

# OSPF

## The Routing Protocol in Detail

The successful utilization of all available LAN and WAN resources requires powerful routing algorithms, which have to be set up clearly and simply and must be able to be implemented independent of the vendor. Over the past years, Open Shortest Path First (OSPF) has established itself as a standardized, high-performance routing protocol in the IP world. By means of careful planning and implementation of the specific OSPF features, all options of the link state algorithm can be fully exploited. The participants will acquire practice-related know-how on OSPF, which can be directly used for network configuration and optimization. In this context, they will gain the competence to set up a structured network configuration on their own and in view of future requirements. As a result, work-intensive redesigning of the network can be avoided later on.

### Course Contents

- Hello Procedure
- Link State Advertisements
- Designated Router
- Graphs and Shortest Path Tree
- Implementation Details
- Area Concepts with Route Summarization and Route Redistribution
- Internal Routers, Area Border Routers, and AS Border Routers
- Setup of a Router Test Network
- Options of the Optimization of OSPF Networks
- OSPF Troubleshooting

In this course of the ExperTeach Networking series, each student will receive the comprehensive ExperTeach course documentation.

### Target Group

The course addresses designers and operators of IP networks who are responsible for the optimization of the network-internal routing and the structuring of internetworking. They will be provided with many suggestions and solutions for OSPF concepts and implementation.

### Knowledge Prerequisites

Profound IP and routing know-how are optimum prerequisites for a successful participation in the course.

### Reservation and Registration

We will be glad to make a free and non-binding course reservation for you for the duration of two weeks. On [www.experteach-training.com](http://www.experteach-training.com) under *Registration*, you can conveniently make course reservations, registrations, and hotel reservations. Alternatively, call us under +49 6074 4868-0.

For closed groups of participants, we can modify the course contents according to your requirements. Do not hesitate to contact us!



3 days €1,695 exclusive of V.A.T.

### Course date (mm/dd/yy)/Location

03/05-03/07/12	Frankfurt	12/10-12/12/12	Frankfurt
06/18-06/20/12	Frankfurt	03/11-03/13/13	Frankfurt
09/10-09/12/12	Frankfurt		

Up-to-date information: [www.experteach-training.com](http://www.experteach-training.com) OSPF



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## OSPF – The Routing Protocol in Detail

