



## **Wolfram's zWelt** z/OS Expertenforum

18./19. Oktober in der  
Kartause Ittingen

■ Wolfram Greis

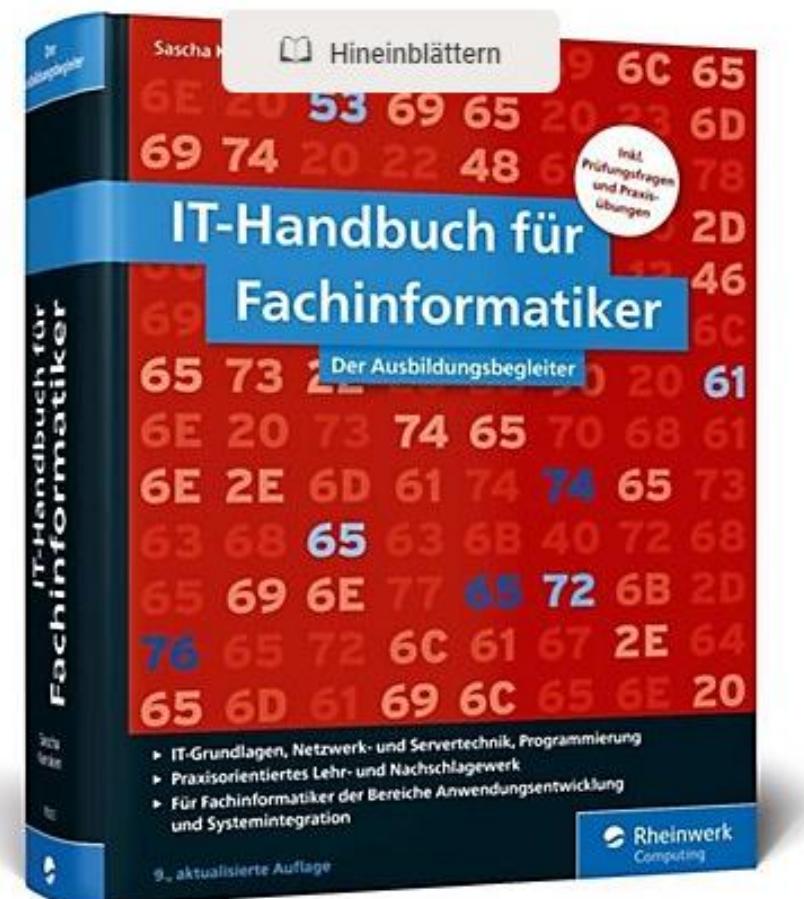
[www.mainframe-academy.de](http://www.mainframe-academy.de)

- Mainframe Consolidation
- New Technology on Mainframes
- Mainframe Modernization
- Ideen zu Reduktion des Fachkräftemangels

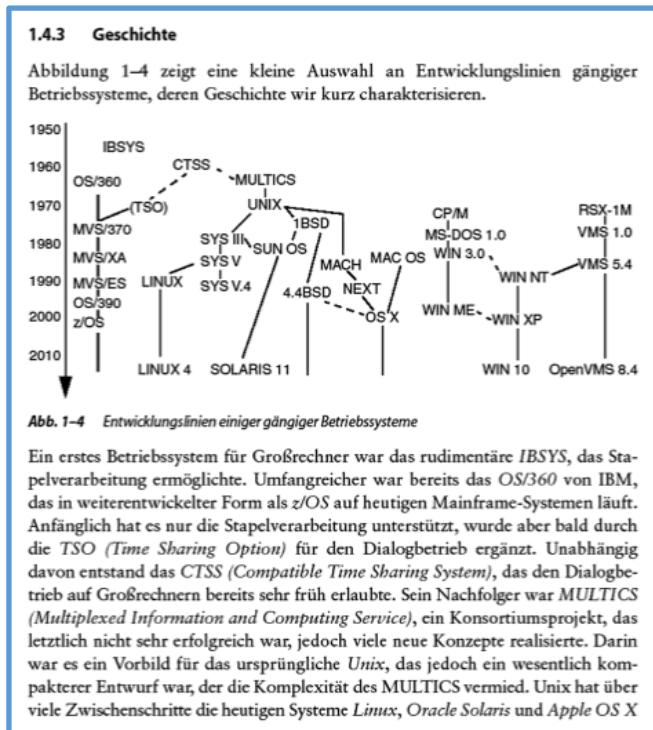
- „IT Handbuch für Fachinformatiker“ by Sascha Kersken  
9th Edition, 1379 Pages
- Just one sentence about Mainframes on page 42:

„Die Großrechner oder Mainframes – vor allem von IBM produziert – **bildeten** die Rechenzentren großer Behörden, Versicherungskonzerne und Universitäten.“

„Mainframes – mainly produced by IBM – **formed** the computing centers of big government organization, insurance companies and universities.“



- „Betriebssysteme“ by Eduard Glatz  
4th Edition, 723 Pages
- On just one page, Mainframes are mentioned:



# MAINFRAME CONSOLIDATION

# PART 1

# FINANCIAL SERVICES COMPANY IN SWITZERLAND

## RZ1



z9 with ~4000 MIPS



z9 with ~3300 MIPS



z990 with ~2300 MIPS



z900 with ~450 MIPS



z990 with ~3000 MIPS

## RZ2



z9 with ~5100 MIPS



z9 with ~5800 MIPS



z9 with ~6200 MIPS



z990 with ~4100 MIPS



z890 with ~490 MIPS



z990 with ~5800 MIPS

**Total ~13'000 MIPS, ~85 KW**

**Total ~28'000 MIPS, ~95 KW**

RZ1



**2817-M66-720**  
**+ 4 zIIPs**  
**+ 6 IFLs**

**39 CPs ~34'000 MIPS**



**2817-M66-719**  
**+ 4 zIIPs**

RZ2



**2817-M66-720**  
**+ 4 zIIPs**

**2817-M66-719**  
**+ 4 zIIPs**

**39 CPs ~34'000 MIPS**

**RZ1**



**3906-M04-744**

+ 11 zIIPs

+ 8 ICFs

**44 CPs ~50'000 MIPS ~30 KW**

**RZ2**



**3906-M04-740**

+ 11 zIIPs

+ 8 ICFs

**40 CPs ~46'000 MIPS ~30 KW**

- Infrastructure was consolidated down from 11 CECs to 2 CECs in **10 years**  
→ **Imagine the reduced floorspace!**
- Each z14 in 2018 has more capacity than **all the 11 CECs in 2007**
- **Floor space, energy consumption, etc.** was **considerably reduced**
- Power consumption has been reduced from 180 KW to 60 KW  
→ **1/3 power consumption vs. 2.3 x capacity**

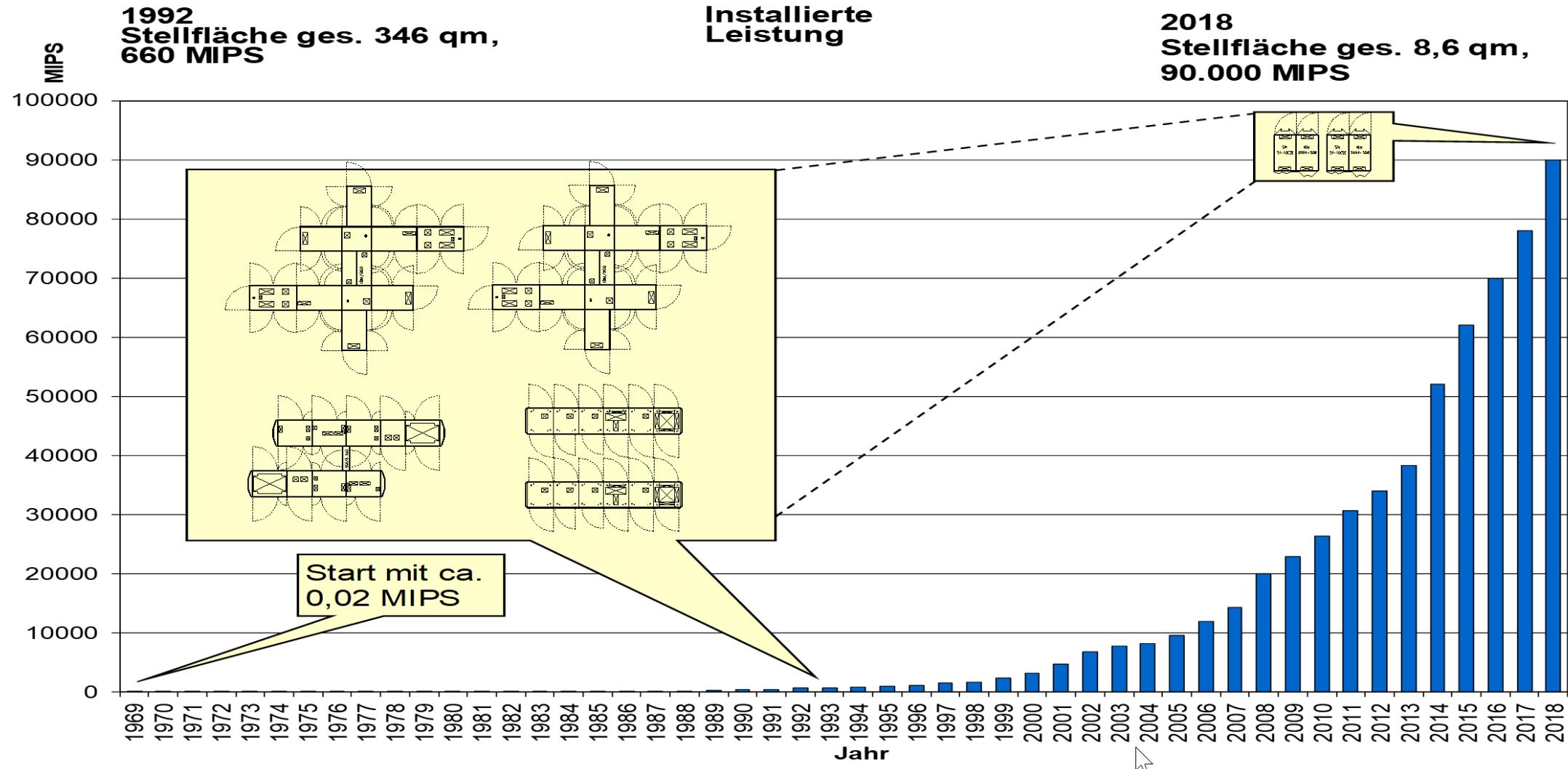


# PART 2

# IT SERVICES COMPANY IN GERMANY

# Capacity vs. Floor Space

IT Service Company in Germany



- Floor space reduced by factor 40
- Capacity increased by factor 136
- Energy consumption also considerably reduced

