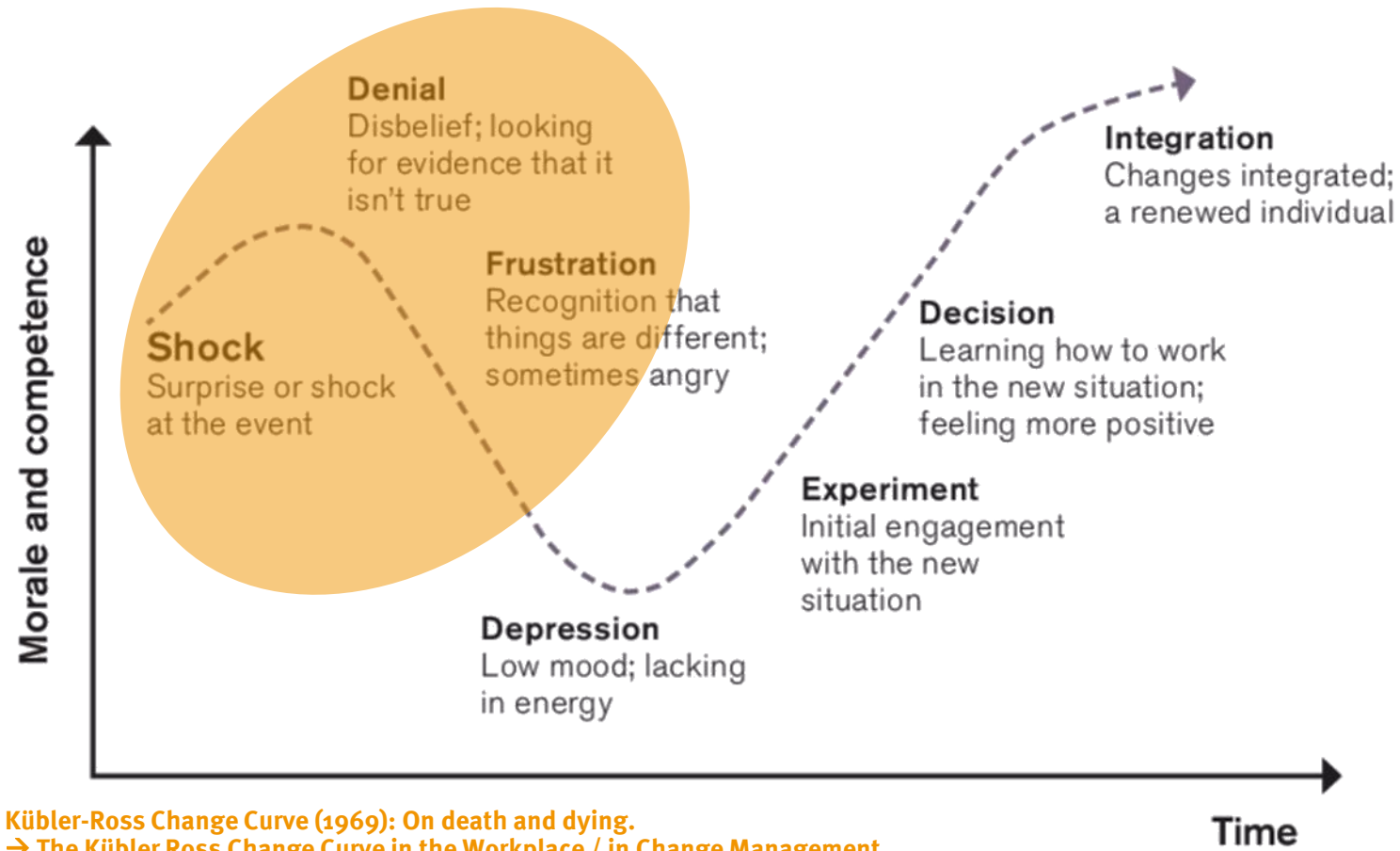
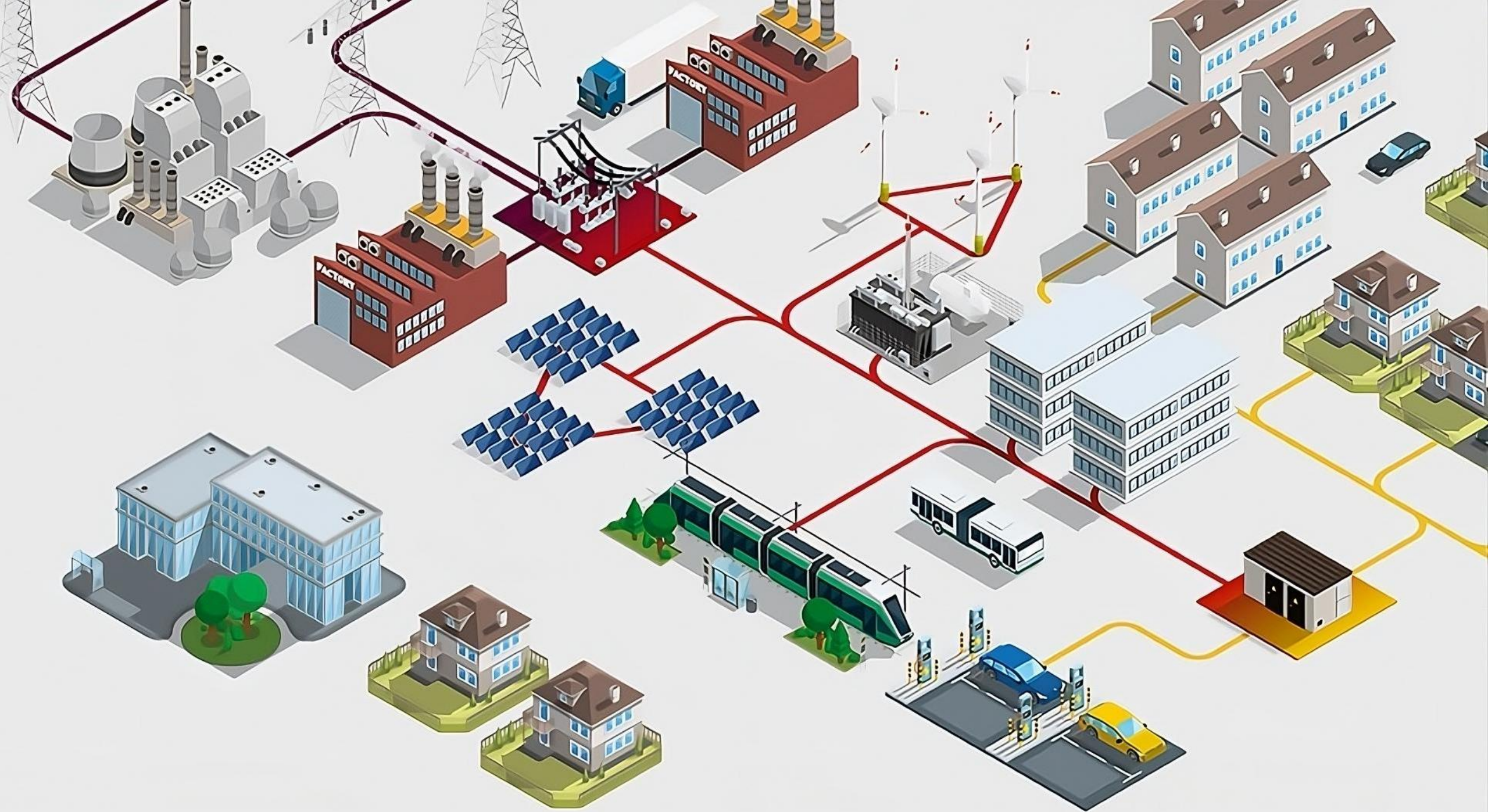


Image Source: Austin, John. (2015). Leading Effective Change: A Primer for the HR Professional.

