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Dynamic Routing Performance Analysis with Border Gateway Protocol (BGP) Single Multi-Homed Diskominfosantik

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ABSTRAK

The study approach uses network simulation software to scan various traffic patterns and network topologies. This study reveals the performance of dynamic routing with Border Gateway Protocol (BGP) in a single multi-homed setting. BGP is the basic routing protocol that governs the exchange of information between autonomous systems (AS) on the internet. In a single multi-homed situation, autonomous systems are connected to multiple egress paths through two internet service providers (ISPs). This study evaluates the performance of BGP by exploiting time convergence, route stability, bandwidth utilization efficiency, and latency. The study approach uses network simulation software to simulate various traffic patterns and network topologies. The research method involves network simulation using a network simulator to simulate various scenarios and topologies.

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INTRODUCTION

Department of Communication, Informatics, Cryptography, and Statistics (Diskominfosantik) The need for reliable and effective network infrastructure is crucial in the rapidly developing digital era, especially in supporting public services based on information and communication technology (ICT). To support local government services effectively and efficiently, the Department of Communication, Informatics, Cryptography, and Statistics (Diskominfosantik) of Bekasi Regency plays an important role in managing and developing ICT infrastructure.

The establishment of a reliable protocol is urgently needed in Bogor Regency considering the need for consistent connectivity for communication between agencies, e-Government services, and cross-sector data integration. The Bogor Regency Communication and Informatics Office can improve the security and leakage of local government network infrastructure, provide redundancy, and optimize network traffic management with high efficiency through the implementation of BGP. The implementation of BGP on the Bogor Regency Communication and Informatics Office network is also intended to improve network

capabilities in handling disruptions, facilitate multihoming management with several ISPs, and ensure that the public and related agencies get better access to digital services. (Lain & Nasional, n.d.)

The router connects computers in the program to allow access to data routes that will then be used to examine incoming data packets. Through this procedure, network data packets are sent to a single network, which can then be connected to each Diskominfosantik Kab. Bekasi router to cover each other. To perform routing tasks on a network, a router is needed. The router will then function as a device or intermediary to allow communication between other hosts resulting from the routing process. (Azhari et al., 2019)

Static routing and dynamic routing are two categories of signaling or routing management systems. Static routing is the process of manually managing routes in a computer network using routers with static routing tables. When packets are routed to a target router with connections to multiple routers, static routing attempts to avoid the problem. In computer networking, dynamic routing is a router with an automatic routing table that determines the optimal path to reach the target router. (Hidayat et al., 2022)

A routing protocol called the Exterior Gateway Protocol (EGP) is used to control how routing data is shared between multiple autonomous systems (AS) in a computer network. EGP is responsible for controlling the flow of traffic between multiple ASs in a larger network. (Rifandi, 2023)

Autonomous System (AS) networks use the Interior Gateway Protocol (IGP) as a routing protocol. A collection of networks under the management and supervision of a single administrative body that share a common internal routing strategy is known as an autonomous system. Examples of such networks are office networks, campus networks, and Diskominfosantik, which includes several branches. (Ramadhani et al., 2023)

RESEARCH METHODS

To conduct research into the use of BGP, here are some research methods that can be used.

a. Literature Study
   This approach develops a hypothesis that substantially supports the content of this final project by using books as reference materials, to produce a final project proposal that meets the requirements.
b. Network Simulation
   Configure BGP on the device, this allows for monitoring and measuring BGP performance in a controlled setting.
c. Observation
   The process of writing observations on research objects that are carried out directly to obtain the data needed in this study, the researcher conducted direct observations by visiting the Communication, Informatics, Cryptography and Statistics Service (Diskominfosantik) of Bekasi Regency.
d. Interview
   A form of communication or conversation that aims to obtain information about the object being studied. In this case, the researcher conducted a direct Q&A with Geeta Putri Mayangsari, S.Kom as the First Expert Computer Technician who served as the Head of the Server Infrastructure Team and Ahdan Alwafi, S.Kom as the senior Network Operating Center (NOC) who served on the Bekasi Regency Diskominfosantik network.

1. Needs Analysis

The Device Requirements Analysis phase involves identifying the devices used in the research, including hardware and software.

