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Forget the Cold Start! Experience the "Spawn" Start in Serverless Computing

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https://www.serverlesscomputing.org/wosc7/demos/d6

Outline

- Introduction
- Evaluation Methodology
- Results
- Conclusion

Spawn Time

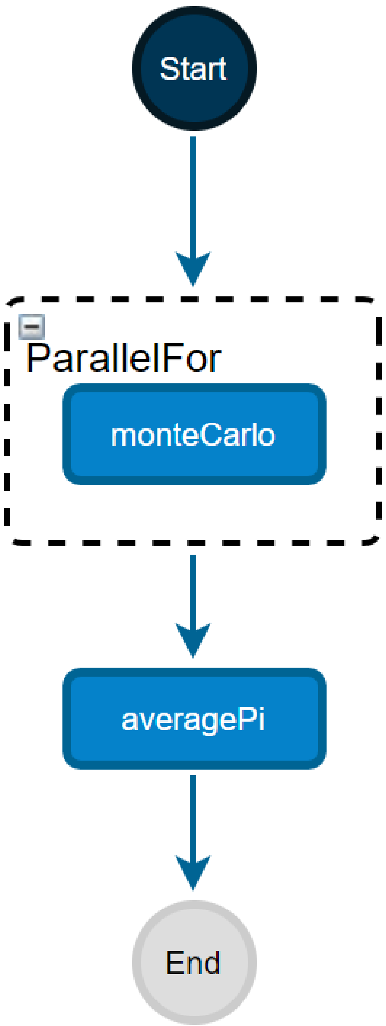
- Considerable *spawn time*

- Spawn **1000 functions** on IBM within **8s**
  - Josep Sampé, Gil Vernik, Marc Sánchez-Artigas, and Pedro García-López. 2018. Serverless Data Analytics in the IBM Cloud. *Middleware '18. ACM DOI:https://doi.org/10.1145/3284028.3284029*

- Spawn **1000 functions** on AWS within **0.6s**
  - S. Ristov, S. Pedratscher and T. Fahringer, "xAFCL: Run Scalable Function Choreographies Across Multiple FaaS Systems," in *IEEE Transactions on Services Computing*, doi: 10.1109/TSC.2021.3128137

Evaluation Methodology

» Monte Carlo Serverless Workflow (Function Choreography)
- Approximates π
- 100 functions monteCarlo
- With concurrency 30
- Measure execution time with SAAF (https://github.com/wlloyduw/SAAF)



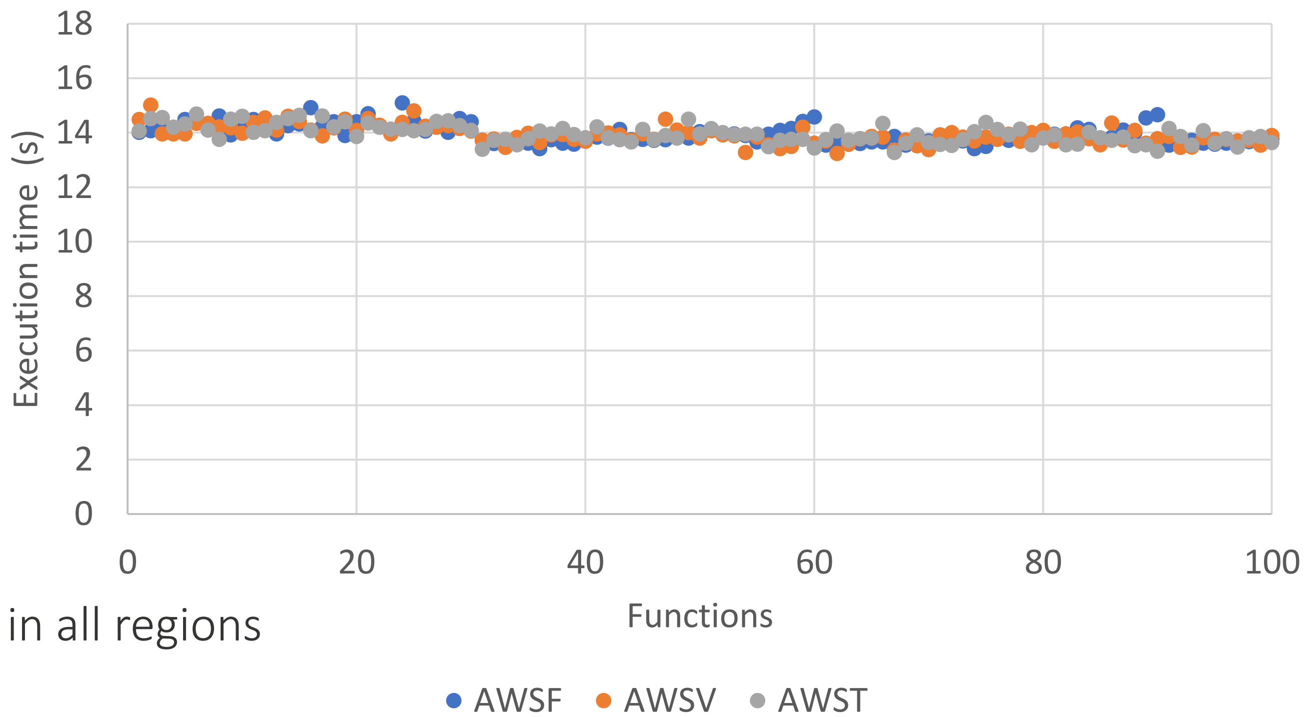
Experiments

- Deployed on 9 regions
  - AWS, IBM, Google
  - EU (Frankfurt), US (Virginia, Washington), Asia (Tokyo)

