

# Virtually the Same? The Empirical Differences Between Physical and Virtual Networks

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Sandia National Laboratories, California

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Sandia makes critical use of Emulytics™

- “Field test” deployments
- Advise procurements

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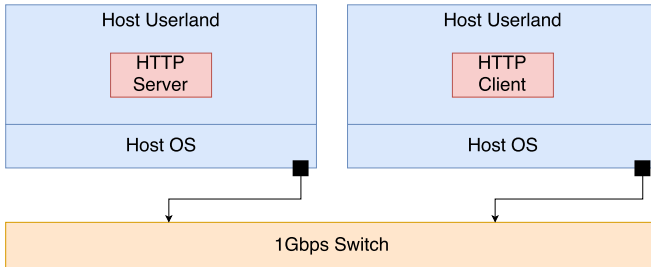
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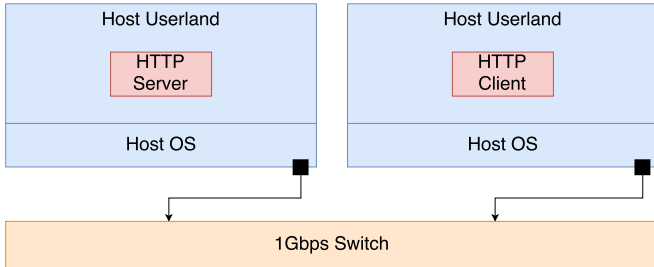
Methodology:

- Run representative workloads in both real world and emulations
- Collect, compare, and contrast metrics

# Starting simple



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Client makes HTTP requests for 60 seconds

# How to Emulate?

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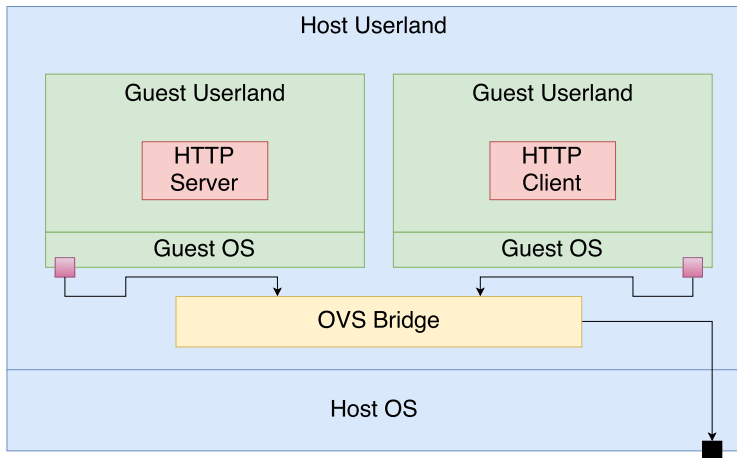
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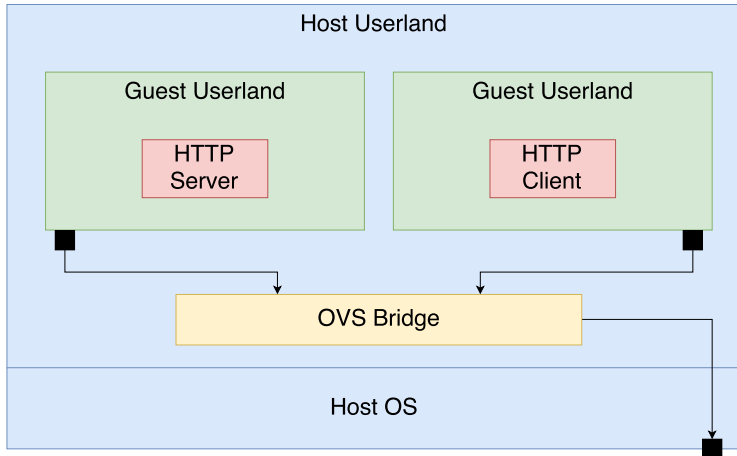
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- ... *many more parameters*



