J Int Comp & He Inf.
Vol. 2, No. 1, March 2021

p-ISSN 2715-6923, e-ISSN 2721-9186
https://jurnal.unimus.ac.id/index.php/ichi

Journal of Intelligent Computing and Health Informatics

Check for updates

Border Gateway Protocol (BGP) Protocol Implementation in Public Network of the Universitas Muhammadiyah Semarang

Research Article

Akhmad Fathurohman*, Safuan

Department of Informatics, Universitas Muhammadiyah Semarang, Semarang 50254, Indonesia

**akhmadfathur@unimus.ac.id (coresponden author)*
safuan@unimus.ac.id

Article history :
Received : 10 Feb 2021
Accepted : 25 Mar 2021
Available online : 30 Mar 2021

ABSTRACT

The need for the smoothness and reliability of the internet network on campus is very high, especially in the current state of the need for a very high internet connection, all activities, both administrative and learning activities, are carried out online. At locations throughout the campus area, adequate availability of computer and internet network access is required. Universitas Muhammadyah Semarang (Unimus) campus which is spread across various collations of the city of Semarang, and in an integrated campus also consists of various buildings that are relatively far apart needed, therefore a network model is needed that meets all Unimus needs. Dynamic routing, also called adaptive routing, is a process where a router can forward data via a different route or given destination based on the current conditions of the communication circuits within a system. The BGP (Border Gateway Protocol) routing method which allows to provide smooth access with equal opportunities at every main network access point. This model is the choice that is applied to the Unimus public network.

Keywords : Computer networks, dynamic routing, BGP routing.

p-ISSN 2715-6923, e-ISSN 2721-9186 , Vol. 2, No. 1, March 2021, *pp.12-16*

1. INTRODUCTION

The need for computer networks at the Universitas Muhammadiyah Semarang (Unimus) to provide public networks and connect computers between campuses requires precise and accurate design so that a reliable computer network is obtained, avoids the smallest disturbance, and can smoothly deliver large data to meet all the needs of data access. Its users are all academicians on campus, especially lecturers and students.

Fig 1. Arsitecture computers network interconnection in campus of Unimus.

Unimus internet network connection on a global network, a dedicated connection is made to 2 (two) Internet Service Providers (ISP) as the main network and the backup network. Of course, a stable and reliable network setting is needed and autorocovery alternates when one disturbances occurs. Meanwhile, Unimus also consists of many campuses and many buildings that have to be connected to a computer network at Unimus, therefore routing is required so that it runs smoothly to all points that require connection.

The router used to manage computer networks at Unimus, both hardware and software, uses Mikrotik. In accordance with what is described in Mikrotik.co.id, if we subscribe to the internet, usually an Internet Provider (ISP) has a service or more to separate the path or gateway between international and local internet connections, also to manage more than one provider requires a simple setting on router so that data communication in the network runs smoothly. In this way users can easily perform bandwidth management for access to both lines, the most widely used method is the BGP Peer. Border Gateway Protocol (BGP) is a type of routing protocol that functions to exchange information between Autonomous Systems (AS). This BGP is a Dynamic Routing and on the proxy there are several kinds of dynamic routing features. The BGP work system in exchanging information utilizes the Transmission Control Protocol (TCP) so that there is no need to use other types of protocols to handle fragmentation, retransmission, acknowledgment and sequencing (mikrotik, 2021a).

The purpose of this study is to determine the implementation of dynamic routing GBP on the Unimus public network, so that the network has good reliability.

The problems in this paper are: (1) how is the public network of Muhammadiyah University in Semarang, (2) how is the implementation of routing on the public network in Unimus, (3) how is the implementation of the BGP dynamic routing model used.

2. METHODS

2.1. Theory

The purpose of a network protocol on a router is to direct data traffic to the optimal path towards a destination when given a choice between multiple paths. The "dynamic" part refers to a protocol's ability to recalculate and reroute traffic when a more optimal path is available or when a link is along the smoothest path. There are several dynamic routing protocols that can be used for smooth routing (mikrotik, 2021b).

