



OpenSER Bootcamp

The **OpenSER Bootcamp** is a full 5 days (40 hours) intensive training providing in depth coverage of OpenSER Installation, configuration and administration. The students will learn how to download, compile and install OpenSER. After the installation, you will start to learn step by step how to configure OpenSER to authenticate users, install a GUI to help with daily administration, forward calls to the PSTN, integrate Asterisk and Voice Mail, Presence Agent, Load Balancing, Traverse Nat for SIP and generate CDR records to a Radius Server. At the end, you will learn how to use troubleshooting tools to solve end user problems.

All the knowledge that is transferred to you will be strongly backed-up by practice sessions where you will get hands-on experience in handling OpenSER SIP Server. The training is structured to be offer 50% - 50% between the theoretical and practical sessions.

Optionally, an certification exam, to proof the knowledge consolidation during the training, can be sustained on request at the end of the course.

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1. Key Objectives

- Explain what SIP is, what it does and its architecture
- Explain Open SIP Express Router
- Install OpenSER on a Linux Machine
- Routing basics and the default configuration
- OpenSER authentication using MySQL
- Install SerMyAdmin for administration
- To connect to the PSTN using a gateway
- Implement call forward to voicemail
- Implement presence agent
- Understand important aspects of load balancing and high availability
- Implement SIP NAT traversal using RTPProxy
- Accounting calls to a RADIUS server
- How to use test and monitoring tools to check your configuration

2. Audience

- VoIP providers seeking “Open Source” platforms to enhance their businesses
- Anyone seeking proficiency in OpenSER
- Network Consultants and VARs who need a jump start in the technology
- Developers who want to use OpenSER to create new telephony applications and appliances

3. Instructors

Bogdan-Andrei Iancu – OpenSER co-founder (board member) and main developer. Also CEO of [Voice System](#), an “know-how” OpenSER company.

Flávio E. Gonçalves de Andrade – CEO of [V.Office Networks](#), writer of the book “Building Telephony Systems with OpenSER”.



4. Prerequisites

- Basic Linux knowledge
- Basic text edition
- Basic SIP protocol
- Programming logic knowledge (you won't need to program, but you need to understand logical concepts applied to the dial-plan)

5. Syllabus

1. Introduction to OpenSER
 - a. What is Open SIP Express Router
 - b. Main characteristics
 - c. Usage scenarios
 - d. OpenSER architecture
 - e. Sessions, Dialogs and Transactions
 - f. Message Processing according to the RFC3261
 - g. Strict Routing and Loose Routing
 - h. SIP and RTP
2. OpenSER installation
 - a. Hardware requirements
 - b. Software requirements
 - c. LAB 2.1 – Installing Linux for OpenSER (previously installed DVD)
 - d. LAB 2.2 – Download, compile and install OpenSER
 - e. LAB 2.3 – Running OpenSER at the Linux Boot
 - f. OpenSER directory structure and log files
 - g. OpenSER startup options
 - h. Starting OpenSER with default configuration script
3. Routing Basics and the Standard Configuration
 - a. Scripting Basics
 - b. Routing Basics



- c. Analyzing the standard configuration files
 - d. LAB 3.1 Connecting two phones to OpenSER
 - e. LAB 3.2 Running stateful with record routing (packet capture)
 - f. LAB 3.3 Running stateless with record routing (packet capture)
 - g. LAB 3.4 Running stateless with no record-routing.
4. Adding authentication with MySQL
- a. The Auth_DB modules
 - b. Register authentication sequence
 - c. Invite authentication sequence
 - d. Digest authentication
 - e. QOP – Quality of protection
 - f. Plaintext or hash passwords
 - g. LAB 4-1 Installing MySQL Support
 - h. The openserctl shell utility
 - i. The openserCTL resource file
 - j. Checking From and TO tags
 - k. Multidomain support
 - l. Inter-domain and intra-domain routing
 - m. LAB4-2 Enhancing the script
5. Building a user portal with SerMyAdmin
- a. Introduction to SerMyadmin
 - b. LAB 5-1 Installing SerMyAdmin
 - c. Basic tasks
 - d. Registering a new user
 - e. Domain administration
 - f. User administration
 - g. Interface customization
6. Connectivity to the PSTN
- a. Introduction to PSTN routing
 - b. Accepting calls from the PSTN

