

# Using z/VM for Teaching Operating Systems

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Retired from IBM

# Course Requirements

- Run programs on Linux & Windows
- Use only portable libraries
- Write concurrent (multi-threaded & multi-process) programs
- Modify Linux kernel code
- Standardized system architectures, compilers, libraries, interfaces
- Access from off-campus

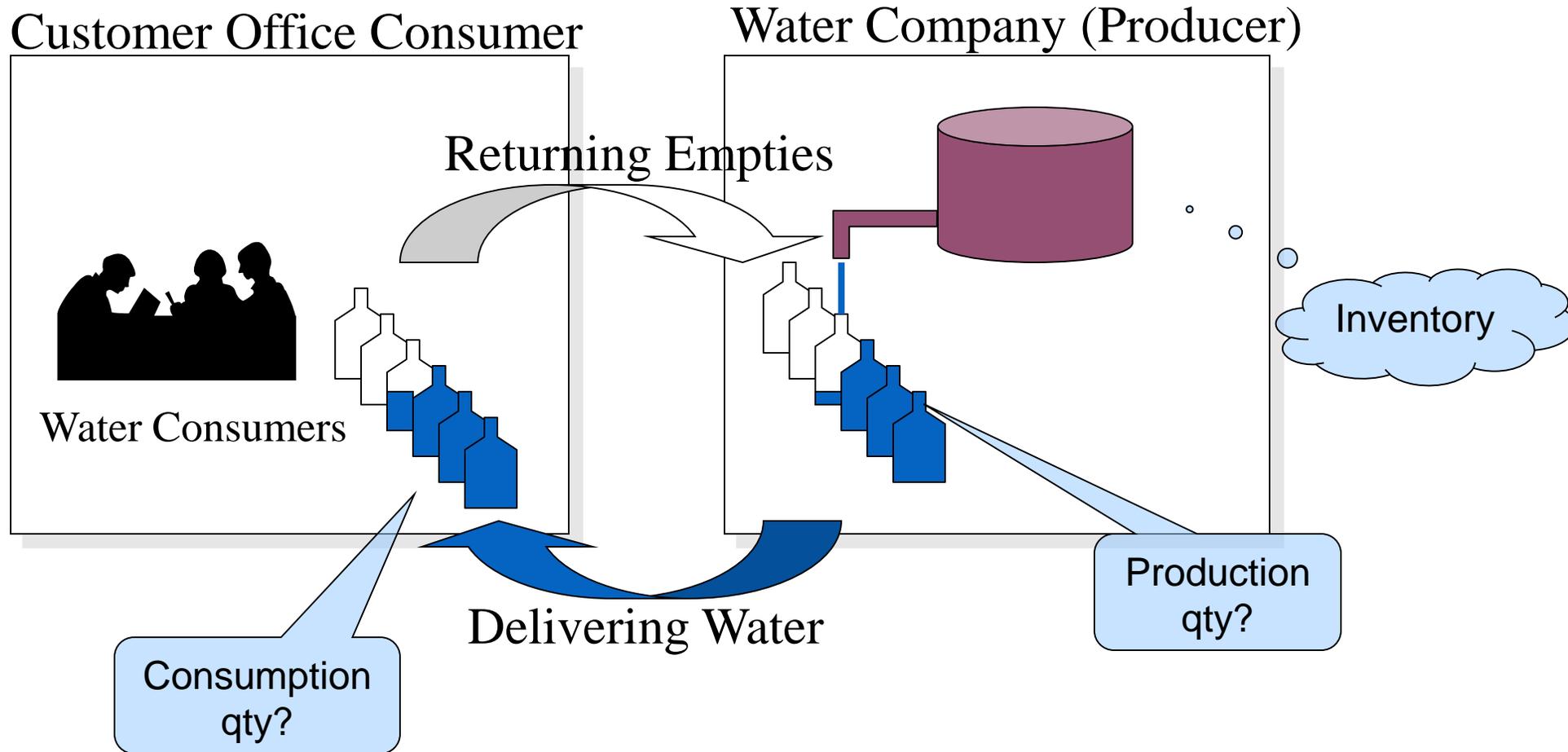
# z/VM System advantages

- Standardized testing interface for TA's
- Easy to rebuild system image
- Instructor/TA access to student accounts
  - reset passwords, see files, verify usage, fix problems

# Other z/VM advantages

- Common timing results
- Multiple real disk drives
  - Needed for certain problems in concurrency
- Link profile exec to a common "startup"
- Protection of original (base) system
- Practical experience using a remote system
- Practical experience using a virtual system

# The "Producer-Consumer" Problem



# Solutions

- Sequential solution: read, wait, write, wait
  - Inefficient (no CPU+I/O overlap)
  - Slow (waiting for both devices, even if one is faster)
- Multi-threaded solution
  - Producer (while writing happens)
    - Read continually into a buffer until it is full
    - Wrap around to beginning of buffer, then (as slots become open) read more
  - Consumer (while reading happens)
    - Start writing from valid buffer slots
    - Continue until all slots written
    - Wrap around to beginning of buffer and (as slots become full) repeat writing
  - Greater efficiency for 2 or more devices
    - but works properly on 1

# Learning to work in the Linux kernel

- Assignment:
  - Add a new system service to count page faults
- Solution:
  - Modify `fault.c` to add a new function
  - Update the required system tables (`syscalls.S`, `unistd.h`, etc.)
  - Rebuild the Linux kernel (each user has a full copy of the source tree)
  - Write a user-mode program to test the call

**For More Information please contact...**

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