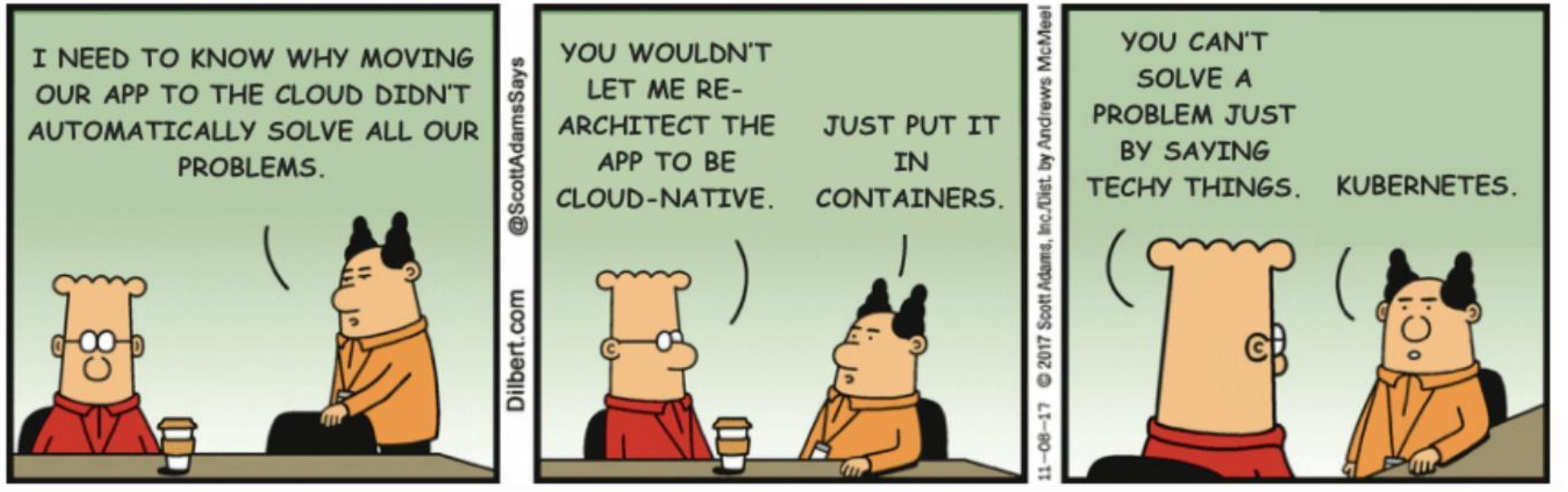


## Replacement-per-se ? System Redesign !

Machine Positioning:  
Biggest machines in the middle!  
Why? Power transmission...

Transmission possible everywhere:  
Repositioning / Conveyor Belts  
Efficiency gains through Redesign

# Dilbert Truths



[https://dilbert.com/search\\_results?terms=cloud](https://dilbert.com/search_results?terms=cloud)

# Five Network Markets $\subset$ Public Infrastructure



**Electricity**

①



**Gas**

②



**Telecommunication**

③



**Postal Service**

④



**Rail Transport**

⑤



Public Infrastructure contains more: + Roads, Aviation, Water Supply, Waste, Waste Water, Government-owned Assets, ...



# Towards Cloud Computing

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**Each business**  
in its basement



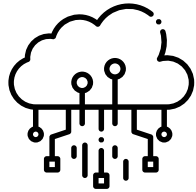
Amazon EC2

**Public Data Center**



# Towards a 6th Network Market

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## Cloud Computing

⑥

?

③

“How will your **grandchildren** look back on **OnPrem-vs-Cloud** in **50 years?**”

4

**“What do we need to do to make cloud resources as pervasive as necessary?”**

# The Obvious Little Difference

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## Freedom of Contract

Vendor Changes Subscription Prices

Vendor Cancels Products

Vendor Cancels Customers

Trade Disputes and Sanctions

National Security Concerns

German “Versorgungsauftrag”

## Supply Mandate

German “Grundversorger”

## Basic Supplier

**Vendor cannot reject you as a customer**

# Freedom Of Contract Risks Materialized

heise online > Microsoft > EU cloud competitor: Microsoft's price increases amount to blackmail

## EU cloud competitor: Microsoft's price increases amount to blackmail



Log In

Home / Resources / Insights / Adobe price increases: what you need to know

## Adobe price increases: what you need to know



Bye Bye Server  
Your guide to alternatives

### What is this about?

Atlassian has given customers advance notice that their Server offering will be retired. You can read the detailed announcement timeline [here](#).

But don't panic - we will create a curated list of alternatives. This site is currently work in progress. Feel free to send us a PR on [Github](#).

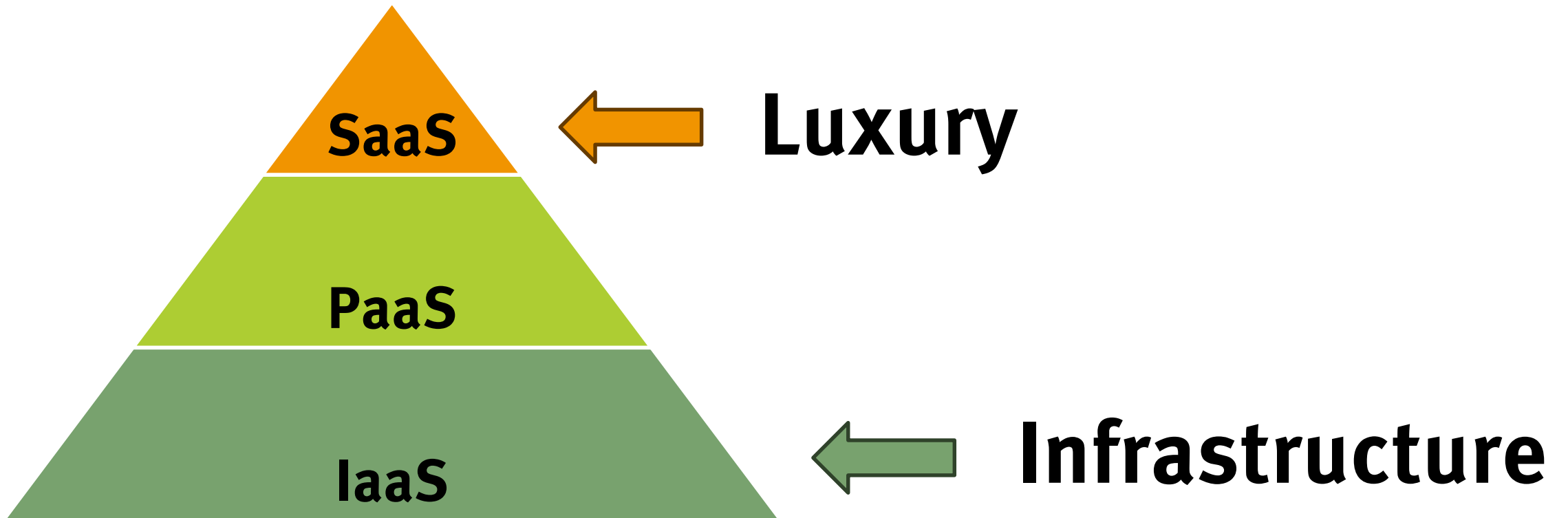
## Jira Software and Alternatives Comparison

