Supplementary Material

December 2, 2021

Packet Type	POX/Default	POX/OVS	Default/OVS
Packets	0.00**	0.02*	0.08
OFPTEchoRequest	0.00**	0.00**	0.19
OFPTPacketIn	0.00**	0.00**	0.70
OFPTPacketOut	0.00**	0.00**	0.11
OFPTFlowMod	0.00**	0.00**	0.25
OFPTEchoReply	0.00**	0.00**	0.15
OFPTBarrierReply	0.00**	0.00**	0.57

Table 1: T-test statistics between the SDN controllers using the iPerf performance test. The scores denote the p-value statistic, where *p¡0.05 and **p¡0.01.

Packet Type	POX/Default	POX/OVS	Default/OVS
Packets	0.00**	0.77	0.00**
OFPTEchoRequest	0.00**	0.37	0.00**
OFPTPacketIn	0.00**	0.55	0.00**
OFPTPacketOut	0.00**	0.07	0.00**
OFPTFlowMod	0.00**	0.21	0.00**
OFPTEchoReply	0.00**	0.25	0.00**
OFPTBarrierReply	0.00**	0.55	0.00**

Table 2: T-test statistics between the SDN controllers using the D-ITG performance test. The scores denote the p-value statistic, where *p¡0.05 and **p¡0.01.

Controller: POX

Run	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Packets	2929	4079	2847	2419	2434	2725	2755	4674	2847	2719	2594	2346	2449	2890	2541
Bytes	2736637	10582830	1170663	462039	673306	937142	1156142	11725098	1305583	1706159	870965	542808	535014	1497362	898106
OFPTEchoRequest	65	69	72	67	61	67	68	68	86	54	63	56	70	61	55
OFPTPacketIn	522	569	550	468	464	556	559	548	511	546	520	449	474	579	501
OFPTPacketOut	510	508	511	512	508	512	513	503	504	512	513	507	512	512	512
OFPTFlowMod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OFPTEchoReply	65	69	72	67	61	67	68	68	86	54	63	56	70	61	55
OFPTBarrierReply	277	249	303	133	173	259	237	299	241	239	208	150	140	302	195

Controller: Default

Run	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Packets	4582	4269	3233	5514	5171	3909	3745	3552	4166	3651	3659	5440	5956	3132	3340
Bytes	11465212	13987084	7516684	22138781	16452478	5713644	7648088	2211216	13979916	6499494	3100494	16682131	30740671	1692024	2487414
OFPTEchoRequest	85	80	100	91	103	91	94	78	89	89	87	91	67	88	95
OFPTPacketIn	1203	1009	768	1396	1736	1125	915	908	864	866	920	1688	1355	770	861
OFPTPacketOut	874	934	619	1190	640	838	814	871	798	812	859	839	1287	721	751
OFPTFlowMod	846	896	560	1047	603	796	698	815	763	756	822	801	1266	678	708
OFPTEchoReply	85	81	100	91	103	91	94	78	89	89	87	91	69	88	85
OFPTBarrierReply	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Controller: OVS

Run	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Packets	3354	3087	3496	4677	3158	3445	3908	3749	3424	3745	3528	2829	3035	2553	5785
Bytes	8893471	9070432	3031050	14271624	1900732	6178230	18786894	11780932	5683940	8523599	3671196	1300146	2731646	1156296	10542826
OFPTEchoRequest	100	96	87	91	94	97	84	91	90	82	83	91	81	88	88
OFPTPacketIn	685	696	878	1054	837	778	844	821	863	897	903	695	733	598	1915
OFPTPacketOut	711	605	836	960	747	738	721	747	757	800	808	665	665	587	1297
OFPTFlowMod	675	566	795	927	710	697	683	708	715	762	766	620	630	549	962
OFPTEchoReply	100	96	87	91	94	97	84	91	90	82	83	91	81	88	87
OFPTBarrierReply	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 3: Controller Packet Analysis conducted using iPerf performance test

