



**KEMENTERIAN PENDIDIKAN, KEBUDAYAAN,
RISET DAN TEKNOLOGI
POLITEKNIK NEGERI SRIWIJAYA**

Jalan Sriwijaya Negara, Palembang 30139 Telp. 0711-353414
Laman: <http://polsri.ac.id>, Pos El : info@polsri.ac.id



KESEPAKATAN BIMBINGAN TUGAS AKHIR (TA)

Kami yang bertanda tangan dibawah ini,

Pihak Pertama

Nama : Trisa Azahra
NIM : 061940351957
Jurusan : Teknik Elektro
Program Studi : Sarjana Terapan Teknik Telekomunikasi

Pihak Kedua

Nama : Mohammad Fadhli, S. Pd., M.T.
NIP : 199004032018031001
Jurusan : Teknik Elektro
Program Studi : Sarjana Terapan Teknik Telekomunikasi

Pada hari ini tanggal..... 2023 telah sepakat untuk melakukan konsultasi bimbingan Tugas Akhir (TA).

Konsultasi bimbingan sekurang- kurangnya 1 (satu) kali dalam satu minggu. Pelaksanaan bimbingan pada setiap hari pukul..... tempat di Politeknik Negeri Sriwijaya.

Demikianlah kesepakatan ini dibuat dengan penuh kesadaran guna kelancaran penyelesaian Tugas Akhir.

Pihak Pertama

(Trisa Azahra)
NIM. 061940351957

Palembang, Mei 2023

Pihak Kedua

Mohammad Fadhli, S. Pd., M.T.
NIP. 199004032018031001

Mengetahui
Ketua Jurusan Teknik Elektro

(Ir. Iskandar Lutfi, M.T.)
NIP. 196501291991031002



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NIM : 061940351957
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Program Studi : Sarjana Terapan Teknik Telekomunikasi

Pihak Kedua

Nama : Sopian Soim, S.T., M.T.
NIP : 197103142001121001
Jurusan : Teknik Elektro
Program Studi : Sarjana Terapan Teknik Telekomunikasi

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Pihak Pertama

(Trisa Azahra)
NIM. 061940351957

Palembang, Mei 2023
Pihak Kedua

(Sopian Soim, S.T., M.T.)
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Ketua Jurusan Teknik Elektro

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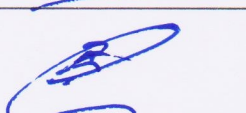
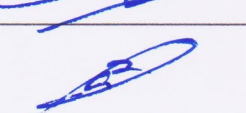
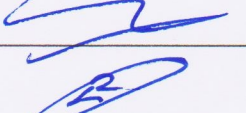
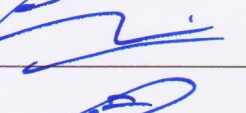
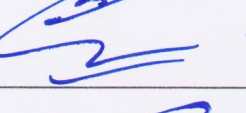
Website : www.polsri.ac.id E-mail : info@polsri.ac.id



LEMBAR BIMBINGAN TUGAS AKHIR

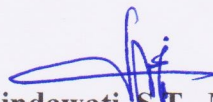
Nama : Trisa Azahra
NPM : 061940351957
Jurusan / Program Studi : Teknik Elektro / Teknik Telekomunikasi
Judul Tugas Akhir : Perancangan Sistem Manajemen Sampah dengan Pengaplikasian Multi-node Sensor Menggunakan Simple Lora Protocol (SLP)
Pembimbing I : Mohammad Fadhli, S.Pd., M.T.
NIP. 199004032018031001

No.	Tanggal	Uraian Bimbingan	Tanda Tangan Pembimbing
1.	3 / 2023 4	Konsultasi Alat	
2.	19 / 2023 4	Konsultasi Pemrograman Alat	
3.	3 / 2023 5	Bimbingan Bab I	
4.	15 / 2023 5	Revisi Bab I	
5.	30 / 2023 5	Bimbingan Bab II	
6.	7 / 2023 6	Revisi Bab II	
7.	12 / 2023 6	Konsultasi Alat	

8.	28/6 2023	Bimbingan Bab III	
9.	16/7 2023	Revisi Bab III	
10.	23/7 2023	Konsultasi Pengambilan Data	
11.	30/7 2023	Bimbingan Jurnal	
12.	4/8 2023	Melakukan Testing Alat	
13.	7/8 2023	Revisi Bab I - III	
14.	14/8 2023	Revisi Bab IV - V	
15.	15/8 2023	ACC	

Palembang, 15 Agustus 2023

Koordinator Program Studi
Sarjana Terapan Teknik
Telekomunikasi


Lindawati, S.T., M.TI
NIP. 197105282006042001

Catatan:

Ketua Jurusan/Ketua Program Studi harus memeriksa jumlah pelaksanaan bimbingan sesuai yang dipersyaratkan dalam Pedoman Laporan Akhir sebelum menandatangani lembar bimbingan ini.
Lembar pembimbingan LA ini harus dilampirkan dalam Laporan Akhir.



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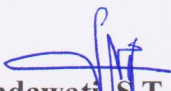
Nama : Trisa Azahra
NPM : 061940351957
Jurusan / Program Studi : Teknik Elektro / Teknik Telekomunikasi
Judul Tugas Akhir : Perancangan Sistem Manajemen Sampah dengan
Pengaplikasian Multi-node Sensor Menggunakan Simple
Lora Protocol (SLP)
Pembimbing II : Sopian Soim, S.T., M.T.
NIP. 197103142001121001

No.	Tanggal	Uraian Bimbingan	Tanda Tangan Pembimbing
1.	$\frac{3}{04}$ 2023	Konsultasi Alat	
2.	$\frac{19}{04}$ 2023	Konsultasi Program Alat	
3.	$\frac{23}{06}$ 2023	Disusun Bab 1-2 sistem	
4.	$\frac{28}{06}$ 2023	Bimbingan Bab 1 - II	
5.	$\frac{15}{07}$ 2023	Revisi Bab 1-II	
6.	$\frac{23}{07}$ 2023	Bimbingan pengambilan Data	
7.	$\frac{30}{07}$ 2023	Bimbingan Jurnal	

8.	$\frac{4}{08}$ 2023	Bimbingan Bab III - IV	g
9.	$\frac{8}{08}$ 2023	Revisi Bab III - IV	g
10.	$\frac{11}{08}$ 2023	Bimbingan bab IV - V	g
11.	$\frac{12}{08}$ 2023	Revisi bab IV - V	g
12.	$\frac{14}{08}$ 2023	Acc huf Yin.	g
13.			
14.			
15.			