**Electricity is Interchangeable !**

**Cloud Service Interoperability ?**



# Interoperability on Multiple Levels



# Another Look at SaaS-Level Examples

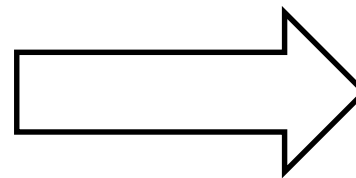
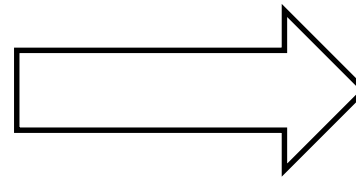


Image Source (CD Rack/ Spotify / Pokemon Cartridge): Unsplash

# Lifetime of the App, Not the Lifetime of the Customer

**DirectX 9 or older  
16-/32-bit Application**



**Perpetual**

**Finite nature of the HW/OS  
ecosystem of any software**

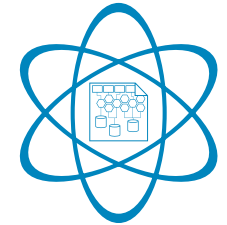
**Win10 64-bit  
Win11**



**Lifetime**

**Freedom of Contract Risks**





# Feature Demands Eat Strategy for Breakfast

... and Risk Analysis, too.

“Killing Arguments”

# Munich City's Council: Digital Sovereignty!?

## (20 Year Anniversary)



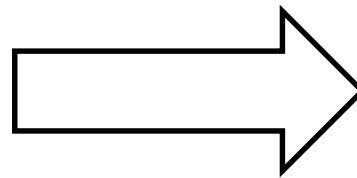
2004:

**Bloomberg** Our Company | Professional | Anywhere

HOME QUICK NEWS OPINION MARKET DATA PERSONAL FINANCE TECH POLITICS SUSTAINABILITY

### Microsoft Loses Munich Contract for 14,000 PCs to Linux Program

By Philipp Encz and Dina Bass - June 16, 2004 11:38 EDT



2017:

**ars TECHNICA** BIZ & IT TECH SCIENCE POLICY CARS GAMING & CULTURE

BIZ & IT —  
**Munich mulls dropping Linux, returning to Windows 10**

Administrative committee claims that using Windows is necessary for compatibility reasons.

ARS STAFF - 2/13/2017, 8:02 PM



**Give customers fair value and they will give you their data, without hesitation!**

**We Say We Want Privacy Online, But Our Actions Say Otherwise**

# Freedom Of Contract Risks ↔ Digital Sovereignty

Consumers:

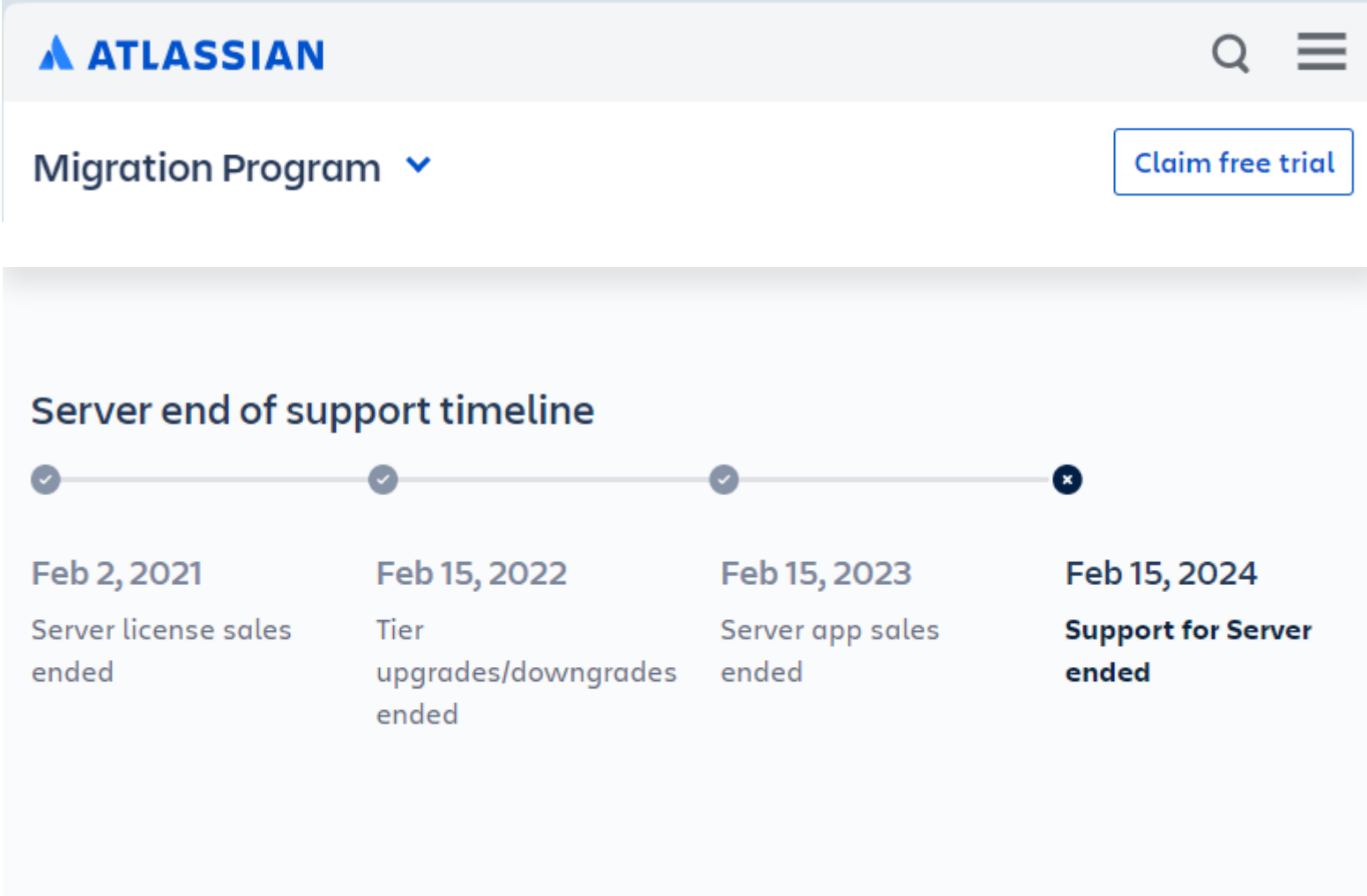


Enterprises:



YOUR CHOICE!?