The dynamic routing protocol that is the most different from all the others is the Border Gateway Protocol (BGP). Routing Information Protocol (RIP), Enhanced Interior Gateway Routing Protocol (EIGRP) and Open Shortest Path First (OSPF) are all interior gateway protocols (IGP) while BGP is an exterior gateway protocol (EGP). Basically, interior protocols are meant to dynamically route data across a network that you fully control and maintain. Exterior routing protocols are used to exchange routes between distinctly separate networks that you have no administrative control over. BGP is the routing protocol used on the internet; therefore, the most common enterprise use is to run BGP on your internet edge when connecting to your ISP (Conte, 2003).

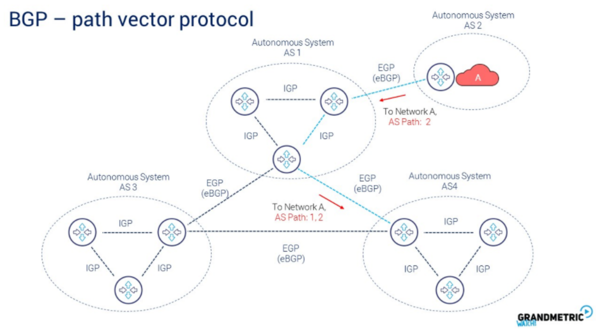


Fig 2. Architecture model BGP(Grand Metric, 2018)

Dynamic routing uses the BGP protocol when a network has multiple internet connections to multiple providers and wants to provide automatic failover and load balancing capabilities. BGP can be used to dynamically redirect from one ISP link to another when the primary connection fails. BGP can also be configured to learn full or partial routing tables to make better routing decisions based on optimal outbound internet paths to all network routes (grandmetric, 2018).

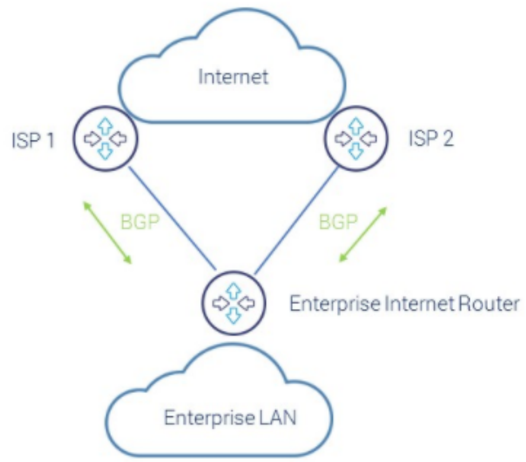


Fig 3. BGP model in Unimus.

Unimus has 2 (two) internet providers, so it is very suitable to use the BGP dynamic rotuting method for network management. This routing method can be implemented on public networks, to publish servers in the Unimus data center, on the unimus.ac.id domain, and smooth internet access from the two providers to all user network routes throughout the Unimus environment (Dutt, 2019).

4.1. Proposed Method

We use the Research & Development (R&D) as the propose method. The subject of this study is Unimus public network managed by the Technical Implementation Unit (UPT) of Information and Communication Technology (TIK) Unimus. The data used in this study process was collected by direct observation accompanied by the UPT TIK Unimus. With this method, clear and complete data is obtained so that the routing problems that occur can be analyzed from the data.

