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LAMPIRAN

Lampiran 1 Hasil Pengukuran *Response Time Concurrent Request*

Fetch Data Sumber Daya Manusia

Sample	*Response Time (milliseconds)*							
	REST				GraphQL			
	100	120	140	160	100	120	140	160
1	143141	99364	149038	187083	109228	132068	164854	178959
2	123935	123867	158635	154995	111222	135200	170191	183062
3	83933	147329	148414	176434	120370	131174	168979	184311
4	109840	115166	134984	172240	123409	140045	168525	251378
5	109154	110964	151120	182088	118989	135832	168902	222715
Average	**114001**	**119338**	**148438**	**174568**	**116644**	**134864**	**168290**	**204085**

Fetch Data Pendidikan Formal SDM

Sample	*Response Time (milliseconds)*							
	REST				GraphQL			
	100	120	140	160	100	120	140	160
1	3028	3312	3808	4293	4276	5266	5891	6830
2	2861	3213	3834	4135	4552	5182	5947	6892
3	2765	3257	3768	4197	4424	5110	6020	6844
4	2841	3340	3909	4532	4551	5165	5964	6918
5	2802	3361	3846	4206	4805	5158	6072	6971
Average	**2859,4**	**3296,6**	**3833**	**4272,6**	**4521,6**	**5176,2**	**5978,8**	**6891**

Fetch Data Dokumen SDM

Sample	*Response Time (milliseconds)*							
	REST				GraphQL			
	100	120	140	160	100	120	140	160
1	3617	4329	4731	5055	6304	7371	8861	9594
2	3479	3962	5105	5082	6281	7783	9905	9713
3	3606	4040	4479	5138	6391	7578	8706	9586
4	3441	4621	4690	5116	6385	7471	8681	10086
5	3827	4067	4591	5039	6406	7478	8570	9720
Average	**3594**	**4203,8**	**4719,2**	**5086**	**6353,4**	**7536,2**	**8944,6**	**9739,8**

Upload Data Dokumen SDM

Sample	*Response Time (milliseconds)*							
	REST				GraphQL			
	100	120	140	160	100	120	140	160
1	80294	97837	111144	123711	78333	94337	108936	120683
2	80287	99112	105873	131389	76880	94414	108706	124702
3	79698	96833	111008	129240	77558	91673	109270	121566
4	77462	96661	108160	127728	79672	91828	106517	121443
5	80110	95012	108284	125706	78280	93417	109274	118337
Average	**79570,2**	**97091**	**108894**	**127555**	**78144,6**	**93133,8**	**108541**	**121346**

Lampiran 2 Hasil Pengukuran *Throughput Concurrent Request*

Fetch Data Sumber Daya Manusia

Sample	*Throughput* (bits/min)							
	REST				GraphQL			
	100	120	140	160	100	120	140	160
1	22	37,5	28,3	23,7	28	26,8	27,8	31,9
2	22,6	29,7	29,4	32	26,9	26,9	27,8	31,8
3	28,8	25,9	27,9	25,2	25,4	27,4	27,8	31,8
4	26,7	33,6	31,7	28,1	24,9	26,8	27,9	19,1
5	28,1	29,9	28,3	26,6	25,9	27,1	27,9	21,8
Average	**25,64**	**31,32**	**29,12**	**27,12**	**26,22**	**27**	**27,84**	**27,28**

Fetch Data Pendidikan Formal SDM

Sample	*Throughput* (*bits*/sec)							
	REST				GraphQL			
	100	120	140	160	100	120	140	160
1	18,9	20	20,1	20	12,3	12	12,4	12,3
2	19,4	20,1	19,6	20,5	11,5	12,1	12,3	12,2
3	19,9	18,7	20	20,2	12	12,4	12,2	12,1
4	19,4	19,8	19,3	19,2	11,6	12,2	12,2	11,9
5	19,7	19,8	18,5	20,4	10,9	12,2	12,1	12,2
Average	**19,46**	**19,68**	**19,5**	**20,06**	**11,66**	**12,18**	**12,24**	**12,14**

Fetch Data Dokumen SDM

Sample	*Throughput* (*bits*/sec)							
	REST				GraphQL			
	100	120	140	160	100	120	140	160
1	15,7	16,3	16,3	17,1	8.1	8,1	8,3	8,5
2	16,1	16,6	15,5	17	8.4	8,2	6,8	8,6
3	16,1	16,5	16,9	17	7.9	8,4	8,5	8,7
4	15,9	14,2	15,9	14,9	8.4	8,6	8,5	8,5
5	14,2	16,4	16,7	17	8.4	8,5	8,6	8,6
Average	**15,6**	**16**	**16,26**	**16,6**	**8.24**	**8,36**	**8,14**	**8,58**

Upload Data Dokumen SDM

Sample	*Throughput* (*bits*/min)							
	REST				GraphQL			
	100	120	140	160	100	120	140	160
1	43,7	37,1	47,5	54,3	34,6	31,5	41,6	48,5
2	40,5	32,4	52,5	54	52,6	43,6	47,4	30
3	47,7	57,9	46,1	36,3	45,2	51,9	29,8	34,5
4	49,2	55,4	33,1	36,6	44,2	45,5	45,6	34,2
5	46,9	28,1	34,9	39,3	56,1	52,3	43,7	38,4
Average	**45,6**	**42,18**	**42,82**	**44,1**	**46,54**	**44,96**	**41,62**	**37,12**

Lampiran 3 Hasil Pengukuran CPU Utilization Concurrent Request

Fetch Data Sumber Daya Manusia

Sample	*CPU Utilization* (%)							
	REST				GraphQL			
	100	120	140	160	100	120	140	160
1	9,40769	11,0818	10,7083	10,7083	84,3194	84,4137	82,8787	79,4893
2	12,0083	12,3889	12,2273	12,2273	84,0033	83,9512	73,0204	82,9009
3	12,6118	11,0714	10,1	10,1	87,8058	83,6309	82,785	81,6314
4	11,225	10,7727	9,25556	9,25556	89,4163	87,82	85,8255	82,47
5	10,9444	10,9444	10,35	10,35	88,5598	83,1101	80,7427	85,6461
Average	**11,2394**	**11,2519**	**10,5282**	**10,5282**	**86,8209**	**84,5852**	**81,0505**	**82,4275**

Fetch Data Pendidikan Formal SDM

Sample	*CPU Utilization* (%)							
	REST				GraphQL			
	100	120	140	160	100	120	140	160
1	30	26,7	31,8	27,375	42,6667	39,76	39,08	36,6
2	25,85	28,1	27,7667	27,8	45,175	41,52	41,78	42,1167
3	22,2333	34,35	31,2333	25,4	38,75	38,68	36,4667	40,75
4	29,15	19,2	31,1	31,25	40,5667	37,075	40,26	44,1667
5	33,3	17,3667	31,9	30,4	38,3	40,425	42,28	39,1
Average	**28,1067**	**25,1433**	**30,76**	**28,445**	**41,0917**	**39,492**	**39,9733**	**40,5467**

Fetch Data Dokumen SDM

Sample	*CPU Utilization* (%)							
	REST				GraphQL			
	100	120	140	160	100	120	140	160
1	26,65	17,58	21,6667	17,92	46,1667	53,3333	49	50,425
2	29,15	25,5667	24,475	26,975	55,76	50,9	41,5222	50,3625
3	22,5	28,2	26,85	24,6	48,16	46,6167	52,8125	52,7
4	26,7	17,6333	26,05	24,725	51,24	52,15	51,7714	46,5667
5	19,4667	31,2	28,35	26,275	56,98	52,7	51,4143	49,9875
Average	**24,8933**	**24,036**	**25,4783**	**24,099**	**51,6613**	**51,14**	**49,3041**	**50,0083**

Upload Data Dokumen SDM

Sample	*CPU Utilization* (%)							
	REST				GraphQL			
	100	120	140	160	100	120	140	160
1	7,33448	10,7542	10,5	8,8383	17,0267	10,8478	10,9793	10,3432
2	10,775	10,3091	10,3091	9,73889	16,9045	14,8739	11,2107	15,1049
3	8,27368	9,53846	9,41481	9,80227	17,24	14,728	14,2897	13,3027
4	8,82273	8,91538	9,07778	11,5767	14,5737	16,8037	12,7469	12,393

5	10,3667	10,0227	9,86667	9,08421	15,9	11,904	10,2237	13,9316
Average	**9,11451**	**9,90797**	**9,83367**	**9,80807**	**16,329**	**13,8315**	**11,8901**	**13,0151**

Lampiran 4 Hasil Pengukuran *Response Time* Interval 5 menit

Fetch Data Sumber Daya Manusia 100 *Number of Threads*

Start time	*Response Time* (ms)		*Start time*	*Response Time* (ms)	
	REST	GraphQL		REST	GraphQL
00:03	2787	4175	02:33	2816	27006
00:06	2829	4140	02:36	2836	26415
00:09	2774	4208	02:39	2804	25790
00:12	3085	4079	02:42	2838	25088
00:15	2842	10482	02:45	2777	24485
00:18	2731	9124	02:48	2798	23804
00:21	2741	8551	02:51	2831	23437
00:24	2744	7883	02:54	2881	23043
00:27	2794	12416	02:57	2822	22405
00:30	2741	11848	03:00	2865	23731
00:33	2785	15405	03:03	2879	22915
00:36	2739	12223	03:06	2826	22257
00:39	2728	11634	03:09	2822	23367
00:42	2810	11210	03:12	2885	26782
00:45	2811	15645	03:15	2777	22909
00:48	2769	14433	03:18	2814	23268
00:51	2742	13812	03:21	2829	23119
00:54	2812	14724	03:24	2876	23014
00:57	2803	14018	03:27	2772	23393
01:00	2832	13479	03:30	2767	29053
01:03	2779	12874	03:33	2773	27920
01:06	2744	20467	03:36	2733	27788
01:09	2778	18088	03:39	2780	32223
01:12	2742	17704	03:42	2829	31225
01:15	2797	17066	03:45	2796	36168
01:18	2783	16438	03:48	2823	33182
01:21	2839	15816	03:51	2787	32824
01:24	2782	15197	03:54	2774	32231

01:27	2776	14582	03:57	2774	31817
01:30	2747	14380	04:00	2823	32690
01:33	2972	16966	04:03	2872	32570
01:36	2780	16304	04:06	2843	31887
01:39	2737	15948	04:09	2819	31543
01:42	2745	15287	04:12	2922	34659
01:45	2734	21313	04:15	2822	38336
01:48	2736	24192	04:18	2775	37989
01:51	2778	21814	04:21	2790	37378
01:54	2838	21160	04:24	2744	36802
01:57	6119	20532	04:27	2812	36140
02:00	4900	19828	04:30	2773	35521
02:03	2940	26162	04:33	2775	35396
02:06	2782	25559	04:36	2865	35785
02:09	2790	24901	04:39	2837	41855
02:12	2976	24504	04:42	2782	40000
02:15	2829	31003	04:45	2845	39404
02:18	2806	28919	04:48	2767	38972
02:21	2838	28529	04:51	2786	39088
02:24	2814	28138	04:54	2769	38448
02:27	2783	27529	04:57	2774	37797
02:30	2828	27182	05:00	2766	37226

Fetch Data Sumber Daya Manusia 120 *Number of Threads*

Start time	*Response Time* (ms)		*Start time*	*Response Time* (ms)	
	REST	GraphQL		REST	GraphQL
00:02:50	4997	4191	02:32:50	3628	39792
00:05:00	8444	4110	02:35:00	6319	45680
00:07:50	5774	4777	02:37:50	5599	50206
00:10:00	4404	5589	02:40:00	8547	49243
00:12:50	2953	5503	02:42:50	4672	49134
00:15:00	10469	5347	02:45:00	4160	54535
00:17:50	2886	5449	02:47:50	3250	56485
00:20:00	2785	5305	02:50:00	2768	56054
00:22:50	2772	5176	02:52:05	2786	59362
00:25:00	2734	9683	02:55:00	2872	59235
00:27:50	3031	9092	02:57:50	5865	59105
00:30:00	2749	12263	03:00:00	8450	58934

00:32:50	3011	14528	03:02:50	4386	58769
00:35:00	2807	12180	03:05:00	3667	58623
00:37:50	2776	12090	03:07:50	3201	62689
00:40:00	2781	12225	03:10:00	2776	61628
00:42:50	3031	12210	03:12:50	2881	65426
00:45:00	2830	12320	03:15:00	2782	64315
00:47:50	2788	12264	03:17:50	2723	69883
00:50:00	2783	12157	03:20:00	2829	69455
00:52:05	3080	12003	03:22:50	2741	69374
00:55:00	2776	11914	03:25:00	8790	69506
00:57:50	5814	11757	03:27:50	3811	69721
01:00:00	8498	17347	03:30:00	2880	69812
01:02:50	4320	17416	03:32:50	4010	70677
01:05:00	2912	17336	03:35:00	9054	70808
01:07:50	2837	17180	03:37:50	2772	70664
01:10:00	2792	16995	03:40:00	9013	72579
01:12:50	3115	18794	03:42:50	2982	77201
01:15:00	2743	18388	03:45:00	2736	77990
01:17:50	3019	18321	03:47:50	5557	75737
01:20:00	2775	18207	03:50:00	8442	80170
01:22:50	3024	24568	03:52:05	4095	79295
01:25:00	2778	22961	03:55:00	2878	79888
01:27:50	6727	23577	03:57:50	2836	79761
01:30:00	4545	23870	04:00:00	2773	79627
01:32:50	4118	24462	04:02:50	2832	84809
01:35:00	3192	24631	04:05:00	2773	82344
01:37:50	3076	24572	04:07:50	4497	82312
01:40:00	2741	24419	04:10:00	8075	82137
01:42:50	2979	26917	04:12:50	3319	82732
01:45:00	2775	27883	04:15:00	2785	82700
01:47:50	4577	32031	04:17:50	2719	82552
01:50:00	8177	27741	04:20:00	2782	82862
01:52:05	3845	28037	04:22:50	3013	82722
01:55:00	2824	27978	04:25:00	2788	82630
01:57:50	8819	28408	04:27:50	2770	82775
02:00:00	10498	29012	04:30:00	2821	86918
02:02:50	14704	28824	04:32:50	3027	86806
02:05:00	12760	32955	04:35:00	2736	86927
02:07:50	11309	32112	04:37:50	3074	86804