Palembang, 15 Agustus 2023

Koordinator Program Studi,
Sarjana Terapan Teknik
Telekomunikasi


Lindawati, S.T., M.TI
NIP. 197105282006042001

Catatan:

Ketua Jurusan/Ketua Program Studi harus memeriksa jumlah pelaksanaan bimbingan sesuai yang dipersyaratkan dalam Pedoman Laporan Akhir sebelum menandatangani lembar bimbingan ini.

Lembar pembimbingan LA ini harus dilampirkan dalam Laporan Akhir

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Jalan Srijaya Negara, Palembang 30139

Telp. 0711-353414 fax. 0711-355918

Website : www.polsri.ac.id E-mail : info@polsri.ac.id**REKOMENDASI UJIAN TUGAS AKHIR**

Pembimbing Tugas Akhir memberikan rekomendasi kepada,

Nama : Trisa Azahra

NIM : 0619 4035 1957

Jurusan/Program Studi : Teknik Elektro/Sarjana Terapan Teknik Telekomunikasi

Judul Tugas Akhir : Perancangan Sistem Manajemen Sampah dengan Pengaplikasian Multi-node Sensor Menggunakan Simple LoRa Protocol (SLP)

Mahasiswa tersebut telah memenuhi persyaratan dan dapat mengikuti Ujian Tugas Akhir (TA) pada Tahun Akademik 2022/2023

Palembang, Agustus 2023

Pembimbing I,

Mohammad Fadhli, S. Pd., M.T
NIP. 199004032018031001

Pembimbing II,

Sopian Soim, S.T., M.T
NIP. 197103142001121001

	KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET DAN TEKNOLOGI POLITEKNIK NEGERI SRIWIJAYA Jalan Srijaya Negara, Palembang 30139 Telp. 0711-353414 Fax. 0711-355918 Website : www.polsri.ac.id E-mail : info@polsri.ac.id	 
	PELAKSANAAN REVISI TUGAS AKHIR	

Mahasiswa berikut,

Nama : Trisa Azahra
 NIM : 0619 4035 1957
 Jurusan/Program Studi : Teknik Elektro/D-IV Teknik Telekomunikasi
 Judul Tugas Akhir : Perancangan Sistem Manajemen Sampah dengan Pengaplikasian Multi-node Sensor Menggunakan Simple LoRa Protocol (SLP)

Telah melaksanakan revisi terhadap Tugas Akhir (TA) yang diujikan pada hari Rabu tanggal 16 bulan Agustus tahun 2023. Pelaksanaan revisi terhadap Tugas Akhir tersebut telah disetujui oleh Dosen Penilai yang memberikan revisi:

No.	Komentar	Nama Dosen Penilai *)	Tanggal	Tanda Tangan
1.	<i>sdh direvisi</i>	Ir. Abdul Rakhman, M.T. NIP.196006241990031002	29/8.23	
2.		Ir. Ibnu Ziad, M.T. NIP.196005161990031001		
3.	<i>ACC, sdh direvisi</i>	Hj. Sarjana S.T., M. Kom. NIP.196911061995032001	22/8-23	
4.	<i>ACC</i>	Mohammad Fadhli, S.Pd., M.T. NIP.199004032018031001	21/8-2023	

Palembang, Agustus 2023

Ketua Penilai **),



(Ir. Abdul Rakhman, M.T.)
 NIP 196006241990031002

Article ID: 4290-JE-23

11 Agustus 2023

Letter of Acceptance

Dear Author(s)

Based on the results of the reviewer evaluation and the coordination meeting of the editorial board of the Jurnal Ecotipe, your article entitled:

Low-Cost Waste Management System with Multi-Node Application Using Simple LoRa Protocol

Written by : Trisa Azahra*, Mohammad Fadhli, Sopian Soim
Affiliation : *Dept.of Electrical Engineering, Politeknik Negeri Sriwijaya
Corresponden email : trisaazahra@gmail.com

has been accepted and will be processed for publication in the **Jurnal Ecotipe** (*Electronic, Control, Telecommunication, Information, and Power Engineering*) **Volume 10 Issue 2, October 2023**. Articles with the above title may not be published in other journals. If in the future, an article with the same title above is known to have been published and plagiarism was found in another journal, then Jurnal Ecotipe is not responsible and is entirely the responsibility of the author. Your article will be published online no later than November 2023.

Thank you for choosing and submitting your article to the Jurnal Ecotipe. We look forward to submitting your other articles in our journal.