# Atlassian to Cloud-only, Stops Selling Server Licenses



The screenshot shows the Atlassian website header with the logo and navigation icons. Below the header, there is a 'Migration Program' dropdown menu and a 'Claim free trial' button. The main content area features a 'Server end of support timeline' section with a horizontal timeline and four key dates.

Date	Event
Oct 16, 2020	Announcement
Feb 2, 2021	Server license sales ended
Feb 15, 2022	Tier upgrades/downgrades ended
Feb 15, 2023	Server app sales ended
Feb 15, 2024	Support for Server ended



# Will you abandon/cancel it? Will you pay it?



## Migrate to Cloud

Operate more efficiently and focus on innovation with seamless collaboration, better integrations, and native automation.

[Cloud migration guide](#)

Cloud Users, i.a., pay with Freedom-of-Contract-Risks



## Upgrade to Data Center

Maintain self-managed environments with security controls, performance at scale, and flexible infrastructure choices.

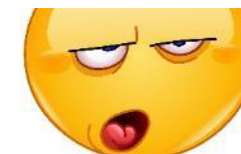
[Data Center upgrade guide →](#)



## Free and open-source software (FOSS):

- Atlassian **Jira**
  - Web/Self-Hosted: [OpenProject](#) [via [docker](#)] | [GitLab](#)
  - Cloud: [YouTrack](#) | [GitLab](#)
- Atlassian **Confluence**
  - Web/Self-Hosted: [XWiki](#) | [BlueSpice](#)
  - Cloud: [MyXWiki.org](#)

<https://www.oth-aw.de/neumann/tools-swe/#kostenlose-alternativen>



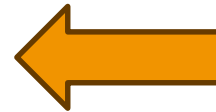
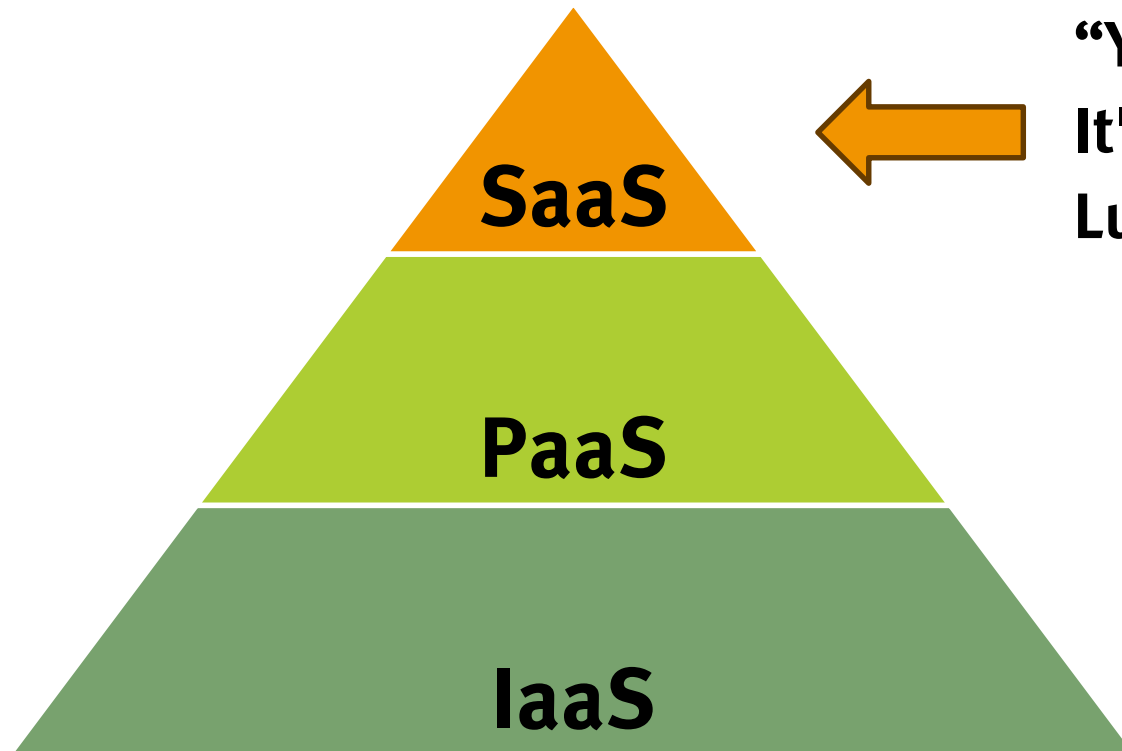
**Munich's Mayor in 2017:**  
They do not provide  
**common market standards** (!?)

**Some pay ridiculous prices for it!**

**Value of software changes, after its social embedding.**

Image Source (Emoticon): <https://www.symbols-n-emoticons.com/2018/05/not-entirely-coherent.html>

# Market Leaders set Market Standards



**“You will pay it!”**  
**It's NOT about the lack of options!**  
**Luxury Effects!**

# Exit Strategy: Cloud Repatriation (Especially SaaS)

## 1. Identify Alternative Solutions

- Features, features, features! Beware of incomplete requirements as well as subconscious and implicit “quite-clear” assumptions. (SECI model: tacit knowledge  $\leftrightarrow$  socialization vs. externalization)
- Cost, scalability, performance, security, and compatibility.

## 2. Current Environment Stocktaking

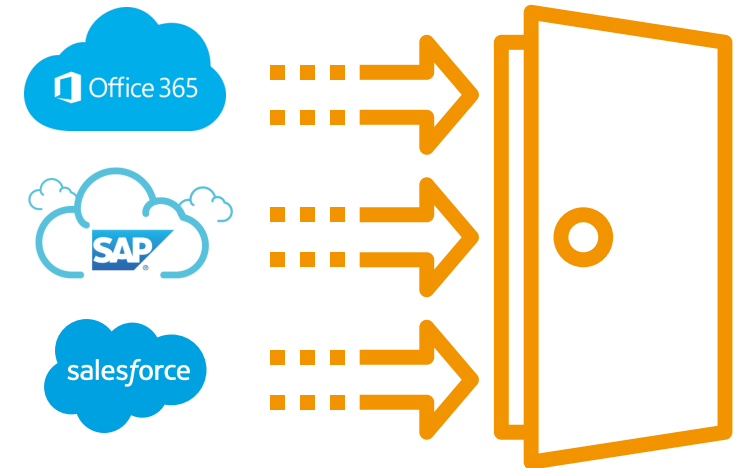
- Infrastructure, services, dependencies, data locations, and configurations.