Table 1. Hardware Details

Perangkat	Spesifikasi	Fungsi
Router	*CCR1009-7G-1C-1S+* • *Architecture TILE* • *CPU TLR4-00980* • *CPU Core Count 9* • *CPU nominal frequency 1.2 Ghz* • *RouterOS License 6* • *Operating system RouterOS*	Used to do port forwarding and IP forwarding

	• *RAM 2GB* • *Storage 128MB* • *Gigabit ethernet* • *Sfp port*	
Router	*JUNIPER Router MX150* • *System Capacity: 40 Gbps* • 2 MIC Slot • Chassis per rack: 42 • *Maximum weight*: 9.48 lb /4.3 kg • *Full service suite* - 1:1 NAT, *firewall*, IPS • 10/100/1000 *and* 10GbE *interfaces*	Used to do *port forwading* and *IP forwading*
Server	*Dell PowerEdge R750xs* • *2x Intel Xeon Silver 4309Y* • *RAM 128GB* • *Hard Drive 198 TB* • *Gigabit ethernet*	Used to run virtual machines
Personal Computer	*Lenovo Ideapad 3* • *Intel Core I3 Gen 11th* • *RAM 8* • *SSD 250 GB* • *Gigabit ethernet*	Used to run virtual machines

Source: Research Results 2025

2. Research Methods

This study uses a cyclical network design process known as PPDIOO (Prepare, Plan, Design, Implement, Operate, Optimize). The main benefit of the PPDIOO method is its ability to reduce TCO (Total Cost of Ownership). In addition, because this approach utilizes an organized network architecture design, it can help improve network availability. (Ryan Hamonangan Sitompul et al., 2021) The model cycle can be seen in Figure 1.

Source: (Ryan Hamonangan Sitompul et al., 2021)

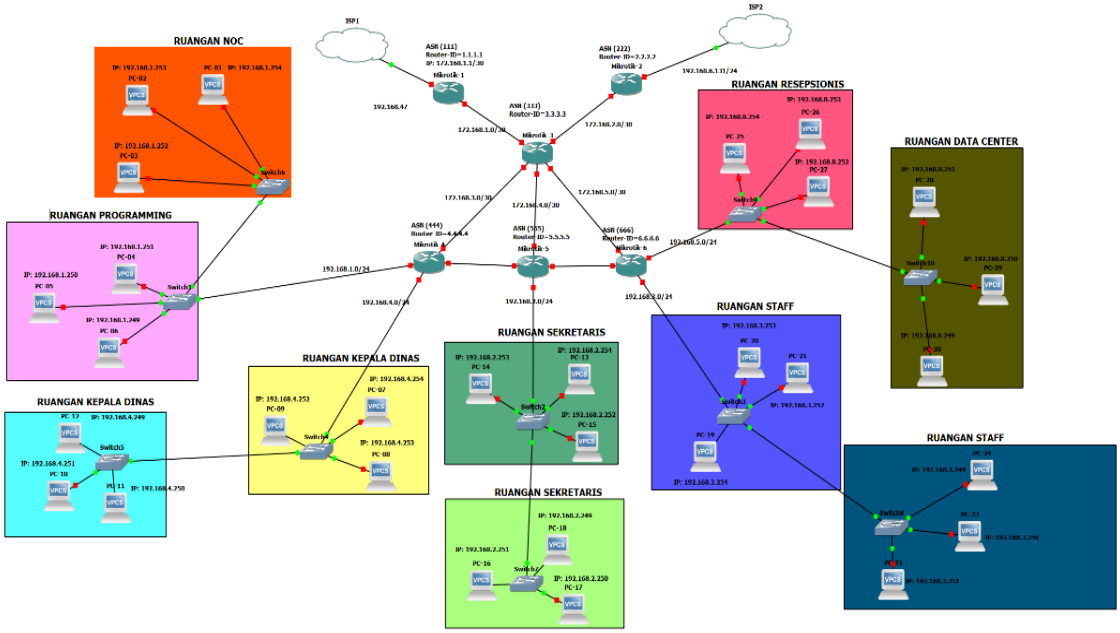
Figure 1. PPDIOO Method

The following is an explanation of the steps of the PPDIOO method which are adapted to research work procedures:

1. *Prepare*
   At this stage, the data collection required for the research was carried out at the Bekasi Regency Communications and Information Service.
2. *Plan*
   Determine what Diskominfosantik needs. Basic network topology design is also applied at this stage.
3. *Design*
   In order for management to understand the topology image in depth, the basic design that has been created will now be modified using the topology design tool. Performance, security, and reliability should all be the strong points of the network architecture.
4. *Implement*
   The most crucial step in this procedure is implementation, where configuration is done to control the Mikrotik router and create a network.
5. *Operate*
   This stage manages and monitors network components, and identifies errors that still occur.
6. *Optimize*
   The final step is when repairs or adjustments can be made to improve the quality of the network if there are too many problems.

RESULTS AND DISCUSSION

The following are the results and discussion of the case of the analysis of the performance of the BGP dynamic routing network at Diskominfosantik Kab. Bekasi. The following is the topology of the Diskominfosantik network

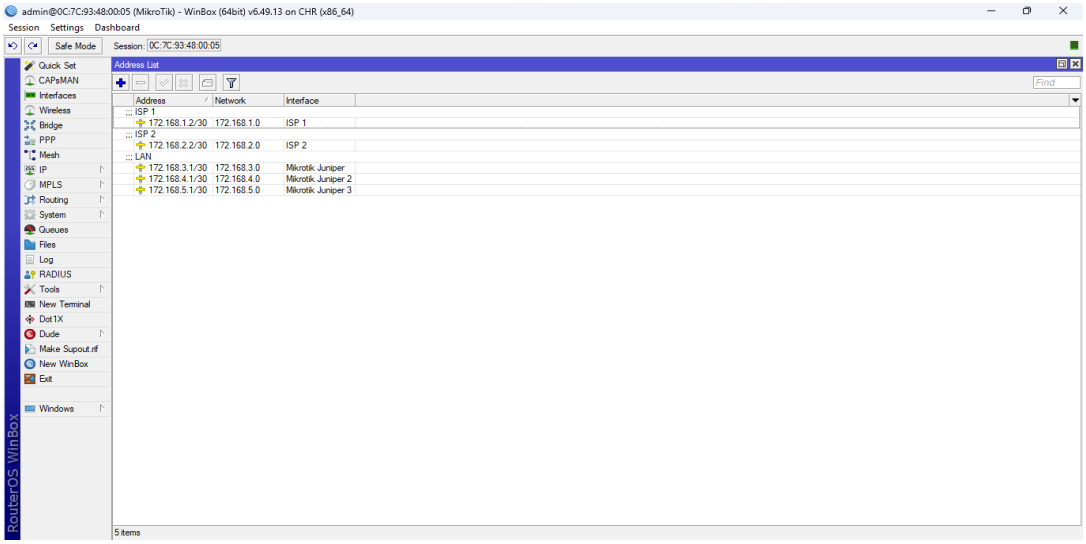


Source: Research Results 2025

Figure 2. Diskominfosantik Network Topology

1. Implementation of Network Configuration with BGP

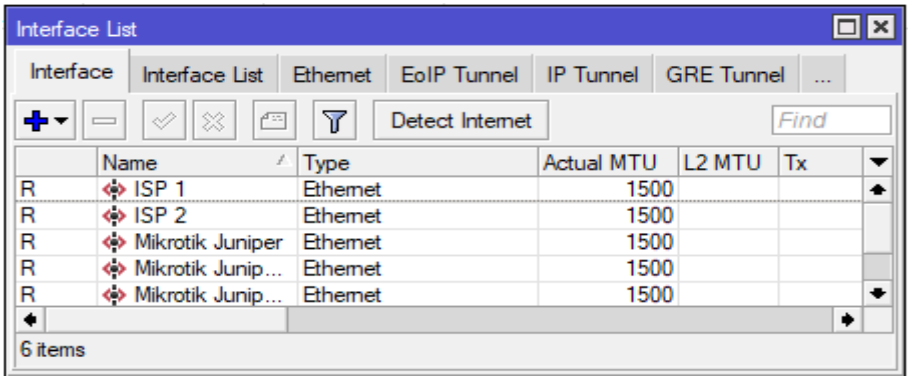
The following are the results of the Mikrotik configuration at Diskominfosantik in the image below, namely the settings for several IP addresses on several interfaces.