02:10:00	10140	31991	04:40:00	2776	86639
02:12:50	8659	32061	04:42:50	2783	87234
02:15:00	7660	32436	04:45:00	2878	88115
02:17:50	6257	32305	04:47:50	3056	88243
02:20:00	4802	38251	04:50:00	2771	88337
02:22:50	3377	36538	04:52:05	2808	88166
02:25:00	2767	40956	04:55:00	2808	88094
02:27:50	2972	39327	04:57:50	8185	87948
02:30:00	2742	39957	05:00:00	2780	87828

Fetch Data Sumber Daya Manusia 140 *Number of Threads*

Start time	*Response Time* (ms)		*Start time*	*Response Time* (ms)	
	REST	GraphQL		REST	GraphQL
00:02:10	2781	5524	02:29:10	2808	66230
00:04:20	2866	6116	02:31:20	2771	66576
00:06:30	2801	6407	02:33:30	3067	66687
00:08:40	2826	6888	02:35:40	2962	71765
00:10:50	2810	7548	02:37:50	2787	70936
00:13:00	2741	8131	02:40:00	2744	72495
00:15:10	2785	8623	02:42:10	2833	72907
00:17:20	2724	9077	02:44:20	2742	75394
00:19:30	2812	10198	02:46:30	2791	79418
00:21:00	5672	10374	02:48:00	2770	75620
00:23:10	7971	10511	02:50:10	3998	76560
00:25:20	5574	10634	02:52:20	3397	76848
00:27:30	5252	11265	02:54:30	2820	77793
00:29:40	6037	11384	02:56:40	2776	79999
00:31:50	4724	11529	02:58:50	2821	84034
00:34:00	3662	11888	03:01:00	2785	80096
00:37:10	2807	14599	03:03:10	4335	80551
00:38:20	2821	14864	03:05:20	3971	81723
00:40:30	2819	15335	03:07:30	9456	81978
00:42:00	2779	15645	03:09:00	10455	82303
00:44:10	2790	16027	03:12:10	9397	82544
00:46:20	2807	16293	03:13:20	8275	82979
00:48:30	2743	16404	03:15:30	7535	83300
00:50:40	2803	16837	03:17:40	6402	83501
00:52:50	5181	17401	03:19:50	5328	83835

00:55:00	4809	17473	03:22:00	8501	84225
00:57:10	4480	17737	03:24:10	6634	85938
00:59:20	3374	26281	03:26:20	6493	86854
01:01:30	2774	24386	03:28:30	6139	87130
01:03:00	2793	24430	03:30:00	5761	87295
01:05:10	5989	24602	03:32:10	5912	87950
01:07:20	3940	25234	03:34:20	5912	87769
01:09:30	3827	25484	03:36:30	5328	88240
01:11:40	2820	32398	03:38:40	4262	88796
01:13:50	2783	31049	03:40:50	3398	89461
01:16:00	2792	31316	03:43:00	3078	89619
01:18:10	2786	35336	03:45:10	2771	89803
01:20:20	3120	38245	03:47:20	2802	89953
01:22:30	3562	35566	03:49:30	2976	90317
01:24:00	3243	36117	03:51:00	2779	91390
01:26:10	2795	36300	03:53:10	2778	91985
01:28:20	2824	42561	03:55:20	2781	91912
01:30:30	2728	42845	03:57:30	2724	92333
01:32:40	2838	43100	03:59:40	2788	92496
01:34:50	3422	46869	04:01:50	3049	92674
01:37:00	2764	46630	04:04:00	6119	93040
01:39:10	8320	46959	04:06:10	5251	93148
01:41:20	2741	55253	04:08:20	4143	95137
01:43:30	2813	53608	04:10:30	3041	98566
01:45:00	2824	53519	04:12:00	2822	95394
01:47:10	2765	53961	04:14:10	2789	96189
01:49:20	4013	54416	04:16:20	2745	97219
01:51:30	2878	57942	04:18:30	4909	97405
01:53:40	7866	57335	04:20:40	3442	97632
01:55:50	2768	57662	04:22:50	2779	103467
01:59:00	2834	57664	04:25:00	2783	102325
02:00:10	2829	58199	04:27:10	2829	102531
02:02:20	2773	58473	04:29:20	2731	102977
02:04:30	2736	59687	04:31:30	2730	103206
02:06:00	2733	61876	04:33:00	2769	103311
02:08:10	2738	60255	04:35:10	2780	103703
02:11:20	2725	60366	04:37:20	2769	104433
02:12:30	2775	60630	04:39:30	2782	105009
02:14:40	2818	60922	04:41:40	2722	105816

02:16:50	2821	61245	04:43:50	2771	106434
02:19:00	2844	61364	04:46:00	3058	106541
02:21:10	3262	62687	04:47:10	2956	106647
02:23:20	2839	65054	04:50:20	2731	106915
02:25:30	2821	65749	04:52:30	2822	107137
02:27:00	2837	66073	04:54:00	2774	107749

Fetch Data Sumber Daya Manusia 160 *Number of Threads*

Start time	*Response Time* (ms)		*Start time*	*Response Time* (ms)	
	REST	GraphQL		REST	GraphQL
00:02:20	3527	4076	02:26:20	2826	109758
00:04:00	3445	4550	02:28:00	2976	110531
00:05:40	2796	5831	02:29:40	2736	111077
00:07:20	2746	9019	02:31:20	2783	111523
00:09:00	2803	11800	02:33:00	2779	113047
00:11:20	2776	15583	02:35:20	2779	114306
00:13:00	2774	12904	02:37:00	2827	114817
00:14:40	2730	15284	02:38:40	2781	115282
00:16:20	2727	16294	02:40:20	2785	116042
00:18:00	2736	16768	02:42:00	2778	116778
00:20:20	2742	17264	02:44:20	2724	118082
00:22:00	2819	17762	02:46:00	2741	118517
00:23:40	2776	25289	02:47:40	2786	119275
00:25:20	2829	30365	02:49:20	2780	119786
00:27:00	2765	30722	02:51:00	2769	125436
00:29:20	2813	31609	02:53:20	2776	125264
00:31:00	2977	32096	02:55:00	2775	125685
00:32:40	8639	32619	02:56:40	3034	126612
00:34:20	7619	33051	02:58:20	4626	127171
00:36:00	6964	33868	03:00:00	3831	133244
00:38:20	6186	34567	03:02:20	2982	133165
00:40:00	5547	35363	03:04:00	8657	133690
00:41:40	4702	35847	03:05:40	2732	134219
00:43:20	4573	36824	03:07:20	2827	134746
00:45:00	4824	38261	03:09:00	3918	135582
00:47:20	3974	39736	03:11:20	3398	136865
00:49:00	3083	40232	03:13:00	2770	137329
00:50:40	2825	42601	03:14:40	9039	139150

00:52:20	2766	42589	03:16:20	2809	140084
00:54:00	2835	43094	03:18:00	2804	141323
00:56:20	2775	43596	03:20:20	2772	141821
00:58:00	2787	44362	03:22:00	2771	142517
00:59:40	4882	45605	03:23:40	2813	143014
01:01:20	8334	46081	03:25:20	3077	143625
01:03:00	5084	48623	03:27:00	6096	144058
01:05:20	4225	51141	03:29:20	4827	144587
01:07:00	3427	49135	03:31:00	4008	148421
01:08:40	2878	49616	03:32:40	3151	148732
01:10:20	2734	50357	03:34:20	2818	149432
01:12:00	2768	55931	03:36:00	2734	155708
01:14:20	3012	57253	03:38:20	7211	155457
01:16:00	2930	63180	03:40:00	9339	156721
01:17:40	2781	63370	03:41:40	13702	157479
01:19:20	2831	63978	03:43:20	12852	164284
01:21:00	2784	64463	03:45:00	12280	163460
01:23:20	2785	67977	03:47:20	14173	164264
01:25:00	2783	70668	03:49:00	13634	165753
01:26:40	2739	68423	03:50:40	12784	166482
01:28:20	2731	69158	03:52:20	12012	168029
01:30:00	2987	69676	03:54:00	11395	168459
01:32:20	4624	70383	03:56:20	10520	169016
01:34:00	3774	71378	03:58:00	10629	169593
01:35:40	2944	71883	03:59:40	10391	174816
01:37:20	2795	72614	04:01:20	15640	174340
01:39:00	2816	75629	04:03:00	16553	174952
01:41:20	2781	79326	04:05:20	14575	175668
01:43:00	8333	76876	04:07:00	17371	176172
01:44:40	7352	77425	04:08:40	14079	176843
01:46:20	6715	84777	04:10:20	16404	177448
01:48:00	5920	84029	04:12:00	17770	177825
01:50:20	5363	84589	04:14:20	20353	178338
01:52:00	5323	84994	04:16:00	17418	178910
01:53:40	5486	85489	04:17:40	16580	180256
01:55:20	4859	89036	04:19:20	15802	181452
01:57:00	4146	92505	04:21:00	16743	181945
01:59:20	3312	89774	04:23:20	21562	187030
02:01:00	2770	91824	04:25:00	19765	186294

02:02:40	2825	93797	04:26:40	19209	187036
02:04:20	2782	95011	04:28:20	19122	187490
02:06:00	2825	95501	04:30:00	18557	188010
02:08:20	2869	96220	04:32:20	20086	188775
02:10:00	2809	97460	04:34:00	23518	189477
02:11:40	2768	97994	04:35:40	24500	189927
02:13:20	3070	98725	04:37:20	23215	193809
02:15:00	3174	99247	04:39:00	22362	193138
02:17:20	3376	100017	04:41:20	21522	193588
02:19:00	2823	101574	04:43:00	20741	194558
02:20:40	2884	108335	04:44:40	19874	195050
05:22:20	2829	108529	04:46:20	19083	201425
02:24:00	2815	109312	04:48:00	23888	201468

Fetch Data Pendidikan Formal SDM 100 *Number of Threads*

Start time	*Response Time* (ms)		*Start time*	*Response Time* (ms)	
	REST	GraphQL		REST	GraphQL
00:03	553	601	02:33	553	595
00:06	604	609	02:36	544	636
00:09	576	594	02:39	553	597
00:12	539	597	02:42	546	641
00:15	573	601	02:45	551	637
00:18	562	589	02:48	606	604
00:21	546	578	02:51	560	588
00:24	612	577	02:54	553	639
00:27	570	590	02:57	541	621
00:30	549	597	03:00	549	585
00:33	579	587	03:03	550	592
00:36	537	586	03:06	554	588
00:39	583	620	03:09	534	609
00:42	631	589	03:12	548	598
00:45	587	631	03:15	773	601
00:48	630	592	03:18	609	655
00:51	578	618	03:21	577	590
00:54	559	587	03:24	571	600
00:57	552	627	03:27	625	589
01:00	571	595	03:30	544	600
01:03	647	581	03:33	553	589

01:06	543	682	03:36	545	604
01:09	585	591	03:39	550	625
01:12	553	586	03:42	555	586
01:15	554	599	03:45	537	589
01:18	551	602	03:48	554	582
01:21	552	590	03:51	581	587
01:24	597	579	03:54	545	586
01:27	585	607	03:57	542	594
01:30	553	593	04:00	592	599
01:33	545	597	04:03	554	629
01:36	554	619	04:06	535	597
01:39	546	599	04:09	535	594
01:42	553	580	04:12	537	585
01:45	535	598	04:15	542	592
01:48	545	578	04:18	575	593
01:51	545	594	04:21	541	598
01:54	543	593	04:24	604	588
01:57	541	589	04:27	539	589
02:00	597	585	04:30	596	590
02:03	555	587	04:33	538	587
02:06	552	595	04:36	542	587
02:09	597	595	04:39	609	604
02:12	545	587	04:42	546	591
02:15	551	670	04:45	561	592
02:18	550	576	04:48	589	581
02:21	582	600	04:51	549	589
02:24	561	636	04:54	541	585
02:27	544	587	04:57	548	588
02:30	542	592	05:00	599	596

Fetch Data Pendidikan Formal SDM 120 *Number of Threads*

Start time	*Response Time* (ms)		*Start time*	*Response Time* (ms)	
	REST	GraphQL		REST	GraphQL
00:02:50	649	641	02:32:50	617	643
00:05:00	686	635	02:35:00	585	668
00:07:50	635	621	02:37:50	797	626
00:10:00	601	644	02:40:00	673	692
00:12:50	601	618	02:42:50	653	619

00:15:00	593	628	02:45:00	658	643
00:17:50	589	623	02:47:50	741	653
00:20:00	592	659	02:50:00	581	645
00:22:50	609	626	02:52:05	842	617
00:25:00	600	639	02:55:00	585	635
00:27:50	612	630	02:57:50	602	637
00:30:00	606	635	03:00:00	589	637
00:32:50	599	641	03:02:50	603	629
00:35:00	649	638	03:05:00	596	687
00:37:50	636	649	03:07:50	643	629
00:40:00	611	639	03:10:00	605	695
00:42:50	599	626	03:12:50	633	633
00:45:00	622	650	03:15:00	653	633
00:47:50	619	630	03:17:50	628	623
00:50:00	590	625	03:20:00	617	633
00:52:05	603	633	03:22:50	690	634
00:55:00	611	680	03:25:00	592	673
00:57:50	637	645	03:27:50	653	631
01:00:00	618	645	03:30:00	590	667
01:02:50	608	619	03:32:50	595	643
01:05:00	629	645	03:35:00	627	687
01:07:50	602	628	03:37:50	636	648
01:10:00	631	649	03:40:00	653	639
01:12:50	601	639	03:42:50	598	621
01:15:00	587	645	03:45:00	596	643
01:17:50	626	622	03:47:50	602	700
01:20:00	593	645	03:50:00	587	649
01:22:50	605	705	03:52:05	645	719
01:25:00	601	624	03:55:00	599	677
01:27:50	646	631	03:57:50	601	622
01:30:00	619	632	04:00:00	583	630
01:32:50	663	677	04:02:50	624	651
01:35:00	633	633	04:05:00	705	634
01:37:50	636	628	04:07:50	615	631
01:40:00	590	644	04:10:00	636	757
01:42:50	633	624	04:12:50	641	655
01:45:00	588	643	04:15:00	600	652
01:47:50	663	641	04:17:50	604	674
01:50:00	608	644	04:20:00	601	646

