Project Cloud Computing

1 Project Outline

You are the new **cloud consultant, architect and engineer** for the company **Awesome Cloud AG**! Your first project as a consultant is to guide the technical transformation for **LowTech GmbH**. You as a lead consultant have the responsibility for advising, designing and implementing the new technological strategy of the LowTech GmbH.

The LowTech GmbH is a small to medium-sized enterprise (SME) with 45 employees producing wooden furniture. Their primary selling strategy used to be sales representatives, which sold the products directly to the customers, but times are changing and they went public with an online store a few years ago. Therefore a web server for hosting the company website, the online store, is operated which is accessed by customers. Surrounding this website are different applications needed for the operation of the overall business (see figure 1).

However times change and the markets evolve so that the online store is now their primary selling platform! In the last two years the user numbers increased making it necessary for the LowTech GmbH to modernize their IT-infrastructure (see slashdot effect[1]). The hard times on the job market make it very hard to find suitable experts in IT for the operation and maintenance of their current infrastructure. Therefore you have the job to transform the application landscape and technical infrastructure for the LowTech GmbH!

In a first step you should get familiar with the use case of the LowTech GmbH and their infrastructure. You should research the technologies used in the infrastructure of the LowTech GmbH and make plans for the future setup of the environment of the company and design a future ready and agile infrastructure for the LowTech GmbH!

Form groups of **4-5 people** and work on the cloud transformation of the LowTech GmbH! The groups are invited to submit any deviating proposals for setting up the (private) hosting infrastructure, the technical infrastructure that result from their research and special features in their offering submitted. In the next section you will find a technical description of the application landscape of the LowTech GmbH together with a detailed description of the technical infrastructure.

The requirements listed are generic, i.e., they do not address the specifics of individual hosting providers and are therefore not yet final. They can change over the course of the semester!

[1] `https://en.wikipedia.org/wiki/Slashdot_effect`

2 As-is situation

The lead **enterprise architect** of the **Awesome Cloud AG** (your employer) gives you the following **as-is** application landscape for the **LowTech GmbH** with the technical details listed below.

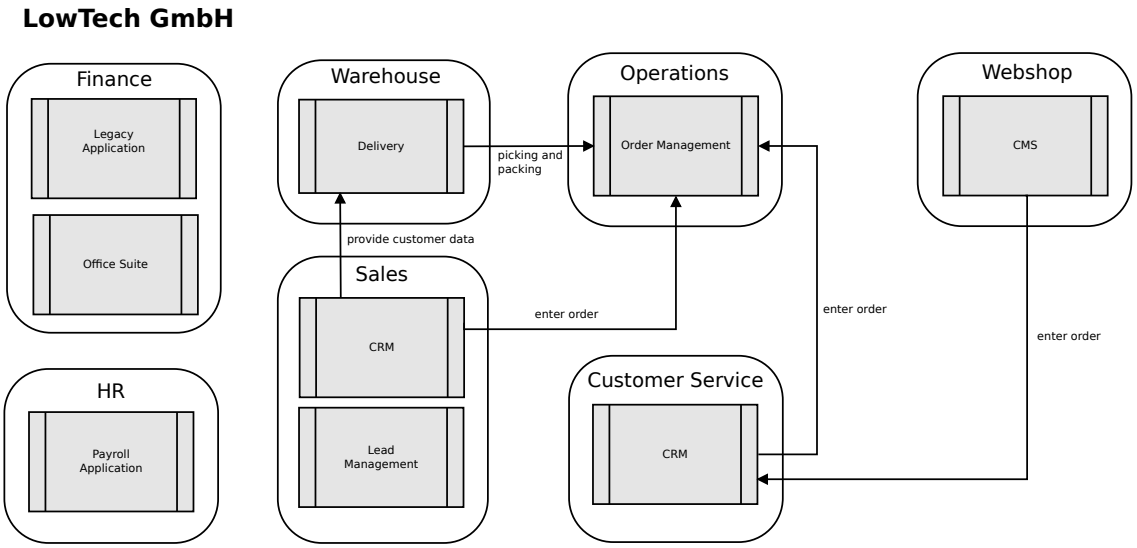

Figure 1: Application landscape of LowTech GmbH

The LowTech GmbH has **7 Departments** with several different applications and devices in their business ecosystem. The enterprise architecture department of your company has derived the list of applications (see table 1) and hardware (see table 2) from interviews with the departments. The new CEO of the LowTech GmbH wants to make the company future ready and read something on **cloud computing**[2]. Now he wants you to make his vision come alive!