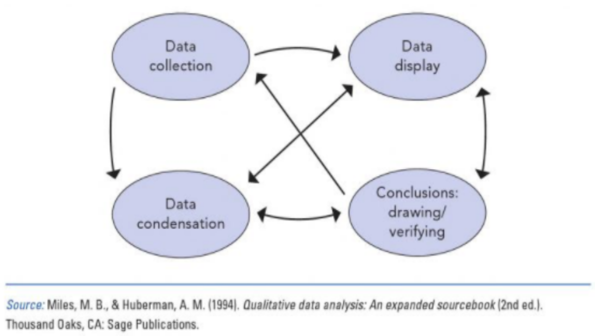


Fig 4. Data analysis techniques according to Milles & Huberman (Miles & Huberman., 2014)

To present the data so that it is easy to understand, the data analysis steps used in this study are the Analysis Interactive Model from Miles and Huberman, which divides the steps in data analysis activities into several parts, namely data collection, data reduction (data reduction), data presentation (data display), and drawing conclusions or verification (conclutions)(Miles, Matthew B. Huberman, A. Michael, Saldana, 2014) .

3. RESLTS AND DISCUSSION

3.1. Unimus public computer network

Referring to the Unimus Information and Communication Technology Blue Print, the design of the type of service design for computer network infrastructure services and internet access through improving the quality of the main backbone network using fiber optic cable devices that allows high-capacity data transfer quality, network development considerations are increased every year in an effort to improve access services as follows. This network is prioritized on the intranet network between campuses and buildings. Furthermore, the network under it for all users is available and sufficient to get access to a wide area network supported by a UTP copper cable network (Unshielded Twisted Pair) and without a Wireless Fidelity (Wifi) cable. Prioritizing the availability of adequate internet bandwidth access based on the number of users throughout the Unimus environment. Main Network Scheme.

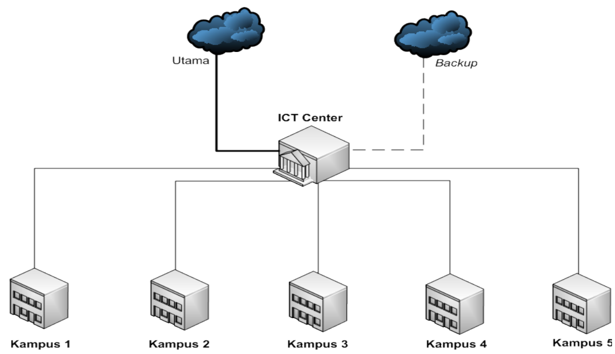


Fig 5. Unimus public computer network.

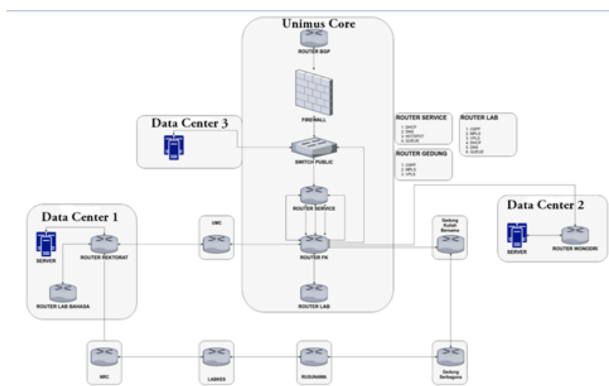


Fig 6. Use of public IP on the Unimus computer network.

The core router is located in one of the buildings on the Main Campus (integrated campus) and then the inter-campus network uses a star topology, while the interbuilding network uses a ring topology (Manzoor et al., 2020), as described in Fig. 5.

3.2. Implementation routing BGP

The BGP dynamic routing method is implemented on the Unimus public network on a special router that functions as a computer network route manager for 2 (two) ISPs (BGP multihoming) and public IP settings on all data servers that exist throughout the Unimus Data Center (Nicol et al., 2004).

The router device specifications used are the Mikrotik CCR1009-7G-1C-1S + and the Mikrotik Router Operating System (OS) v6. The connection is managed from the BGP router to the provider, to the router which functions to create a Public IP path on the Unimus data center servers, with a network architecture as shown in Fig. 7.