<p><b>1 The Internetworking World: Classification of OSPF</b></p> <p>1.1 Protocol Stacks</p> <p>1.2 Routing and Routers</p> <p>1.3 Routing Protocols and Routable Protocols</p> <p>1.4 OSPF: Far, far away?</p> <p><b>2 Routing Concepts</b></p> <p>2.1 Data Transport</p> <p>2.1.1 Routing Decision</p> <p>2.1.2 A Routing Table</p> <p>2.1.3 Features of IP Routing</p> <p>2.2 Routing Protocols</p> <p>2.2.1 Classification of Routing Protocols</p> <p>2.2.2 Static or Dynamic Routing</p> <p>2.2.3 CIDR—Classless Inter-Domain Routing</p> <p>2.2.4 Redistribution: Importing Routes</p> <p>2.3 RIP: The Classic</p> <p>2.3.1 Hop Count as Metric</p> <p>2.3.2 Convergence Problems</p> <p>2.3.3 RIP-1 and RIP-2</p> <p>2.3.4 Packet Formats</p> <p>2.4 BGP-4</p> <p>2.4.1 Autonomous Systems</p> <p>2.4.2 Internal and External BGP</p> <p>2.4.3 What Is a BGP Route?</p> <p>2.4.4 The BGP Routing Process</p> <p>2.4.5 (IGP/BGP) Synchronization</p> <p><b>3 OSPF: The Basics</b></p> <p>3.1 The Link State Algorithm</p> <p>3.1.1 Topology Database</p> <p>3.1.2 Scalability and Hierarchy</p> <p>3.1.3 Hello Procedure</p> <p>3.2 OSPF: Theoretical Basics</p> <p>3.2.1 Representation of the Topology</p> <p>3.2.2 Adjacencies on Point-to-Point Connections</p> <p>3.2.3 Adjacencies in the LAN</p> <p>3.2.4 Case Study: 1-Area Scenario</p> <p>3.3 The Area Philosophy</p> <p>3.3.1 Router Types</p> <p>3.3.2 Intra- and Inter-Area Routing</p> <p>3.3.3 The Example: One Step Beyond</p> <p>3.3.4 Virtual Links</p> <p>3.4 Import of External Information</p> <p>3.4.1 Type-1 External Routes</p> <p>3.4.2 Type-2 External Routes</p> <p><b>4 OSPF: Propagation of Information</b></p> <p>4.1 Link State Advertisements</p> <p>4.1.1 Router LSAs</p> <p>4.1.2 Network LSAs</p>	<p>4.1.3 Summary LSA—Networks</p> <p>4.1.4 Summary LSA—ASBR</p> <p>4.1.5 AS External LSAs</p> <p>4.2 Basic Procedures</p> <p>4.2.1 The OSPF Header</p> <p>4.2.2 The OSPF State Graph</p> <p>4.3 The Hello Protocol</p> <p>4.3.1 Scenarios in Active Operation</p> <p>4.3.2 The Hello Packet</p> <p>4.3.3 Designated Router and Backup</p> <p>4.4 The Database Description Protocol</p> <p>4.5 The Link State Protocol during Loading</p> <p>4.5.1 Link State Request</p> <p>4.5.2 Link State Update</p> <p>4.6 Database Update—Flooding Process</p> <p>4.6.1 Principle and Control</p> <p>4.6.2 Link State Acknowledgment</p> <p>4.7 Adaptation to the Transmission Technology</p> <p>4.7.1 NBMA—Non-Broadcast Medium</p> <p>4.7.2 NBMA</p> <p>4.7.3 Point-to-Point</p> <p>4.7.4 Mixed Variant</p> <p>4.7.5 Point-to-Multipoint</p> <p>4.8 OSPF Parameter</p> <p>4.9 Computing the Routing Table</p> <p><b>5 Optimization of OSPF</b></p> <p>5.1 The Options Field</p> <p>5.2 Optimization of the Databases</p> <p>5.2.1 Aggregation</p> <p>5.2.2 Stub Areas</p> <p>5.2.3 Not-so-Stubby Area (NSSA)</p> <p>5.2.4 Passive Interfaces</p> <p>5.2.5 Support for Demand Circuits</p> <p>5.3 MOSPF—Multicast Routing</p> <p>5.4 IPng and Routing?</p> <p><b>6 Hints for Planning:</b></p> <p>6.1 A Comparison: RIP and/or OSPF</p> <p>6.2 IS-IS and OSPF in Comparison</p> <p>6.3 Concepts of Addresses, Areas, and Networks</p> <p>6.3.1 Meshed Networks</p> <p>6.3.2 Backbone Networks</p> <p>6.3.3 Area Connection</p> <p>6.4 OSPF in the End Device</p> <p>6.5 Empirical Values and Threshold Values</p> <p><b>7 OSPF Configuration</b></p> <p>7.1 Configuration on Cisco Routers</p> <p>7.2 A Checklist</p> <p><b>8 Practical Application: Just Do It!</b></p>	<p>8.1 Setup of a Test Network with OSPF</p> <p>8.2 Configuration of an OSPF Network (Exercise)</p> <p>8.3 Function Test (Exercise)</p> <p>8.4 The Area Graphs of the Test Network (Exercise)</p> <p>8.5 Analysis of the Link State Database (Exercise)</p> <p>8.6 Application of Virtual Links (Exercise)</p> <p>8.7 Definition of Stub Areas (Exercise)</p> <p>8.8 Definition of Ranges (Exercise)</p> <p>8.9 NSSA—Connection of External Islands (Exercise)</p> <p>8.10 Route Exchange between OSPF and RIP</p> <p><b>A Standards: Round About Routing</b></p> <p>A.1 OSPF</p> <p>A.2 RIP</p> <p>A.3 Addressing and EGP's</p> <p><b>B Glossary</b></p> <p><b>C Traces</b></p> <p>C.1 Hello Dialogs</p> <p>C.2 Comparison of Databases—Database Description</p> <p>C.3 Comparison of Databases—LS Request and LS Update</p> <p>C.4 Further LSAs</p>
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