Intro to Communication

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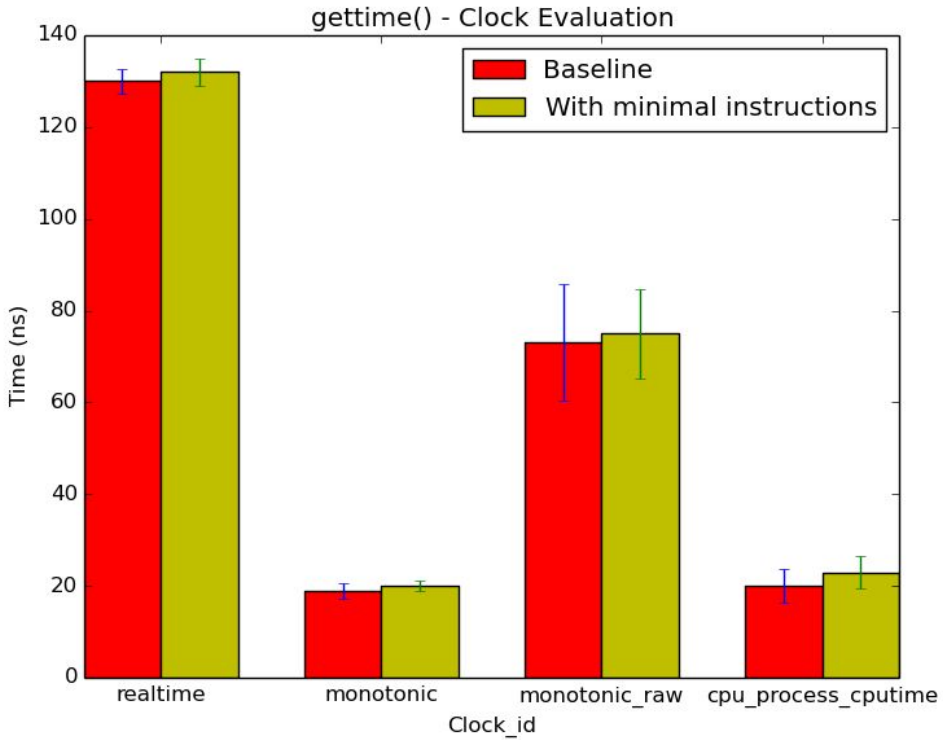
Clock Selection - Overhead and Resolution

- AIM :
  Measure overhead of clock_gettime() call
- Method :
  Consecutive calls
  Median
- Error bar - StDev



Clock Measurement - Overhead and Resolution

	CPU_PROCESS_CPUTIME		MONOTONIC		MONOTONIC_RAW		REALTIME	
	Baseline	**Diff**	**Baseline**	**Diff**	**Baseline**	**Diff**	**Baseline**	**Diff**
Median	**130**	**132**	**19**	**20**	**73**	**75**	**20**	**23**
Average	130.12	131.98	18.58	20.26	78.39	77.35	20.09	21.96
StdDev	**2.73**	**2.90**	**1.68**	**1.16**	**12.68**	**9.72**	**3.58**	**3.49**
Min	123.00	125.00	15.00	16.00	63.00	67.00	13.00	15.00
Max	137.00	139.00	23.00	24.00	117.00	112.00	31.00	31.00

* - all time measurements are in ns

Options

- With / without optimization
- Median / average values
- Remote / local machine

Choices for subsequent graphs

(Unless otherwise specified)

- With optimization
- Median values
- Remote machine

Clock Measurement - Overhead and Resolution

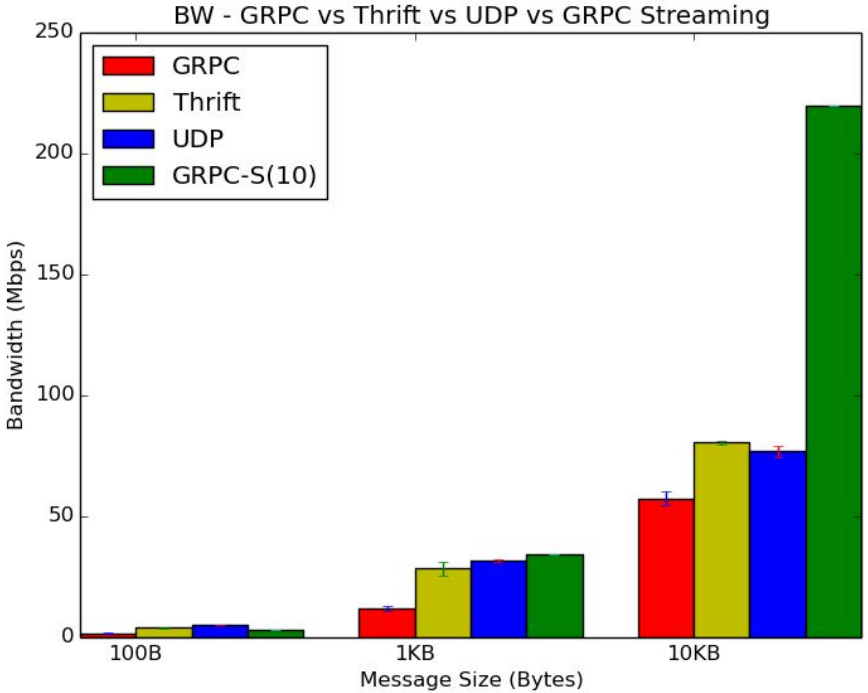
	Time
L1 Cache	2.25 ns
Branch Misprediction	80 ns
Mutex Lock	25 ns
Mutex Unlock	34 ns
Read 1 MB sequentially from SSD	6.40 (MBps)
Read 1 MB sequentially from disk	6.29 (MBps)
Send packet CA->Netherlands->CA	168.116 (ms)
Compress 1KB with Zippy / Snappy	776 ns

