Wireless Sensor Network, 2014, 6, 43-48
Published Online April 2014 in SciRes. http://www.scirp.org/journal/wsn
http://dx.doi.org/10.4236/wsn.2014.64006

Comparison between OSPFv3 and OSPFv2

Mustafa ElGili Mustafa

Computer Department, Community College, Shaqra University, Shaqra, Saudi Arabia
Email: mustgili@hotmail.com

Received 4 February 2014; revised 4 March 2014; accepted 11 March 2014

Abstract

This paper aims to compare between OSPFv2 and OSPFv3, to explain the impact of the change in OSPFv3 packet format and the over load when OSPFv3 uses IPv6 packet instead of IPv4 packet format that was used by OSPFv2, and the comparison based on common OSPF packets that was sent in the same network.

Keywords

Routing Protocols, OSPF, OSPFv2, OSPFv3, IPv6

1. Introduction

Link State Protocol type of routing protocol requires each router to maintain at least a partial map of the network [1]. Using the Dijkstra algorithm, a well-known algorithm for computing single-source shortest path in a graph [2], each router calculates the shortest path to each network and enters this information into the route table. Neighbor discovery is the first step in getting a link state environment up and running. In keeping with the friendly neighbor terminology, a Hello packet is used for this step. After the adjacencies are established, the routers may begin sending out LSAs. When a network link changes state, a notification, called a link state advertisement (LSA) is flooded throughout the network. All the routers store a copy of all the LSAs and it is seen in a database. The completed topological database, also called the link state database, describes a graph of the internetwork [1].

2. OSPFv2

In 1988, the group: Internet Engineers Task Force (IETF) began to develop a new protocol of routing that it would replace to protocol RIP. Then development the Open Shortest Path First protocol (OSPF) [3]. OSPF is classified as an Interior Gateway Protocol (IGP), it bases on link-state routing algorithm [4]. Protocol OSPF is an open standard routing protocol and a particularly efficient IGP that is faster than the RIP [5].

How to cite this paper: Mustafa, M.E. (2014) Comparison between OSPFv3 and OSPFv2. *Wireless Sensor Network*, **6**, 43-48.
http://dx.doi.org/10.4236/wsn.2014.64006

2.1. OSPF Packets Type [6]

OSPF has five different packet types. Each packet has a specific purpose in OSPF process. Below are OSPF packet types:

1) Hello packet;
2) Database description;
3) Link state request packet;
4) Link state update;
5) Link state acknowledgement packet.

2.2. Advantages of Using OSPF [6]

Advantages of using OSPF routing protocol are:

- OSPF is not a CISCO proprietary protocol.
- OSPF always determine the loop free routes.
- If any changes occur in the network it updates fast.
- Low bandwidth utilization.
- Support multiple routes for a single destination network.
- OSPF is based on cost of the interface.
- Support Variable Length Subnet Mask (VLSM).

2.3. The Disadvantages of OSPF [6]

The disadvantages of OSPF are:

- Difficult to configure;
- More memory requirements.

3. OSPFv3

OSPFv3 is an interior gateway routing protocol, which is widely used in IPV6 environment. It is the realization of OSPFv2 for IPV4 in the IPV6 environment. They are the same in the basic principles [7].

3.1. OSPFv3 and v2 Differences [8] [9]

- Protocol processing per-link, not per-subnet;
- Removal of addressing semantics from OSPF packets and LSAs making it network-protocol-independent;
- Addition of Flooding scope;
- Explicit support for multiple instances per link;
- Use of IPv6 link-local addresses;
- Authentication method changes;
- Packet format, LSA header format changes;
- New LSA has been created to carry IPv6 addresses and prefixes;
- Changes made to OSPFv2 to accommodate increased address size of IPv6.

3.2. OSPFv3 Header Comparison [8] [9]

As shown in **Table 1** the size of the header is reduced from 24 bytes to 16, Router ID & Area ID are still a 32 bit

Table 1. OSPFv3, v2 header comparison.

Field	OSPFv3	OSPFv2
Header Size	16 Bytes	24 Bytes
Router & Area ID	32 Bit	32 Bit
Instance ID	Yes	No
Authentication	IP Sec	Interface Specific and Entire Area

numbers and Authentication fields have been suppressed.