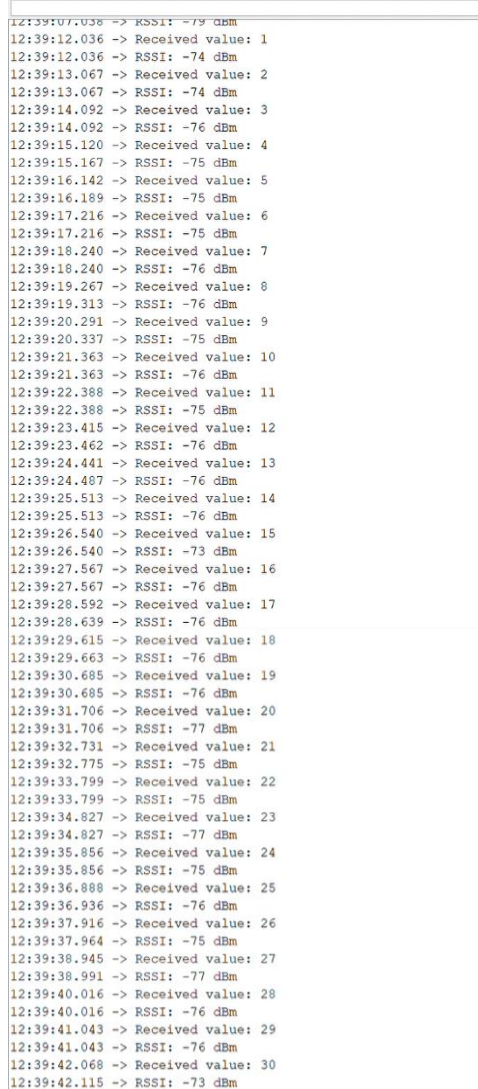
Kindly Regards,



Rudy Kurniawan
Editor-in-Chief

LAMPIRAN

Data Pengujian Performansi Modul LoRa RFM95

Jarak	Serial Monitor Node	Serial Monitor Gateway
100 m		

200 m	12:41:21.193 -> Sending packet 1 12:41:21.239 -> Packet sent successfully. 12:41:22.224 -> Sending packet 2 12:41:22.271 -> Packet sent successfully. 12:41:23.255 -> Sending packet 3 12:41:23.317 -> Packet sent successfully. 12:41:24.302 -> Sending packet 4 12:41:24.349 -> Packet sent successfully. 12:41:25.333 -> Sending packet 5 12:41:25.380 -> Packet sent successfully. 12:41:26.364 -> Sending packet 6 12:41:26.411 -> Packet sent successfully. 12:41:27.411 -> Sending packet 7 12:41:27.411 -> Packet sent successfully. 12:41:28.427 -> Sending packet 8 12:41:28.474 -> Packet sent successfully. 12:41:29.474 -> Sending packet 9 12:41:29.536 -> Packet sent successfully. 12:41:30.521 -> Sending packet 10 12:41:30.521 -> Packet sent successfully. 12:41:31.567 -> Sending packet 11 12:41:31.567 -> Packet sent successfully. 12:41:32.614 -> Sending packet 12 12:41:32.614 -> Packet sent successfully. 12:41:33.630 -> Sending packet 13 12:41:33.692 -> Packet sent successfully. 12:41:34.677 -> Sending packet 14 12:41:34.677 -> Packet sent successfully. 12:41:35.692 -> Sending packet 15 12:41:35.755 -> Packet sent successfully. 12:41:36.739 -> Sending packet 16 12:41:36.786 -> Packet sent successfully. 12:41:37.770 -> Sending packet 17 12:41:37.817 -> Packet sent successfully. 12:41:38.802 -> Sending packet 18 12:41:38.848 -> Packet sent successfully. 12:41:39.833 -> Sending packet 19 12:41:39.896 -> Packet sent successfully.	12:41:21.298 -> Received value: 1 12:41:21.298 -> RSSI: -107 dBm 12:41:23.349 -> Received value: 3 12:41:23.394 -> RSSI: -102 dBm 12:41:24.372 -> Received value: 4 12:41:24.418 -> RSSI: -101 dBm 12:41:25.448 -> Received value: 5 12:41:25.448 -> RSSI: -97 dBm 12:41:26.471 -> Received value: 6 12:41:26.471 -> RSSI: -95 dBm 12:41:27.502 -> Received value: 7 12:41:27.502 -> RSSI: -92 dBm 12:41:28.524 -> Received value: 8 12:41:28.572 -> RSSI: -91 dBm 12:41:29.599 -> Received value: 9 12:41:29.599 -> RSSI: -93 dBm 12:41:30.623 -> Received value: 10 12:41:30.623 -> RSSI: -96 dBm 12:41:31.653 -> Received value: 11 12:41:31.653 -> RSSI: -93 dBm 12:41:33.699 -> Received value: 13 12:41:33.745 -> RSSI: -105 dBm 12:41:34.772 -> Received value: 14 12:41:34.772 -> RSSI: -96 dBm 12:41:35.794 -> Received value: 15 12:41:35.794 -> RSSI: -96 dBm 12:41:36.822 -> Received value: 16 12:41:36.871 -> RSSI: -95 dBm 12:41:37.851 -> Received value: 17 12:41:37.898 -> RSSI: -95 dBm 12:41:38.921 -> Received value: 18 12:41:38.921 -> RSSI: -98 dBm 12:41:39.949 -> Received value: 19 12:41:39.949 -> RSSI: -93 dBm 12:41:40.975 -> Received value: 20 12:41:41.022 -> RSSI: -95 dBm 12:41:42.002 -> Received value: 21 12:41:42.049 -> RSSI: -93 dBm 12:41:43.075 -> Received value: 22 12:41:43.075 -> RSSI: -92 dBm 12:41:44.099 -> Received value: 23 12:41:44.099 -> RSSI: -104 dBm 12:41:49.271 -> Received value: 28 12:41:49.271 -> RSSI: -104 dBm 12:41:50.294 -> Received value: 29 12:41:50.343 -> RSSI: -104 dBm 12:41:51.322 -> Received value: 30 12:41:51.369 -> RSSI: -106 dBm
300 m	12:42:53.280 -> Sending packet 1 12:42:53.327 -> Packet sent successfully. 12:42:54.343 -> Sending packet 2 12:42:54.343 -> Packet sent successfully. 12:42:55.374 -> Sending packet 3 12:42:55.374 -> Packet sent successfully. 12:42:56.421 -> Sending packet 4 12:42:56.421 -> Packet sent successfully. 12:42:57.452 -> Sending packet 5 12:42:57.452 -> Packet sent successfully. 12:42:58.483 -> Sending packet 6 12:42:58.483 -> Packet sent successfully. 12:42:59.514 -> Sending packet 7 12:42:59.514 -> Packet sent successfully. 12:43:00.546 -> Sending packet 8 12:43:00.546 -> Packet sent successfully. 12:43:01.592 -> Sending packet 9 12:43:01.592 -> Packet sent successfully. 12:43:02.639 -> Sending packet 10 12:43:02.639 -> Packet sent successfully. 12:43:03.639 -> Sending packet 11 12:43:03.702 -> Packet sent successfully. 12:43:04.670 -> Sending packet 12 12:43:04.626 -> Packet sent successfully. 12:43:05.748 -> Sending packet 13 12:43:05.748 -> Packet sent successfully. 12:43:06.779 -> Sending packet 14 12:43:06.779 -> Packet sent successfully. 12:43:07.795 -> Sending packet 15 12:43:07.858 -> Packet sent successfully. 12:43:08.826 -> Sending packet 16 12:43:08.889 -> Packet sent successfully. 12:43:09.857 -> Sending packet 17 12:43:09.920 -> Packet sent successfully. 12:43:10.920 -> Sending packet 18 12:43:10.920 -> Packet sent successfully. 12:43:11.967 -> Sending packet 19 12:43:11.967 -> Packet sent successfully.	12:42:53.368 -> Received value: 1 12:42:53.415 -> RSSI: -102 dBm 12:42:54.439 -> Received value: 2 12:42:54.439 -> RSSI: -105 dBm 12:42:55.465 -> Received value: 3 12:42:55.465 -> RSSI: -107 dBm 12:42:56.492 -> Received value: 4 12:42:56.537 -> RSSI: -104 dBm 12:42:59.608 -> Received value: 7 12:42:59.608 -> RSSI: -102 dBm 12:43:00.635 -> Received value: 8 12:43:00.681 -> RSSI: -104 dBm 12:43:01.663 -> Received value: 9 12:43:01.710 -> RSSI: -100 dBm 12:43:02.736 -> Received value: 10 12:43:02.736 -> RSSI: -93 dBm 12:43:03.764 -> Received value: 11 12:43:03.764 -> RSSI: -102 dBm 12:43:07.911 -> Received value: 15 12:43:07.911 -> RSSI: -102 dBm 12:43:08.933 -> Received value: 16 12:43:08.980 -> RSSI: -103 dBm 12:43:09.958 -> Received value: 17 12:43:10.006 -> RSSI: -103 dBm 12:43:13.085 -> Received value: 20 12:43:13.085 -> RSSI: -100 dBm 12:43:14.109 -> Received value: 21 12:43:14.155 -> RSSI: -103 dBm 12:43:15.133 -> Received value: 22 12:43:15.179 -> RSSI: -108 dBm 12:43:16.204 -> Received value: 23 12:43:16.204 -> RSSI: -100 dBm 12:43:17.231 -> Received value: 24 12:43:17.231 -> RSSI: -98 dBm 12:43:18.252 -> Received value: 25 12:43:18.298 -> RSSI: -101 dBm 12:43:19.321 -> Received value: 26 12:43:19.321 -> RSSI: -99 dBm 12:43:21.367 -> Received value: 28 12:43:21.413 -> RSSI: -102 dBm 12:43:22.393 -> Received value: 29 12:43:22.439 -> RSSI: -102 dBm