# PART 3

# DASD CAPACITY EXAMPLE

# IBM 3350 DASD Compared to a Memory Stick



## ■ IBM 3350

- Capacity: 317 MB per DASD drive
- 128 DASD drives  $\times$  317 MB = 40 GB
- Connected with copper cables!
- Max. distance = 120 m

$\times 50 =$



2 TB USB 3.0 Flash Drive  
Memory Stick

★★★★★ 2 Bewertungen



- ✓ 100% kostenloser Versand
- ✓ 14 Tage Rückgaberecht
- ✓ 100% Zufriedenheitsgarantie

### Optionen

#### FARBE:



€24,99  
**€16,99**

MENGE

- 1 +

IN DEN WARENKORB

JETZT KAUFEN



### Technologischer Durchbruch

Kioxia entwickelt 2 TByte große  
MicroSD-Karte

- DS8886
  - Up to 2 TB Cache
  - Up to 128 FICON 16 Gb Ports
  - Up to 4,32 PB
- Kaon Animation:  
<https://apps.kaonadn.net/4882011/index.html#C181>



$\times 86^{\prime}400 =$



# NEW TECHNOLOGIES ON MAINFRAMES

# OPEN MAINFRAME PROJECT DER LINUX SOFTWARE FOUNDATION

# Open Mainframe Project



4

years since  
launch

36

Supporting  
Organizations

9

Hosted Projects

36

Mentees  
Sponsored

100+

Students  
Impacted

200+

Project  
Contributors

AMC Academic Mainframe Consortium	ADP	Albany State University	ca technologies A Broadcom Company	CANONICAL	hochschule coburg university of applied sciences	docker	East Carolina UNIVERSITY	EPSI L'École d'ingénierie informatique	European Mainframe Academy	GSE GUIDE SHARE EUROPE
Guide Share Europe - UK Region	GT Software	htl donaustadt	IBM	GOETHE UNIVERSITÄT FRANKFURT AM MAIN	MARIST COLLEGE NEW YORK	North Carolina A & T State University	PHOENIX Software International	Rocket	SHARE EDUCATE • NETWORK • INFLUENCE	SINE NOMINE ASSOCIATES
SUSE	syncsort	University of Bedfordshire	University of Washington	UNIVERSITY OF WOLVERHAMPTON	UNIVERSITÄT LEIPZIG	VICOM Infinity	VCU	Western UNIVERSITY - CANADA	WILLIAM PATERSON UNIVERSITY	Zoss Team LLC

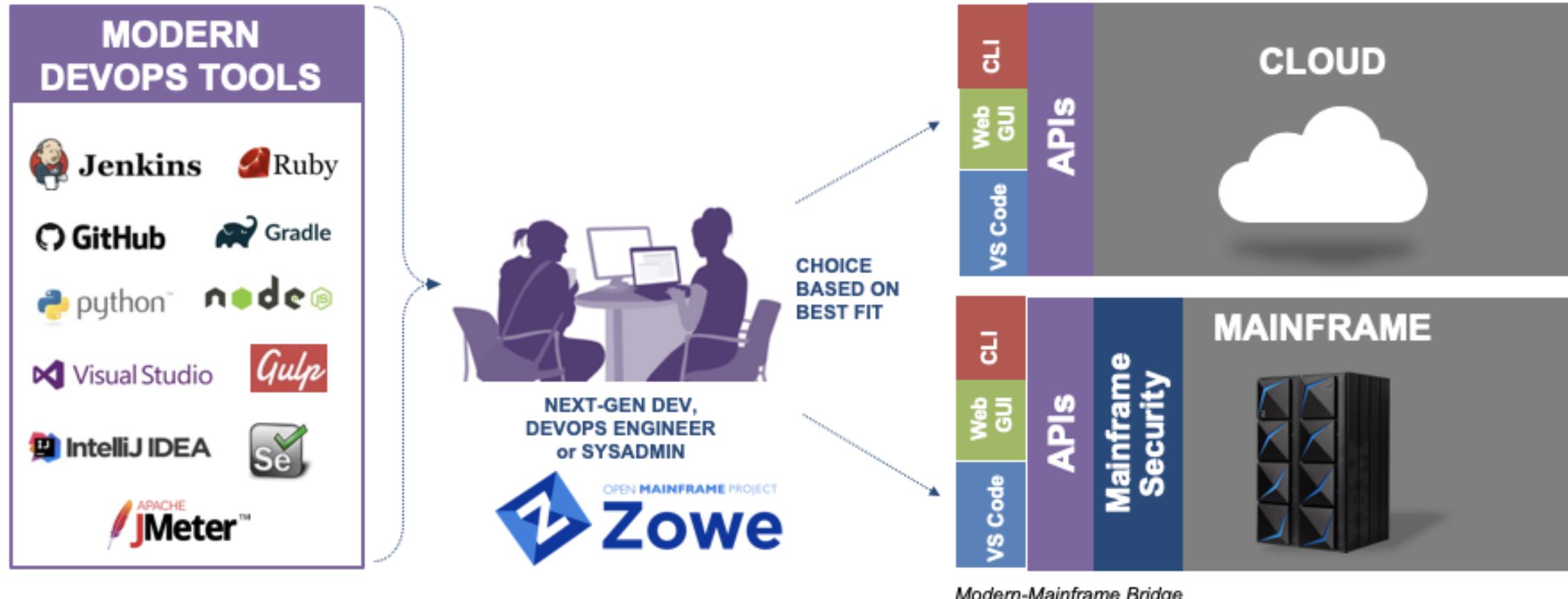
# Mainframe-centric projects hosted



OPEN MAINFRAME PROJECT  
**ATOM**  
Language Syntax  
Highlighting for z/VM



Learn about all Open Mainframe projects at <https://www.openmainframeproject.org/projects>



# ... unser System in Leipzig



## Installing IBM Open Enterprise Python 3.8 for z/OS

Petr Plavjaník [Follow](#)

Jul 20, 2020 · 5 min read

[Twitter](#) [LinkedIn](#) [Facebook](#) [Read more](#) ...

Python has been popular for a long time, and in the last few years, its popularity reached the top level. It is typically used for web application development, automation, data analysis, and machine learning. It can run well on mainframes and z/OS for a few last years and we will see more Python on z/OS in the future.

This story provides instructions on how to install IBM Python to z/OS and how to use it.

<https://levelup.gitconnected.com/installing-ibm-open-enterprise-python-3-8-for-z-os-dbe4e701be47>

The screenshot shows a Visual Studio Code window with the following details:

- File Bar:** File, Edit, Selection, View, Go, Run, Terminal, Help
- Title Bar:** UWGR.TEST.COBOL(HELLO).cbl - EMA - Visual Studio Code
- Left Sidebar:** Shows a ZOWE icon and sections for DATA SETS and JOBS.
- DATA SETS:** Contains entries for UWGR.TASID.SNAPSHOT, UWGR.TEST.ASM, UWGR.TEST.C, UWGR.TEST.CLIST, UWGR.TEST.CNTL, and UWGR.TEST.COBOL, which contains EMA001 and HELLO.
- JOBS:** Contains entries for Favorites, EMA, and M003500.
- Code Editor:** Displays the COBOL source code for a program named HELLO. The code includes:
 

```

1 000100 ID DIVISION.
2 000200 PROGRAM-ID. HELLO.
3 000300 PROCEDURE DIVISION.
4 000400 DISPLAY "HELLO MAINFRAME FROM EMA EDUCATION".
5 000500 STOP RUN.
6
      
```
- Bottom Status Bar:** Ln 1, Col 1, Spaces: 3, UTF-8, CRLF, COBOL, a refresh icon, and a search icon.

```

UWGR:/u/uwgr:>git --version
git version 2.14.4_zos_b09
UWGR:/u/uwgr:>
    
```

# WHAT IS ZOWE?

# What is Zowe?



- Zowe is an integrated and extensible **open-source framework** for connecting applications and tools to z/OS mainframe data and applications.
- Its aim is to **make the mainframe z/OS environment an agile platform** within the changing IT architectural landscape.
- Zowe comes with a **set of APIs and OS capabilities** that applications build on and includes some applications out of the box.
- Zowe offers **modern interfaces** to interact with z/OS and allows you to work with z/OS in a way that is like what you experience on cloud platforms today.
- You can use these interfaces as delivered or through plug-ins and extensions that are created by clients or third-party vendors.
- A typical example is to connect the **VSCode IDE** to z/OS and access mainframe data via a graphical user interface that is known by every student with a background in informatics.

- Zowe **reduces the time to on-board new developers and system programmers** working on the mainframe.
- Zowe makes interacting with the mainframe **look and feel like any modern cloud or desktop platform**.
- Zowe improves responsiveness to Line of Business requests and time to market by **simplifying tasks and interactions**.

## ■ Zowe Application Framework

- A web user interface (UI) that provides a virtual desktop containing apps allowing access to z/OS functions.

## ■ API Mediation Layer

- Provides a gateway that acts as a central access point for z/OS services, together with a catalog of REST APIs and a dynamic discovery capability.

## ■ Zowe CLI

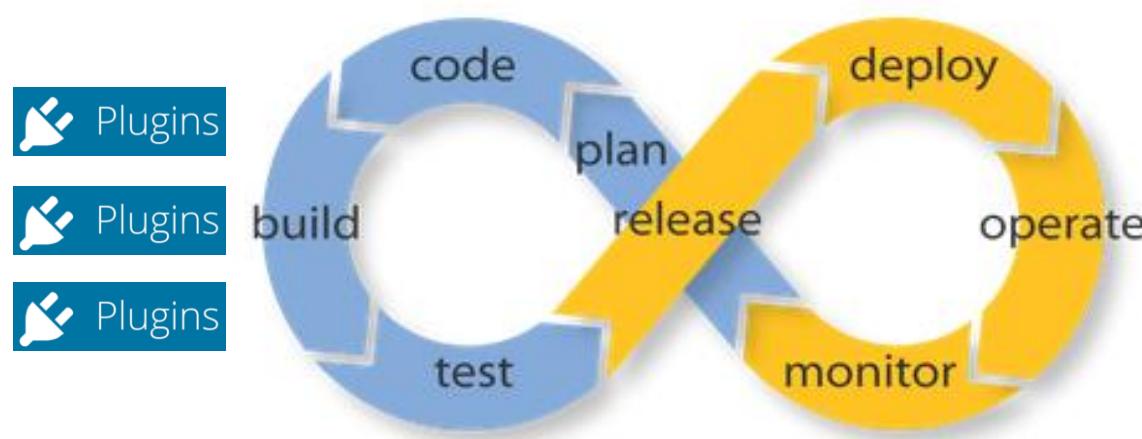
- Provides a command-line interface that lets you interact with the mainframe remotely and use common tools such as Integrated Development Environments (IDEs), shell commands, bash scripts, and build tools for mainframe development.