Overall Comparison

Cross comparison UDP / GRPC / Thrift

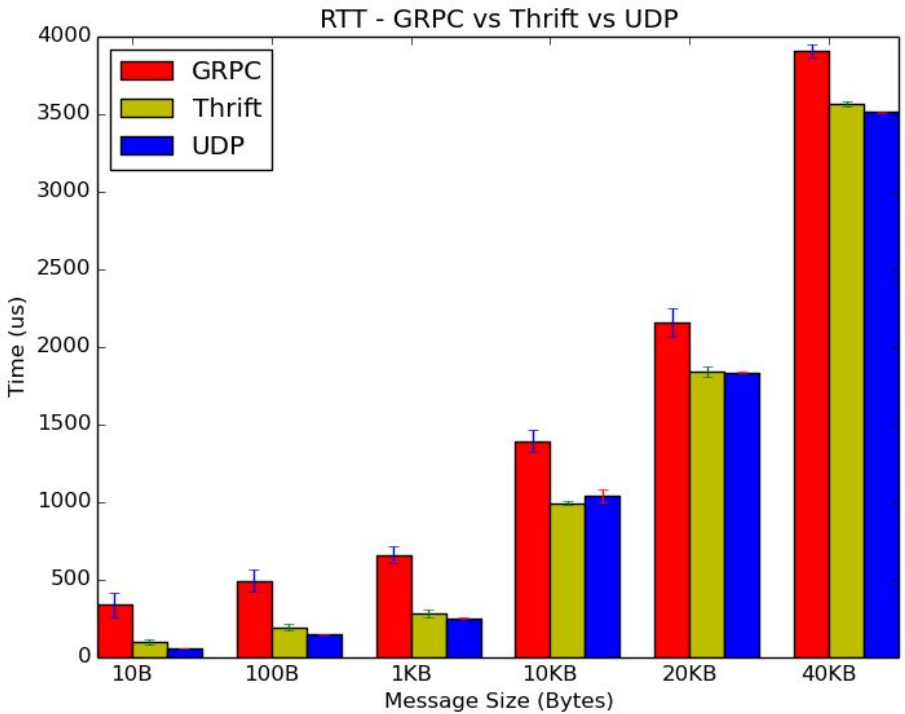
- **Bandwidth**
- With optimization
- Median values
- Remote machine

- Note: Discuss how we measure BW, and whether it's right to compare UDP with this.
- Key point - RPC could return data, UDP returns Ack.
- Also, layers below the Application Layer in RPC could be doing this internally.



Cross comparison GRPC / Thrift

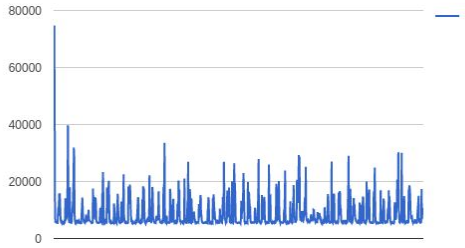
- **RTT**
- With optimization
- Median values
- Remote machine