400m	12:44:32.058 -> Sending packet 1 12:44:32.105 -> Packet sent successfully. 12:44:33.105 -> Sending packet 2 12:44:33.152 -> Packet sent successfully. 12:44:34.136 -> Sending packet 3 12:44:34.136 -> Packet sent successfully. 12:44:35.168 -> Sending packet 4 12:44:35.215 -> Packet sent successfully. 12:44:36.199 -> Sending packet 5 12:44:36.262 -> Packet sent successfully. 12:44:37.230 -> Sending packet 6 12:44:37.277 -> Packet sent successfully. 12:44:38.262 -> Sending packet 7 12:44:38.309 -> Packet sent successfully. 12:44:39.340 -> Sending packet 8 12:44:39.340 -> Packet sent successfully. 12:44:40.371 -> Sending packet 9 12:44:40.371 -> Packet sent successfully. 12:44:41.402 -> Sending packet 10 12:44:41.402 -> Packet sent successfully. 12:44:42.434 -> Sending packet 11 12:44:42.434 -> Packet sent successfully. 12:44:43.465 -> Sending packet 12 12:44:43.465 -> Packet sent successfully. 12:44:44.496 -> Sending packet 13 12:44:44.543 -> Packet sent successfully. 12:44:45.528 -> Sending packet 14 12:44:45.575 -> Packet sent successfully. 12:44:46.559 -> Sending packet 15 12:44:46.606 -> Packet sent successfully. 12:44:47.590 -> Sending packet 16 12:44:47.637 -> Packet sent successfully. 12:44:48.637 -> Sending packet 17 12:44:48.684 -> Packet sent successfully. 12:44:49.669 -> Sending packet 18 12:44:49.731 -> Packet sent successfully. 12:44:50.700 -> Sending packet 19 12:44:50.762 -> Packet sent successfully. ☒ Autoscroll ☒ Show timestamp	12:44:32.187 -> Received value: 1 12:44:32.187 -> RSSI: -93 dBm 12:44:33.212 -> Received value: 2 12:44:33.212 -> RSSI: -92 dBm 12:44:34.240 -> Received value: 3 12:44:34.287 -> RSSI: -95 dBm 12:44:35.261 -> Received value: 4 12:44:35.307 -> RSSI: -93 dBm 12:44:36.330 -> Received value: 5 12:44:36.330 -> RSSI: -99 dBm 12:44:37.358 -> Received value: 6 12:44:37.358 -> RSSI: -95 dBm 12:44:38.388 -> Received value: 7 12:44:38.388 -> RSSI: -96 dBm 12:44:39.409 -> Received value: 8 12:44:39.455 -> RSSI: -95 dBm 12:44:40.478 -> Received value: 9 12:44:40.478 -> RSSI: -96 dBm 12:44:41.506 -> Received value: 10 12:44:41.506 -> RSSI: -100 dBm 12:44:42.533 -> Received value: 11 12:44:42.580 -> RSSI: -98 dBm 12:44:43.561 -> Received value: 12 12:44:43.608 -> RSSI: -97 dBm 12:44:44.635 -> Received value: 13 12:44:44.635 -> RSSI: -97 dBm 12:44:45.660 -> Received value: 14 12:44:45.660 -> RSSI: -99 dBm 12:44:46.688 -> Received value: 15 12:44:46.688 -> RSSI: -103 dBm 12:44:48.743 -> Received value: 17 12:44:48.790 -> RSSI: -101 dBm 12:44:49.772 -> Received value: 18 12:44:49.819 -> RSSI: -97 dBm 12:44:50.846 -> Received value: 19 12:44:50.846 -> RSSI: -102 dBm 12:44:51.870 -> Received value: 20 12:44:51.870 -> RSSI: -97 dBm 12:44:52.897 -> Received value: 21 12:44:52.943 -> RSSI: -97 dBm 12:44:53.923 -> Received value: 22 12:44:53.968 -> RSSI: -98 dBm 12:44:54.998 -> Received value: 23 12:44:54.998 -> RSSI: -99 dBm 12:44:56.026 -> Received value: 24 12:44:56.026 -> RSSI: -99 dBm 12:44:57.052 -> Received value: 25 12:44:57.052 -> RSSI: -91 dBm 12:44:58.076 -> Received value: 26 12:44:58.123 -> RSSI: -97 dBm 12:44:59.105 -> Received value: 27 12:44:59.152 -> RSSI: -97 dBm 12:45:00.179 -> Received value: 28 12:45:00.179 -> RSSI: -93 dBm 12:45:01.205 -> Received value: 29 12:45:01.205 -> RSSI: -95 dBm 12:45:02.230 -> Received value: 30 12:45:02.230 -> RSSI: -100 dBm
500m	12:46:00.217 -> Sending packet 1 12:46:00.279 -> Packet sent successfully. 12:46:01.263 -> Sending packet 2 12:46:01.310 -> Packet sent successfully. 12:46:02.326 -> Sending packet 3 12:46:02.326 -> Packet sent successfully. 12:46:03.341 -> Sending packet 4 12:46:03.341 -> Packet sent successfully. 12:46:04.388 -> Sending packet 5 12:46:04.388 -> Packet sent successfully. 12:46:05.404 -> Sending packet 6 12:46:05.466 -> Packet sent successfully. 12:46:06.466 -> Sending packet 7 12:46:06.466 -> Packet sent successfully. 12:46:07.497 -> Sending packet 8 12:46:07.497 -> Packet sent successfully. 12:46:08.544 -> Sending packet 9 12:46:08.544 -> Packet sent successfully. 12:46:09.575 -> Sending packet 10 12:46:09.575 -> Packet sent successfully. 12:46:10.591 -> Sending packet 11 12:46:10.591 -> Packet sent successfully. 12:46:11.607 -> Sending packet 12 12:46:11.653 -> Packet sent successfully. 12:46:12.669 -> Sending packet 13 12:46:12.669 -> Packet sent successfully. 12:46:13.716 -> Sending packet 14 12:46:13.716 -> Packet sent successfully. 12:46:14.810 -> Sending packet 15 12:46:14.810 -> Packet sent successfully. 12:46:15.794 -> Sending packet 16 12:46:15.794 -> Packet sent successfully. 12:46:16.794 -> Sending packet 17 12:46:16.857 -> Packet sent successfully. 12:46:17.857 -> Sending packet 18 12:46:17.857 -> Packet sent successfully. 12:46:18.888 -> Sending packet 19 12:46:18.888 -> Packet sent successfully. ☒ Autoscroll ☒ Show timestamp	12:45:55.373 -> Received value: 30 12:45:55.373 -> RSSI: -108 dBm 12:46:04.514 -> Received value: 5 12:46:04.514 -> RSSI: -105 dBm 12:46:05.540 -> Received value: 6 12:46:05.540 -> RSSI: -108 dBm 12:46:06.563 -> Received value: 7 12:46:06.612 -> RSSI: -106 dBm 12:46:09.690 -> Received value: 10 12:46:09.690 -> RSSI: -107 dBm 12:46:10.719 -> Received value: 11 12:46:10.719 -> RSSI: -107 dBm 12:46:13.832 -> Received value: 14 12:46:13.832 -> RSSI: -104 dBm 12:46:16.913 -> Received value: 17 12:46:16.959 -> RSSI: -107 dBm 12:46:24.194 -> Received value: 24 12:46:24.194 -> RSSI: -105 dBm 12:46:26.242 -> Received value: 26 12:46:26.290 -> RSSI: -103 dBm 12:46:27.316 -> Received value: 27 12:46:27.316 -> RSSI: -103 dBm 12:46:29.365 -> Received value: 29 12:46:29.412 -> RSSI: -105 dBm 12:46:30.390 -> Received value: 30 12:46:30.437 -> RSSI: -108 dBm