# KVM Environment



# Container Environment



## Number of Transactions

		Transactions		
Environment	Offloading	1 Worker	4 Workers	16 Workers
physical	N	883 $\pm$ 0	906 $\pm$ 1	919 $\pm$ 2
physical	Y	879 $\pm$ 0	906 $\pm$ 1	918 $\pm$ 2
e1000	N	282 $\pm$ 6	549 $\pm$ 11	390 $\pm$ 20
virtio	N	916 $\pm$ 0	920 $\pm$ 1	934 $\pm$ 2
containers	N	888 $\pm$ 11	918 $\pm$ 4	931 $\pm$ 6
e1000	Y	914 $\pm$ 1	918 $\pm$ 1	929 $\pm$ 4
virtio	Y	916 $\pm$ 0	921 $\pm$ 1	933 $\pm$ 2
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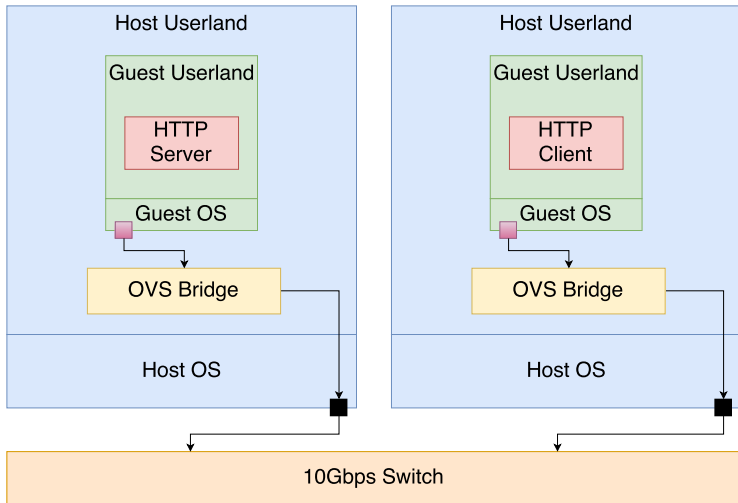
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# Multi-host environments



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e1000	N	259 $\pm$ 13	429 $\pm$ 14	358 $\pm$ 15
virtio	N	916 $\pm$ 0	919 $\pm$ 1	931 $\pm$ 2
containers	N	916 $\pm$ 0	920 $\pm$ 1	931 $\pm$ 2
e1000	Y	903 $\pm$ 3	917 $\pm$ 1	890 $\pm$ 46
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# Anatomy of an HTTP request