01:52:05	600	633	04:22:50	617	626
01:55:00	587	653	04:25:00	598	635
01:57:50	597	639	04:27:50	605	622
02:00:00	592	642	04:30:00	617	626
02:02:50	611	624	04:32:50	612	631
02:05:00	603	647	04:35:00	642	644
02:07:50	611	621	04:37:50	636	623
02:10:00	662	679	04:40:00	636	657
02:12:50	598	624	04:42:50	656	682
02:15:00	593	657	04:45:00	598	639
02:17:50	598	640	04:47:50	598	630
02:20:00	587	638	04:50:00	621	632
02:22:50	608	664	04:52:05	608	640
02:25:00	688	644	04:55:00	646	641
02:27:50	609	631	04:57:50	597	648
02:30:00	650	637	05:00:00	584	644

Fetch Data Pendidikan Formal SDM 140 *Number of Threads*

Start time	*Response Time* (ms)		*Start time*	*Response Time* (ms)	
	REST	GraphQL		REST	GraphQL
00:02:10	565	622	02:29:10	570	586
00:04:20	542	610	02:31:20	550	590
00:06:30	555	582	02:33:30	545	575
00:08:40	561	598	02:35:40	591	581
00:10:50	549	694	02:37:50	552	593
00:13:00	549	689	02:40:00	638	577
00:15:10	551	577	02:42:10	549	602
00:17:20	604	585	02:44:20	575	587
00:19:30	557	576	02:46:30	558	625
00:21:00	553	583	02:48:00	595	628
00:23:10	552	586	02:50:10	555	598
00:25:20	576	578	02:52:20	554	616
00:27:30	563	605	02:54:30	560	601
00:29:40	547	618	02:56:40	563	594
00:31:50	597	623	02:58:50	554	579
00:34:00	566	581	03:01:00	559	615
00:37:10	561	608	03:03:10	549	588
00:38:20	556	573	03:05:20	640	593

00:40:30	558	589	03:07:30	554	601
00:42:00	601	592	03:09:00	541	684
00:44:10	547	582	03:12:10	616	603
00:46:20	563	583	03:13:20	549	645
00:48:30	552	598	03:15:30	557	577
00:50:40	542	584	03:17:40	571	646
00:52:50	560	587	03:19:50	550	583
00:55:00	547	648	03:22:00	687	578
00:57:10	565	577	03:24:10	557	583
00:59:20	560	587	03:26:20	548	578
01:01:30	554	588	03:28:30	564	618
01:03:00	559	593	03:30:00	539	617
01:05:10	557	614	03:32:10	577	596
01:07:20	548	592	03:34:20	541	598
01:09:30	574	619	03:36:30	554	595
01:11:40	576	596	03:38:40	634	574
01:13:50	555	601	03:40:50	574	581
01:16:00	552	597	03:43:00	545	581
01:18:10	545	614	03:45:10	543	579
01:20:20	550	719	03:47:20	556	591
01:22:30	560	595	03:49:30	559	638
01:24:00	541	580	03:51:00	564	644
01:26:10	615	578	03:53:10	546	594
01:28:20	562	584	03:55:20	552	594
01:30:30	550	586	03:57:30	567	593
01:32:40	554	593	03:59:40	549	591
01:34:50	542	582	04:01:50	563	578
01:37:00	549	579	04:04:00	566	589
01:39:10	592	626	04:06:10	592	597
01:41:20	549	586	04:08:20	550	595
01:43:30	613	586	04:10:30	541	593
01:45:00	539	624	04:12:00	542	577
01:47:10	557	599	04:14:10	551	580
01:49:20	551	609	04:16:20	558	594
01:51:30	557	583	04:18:30	621	599
01:53:40	551	589	04:20:40	552	587
01:55:50	554	579	04:22:50	549	669
01:59:00	546	597	04:25:00	568	585
02:00:10	554	586	04:27:10	577	583

02:02:20	628	665	04:29:20	593	613
02:04:30	556	594	04:31:30	545	651
02:06:00	543	581	04:33:00	551	630
02:08:10	558	578	04:35:10	599	613
02:11:20	560	633	04:37:20	551	620
02:12:30	545	592	04:39:30	722	592
02:14:40	579	587	04:41:40	554	586
02:16:50	547	575	04:43:50	555	583
02:19:00	588	604	04:46:00	549	606
02:21:10	568	605	04:47:10	668	595
02:23:20	553	581	04:50:20	552	596
02:25:30	549	585	04:52:30	631	576
02:27:00	549	593	04:54:00	545	583

Fetch Data Pendidikan Formal SDM 160 *Number of Threads*

Start time	*Response Time* (ms)		*Start time*	*Response Time* (ms)	
	REST	GraphQL		REST	GraphQL
00:02:20	552	649	02:26:20	546	674
00:04:00	542	576	02:28:00	565	585
00:05:40	582	590	02:29:40	553	577
00:07:20	632	578	02:31:20	553	580
00:09:00	571	571	02:33:00	557	584
00:11:20	551	658	02:35:20	568	592
00:13:00	546	588	02:37:00	554	581
00:14:40	567	576	02:38:40	568	585
00:16:20	554	577	02:40:20	553	587
00:18:00	604	592	02:42:00	596	575
00:20:20	554	591	02:44:20	618	596
00:22:00	548	570	02:46:00	560	586
00:23:40	569	575	02:47:40	550	573
00:25:20	589	581	02:49:20	593	585
00:27:00	547	587	02:51:00	536	656
00:29:20	553	578	02:53:20	636	576
00:31:00	550	583	02:55:00	568	595
00:32:40	543	598	02:56:40	559	583
00:34:20	556	591	02:58:20	562	608
00:36:00	597	595	03:00:00	563	581
00:38:20	559	587	03:02:20	659	585

00:40:00	563	601	03:04:00	542	583
00:41:40	603	578	03:05:40	558	591
00:43:20	558	584	03:07:20	562	580
00:45:00	550	601	03:09:00	557	622
00:47:20	614	578	03:11:20	557	569
00:49:00	557	587	03:13:00	595	583
00:50:40	545	568	03:14:40	561	608
00:52:20	595	590	03:16:20	549	639
00:54:00	542	589	03:18:00	556	590
00:56:20	630	591	03:20:20	568	593
00:58:00	553	588	03:22:00	562	569
00:59:40	576	613	03:23:40	570	588
01:01:20	588	574	03:25:20	577	583
01:03:00	620	590	03:27:00	568	579
01:05:20	564	589	03:29:20	537	575
01:07:00	550	607	03:31:00	554	582
01:08:40	559	575	03:32:40	536	622
01:10:20	593	591	03:34:20	564	589
01:12:00	556	579	03:36:00	557	575
01:14:20	554	586	03:38:20	555	580
01:16:00	556	571	03:40:00	539	570
01:17:40	553	585	03:41:40	584	591
01:19:20	551	577	03:43:20	555	582
01:21:00	559	588	03:45:00	551	574
01:23:20	543	583	03:47:20	545	593
01:25:00	579	589	03:49:00	590	584
01:26:40	544	584	03:50:40	556	611
01:28:20	546	606	03:52:20	596	611
01:30:00	539	644	03:54:00	566	582
01:32:20	576	587	03:56:20	560	585
01:34:00	554	572	03:58:00	543	589
01:35:40	581	595	03:59:40	576	600
01:37:20	545	645	04:01:20	704	627
01:39:00	563	594	04:03:00	603	588
01:41:20	548	577	04:05:20	548	650
01:43:00	576	587	04:07:00	546	597
01:44:40	574	574	04:08:40	541	575
01:46:20	544	574	04:10:20	555	592
01:48:00	554	593	04:12:00	544	649

01:50:20	562	586	04:14:20	624	581
01:52:00	591	597	04:16:00	540	596
01:53:40	542	618	04:17:40	558	587
01:55:20	564	579	04:19:20	558	585
01:57:00	642	594	04:21:00	549	598
01:59:20	546	658	04:23:20	547	658
02:01:00	553	643	04:25:00	556	582
02:02:40	542	631	04:26:40	556	583
02:04:20	561	580	04:28:20	553	592
02:06:00	547	695	04:30:00	550	591
02:08:20	547	588	04:32:20	551	589
02:10:00	553	675	04:34:00	558	579
02:11:40	564	583	04:35:40	556	605
02:13:20	584	577	04:37:20	557	630
02:15:00	589	586	04:39:00	567	592
02:17:20	560	588	04:41:20	576	602
02:19:00	664	598	04:43:00	558	616
02:20:40	547	594	04:44:40	580	612
05:22:20	553	596	04:46:20	582	583
02:24:00	559	577	04:48:00	545	576

Fetch Data Dokumen SDM 100 *Number of Threads*

Start time	*Response Time* (ms)		*Start time*	*Response Time* (ms)	
	REST	GraphQL		REST	GraphQL
00:03	882	3387	02:33	794	956
00:06	949	925	02:36	813	888
00:09	917	935	02:39	817	891
00:12	1180	1016	02:42	859	966
00:15	803	1011	02:45	800	2869
00:18	794	914	02:48	839	876
00:21	826	890	02:51	828	979
00:24	963	901	02:54	834	881
00:27	826	893	02:57	819	1136
00:30	795	1079	03:00	881	2013
00:33	829	946	03:03	1277	903
00:36	860	1017	03:06	820	880
00:39	917	2156	03:09	871	874
00:42	868	892	03:12	1091	857

00:45	843	874	03:15	857	874
00:48	825	871	03:18	951	875
00:51	788	968	03:21	859	868
00:54	837	995	03:24	931	1055
00:57	853	885	03:27	851	923
01:00	812	864	03:30	823	925
01:03	835	894	03:33	884	909
01:06	793	893	03:36	966	975
01:09	927	2566	03:39	896	863
01:12	831	1721	03:42	1021	974
01:15	823	2604	03:45	984	893
01:18	2415	875	03:48	841	874
01:21	3215	867	03:51	896	884
01:24	802	941	03:54	947	881
01:27	951	861	03:57	822	878
01:30	901	920	04:00	833	2718
01:33	821	953	04:03	912	880
01:36	833	865	04:06	796	880
01:39	839	993	04:09	812	2534
01:42	855	2532	04:12	1465	906
01:45	828	907	04:15	805	1037
01:48	806	889	04:18	1044	3005
01:51	816	3326	04:21	929	2051
01:54	892	873	04:24	896	918
01:57	819	1318	04:27	848	1133
02:00	842	946	04:30	827	2458
02:03	812	926	04:33	804	980
02:06	814	2558	04:36	797	936
02:09	798	2929	04:39	831	931
02:12	1005	910	04:42	884	2101
02:15	886	1006	04:45	947	2489
02:18	944	989	04:48	858	935
02:21	2331	943	04:51	844	866
02:24	832	2480	04:54	841	2768
02:27	809	871	04:57	883	934
02:30	859	898	05:00	835	870

Fetch Data Dokumen SDM 120 *Number of Threads*

Start time	*Response Time* (ms)		*Start time*	*Response Time* (ms)	
	REST	GraphQL		REST	GraphQL
00:02:50	1932	877	02:32:50	897	849
00:05:00	907	952	02:35:00	930	958
00:07:50	800	861	02:37:50	836	877
00:10:00	958	961	02:40:00	793	903
00:12:50	833	856	02:42:50	858	902
00:15:00	813	883	02:45:00	971	876
00:17:50	865	882	02:47:50	827	847
00:20:00	816	880	02:50:00	808	923
00:22:50	878	1001	02:52:05	796	848
00:25:00	855	977	02:55:00	860	876
00:27:50	833	868	02:57:50	958	885
00:30:00	839	1000	03:00:00	820	900
00:32:50	841	963	03:02:50	855	902
00:35:00	806	954	03:05:00	821	903
00:37:50	868	890	03:07:50	865	920
00:40:00	885	902	03:10:00	798	904
00:42:50	889	915	03:12:50	861	961
00:45:00	836	1035	03:15:00	1068	936
00:47:50	862	982	03:17:50	806	852
00:50:00	1013	872	03:20:00	859	1124
00:52:05	838	925	03:22:50	824	2296
00:55:00	881	874	03:25:00	807	853
00:57:50	846	926	03:27:50	796	899
01:00:00	898	858	03:30:00	892	894
01:02:50	829	848	03:32:50	942	956
01:05:00	923	839	03:35:00	910	886
01:07:50	792	1040	03:37:50	905	2254
01:10:00	808	1071	03:40:00	861	902
01:12:50	808	912	03:42:50	808	964
01:15:00	799	955	03:45:00	878	916
01:17:50	794	854	03:47:50	800	849
01:20:00	976	903	03:50:00	900	895
01:22:50	814	1012	03:52:05	840	901
01:25:00	829	890	03:55:00	914	946
01:27:50	815	882	03:57:50	847	869

01:30:00	910	870	04:00:00	867	901
01:32:50	816	836	04:02:50	815	912
01:35:00	789	856	04:05:00	789	902
01:37:50	822	951	04:07:50	911	932
01:40:00	811	944	04:10:00	813	920
01:42:50	826	895	04:12:50	885	894
01:45:00	803	886	04:15:00	882	936
01:47:50	997	926	04:17:50	808	1071
01:50:00	840	896	04:20:00	899	952
01:52:05	938	926	04:22:50	842	927
01:55:00	827	965	04:25:00	822	969
01:57:50	787	863	04:27:50	831	851
02:00:00	907	877	04:30:00	828	869
02:02:50	837	978	04:32:50	990	883
02:05:00	807	961	04:35:00	810	845
02:07:50	993	869	04:37:50	1011	1161
02:10:00	812	854	04:40:00	833	998
02:12:50	787	862	04:42:50	903	850
02:15:00	849	879	04:45:00	821	871
02:17:50	809	874	04:47:50	811	932
02:20:00	817	1901	04:50:00	910	962
02:22:50	915	922	04:52:05	810	881
02:25:00	902	909	04:55:00	815	886
02:27:50	889	954	04:57:50	893	866
02:30:00	809	982	05:00:00	815	922

Fetch Data Dokumen SDM 140 *Number of Threads*

Start time	*Response Time* (ms)		*Start time*	*Response Time* (ms)	
	REST	GraphQL		REST	GraphQL
00:02:10	873	1032	02:29:10	851	885
00:04:20	841	871	02:31:20	861	856
00:06:30	811	855	02:33:30	799	936
00:08:40	853	875	02:35:40	803	892
00:10:50	798	862	02:37:50	819	917
00:13:00	833	1172	02:40:00	808	920
00:15:10	828	875	02:42:10	813	860
00:17:20	800	926	02:44:20	841	876
00:19:30	893	875	02:46:30	877	900