Data Pernode

Node 1

```
17:04:52.567 -> node1,72,80.40,-3.015609,104.823230,  
17:04:52.847 ->  
17:04:52.847 -> node : node1  
17:04:52.895 -> jarak: 72  
17:04:52.895 -> humidity: 80.40  
17:04:52.941 -> lat: -3.015609  
17:04:52.941 -> long: 104.823230  
17:04:55.973 -> Set string lat... ok  
17:04:55.973 ->  
17:04:57.605 -> Set string long... ok  
17:04:57.605 ->  
17:04:58.073 -> Set string hum... ok  
17:04:58.073 ->  
17:05:01.187 -> Set string jarak... ok
```

Node 2

```
16:57:34.547 -> node2,72,79.70,-3.015585,104.823270,  
16:57:34.828 ->  
16:57:34.828 -> node : node2  
16:57:34.874 -> jarak: 72  
16:57:34.874 -> humidity: 79.70  
16:57:34.874 -> lat: -3.015585  
16:57:34.874 -> long: 104.823270  
16:57:39.918 -> Set string lat... ok  
16:57:39.918 ->  
16:57:40.389 -> Set string long... ok  
16:57:40.389 ->  
16:57:40.858 -> Set string hum... ok  
16:57:40.858 ->  
16:57:43.349 -> Set string jarak... ok
```

Node 3

```
16:57:52.535 -> node3,73, NAN,-3.015577,104.823260,  
16:57:52.816 ->  
16:57:52.816 -> node : node3  
16:57:52.863 -> jarak: 73  
16:57:52.863 -> humidity: NAN  
16:57:52.911 -> lat: -3.015577  
16:57:52.911 -> long: 104.823260  
16:57:55.529 -> Set string lat... ok  
16:57:55.529 ->  
16:57:56.045 -> Set string long... ok  
16:57:56.045 ->  
16:57:56.838 -> Set string hum... ok  
16:57:56.838 ->  
16:57:57.350 -> Set string jarak... ok  
16:57:57.350 ->
```

Node 4

```
17:02:03.541 -> node4,72,80.60,-3.015549,104.823330,  
17:02:03.817 ->  
17:02:03.817 -> node : node4  
17:02:03.863 -> jarak: 72  
17:02:03.863 -> humidity: 80.60  
17:02:03.910 -> lat: -3.015549  
17:02:03.910 -> long: 104.823330  
17:02:04.890 -> Set string lat... ok  
17:02:04.890 ->  
17:02:05.402 -> Set string long... ok  
17:02:05.402 ->  
17:02:10.308 -> Set string hum... ok  
17:02:10.308 ->  
17:02:11.617 -> Set string jarak... ok
```

Source Code Program pada Arduino IDE

1) Node

```
#include <SPI.h>
#include <RH_RF95.h>

#define RFM95_CS 10
#define RFM95_RST 9
#define RFM95_INT 2

#include <SoftwareSerial.h>

SoftwareSerial mySerial(3, 4); // RX, TX

const String my_node = "node4";

RH_RF95 rf95(RFM95_CS, RFM95_INT);

#include <DHT.h>
#define DHT_PIN 7 // DHT22 Output Data
#define DHT_TYPE DHT22

#include <NewPing.h>
#define TRIGGER_PIN 6 // Arduino pin tied to trigger pin on
the ultrasonic sensor.
#define ECHO_PIN 5 // Arduino pin tied to echo pin on the
ultrasonic sensor.
#define MAX_DISTANCE 100 // Maximum distance we want to ping for
(in centimeters).

#include <TinyGPS++.h>
TinyGPSPlus gps;

DHT dht(DHT_PIN, DHT_TYPE);

NewPing sonar(TRIGGER_PIN, ECHO_PIN, MAX_DISTANCE);

bool isMe(String node) {
    if (my_node.equals(node)) {
        return true;
    }
    return false;
}

void setup() {
    pinMode(RFM95_RST, OUTPUT);
    digitalWrite(RFM95_RST, HIGH);

    Serial.begin(9600);
    mySerial.begin(9600);
    while (!Serial)
        ;

    if (!rf95.init()) {
        Serial.println("LoRa initialization failed!");
    }
}
```

```

        while (1)
        ;
    }

    // Set spreading factor and code rate
    rf95.setSpreadingFactor(7); // Spreading factor SF7
    rf95.setCodingRate4(5);     // Code rate 4/5

    // Set other LoRa parameters (frequency, power, etc.)
    rf95.setFrequency(923.0);
    rf95.setTxPower(23, false);

    // Set into transmitter mode
    rf95.setModeTx();
    rf95.setModeRx();

    dht.begin();
}

void loop() {
    float humidity = dht.readHumidity(); // Read humidity value
    from DHT22 sensor
    delay(1000);
    long pingData = sonar.ping_cm();
    delay(1000);
    float latitude;
    float longitude;

    Serial.println(humidity);
    Serial.println(pingData);
    delay(1000);

    // latitude = gps.location.lat(), 6;
    Serial.println(gps.location.lat(), 6);

    // Serial.print(" Longitude=");
    // longitude = gps.location.lng(), 6;
    Serial.println(gps.location.lng(), 6);
    //delay(5000);
    long waktu_tunggu = millis();
    while (millis() - waktu_tunggu < 5000) {
        while (mySerial.available()) {
            // Serial.write(mySerial.read());
            gps.encode(mySerial.read());
        }
        if (gps.location.isUpdated()) {
            Serial.print("Latitude=");
            latitude = gps.location.lat(), 6;
            Serial.print(gps.location.lat(), 6);

            Serial.print(" Longitude=");
            longitude = gps.location.lng(), 6;
            Serial.print(gps.location.lng(), 6);
            //delay(5000);
            break;
        }
    }
}