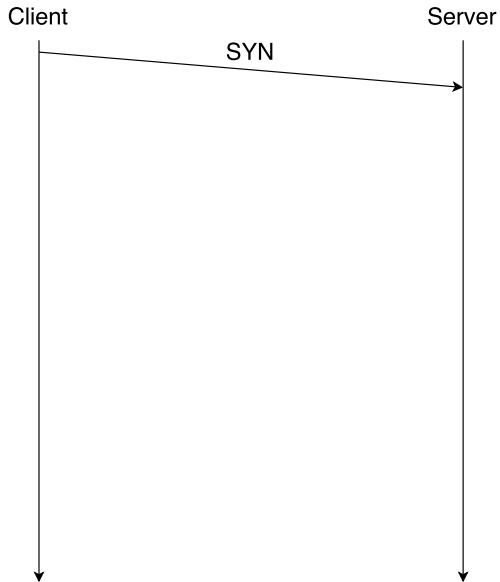
Client



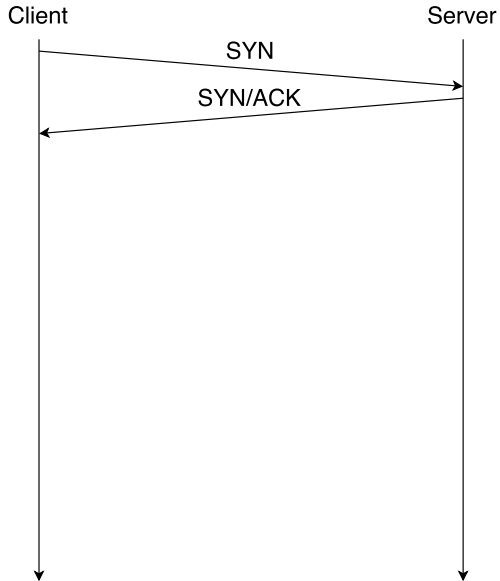
Server



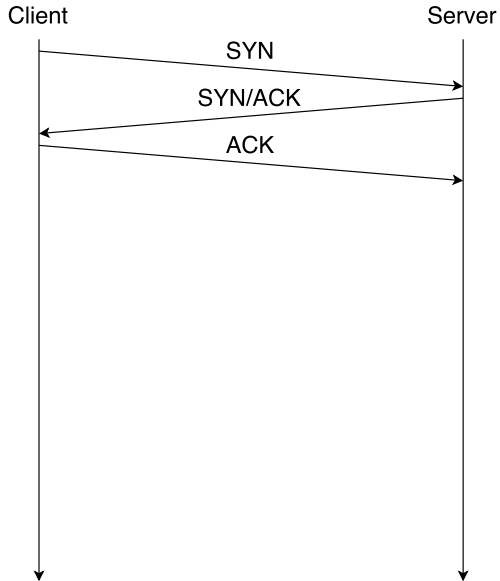
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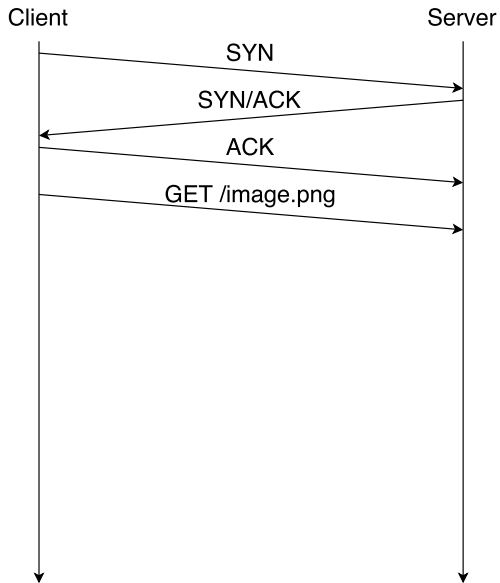
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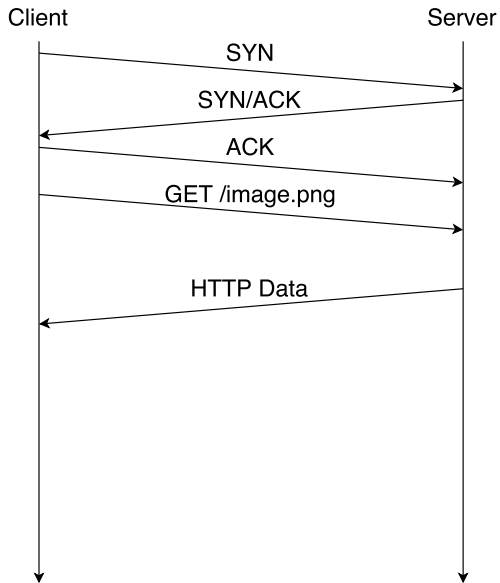
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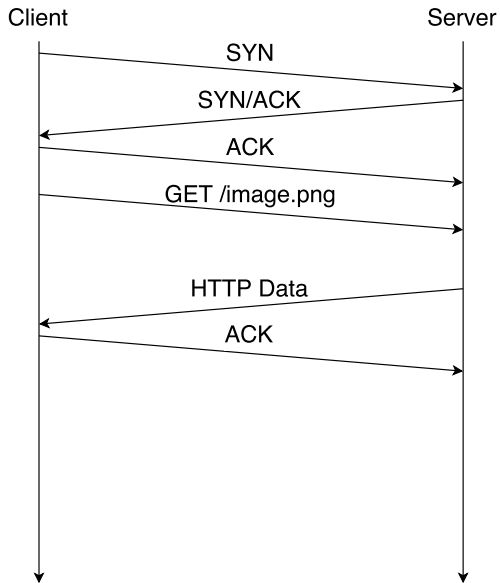