Source: Research Results 2025

Figure 3. IP Address Configuration

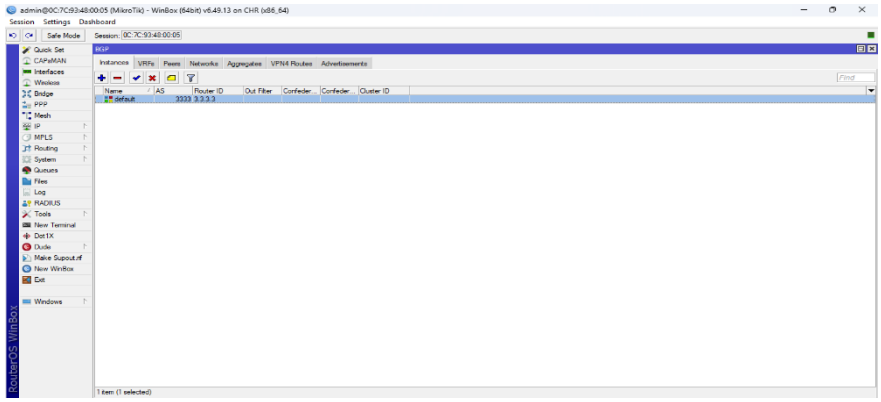
Next, add comments to each available interface, namely ether 1 “ISP1”, ether2 “ISP2”, ether 3 “Mikrotik Juniper”, ether4 “Mikrotik Juniper 2”, ether 5 “Mikrotik Juniper 3”. Add these comments to provide additional information or markers that make it easier to manage and administer the network.



Source: Research Results 2025

Figure 4. Mikrotik CCR Interface List

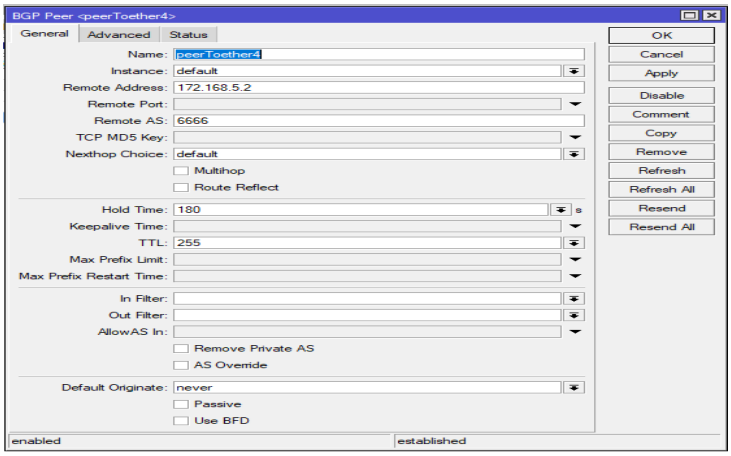
Menambahkan ID router dan ASN pada router Mikrotik CCR