## 3. Contractual Obligations and Legal Considerations

- Current cloud provider contracts: terms related to termination, data ownership, and data retrieval.

## 4. Migration Planning (Data and Application)

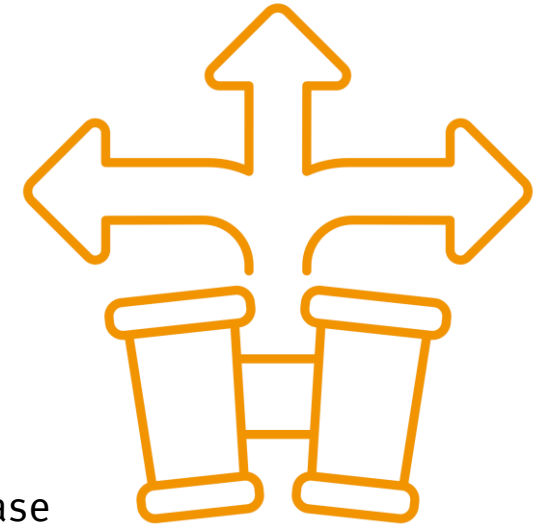
- Prepare your team. Prepare a budget. Back up data. Prepare for emergencies.
- Data transfer approach, potential downtimes, service interruptions, data transformations.
- Test environment: validation and verification procedures to mitigate risks and minimize downtime.

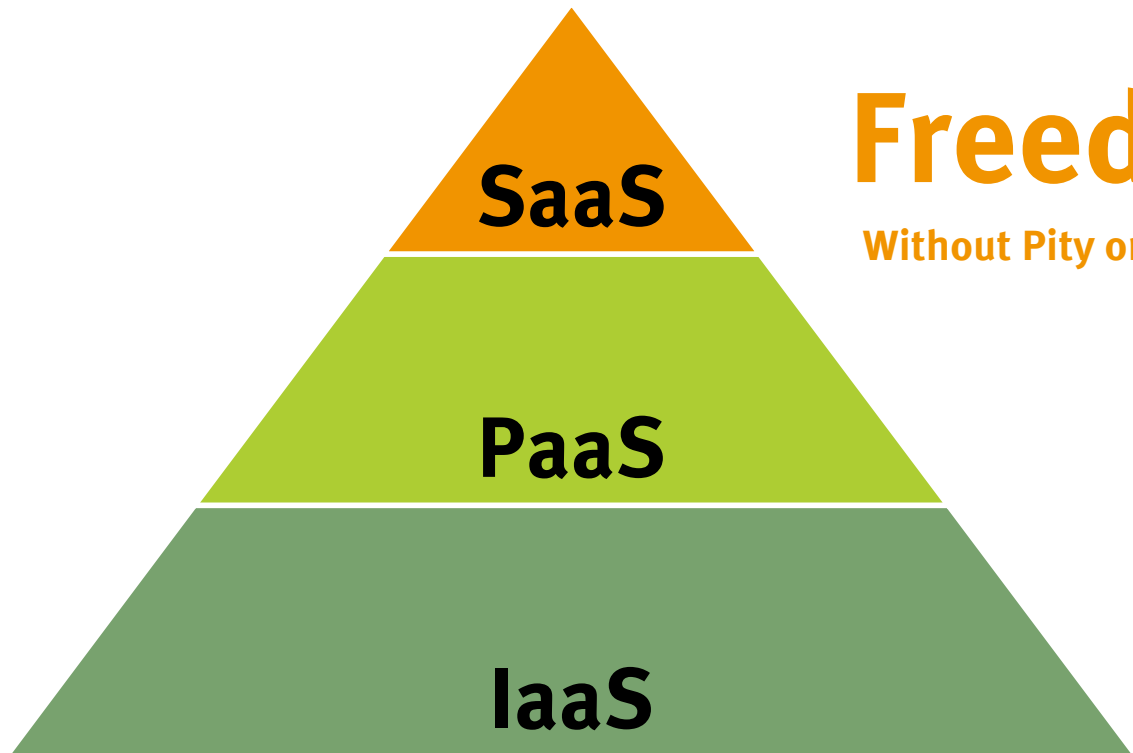


# Preemptive Cloud Exit Strategy

## (For all service models: SaaS, PaaS, IaaS)

1. **When** in the cloud journey should an exit strategy be defined? **Early!**
  - Avoid being the spoilsport! Motivational scenario? **Mergers & Acquisitions**
2. Consider and set an **appropriate exit timeframe**?!
  - Impact on: Contract terms! Data and application complexity! ...
3. Avoid vendor lock-in
  - Opt for **Open-Source** solutions whenever possible
  - **Avoid CSP-native options** like {Azure Cosmos DB, GCP BigTable, AWS DynamoDB} as database and avoid {Azure Event Hub, AWS Kinesis, GCP Pub/Sub} for messaging backbone
4. Ensure data portability
  - Opt for document-oriented formats
5. **Categorize** the application **portfolio** into business critical, important, and non-essential applications
  - Define the recovery point objective (RPO) and recovery time objective (RTO) for each application; the exit strategy should outline how to handle each category of apps





## Freedom of Contract !

Without Pity or Empathy for the Victims of its Risks

## Supply Mandate ?!

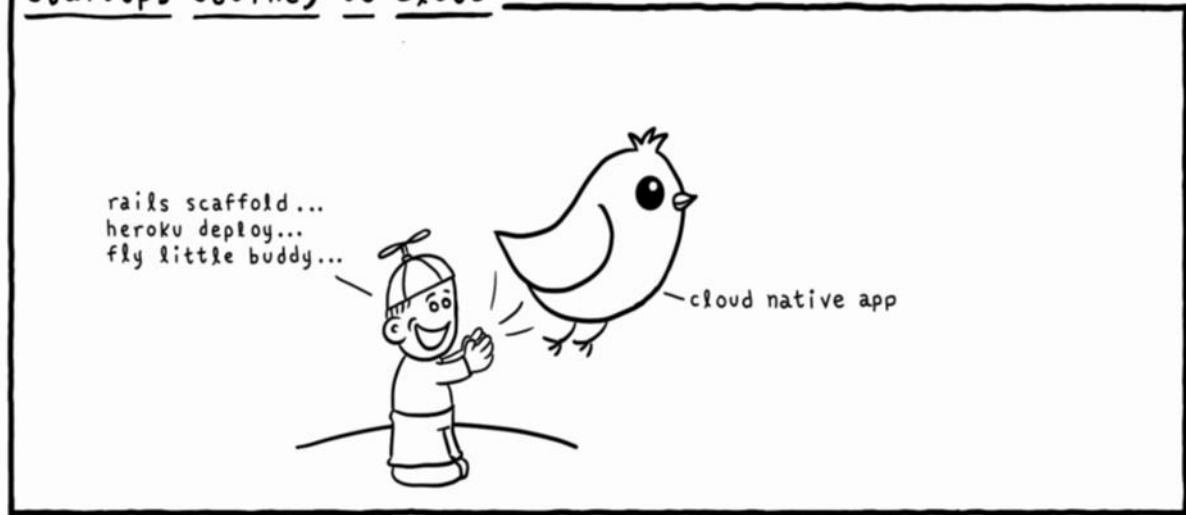
For Cloud to become Public Infrastructure