```

```

if (rf95.available()) {
    uint8_t buf[RH_RF95_MAX_MESSAGE_LEN];
    uint8_t len = sizeof(buf);

    if (rf95.recv(buf, &len)) {
        Serial.print("Received message: ");
        Serial.println((char*)buf);
        String node = (char*)buf;
        Serial.println("Pengecekan ID");
        Serial.println(node);
        if (isMe(node)) {

            String data = my_node + "," + String(pingData) + "," +
String(humidity) + "," + String(latitude,6) + "," +
String(longitude,6) + "," ; // Format sensor data as CSV

            // String message = data;
            const char* message = data.c_str(); // Message to send

            // Send LoRa packet
            rf95.send((uint8_t*)message, strlen(message));
            rf95.waitPacketSent();

            Serial.println("Message sent!");
            if (rf95.recv(buf, &len)) {
                Serial.println((char*)buf);

            }
            Serial.print("RSSI: ");
            Serial.print(rf95.lastRssi(), DEC);
            Serial.println(" dBm");
        }
    }

    delay(1000); // Delay before sending the next packet
}
}

```

2) Gateway

```

#include <SPI.h>
#include <RH_RF95.h>

#define RFM95_CS 15
#define RFM95_RST 16
#define RFM95_INT 5

RH_RF95 rf95(RFM95_CS, RFM95_INT);

String node[] = {
    "node1", "node2", "node3", "node4"
};

#include <Arduino.h>
#ifdef ESP32 || defined(ARDUINO_RASPBERRY_PI_PICO_W)
#include <WiFi.h>
#elif defined(ESP8266)
#include <ESP8266WiFi.h>
#endif

```

```

#include <Firebase_ESP_Client.h>
#include <addons/TokenHelper.h>
#include <addons/RTDBHelper.h>
/* 1. Define the WiFi credentials */
#define WIFI_SSID "Box"
#define WIFI_PASSWORD "rumahbox"

/* 2. Define the API Key */
#define API_KEY "AIzaSyAx_7FJaPu3GpsWCHI3vjvCH-141xxhmJU"

/* 3. Define the RTDB URL */
#define DATABASE_URL "projektrisa-default-rtdb.firebaseio.com"
//<databaseName>.firebaseio.com or
<databaseName>.<region>.firebaseio.com

/* 4. Define the user Email and password that already registered
or added in your project */
#define USER_EMAIL "trisaazahra@gmail.com"
#define USER_PASSWORD "Trash123"
// Define Firebase Data object
FirebaseData fbdo;
FirebaseAuth auth;
FirebaseConfig config;
unsigned long sendDataPrevMillis = 0;
int count = 0;
uint32_t idleTimeForStream = 15000;
#ifdef ARDUINO_RASPBERRY_PI_PICO_W
WiFiMulti multi;
#endif
String data;
char c;
String inputString = "";          // a String to hold incoming
data
bool stringComplete = false;    // whether the string is complete

void setup() {
  pinMode(RFM95_RST, OUTPUT);
  digitalWrite(RFM95_RST, HIGH);
  Serial.begin(9600);
  while (!Serial)
    ;

  if (!rf95.init()) {
    Serial.println("LoRa initialization failed!");
    while (1)
      ;
  }

  // Set spreading factor dan coding rate
  rf95.setSpreadingFactor(7); // Spreading factor SF7
  rf95.setCodingRate4(5);    // Code rate 4/5

  // Set other LoRa parameters (frequency and power)
  rf95.setFrequency(923.0);
  rf95.setTxPower(23, false);

  // Set into transmitter and receiver mode
  rf95.setModeTx();
  rf95.setModeRx();

```

```

#if defined(ARDUINO_RASPBERRY_PI_PICO_W)
    multi.addAP(WIFI_SSID, WIFI_PASSWORD);
    multi.run();
#else
    WiFi.begin(WIFI_SSID, WIFI_PASSWORD);
#endif
    Serial.print("Connecting to Wi-Fi");
    unsigned long ms = millis();
    while (WiFi.status() != WL_CONNECTED)
    {
        Serial.print(".");
        delay(300);
#if defined(ARDUINO_RASPBERRY_PI_PICO_W)
        if (millis() - ms > 10000)
            break;
#endif
    }
    Serial.println();
    Serial.print("Connected with IP: ");
    Serial.println(WiFi.localIP());
    Serial.println();
    Serial.printf("Firebase Client v%s\n\n",
FIREBASE_CLIENT_VERSION);

    /* Assign the api key (required) */
    config.api_key = API_KEY;

    /* Assign the user sign in credentials */
    auth.user.email = USER_EMAIL;
    auth.user.password = USER_PASSWORD;

    /* Assign the RTDB URL (required) */
    config.database_url = DATABASE_URL;

    // The WiFi credentials are required for Pico W
    // due to it does not have reconnect feature.
#if defined(ARDUINO_RASPBERRY_PI_PICO_W)
    config.wifi.clearAP();
    config.wifi.addAP(WIFI_SSID, WIFI_PASSWORD);
#endif

    /* Assign the callback function for the long running token
generation task */
    config.token_status_callback = tokenStatusCallback; // see
addons/TokenHelper.h

    // Or use legacy authenticate method
    // config.database_url = DATABASE_URL;
    // config.signer.tokens.legacy_token = "<database secret>";

    Firebase.begin(&config, &auth);
    Firebase.reconnectWiFi(true);
    if (!Firebase.RTDB.beginStream(&fbdo, "/test/stream/data"))
        Serial.printf("stream begin error, %s\n\n",
fbdo.errorReason().c_str());
    }
String getValue(String data, char separator, int index)