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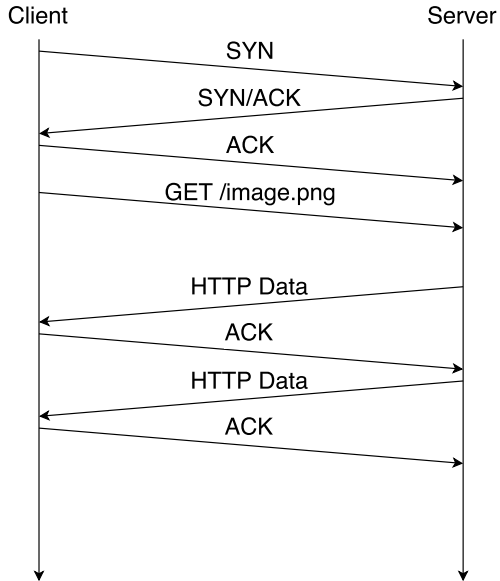




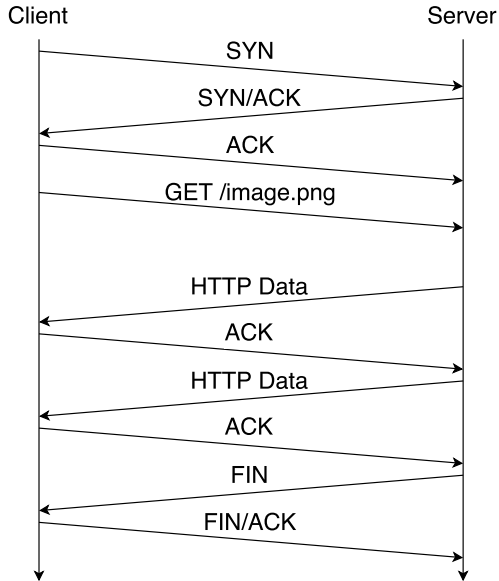
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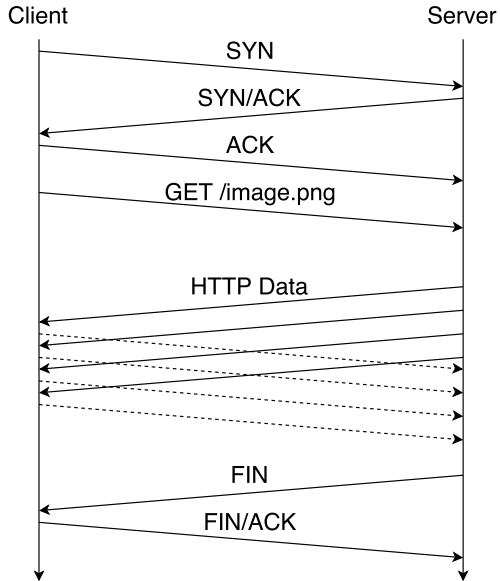
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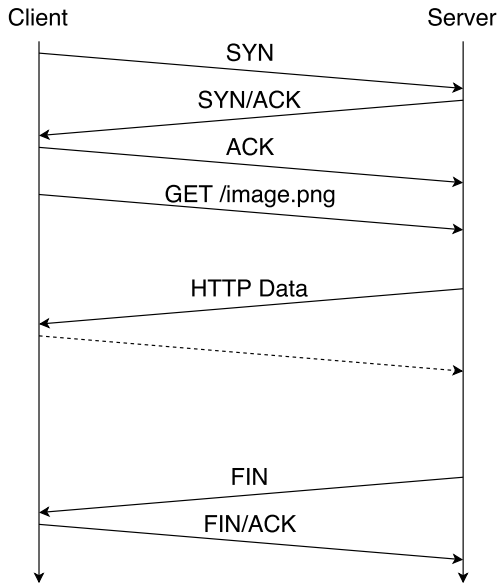