## ■ Zowe Explorer

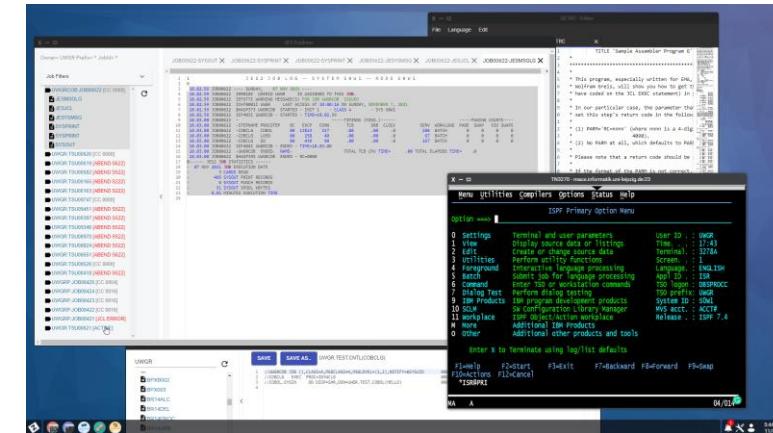
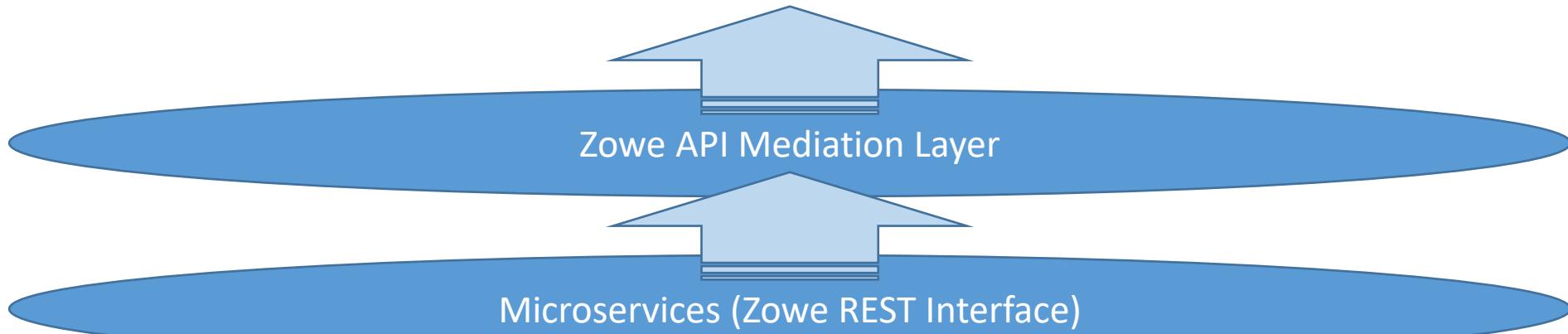
- Visual Studio Code extension that modernizes the way developers and system administrators interact with z/OS mainframes.

## ■ Zowe Client SDK (under development)

# Core Zowe Framework



Zowe CLI



Zowe Web UI

- API Catalog
  - User Interface Catalog of available APIs with their OpenAPI doc and service status.
- API Gateway
  - Single point of entry to an ecosystem of microservices.
- Directory Services
  - Discover APIs across many applications. Repository of services.
- ESM (External Security Manager) Microservice
  - Authenticate and authorize API users with mainframe credentials.

# **NEW TECHNOLOGIES ON MAINFRAMES**

**→ ANSIBLE FOR AUTOMATION**

# What is Ansible?



- History
  - Originally written by Michael DeHaan in 2012
  - Acquired by Red Hat in 2015
  - IBM took over Red Hat in 2019
- Ansible is open-source software and is used for
  - Provisioning
  - Configuration Management
  - Application Deployment
  - Tagline:  
*„Turn tough tasks into repeatable playbooks.“*
- Turns z/OS into an **enterprise automation environment** in a consistent way
- Onboarding systems programmers, DBAs and developers is much easier
- Implement **Infrastructure as Code (IaC)**



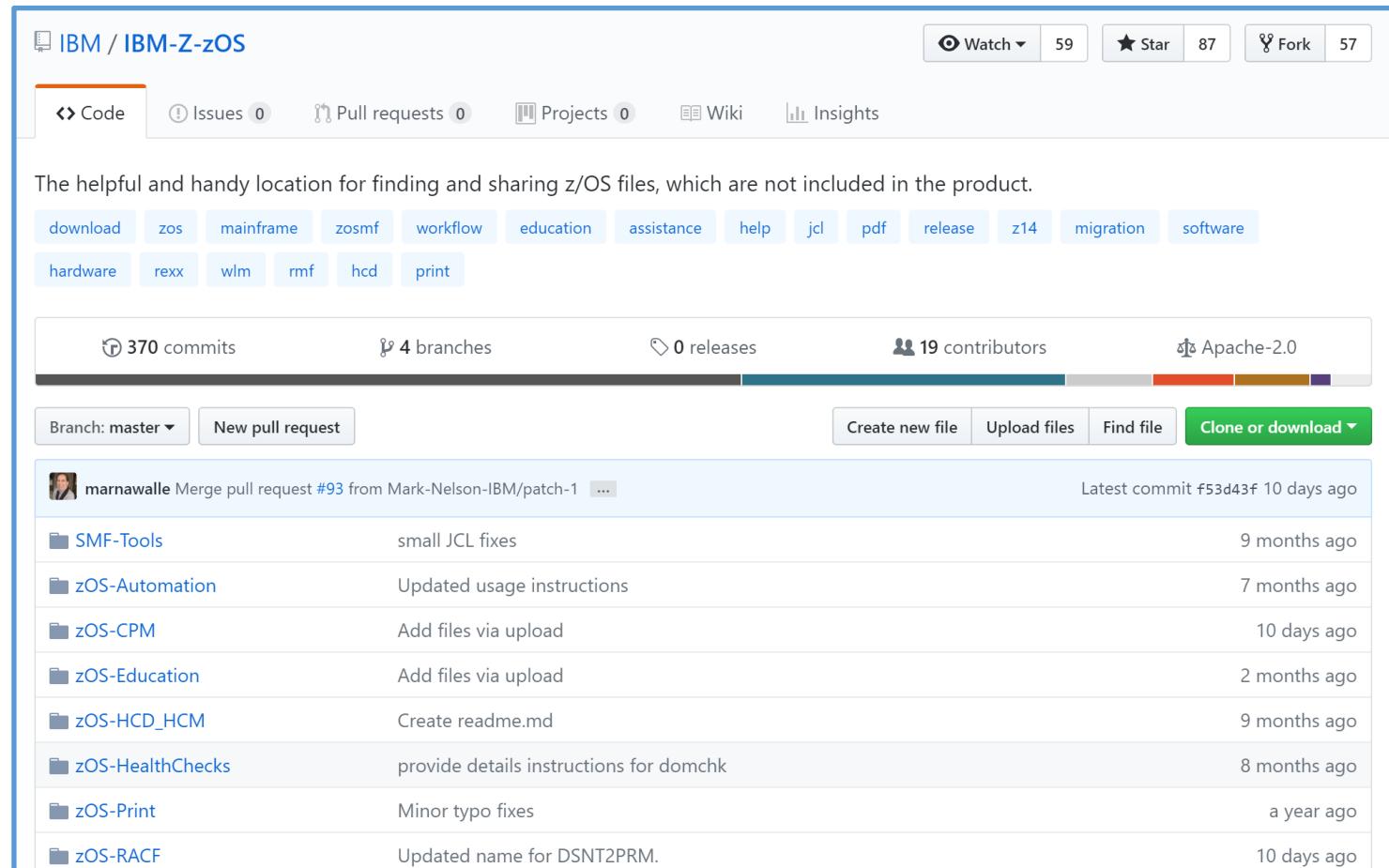
- The **Ansible for IBM Z collection** contains a **powerful set of playbooks and modules** that allow users to **automate common z/OS tasks**.
- There are also **dedicated collections and samples** for different products, subsystems, and middleware such as Db2, IMS and CICS.
- By sharing the **same automation strategy as the rest of the enterprise**, users can unlock opportunities for **collaboration and integration**.
- Ansible's flexibility permits the reuse of their existing automation—triggering system automation, z/OSMF workflows, JCL, etc.—or adaptations to specific Ansible tasks.

- Installing Ansible for IBM Z has some prerequisites:
  - Unix System Services (USS)
  - Secure Shell (SSH) enabled on z/OS
  - Python
  - Z Open Automation Utilities (ZOAU)
  - Install Ansible
  - Install the desired Ansible for z/OS collection from Ansible Galaxy
- Because Ansible runs on Linux and Windows, finding people who are familiar with it shouldn't be a problem for mainframe sites, especially where there is a shortage of mainframe-specific expertise.
- The ability of Ansible to not only automate the usual tasks, but also provision infrastructure as code, is what attracts IMS, CICS, and Db2 specialists, as well as ordinary z/OS systems programmers.

# NEW TECHNOLOGIES ON MAINFRAMES

→ GIT AND GITHUB

- Code management and distribution
- git and github becoming standard
- More and more resources available
- From IBM and other sources
- <https://github.com/IBM/IBM-Z-zOS/>



The screenshot shows the GitHub repository page for `IBM / IBM-Z-zOS`. The page includes navigation tabs for Code, Issues (0), Pull requests (0), Projects (0), Wiki, and Insights. It displays statistics: 370 commits, 4 branches, 0 releases, 19 contributors, and Apache-2.0 licensing. A pull request button and file manipulation buttons (Create new file, Upload files, Find file, Clone or download) are also present. The commit history lists several contributions from `marnawalle`, including merge pull requests and updates to various tools like SMF-Tools, zOS-Automation, and zOS-Print.

Commit Details	Date
marnawalle Merge pull request #93 from Mark-Nelson-IBM/patch-1 ...	Latest commit f53d43f 10 days ago
SMF-Tools small JCL fixes	9 months ago
zOS-Automation Updated usage instructions	7 months ago
zOS-CPM Add files via upload	10 days ago
zOS-Education Add files via upload	2 months ago
zOS-HCD_HCM Create readme.md	9 months ago
zOS-HealthChecks provide details instructions for domchk	8 months ago
zOS-Print Minor typo fixes	a year ago
zOS-RACF Updated name for DSNT2PRM.	10 days ago

# Walmart zUID / zFAM / zECS



<https://github.com/walmart>

The screenshot shows the GitHub search results for the query 'z\*'. It displays three repositories:

- zUID**: z/OS-based Unique Identifier generator. Assembly, 10 stars, 15 forks, Apache-2.0 license, updated on Dec 17, 2018.
- zFAM**: z/OS-based File. Assembly, 1 star.
- zECS**: z/OS-based Enterprise Cache Service. COBOL, 7 stars.