3.3. OSPFv3 Hello Packet Comparison [8] [9]

- Network Mask field has been removed because OSPFv3 does not require a Network mask to form an adjacency formation. Adjacency is formed on the link local as v6 runs on per link instead of per subnet.
- Option field has been increased to 24-bit from 8-bits.
- Dead interval has been reduced to 16 bits from 32.
- DR and BDR are still 32-bit field and contain the.
- Router ID of DR/BDR instead of IP address. Router ID along with the Link ID uniquely identifies the DR on an interface.

4. Simulation Methodology

Network is simulated using OPNET Modeler. OPNET is extensive and powerful simulation software tool with wide variety of capabilities. It enables the possibility to simulate entire heterogeneous networks with various protocols [1]. The simulated communication network designed for OSPF as shown in the **Figure 1**, consists of 5 routers and 2 PCs and one videoconference server.

5. Result Discussion

As we have seen in **Figure 2** the hello traffic sent by OSPFv3 less overhead than the others that they sent by OSPFv2 because of change in Hello packet format fields specifically the option field witch increased in ospfv3 to 24 bit and in ospfv2 was 8 bit, and the option field used just in certain situations, and Dead intervals field reduced to 16 bits from 32.

As compared, OSPFv3 does not require a Network mask to form an adjacency formation. Adjacency is formed on the link local as v6 runs on per link instead of per subnet, that is explained as in **Figure 3** why is Link State Update (Multicast) traffic sent by OSPFv3 lower than other one witch is sent by OSPFv2.

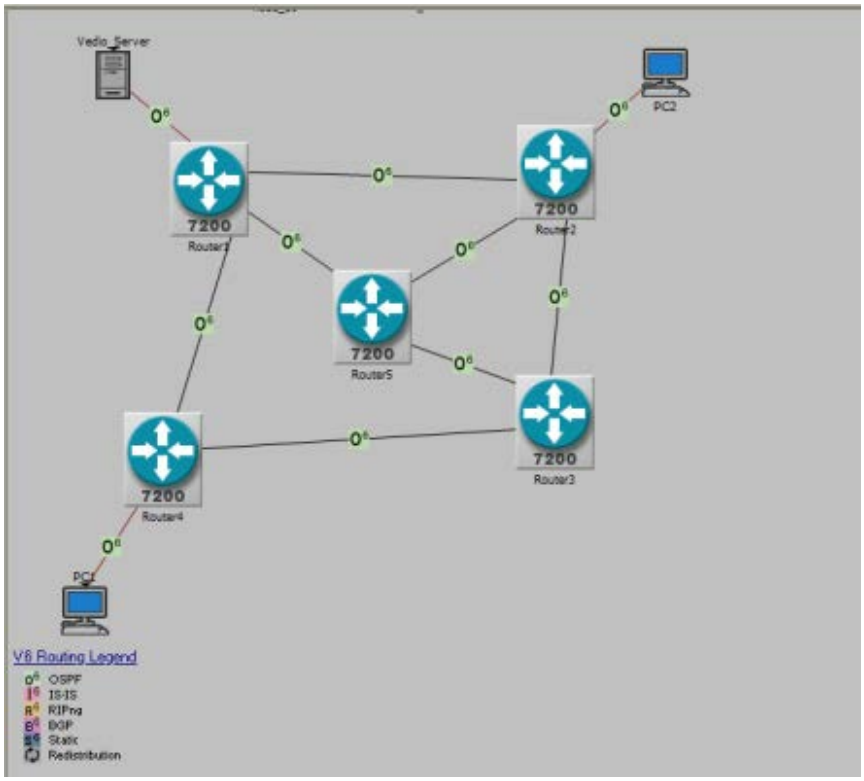

Figure 1. Scenario map.