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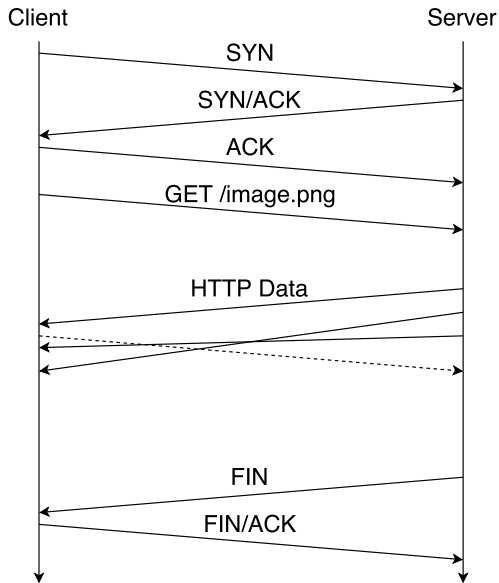
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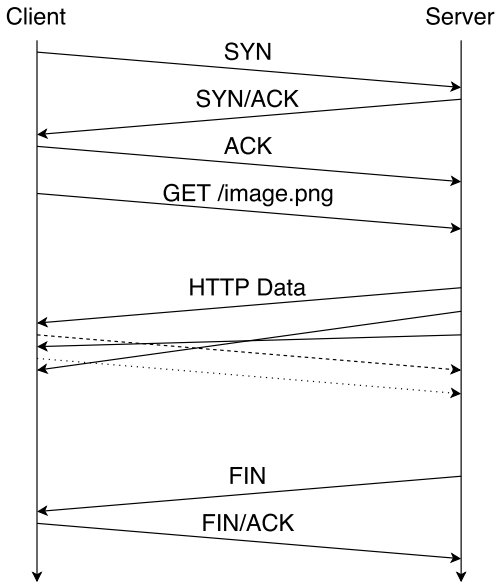
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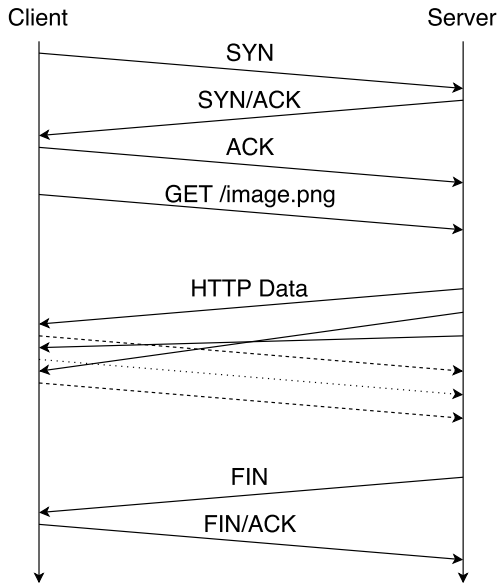
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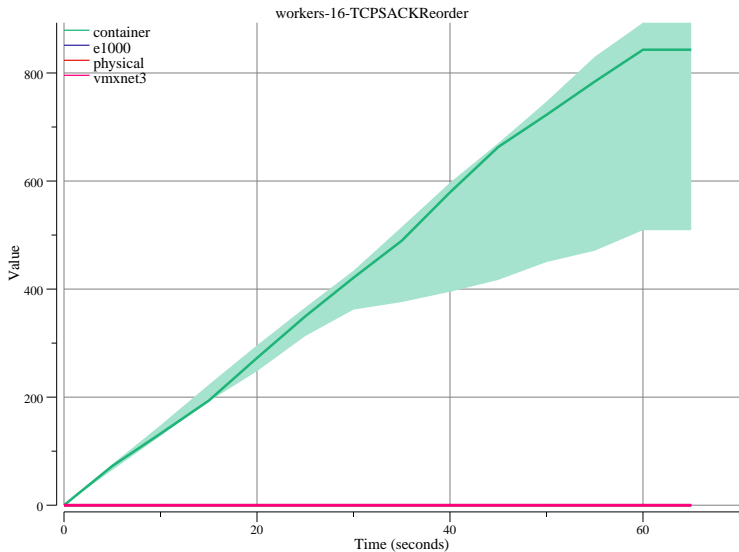