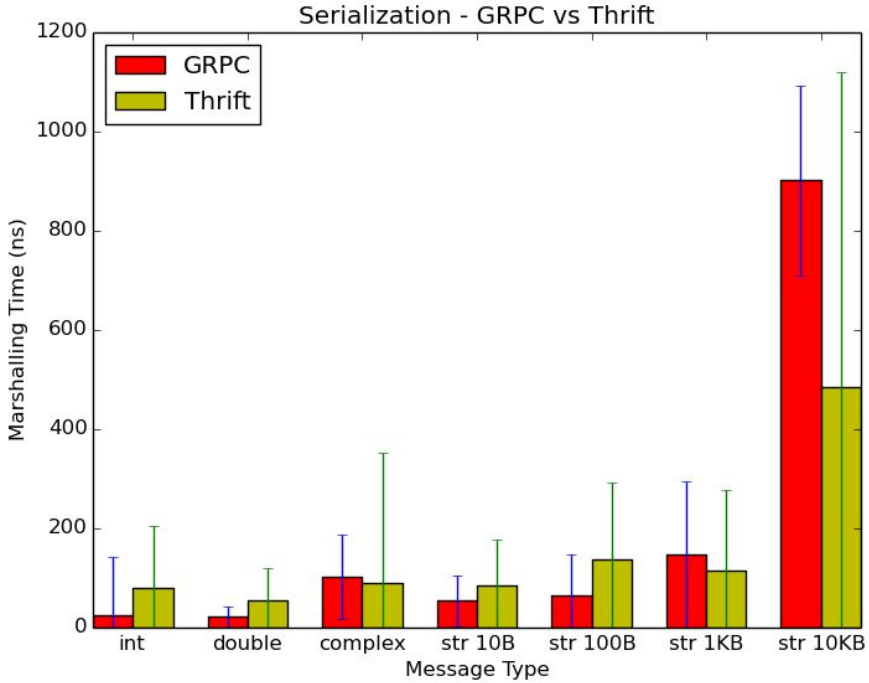


Reliable UDP

Cross comparison GRPC / Thrift

- **Time for Marshalling**
- With optimization
- Median values
- Remote machine

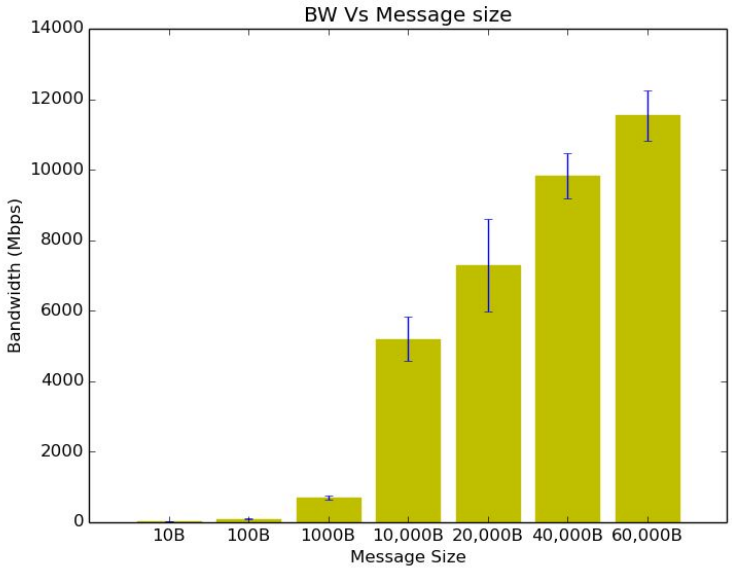




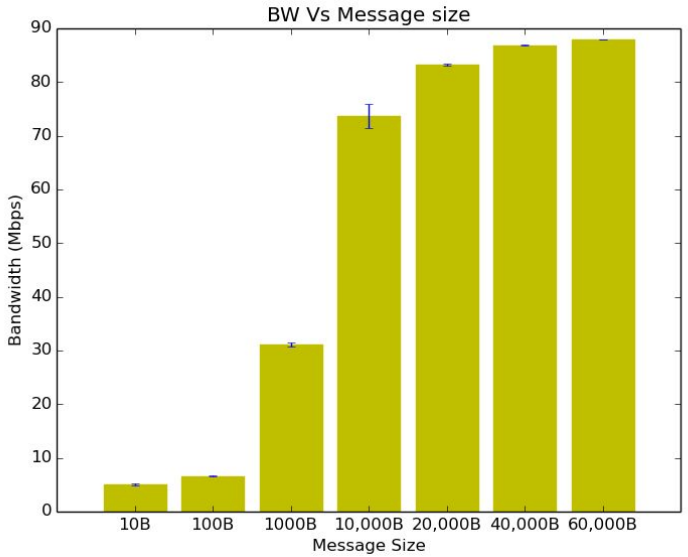
Reliable UDP

- **Bandwidth**
- Optimized
- Median

Same Machine

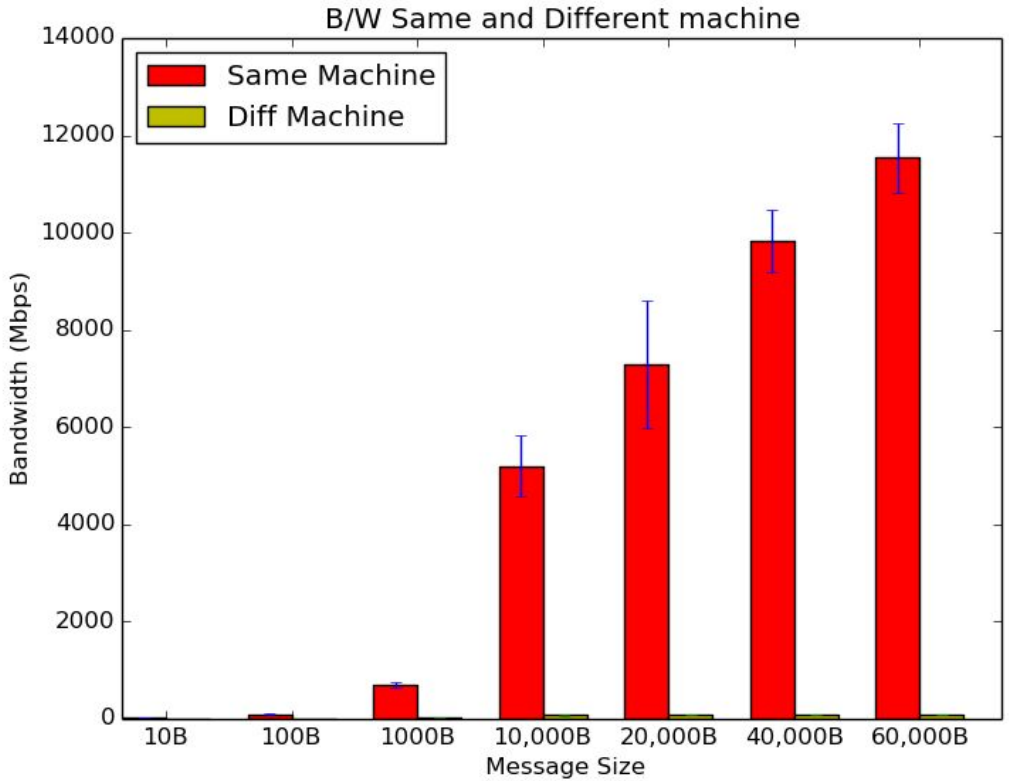


Different Machines



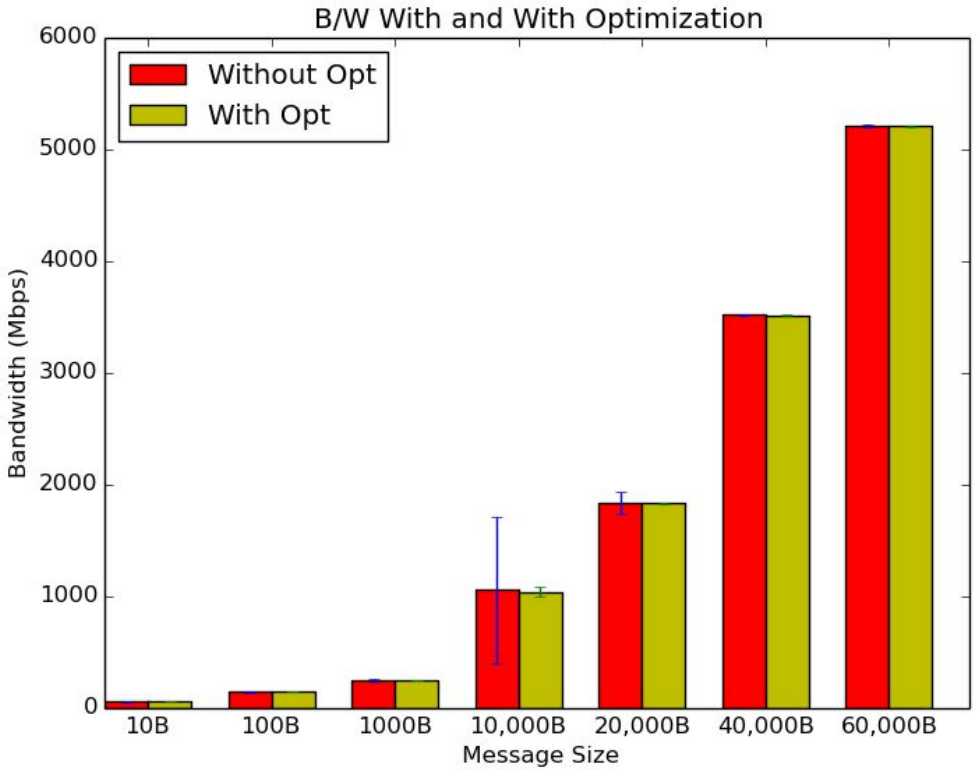
Reliable UDP

- **Bandwidth**