The 'zECS' repository page is highlighted with a blue box and has a blue arrow pointing from the GitHub search bar above. The repository details include 20 commits, 1 branch, 0 releases, 5 contributors, and Apache-2.0 license. The commit history shows several initial commits and updates to README files.

The screenshot shows the GitHub organization page for Walmart Labs. It features a lightning bolt icon and the text 'Walmart Labs' with 'Distributed' status. It includes links to 'Repositories' (183) and 'People' (13). The 'Pinned repositories' section lists three projects:

- electrode**: Electrode - Application Platform on React/Node.js powering Walmart.com. Clojure, 379 stars, 24 forks, Apache-2.0 license.
- lacinia**: GraphQL implementation in pure Clojure. Clojure, 1.1k stars, 89 forks, Apache-2.0 license.
- concord**: Concord - workflow orchestration and continuous deployment management. Java, 27 stars, 5 forks, Apache-2.0 license.

The GitHub search bar, 'Type: All' dropdown, and 'Language: All' dropdown are also visible at the bottom of the page.

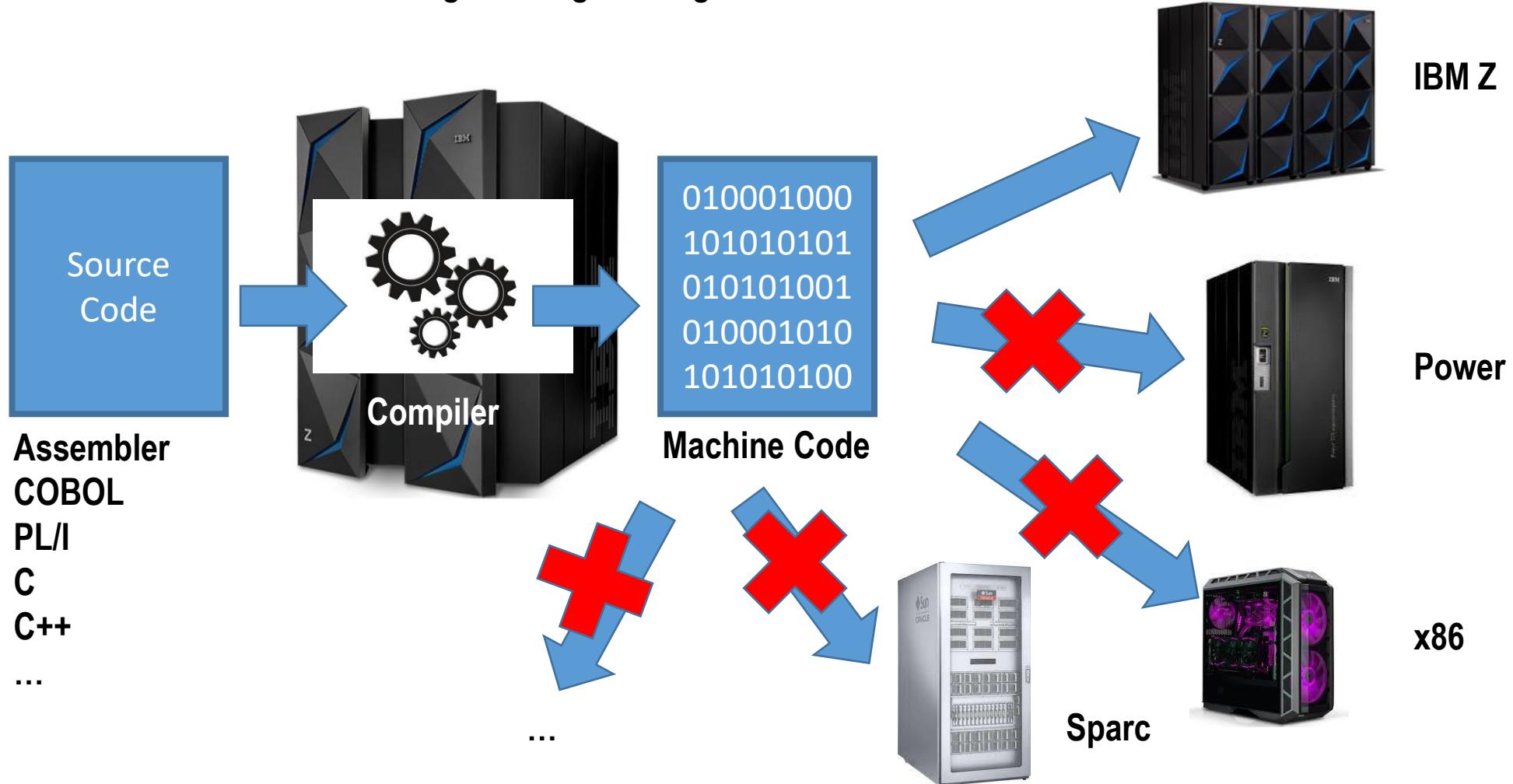
# MAINFRAME MODERNIZATION

# JAVA vs. COBOL

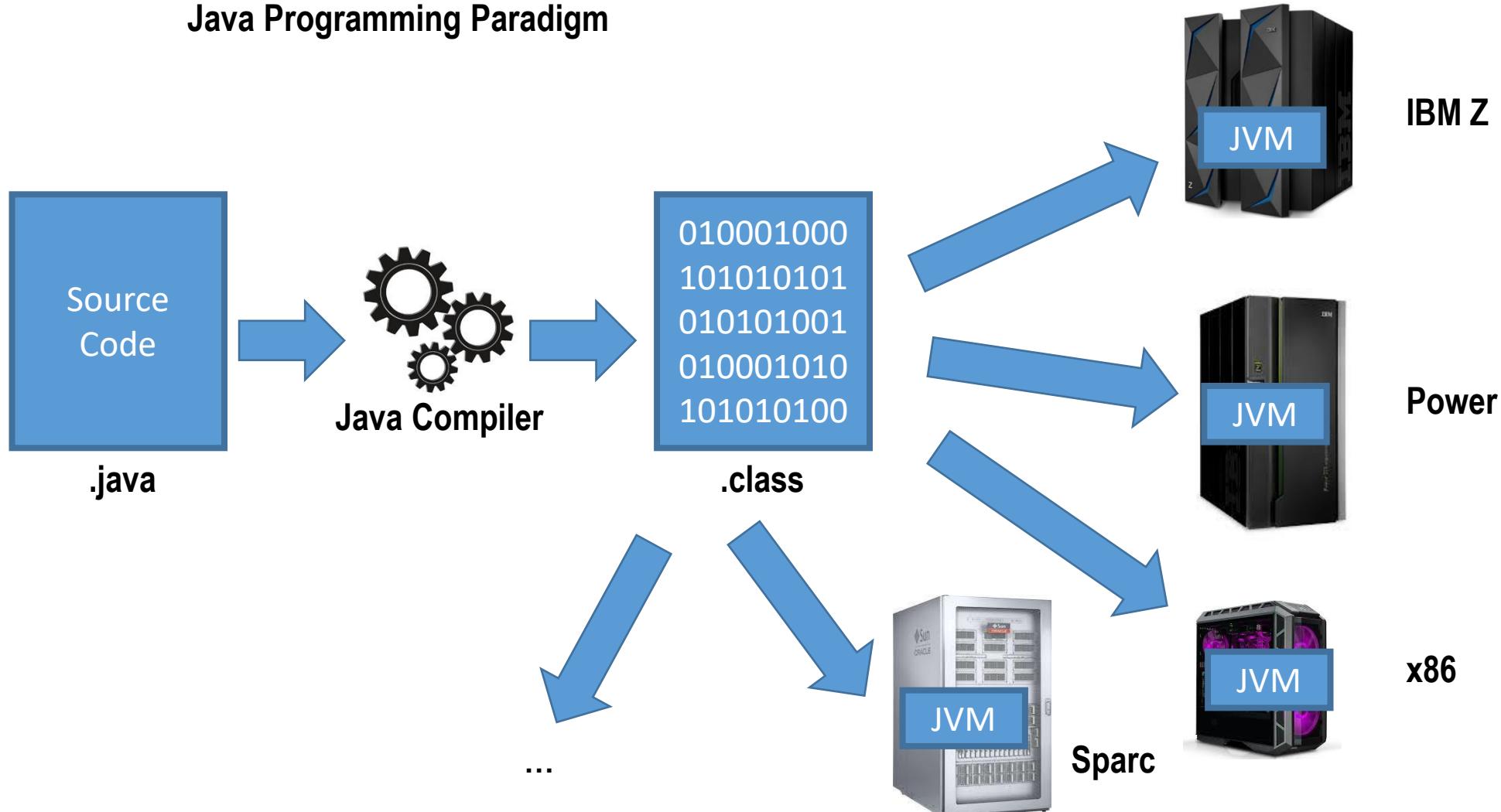
- Java – more than a programming language
- Java SDK and Java RE (Runtime Environment)
- JRE is not just for Java → Kotlin, Clojure, NetREXX, ...  
JVM is a general-purpose and language-agnostic environment for running programs
- Java Language Specification (JLS) vs. JVM Specification (VMSpec)
- Java ME / SE / EE
- Applets vs Servlets