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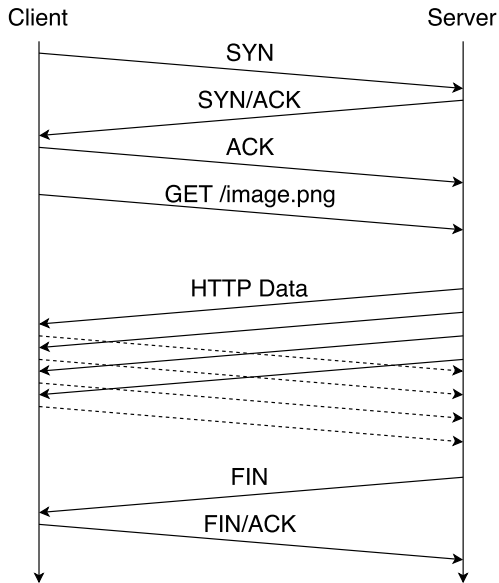




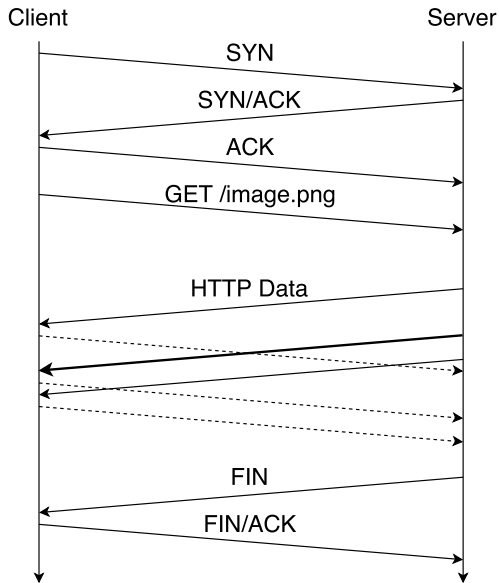
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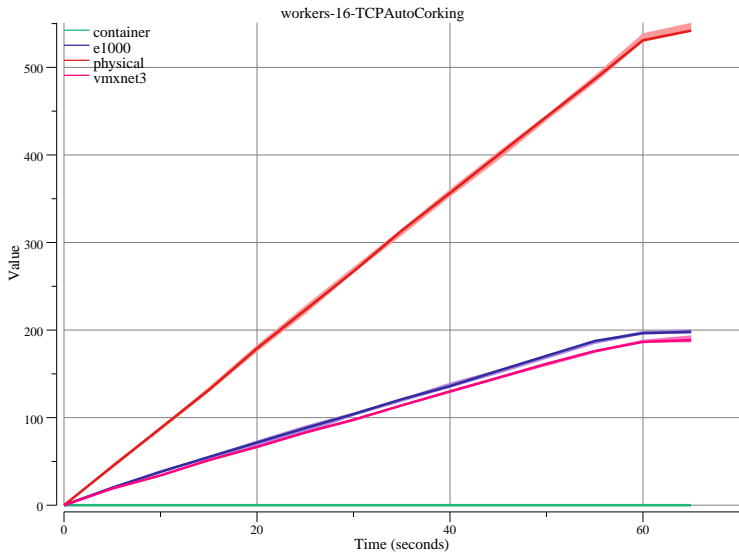
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# Autocorking



## Next Steps

- Survey of Emulytics portfolio to guide future experiments
- Many more experiments to run
  - Varying resource contention
  - Varying network trunking
  - Varying workloads
  - ...

# Conclusion

Questions/Comments?

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