- Optimization
- Median
- Across Machine



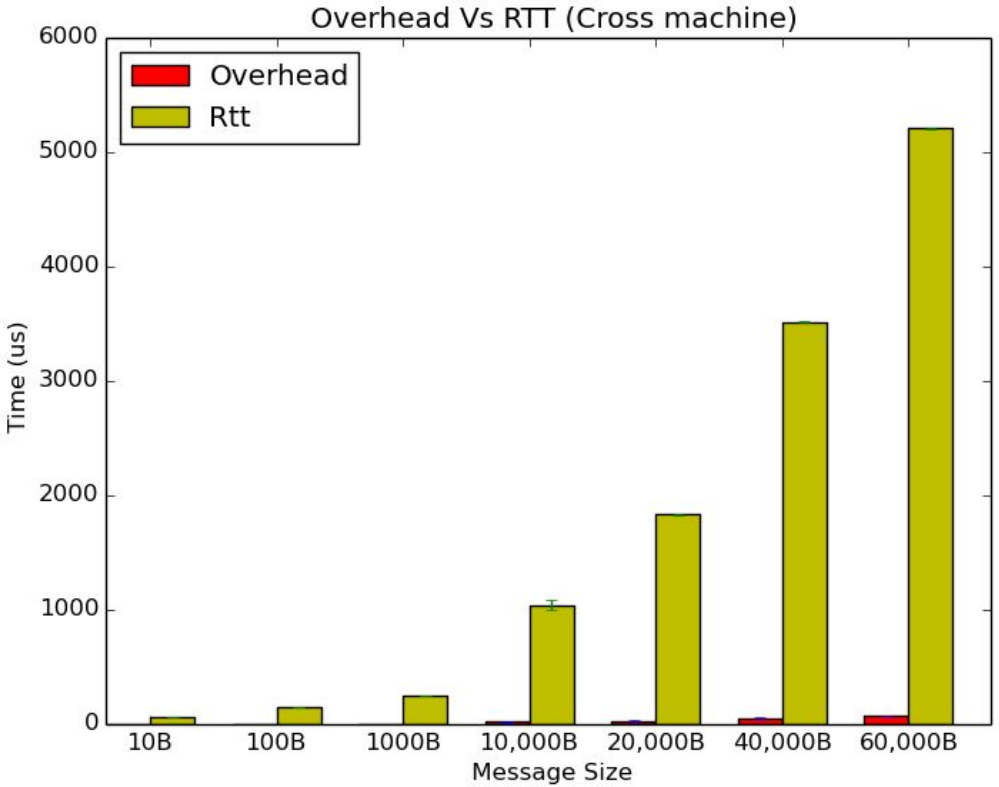
Reliable UDP

- Bandwidth With Vs Without optimization
- Median
- Different Machine



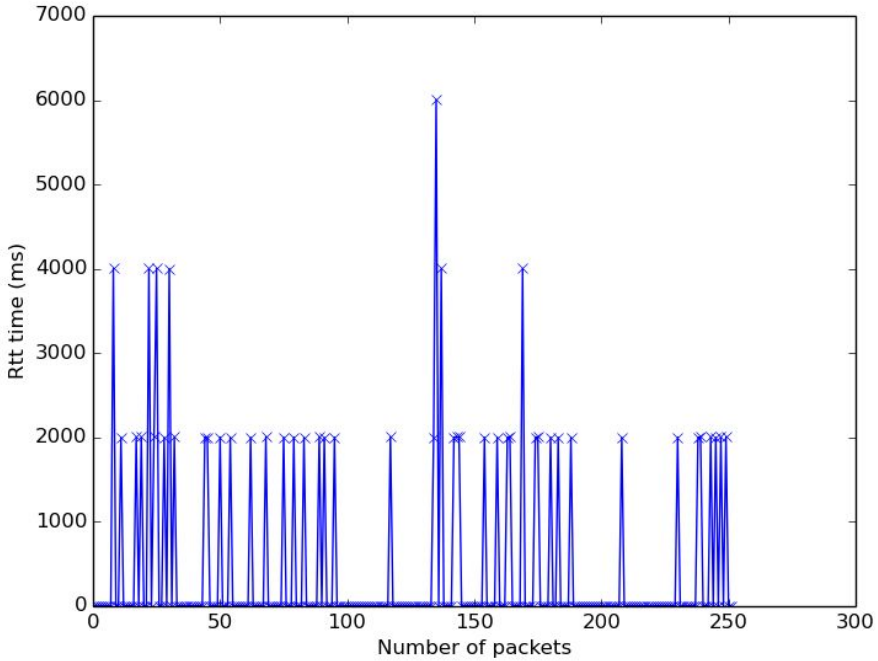
Reliable UDP

- With Optimization
- Median
- Different machine
- **Overhead Vs RTT**



Reliable UDP

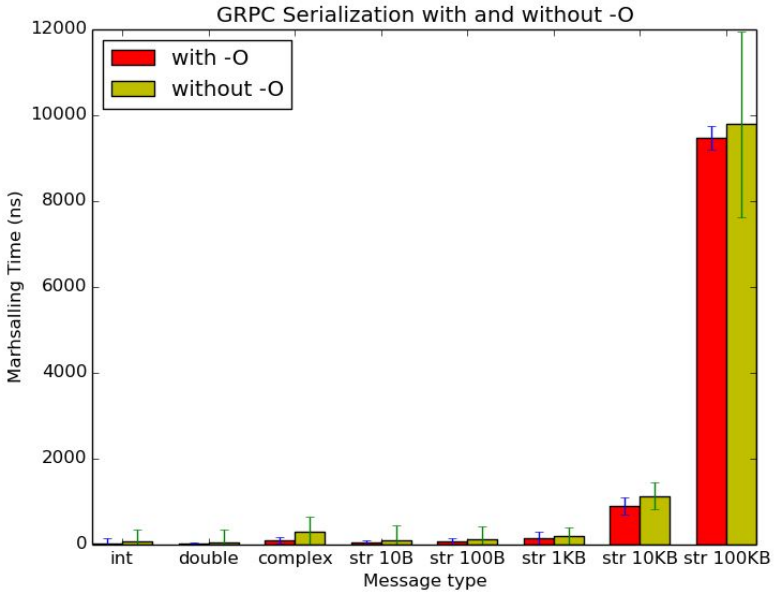
- **RTT with packet drop rate 20%**
- Timeout - 3sec
- With optimization
- Same machine
- Median



