Challenges and Research Questions while Developing a Modern Desktop-as-a-Service (DaaS) to overcome Constraints we all face in Practice

U!REKA CONNECTS 2023 – Amsterdam

Prof. Dr. Christian Baun

Frankfurt University of Applied Sciences
Faculty of Computer Science and Engineering
`christianbaun@fb2.fra-uas.de`

Motivation for the Project

License of all images: CC0

Deciding which deployment strategy is best, today often feels like having to choose between. . .

⟹ **Locally deployed applications**

(„native Linux/Windows applications")

or. . .

+

⟹ **Software-as-a-Service – SaaS**

(„web applications")

Benefits and Drawbacks of Traditional IT vs. SaaS

Locally deployed applications

(„native Linux/Windows applications“)

- 🙂 Privacy + Security
- 🙂 Legacy applications supported
- 🙂 No vendor lock-in possible

- ☹ Client requires specific operating system
- ☹ Client must be trustworthy
- ☹ Administration effort
- ☹ Remote access to applications is difficult
- ☹ No automatic synchronisation
- ☹ No automatic backup

Software-as-a-Service – SaaS

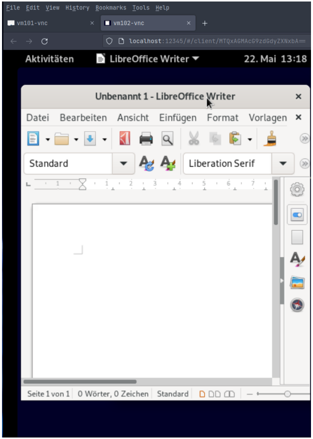
(„web applications“)

- 🙂 Any client with a browser can be used
- 🙂 Simple data synchronisation and backup
- 🙂 No deployment effort (if public cloud)

- ☹ Much deployment effort (if private cloud)
- ☹ Provider must be trustworthy
- ☹ Fear for a vendor lock-in
- ☹ Potential privacy and security issues
- ☹ Network connection required
- ☹ Cannot replace all applications (e.g., legacy applications)

DaaS-DESIGN

Is it possible to develop a system or service that has all mentioned benefits and avoids the drawbacks?


File Edit View History Bookmarks Tools Help
vm101-vnc
vm102-vnc
localhost:12345/#/client/MTQxAGMAcG9zdGdyZXNxbA==
Aktivitäten
LibreOffice Writer
22. Mai 13:18
Unbenannt 1 - LibreOffice Writer
Datei Bearbeiten Ansicht Einfügen Format Vorlagen
Standard
Liberation Serif
Seite 1 von 1 0 Wörter, 0 Zeichen Standard

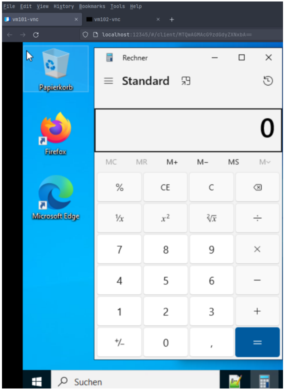
We try hard while developing DaaS-DESIGN!

A modern Desktop-as-a-Service with unique characteristics:

1. Integration of unmodified Linux/Windows applications
2. Focus is applications and not full desktops
3. All interaction is done via the browser
4. On-premises deployment and renting as a service possible
5. Avoiding security, privacy, and vendor lock-in issues
6. Improved reliability when running in clusters

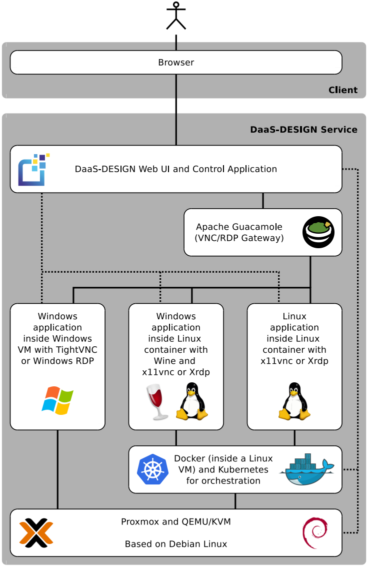
Consequences for the Architecture

The characteristics we aim for set the demands for the components we plan to integrate