→ Java is a Platform

## Conventional Programming Paradigm



## Java Programming Paradigm

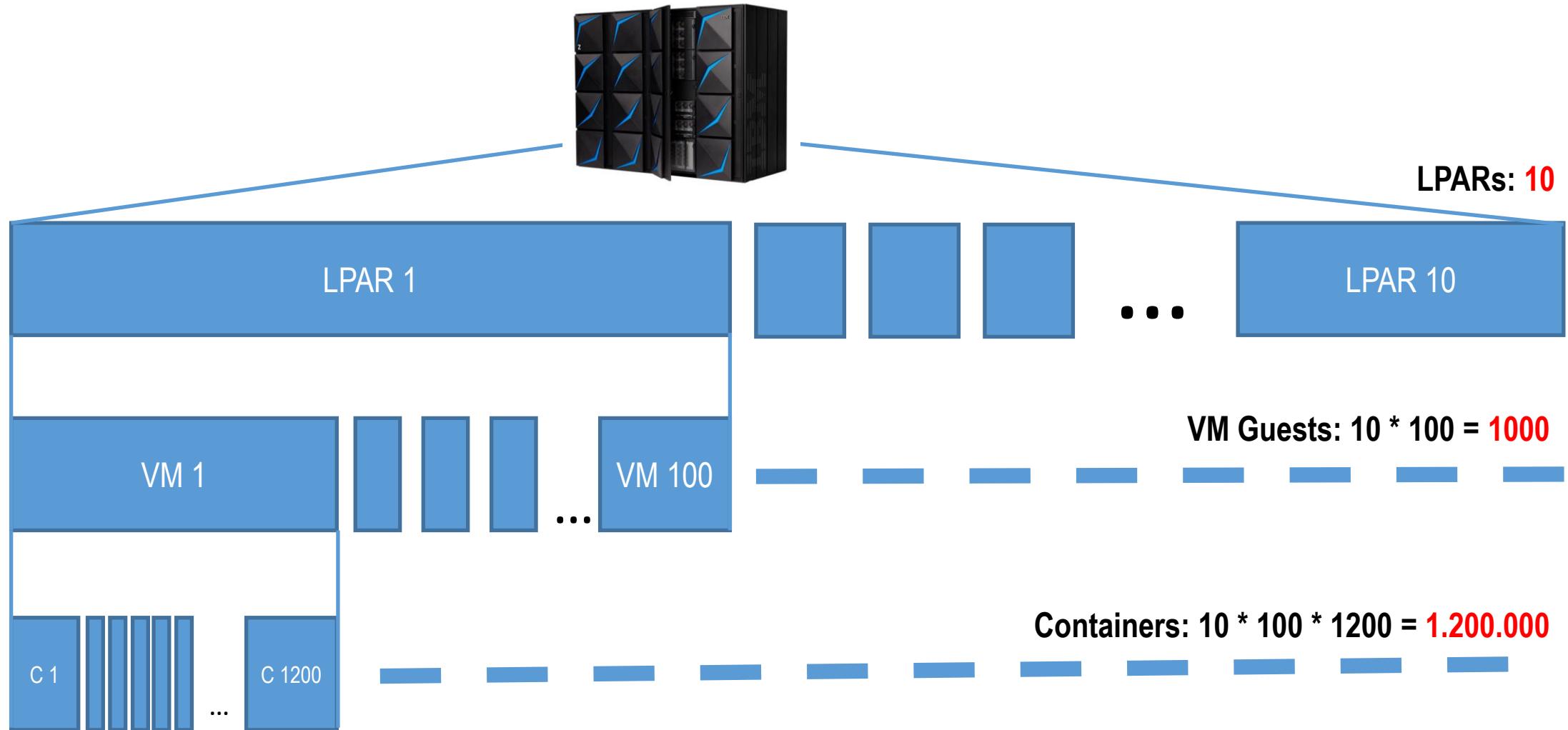


# **NEW TECHNOLOGIES ON MAINFRAMES**

**→ MICRO SERVICES & DOCKER**

# CONTAINER ON MAINFRAMES

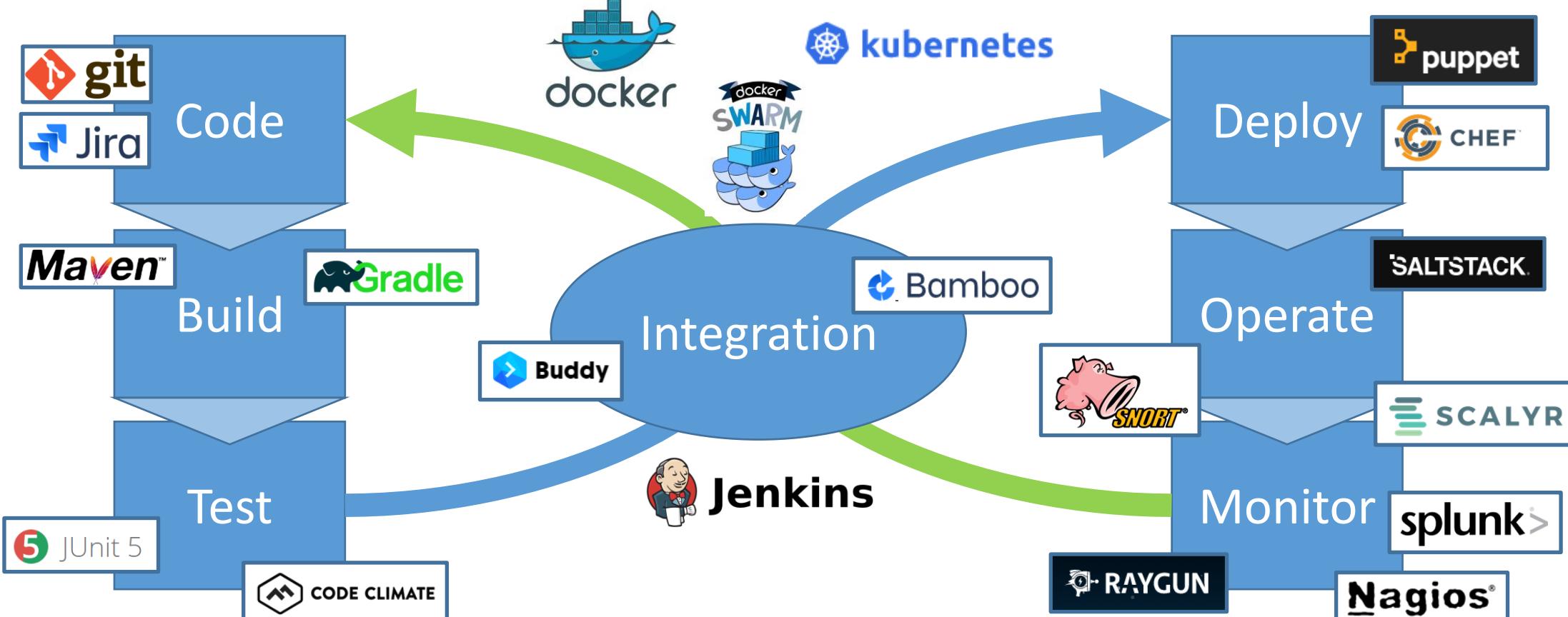
# Virtualization Granularity / Scalability



# **zCX – DOCKER IN A Z/OS ENVIRONMENT**

- zCX provides a complete Linux on Z operating system as part of z/OS.
- zCX runs as a started task and contains both a full Linux system and Docker (a portable software packaging and execution environment).
- zCX is a virtual appliance that requires minimal involvement after set up.
- z/OS V2.4 provides this virtual Linux appliance as part of the OS.
- The version of Linux that comes with zCX is Ubuntu.
- It's set up to expose Docker-based functionality.
- And the benefit is that z/OS can run Linux code that has an affinity for z/OS data or applications.
- Any management the zCX server does need can be simplified by using z/OSMF workflows.

# SOFTWARE DEVELOPMENT LIFE CYCLE (SDLC) & TOOLS



# IDEEN ZUR REDUZIERUNG DES FACHKRÄFTEMANGELS

Im Jahr 2021 konnten in Deutschland 96'000 Stellen für IT-Fachkräfte nicht besetzt werden.

Es mangelt massiv an IT-Fachpersonal.

Zwei Drittel der Befragten erwarten, dass sich der Fachkräftemangel weiter verschärfen wird.

**Gründe:** Voranschreitende Digitalisierung und demografische Wandel

Quelle: Bitcom, Repräsentative Umfrage unter 850 Unternehmen.

Der Stifterverband und McKinsey kommen in einer gemeinsamen Studie zu dem Ergebnis, dass bis zum Jahr 2026 in Deutschland bis zu 780.000 Technologie-Expertinnen und -Experten fehlen könnten. Zwei Drittel der Befragten erwarten, dass sich der Fachkräftemangel weiter verschärfen wird.

Die Boston Consulting Group geht 2030 von rund 1,1 Millionen fehlenden IT-Fachkräfte aus. Neue digitale Geschäftsmodelle, die Digitalisierung der Verwaltung oder die steigende Homeoffice-Nutzung treiben den Bedarf an IT-Arbeitskräften hoch. Trifft diese Prognose zu, würde sich die IT-Fachkräftelücke im Vergleich zu heute **verzehnfachen**.

Die **Vakanzkosten**, das sind die Kosten, die ein Unternehmen aufbringen muss, bis die Stelle wieder besetzt ist, liegen in Deutschland für einen IT-Job bei **37.301 Euro** für die Besetzung einer einzigen Stelle.

Quelle: Stepstone

Laut der Bundesagentur für Arbeit dauerte es im Mai dieses Jahres **134 Tage**, bis eine offene Stelle mit neuem Personal besetzt war.

Quelle: Bundesagentur für Arbeit

# Ideen zur Reduzierung des Fachkräftemangels

## Part 1 - Powercoders

# Modell der "Powercoders" in der Schweiz



- Mehr als 100 Millionen Flüchtlinge weltweit. Millionen vakanter IT Jobs.

Zwei Probleme, eine Lösung:

„Geben wir den Flüchtlingen und uns eine Chance!“

The screenshot shows a group of four people (three men and one woman) working together on a computer screen. One man in the foreground is pointing at the screen. The website header reads '{POWER.CODERS}' and has links for Participants, Companies, Volunteers, About, Press, and DONATE. A banner below the image states 'Impacting Lives by Teaching Digital Skills' and 'OUR PROGRAM'. At the bottom, a red banner contains the text 'Over 100 million refugees in the world. Millions of vacant IT jobs due to digitalization.' and 'Two problems, one solution: Empowering refugees & migrants for an IT career'.