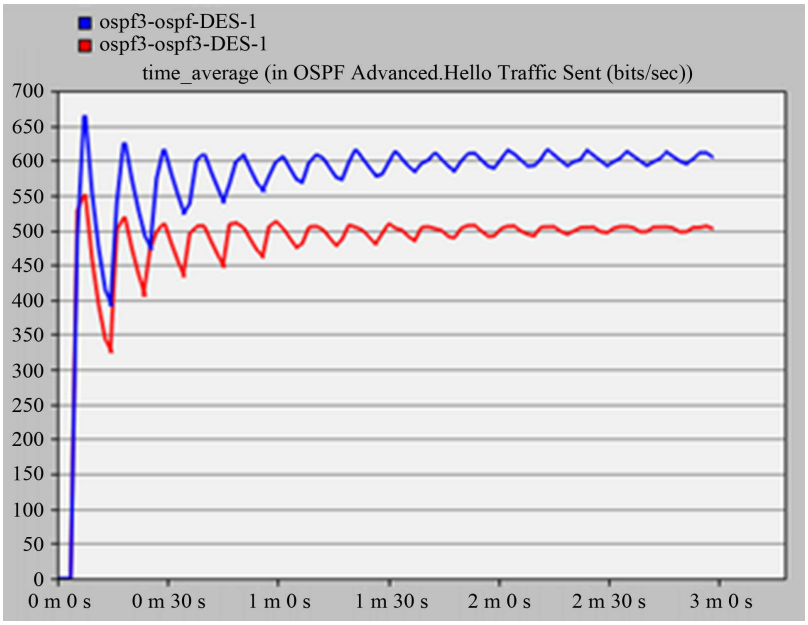

Figure 2. Hello traffic sent.

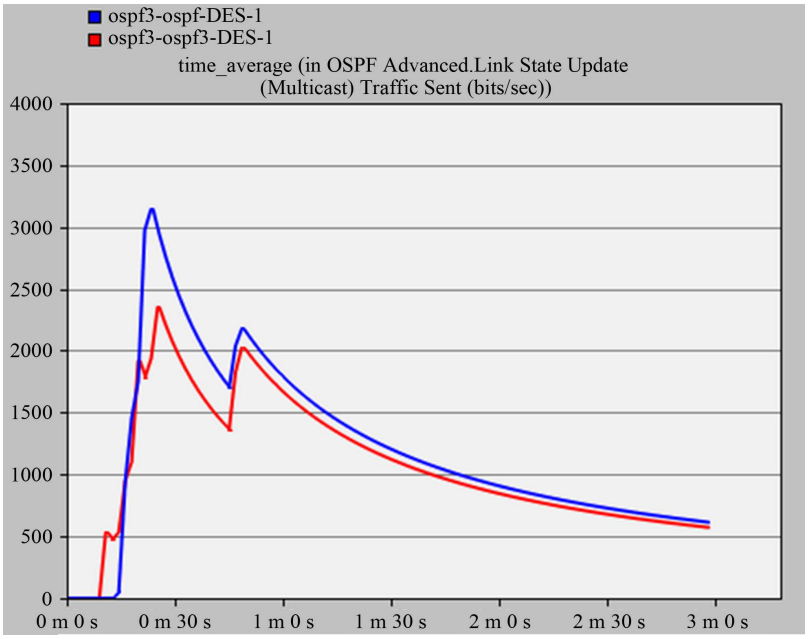

Figure 3. Link state update (multicast) traffic sent.

OSPFv3 packets are encapsulated in IPv6 headers, and OSPFv2 packets are encapsulated in IPv4 headers. The size of IPv6 header (40 byte) is bigger than the IPv4 header witch (20 byte) instead of the authentication change of OSPFv3 header witch it has been removed from the OSPF packet header. OSPFv3 relies on the authentication mechanism of IPv6 to ensure integrity and validity, the impact of this encapsulation clearly arises in **Figures 4-6**. Thus Link State Update (Unicast) traffic sent, Link State Request traffic sent and Database Description Traffic Sent, have more overload data sent through the network.

6. Conclusions

From the simulation and analysis performed, the study resulted in the following findings:

- Packet sent in an IPv4 environment is smaller than the packet sent in an IPv6 environment. This is because in the IPv6 network, addressing is much larger than in IPv4. IPv4 header size is 20 bytes, whereas in IPv6 is 40 bytes.
- In OSPFv3, authentication has been removed from the OSPF packet header. OSPFv3 relies on the authentication mechanism of IPv6 to ensure integrity and validity.

