Quick Start Guide — Week 1

> ***Print this page*** *for quick reference during environment setup.*

Lab 0 Homework (Due Before Week 2 Lecture)

Required

- [ ] `lab0_report.md` — Environment check + first measurement + explanation
- [ ] `week1_learning_needs.md` — Your goals and concerns

Step 1: Get Ubuntu VM

Download:

- VirtualBox: https://www.virtualbox.org/
- Ubuntu 22.04/24.04 LTS: https://ubuntu.com/download/desktop

VM Settings:

- RAM: 4GB (8GB if possible)
- CPU: 2 cores
- Disk: 25GB+

Step 2: Install Tools

```
# Update packages
sudo apt update

# Install build tools
sudo apt install -y build-essential

# Install perf
sudo apt install -y linux-tools-common linux-tools-$(uname -r)

# Install strace
sudo apt install -y strace

# Install git
sudo apt install -y git curl wget
```

Step 3: Verify

```
gcc --version          # Should show version
sudo perf stat ls      # Should show stats
strace --version       # Should show version
```

Step 4: First Measurement

Create `hello.c`

```c
#include <stdio.h>
#include <unistd.h>

int main() {
    printf("Hello from process %d\n", getpid());
    return 0;
}
```

Compile and Run

```
gcc -o hello hello.c
./hello
```

Trace System Calls

```
strace ./hello
```

Measure Performance

```
sudo perf stat ./hello
```

Common Issues

Problem	Solution
`perf: command not found`	`sudo apt install linux-tools-common linux-tools-$(uname -r)`
`Permission denied`	Use `sudo perf stat ...`
VM is slow	Allocate more RAM/CPU, enable VT-x in BIOS
No network	Check VirtualBox: Settings → Network → NAT

Understanding perf Output

```
Performance counter stats for './hello':
         0.42 msec task-clock     ← CPU time used
            1      context-switches ← OS paused your program
           54      page-faults     ← Memory pages loaded
      912,345      cycles          ← CPU cycles consumed
      456,789      instructions    ← Machine instructions
```

IPC = instructions / cycles (higher is better)

⚠️ NOT Supported

Environment	Why
WSL2	Kernel features limited — eBPF/perf won't work properly
Docker	Can't access host kernel — no BPF, restricted /proc
macOS	Different kernel — no /proc, no perf, no cgroups

Use: Ubuntu in VirtualBox (or native Linux)

Need Help?

- **During lab:** Ask instructor or TA
- **Outside class:** Office hours, course forum
- **Don't wait:** Environment problems get harder to fix under deadline pressure

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Next Week

Topic: Performance Methodology — From Measurement to Mechanism

What to expect:

- Memory hierarchy, cache, page faults
- How to design reproducible experiments
- Lab 1: Quicksort performance analysis