00:21:00	913	926	02:48:00	827	885
00:23:10	787	890	02:50:10	814	943
00:25:20	796	935	02:52:20	804	916
00:27:30	787	931	02:54:30	925	913
00:29:40	799	989	02:56:40	800	925
00:31:50	878	926	02:58:50	887	917
00:34:00	884	864	03:01:00	812	924
00:37:10	815	934	03:03:10	798	876
00:38:20	799	965	03:05:20	860	889
00:40:30	1034	960	03:07:30	813	863
00:42:00	818	899	03:09:00	829	991
00:44:10	864	903	03:12:10	819	842
00:46:20	849	896	03:13:20	816	898
00:48:30	834	990	03:15:30	867	888
00:50:40	816	1014	03:17:40	811	865
00:52:50	834	1059	03:19:50	827	883
00:55:00	795	880	03:22:00	990	950
00:57:10	1048	881	03:24:10	821	935
00:59:20	809	999	03:26:20	915	862
01:01:30	906	871	03:28:30	804	866
01:03:00	837	844	03:30:00	810	925
01:05:10	950	867	03:32:10	881	858
01:07:20	818	991	03:34:20	875	997
01:09:30	813	904	03:36:30	789	837
01:11:40	826	890	03:38:40	813	958
01:13:50	793	860	03:40:50	880	855
01:16:00	881	872	03:43:00	887	883
01:18:10	820	976	03:45:10	808	907
01:20:20	861	847	03:47:20	841	1047
01:22:30	808	870	03:49:30	926	890
01:24:00	907	867	03:51:00	861	881
01:26:10	786	861	03:53:10	1015	876
01:28:20	808	908	03:55:20	862	971
01:30:30	804	877	03:57:30	817	901
01:32:40	820	852	03:59:40	844	1065
01:34:50	843	853	04:01:50	897	901
01:37:00	966	893	04:04:00	820	904
01:39:10	813	950	04:06:10	808	894
01:41:20	819	935	04:08:20	826	906

01:43:30	863	876	04:10:30	828	863
01:45:00	809	887	04:12:00	825	904
01:47:10	817	880	04:14:10	867	986
01:49:20	836	900	04:16:20	796	891
01:51:30	854	850	04:18:30	811	1000
01:53:40	789	900	04:20:40	819	882
01:55:50	795	893	04:22:50	930	1015
01:59:00	811	927	04:25:00	810	849
02:00:10	935	877	04:27:10	813	900
02:02:20	1048	863	04:29:20	819	856
02:04:30	922	881	04:31:30	804	872
02:06:00	920	975	04:33:00	826	929
02:08:10	822	943	04:35:10	902	904
02:11:20	837	875	04:37:20	816	866
02:12:30	835	839	04:39:30	825	917
02:14:40	847	933	04:41:40	987	923
02:16:50	906	879	04:43:50	833	941
02:19:00	825	1053	04:46:00	837	994
02:21:10	842	870	04:48:10	871	901
02:23:20	846	1041	04:50:20	914	891
02:25:30	816	852	04:52:30	916	871
02:27:00	790	898	04:54:00	798	874

Fetch Data Dokumen SDM 160 *Number of Threads*

Start time	*Response Time* (ms)		*Start time*	*Response Time* (ms)	
	REST	GraphQL		REST	GraphQL
00:02:20	858	873	02:26:20	798	886
00:04:00	873	837	02:28:00	805	897
00:05:40	950	888	02:29:40	849	898
00:07:20	825	863	02:31:20	813	841
00:09:00	830	904	02:33:00	941	870
00:11:20	822	864	02:35:20	910	911
00:13:00	834	902	02:37:00	928	1010
00:14:40	815	873	02:38:40	809	948
00:16:20	907	919	02:40:20	806	861
00:18:00	828	915	02:42:00	838	953
00:20:20	828	864	02:44:20	816	932
00:22:00	844	858	02:46:00	864	964

00:23:40	816	887	02:47:40	828	979
00:25:20	833	843	02:49:20	846	837
00:27:00	919	946	02:51:00	825	967
00:29:20	795	868	02:53:20	847	892
00:31:00	804	974	02:55:00	791	908
00:32:40	852	959	02:56:40	859	850
00:34:20	812	884	02:58:20	851	893
00:36:00	804	855	03:00:00	808	911
00:38:20	856	940	03:02:20	830	1112
00:40:00	853	963	03:04:00	820	926
00:41:40	851	969	03:05:40	877	876
00:43:20	837	916	03:07:20	890	964
00:45:00	807	882	03:09:00	795	915
00:47:20	924	957	03:11:20	805	964
00:49:00	791	876	03:13:00	849	892
00:50:40	1151	897	03:14:40	860	890
00:52:20	841	874	03:16:20	889	883
00:54:00	813	883	03:18:00	827	935
00:56:20	828	885	03:20:20	937	968
00:58:00	849	937	03:22:00	837	891
00:59:40	839	862	03:23:40	846	865
01:01:20	883	866	03:25:20	809	867
01:03:00	823	1117	03:27:00	904	1022
01:05:20	829	873	03:29:20	833	842
01:07:00	833	1076	03:31:00	842	863
01:08:40	794	892	03:32:40	833	953
01:10:20	801	947	03:34:20	841	906
01:12:00	840	933	03:36:00	895	846
01:14:20	839	993	03:38:20	812	1033
01:16:00	879	877	03:40:00	889	888
01:17:40	829	911	03:41:40	819	888
01:19:20	776	855	03:43:20	787	921
01:21:00	884	911	03:45:00	851	873
01:23:20	803	927	03:47:20	933	973
01:25:00	928	849	03:49:00	840	1335
01:26:40	888	1027	03:50:40	806	876
01:28:20	810	863	03:52:20	855	961
01:30:00	795	861	03:54:00	943	912
01:32:20	840	925	03:56:20	861	1237

01:34:00	938	958	03:58:00	829	959
01:35:40	862	1001	03:59:40	827	982
01:37:20	881	894	04:01:20	788	956
01:39:00	825	1012	04:03:00	850	978
01:41:20	797	857	04:05:20	808	857
01:43:00	838	909	04:07:00	803	1132
01:44:40	823	886	04:08:40	841	917
01:46:20	832	940	04:10:20	851	981
01:48:00	787	920	04:12:00	815	2578
01:50:20	1128	879	04:14:20	844	896
01:52:00	820	872	04:16:00	865	957
01:53:40	822	854	04:17:40	874	1035
01:55:20	806	914	04:19:20	850	875
01:57:00	900	999	04:21:00	859	1018
01:59:20	816	1063	04:23:20	801	911
02:01:00	862	880	04:25:00	909	848
02:02:40	917	891	04:26:40	834	891
02:04:20	799	872	04:28:20	813	886
02:06:00	904	889	04:30:00	918	966
02:08:20	831	956	04:32:20	784	869
02:10:00	851	1160	04:34:00	825	999
02:11:40	863	873	04:35:40	790	930
02:13:20	826	936	04:37:20	832	941
02:15:00	835	898	04:39:00	847	921
02:17:20	800	944	04:41:20	931	846
02:19:00	837	871	04:43:00	866	904
02:20:40	798	1227	04:44:40	808	877
05:22:20	821	899	04:46:20	882	859
02:24:00	816	882	04:48:00	791	898

Upload Data Dokumen SDM 100 *Number of Threads*

Start time	*Response Time* (ms)		*Start time*	*Response Time* (ms)	
	REST	GraphQL		REST	GraphQL
00:03	5158	5303	02:33	5128	4844
00:06	4957	5019	02:36	4909	4921
00:09	8135	5052	02:39	4912	5409
00:12	4999	5224	02:42	4956	5160
00:15	5232	9599	02:45	5008	5267

00:18	5188	5094	02:48	4959	5165
00:21	5112	5040	02:51	5030	5197
00:24	5172	5479	02:54	4649	4942
00:27	5381	5459	02:57	4980	5139
00:30	4994	5279	03:00	5166	4949
00:33	5076	4988	03:03	5231	5024
00:36	4940	5188	03:06	5057	4958
00:39	5061	4994	03:09	4744	5202
00:42	5401	5208	03:12	4682	5717
00:45	4753	5243	03:15	5594	5467
00:48	4805	5164	03:18	4968	4914
00:51	4849	5017	03:21	5030	5248
00:54	5073	5131	03:24	4751	5225
00:57	4749	5220	03:27	4809	5792
01:00	4810	4880	03:30	4838	4941
01:03	4938	5167	03:33	4981	5017
01:06	5289	5107	03:36	5128	5173
01:09	5134	5659	03:39	4931	5165
01:12	4898	5074	03:42	5211	5137
01:15	5165	4811	03:45	4818	4907
01:18	5016	4922	03:48	4834	5131
01:21	9192	5317	03:51	4867	4874
01:24	4903	5027	03:54	5077	5032
01:27	5078	5051	03:57	5043	5110
01:30	4901	5350	04:00	5288	4923
01:33	5101	5119	04:03	5259	5100
01:36	5710	5201	04:06	5069	5149
01:39	4848	5050	04:09	4965	5208
01:42	5161	4914	04:12	5105	4927
01:45	5185	5199	04:15	4862	5131
01:48	4885	5083	04:18	4963	4950
01:51	5218	5374	04:21	5297	4878
01:54	5175	5136	04:24	5178	4986
01:57	5092	5243	04:27	5051	5619
02:00	5216	5276	04:30	5200	5389
02:03	5519	5172	04:33	4897	5495
02:06	4982	4946	04:36	4971	5814
02:09	4943	5454	04:39	4952	5222
02:12	5249	5888	04:42	4924	5171

02:15	4976	4916	04:45	4897	4960
02:18	4942	5280	04:48	5240	4859
02:21	4978	5179	04:51	5150	5003
02:24	4892	4868	04:54	5235	5161
02:27	5042	5238	04:57	5376	5055
02:30	5156	5294	05:00	4897	5175

Upload Data Dokumen SDM 120 *Number of Threads*

Start time	*Response Time* (ms)		*Start time*	*Response Time* (ms)	
	REST	GraphQL		REST	GraphQL
00:02:50	4856	4951	02:32:50	5108	5007
00:05:00	4897	4941	02:35:00	5007	5110
00:07:50	6963	5141	02:37:50	4938	5022
00:10:00	4988	5303	02:40:00	4883	5152
00:12:50	5351	5259	02:42:50	4924	4873
00:15:00	5342	4935	02:45:00	5285	4920
00:17:50	5415	4910	02:47:50	4920	5587
00:20:00	5212	4961	02:50:00	4967	4965
00:22:50	5346	4954	02:52:05	4939	4798
00:25:00	5009	4939	02:55:00	4944	5324
00:27:50	5148	5354	02:57:50	4902	5450
00:30:00	4908	5271	03:00:00	4944	4969
00:32:50	5338	4970	03:02:50	4910	5011
00:35:00	4936	5223	03:05:00	4930	4898
00:37:50	4968	4996	03:07:50	4849	4992
00:40:00	5569	5487	03:10:00	4949	5374
00:42:50	5964	4845	03:12:50	5274	5215
00:45:00	5772	7701	03:15:00	5222	4990
00:47:50	5471	4928	03:17:50	5212	5308
00:50:00	4922	5046	03:20:00	4949	5337
00:52:05	4880	4960	03:22:50	4792	5023
00:55:00	9497	4998	03:25:00	5026	5309
00:57:50	4842	5175	03:27:50	5187	5379
01:00:00	4798	4952	03:30:00	4987	5400
01:02:50	4635	4902	03:32:50	5067	5561
01:05:00	4808	5125	03:35:00	4839	5650
01:07:50	4982	5326	03:37:50	5019	5836
01:10:00	5511	5335	03:40:00	5228	5653

01:12:50	5819	5016	03:42:50	5081	4929
01:15:00	5335	5065	03:45:00	5079	4961
01:17:50	4902	5243	03:47:50	5112	5290
01:20:00	5007	5005	03:50:00	5107	5004
01:22:50	4833	5133	03:52:05	5047	4975
01:25:00	4823	5285	03:55:00	5117	4993
01:27:50	4805	5237	03:57:50	4900	5214
01:30:00	4906	5043	04:00:00	5891	5019
01:32:50	5188	5240	04:02:50	5288	7126
01:35:00	4807	5351	04:05:00	5298	5169
01:37:50	4932	4968	04:07:50	5180	5223
01:40:00	4876	5297	04:10:00	4848	4991
01:42:50	4867	5472	04:12:50	5278	5099
01:45:00	4900	5172	04:15:00	5889	5043
01:47:50	4852	5032	04:17:50	5460	5358
01:50:00	4941	5010	04:20:00	5005	5258
01:52:05	4866	5072	04:22:50	5256	4987
01:55:00	4967	4953	04:25:00	5363	4832
01:57:50	5097	4968	04:27:50	5135	4938
02:00:00	4834	4943	04:30:00	4930	4736
02:02:50	4969	4952	04:32:50	5012	5237
02:05:00	5124	4856	04:35:00	4794	5453
02:07:50	4923	4935	04:37:50	4836	5014
02:10:00	5483	4997	04:40:00	5043	5214
02:12:50	5168	4855	04:42:50	5215	5123
02:15:00	5128	4942	04:45:00	5096	5025
02:17:50	5356	5125	04:47:50	4962	5286
02:20:00	5174	5079	04:50:00	4899	5257
02:22:50	4930	5195	04:52:05	5202	5227
02:25:00	5101	4915	04:55:00	4887	5178
02:27:50	4827	5089	04:57:50	4963	5531
02:30:00	4739	5357	05:00:00	5077	4987

Upload Data Dokumen SDM 140 *Number of Threads*

Start time	*Response Time* (ms)		*Start time*	*Response Time* (ms)	
	REST	GraphQL		REST	GraphQL
00:02:10	5062	4964	02:29:10	4836	4940
00:04:20	5120	4943	02:31:20	5066	4936