›15a of Production Systems as Cloud-Based Applications

# A Journey of a Fictional Company

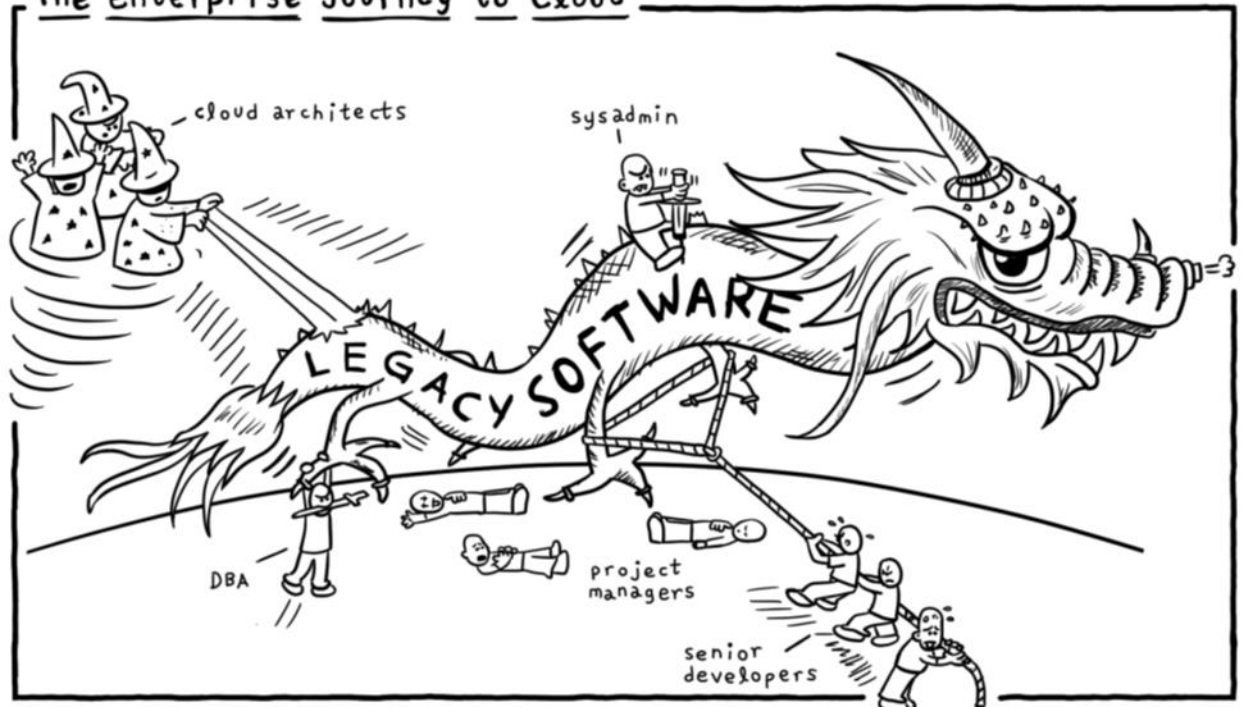
Courtesy of Dr. Thomas Fischer

## Startups Journey to Cloud



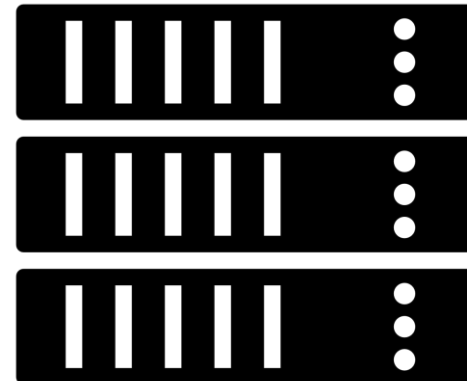
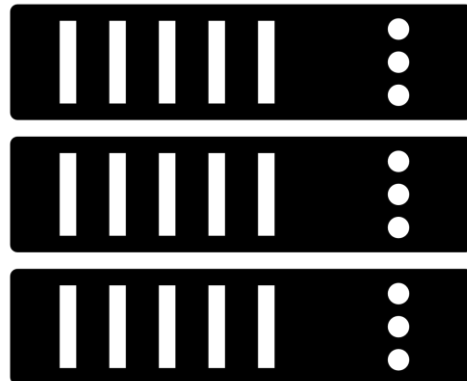
Daniel Stori {turnoff.us}  
Thanks to Michael Tharrington

## The Enterprise Journey to Cloud



# The World Before the Cloud

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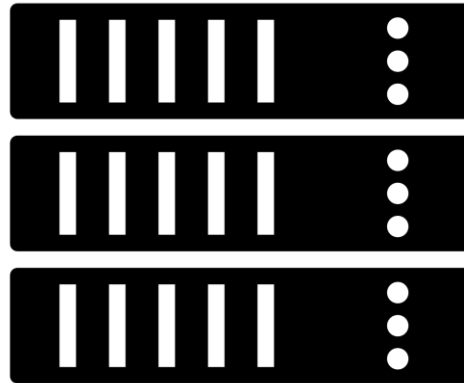
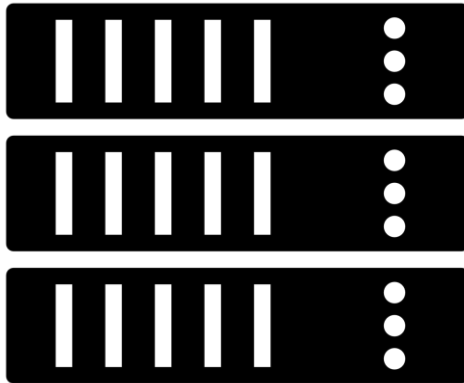






# 1<sup>st</sup> Pilot Project: Strangler Pattern

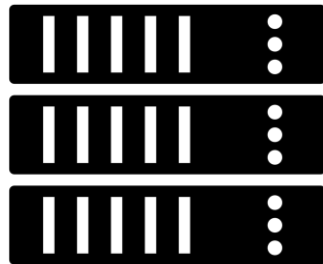
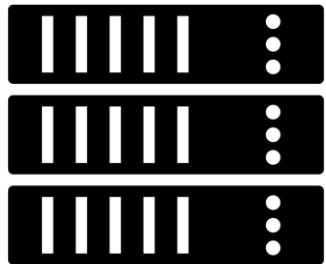
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# ... Is Not a Straight Path!



# Help! I Have a Hybrid Multi-Cloud...



# Cloud-Native Will Fix It!

## Pods as Unified Deployment



# kubernetes

# The Proliferation of Architectural Styles

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# From the Point of the Architects, Cloud-Native is just another Architecture Generation

**App Definition and Development**

Database: Veeva, KV, etc.

Streaming & Messaging: cloudevents, NATS, etc.

Application Definition & Image Build: HELM, etc.