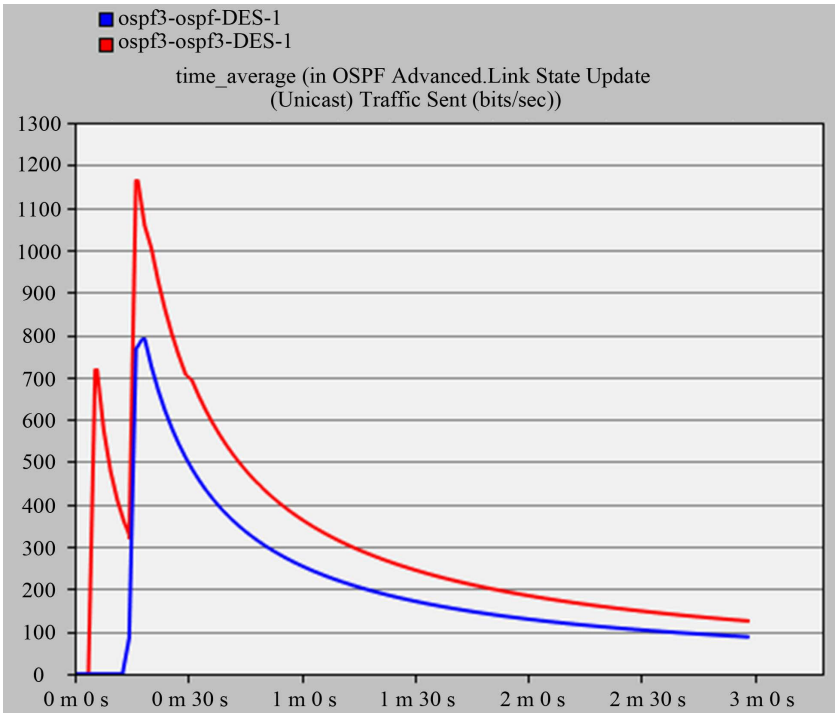

Figure 4. Link state update (multicast) traffic sent.

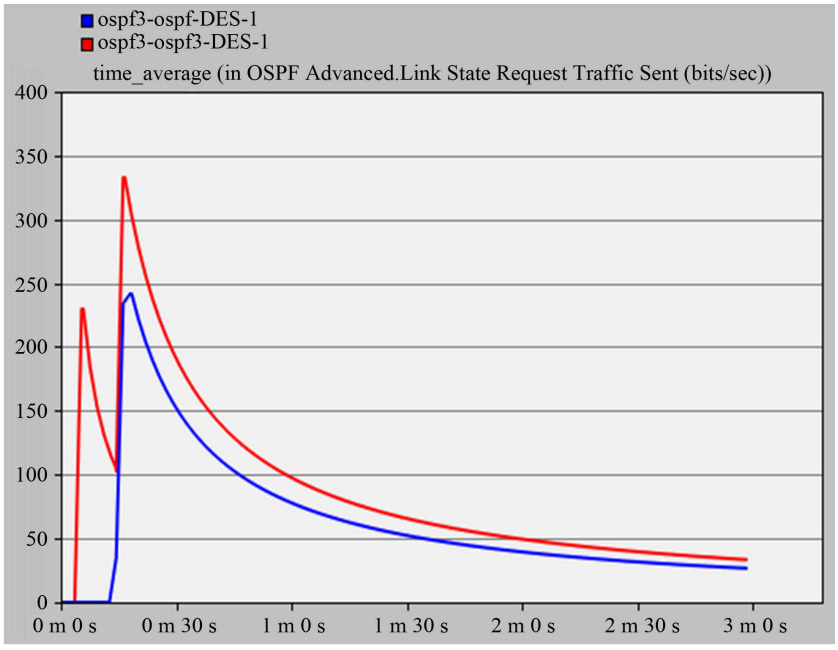

Figure 5. Link state update (multicast) traffic sent.