00:06:30	4957	5005	02:33:30	4960	4829
00:08:40	4967	4978	02:35:40	4836	4934
00:10:50	4830	4835	02:37:50	5206	5147
00:13:00	5132	4851	02:40:00	5123	4826
00:15:10	5131	4935	02:42:10	5103	5099
00:17:20	5104	5189	02:44:20	5374	4948
00:19:30	5090	5190	02:46:30	5395	5273
00:21:00	5006	5367	02:48:00	5163	5040
00:23:10	4779	5230	02:50:10	5266	4893
00:25:20	4787	4984	02:52:20	5160	4897
00:27:30	5076	5053	02:54:30	5218	4912
00:29:40	5177	4850	02:56:40	4853	5108
00:31:50	5073	4983	02:58:50	4981	5093
00:34:00	4908	4990	03:01:00	4852	5158
00:37:10	5112	4864	03:03:10	5110	5019
00:38:20	5054	5415	03:05:20	5033	4895
00:40:30	5060	5394	03:07:30	4990	4808
00:42:00	5144	5084	03:09:00	4778	4809
00:44:10	5893	4991	03:12:10	4874	5192
00:46:20	5700	4835	03:13:20	5395	5094
00:48:30	5410	4909	03:15:30	5460	4857
00:50:40	4976	5167	03:17:40	5473	4810
00:52:50	5171	4965	03:19:50	4804	4894
00:55:00	5134	4891	03:22:00	4900	5220
00:57:10	5155	5136	03:24:10	5043	5175
00:59:20	5000	5124	03:26:20	5407	4857
01:01:30	4850	5144	03:28:30	5055	5040
01:03:00	5271	4943	03:30:00	5132	4878
01:05:10	5182	5648	03:32:10	5022	5018
01:07:20	4909	5266	03:34:20	5181	4907
01:09:30	4958	5259	03:36:30	5269	5643
01:11:40	5155	5107	03:38:40	5633	5161
01:13:50	5168	5080	03:40:50	5178	5133
01:16:00	5058	4984	03:43:00	4946	5247
01:18:10	5040	5081	03:45:10	5136	5735
01:20:20	5409	4964	03:47:20	5080	4916
01:22:30	5356	5167	03:49:30	5088	4918
01:24:00	5051	4936	03:51:00	5109	4795
01:26:10	4897	4938	03:53:10	5093	5246

01:28:20	4968	5064	03:55:20	4858	5181
01:30:30	4844	4872	03:57:30	4868	5085
01:32:40	5093	4944	03:59:40	4903	4970
01:34:50	5136	4832	04:01:50	5197	5155
01:37:00	5403	5125	04:04:00	5214	4845
01:39:10	5392	5156	04:06:10	6280	4995
01:41:20	5085	5466	04:08:20	8747	5256
01:43:30	5010	5546	04:10:30	6002	4852
01:45:00	5016	5214	04:12:00	5030	4921
01:47:10	4826	5310	04:14:10	4889	5191
01:49:20	4841	5401	04:16:20	5336	4934
01:51:30	4776	4998	04:18:30	6057	4882
01:53:40	4909	4928	04:20:40	5562	5852
01:55:50	4799	4955	04:22:50	5149	5299
01:59:00	4791	5224	04:25:00	4909	5394
02:00:10	5181	4895	04:27:10	5353	4992
02:02:20	5144	4944	04:29:20	5276	5089
02:04:30	5030	5207	04:31:30	5509	4881
02:06:00	5082	4927	04:33:00	5153	5299
02:08:10	5116	4903	04:35:10	5129	5359
02:11:20	5879	4958	04:37:20	5219	5385
02:12:30	5080	4824	04:39:30	5153	5124
02:14:40	4977	4871	04:41:40	4794	5200
02:16:50	4992	5014	04:43:50	4766	4995
02:19:00	4871	5210	04:46:00	4804	4844
02:21:10	5215	5261	04:47:10	4983	5127
02:23:20	5209	5128	04:50:20	4841	5075
02:25:30	5035	5115	04:52:30	5011	5168
02:27:00	4805	5179	04:54:00	4878	5410

Upload Data Dokumen SDM 160 *Number of Threads*

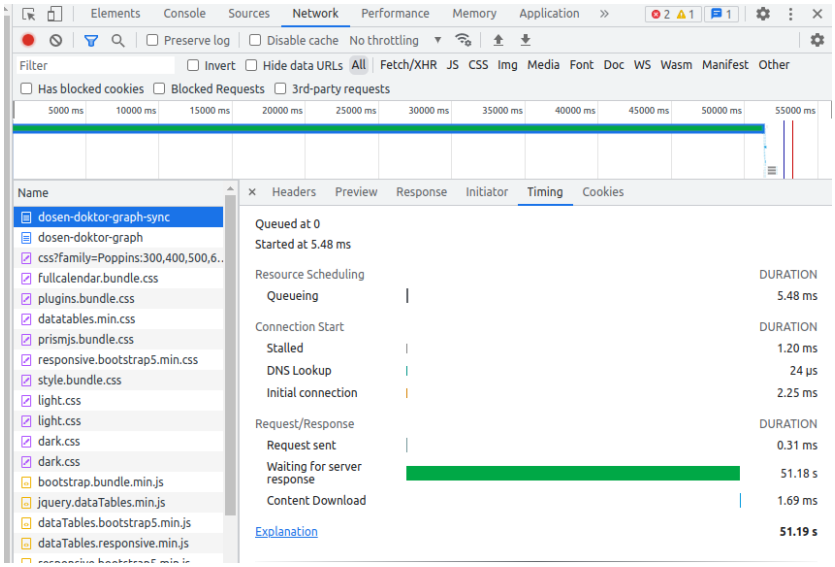
Start time	*Response Time* (ms)		*Start time*	*Response Time* (ms)	
	REST	GraphQL		REST	GraphQL
00:02:20	5230		02:26:20	4805	5439
00:04:00	4794	5166	02:28:00	4795	5216
00:05:40	4849	5178	02:29:40	4906	5200
00:07:20	4843	5056	02:31:20	4919	5107
00:09:00	4853	4872	02:33:00	4942	5131

00:11:20	4835	4855	02:35:20	5111	5068
00:13:00	4821	4865	02:37:00	5102	5131
00:14:40	4905	4781	02:38:40	5152	5164
00:16:20	4851	4829	02:40:20	5235	5086
00:18:00	4829	4967	02:42:00	5484	5231
00:20:20	5212	4890	02:44:20	5474	5258
00:22:00	5278	5662	02:46:00	5123	4942
00:23:40	5183	6091	02:47:40	4853	5007
00:25:20	5113	5984	02:49:20	4825	4757
00:27:00	4806	5677	02:51:00	5086	4843
00:29:20	5103	5275	02:53:20	4955	5211
00:31:00	5065	5050	02:55:00	5180	5150
00:32:40	5344	5389	02:56:40	4869	5188
00:34:20	5724	5277	02:58:20	4919	5092
00:36:00	5752	5227	03:00:00	4693	4899
00:38:20	5315	5289	03:02:20	4820	5194
00:40:00	4953	5154	03:04:00	4906	4957
00:41:40	4752	5284	03:05:40	4993	4766
00:43:20	4794	4788	03:07:20	4961	5189
00:45:00	5131	4922	03:09:00	4831	5168
00:47:20	5107	5202	03:11:20	5159	5133
00:49:00	5022	4991	03:13:00	5105	5146
00:50:40	4911	4780	03:14:40	5201	5172
00:52:20	5026	4908	03:16:20	5266	5001
00:54:00	4824	5289	03:18:00	4909	4997
00:56:20	4834	5087	03:20:20	4872	4853
00:58:00	5083	4860	03:22:00	4845	4913
00:59:40	4861	4839	03:23:40	4803	4908
01:01:20	4830	5181	03:25:20	4707	5016
01:03:00	4831	5037	03:27:00	9203	4837
01:05:20	4907	4882	03:29:20	4683	4961
01:07:00	5151	4792	03:31:00	4856	4905
01:08:40	5211	5167	03:32:40	5257	4903
01:10:20	4814	4966	03:34:20	5098	4826
01:12:00	5170	4971	03:36:00	4931	4904
01:14:20	5147	4845	03:38:20	4794	5113
01:16:00	5129	5283	03:40:00	4911	5431
01:17:40	5072	5464	03:41:40	5196	5498
01:19:20	5061	5500	03:43:20	5199	5347

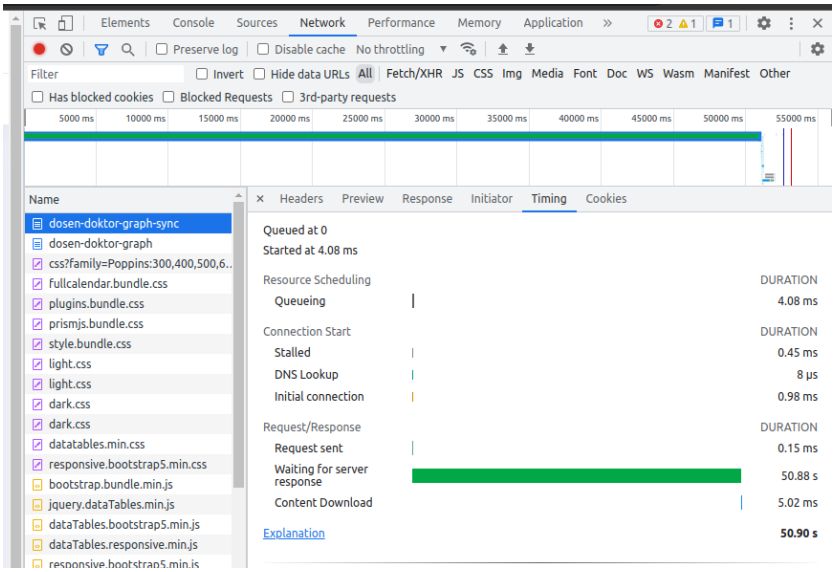
01:21:00	4833	5277	03:45:00	5149	4927
01:23:20	5087	5205	03:47:20	4666	4877
01:25:00	5151	5119	03:49:00	4862	4872
01:26:40	4892	4795	03:50:40	5145	4905
01:28:20	4764	5470	03:52:20	4872	5890
01:30:00	4732	5413	03:54:00	5513	5461
01:32:20	5087	5257	03:56:20	5200	5134
01:34:00	5011	5160	03:58:00	5156	5224
01:35:40	4849	5249	03:59:40	4890	5145
01:37:20	4761	5154	04:01:20	5113	4913
01:39:00	5109	9531	04:03:00	5217	4859
01:41:20	5099	4960	04:05:20	5277	5209
01:43:00	5114	5324	04:07:00	5143	5393
01:44:40	4958	4858	04:08:40	5118	5272
01:46:20	5185	4908	04:10:20	5222	4942
01:48:00	5087	4873	04:12:00	5214	5075
01:50:20	5153	4821	04:14:20	5438	4916
01:52:00	5000	5221	04:16:00	4988	5204
01:53:40	4895	5182	04:17:40	4899	4868
01:55:20	4796	5349	04:19:20	4973	4839
01:57:00	5105	5417	04:21:00	4779	9320
01:59:20	5120	5703	04:23:20	4837	4924
02:01:00	5145	5401	04:25:00	4833	4884
02:02:40	5034	5333	04:26:40	4827	4816
02:04:20	5011	5104	04:28:20	5024	4881
02:06:00	4878	4945	04:30:00	5989	4979
02:08:20	4914	4858	04:32:20	5330	4950
02:10:00	5263	5156	04:34:00	5139	4909
02:11:40	5492	5042	04:35:40	4783	5291
02:13:20	4787	4895	04:37:20	4827	4933
02:15:00	4992	6464	04:39:00	5121	5028
02:17:20	4992	5303	04:41:20	5162	5342
02:19:00	5132	5244	04:43:00	5126	5345
02:20:40	5261	4818	04:44:40	5799	5219
05:22:20	4949	4885	04:46:20	5248	5132
02:24:00	4760	5671	04:48:00	5455	5289

