

# Unix/Linux system developer

Hands-on course of 4 days - 28h

Ref.: LIS - Price 2024: CHF2 550 (excl. taxes)

## HANDS-ON WORK

Progressive practicals and case studies will enable you to fully understand the presentation of the UNIX/Linux system programming interface.

## THE PROGRAMME

last updated: 01/2018

### 1) Development method and tools

- The linux distributions, open source software, licenses.
- Compilers and associated tools, profilers and debuggers.

*Hands-on work* : Use of GDB, cscope and profiling with a simple application.

### 2) Processes

- The UNIX processes, scheduling processes, priorities and processor affinity.
- Live and death of a process. Fork, exec, exit and wait.
- Security issues. Root and standard user, user ids.
- Namespaces and application mobility.

*Hands-on work* : Creation of a simple multi-process application. Tests of some security issues like process running wild and handling with `setrlimit(2)`.

### 3) Posix Threads

- Programming with threads. Overview of Posix 1c threads.
- Thread creation and termination. Thread scheduling.
- Synchronizing Threads. Mutex and data protection, priority inversion.
- Condition variable and flow control. Using signals and threads.

*Hands-on work* : A simple multi-thread application using mutexes and condition variables.

### 4) Files and filesystems

- File handling.
- Filesystems. Accessing metadata. Accessing directories.
- I/O Multiplexing. Using poll and select.
- Signals and events with multiplexed I/O

*Hands-on work* : A small program using `fcntl(2)` for file locking and accessing a directory.

### 5) Inter Process Communication

- Message queues.
- Shared memory.
- Semaphores. Handling multiple semaphore sets.
- Pipes. Standard I/O redirections.
- Signals. UNIX signals implementation.

*Hands-on work* : Implementation of a client/server use case with the help of various technologies: message queues, shared memory and semaphores, pipes and signals.

### 6) Network

- Socket Interface.
- Address and protocol management. TCP/IP interface.

#### TRAINER QUALIFICATIONS

The experts leading the training are specialists in the covered subjects. They have been approved by our instructional teams for both their professional knowledge and their teaching ability, for each course they teach. They have at least five to ten years of experience in their field and hold (or have held) decision-making positions in companies.

#### ASSESSMENT TERMS

The trainer evaluates each participant's academic progress throughout the training using multiple choice, scenarios, hands-on work and more. Participants also complete a placement test before and after the course to measure the skills they've developed.

#### TEACHING AIDS AND TECHNICAL RESOURCES

- The main teaching aids and instructional methods used in the training are audiovisual aids, documentation and course material, hands-on application exercises and corrected exercises for practical training courses, case studies and coverage of real cases for training seminars.
- At the end of each course or seminar, ORSYS provides participants with a course evaluation questionnaire that is analysed by our instructional teams.
- A check-in sheet for each half-day of attendance is provided at the end of the training, along with a course completion certificate if the trainee attended the entire session.

#### TERMS AND DEADLINES

Registration must be completed 24 hours before the start of the training.

#### ACCESSIBILITY FOR PEOPLE WITH DISABILITIES

Do you need special accessibility accommodations? Contact Mrs. Fosse, Disability Manager, at [psh-accueil@ORSYS.fr](mailto:psh-accueil@ORSYS.fr) to review your request and its feasibility.

- Network daemons.
  - Implementation of network servers and super servers.
- Hands-on work : Implementation of our client/server use case with the network interface.*

### 7) Memory management and Time

- Virtual memory.
- Memory allocation.
- Advanced use
- Date and time. Timers and timeout.
- Latencies and determinism.

*Hands-on work : Test of various allocations schemes using malloc(3), brk(2) or mmap(2).  
Implementing good practice for real-time applications. Using the UNIX time interface to measure scheduling latency.*

### 8) Advanced linker control

- Security, real-time and multithreading.
- Shared libraries.

*Hands-on work : A multi-thread real-time application with a time share thread.  
Implementation of a memory allocation tracer with dlopen.*

## DATES

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### REMOTE CLASS

2024 : 25 Jun, 17 Sep, 19 Nov