```

```

{
    int found = 0;
    int strIndex[] = {0, -1};
    int maxIndex = data.length()-1;

    for(int i=0; i<=maxIndex && found<=index; i++){
        if(data.charAt(i)==separator || i==maxIndex){
            found++;
            strIndex[0] = strIndex[1]+1;
            strIndex[1] = (i == maxIndex) ? i+1 : i;
        }
    }
    return found>index ? data.substring(strIndex[0], strIndex[1])
    : "";
}

void loop() {
    for (int i = 0 ; i < 4 ; i++) {
        const char* message = node[i].c_str(); // Message to send
        Serial.println(message);

        // Kirim Pesan Broadcast
        rf95.send((uint8_t*)message, strlen(message));
        rf95.waitPacketSent();
        Serial.println("Pesan Ke Node Dikirim!");
        bool sudah_dapat = false;
        Serial.println("Menunggu");
        long waktu_mulai = millis();
        while (!sudah_dapat) {
            delay(50);
            if (rf95.available()) {
                uint8_t buf[RH_RF95_MAX_MESSAGE_LEN];
                uint8_t len = sizeof(buf);

                if (rf95.recv(buf, &len)) {
                    Serial.print("Received message: ");
                    String pesan_masuk = (char*)buf;
                    Serial.println(pesan_masuk);
                    Serial.print("RSSI: ");
                    Serial.print(rf95.lastRssi(), DEC);
                    Serial.println(" dBm");
                    sudah_dapat = true;
                }

                //Pemecahan data yang dikirim ke nodemcu
                String node_dapat = getValue(pesan_masuk, ',', 0);
                String jarak = getValue(pesan_masuk, ',', 1);
                String humidity = getValue(pesan_masuk, ',', 2);
                String latitude = getValue(pesan_masuk, ',', 3);
                String longitude = getValue(pesan_masuk, ',', 4);

                Serial.print("node : ");
                Serial.println(node_dapat);
                Serial.print("jarak: ");
                Serial.println(jarak);
                Serial.print("humidity: ");
                Serial.println(humidity);
                Serial.print("lat: ");
                Serial.println(latitude);
                Serial.print("long: ");
            }
        }
    }
}

```

```

        Serial.println(longitude);
        const char* message2 = "ACK Dikirim!"; // Message to
send
        Serial.println(message2);

        // Kirim Pesan ACK
        rf95.send((uint8_t*)message2, strlen(message2));
        rf95.waitPacketSent();

        String kode_lat = node_dapat + "_lat";
        String kode_long = node_dapat + "_long";
        String kode_hum = node_dapat + "_hum";
        String kode_jarak = node_dapat + "_jarak";

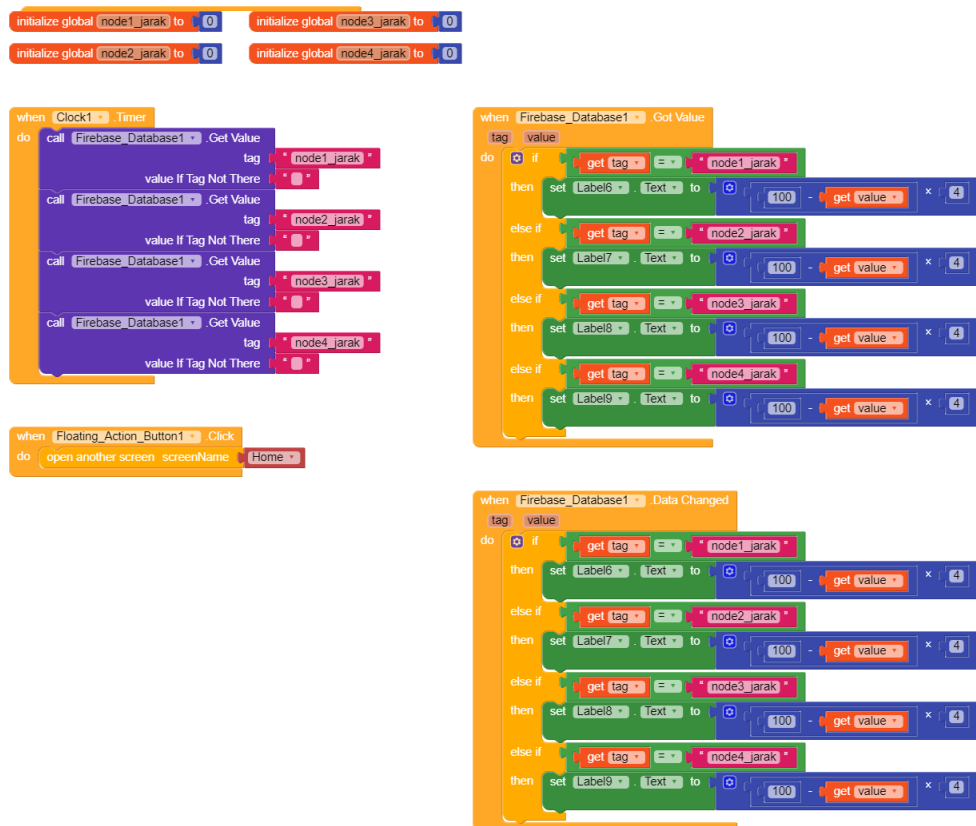
        Serial.printf("Set string lat... %s\n\n",
        Firebase.RTDB.setString(&fbdo, "/data_sensor/" + kode_lat,
        String(latitude)) ? "ok" : fbdo.errorReason().c_str());
        Serial.printf("Set string long... %s\n\n",
        Firebase.RTDB.setString(&fbdo, "/data_sensor/" + kode_long,
        String(longitude)) ? "ok" : fbdo.errorReason().c_str());
        Serial.printf("Set string hum... %s\n\n",
        Firebase.RTDB.setString(&fbdo, "/data_sensor/" + kode_hum,
        String(humidity)) ? "ok" : fbdo.errorReason().c_str());
        Serial.printf("Set string jarak... %s\n\n",
        Firebase.RTDB.setString(&fbdo, "/data_sensor/" +
        kode_jarak, String(jarak)) ? "ok" :
        fbdo.errorReason().c_str());

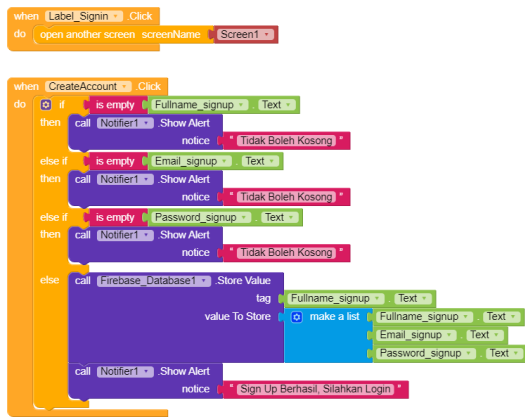
    }
}

    if (millis() - waktu_mulai > 3000) {
        sudah_dapat = true;
    }
}
delay(3000);
}
}

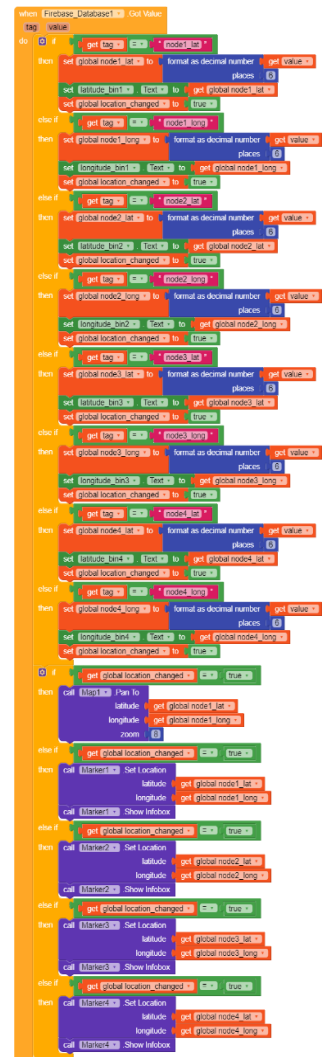
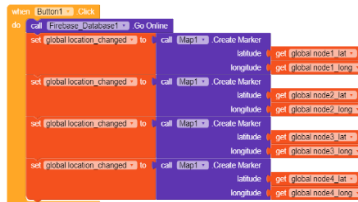
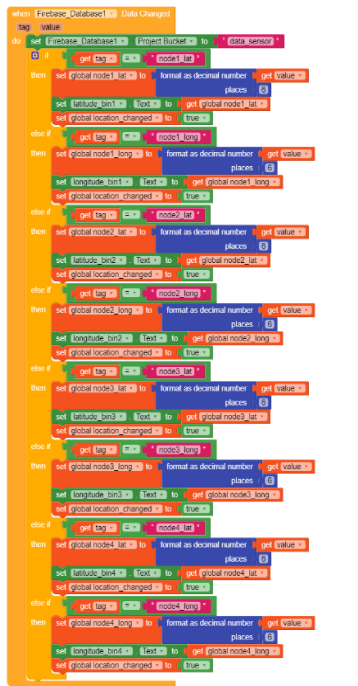
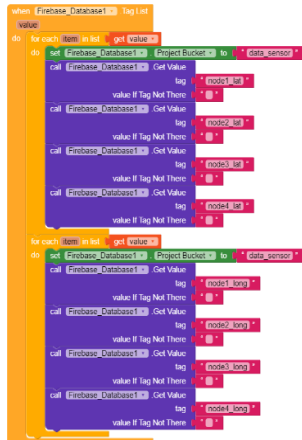
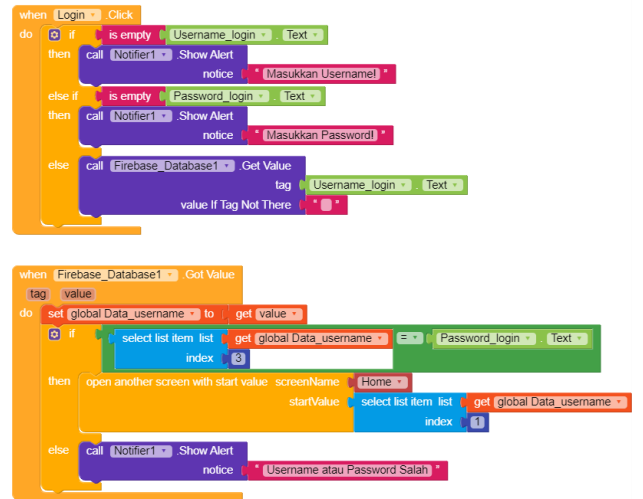
```

