



Comparing ISIS and OSPF

ISP/IXP Workshops

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

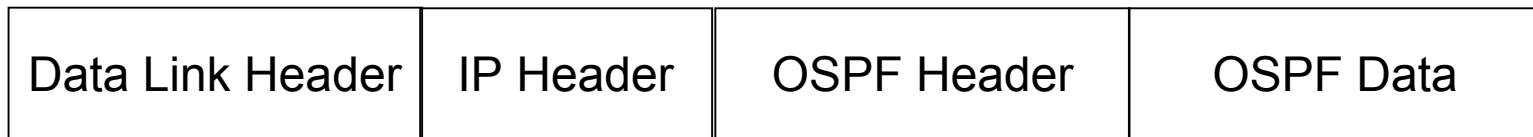
- Area
- Non-backbone area
- Backbone area
- Area Border Router (ABR)
- Autonomous System Boundary Router (ASBR)

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 90s, Cisco implementation of ISIS was much more solid 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”

- 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

- 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

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, it tends to get new optimisation features before OSPF does



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