In total the company has **7 Server** hosted on premises of the company (basement), **17 Clients** and **19 Laptops**. Overall the company has several applications for their daily operations running on servers, clients and laptops. Unfortunately the hardware and software are very old and the former business partner and provider of the infrastructure **IT From Yesterday OHG** has gone out of business.

Your department of the Awesome Cloud AG (your employer) now has the job to make a technical assessment of the infrastructure and the accompanying applications in order to make the LowTech GmbH ready for the future!

In a first step you are asked to develop a strategy to make the operation of the infrastructure more **scalable, available** and **secure**. You are also asked to update the infrastructure regarding **technology, runtime** and **operation modality**. The customer is not yet keen on moving to the cloud so consider an option of operating the infrastructure in a **private context** (on premise, server colocation, hosting)!

[2]His source: `https://techmonitor.ai/technology/ways-to-explain-cloud-computing-to-a-five-year-old`

Important notes on the setting

The LowTech GmbH has made several requests for the transformation of their infrastructure! The following figures are provided by LowTech GmbH and will help you in your estimation and calculation of the project on **security, traffic** and **usage**. Consider these aspects in your project!

All servers are installed in **one 19 inch rack**! There is no additional space left for hardware on premise! Everything has to fit into an ordinary 19 inch (of the shelf) rack!

Security in infrastructure:

- Windows Firewall on clients
- pfSense in network for packet filtering
- No other means of security!

Traffic and usage last month:

- Traffic: 500 GB
- Average payload from clients 250 KB per visit
- Site visits 9000
- Database sizes:
  - Legacy Accounting Software – 350 GB
  - Payroll – 1TB
  - Delivery – 250 GB
  - CRM – 980 GB
  - CRM Storage – 5.5 TB
  - Order Management – 100 GB
  - CMS – 10 GB

Customer requirements:

- High Availability of 99.5%!
- Max. Downtime 4 hours!
- Significant reduction on costs!
- Significant reduction on maintenance!
- Future ready design!

3 Tasks

The aim of this project is to describe the requirements for the new operating infrastructure and the hosting environment. It serves as a basis for submitting proposals and offers for the concrete design of the setup and operation of the new infrastructure. This milestone also serves as the basis for the tasks required in **Milestone 2**!

The following tasks should be covered:

- Make a critical assessment of the **as-is** infrastructure regarding the *NIST "five essential characteristics"*! Focus on elasticity and availability!
- Calculate the energy consumption and cost of operation for the **as-is** infrastructure! (Assume an average load!)
- Calculate the TCO (total cost of ownership) of the infrastructure **as-is** (energy, personal, etc.)[3].
- Develop a strategy on operation of the infrastructure for the future! (Own server hosting, server colocation, hosting service provider).
- Explain the transformation in detail and develop a **Roadmap** for the transformation process!
- Research on technologies for the infrastructure **to-be** (Hardware, Hypervisor, Firewall, etc.) and list the components for the future infrastructure!
- Calculate the TCO of the infrastructure **to-be** (server hosting, etc.)!
- Make a diagram depicting the components and architecture for the **to-be** infrastructure and applications!
- List and explain your improvements on **scalability, availability** and **security** of your proposed **to-be** infrastructure!

Consider a **private context** of operation! Consider **private cloud platforms** for the operation of the infrastructure (future prove)! **Do not consider a transformation to a public cloud service provider (CSP) yet!**

[3]For networking energy consumption consider 1000W for Switches and Routers!
For personal consider 3 full time employees!