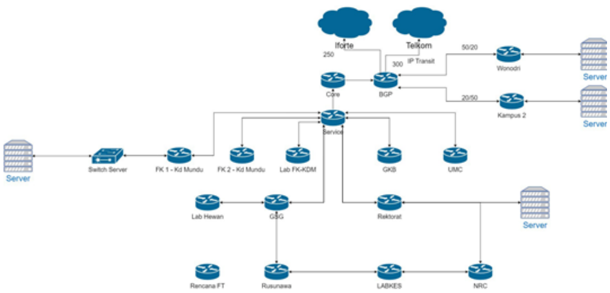


Fig 7. Implementaion routing method BGP in Unimus computer network

After the access rules are managed and arranged on each interface connected to the predetermined network, then the BGP routing implementation is tested, and one of the observations is as shown in the following in Fig. 8.

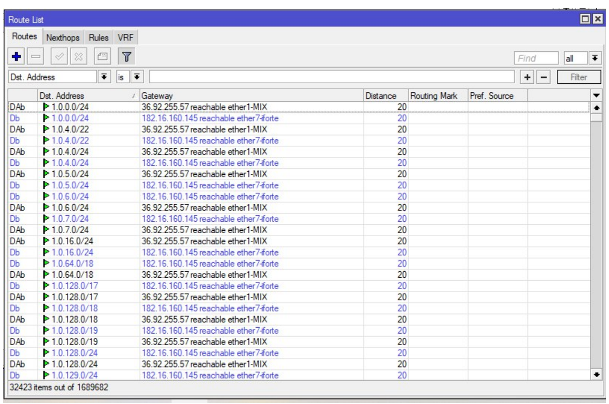


Fig 8. Route list accsess using routing BGP method in Unimus computer network.

The results of observations on the quality and smoothness of network access are shown from the pinging results on ISP 1 and ISP 2 as shown below.

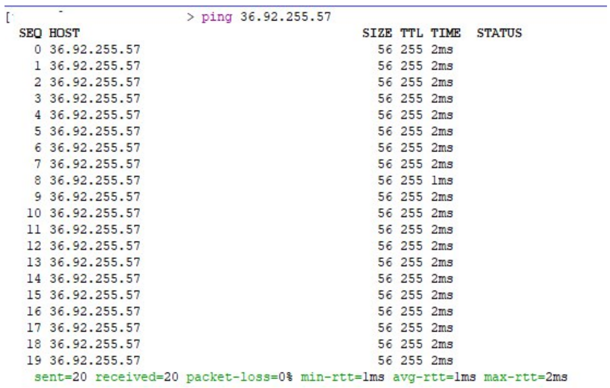


Fig 9. Testing connection to provider ISP 1.

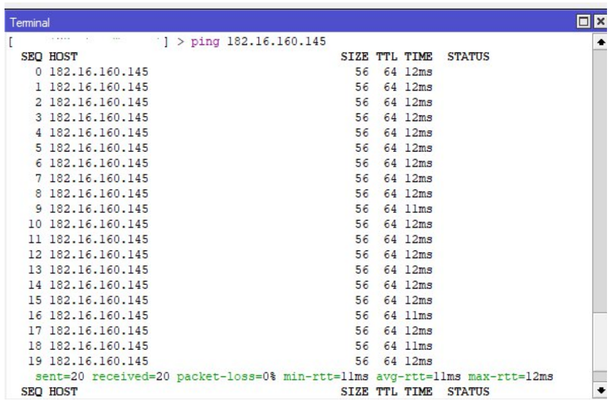


Fig 10.Testing connection to provider ISP 2.

As shown in Fig. 9, the pinging results to ISP 1 with IP 36.92.255.57 of 20 packets were obtained (sent = 20 reveive = 20 packet-loss = 0% min-rtt=1ms avg-rtt = 1ms max-rtt = 2ms), these results indicate a very good connection.

As shown in Fig. 10, the pinging results to ISP 2 with IP 182.16.160.145 as many as 20 packets are obtained (sent = 20 reveive = 20 packet-loss = 0% min-rtt=11ms avg-rtt = 11ms max-rtt = 12ms), these results indicate a good connection.