- Run with xAFCL enactment engine
  - S. Ristov, S. Pedratscher and T. Fahringer, "xAFCL: Run Scalable Function Choreographies Across Multiple FaaS Systems," in IEEE Transactions on Services Computing, doi: 10.1109/TSC.2021.3128137
  - https://github.com/sashkoristov/enactmentengine

Results (AWS)

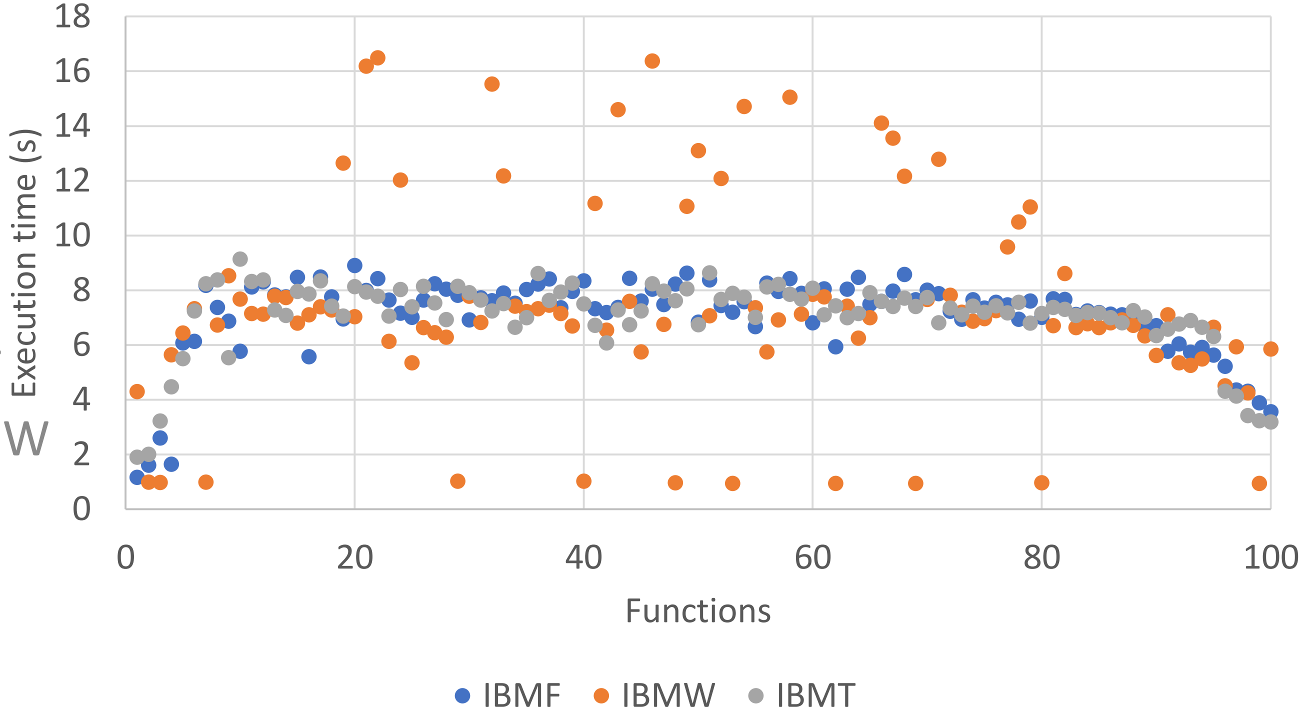
- » No spawn start
- » Cold start effect
  - ❖ Up to 3.5%
  - ❖ 480 ms
  - ❖ The first 30 functions



- » The same pattern in all regions

Results (IBM)

» Spawn start effect
  ❖ 6.7x in IBMF
  ❖ 3.8x in IBMT
  ❖ 16.7x in IBMW
  ❖ 7.2 – 15.5s