4 Project organization

- Form groups of **4-5 people** and work on the cloud transformation of the LowTech GmbH!
- The project consists of **three milestones**!
- Show your progress throughout the semester by actively attending the exercises!
- The first milestone is due till **24.05.2024**!

5 First Milestone (Date)

Artifacts for first Milestone:

1. Detailed calculation of costs for the maintenance and operation of the server infrastructure **as-is** and **to-be**!
2. Strategy for the technological transformation of the server and application infrastructure for future operation! (with **infrastructure diagram**, **roadmap** and **list of technologies**)
3. Detailed research on alternative technological components (Hardware, Hypervisor, Firewall, platforms, etc.) for the operation of applications and their respective costs!
4. Critical assessment of the **as-is** and **to-be** infrastructure and detailed explanation of your improvements on **scalability, availability** and **security** for your proposal!

Prepare a report and a presentation of 10 minutes length on the artifacts! The report and presentation are due to **24.05.2024** and shall be uploaded in the **CampUAS** course!

`https://campuas.frankfurt-university.de/course/view.php?id=5653`

6 Application and hardware specifications

Table 1: Applications and runtimes of the LowTech GmbH

Department	Application	Platform	Runtime
Finance	Office	4 Clients	Windows XP SP 3
Finance	Legacy Accounting Software	1 Application Server	RHEL 7 MySQL Community 5.7 Java Application (Java 1.8) JBoss Application Server (EAP 7.4)
HR	Payroll	3 Clients	Windows 7 SP 3
HR	Payroll	1 Application Server	Windows Server 2012 Microsoft SQL 2012 Java Servlet-Application (Java 1.7) Tomcat 7.0 Server
Warehouse	Delivery	10 Clients	Debian Desktop 5.0 Lenny Web browser Firefox 3.6 on Client
Warehouse	Delivery	1 Application Server	Debian Server 5.0 Lenny PHP 5.3 program MySQL 5.5 Database on Server
Sales	Lead Management	10 Laptops	Windows 11 Microsoft Dynamics 365 Sales
Sales	CRM	1 Application Server	RHEL 7 CRM SAP 2008 (7.0)
Sales	CRM Storage	1 Storage Server	Ubuntu 16.04 LTS
Operations		4 Laptops	Windows 11
Operations	Order Management	1 Application Server	Windows Server 2012 Microsoft SQL 2012 Java JSP-Application (Java 9) Tomcat 8.0 Server
Customer Service	CRM System of Sales Department	5 Laptops	Windows 7 SP 3
Webshop	CMS	1 Web Server	Debian 9.0 Server Stretch Drupal 7.3

Table 2: Hardware Specifications of the infrastructure

Department	Hardware	Specs	Power consumption
Finance	4 Clients	Core 2 Duo SU7300, 4GB RAM, 250 GB HDD	500W
Finance	1 Application Server	Xeon X5680, 8GB RAM, 500 GB HDD	1000W
HR	3 Clients	Core 2 Duo SU7300, 4GB RAM, 250 GB HDD	500W
HR	1 Application Server	Xeon X5680, 8GB RAM, 2 TB HDD	1000W
Warehouse	10 Clients	Core 2 Duo SU7300, 4GB RAM, 250 GB HDD	500W
Warehouse	1 Application Server	Xeon X5680, 8GB RAM, 1 TB HDD	1000W
Sales	10 Laptops	ThinkPad X13 Gen 2 AMD Ryzen5	50W
Sales	1 Application Server	Xeon X5680, 16GB RAM, 2 TB HDD	1000W
Sales	1 Storage Server	Intel Xeon E7 4830, 32GB RAM, 10TB Tape drive	1200W
Operations	4 Laptops	ThinkPad X13 Gen 2 AMD Ryzen5	50W
Operations	1 Application Server	Intel Xeon E7 4830, 32GB RAM, 3TB HDD	1200W
Customer Service	5 Laptops	ThinkPad T410 Intel Core i5 520M	100W
Webshop	1 Web Server	Intel Xeon E7 4830, 128GB RAM, 500GB SSD	1200W