The connection to the public IP that is set on a server in the Unimus data center with different locations, the results of the observations were tried on two public servers with different data center locations. The observation results show that on the unimus.ac.id server which is on IP (103.97.100.2) at location I as many as 20 packets were obtained (sent = 20 reveive = 20 packet-loss = 0% min-rtt = 4ms avg-rtt = 13ms max-rtt = 47ms), then on the ifmipa.unimus.ac.id server on IP (103.100.97.246) at location II as many as 20 packets were obtained (sent = 20 reveive = 20 packet-loss = 0% min-rtt = 0ms avg -rtt = 0ms max-rtt = 1ms). These results indicate the network connection on the server shows a very good connection (no packet loss).

However, the unimus.ac.id server is a little slower than the connection on the ifmipa server (13 ms> 0ms), there is a 13 ms difference, this is due to several factors, generally the load on the access to the server, unimus.ac.id is a the main server to which all public accesses are through unimus.ac.id, while ifmipa.unimus.ac.id is a sub domain that is especially relatively only accessed by users in the faculty of mathematics and natural sciences (FMIPA), which is 1 faculty of 8 faculties in Unimus.

4. CONCLUSION

The conclusions of this study are that: (1) Dynamic Border Gateway Protocol (BGP) Routing Method has been implemented in the public network unimus 103.97.100.0/24. (2) Implemented interconnection, namely for connection to 2 (two) Internet Service Providers (ISP)- BGP Multihoming and management of public IP on servers located at the Unimus Data Center. (3) Implementation of BGP dynamic routing method has run on Unimus network rule very well.

Furthermore, we recommend the implementation of this BGP dynamic routing method on a network of educational institutions or other institutions, which have their own public IP and have access to more than one provider such as Unimus.

REFERENCES

Conte, M. (2003). *Dynamic Routing in Broadband Networks* (Vol. 3). Springer US. https://doi.org/10.1007/978-1-4615-0251-7

Dutt, D. G. (2019). *Cloud Native Data Center Networking: Architecture, Protocols, and Tools*.

grandmetric. (2018). *Dynamic Routing – BGP*. Grandmetric. https://www.grandmetric.com/topic/dynamic-routing-bgp-01/

Manzoor, A., Hussain, M., & Mehrban, S. (2020). Performance Analysis and Route Optimization: Redistribution between EIGRP, OSPF & BGP Routing Protocols. *Computer Standards & Interfaces*, *68*, 103391. https://doi.org/10.1016/j.csi.2019.103391

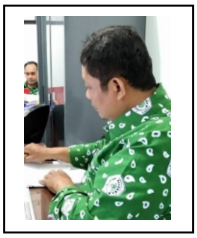
mikrotik. (2021a). *BGP-Peer, Memisahkan Routing dan Bandwidth Management*. Citraweb. https://citraweb.com/artikel_lihat.php?id=21

mikrotik. (2021b). *Konfigurasi Dasar BGP*. Mikrotik. http://www.mikrotik.co.id/artikel_lihat.php?id=170

Miles, Matthew B. Huberman, A. Michael, Saldana, J. (2014). *Qualitative Data Analysis: A Methods Sourcebook*.

Nicol, D. M., Smith, S. W., & Zhao, M. (2004). Evaluation of efficient security for BGP route announcements using parallel simulation. *Simulation Modelling Practice and Theory*, *12*(3–4), 187–216. https://doi.org/10.1016/j.simpat.2003.10.003

Akhmad Fathurohman received the Master of Computer Science (M.Kom) degree in Informatics Engineering from Universitas Dian Nuswantoro in 2011. His research interests informatis technology & networks.



Safuan received the Master of Science (M.Kom) in Informatics Engineering from Universitas Dian Nuswantoro in 2011. His research interests informatis science & database management system.