GRPC

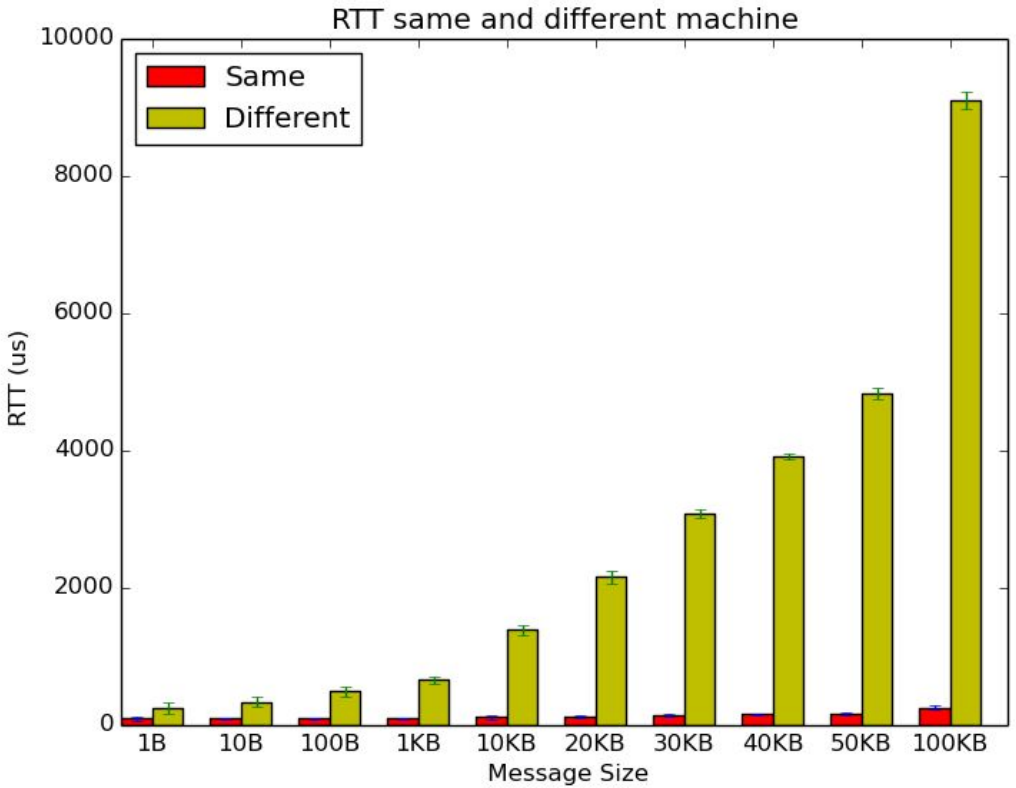
GRPC

- **Marshalling overhead (time)**
- With Vs Without optimization
- Median values



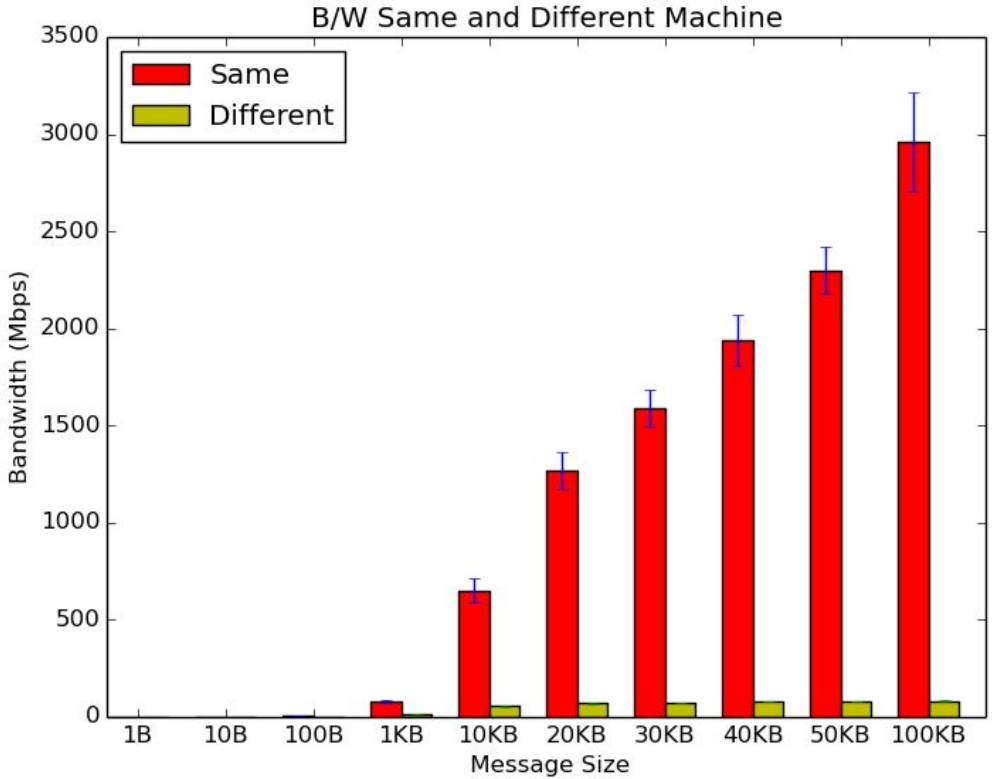
GRPC

- **RTT**
- Same and different machine
- With Optimization
- Median values



GRPC

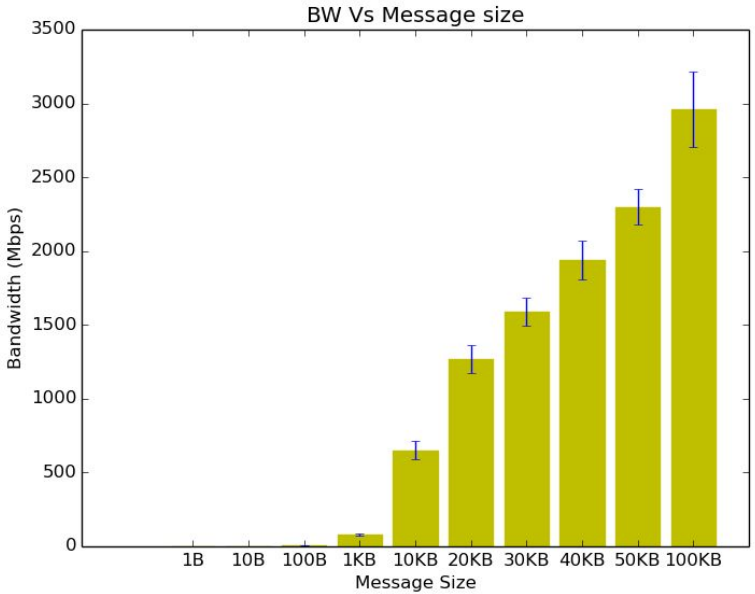