Bettina Hirsig, CEO

# **Ideen zur Reduzierung des Fachkräftemangels**

## **PART 2 – ACADEMIC MAINFRAME CONSORTIUM**



# **ACADEMIC MAINFRAME CONSORTIUM E.V. DER VEREIN**

- Koordination der Mainframe-Aktivitäten an akademischen Einrichtungen
- „Erbe“ von Professor Spruth antreten und die Aktivitäten im Mainframe-Umfeld in seinem Sinne fortführen
- Aufgaben, die sich der Verein gestellt hat
  - Mainframes bekannter machen für Nachwuchs
  - Austausch und Sharing von Unterrichtsmaterial
  - Infrastrukturen (LMS, Rechner, ...)
  - Operativen Betrieb sichern
  - Zusammenarbeit mit der Industrie fördern
  - Zusammenarbeit mit IBM (und Academic Initiative weltweit)
  - Forschung / Entwicklung fördern
  - Internationale Zusammenarbeit
  - Presse / Medienarbeit

# Vorstand Academic Mainframe Consortium e.V.



**Vorstand bei der Vereinsgründung 2017**



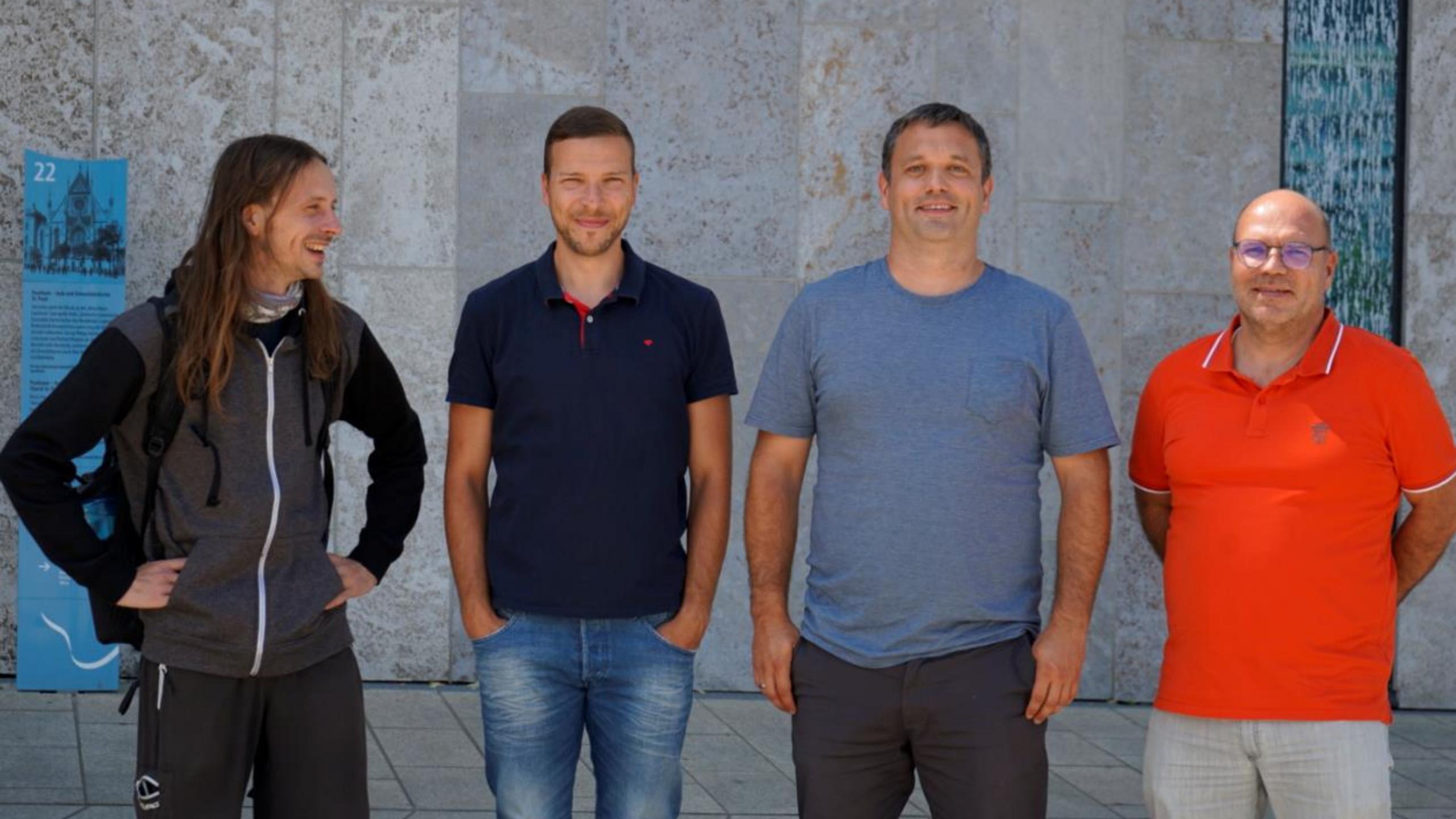
**Aktueller Vorstand v.l.n.r.:**

- Prof. Dr. Martin Bogan, Uni Leipzig
- Prof. Dr. Udo Kebschull, Uni Frankfurt
- Gerhard Hauser, Rentner, ehem. Atruvia
- Prof Dr. Philipp Brune, Hochschule Neu-Ulm
- Dr. Ernst Lugert, Rentner, ehem. Datev
- Wolfram Greis, European Mainframe Academy

# **ACADEMIC MAINFRAME CONSORTIUM E.V.**

## **AKTUELLE HARDWARE**

- Das AMC bekam eine zEC12 und eine zBC12 von T-Systems geschenkt
  - zEC12 ersetzte eine z114 (von der Fiducia & GAD) an der Uni Leipzig
  - zBC12 ersetzte eine zBC12 an der Uni Frankfurt
  - Eine weitere z114 (von der Fiducia & GAD) läuft noch an der Uni Tübingen
- Plattensubsysteme DS8K vom IBM Labor in Böblingen und von der Datev sind weiterhin im Einsatz bzw. konnten nach einigen Schwierigkeiten an der Uni Tübingen zwischenzeitlich zum Laufen gebracht werden.
- Die Unterstützung der IBM inkl. dem persönlichen Einsatz zahlreicher Spezialisten ist herausragend!
- Wir sind gerade dabei, zwei weitere Plattensubsysteme von der Stuttgarter Versicherung zu übernehmen.



# DS8K an der Uni Tübingen

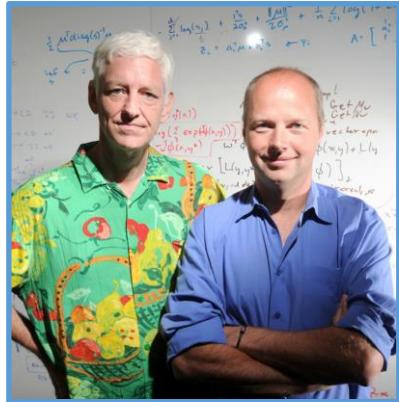


Fotos: © Martin Lang, Uni Tübingen

# **ACADEMIC MAINFRAME CONSORTIUM E.V.**

## **ERSTER MAINFRAME MOOC IN 2017/2018**

# What is a MOOC? First German Mainframe MOOC



- Ivy leage University
- Every 20th applicant is accepted
- Tuition fee up to \$50'0000 / year

- "Salman Khan is one of my heroes" (Thrun)
- 2012: AI lecture placed on internet
- 160'000 subscriptions



Mainframes

Prof. Dr. Andreas Polze

26. 5. Juni 2017 - 17. Juli 2017

Deutsch

Qualifiziertes Zertifikat / ECTS

Kaum jemand kennt sie. Und dennoch hat man täglich mit ihnen zu tun. Wer an einem Bankautomaten Geld

Kursdetails zeigen

► Für den Kurs einschreiben

M assive O pen O nline C ourse



TED Talk 2011: Let's use videos to reinvent education



Hasso  
Plattner  
Institut



fit for mainframe



Academic  
Mainframe  
Consortium

- First German Mainframe MOOC
- June/July 2017 (6 weeks)
- > 9000 subscriptions
- Still available as archived material
- Very positive feedback
- 2018 in English!

[Link zu OpenHPI](#)

Mainframes Wolfram Greis, Prof. Dr. Philipp Brune, Prof. Dr. Andreas Polze

Kursadministration ▾

<https://open.hpi.de/course/mainframes2017>

The screenshot shows a video player interface for a MOOC. On the left, two men are seated at a desk; the man on the right is wearing a suit and tie. The video player controls at the bottom include a play button, a progress bar showing 0:00 / 9:16, a 1.0x speed button, an HD button, a volume icon, and a full-screen icon.

**8'891 Enrollments!**

Course details:

- Duration: 26 weeks
- Start Date: Montag, 05. Juni 2017, 08:00 Uhr (UTC)
- End Date: Donnerstag, 27. Juli 2017, 20:00 Uhr (UTC)
- Language: Deutsch
- Note: Die Buchung eines Qualifizierten Zertifikats ist nicht mehr möglich.

Navigation buttons at the bottom:

- Zum Kurs
- Kursteilnahme beenden
- Qualifiziertes Zertifikat buchen

... Für mich war der Mainframe immer eine alte und verstaubte Black Box. Nicht nur mein Bild über den Mainframe hat sich geändert, sondern ich habe auch viele Informationen vom, im und um den Mainframe mitgenommen. Nach diesem MOOC kann ich sagen, dass dieser **definitiv keine alte und verstaubte Black Box** ist. Dieser ist viel aktueller und leistungsfähiger den je...und die Entwicklung geht weiter. Also: DANKE! Ich freue mich auf eine Fortführung!

Andre auf openHPI

# **ACADEMIC MAINFRAME CONSORTIUM E.V.**

## **SUMMERCAMP & YOUNG TALENTS MAINFRAME COMMUNITY**

## ■ 1. AMC Summercamp 2019 im IBM Labor in Böblingen



# YTMC

# YOUNG TALENTS MAINFRAME COMMUNITY

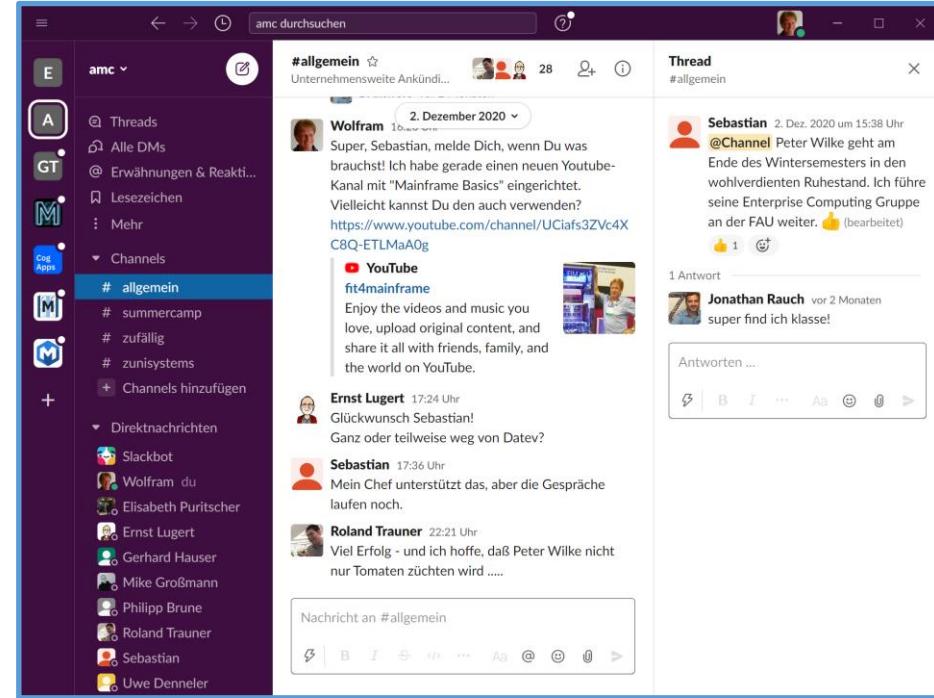
# Neue Community unter dem Dach des AMC



- Es geht um Austausch und Kommunikation → nicht nur für Nachwuchs!
- Jeden dritten Donnerstag im Monat ab 18:30 Uhr
- Spannende Diskussionen
- Bei Interesse bitte über unsere AMC Homepage melden!