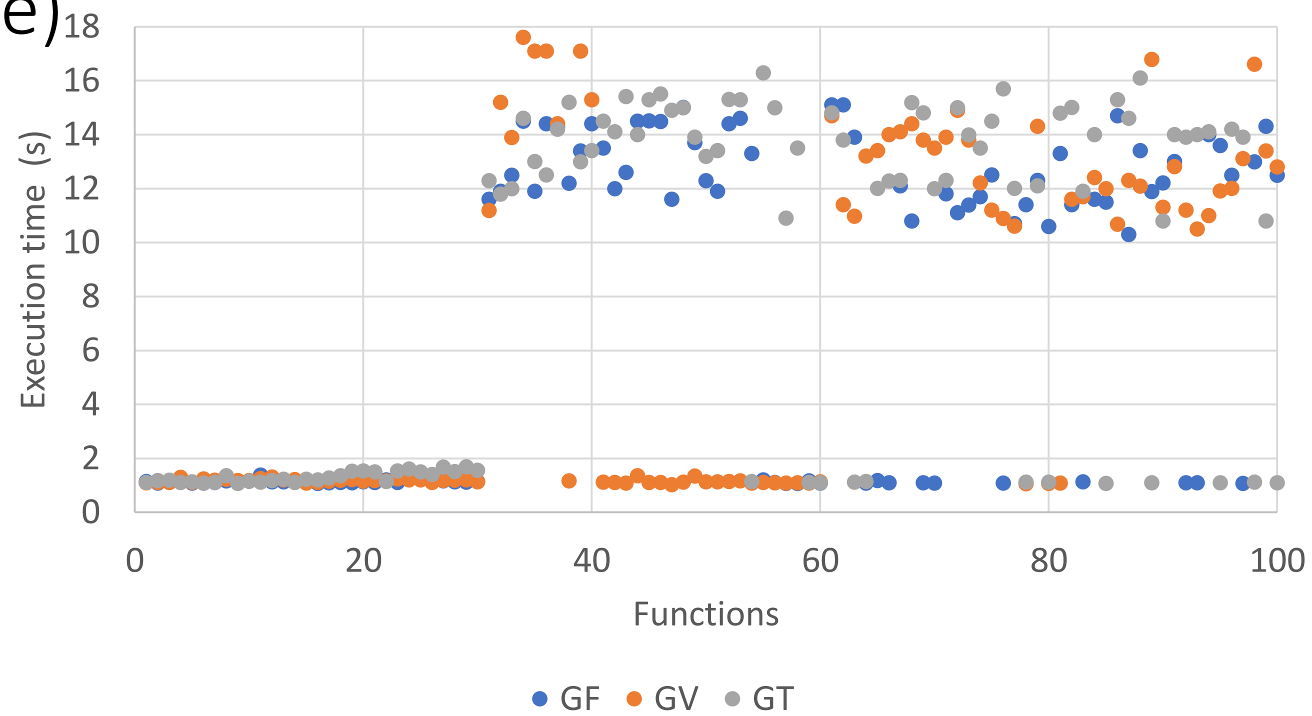


» The same pattern in all regions

» IBMW provided various CPUs
  ❖ The fastest points in IBMW are due to Xeon(R) Gold 6140
  ❖ But, it does not provide such performance in IBMT!

Results (Google)

» Cold start is HOT!
  - New container = 0



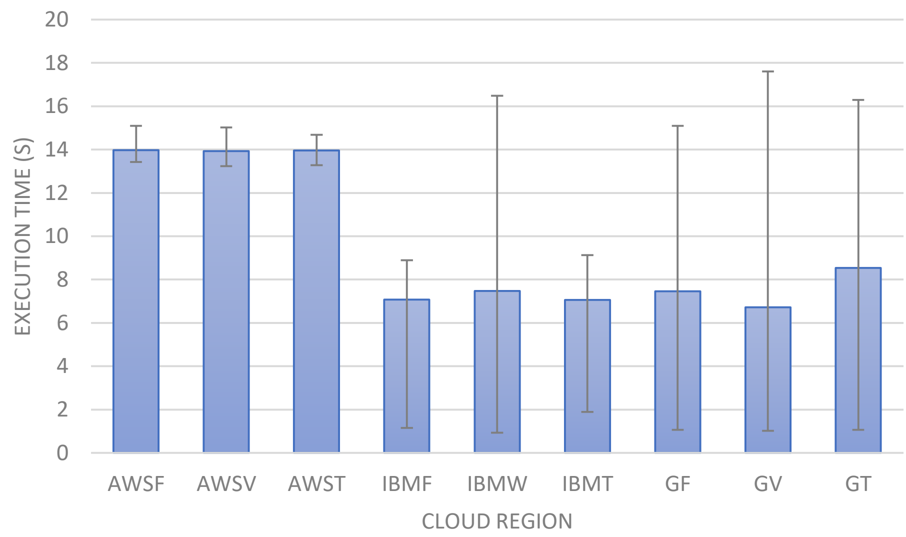
» Spawn start effect
  - 10.5x
  - or 12.6 s

» The same pattern in all regions

Summary Results

» Google and IBM are fastest for low concurrency

» But are often slower than AWS for high concurrency



» IBMF and IBMT are the fastest when spawn 100 functions

Conclusion

» Classical cold start effects on AWS only

» Google’s cold start is HOT compared to its spawn start!

» AWS is not affected by the spawn start
  - **But, IBM (15.5s) and Google (12.6s) are affected**

» Be aware, all functions of a parallel loop lie on the critical path
  - **Delaying even a single function affects makespan**

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