Mastering Advanced Router Technologies: Networking, Security, and Performance Optimization

24 - 28 Mar 2025
Istanbul

AGILE LEADERS
Training Center

Mastering Advanced Router Technologies: Networking, Security, and Performance Optimization

Ref.: 36382_265419 **Date:** 24 - 28 Mar 2025 **Location:** Istanbul **Fees:** 4500 **Euro**

Course Overview:

The course is an in-depth, hands-on program designed for IT professionals and network engineers looking to master advanced router configurations, optimize high-performance networking, and enhance network security. This course dives into cutting-edge technologies such as Linux kernel networking, multicast routing, and traffic engineering with eBPF, while also providing extensive training on policy-based routing PBR, advanced MPLS networking, and custom kernel module development. Participants will gain expertise in topics like secure VPN tunneling with WireGuard, IPsec implementation, and debugging techniques for Linux kernel networking. By the end of this course, attendees will be equipped with the tools and skills to design, implement, and troubleshoot complex network solutions. Whether you are exploring advanced kernel tunneling techniques or optimizing latency with eBPF, this course ensures you stay ahead in the rapidly evolving field of network engineering.

Target Audience:

- Network Engineers and Architects
- IT Infrastructure Specialists
- Cybersecurity Professionals
- System Administrators managing Linux-based networks
- Professionals transitioning to advanced roles in networking and security

Targeted Organizational Departments:

- IT and Networking Departments
- Cybersecurity Teams
- Cloud Infrastructure Teams
- Telecom and ISP Operations Teams

Targeted Industries:

- Telecommunications
- Cloud Computing and Data Centers
- Cybersecurity Firms
- Enterprise IT
- Financial Services

Course Offerings:

By the end of this course, participants will be able to:

- Design and implement Linux kernel networking solutions.
- Optimize high-performance networks for scalability.
- Configure and troubleshoot multicast routing with PIM-SM.
- Develop traffic engineering strategies using eBPF.
- Implement advanced policy-based routing PBR.
- Secure VPN tunnels with WireGuard and IPsec.
- Develop and debug custom kernel modules.

Training Methodology:

The training employs a blend of theoretical instruction, practical hands-on labs, case studies, and interactive group sessions. Participants will work on real-world scenarios, leveraging tools such as OpenSSL, Quagga/FRR, and bpftool. Interactive feedback sessions ensure participants grasp complex concepts and can apply them effectively.

Course Toolbox:

- ebooks and technical documentation
- Access to lab environments
- Tools like WireGuard, OpenSSL, and eBPF utilities
- Sample configurations and troubleshooting guides

Course Agenda:

Day 1: Kernel-Level Tunneling and Security

- **Topic 1:** Introduction to modern tunneling techniques for Layer 2 L2 and Layer 3 L3 VPNs
- **Topic 2:** GRE tunnel setup and WireGuard for secure tunneling
- **Topic 3:** Deep dive into encryption and secure tunneling kernel modules IPsec, WireGuard
- **Topic 4:** Developing and testing custom kernel-level tunneling protocols
- **Topic 5:** Debugging kernel tunneling code using ftrace and perf
- **Topic 6:** Performance insights with kernel debugging tools like dmesg and gdb
- **Reflection & Review:** Recap of tunneling techniques and secure implementations

Day 2: Multicast Routing and High-Performance Networking

- **Topic 1:** Linux kernel multicast implementation overview
- **Topic 2:** Managing multicast groups with IGMP utilities and ip maddr
- **Topic 3:** Optimizing multicast routing with PIM-SM and MSDP

- **Topic 4:** Dynamic multicast group management with kernel modules
- **Topic 5:** Implementing multicast flow control for traffic spikes
- **Topic 6:** Validating QoS mechanisms in multicast networks
- **Reflection & Review:** Discussion on multicast performance and optimizations

Day 3: Segment Routing and Traffic Engineering with eBPF

- **Topic 1:** Introduction to Segment Routing over IPv6 SRv6
- **Topic 2:** Writing and deploying eBPF programs for traffic engineering
- **Topic 3:** Real-time traffic monitoring and adjustments with eBPF tools
- **Topic 4:** Building traffic engineering features within the Linux kernel
- **Topic 5:** Optimizing latency-sensitive applications using custom queuing algorithms
- **Topic 6:** Performance analysis using pktgen and perf
- **Reflection & Review:** Reflect on eBPF applications and segment routing