Data Block Programming di Kodular





initialize global Data_username to create empty list



Ukuran Data Tiap Sensor

1. Sensor Kelembaban

```
COM4
|
|
21:01:39.127 -> 61.30
21:01:39.171 -> Size in Bytes: 4
21:01:42.173 -> 61.20
21:01:42.173 -> Size in Bytes: 4
21:01:45.172 -> 61.20
21:01:45.172 -> Size in Bytes: 4
21:01:48.192 -> 61.20
21:01:48.192 -> Size in Bytes: 4
21:01:51.183 -> 61.30
21:01:51.183 -> Size in Bytes: 4
21:01:54.208 -> 61.30
21:01:54.208 -> Size in Bytes: 4
21:01:57.196 -> 61.30
21:01:57.196 -> Size in Bytes: 4
21:02:00.234 -> 61.20
21:02:00.234 -> Size in Bytes: 4
```

2. Sensor Ultrasonik

```
COM4
|
|
21:08:13.460 -> Size in Bytes: 4
21:08:15.518 -> Ping: 27cm
21:08:15.518 -> Size in Bytes: 4
21:08:17.546 -> Ping: 51cm
21:08:17.594 -> Size in Bytes: 4
21:08:19.623 -> Ping: 51cm
21:08:19.623 -> Size in Bytes: 4
21:08:21.661 -> Ping: 62cm
21:08:21.708 -> Size in Bytes: 4
21:08:23.725 -> Ping: 40cm
21:08:23.725 -> Size in Bytes: 4
21:08:25.794 -> Ping: 45cm
21:08:25.794 -> Size in Bytes: 4
21:08:27.838 -> Ping: 71cm
21:08:27.884 -> Size in Bytes: 4
21:08:29.882 -> Ping: 21cm
21:08:29.929 -> Size in Bytes: 4
21:08:31.971 -> Ping: 22cm
21:08:31.971 -> Size in Bytes: 4
21:08:34.014 -> Ping: 50cm
```

3. GPS

```
COM4
|
|
01:38:06.044 -> GPS Mulai
01:38:08.546 -> Latitude=-3.015703Size in Bytes: 4
01:38:08.593 -> Longitude=104.823272Size in Bytes: 4
01:38:11.549 -> Latitude=-3.015704Size in Bytes: 4
01:38:11.597 -> Longitude=104.823272Size in Bytes: 4
01:38:14.564 -> Latitude=-3.015704Size in Bytes: 4
01:38:14.610 -> Longitude=104.823272Size in Bytes: 4
01:38:17.554 -> Latitude=-3.015705Size in Bytes: 4
01:38:17.600 -> Longitude=104.823272Size in Bytes: 4
01:38:20.546 -> Latitude=-3.015707Size in Bytes: 4
01:38:20.594 -> Longitude=104.823272Size in Bytes: 4
01:38:23.548 -> Latitude=-3.015710Size in Bytes: 4
01:38:23.597 -> Longitude=104.823272Size in Bytes: 4
```