Continuous Integration & Delivery: Jenkins, etc.

**Orchestration & Management**

Scheduling & Orchestration: Kubernetes, etc.

Coordination & Service Discovery: CoreDNS, etcd, etc.

Remote Procedure Call: gRPC, etc.

Service Proxy: envoy, etc.

API Gateway: Kong, etc.

Service Mesh: Istio, etc.

**Runtime**

Cloud Native Storage: Rook, etc.

Container Runtime: Docker, cri-o, etc.

Cloud Native Network: CNI, etc.

**Provisioning**

Automation & Configuration: Ansible, etc.

Container Registry: Harbor, etc.

Security & Compliance: Falco, etc.

Key Management: HashiCorp Vault, etc.

**Platform**

Certified Kubernetes - Distribution: OpenShift, etc.

Certified Kubernetes - Hosted: AWS EKS, etc.

Certified Kubernetes - Installer: Kubeadm, etc.

PaaS/Container Service: Heroku, etc.

**Observability and Analysis**

Monitoring: Prometheus, etc.

Logging: ELK, etc.

Tracing: Jaeger, etc.

Chaos Engineering: Chaos Mesh, etc.

**Serverless**

Cloud Functions, etc.

**CLOUD NATIVE Landscape**

CLOUD NATIVE COMPUTING FOUNDATION

Redpoint, Amplify

QR code to [l.cncf.io](https://l.cncf.io)

This landscape is intended as a map through the previously uncharted terrain of cloud native technologies. There are many routes to deploying a cloud native application, with CNCF Projects representing a particularly well-traveled path.

**Kubernetes Certified Service Provider**

**Kubernetes Training Partner**

Special: SUSE, etc.

**Members**

Member list and details.



# Next Stop: Serverless

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**It is illusory to have a uniform architecture generation throughout a major company.**

**It is more desirable to keep the number of generations in check.**

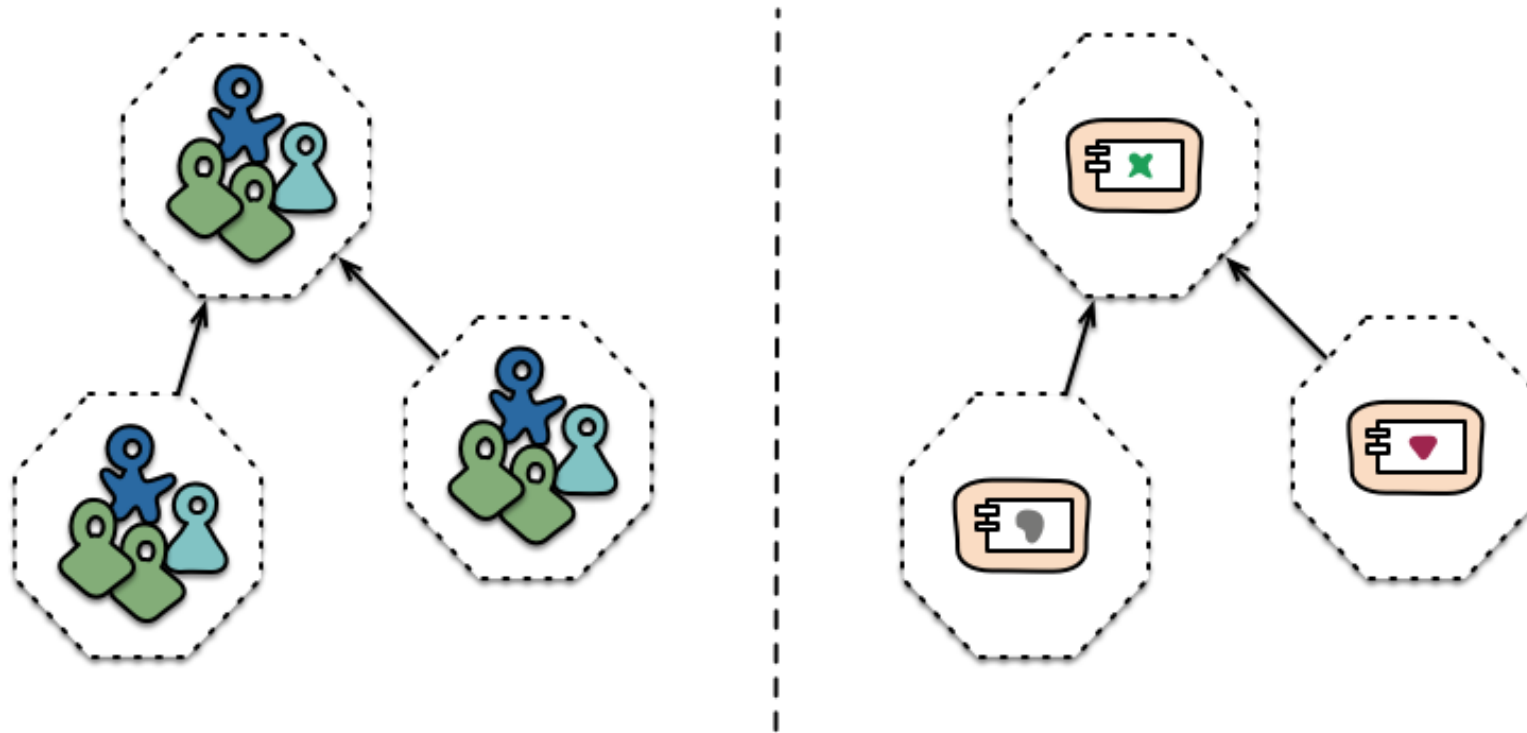
# Not Only About Architectural Proliferation...