- **Isolate** Linux/Windows applications for **security** purposes
  ⟹ Container virtualization or Virtual Machines
- Enable **remote control** of the Linux/Windows applications
  ⟹ Containers/VMs must include a VNC or RDP service
- **All interaction** can be done **via the browser**
  ⟹ A Gateway can translate the GUI into a web stream
- **Only applications** shall be **exported**, and not full desktops
  ⟹ Few VNC and RDP implementations offer this feature
- On-premises deployment is made possible by using **well-established tools and components** (i.a., via an Open Source virtualization platform)
  ⟹ This ensures privacy and avoids lock-in scenarios

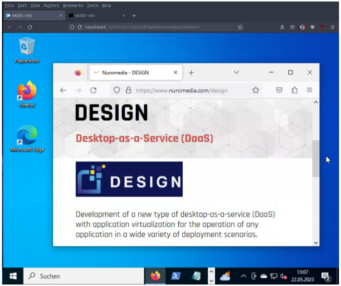
Planned Architecture


Browser
Client
DaaS-DESIGN Service
DaaS-DESIGN Web UI and Control Application
Apache Guacamole (VNC/RDP Gateway)
Windows application inside Windows VM with TightVNC or Windows RDP
Windows application inside Linux container with Wine and x11vnc or Xrdp
Linux application inside Linux container with x11vnc or Xrdp
Docker (inside a Linux VM) and Kubernetes for orchestration
Proxmox and QEMU/KVM
Based on Debian Linux

- Apache Guacamole as VNC/RDP Gateway
  - Lightweight alternative: noVNC directly inside Linux containers
- **3 deployment ways for applications:**
  1. Linux applications running inside Linux containers
  2. Windows applications running inside Linux containers with Wine (if it works)
  3. Windows applications running inside Windows VMs (if Wine does not work)
- The Proxmox server virtualization platform offers i.a., VMs (KVM), containers (LXC), storage, networks, multi-node deployment,. . .
- Docker offers an API and range of features that are superior compared to LXC and runs well inside a Linux VM

All components (except the Windows operating system inside the Windows VMs are free software (open source)

Some Challenges we need to face and overcome

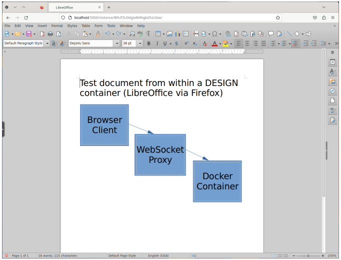


DESIGN

Desktop-as-a-Service (DaaS)

DESIGN

Development of a new type of desktop-as-a-service (DaaS) with application virtualization for the operation of any application in a wide variety of deployment scenarios.



Test document from within a DESIGN container (LibreOffice via Firefox)

- Exporting the GUI of an application via VNC or RDP from Linux containers is trivial
  - But for Windows containers, this is impossible
  - And not all Windows applications run with Wine
    - ⟹ If an application demands a true Windows operating system environment, a VM and a **Windows License** are required
- Applications run isolated in containers and VMs
  - But applications must be able to **share data**
  - And Docker containers are stateless
    - ⟹ A distributed and reliable file system needs to be integrated into containers and VMs. Proxmox provides this, but integration and configuration are challenging
- What if an application has **multiple windows?**
- Will the **time to provide** new applications be acceptable?
- Will the interaction via the Gateway be acceptable regarding **performance/latency** for all applications?

Thank you! Questions?

Soon you will find here information about DESIGN, a novel Desktop-as-a-Service solution with unique features that adapts to your needs.

- DaaS-DESIGN is a joint development of Nuromedia and Frankfurt University of Applied Sciences, funded by the Federal Ministry for Economic Affairs and Climate Action
- The service is planned to be ready in the summer/autumn of 2024
- An URL worth remembering: `https://www.daas-design.de`
- Questions? Do not hesitate to ask: `christianbaun@fb2.fra-uas.de`

NUROMEDIA

FRANKFURT UNIVERSITY OF APPLIED SCIENCES

Federal Ministry
for Economic Affairs
and Climate Action

ZIM
Zentrales
Innovationsprogramm
Mittelstand