- **Bandwidth**
- Same and different machine
- With Optimization
- Median values



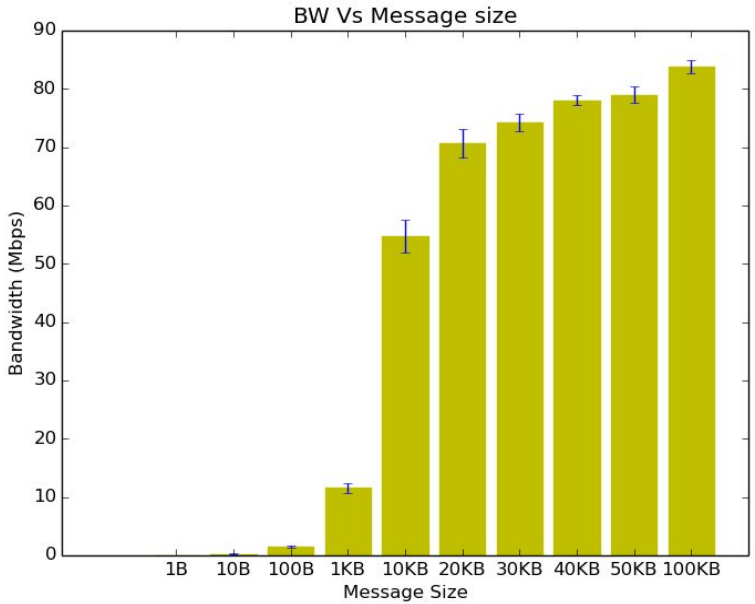
GRPC

- Bandwidth - Remote hosts and Localhost

Same Machine



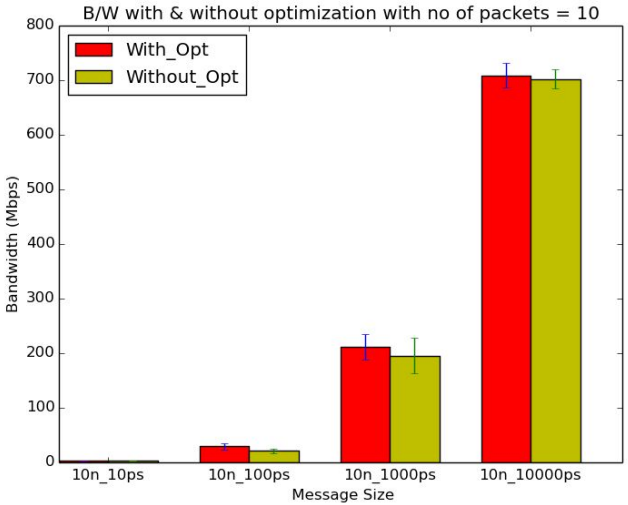
Different Machine



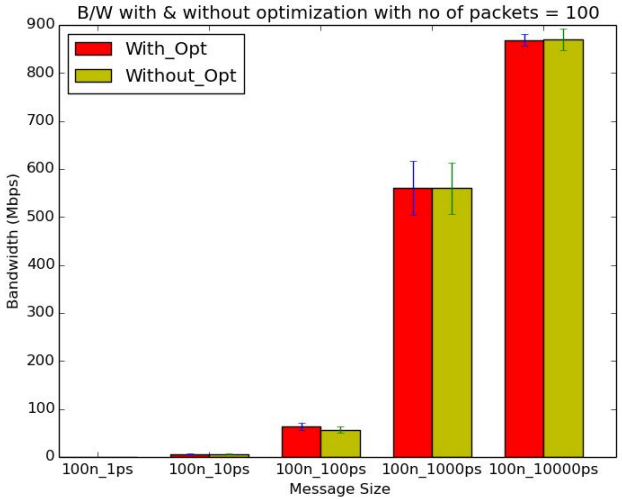
GRPC (Server Streaming)