Lampiran 5 Hasil *Fetch* Data *Nested* saat *Integrasi* dengan Sinkron Sister

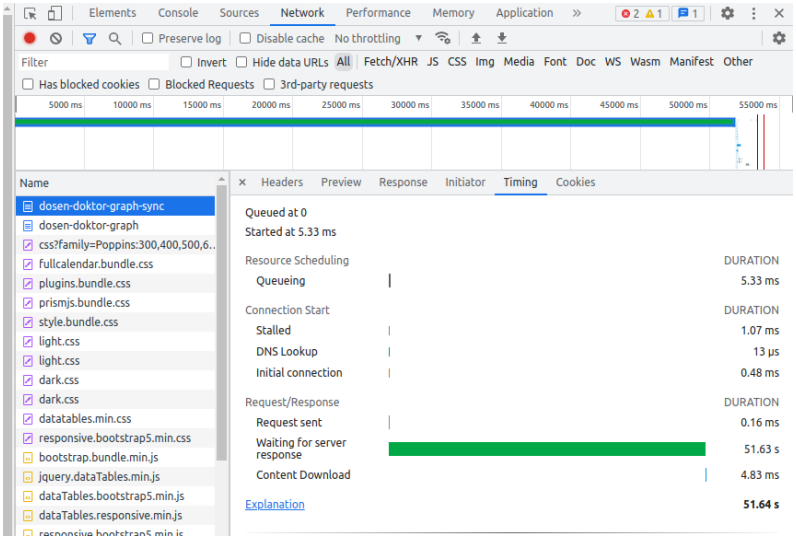
Tangkapan Layar GraphQL – 1



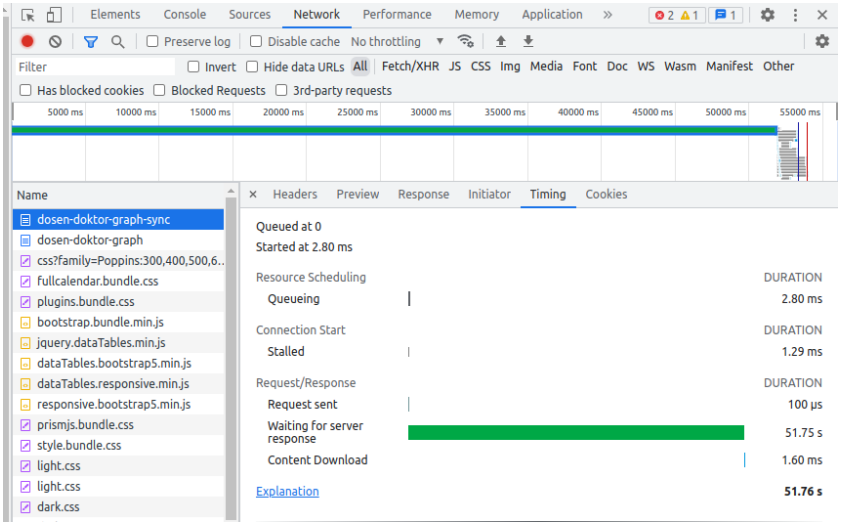
Tangkapan Layar GraphQL – 2



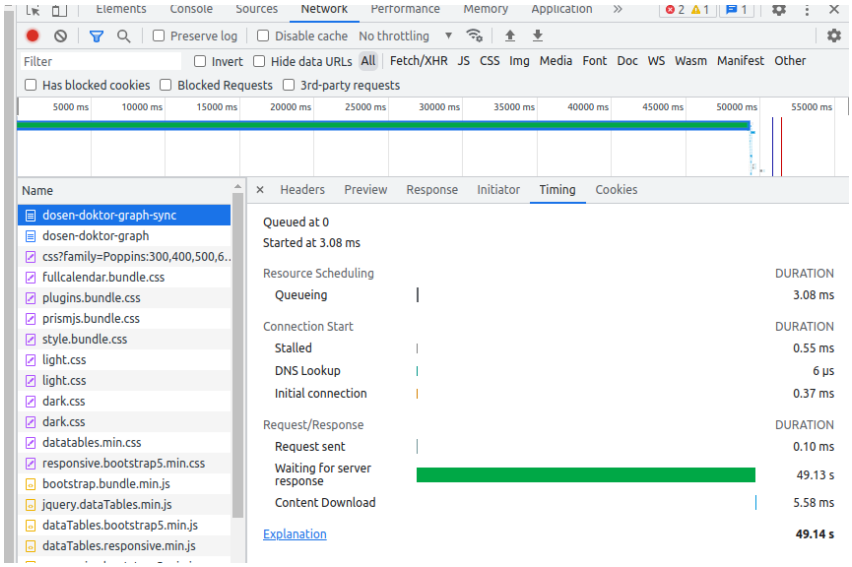
Tangkapan Layar GraphQL - 3



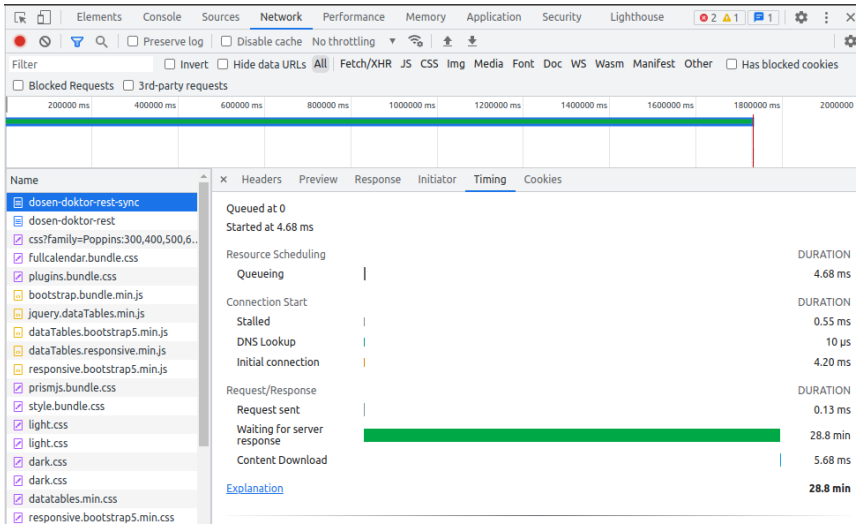
Tangkapan Layar GraphQL – 4



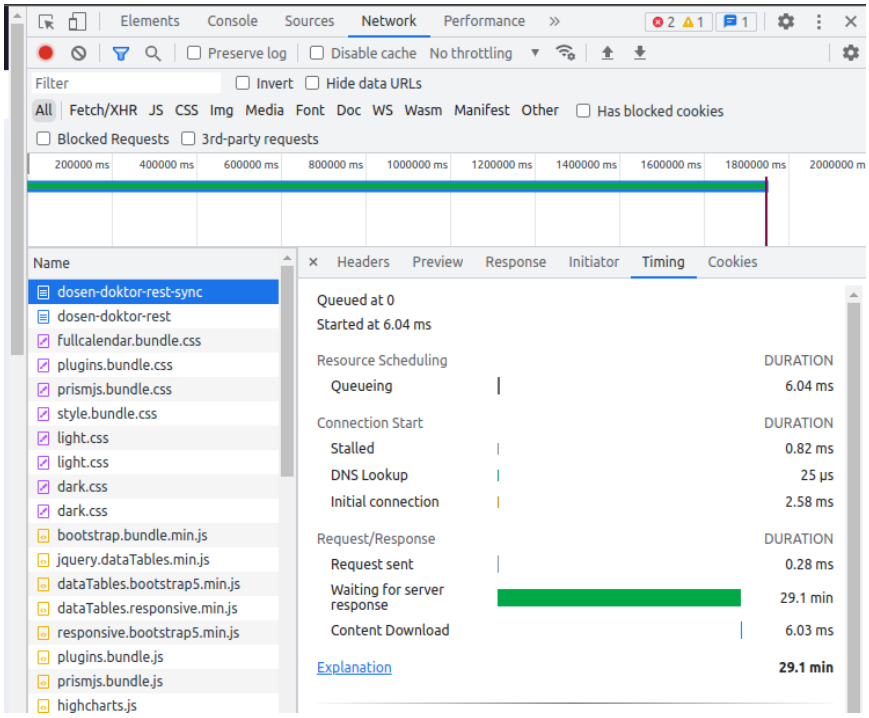
Tangkapan Layar GraphQL - 5



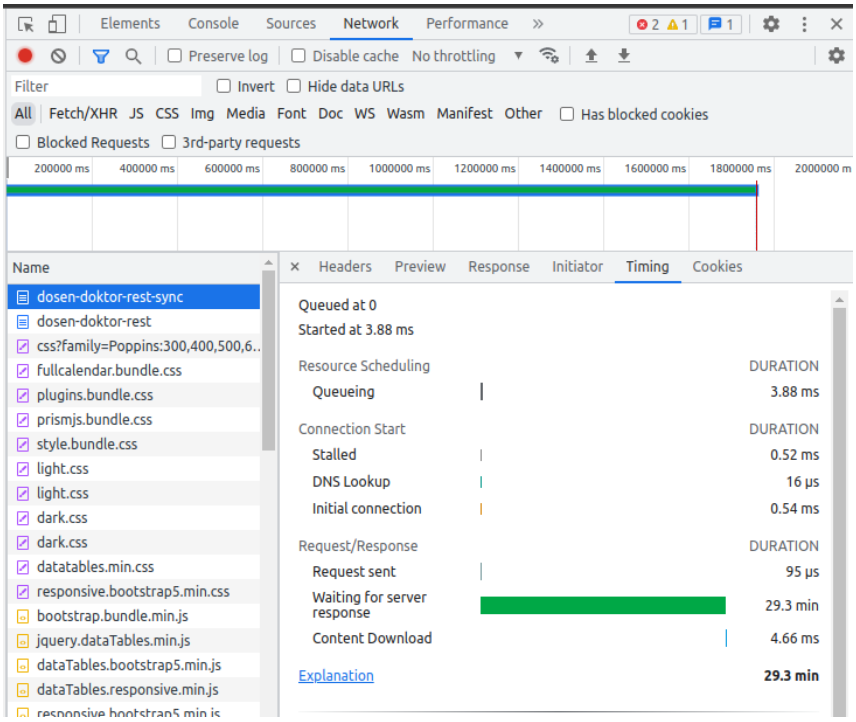
Tangkapan Layar REST – 1



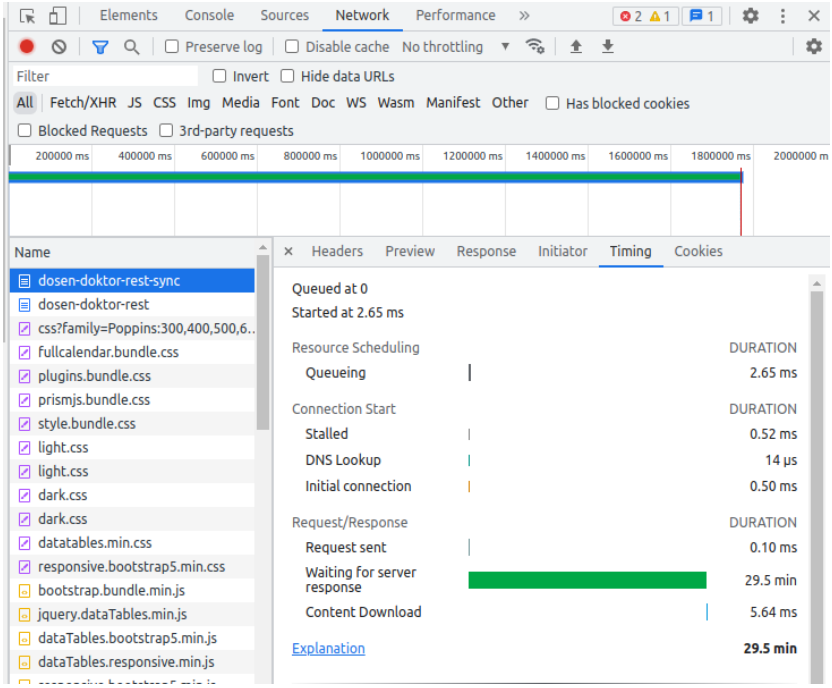
Tangkapan Layar REST - 2



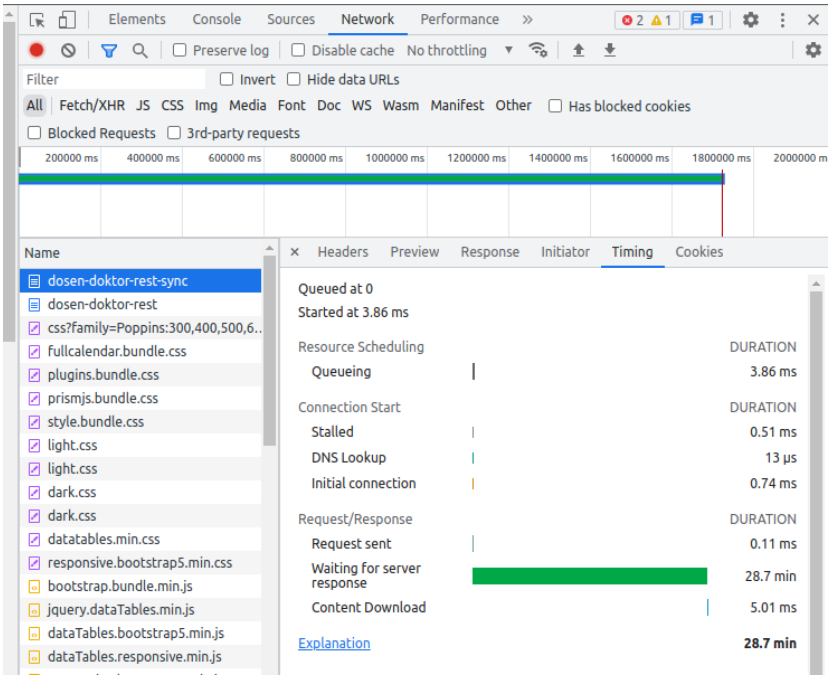
Tangkapan Layar REST - 3



Tangkapan Layar REST – 4



Tangkapan Layar REST - 5



Page Load Time (Second)					
Sample	1	2	3	4	5
REST	1728	1746	1758	1770	1722
GraphQL	51,19	50,9	51,64	51,76	49,14

Lampiran 6 *Source Code REST API* pada *Service Sister*

File api.php

```
<?php

use Illuminate\Http\Request;
use App\Models\HumanResource;
use Illuminate\Support\Facades\Route;
use App\Http\Controllers\LoginController;
use App\Http\Controllers\DokumenController;
use App\Http\Controllers\HumanResourceController;
use App\Http\Controllers\FormalEducationController;

Route::middleware('auth:sanctum')->get('/user', function (Request $request) {
    return $request->user();
});

Route::post('login', [LoginController::class, 'login']);
Route::post('logout', [LoginController::class, 'logout']);
Route::get('sumberDayaManusia', [HumanResourceController::class, 'getAll']);
Route::get('pendidikanFormal/{id_sdm}', [FormalEducationController::class,
'getByIDSdm']);
Route::get('dokumen/{id_sdm}', [DokumenController::class, 'getByIDSdm']);
Route::post('dokumen/{id_sdm}', [DokumenController::class,
'uploadDokumenSDM']);
```

File LoginController.php

```
<?php

namespace App\Http\Controllers;

use Illuminate\Http\Request;
use App\Repositories\AuthSister;
use Illuminate\Support\Facades\Http;

class LoginController extends Controller
{
    protected $authSister;

    public function __construct()
    {
        $this->authSister = new AuthSister;
    }
```

```
    public function login(Request $request)
    {
        $response = Http::post('http://10.0.0.108/api/login', [
            'email' => $request->email,
            'password' => $request->password,
        ]);

        return response()->json($response->json(), $response->status());
    }

    public function logout(Request $request)
    {
        if ($request->header('Authorization') != null) {
            $token = explode(' ', $request->header('Authorization'));
            $valid = $this->authSister->verifyTokenRest($token[1]);

            if ($valid) {
                $response = Http::post('http://10.0.0.108/api/logout', [
                    'token' => $token[1],
                ]);

                return handleResponse($response->json(), 'success');
            } else {
                return handleError('Unauthorized', [], 401);
            }
        } else {
            return handleError('Unauthorized', [], 401);
        }
    }
}
```

File HumanResourcesController.php

```
<?php

namespace App\Http\Controllers;

use Illuminate\Http\Request;
use App\Repositories\AuthSister;
use Illuminate\Support\Facades\DB;

class HumanResourceController extends Controller
{
    protected $authSister;
```

```
    public function __construct()
    {
        $this->authSister = new AuthSister;
    }

    public function getAll(Request $request)
    {
        if ($request->header('Authorization') != null) {
            $token = explode(' ', $request->header('Authorization'));
            $valid = $this->authSister->verifyTokenRest($token[1]);

            if ($valid) {
                $humanResources = DB::table('human_resources')->get();
                return handleResponse($humanResources, 'success');
            }else{
                return handleError('Unauthorized', [], 401);
            }
        }else{
            return handleError('Unauthorized', [], 401);
        }
    }
}
```

