

Comparing ISIS and OSPF



SI-F
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Comparing ISIS and OSPF

- ❑ Both are Link State Routing Protocols using the Dijkstra SPF Algorithm
- ❑ So what's the difference then?
- ❑ And why do ISP engineers end up arguing so much about which is superior?

What Is IS-IS ?

- ❑ Intermediate System to Intermediate System
- ❑ An “IS” is ISO terminology for a router
- ❑ IS-IS was originally designed for use as a dynamic routing protocol for ISO CLNP, defined in the ISO 10589 standard
- ❑ Later adapted to carry IP prefixes in addition to CLNP (known as Integrated or Dual IS-IS) as described in RFC 1195
- ❑ Predominantly used in ISP environment

IS-IS Timeline

- 1978ish “New” Arpanet Algorithm
 - Eric Rosen et al
- 1986 to 90 Decnet Phase V
 - Radia Perlman, Mike Shand
- 1987 ISO 10589 (IS-IS)
 - Dave Oran
- 1990 RFC 1195 (Integrated IS-IS)
 - Ross Callon, Chris Gunner
- 1990 to present: All sorts of enhancements
 - Everyone contributed!
- 2008 RFC5308 adds IPv6 support
 - And RFC5120 adds Multi-Topology Routing support

What Is OSPF ?

- ❑ Open Shortest Path First
- ❑ Link State Protocol using the Shortest Path First algorithm (Dijkstra) to calculate loop-free routes
- ❑ Used purely within the TCP/IP environment
- ❑ Designed to respond quickly to topology changes but using minimal protocol traffic
- ❑ Used in both Enterprise and ISP Environment

OSPF Timeline

- ❑ Development began in 1987 by IETF
- ❑ OSPFv1 published in 1989 with RFC 1131
- ❑ OSPFv2 published in 1991 with RFC 1247
- ❑ Further enhancements to OSPFv2 in 1994 with RFC 1583 and in 1997 with RFC 2178
- ❑ Last revision was in 1998 with RFC 2328 to fix minor problems
- ❑ All above OSPF RFCs authored by John Moy
- ❑ RFC2740 introduced OSPFv3 (for IPv6) in 1999, replaced by RFC5340 in 2008

IS-IS & OSPF:

Similarities

- Both are Interior Gateway Protocols (IGP)
 - They distribute routing information between routers belonging to a single Autonomous System (AS)
- With support for:
 - Classless Inter-Domain Routing (CIDR)
 - Variable Subnet Length Masking (VLSM)
 - Authentication
 - Multi-path
 - IP unnumbered links

IS-IS and OSPF Terminology

OSPF

- ❑ Host
- ❑ Router
- ❑ Link
- ❑ Packet
- ❑ Designated router (DR)
- ❑ Backup DR (BDR)
- ❑ Link-State Advertisement (LSA)
- ❑ Hello packet
- ❑ Database Description (DBD)

ISIS

- ❑ End System (ES)
- ❑ Intermediate System (IS)
- ❑ Circuit
- ❑ Protocol Data Unit (PDU)
- ❑ Designated IS (DIS)
- ❑ N/A (no BDIS is used)
- ❑ Link-State PDU (LSP)
- ❑ IIH PDU
- ❑ Complete sequence number PDU (CSNP)

IS-IS and OSPF Terminology

(Cont.)

OSPF

- ❑ Area
- ❑ Non-backbone area
- ❑ Backbone area

- ❑ Area Border Router (ABR)
- ❑ Autonomous System Boundary Router (ASBR)

ISIS

- ❑ Sub domain (area)
- ❑ Level-1 area
- ❑ Level-2 Sub domain (backbone)
- ❑ L1L2 router

- ❑ Any IS

Transport

- OSPF uses IP Protocol 89 as transport



- IS-IS is directly encapsulated in Layer 2



For Service Providers

- Which IGP should an ISP choose?
 - Both OSPF and ISIS use Dijkstra SPF algorithm
 - Exhibit same convergence properties
 - ISIS less widely implemented on router platforms
 - ISIS runs on data link layer, OSPF runs on IP layer

For Service Providers

- Biggest ISPs tend to use ISIS – why?
 - In early 1990s, Cisco implementation of ISIS was much more stable and reliable than OSPF implementation – ISPs naturally preferred ISIS
 - Main ISIS implementations more tuneable than equivalent OSPF implementations – because biggest ISPs using ISIS put more pressure on Cisco to implement “knobs”

For Service Providers

- Moving forward a decade
 - Early Cisco OSPF implementation substantially rewritten
 - Now competitive with ISIS in features and performance
 - Router vendors wishing a slice of the core market need an ISIS implementation as solid and as flexible as that from Cisco
 - Those with ISIS & OSPF support tend to ensure they exhibit performance and feature parity

How to choose an IGP?

□ OSPF

- Rigid area design – all networks must have area 0 core, with sub-areas distributed around
- Suits ISPs with central high speed core network linking regional PoPs
- Teaches good routing protocol design practices

But requires OSPFv2 and v3 for dual-stack IPv4 and IPv6

How to choose an IGP?

□ ISIS

- Relaxed two level design – L2 routers must be linked through the backbone
- Suits ISPs with “stringy” networks, diverse infrastructure, etc, not fitting central core model of OSPF
- More flexible than OSPF, but easier to make mistakes too
- Supports both IPv4 and IPv6

Other considerations

- ❑ ISIS runs on link layer
 - Not possible to “attack” the IGP using IP as with OSPF
- ❑ ISIS’ s NSAP addressing scheme avoids dependencies on IP as with OSPF
- ❑ Because biggest ISPs use ISIS, major router vendors tend to apply new optimisation features before they are added to OSPF

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