- c. The permissions module and the `allow_trusted()` function
 - d. Routing a call to the PSTN
 - e. DID redirection using Aliases
 - f. ACL and Group permissions
 - g. Introduction to LCR
 - h. LCR tables
 - i. `Openserctl lcr` commands
 - j. LAB 6-1 Using LCR to route calls to the PSTN
 - k. Inter-domain Peering
7. Call Forwarding and Voicemail
- a. Introduction to Call Forwarding
 - b. Pseudo-variables and AVPs
 - c. AVP functions
 - d. Implementing Blind Call Forwarding
 - e. Busy or Unanswered forwarding to Voice Mail
 - f. LAB 7-1 Testing the Call Forwarding feature
8. Using Presence
- a. SIP presence overview
 - b. Presence Agent setup
 - c. Publishing Presence from non-SIP devices
 - d. Registration-to-Presence conversion (old SIP devices)
 - e. Scalability of the presence model
 - f. Aggregation of the presence information
 - g. LAB 8-1 Implementing presence aggregation
 - h. LAB 8-2 Publishing non-SIP Presence
9. Load Balancing and High Availability
- a. OpenSER High Availability
 - i. Active/Active and Active/Backup setups
 - ii. SIP and Data Replication
 - b. OpenSER Load balancing/Dispatching Capabilities



- i. Balancing algorithms
 - ii. Balancing and failover
 - iii. Multiple groups of balancing
- c. LAB 9-1 Load balancing & failover for an Asterisk Cluster

10.SIP NAT Traversal

- a. NAT Types
- b. Solving the NAT traversal challenge
- c. Implementing a far end NAT solution
- d. RFC3581 and force_rport() function
- e. Solving the traversal of RTP packets
- f. Handling Register Requests
- g. Detecting clients Behind NAT
- h. Handling Invite requests behind NAT
- i. RTPProxy installation and configuration
- j. LAB 9-1 Usind RTPProxy for NAT traversal
- k. STUN – Simple Traversal of UDP NAT

11.OpenSER accounting and Billing

- a. Authentication, Accounting and Authorization
- b. LAB 10-1 Accounting to a MySQL database
- c. Accounting using a RADIUS server
- d. LAB 10-2 Accounting to a Radius Server

12.Troubleshooting Tools

- a. Built in tools
- b. Packet Capture and Trace Tools
- c. The SIPTRACE module
- d. Predefined and Custom Statistics
- e. Stress Testing Tools
- f. LAB 12-1 (If time permits) using sipp to stress test OpenSER



6. Agenda: 40 hours

	Mon	Tue	Wed	Thu	Fri
08:30-10:00	Arrivals	Routing Basics LABs 3.1-3.4	Admin LABs – Manag.users and domains	8. Presence and LAB 8-1	NAT Traversal LABs 10.1 or 10.2
10:00-10:15	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
10:15-12:30	1. Introduction to OpenSER	4. Adding Authentication with MySQL	6. Connectivity to the public network	9. Load Balancing and High-Availability	10. Accounting with Freeradius
12:30-13:30	Lunch Break	Lunch Break	Lunch Break	Lunch Break	Lunch Break
13:30-15:30	2. OpenSER Installation LAB	Auth LABs 4.1-4.3	PSTN Labs. 6.1	9. LAB 9.1 – Load Balancing	LAB 10.1 – Accounting using freeradius
15:30-15:45	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
15:45-18:30	3. Routing and Scripting Basics.	5. Managing OpenSER with SerMyAdmin	7. Call forwarding and LABs	10. SIP NAT Traversal	11. Troubleshooting tools and LABs

7. Certification

Optional, the students can choose to additionally sustain a certification exam to confirm the knowledge consolidation during the course.

The certification exam (with time limit) will be supervised by our instructors and it will consist in random questions (from a larger set) that cover all OpenSER relevant areas. If approved, *Voice Systems* and *V.Office Networks* will issue a certificate of “**Certified OpenSER Admin**”.

The certificates are signed by both our teachers as representative players in the OpenSER project.



8. Handouts/Materials

1. Book – Building Telephony Systems with OpenSER
2. DVD containing:
 - a. PDF copy of the Overhead transparencies
 - b. DVD with the Virtual machine containing Linux with Debian pre-installed and all the scripts used in the training
3. Headset
4. IP Phone: Polycom IP320
5. T-Shirt: OpenSER official T-Shirt (male or female version)