File FormalEducationController.php

```
<?php

namespace App\Http\Controllers;

use Illuminate\Http\Request;
use App\Repositories\AuthSister;
use Illuminate\Support\Facades\DB;

class FormalEducationController extends Controller
{
    protected $authSister;

    public function __construct()
    {
        $this->authSister = new AuthSister;
    }

    public function getByIDSdm(Request $request, $id_sdm)
    {
        if ($request->header('Authorization') != null) {
```

```
            $token = explode(' ', $request->header('Authorization'));
            $valid = $this->authSister->verifyTokenRest($token[1]);

            if ($valid) {
                $formalEducations = DB::table('formal_education')->where('id_sdm',
'=', $id_sdm)->get();
                return handleResponse($formalEducations, 'success');
            } else {
                return handleError('Unauthorized', [], 401);
            }
        } else {
            return handleError('Unauthorized', [], 401);
        }
    }
}
```

File DokumenController.php

```
<?php

namespace App\Http\Controllers;

use Illuminate\Support\Str;
use Illuminate\Http\Request;
use App\Repositories\AuthSister;
use Illuminate\Support\Facades\DB;
use Illuminate\Support\Facades\Storage;

class DokumenController extends Controller
{
    protected $authSister;

    public function __construct()
    {
        $this->authSister = new AuthSister;
    }

    public function getByIDSdm(Request $request, $id_sdm)
    {
        if ($request->header('Authorization') != null) {
            $token = explode(' ', $request->header('Authorization'));
            $valid = $this->authSister->verifyTokenRest($token[1]);

            if ($valid) {
                $dokumens = DB::table('dokumens')->where('id_sdm', '=', $id_sdm)-
>get();
```

```
            return handleResponse($dokumens, 'success');
        } else {
            return handleError('Unauthorized', [], 401);
        }
    } else {
        return handleError('Unauthorized', [], 401);
    }
}

public function uploadDokumenSDM(Request $request, $id_sdm)
{
    if ($request->header('Authorization') != null) {
        $token = explode(' ', $request->header('Authorization'));
        $valid = $this->authSister->verifyTokenRest($token[1]);

        if ($valid) {
            $fileName = $request->file('file')->getClientOriginalName();
            $path = 'storage/rest/'. $fileName;

            $id_jenis_dokumen = 0;
            $jenis_dokumen = '';
            $nama = '';
            $keterangan = '';

            if ($request->id_jenis_dokumen) {
                $id_jenis_dokumen = $request->id_jenis_dokumen;
            }

            if ($request->jenis_dokumen) {
                $jenis_dokumen = $request->jenis_dokumen;
            }

            if ($request->nama) {
                $nama = $request->nama;
            }

            if ($request->keterangan) {
                $keterangan = $request->keterangan;
            }

            Storage::disk('public')->put('rest/' . $fileName,
file_get_contents($request->file('file')->getRealPath()));
            DB::table('dokumens')->insert([
                'id_dokumen' => Str::uuid(),
                'id_sdm' => $id_sdm,
                'tautan' => $path,
```

```
                'id_jenis_dokumen' => $id_jenis_dokumen,
                'jenis_dokumen' => $jenis_dokumen,
                'nama' => $nama,
                'keterangan' => $keterangan
            ]);
            return handleResponse(['path' => $path], 'success');
        } else {
            return handleError('Unauthorized', [], 401);
        }
    } else {
        return handleError('Unauthorized', [], 401);
    }
  }
}
```

Lampiran 7 *Source Code GraphQL* pada *Service Sister*

File schema.graphql

```
scalar Upload
  @scalar(class: "Nuwave\\Lighthouse\\Schema\\Types\\Scalars\\Upload")

type Query {
  sumberDayaManusia: [HumanResource] @field(resolver:
"SDM@sumberDayaManusia")
  pendidikanFormal(id_sdm: String!): [FormalEducation] @field(resolver:
"FormalEducation@byID")
  dokumen(id_sdm: String!): [Dokumen] @field(resolver:
"\\App\\GraphQL\\Mutations\\Dokumen@byIDSdm")
}

type Mutation{
  uploadDokumen(
    file: Upload!,
    id_sdm: String!,
    tautan: String,
    id_jenis_dokumen: Int,
    jenis_dokumen: String,
    nama: String,
    keterangan: String,
  ): String @field(resolver: "Dokumen@uploadDokumen")
}
```

```
type HumanResource {
    id: ID
    id_sdm: String
    nama_sdm: String
    nidn: String
    nip: String
    nama_status_aktif: String
    nama_status_pegawai: String
    jenis_sdm: String
    created_at: String,
    updated_at: String,
    pendidikan_formal: [FormalEducation] @hasMany
    dokumen: [Dokumen] @hasMany
}

type FormalEducation {
    id: ID
    id_sdm: String
    id_pendidikan: String
    jenjang_pendidikan: String
    gelar_akademik: String
    bidang_studi: String
    nama_perguruan_tinggi: String
    tahun_lulus: Int
    created_at: String,
    updated_at: String
}

type Dokumen {
    id: ID
    id_sdm: String
    id_dokumen: String
    tautan: String
    id_jenis_dokumen: Int
    jenis_dokumen: String
    nama: String
    keterangan: String
    tanggal_upload: String
    nama_file: String
    jenis_file: String
    created_at: String
    updated_at: String
}

type User {
    id: ID
```

```
    nama: String
    email: String
}
#import auth.graphql
```

File auth.graphql

```
extend type Mutation{
    login(email: String!, password: String!): String! @field(resolver:
"Authentication@login")
    logout: User @field(resolver: "Authentication@logout")
}
```

File Authentication.php

```
<?php

namespace App\GraphQL\Mutations;

use Softonic\GraphQL\ClientBuilder;
use GraphQL\Type\Definition\ResolveInfo;
use Nuwave\Lighthouse\Support\Contracts\GraphQLContext;
use Symfony\Component\HttpKernel\Exception\HttpException;

use App\Repositories\AuthSister;

final class Authentication
{
    protected $authSister;

    public function __construct()
    {
        $this->authSister = new AuthSister;
    }

    public function login($_, array $args): String
    {
        $client = ClientBuilder::build('http://10.0.0.108/graphql');

        $query = '
        mutation login($email: String!, $password: String!){
            login(email: $email, password: $password)
        }
        ';
```

```
        $variables = [
            'email' => $args['email'],
            'password' => $args['password']
        ];

        $response = $client->query($query, $variables);
        if (property_exists($response, 'errors') && $response->getErrors() != []) {
            return throw new HttpException(401, 'The provided credentials are
incorrect.');
        }else{
            $result = $response->getData();
            return $result['login'];
        }
    }

    public function logout($rootValue, array $args, GraphQLContext $context,
ResolveInfo $resolveInfo)
    {
        if (array_key_exists('HTTP_AUTHORIZATION', $context->request()-
>server())) {
            $arrToken = explode(' ', $context->request()-
>server()['HTTP_AUTHORIZATION']);

            $valid = $this->authSister->verifyToken($arrToken[1]);

            if ($valid) {
                $client = ClientBuilder::build('http://10.0.0.108/graphql');

                $query = '
                mutation logout($token: String!){
                    logout(token: $token){
                        id,
                        nama,
                        email
                    }
                }
                ';

                $variables = [
                    'token' => $arrToken[1]
                ];

                $response = $client->query($query, $variables);
                $result = $response->getData();
                return $result['logout'];
            } else {
```

```
            return throw new HttpException(401, 'Unauthorize');
        }
    } else {
        return throw new HttpException(401, 'Unauthorize');
    }
  }
}
```

File SDM.php

```
<?php

namespace App\GraphQL\Queries;

use App\Models\HumanResource;
use App\Repositories\AuthSister;
use GraphQL\Type\Definition\ResolveInfo;
use Nuwave\Lighthouse\Support\Contracts\GraphQLContext;
use Symfony\Component\HttpKernel\Exception\HttpException;

final class SDM
{
  protected $authSister;

  public function __construct()
  {
    $this->authSister = new AuthSister;
  }

  public function SumberDayaManusia($rootValue, array $args,
GraphQLContext $context, ResolveInfo $resolveInfo)
  {
    if (array_key_exists('HTTP_AUTHORIZATION', $context->request()-
>server())) {
        $arrToken = explode(' ', $context->request()-
>server()['HTTP_AUTHORIZATION']);

        $valid = $this->authSister->verifyToken($arrToken[1]);

        if ($valid) {
          return HumanResource::all();
        } else {
          return throw new HttpException(401, 'Unauthorize');
        }
    } else {
        return throw new HttpException(401, 'Unauthorize');
```

```
        }
    }
}
```

File FormalEducation.php

```
<?php

namespace App\GraphQL\Queries;

use App\Repositories\AuthSister;
use Illuminate\Support\Facades\DB;
use Nuwave\Lighthouse\Support\Contracts\GraphQLContext;
use Symfony\Component\HttpKernel\Exception\HttpException;

final class FormalEducation
{
    protected $authSister;

    public function __construct()
    {
        $this->authSister = new AuthSister;
    }

    public function byID($_, array $args, GraphQLContext $context)
    {
        if (array_key_exists('HTTP_AUTHORIZATION', $context->request()->server())) {
            $arrToken = explode(' ', $context->request()->server()['HTTP_AUTHORIZATION']);

            $valid = $this->authSister->verifyToken($arrToken[1]);

            if ($valid) {
                return DB::table('formal_education')->where('id_sdm', '=', $args['id_sdm'])->get();
            } else {
                return throw new HttpException(401, 'Unauthorize');
            }
        }else{
            return throw new HttpException(401, 'Unauthorize');
        }
    }
}
```

File Dokumen.php

```
<?php

namespace App\GraphQL\Mutations;

use Illuminate\Support\Str;
use Illuminate\Http\Request;
use App\Models\Dokumen as Model;
use App\Repositories\AuthSister;
use Illuminate\Support\Facades\DB;
use Illuminate\Support\Facades\Storage;
use GraphQL\Type\Definition\ResolveInfo;
use Nuwave\Lighthouse\Support\Contracts\GraphQLContext;
use Symfony\Component\HttpKernel\Exception\HttpException;

final class Dokumen
{
   protected $authSister;

   public function __construct()
   {
      $this->authSister = new AuthSister;
   }

   public function byIDSdm($rootValue, array $args, GraphQLContext
$context, ResolveInfo $resolveInfo)
   {
      if (array_key_exists('HTTP_AUTHORIZATION', $context->request()-
>server())) {
         $arrToken = explode(' ', $context->request()-
>server()['HTTP_AUTHORIZATION']);

         $valid = $this->authSister->verifyToken($arrToken[1]);

         if ($valid) {
            $dokumen = DB::table('dokumens')->where('id_sdm', '=',
$args['id_sdm'])->get();
            return $dokumen;
         } else {
            return throw new HttpException(401, 'Unauthorize');
         }
      } else {
         return throw new HttpException(401, 'Unauthorize');
      }
   }
```

```
   public function uploadDokumen($rootValue, array $args, GraphQLContext
$context, ResolveInfo $resolveInfo)
   {
      if (array_key_exists('HTTP_AUTHORIZATION', $context->request()-
>server())) {
         $response = $context->request()->server('HTTP_AUTHORIZATION');
         $token = substr($response, strpos($response, " ") + 1);

         $valid = $this->authSister->verifyToken($token);

         if ($valid) {
            $fileName = $args['file'];
            $path = 'storage/graphql/' . $fileName->getClientOriginalName();

            $id_jenis_dokumen = 0;
            $jenis_dokumen = '';
            $nama = '';
            $keterangan = '';

            if (array_key_exists('id_jenis_dokumen', $args)) {
               $id_jenis_dokumen = $args['id_jenis_dokumen'];
            }

            if (array_key_exists('jenis_dokumen', $args)) {
               $jenis_dokumen = $args['jenis_dokumen'];
            }

            if (array_key_exists('nama', $args)) {
               $nama = $args['nama'];
            }

            if (array_key_exists('keterangan', $args)) {
               $keterangan = $args['keterangan'];
            }
            Storage::disk('public')->put('graphql/' . $fileName-
>getClientOriginalName(), file_get_contents($args['file']));
            DB::table('dokumens')->insert([
               'id_dokumen' => Str::uuid(),
               'id_sdm' => $args['id_sdm'],
               'tautan' => $path,
               'id_jenis_dokumen' => $id_jenis_dokumen,
               'jenis_dokumen' => $jenis_dokumen,
               'nama' => $nama,
               'keterangan' => $keterangan
            ]);
```

```
            return $path;
        } else {
            return throw new HttpException(401, 'Unauthorize');
        }
    } else {
        return throw new HttpException(401, 'Unauthorize');
    }
  }
}
```

Lampiran 8 *Source Code Repository Pattern* dan *Helper* pada *Service Sister*

File AuthSister.php

```
<?php

namespace App\Repositories;

use Softonic\GraphQL\ClientBuilder;
use Illuminate\Support\Facades\Http;

class AuthSister
{
   public function verifyToken(string $token)
   {
      $client = ClientBuilder::build('http://127.0.0.1:8001/graphql');

      $query = '
      mutation verify($token: String!){
         verify(token: $token)
      }
      ';

      $variables = [
         'token' => $token,
      ];

      $response = $client->query($query, $variables);

      $result = $response->getData();

      return $result['verify'];
   }
```

```
    public function verifyTokenRest(string $token)
    {
        $response = Http::post('http://10.0.0.108/api/verify', [
            'token' => $token,
        ]);


        if ($response->status() == 200) {
            $result = $response->json();
            return $result['verify'];
        }
    }
}
```

File helpers.php

```
<?php

function handleResponse($result, $msg)
{
    $res = [
        'success' => true,
        'message' => $msg,
        'datas' => $result,
    ];
    return response()->json($res, 200);
}

function handleError($error, $errorMsg = [], $code = 404)
{
    $res = [
        'success' => false,
        'message' => $error
    ];

    if (!empty($errorMsg)) {
        $res['data'] = $errorMsg;
    }
    return response()->json($res, $code);
}
```