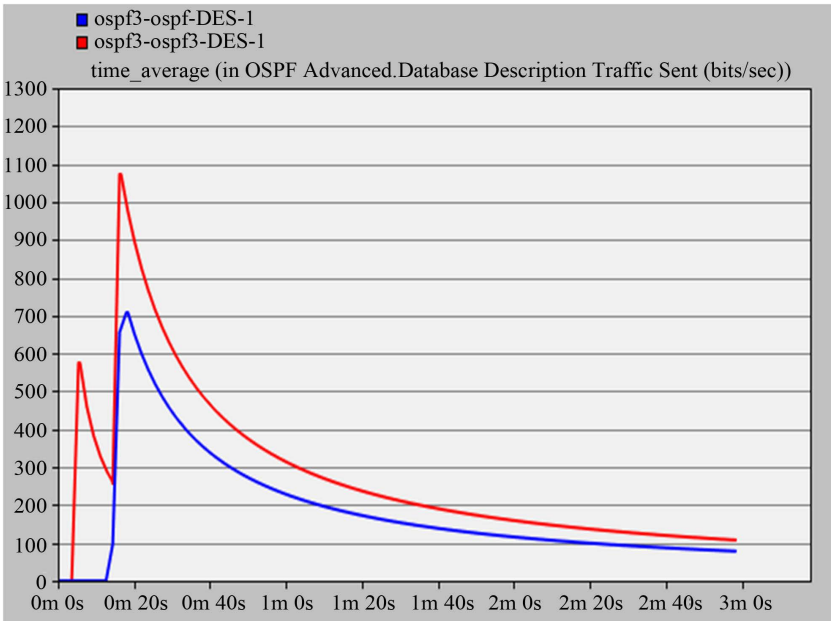

Figure 6. Database description traffic sent.

- OSPFv3 does not require a Network mask to form an adjacency formation. Adjacency is formed on the link local as v6 runs on per link instead of per subnet.

References

[1] S.G. Thorenoor (2010) Communication Service Provider's Choice between OSPF and IS-IS Dynamic Routing Protocols and Implementation Criteria Using OPNET Simulator. *Second International Conference on Computer and Network Technology*, Bangkok, 23-25 April 2010, 38-42.

[2] Jasika, N., Alispahic, N., Elma, A., Ilvana, K., Elma, L. and Nosovic, N. (2012) Dijkstra's Shortest Path Algorithm Serial and Parallel Execution Performance Analysis. *MIPRO*, Opatija, 21-25 May 2012, 1811-1815.

[3] Perez, M.H. and Santiago, A.M. (2006) Process of Migration of Routing Protocols in a LAN: RIP to OSPF. 3*rd International Conference on Electrical and Electronics Engineering*, Veracruz, 6-8 September 2006, 1-5.

[4] Zhou, H.J., Pan, J. and Shen, P.B. (2003) Cost Adaptive OSPF. *Proceedings of the Fifth International Conference on Computational Intelligence and Multimedia Applications* (*ICCIMA*'03), Xi'an, 27-30 September 2003, 55-60.

[5] Celik, F. and Zengin, A. (2013) Discrete Event Simulation-Based Performance Evaluation of Internet Routing Protocols. *Turkish Journal of Electrical Engineering & Computer Sciences*, **21**, 1720-1736.

[6] Wijaya, C. (2011) Performance Analysis of Dynamic Routing Protocol EIGRP and OSPF in IPv4 and IPv6 Network. *First International Conference on Informatics and Computational Intelligence*, Bandung, 12-14 December 2011, 355-360.

[7] Chen, H.H. and Sun, X.L. (2013) Simulation and Research of OSPFv3 Performance. *International Conference on Computational and Information Sciences*, Shiyang, 21-23 June 2013, 1901-1903.

[8] Shirkar, A. (2013) Comparing OSPFv3 & OSPFv2 Routing Protocol. https://supportforums.cisco.com/docs/DOC-23905

[9] Cisco (2008) IPv6 Routing Protocols. http://www.txv6tf.org/wp-content/uploads/2010/08/Shamim-Tutorial-IPv6_Routing.pdf