- BW in Server Streaming (with/without optimization)

No of packets = 10



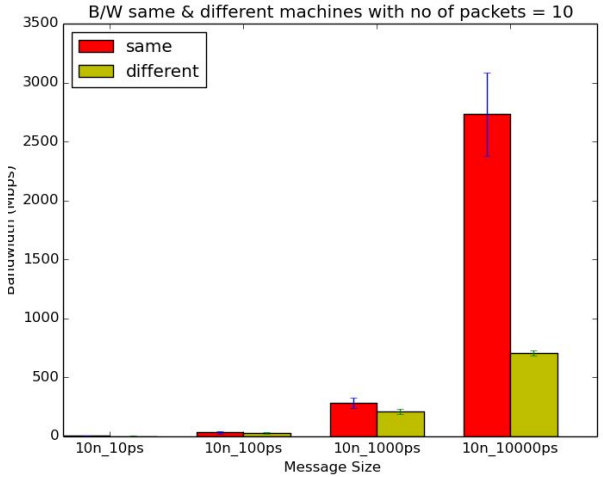
Number of packets =100



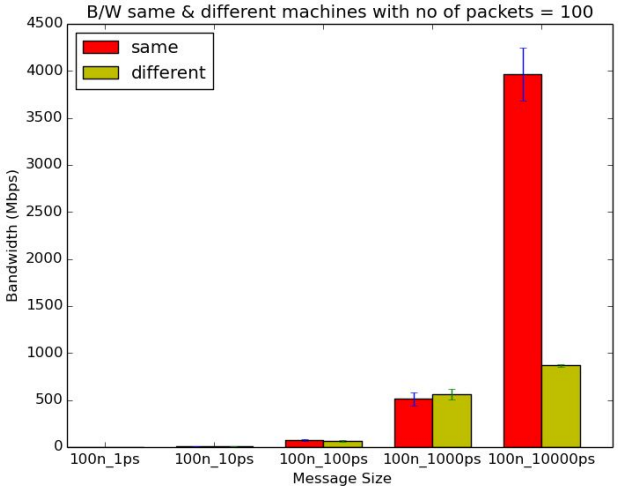
GRPC (Server Streaming)

- BW in Server Streaming (same and different machine)
- With Optimization

No of packets = 10



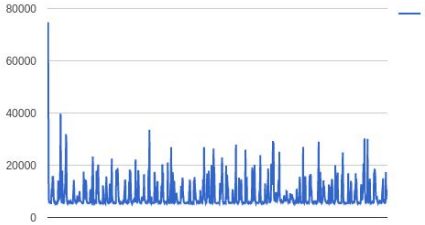
Number of packets =100

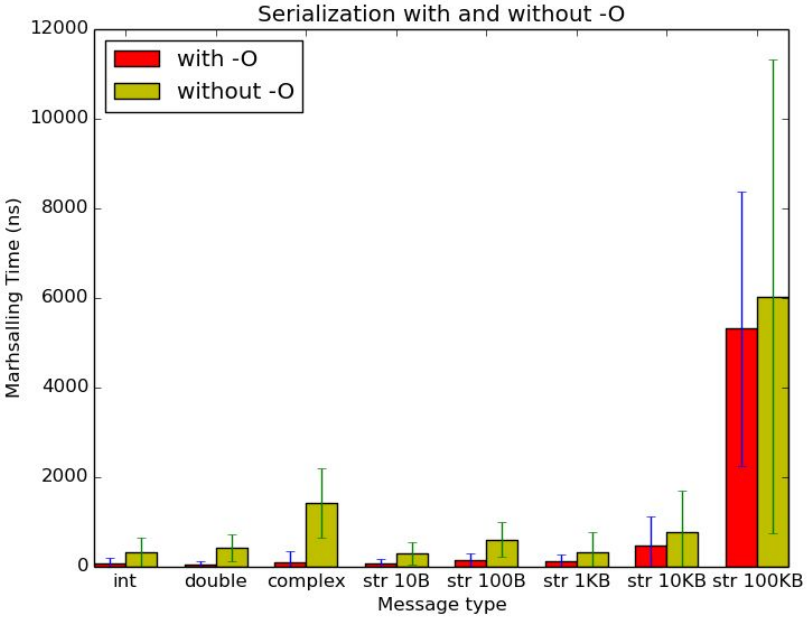


Thrift

Thrift

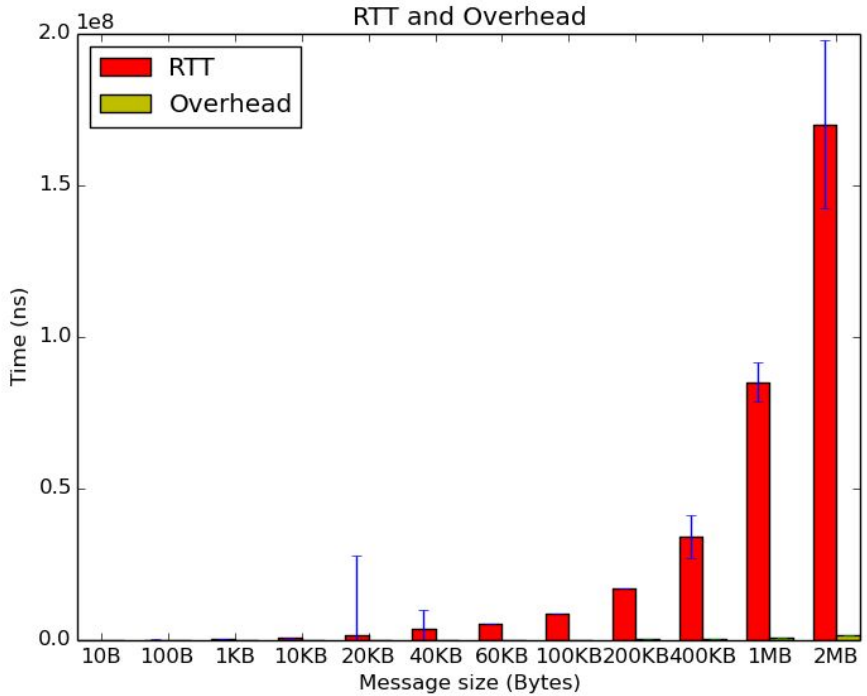
- With Vs Without optimization
- Marshalling overhead (time)
- Median values