Lampiran 9 *Source Code REST* pada *Service Auth*

File api.php

```
<?php

use Illuminate\Http\Request;
use Illuminate\Support\Facades\Route;
use App\Http\Controllers\LoginController;

Route::middleware('auth:sanctum')->get('/user', function (Request $request) {
    return $request->user();
});

Route::post('/login', [LoginController::class, 'login']);
Route::post('/verify', [LoginController::class, 'verify']);
```

File LoginController.php

```
<?php

namespace App\Http\Controllers;

use App\Models\User;
use App\Models\UserToken;
use Illuminate\Http\Request;
use Illuminate\Support\Facades\DB;
use Illuminate\Support\Facades\Hash;

class LoginController extends Controller
{
    public function login(Request $request)
    {
        $request->validate([
            'email' => 'required|email',
            'password' => 'required',
        ]);

        $user = User::where('email', $request->email)->first();

        if (!$user || !Hash::check($request->password, $user->password)) {
            $error = 'The provided credentials are incorrect.';
```

```
            return handleError('Unprocessable Content', ['error' => $error], 422);
        }

        $token = $user->createToken($request->email)->plainTextToken;

        DB::table('user_tokens')->insert([
            'user_id' => $user->id,
            'token' => $token,
            'created_at' => now(),
            'updated_at' => now()
        ]);

        return handleResponse(['token' => $token], 'success');
    }

    public function verify(Request $request)
    {
        $request->validate([
            'token' => 'required'
        ]);

        $token = DB::table('user_tokens')->where('token', $request->token)-
>first();
        if ($token != null) {
            $datas = ['verify' => true];
            $code = 200;
        }else{
            $datas = ['verify' => false];
            $code = 401;
        }

        return response()->json($datas, $code);
    }

    public function logout(Request $request)
    {
        $request->validate([
            'token' => 'required'
        ]);

        $user = DB::table('user_tokens')->where('token', $request->token)-
>with('user')->first();

        if ($user) {
            $token = UserToken::find($user->id);
            $token->delete();
```

```
            return $user->user;
        } else {
            return null;
        }
    }
}
```

Lampiran 10 *Source Code GraphQL* pada *Service Auth*

File schema.graphql

```
type Query {
    me: User! @auth @guard
}

type Mutation {
    login(email: String!, password: String!): String!@field(resolver:
"Authentication@login")
    verify(token: String!): Boolean! @field(resolver: "Authentication@verify")
    logout(token: String!): User @field(resolver: "Authentication@logout")
}

type User {
    id: ID
    nama: String
    email: String
    created_at: String
    updated_at: String
}
```

File Authentication.php

```
<?php

namespace App\GraphQL\Mutations;

use App\Models\User;
use App\Models\UserToken;
use Illuminate\Support\Facades\DB;
use Illuminate\Support\Facades\Hash;
use Illuminate\Validation\ValidationException;

final class Authentication
{
```

```
    public function login($_, array $args)
    {

        $user = User::where('email', $args['email'])->first();

        if (!$user || !Hash::check($args['password'], $user->password)) {
            throw ValidationException::withMessages([
                'email' => ['The provided credentials are incorrect.'],
            ]);
        }

        $token = $user->createToken($args['email'])->plainTextToken;

        DB::table('user_tokens')->insert([
            'user_id' => $user->id,
            'token' => $token,
            'created_at' => now(),
            'updated_at' => now()
        ]);

        return $token;
    }

    public function verify($_, array $args)
    {
        $token = DB::table('user_tokens')->where('token', $args['token'])->first();
        if ($token != null) {
            return true;
        }else{
            return false;
        }
    }

    public function logout($_, array $args)
    {
        $user = DB::table('user_tokens')->where('token', $args['token'])-
>with('user')->first();
        if ($user) {
            $token = UserToken::find($user->id);
            $token->delete();
            return $user->user;
        } else {
            return null;
        }
    }
}
```

Lampiran 11 *Source Code Helper* pada *Service Auth*

File helpers.php

```
<?php


function handleResponse($result, $msg)
{
    $res = [
        'success' => true,
        'message' => $msg,
        'datas' => $result,
    ];

    return response()->json($res, 200);
}

function handleError($error, $errorMsg = [], $code = 404)
{
    $res = [
        'success' => false,
        'message' => $error
    ];

    if (!empty($errorMsg)) {
        $res['data'] = $errorMsg;
    }
    return response()->json($res, $code);
}
```

Lampiran 12 *Source Code* Integrasi Sinkron Sister

File web.php

```
<?php
++++++
    Route::group(['prefix' => 'data-tugas-akhir'], function(){
        Route::get('/dosen-doktor-rest', [TugasAkhirController::class,
'getDosenDoktorRest'])->name('dosen-doktor-rest');
        Route::get('/dosen-doktor-rest-sync', [TugasAkhirController::class,
'getDosenDoktorRestSync'])->name('dosen-doktor-rest-sync');
```

```
    Route::get('/dosen-doktor-graph', [TugasAkhirController::class,
'getDosenDoktorGraph'])->name('dosen-doktor-graph');
    Route::get('/dosen-doktor-graph-sync', [TugasAkhirController::class,
'getDosenDoktorGraphSync'])->name('dosen-doktor-graph-sync');
  });
+++++++
});
```

File TugasAkhirController.php

```
<?php

namespace App\Http\Controllers;

use App\Models\PegawaiPerguruanTinggi;
use Error;
use Illuminate\Http\Request;
use Illuminate\Support\Facades\DB;
use Softonic\GraphQL\ClientBuilder;
use Illuminate\Support\Facades\Http;
use App\Repositories\SisterUniversitas\Pegawai;

class TugasAkhirController extends Controller
{
  protected $api;

  public function __construct()
  {
    $this->api = new Pegawai();
  }

  public function getDosenDoktorRest(Request $request)
  {
    $datas = [];
    $rute = route('dosen-doktor-rest');
    $title = 'Data Pegawai/SDM di Universitas';

    $sqlQuery = "SELECT t1.id_sdm, t1.nama_sdm, t2.bidang_studi,
t2.jenjang_pendidikan, t2.gelar_akademik
          FROM tugas_akhir_s_d_m_s AS t1
          JOIN tugas_akhir_pend_formals AS t2 ON t2.id_sdm = t1.id_sdm
          WHERE jenjang_pendidikan = 'S3'
          AND jenis_sdm = 'Dosen'
          AND nama_status_aktif = 'Aktif'
          ORDER BY nama_sdm";
```

```
        $datas = DB::connection('mysql')->select(DB::raw($sqlQuery));

        return view('app.dashboard.tugas-akhir.dosen-doktor', [
            'data' => $title,
            'rute' => $rute,
            'datas' => $datas
        ]);
    }

    public function getDosenDoktorGraph()
    {
        $datas = [];
        $rute = route('dosen-doktor-rest');
        $title = 'Data Pegawai/SDM di Universitas';

        $sqlQuery = "SELECT t1.id_sdm, t1.nama_sdm, t2.bidang_studi,
t2.jenjang_pendidikan, t2.gelar_akademik
                FROM tugas_akhir_s_d_m_graphs AS t1
                JOIN tugas_akhir_pend_formal_graphs AS t2 ON t2.id_sdm =
t1.id_sdm
                WHERE jenjang_pendidikan = 'S3'
                AND jenis_sdm = 'Dosen'
                AND nama_status_aktif = 'Aktif'
                ORDER BY nama_sdm";

        $datas = DB::connection('mysql')->select(DB::raw($sqlQuery));

        return view('app.dashboard.tugas-akhir.dosen-doktor-graph', [
            'data' => $title,
            'rute' => $rute,
            'datas' => $datas
        ]);
    }

    public function getDosenDoktorGraphSync()
    {
        $token = session()->get('tokenTA');

        $options = [
            'headers' => [
                'Authorization' => "Bearer $token",
            ]
            ];

        $client = ClientBuilder::build('http://54.167.250.198/graphql', $options);
```

```
    $query = '
    query{
      sumberDayaManusia{
        id_sdm,
        nidn,
        nama_sdm,
        nama_status_aktif,
        jenis_sdm,
        pendidikan_formal{
          id_pendidikan,
          id_sdm,
          jenjang_pendidikan,
          bidang_studi,
        }
      }
    }
    ';

    $variables = [];

    $response = $client->query($query, $variables);

    $datas = $response->getData();

    $success = $this->savePengawaiGraph($datas['sumberDayaManusia']);
    if ($success) {
      return redirect(route('dosen-doktor-graph'));
    }
  }

  private function savePengawaiGraph($dosens)
  {
    foreach($dosens as $dosen){
      DB::beginTransaction();
      try {
        DB::table('tugas_akhir_s_d_m_graphs')->insertOrIgnore([
          'id_sdm' => $dosen['id_sdm'],
          'nama_sdm' => $dosen['nama_sdm'],
          'nidn' => $dosen['nidn'],
          'nama_status_aktif' => $dosen['nama_status_aktif'],
          'jenis_sdm' => $dosen['jenis_sdm'],
        ]);
        DB::commit();
      } catch (Error $e) {
        DB::rollBack();
        dd($e);
```

```
        }

        foreach($dosen['pendidikan_formal'] as $pend_formal){
            DB::beginTransaction();
            try {
                DB::table('tugas_akhir_pend_formal_graphs')->insertOrIgnore([
                    'id_pendidikan' => $pend_formal['id_pendidikan'],
                    'id_sdm' => $dosen['id_sdm'],
                    'jenjang_pendidikan' => $pend_formal['jenjang_pendidikan'],
                    'bidang_studi' => $pend_formal['bidang_studi'],
                ]);
                DB::commit();
            } catch (Error $e) {
                DB::rollBack();
                dd($e);
            }
        }
    }

    return true;
}

private $id_sdm;

public function getDosenDoktorRestSync()
{
    $token = session()->get('tokenTA');
    $response = Http::withHeaders([
        'Accept' => 'application/json',
        'Authorization' => "Bearer $token"
    ])->get('http://54.167.250.198/api/sumberDayaManusia');

    if ($response->status() == 200) {
        $dosens = $response->json();
    }

    $successSavePegawai = $this->savePegawai($dosens['datas']);
    if ($successSavePegawai) {
        $this->savePendidikanFormal();
    }


    return redirect(route('dosen-doktor-rest'));
}

private function savePegawai($dosens)
```

```
{
    foreach ($dosens as $item) {
        $this->id_sdm[] = $item['id_sdm'];
        DB::beginTransaction();
        try {
            DB::table('tugas_akhir_s_d_m_s')->insertOrIgnore([
                'id_sdm' => $item['id_sdm'],
                'nama_sdm' => $item['nama_sdm'],
                'nidn' => $item['nidn'],
                'nama_status_aktif' => $item['nama_status_aktif'],
                'jenis_sdm' => $item['jenis_sdm'],
            ]);
            DB::commit();
        } catch (Error $e) {
            DB::rollBack();
            dd($e);
        }

    }

    return true;
}

private function savePendidikanFormal()
{
    $idSdmFail = [];
    foreach($this->id_sdm as $sdm){
        $token = session()->get('tokenTA');
        $response = Http::withHeaders([
            'Accept' => 'application/json',
            'Authorization' => "Bearer $token"
        ])->get('http://54.167.250.198/api/pendidikanFormal/'. $sdm);

        $result = $response->json();
        if ($response->status() == 200) {
            foreach($result['datas'] as $item){
                DB::beginTransaction();
                try {
                    DB::table('tugas_akhir_pend_formals')->insertOrIgnore([
                        'id_pendidikan' => $item['id_pendidikan'],
                        'id_sdm' => $item['id_sdm'],
                        'jenjang_pendidikan' => $item['jenjang_pendidikan'],
                        'bidang_studi' => $item['bidang_studi'],
                    ]);
                    DB::commit();
                } catch (Error $e) {
```

```
                DB::rollBack();
                dd($e);
            }
        }
    }else{
        $idSdmFail[] = $sdm;
    }
}

if ($idSdmFail != []) {
    foreach ($idSdmFail as $idSdm) {
        $token = session()->get('tokenTA');
        $response = Http::withHeaders([
            'Accept' => 'application/json',
            'Authorization' => "Bearer $token"
        ])->get('http://54.167.250.198/api/pendidikanFormal/' . $idSdm);

        $result = $response->json();
        if ($response->status() == 200) {
            foreach ($result['datas'] as $item) {
                DB::beginTransaction();
                try {
                    DB::table('tugas_akhir_pend_formals')->insertOrIgnore([
                        'id_pendidikan' => $item['id_pendidikan'],
                        'id_sdm' => $item['id_sdm'],
                        'jenjang_pendidikan' => $item['jenjang_pendidikan'],
                        'bidang_studi' => $item['bidang_studi'],
                    ]);
                    DB::commit();
                } catch (Error $e) {
                    DB::rollBack();
                    dd($e);
                }
            }
        } else {
            $idSdmFail[] = $idSdm;
        }
    }
}else {
    return true;
}
}

public function tarikDokumen()
{
    $sdm = PegawaiPerguruanTinggi::all();
```

```
        foreach($sdm as $item){
            $results = $this->api->dokumen_sdm($item['id_sdm']);
            if ($results['statusCode'] == 200) {

                foreach($results['data'] as $dokumen){
                    DB::beginTransaction();
                    try{
                        DB::table('tugas_akhir_dokumens')->insertOrIgnore([
                            'id_dokumen' => $dokumen['id'],
                            'id_sdm' => $item['id_sdm'],
                            'id_jenis_dokumen' => $dokumen['id_jenis_dokumen'],
                            'jenis_dokumen' => $dokumen['jenis_dokumen'],
                            'nama' => $dokumen['nama'],
                            'keterangan' => $dokumen['keterangan'],
                            'tautan' => $dokumen['tautan'],
                            'tanggal_upload' => $dokumen['tanggal_upload'],
                            'nama_file' => $dokumen['nama_file'],
                            'jenis_file' => $dokumen['jenis_file'],
                        ]);
                        DB::commit();
                    }catch(Error $e){
                        DB::rollBack();
                        dd($e);
                    }
                }
            }
        }
    }
}
```

LEMBAR PERBAIKAN SKRIPSI

"ANALISIS KINERJA REST API DAN GRAPHQL PADA TEKNOLOGI *WEB SERVICES*"

OLEH:

DARUL IKHSAN
D121181017

Skripsi ini telah dipertahankan pada Ujian Akhir Sarjana tanggal 30 November 2022.

Telah dilakukan perbaikan penulisan dan isi skripsi berdasarkan usulan dari penguji dan pembimbing skripsi.

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