Cloud Computing Project

- ☐ Tasks 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.)For networking energy consumption consider 1000W for Switches and Routers! For personal consider 3 full time employees!

Total 7 servers:

Department	Hardware	Specs	Power Consumption	
Finance	1 App Server	Xeon X5680, 8GB RAM, 500 GB HDD	1000W	RHEL 7 free MySQL Community 5.7 free Java Application (Java 1.8) free JBoss Application Server (EAP 7.4) free
HR	1 App Server	Xeon X5680, 8GB RAM, 2 TB HDD	1000W	Microsoft SQL 2012 no license req Windows server 2012 no license req Java Servlet-Application (Java 1.7) free Tomcat 7.0 Server free
Warehouse	1 App Server	Xeon X5680, 8GB RAM, 1 TB HDD	1000W	Debian Server 5.0 Lenny free PHP 5.3 program free MySQL 5.5 Database on Server free
Sales	1 App Server	Xeon X5680, 16GB RAM, 2 TB HDD	1000W	RHEL 7 free CRM SAP 2008 (7.0) eoc
Sales	1 Storage Server	Intel Xeon E7 4830, 32GB RAM, 10TB Tape drive	1200W	Ubuntu 16.04 LTS free
Operations	1 App Server	Intel Xeon E7 4830, 32GB RAM, 3TB HDD	1200W	Windows Server 2012 no license req Microsoft SQL 2012 no license req Java JSP-Application (Java 9) free Tomcat 8.0 Server free
Webshop	1 Web Server	Intel Xeon E7 4830, 128GB RAM, 500GB SSD	1200W	Debian9.0 free Drupal 7.3 free
Switches and routers			1000W	
Total Power consumption			8600W	

To calculate the annual energy consumption for a total power consumption of 8600 watts (or 8.6 kW), assuming the servers operate continuously for one year (8760 hours), we can use the formula:

Energy consumption (kWh)=Power (kW)×Time (hours)

Given:

- Power (kW) = 8.6 kW
- Time (hours) = 8760 hours (assuming the servers operate continuously for one year)

Energy consumption (kWh)=8.6 kW×8760 hours

Energy consumption (kWh)=75336 kWh

So, the annual energy consumption for a total power consumption of

8600 watts is 75336 kWh.

Energy cost (€) = Energy consumption (kWh) * Cost per kWh (€)

Given:
- Energy consumption = 75336 kWh (as calculated earlier)
- Cost per kWh = 32 cents = 0.32 euros (used the average rate
 from 2 companies that provide energy for commercial use)

Now, plug in the values into the formula:
Energy cost (€) = 75336 kWh * 0.32 €/kWh
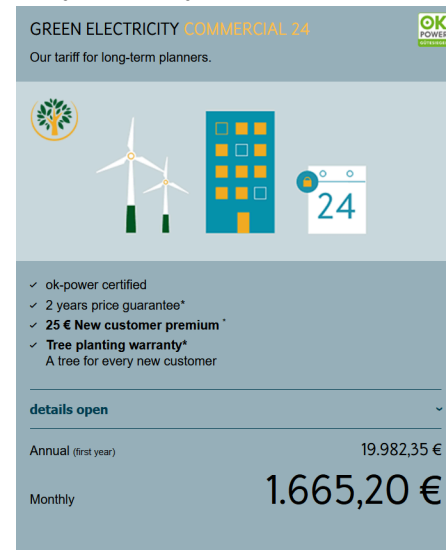Energy cost (€) = 24107.52 €

So, the estimated energy cost for total power consumption
of 8600 watts over a year, based on the cost of 32 cents per
kilowatt-hour for commercial customers in Germany, would
be approximately 24107.52 euros.

https://www.entega.de/geschaeftskunden/tarifvergleich/

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These three roles are crucial for maintaining servers:
1. **System Administrator**:
   a. Manages day-to-day server operations, user accounts, and performs maintenance tasks like updates and backups.

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details open

Annual (first year)   19.982,35 €

Monthly   **1.665,20 €**

Your estimated price in the network of NRM Netzdienste Rhein-Main GmbH NRM Netzdienste Rhein-Main GmbH to:

1.838,06 € per month*

22.056,76 per Year*

Contract period

12/31/2025   12/31/2026

◉ Gross ○ Net

32,94
Working Price (ct/kWh)
10.33
Base price (€/month)

* • Gross prices
  • Applies to standard load profile (SLP) One three-three-phase meter.
  • For meters with registering power measurement (RLM), the **natural** electricity basic price is 30,00 Euro/month net and a separate supply contract is created

b. Approximate salary: €60,000 per year.

2. **Network Administrator**:
    a. Oversees networking infrastructure, ensuring reliable connectivity, configuring network services, and implementing security measures.
    b. Approximate salary: €100,000 per year.

Salary: Network Administrator in Germany 2024 | Glassdoor

3. **Security Specialist**:
    a. Focuses on cybersecurity, conducting risk assessments, implementing security controls, monitoring for threats, and educating staff on security best practices.
    b. Approximate salary: €70,000 per year.

Cyber Security Engineer salary in Germany

A reasonable budget allocation for hardware maintenance and replacement parts for 7 servers could range from a few hundred to several thousand euros per year, depending on the factors mentioned above. It's essential to regularly reassess your budget and adjust as needed based on changing circumstances, such as the aging of servers, changes in warranty coverage, or shifts in risk factors. Additionally, consulting with a professional IT services provider or hardware vendor can help you develop a more precise budget tailored to your specific needs and circumstances.

Certainly! Let's focus solely on the cooling cost for your server infrastructure. To calculate the cooling requirement, you'll need to determine the heat load generated by the servers and networking equipment, and then estimate the cooling capacity required to maintain optimal operating temperatures in your server room or data center.

Here's how you can calculate the cooling requirement:

1. **Determine Total Heat Load**:

   - Add up the power consumption of all servers and networking equipment in your infrastructure. You mentioned a total power consumption of 8600W, with 7600W for servers and 1000W for switches and routers.

2. **Convert Heat Load to BTU/hr**:

   - Multiply the total heat load (in watts) by the conversion factor to convert it to British Thermal Units per hour (BTU/hr). One watt is approximately equal to 3.412 BTU/hr.

3. **Select Cooling Solution**:

- Choose an appropriate cooling solution based on the calculated heat load. The cooling system's capacity should exceed the total heat load to ensure efficient cooling.

4. **Calculate Cooling Cost**:

   - Once you've selected a cooling solution, estimate the operating cost of the cooling system. This may include electricity costs for running the cooling equipment and any maintenance expenses.

5. **Factor in Other Costs**:

   - Consider any additional costs associated with cooling, such as maintenance contracts, repair costs, or upgrades to improve energy efficiency.

Cost of operation for the as-is infrastructure (Annual Cost) = Energy Cost (Cooling cost not incl. yet) + Salaries (60000+100000+70000) + Licensing cost (assuming zero as most of the sw are outdated or free source) + Maintenance cost = 24107.52 + 230000 + 0 + 7000 = 261107.52 €

Total cost of ownership = Cost of operation + Initial cost (Buying cost assuming zero as it is already present) = 261107.52 + 0 = 261107.52 €

Questions

How is cooling taking place in the server area?

How do I calculate energy consumption and operational cost considering avg load? Is there any downtime and maintenance time?

Total cost of ownership (Do i consider the entire lifecycle of the servers. Or just calculate this for 2-5 years. Also, is this the same as the operational cost?)