Day 4: Policy-Based Routing and Advanced Network Security

- **Topic 1:** Implementing policy-based routing PBR in the Linux kernel
- **Topic 2:** Advanced traffic filtering with custom Netfilter hooks
- **Topic 3:** Enforcing traffic policies with stateful filtering conntrack
- **Topic 4:** TCP congestion control for high-traffic scenarios
- **Topic 5:** Monitoring security events with a user-space interface
- **Topic 6:** Centralized monitoring with the ELK Stack
- **Reflection & Review:** Review of advanced PBR and network security techniques

Day 5: Advanced MPLS and Performance Optimization

- **Topic 1:** Exploring advanced MPLS features in Linux-based routers
- **Topic 2:** Managing MPLS labels and traffic flows with kernel modules
- **Topic 3:** Virtual Private Routed Networks VPRN implementation in the kernel
- **Topic 4:** Debugging and profiling kernel networking code for performance
- **Topic 5:** High-performance packet forwarding with DPDK
- **Topic 6:** Building scalable data plane applications with SmartNICs and SR-IOV
- **Reflection & Review:** Recap on MPLS advancements and performance optimization

How This Course is Different from Other Advanced Router Training Courses:

Unlike generic router training programs, the course focuses on hands-on, Linux-based implementations and cutting-edge technologies like eBPF, WireGuard, and advanced MPLS networking. This course uniquely combines theoretical knowledge with practical applications, enabling participants to work on real-world scenarios using state-of-the-art tools and methodologies. The integration of advanced debugging techniques and performance optimization strategies ensures participants are well-equipped to tackle complex networking challenges, making this course a

standout in the field.

WHO WE ARE

Agile Leaders is a renowned training center with a team of experienced experts in vocational training and development. With 20 years of industry experience, we are committed to helping executives and managers replace traditional practices with more effective and agile approaches.

OUR VISION

We aspire to be the top choice training provider for organizations seeking to embrace agile business practices. As we progress towards our vision, our focus becomes increasingly customer-centric and agile.

OUR MISSION

We are dedicated to developing value-adding, customer-centric agile training courses that deliver a clear return on investment. Guided by our core agile values, we ensure our training is actionable and impactful.

WHAT DO WE OFFER

At Agile Leaders, we offer agile, bite-sized training courses that provide a real-life return on investment. Our courses focus on enhancing knowledge, improving skills, and changing attitudes. We achieve this through engaging and interactive training techniques, including Q&As, live discussions, games, and puzzles.

AGILE LEADERS
Training Center

CONTACT US

UAE, Dubai Investment Park First

+971585964727
+447700176600

sales@agile4training.com

Gamified and
Interactive Training

We understand that training delivery can be challenging, both online and offline. To ensure engagement and achieve learning objectives, we have developed our own activities and collaborated with industry-leading solutions to gamify our training sessions. This approach increases interaction levels and guarantees effective learning outcomes.

Our Training
Cate gories

We cover a wide range of training categories to cater to different needs and interests

Branding, Marketing, Customer Relations, & Sales Programs
Finance and Accounting Programs
Human Resources Management Programs
Management & Leadership Programs

Political & Public Relations Programs
Project Management Programs
Quality & Process Management
Self-Development Programs

Join Agile Leaders today and embark on a transformative journey towards becoming a more agile and effective leader. Experience our customer-centric approach, actionable training, and guaranteed return on investment. Let us help you unleash your full potential in the dynamic business landscape.

Where to
Find Us

You can join our training programs at our centers located in

We also offer online training sessions through the Zoom platform.

Malaysia	Morocco	Spain	France	UK	Italy	Egypt	Turkey	Georgia	Azerbaijan	UAE
Kuala Lumpur	Casablanca	Barcelona	Paris	London	Rome	Cairo Sharm El-Sheikh	Istanbul	Tbilisi	Baku	Dubai

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