Source: Research Results 2025

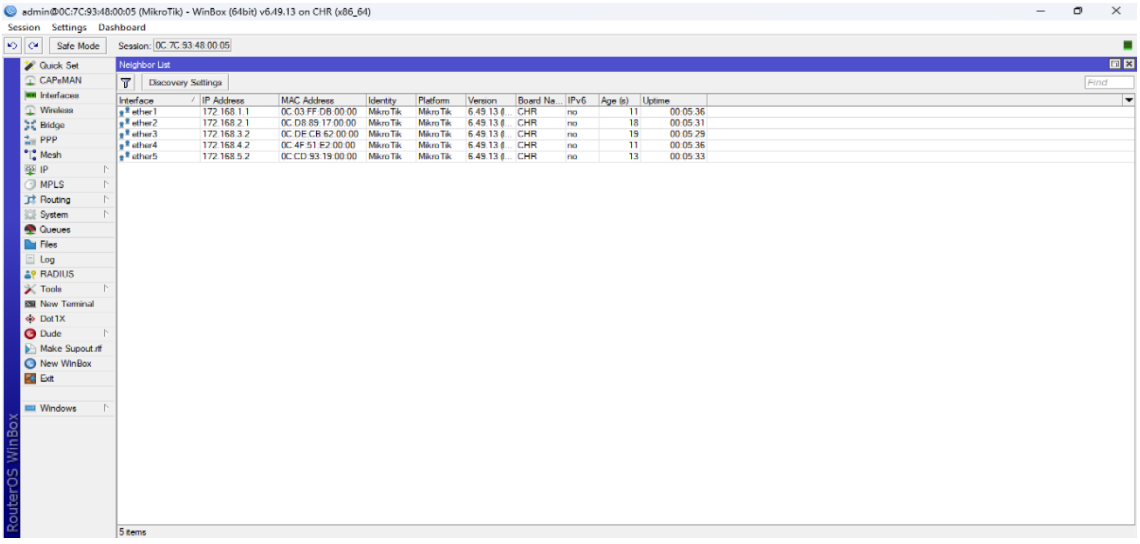
Figure 5. Adding Router ID & ASN

Buat Peer BGP dengan router-id 6666 pada ether 4 dengan remote-address=172.168.5.2