5

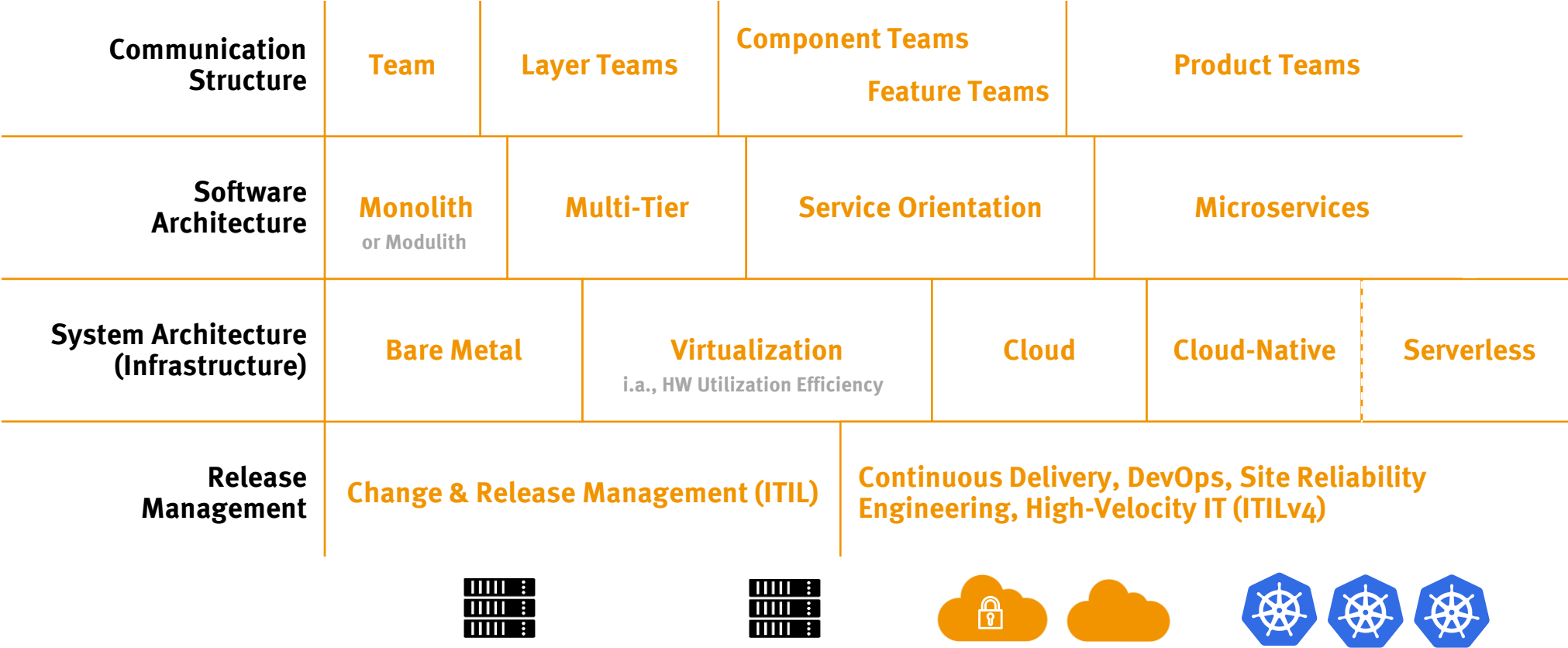
“How many of you know  
**Conway's Law?**”

# Conway's Law vs. System Landscapes



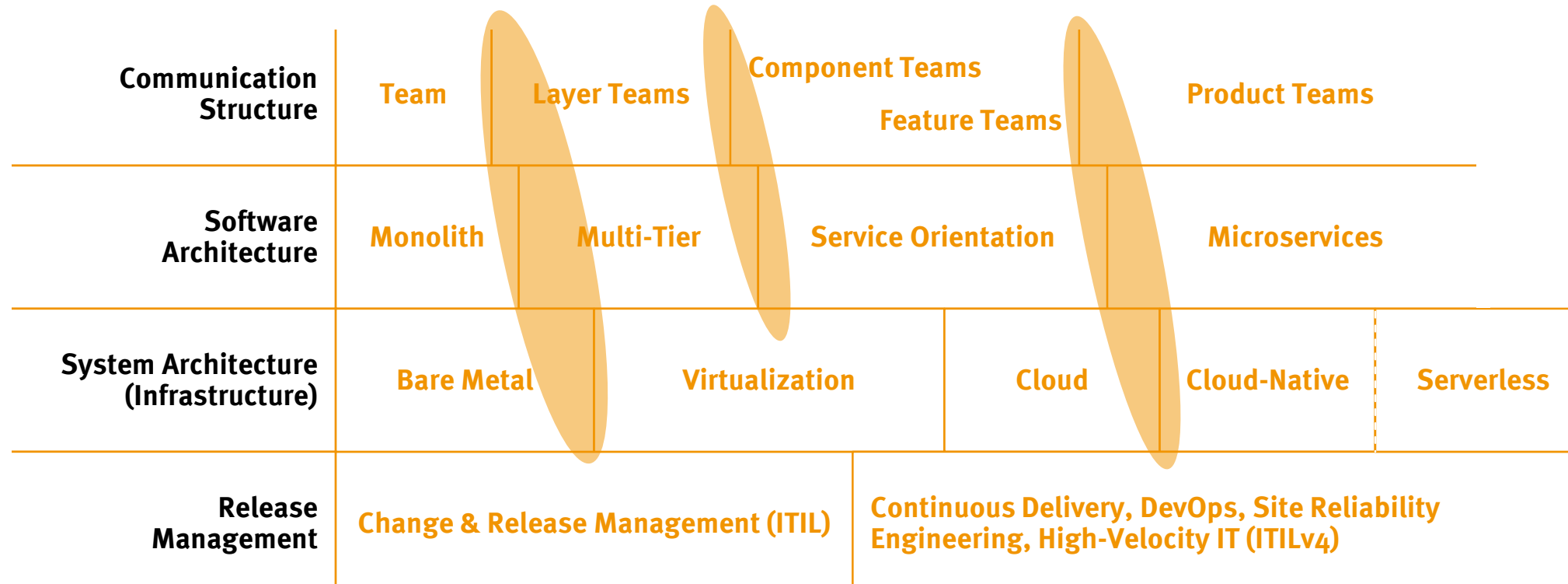
**“Organizations which design systems ... are constrained to produce designs which are copies of the communication structures of these organizations.” Melvin Conway (1967)**

# Holistic Approach to IT Modernization



Adopted from Dr. Thomas Fischer: Private, Hybrid & Multi-Cloud, Cloud-Native or Serverless? CCX Conference, 2021. <https://youtu.be/e97lwrCoutA>

# The Reverse Conway Maneuvre



Inventors of the Term: Jonny LeRoy and Matt Simons: Dealing with creaky legacy platforms. Cutter IT journal, 2010. <http://jonnyleroy.com/2011/02/03/dealing-with-creaky-legacy-platforms/>

Further Reading: Skelton, Matthew, and Manuel Pais: Team topologies: organizing business and technology teams for fast flow. It Revolution, 2019. <https://teampologies.com/book>

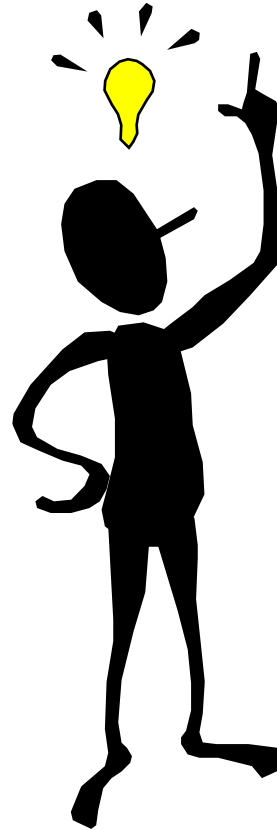
# Takeaways

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- 1. Communication structure, system and software architecture are mutually dependent for optimum outcome.**
- 2. Too many generations of architecture, in one company, slow down the speed.**
- 3. Conway's Law is more relevant than ever in the age of the cloud – Companies need to start modernization initiatives at the right level(s).**
- 4. Change at just a singular level (i.e., usually just the infrastructure level) leads to costs (communication overhead / frustration / slowness / blockages)**

# Questions? Ideas? Remarks?

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<https://clipart-library.com/clipart/614507.htm>