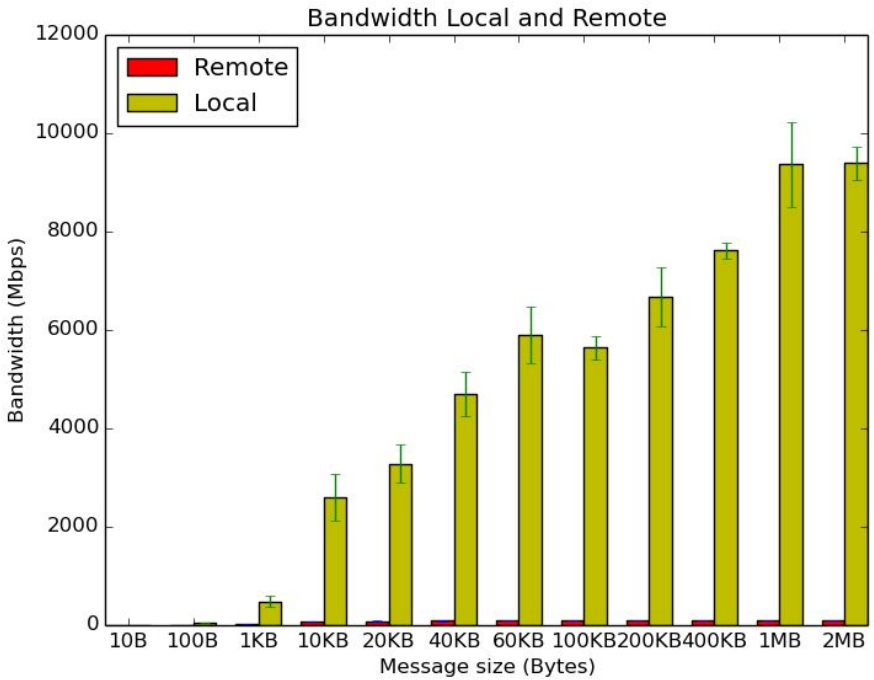
Thrift

- **Overhead and RTT as 2 bars**
- Median values
- With Optimization
- Remote



Thrift

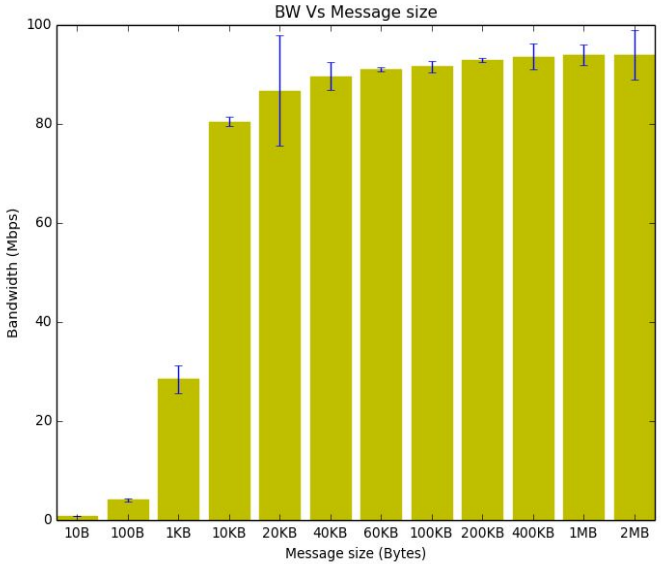
- **Bandwidth: Local And Remote**
- Median values
- With Optimization



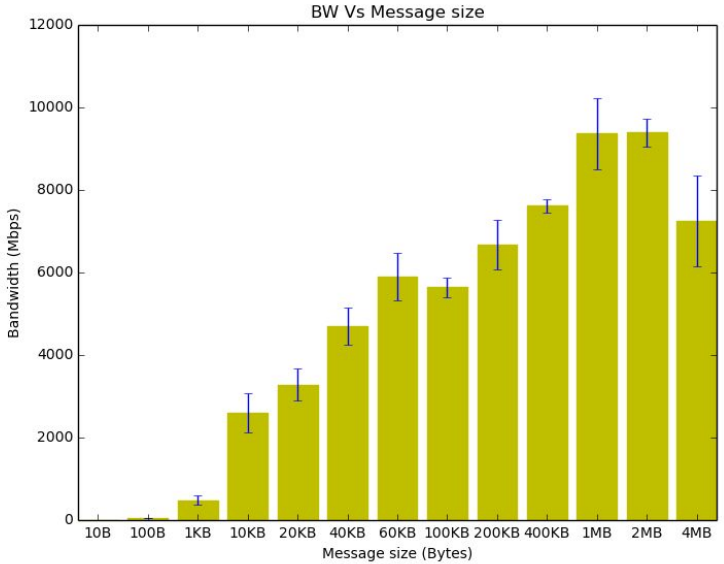
Thrift

- Bandwidth - Remote hosts and Localhost

Different Machines



Same Machine



Questions...

Extra Slides