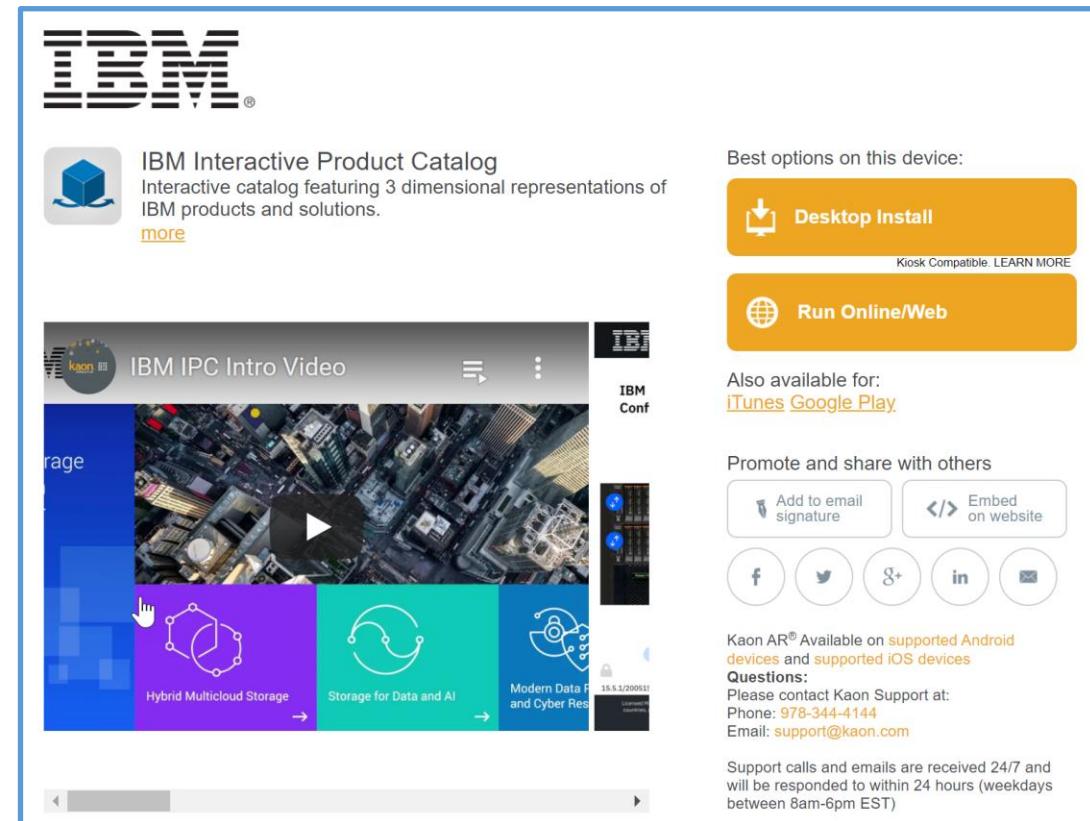
# Kommunikation mit Slack

- Slack Workspace
- ... offen für alle Mitglieder und Interessenten
- amc-ev.slack.com

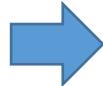


# IBM Interactive Product Catalog

- Interactive catalog featuring 3 dimensional representations of IBM products and solutions.
- <http://m.kaon.com/c/b>
- Animation / Demo
  - Server
  - Storage
  - Network
  - Solutions
- View In Browser or ...
- for Download
  - Windows
  - Android
  - iOS



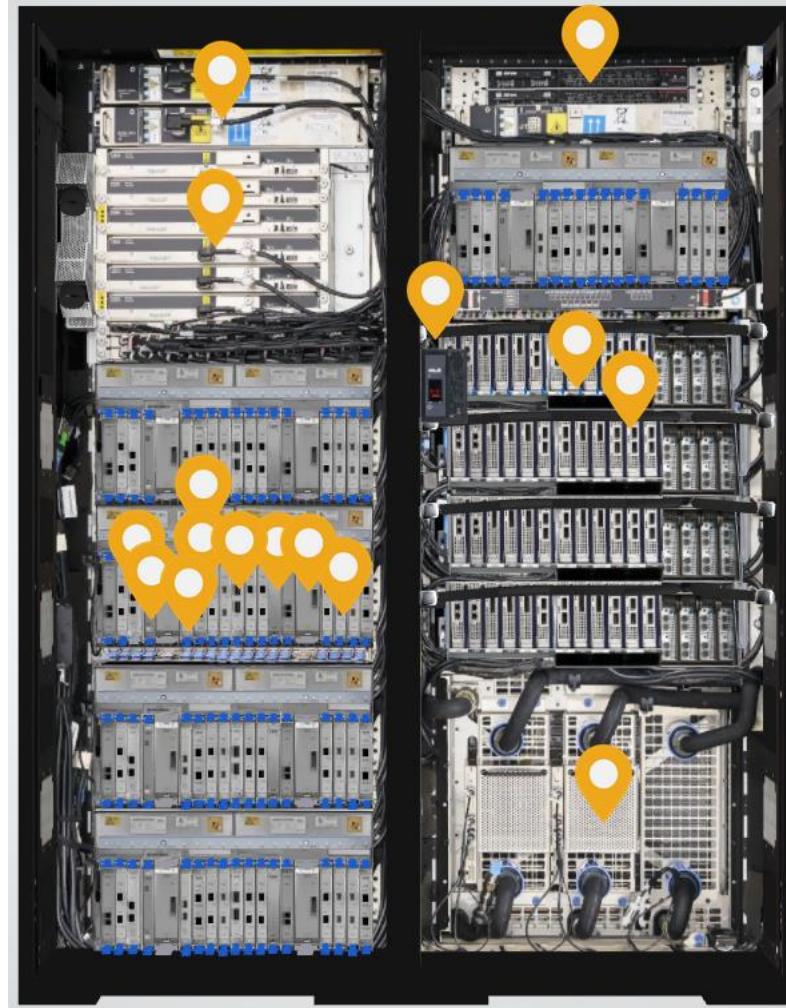
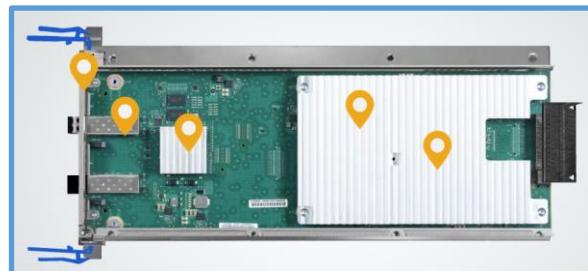
# IBM Interactive Product Catalog (Screenshots)



Systems and Servers >

Storage, SDI and Networking >

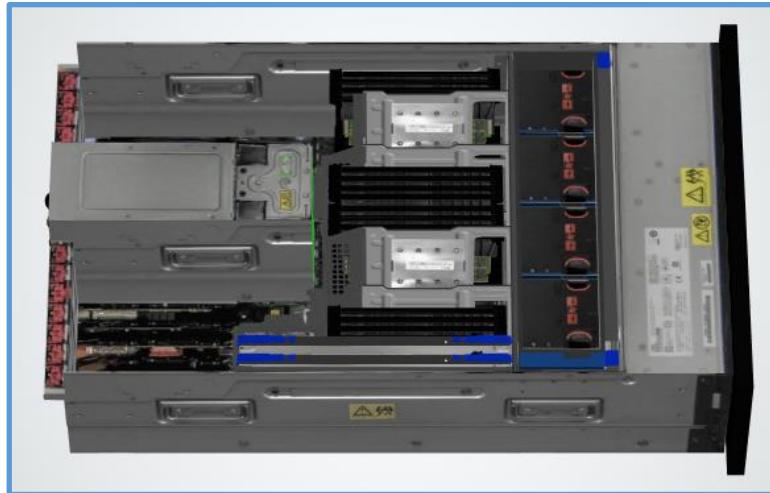
Solutions >



e.g. z14

Markers can be switched on/off  
Many animation features

# IBM Interactive Product Catalog (Screenshots)



# MAINFRAMES IN DER PRESSE

- [\*\*Mainframes: Exzellente Chancen für Linux-Admins, aber Manager müssen umdenken\*\*](#)  
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- [\*\*Moderne Mainframe-Anwendungen: Frische Köpfe statt neuer Technik\*\*](#)  
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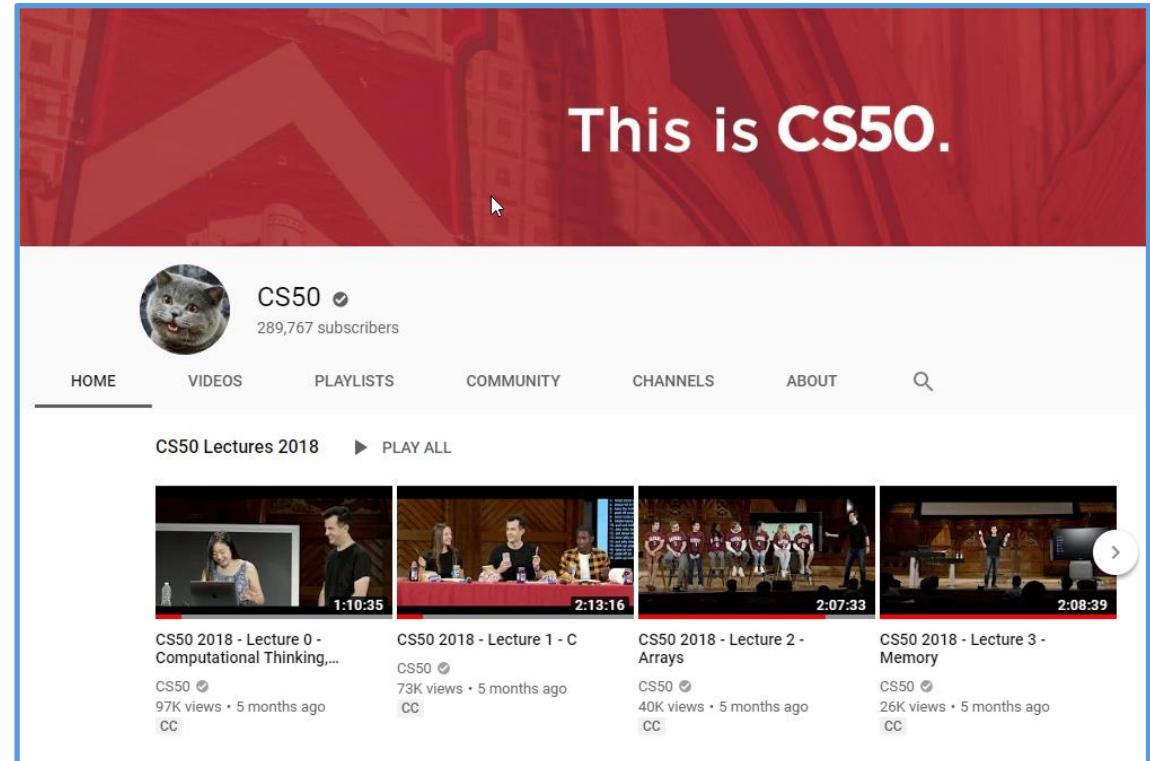


