Calls /s	Number of MPI of This pair of metri	alls per second p		racks the time spe	ent in an MPI call	so far			
Calls /s Is /s r()	This pair of metri	•	er process						
ls/s r()		ce tracke the num	p						
ls /s r()	Percentage of to	Co Hacks HIE HUII	ber of point-to-po	int calls per secon	d per process				
r()		tal time spent on l	MPI_Finalize func	tion on main threa	d by all processo	ors- function to fini	sh all MPI calls and ex	xit	
"	This pair of metri	cs tracks the num	ber of collective of	alls per second pe	er process				
	Percentage of to	tal time spent on l	MPI_comm_barrie	er function on mair	thread by all pro	cessors- function	for waiting for all proc	essors to reach	the point
	Amount of physic	cal memory used	by each process						
	Percentage of to	tal time spent on l	MPI_comm_dup f	unction on main th	read by all proce	ssors- function fo	or creating duplicate co	mmunicators	
	The total execution	on time of the pro	gram						
ND AND REC	EIVE USING I	 Python obji	ECTS		(sr normal.py)				
Size	MPI_Call_Duration	on (ms)	MPI calls (/s)	MPI Point to Poin		MPI_Finalize()	Time (s)		
			, ,						
100000	0.0098		0.85	0.3		6.8 %	3.362		
1000000	0.38		0.30	0.15		23.0 %	6.712		
10000000	8.84		0.05	0.03		42.0 %	37.684		
ND AND REC	EIVE USING I	NUMPY			(sr_numpy.py)				
Size	MPI_Call_Duration	on(ms)	MPI calls(/s)	MPI Point to Poir	nt Calls(/s)	MPI_Finalize()	Time (s)		
100000	0.00192		0.66	0.74		1.5 %	3.24		
1000000	0.00452		1.1	0.34		4.2 %	4.375		
10000000	0.09		1.17	0.46		7.5 %	4.453		
IG SEND ANI	D RECEIVE III	SING NUMPY			(er comparisio	n nv)			
(O OLIVE) (III	D INCOLIVE O				(31_companisio	п.ру)			
Size	MPI_Call_Duration	on(ms)	MPI calls (/s)	MPI Point to Poir	nt Calls(/s)	MPI_Finalize()	Time(s)		
100000	0.00242		2	0.57		2.2 %	3.12		
	0.0021					2.2 %			
10000000	0.00311					3.5 %	3.99		
					(reduce.py)				
IPI Call Duration	n(ms)	MPI Calls(/s)	MPI Collective C	alls(/s)	Time(s)		MPI_comm _dup(%)		
	100000 1000000 1000000 1000000 1000000 1000000	The total execution ND AND RECEIVE USING Size	The total execution time of the pro ND AND RECEIVE USING PYTHON OBJI Size MPI_Call_Duration (ms) 100000 0.0098 1000000 0.38 10000000 8.84 ND AND RECEIVE USING NUMPY Size MPI_Call_Duration(ms) 100000 0.00192 1000000 0.00452 10000000 0.09 NG SEND AND RECEIVE USING NUMPY Size MPI_Call_Duration(ms) 100000 0.00242 1000000 0.00242 1000000 0.00211 10000000 0.00311	The total execution time of the program ND AND RECEIVE USING PYTHON OBJECTS Size	The total execution time of the program ND AND RECEIVE USING PYTHON OBJECTS Size MPI_Call_Duration (ms) MPI calls (/s) MPI Point to Point 100000 0.0098 0.85 0.3 1000000 0.38 0.30 0.15 1000000 8.84 0.05 0.03 ND AND RECEIVE USING NUMPY Size MPI_Call_Duration(ms) MPI calls(/s) MPI Point to Point 100000 0.00192 0.66 0.74 1000000 0.00452 1.1 0.34 1000000 0.09 1.17 0.46 NG SEND AND RECEIVE USING NUMPY Size MPI_Call_Duration(ms) MPI calls (/s) MPI Point to Point MPI Calls (/s) MPI Point to Point MPI Calls (/s) MPI Point to Point 100000 0.00242 2 0.57 1000000 0.00241 1.76 0.55 10000000 0.00311 1.13 0.44	The total execution time of the program	The total execution time of the program	The total execution time of the program ND AND RECEIVE USING PYTHON OBJECTS Size	ND AND RECEIVE USING PYTHON OBJECTS MPI_Call_Duration (ms) MPI calls (/s) MPI Point to Point calls (/s) MPI_Finalize() Time (s)

128	23.2		14.3	1.2		1.134		19.8	
160	26.7		12.1			1.153		16.3	
192	29.3		12.1			1.443		18.8	
224	29.6		18.5			1.448		24	
224	29.0		10.3	2.00		1.440		24	
MPI GATHER						(gather.py)			
Processors	MPI Call Duration	n(ms)	MPI Calls(/s)	MPI Collective C	Calls(/s)	Time(s)			
128	25.1		3.29	3.29		0.942			
160	28.2		3.36			0.972			
192	29.5		3.3			0.945			
224	39.9		4.18			0.984			
MPI BROADCAS	ST					(broadcast.py)			
Processors	Size	MPI_Call_Durati	on(ms)	MPI calls (/s)	MPI Collective C	alls(/s)	Time(s)		
64	100000	4.57		26			3.12		
64	1000000	36.6		12.6			3.376		
64	10000000	380		0.82	0.82		3.99		
MPI SCATTER						(scatter.py)			
Processors	MPI Call Duration	n(ms)	MPI Calls(/s)	MPI Collective C	calls(/s)	Time(s)			
64	0.58		0.82	0.82		4.019			
96	5.23		0.62			3.103			
128	9.44		0.6			3.461			
MPI IREDUCE						(nonblock_redu	ce.py)		
_									
Processors	MPI Call Duration	n(ms)	MPI Calls(/s)	MPI Collective C	Calls(/s)	Time(s)	MPI_comm_bar	rier(%)	
128	0.02		26.2	26.2		0.454	0.7		
160	0.29		23.9	23.9		0.413	3.7		
192	3.1		18.3	18.3		0.473	3.2		
224	6.99		12.2	12.2		0.512	18.8		

MPI ONE SIDEI	COMMUNICATION	ON			(one-sidedcomm.py)	
Processors	Size	MPI_Call_Duration	n(ms) MPI calls (/s)	Memory(MB)	Time(s)	
64	100000	0.02	22.5	26.5	C	0.169
64	1000000	0.15	21.7	26.7	C	0.228
64	10000000	1.34	13.8	29.7	C).427
BLOCKING S	END AND REC	EIVE OF USER	R DEFINED TYPE		(user_def_type.py)	
Processors	Size	MPI_Call_Duration	n (ms) MPI calls (/s)	MPI Point to Poir	nt calls (/s) Time (s)	
		0.00	0.48	0.3	3.	1701
64	100000	0.82	0.70			
64 64			0.72			5231
	1000000	0.92		0.44	3.	5231 3.12
64	1000000	0.92	0.72	0.44	3.	