Controller: POX

Run	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Packets	1449	1432	1575	1456	1250	1327	1386	1445	1489	1383	1277	1470	1511	1325	1510
Bytes	156164	157876	166284	154224	135811	145850	153400	151331	158942	146742	140584	151427	157672	144076	164257
OFPTEchoRequest	40	13	50	56	6	5	13	48	45	31	0	61	59	13	33
OFPTPacketIn	255	276	270	241	235	259	163	245	262	243	249	234	250	246	281
OFPTPacketOut	288	294	297	283	281	293	292	286	291	288	289	282	289	283	194
OFPTFlowMod	5	7	9	5	8	5	6	5	5	8	8	9	6	9	5
OFPTEchoReply	40	13	50	56	6	5	13	48	45	31	0	61	59	13	33
OFPTBarrierReply	62	78	71	51	47	61	67	50	66	51	56	47	57	58	79

Controller: Default

Run	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Packets	1688	1679	1830	1652	1518	1805	1585	1674	1590	1678	1794	1905	1634	1950	1838
Bytes	214082	224046	270404	217260	193072	250756	223586	218168	209208	220844	255136	297374	207344	279198	267028
OFPTEchoRequest	67	70	70	78	83	72	83	79	85	73	64	72	65	72	69
OFPTPacketIn	366	358	398	348	304	395	327	351	325	358	394	421	344	431	411
OFPTPacketOut	366	358	398	348	304	395	327	351	325	358	494	421	344	432	411
OFPTFlowMod	321	318	363	313	274	360	291	321	295	321	358	296	324	395	371
OFPTEchoReply	67	70	70	78	83	72	83	79	85	73	64	72	65	72	69
OFPTBarrierReply	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Controller: OVS

Run	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Packets	1551	1383	1520	1335	1473	1628	1492	1323	1376	1501	1276	1355	1301	1486	1457
Bytes	165747	150145	170461	149496	153517	170991	158770	146971	144700	162599	140644	151116	140185	159830	162710
OFPTEchoRequest	47	16	11	0	52	71	47	3	40	29	0	0	21	39	7
OFPTPacketIn	276	258	297	265	243	272	259	255	234	281	252	267	238	264	289
OFPTPacketOut	296	288	305	293	288	292	289	287	282	298	290	287	285	288	295
OFPTFlowMod	8	8	9	5	9	5	5	9	8	7	5	9	5	9	8
OFPTEchoReply	47	16	11	0	52	71	47	3	40	29	0	0	21	39	7
OFPTBarrierReply	74	63	89	67	53	74	66	63	47	74	55	74	49	71	88

Table 4: Controller Packet Analysis conducted using D-ITG performance test

Controller (→)	POX		Default		OVS	
Packet Type (↓)	Mean	Stdev.	Mean	Stdev.	Mean	Stdev.
Packets	2883.2	643.94	4221.3	908.56	3584.9	786.89
OFPTEchoRequest	65.5	7.98	88.5	8.84	89.5	5.66
OFPTPacketIn	521.1	41.82	1092.3	317.54	879.8	307.86
OFPTPacketOut	509.9	3.21	856.5	178.03	776.3	171.31
OFPTFlowMod	0.0	0.00	803.7	173.92	717.7	115.29
OFPTEchoReply	65.5	7.98	88.1	8.29	89.47	5.68
OFPTBarrierReply	227.0	58.35	0.0	0.00	0.0	0.00

Table 5: Controller packet analysis conducted using the **iPerf performance test** for 15 multiple interleaved trials for three SDN controllers: POX, Default and OVS.

Controller (→)	POX		Default		OVS	
Packet Type (↓)	Mean	Stdev.	Mean	Stdev.	Mean	Stdev.
Packets	1419.0	92.62	1721.3	125.46	1430.5	102.86
OFPTEchoRequest	31.5	21.50	73.5	6.65	25.5	22.71
OFPTPacketIn	253.9	14.34	368.7	37.81	263.3	17.96
OFPTPacketOut	282.0	24.79	375.5	49.65	290.9	5.80
OFPTFlowMod	6.7	1.68	328.1	34.20	7.3	1.75
OFPTEchoReply	31.5	21.50	73.5	6.65	25.5	22.71
OFPTBarrierReply	60.1	10.44	0.0	0.00	67.1	12.63

Table 6: Controller packet analysis conducted using the **D-ITG performance test** for 15 multiple interleaved trials for three SDN controllers: POX, Default and OVS.