# YouTube Channels

- Harvard University CS50
- Strongly recommended!  
Introduction to computer science
- Prof. David J. Malan
- You can take this course on edX



David J. Malan

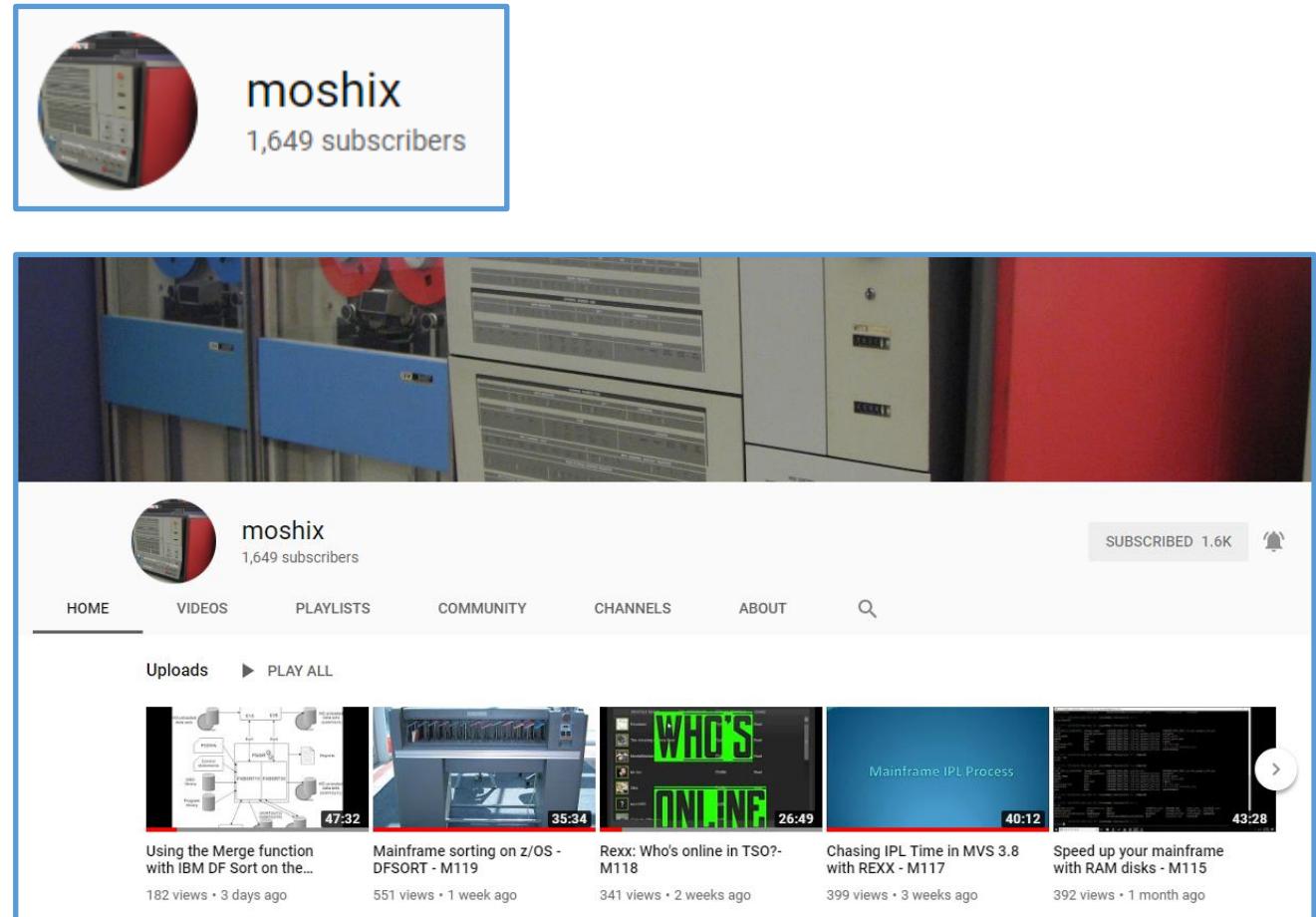


The screenshot shows the YouTube channel page for CS50. The channel has 289,767 subscribers. The 'HOME' tab is selected, showing four video thumbnails for lectures from 2018:

- CS50 2018 - Lecture 0 - Computational Thinking... (1:10:35)
- CS50 2018 - Lecture 1 - C (2:13:16)
- CS50 2018 - Lecture 2 - Arrays (2:07:33)
- CS50 2018 - Lecture 3 - Memory (2:08:39)

Each video thumbnail includes the title, duration, number of views (e.g., 97K views), upload date (5 months ago), and closed captioning (CC) icon.

- <https://www.youtube.com/user/moshe5760>
- Mainframe General Topics
- Operating Systems
- Virtualization Techniques
- Programming Languages on IBM Z  
(REXX; COBOL, PL/I, Assembler...)
- Hercules
- Vintage / History



The screenshot shows the homepage of the TechWorld with Nana YouTube channel. At the top, there's a navigation bar with links to HOME, DevOps Bootcamp, CKA Course, Courses, Community, E-books, and More, along with social media icons for Instagram, LinkedIn, Twitter, and Facebook. Below the navigation is a large orange header featuring a portrait of Nana Janashia. The main video thumbnail is titled "YAML Tutorial for DevOps" and features the text "DevOps SIMPLY EXPLAINED". To the right of the video, there's a "YAML" icon and the question "What is YAML?". The channel stats show 380K subscribers. The "SUBSCRIBED" button is visible. Below the video, there's a section for "Popular uploads" with thumbnails for "Kubernetes FROM ZERO TO HERO!", "Docker Tutorial for Beginners ZERO TO HERO!", "Python ZERO TO HERO!", "What is Kubernetes? in 15 mins", "Terraform EXPLAINED IN 15 MINS", and "Kubernetes Tutorial for Beginners [FULL COURSE in 3 Hours]". Each video thumbnail includes its title, duration, and view count.



Nana Janashia

The screenshot shows the YouTube channel page for 'fit4mainframe'. The channel has 86 subscribers and is marked as 'SUBSCRIBED'. The 'VIDEOS' tab is selected, displaying nine video thumbnails under the heading 'Uploads'. The videos cover topics such as Mainframe users, what a Mainframe is, Mainframe Quality of Service (QoS), Walmart as a cloud service provider, Mainframe myths, Mainframe architecture, and virtualization parts 1, 2, and 3. Each video includes its title, view count, and upload date.

Title	Views	Published
01 Wer nutzt Mainframes?	407	1 year ago
02 Was ist ein Mainframe?	761	1 year ago
03 Mainframe Quality of Service (QoS)	163	1 year ago
04 Walmart als Cloud Service Provider	124	1 year ago
05 Mainframe Mythen	135	1 year ago
06 Mainframe Architecture	209	1 year ago
07 Virtualization Part 1	117	1 year ago
08 Virtualization Part 2	50	1 year ago
09 Virtualization Part 3	65	1 year ago

[Link to fit4mainframe YouTube channel](#)

# The Virtual Key Punch (etwas Nostalgie ;-))

# The so called „Job stream“



A screenshot of a mainframe editor window titled "EDIT UWGR.TEST.CNTL(IEBGENER) - 01.03". The window displays a job stream script with various JCL statements and data. The script includes:

```
//SYSUT2 DD SYSOUT=B  
//SYSUT1 DD DSN=GREIS.REF.DATA,DISP=SHR  
//SYSPRINT DD SYSOUT=A  
//STEP01 EXEC PGM=IEBGENER  
//EMA0899A JOB (1234,5),'GREIS',CLASS=A
```

The editor interface has a menu bar with "File", "Edit", "Edit\_Settings", "Menu", "Utilities", "Compilers", "Test", and "Help". A toolbar with various icons is located above the menu. The status bar at the bottom shows "Columns 00001 00072" and "Scroll ==> CSR". The bottom of the screen displays the text "\*\*\*\*\* \* Bottom of Data \*\*\*\*\*".

# The Virtual Key Punch



The screenshot displays two main sections of the website. On the left, a photograph shows a stack of numerous physical punch cards. Overlaid on this image is a digital representation of a single punch card with a grid of holes. The card contains text: "MR. DONALD F. DRAPER, 104 WAVERLY PLACE, APT 3R, NEW YORK, NY" at the top, followed by a series of numbers and symbols representing data. A large green circular button labeled "START" is positioned in the center of the card's grid. On the right, a detailed digital interface for keypunching is shown. It features a large grid of small circles, each containing a character or symbol from a standard keyboard. Below this grid is a long horizontal bar with various symbols and labels, including "MULT PCH", "BIN-ARY", "DIS CARD", "FREE EASE", and "PICS". Above the digital card, there is a red "PUNCH" button and some smaller text, including "MASS:WERK DATA CENTER masswerk.at". At the very bottom of the page, a footer bar reads "A FREE SERVICE BY MASS:WERK - MEDIA ENVIRONMENTS, WWW.MASSWERK.AT".

<https://www.masswerk.at/keypunch/>

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- European Mainframe Academy  
<https://www.mainframe-academy.de>
- OpenHPI Mainframe MOOC auf Deutsch  
<https://open.hpi.de/courses/mainframes2017>
- OpenHPI Mainframe MOOC auf Englisch  
<https://open.hpi.de/courses/mainframes2018>
- Academic Mainframe Consortium e.V.  
<https://amc-ev.org>
- YouTube Channel fit4mainframe:  
<https://www.youtube.com/channel/UCIafs3ZVc4XC8Q-ETLMaA0g>
- Blog:  
<https://fit4mainframe.com/>

# QUESTIONS? REMARKS?