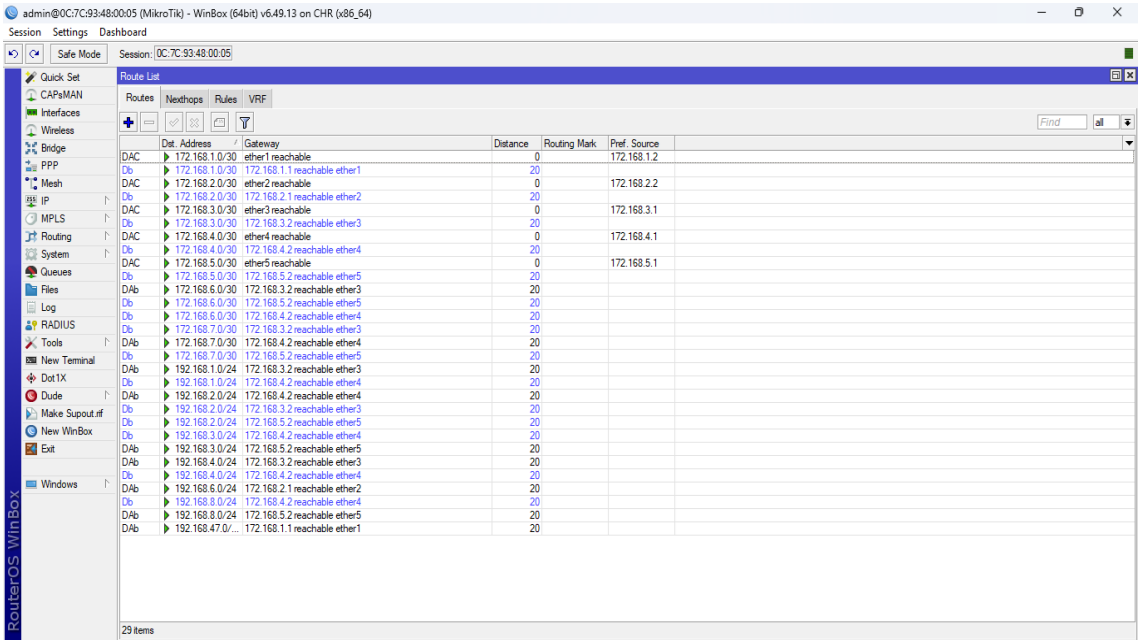
Source: Research Results 2025

Figure 6. Setting Up BGP Peer



Source: Research Results 2025

Figure 7. BGP Neighbor On Mirkrotik CCR



Source: Research Results 2025

Figure 8. Mikrotik CCR BGP Route List

Results of the first day of trial measurements on BGP dynamic routing

Table 2. BGP Dynamic Routing Measurement Results

No	Hasil Pengukuran Routing Dinamis BGP			
	Pengujian	Delay (MS)	Packet Loss(%)	Thoughput(kbps)
1	PC NOC 1 Ke PC Programing PC 1	45	0	1,52
2	PC NOC 2 ke PC Programing PC2	46	0	1,45
3	PC NOC 3 Ke PC Programing Kepala Dinas 1	47	0	2,04
4	PC Kepala Dinas 1 Ke Ruang Programing PC1	48	0	1,3
5	PC1 Programing ke Ruang Sekretaris	39	2,5	4,8
6	Kepala Dinas PC1 Ke Sekretaris PC1	48	0	4,1
7	Kepala Dinas PC 1 Ke Resepsionis 1	45	2,5	9,12
8	Kepala Dinas PC1 Ke Resepsionis 2	48	0	9,84
9	Kepala Dinas PC 1 Ke Resepsionis PC3	44	2,5	5,81
10	Kepala Dinas PC 2 Ke Resepsionis PC3	44	0	5,12

11	Resepsionis PC 1 Ke Comand Center 1	34	2,5	9,1
12	Resepsionis PC 2 Ke Comand Center 2	32	0	9,2
13	Resepsionis PC 2 Ke Comand Center PC1	44	0	5,4
14	Comand Center PC2 Ke Kepala Dinas 1	62	2,5	5,24
15	Comand Center PC3 Kepala Dinas 2	54	2,5	6,18

Source: Research Results 2025

CONCLUSION

The following is the conclusion of the Dynamic Routing research using Border Gateway Protocol (BGP) at Diskominfosantik Kab. Bekasi

1. More Complex in configuration and management compared to Single-Homed

2. BGP is capable of handling very large and complex network. It is used by large Internet Service Providers (ISP) to manage routing between AS (Autonomous Servers).

3. Multi-Homed BGP is a network architecture that uses more than one Internet Service Provider (ISP) or multiple connections to the same ISP. The main purpose of this configuration is to improve network reliability, redundancy, and performance. Using more than one ISP or having multiple connections to single ISP.

4. Multi-Homed BGP is an ideal solution for organizations that require reliable, redundant, and flexible internet connectivity. While more complex and expensive than a Single-Homed configuration, its benefits in terms of network resilience and traffic management make it a great choice for businesses that rely heavily on internet connectivity

REFERENSI

Azhari, M. I., Diansyah, T. M., & Usman, A. (2019). Perbandingan Routing Protocol Exterior Bgp Versi 4 Dengan Routing Interior Eigrp Pada Algoritma Linkstate Menggunakan Parameter Packet Loss. *(JurTI) Jurnal Teknologi Informasi*, *3*(2), 185–191.

Hidayat, A. S., Handono, F. W., & Akhirianto, P. M. (2022). Implementasi Routing Border Gateway Protocol sebagai Alternatif Metode Fail Over pada Jaringan Komputer. *Jurnal Teknologi Informatika Dan Komputer*, *8*(2), 261–272. https://doi.org/10.37012/jtik.v8i2.849

Lain, L., & Nasional, P. (n.d.). *Implementasi Virtual Local Area Network Dinas Komunikasi Informatika Persandian Dan Statistik Kabupaten Bekasi*.

Ramadhani, G., Maulana Sugiartana Nursuwars, F., & Gunawan, R. (2023). Studi Komparasi Kinerja Interior Gateway Protocol Berbasis Distance Vector dan Link State. *Jurnal Teknik Elektro Dan Komputasi (ELKOM)*, *5*(1), 144–153. https://doi.org/10.32528/elkom.v5i1.7993

Rifandi, A. S. (2023). *PENGUKURAN KINERJA FHRP MENGGUNAKAN ETHERCHANNEL DAN ROUTING PROTOCOL OSPFv2, EIGRP DAN BGPv4 DENGAN TOPOLOGI THREE-TIER ENTERPRISE NETWORK ARCHITECTURE*.

Ryan Hamonangan Sitompul, D., Jaya Harmaja, O., & Indra, E. (2021). PERANCANGAN PENGEMBANGAN DESAIN ARSITEKTUR JARINGAN MENGGUNAKAN METODE PPDIOO. *Jurnal Sistem Informasi Dan Ilmu Komputer Prima*, *4*(2).