Performance Engineering: New and Conflicting Trends

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Alex Podelko

- Specializes in performance since 1997
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  - Before worked for MongoDB, Oracle/Hyperion, Intel, and Aetna
- SPEC RG Steering Committee Member

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Performance Topics Getting More Attention

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Algorithmic Complexity

- Time Complexity
- Space Complexity
- Big-O notation

Almost in every interview around the globe !

- Connect it with practical performance engineering?

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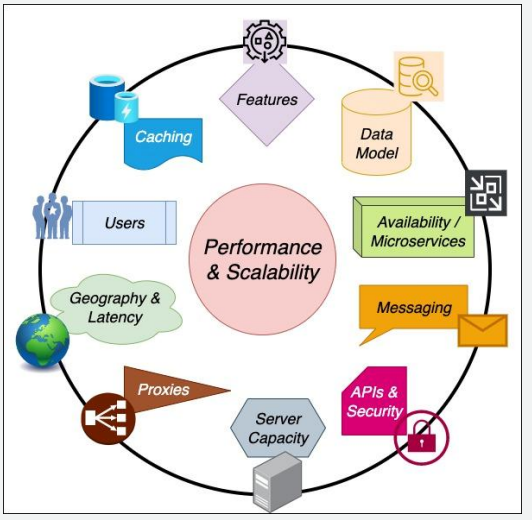
System Design Interview Cheat Sheet
by Vahid Dejwakh

Just ***an example*** of the changing attitude



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AWS Well-Architected Framework

The 6 Pillars of the AWS Well-Architected Framework

- Operational Excellence
- Security
- **Reliability**
- **Performance Efficiency**
- **Cost Optimization**
- Sustainability

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Well-Architected Trend Across the Industry

- Azure Well-Architected Framework
  - Pillars: Performance Efficiency, Cost Optimization, etc.
- Google Cloud Well-Architected Framework
  - Pillars: Performance Optimization, Cost Optimization, etc.
- Well-Architected Framework for Oracle Cloud Infrastru
  - Pillars: Performance and Cost Optimization, etc.

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Adjusting Performance Engineering to Major Industry Trends

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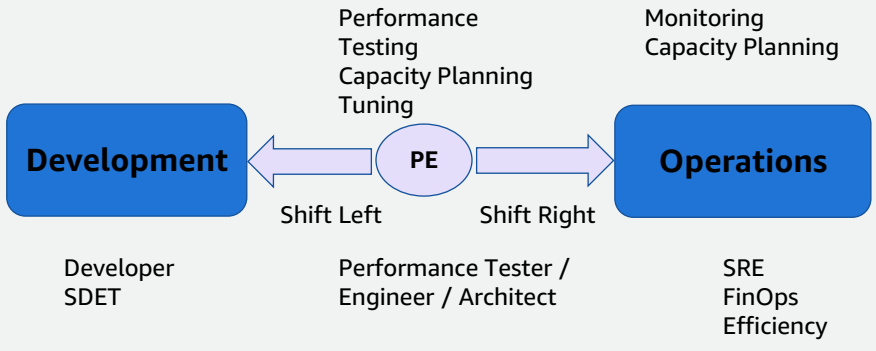
What Changed?

- Web
  - Centralization
  - Open / unlimited workload
- Cloud
  - Further centralization [chargeback – direct cost to performance correlation]
  - Dynamic configurations / Self-Management
- Agile / iterative development
  - Continuous Integration / Delivery [fuzzier line between Dev and Ops]

[The Past, Present, and Future of Performance Engineering]

Integrating Performance Engineering into DevOps



Expand or be Squeezed Out ?

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Performance Engineering as an Independent Discipline

- Not well defined, no agreed Body of Knowledge, no certifications
- Fractured
  - Performance Testing
  - Web Performance
  - Capacity Planning
  - Etc.
- No significant developments recently [comparing to the increased attention]
  - Most developments are in integrated areas

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Decreased Attention - Queuing Models

- An important approach, but not the foundation [anymore]
- Multi-core servers, horizontal scalability, and not using servers to 100% probably allow using linear models in many cases
- The hard-core queuing theory probably belongs to graduate studies (where it landed anyway)
- "Black Box" ML models are not a replacement

The Forgotten Art of Performance Modeling

Decreased Attention - Load Testing Tools

- Performance engineering shifted to
  - Other ways to mitigate performance risk
  - More closely integrated continuous performance testing
    - Proprietary solutions
- Never got track in academia anyway
  - Traditional record / playback approach (with correlation and parameterization) has some didactic value

DevPerfOps Foundation

- A new attempt to consolidate Performance Engineering
  - Taking a holistic approach not limiting to technical issues only.
  - DevPerfOps manifesto states "Performance is not just a technical issue, but a business driver. We believe that performance directly impacts user satisfaction, brand reputation, and ultimately, business success."
  - https://devperfops.org

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Shift Left
Integration with Development

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Adjusting to Agile and CI/CD

- Agile development completely changes the performance testing dynamics
  - Working system on each iteration from the beginning
  - You need a performance engineer for the whole project
    - **Savings come from detecting problems early**
- Traditional Performance Engineering teams don't scale well
  - Increased volume exposes the problem
    - Early testing
    - Each iteration
- Remedies: automation, making performance everyone's job (->"Shift Left")

Early Testing - Mentality Change

- Making performance everyone's job
- Late record/playback performance testing -> Early Performance Engineering
- System-level requirements -> Component-level requirements
- Record/playback approach -> Programming to generate load/create stubs
- "Black Box" -> "Grey Box"

Need for Continuous Performance Testing

- Integration into Agile and CI/CD
  - To catch regressions early
  - Collecting all info needed to investigate
  - From realistic testing to coverage, from SLO checking to differences between builds
- Foundation to build further automation on the top of it
  - For further performance optimization

Continuous Performance Testing

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Challenges of Continuous Performance Testing

- Integration
- Coverage Optimization
- Variability / Noise Reduction
- Change Detection
- Advanced Analysis
- Operations / Maintenance

Modern Challenges in Performance Testing

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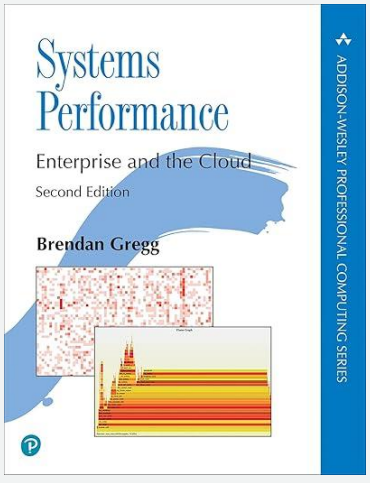
Systems Performance Book



- 886 pages
  - Modeling, 7 pages – including USL and Queueing theory
  - Large detailed sections on OSs, CPUs, Memory, File Systems, Disks, Network, perf, Ftrace, BPF

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Shift Right Integration with Operations

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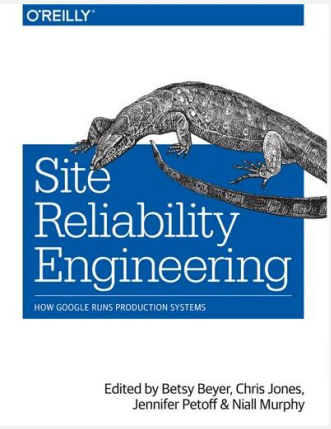
Observability

- Significant advances in tools (under observability umbrella)
  - Allow to do more PE work in production
    - In spite of more sophisticated environments
  - Three pillars: metrics, logs, traces
  - Further PE integration with operations
- [Notion: Systems are too complex to properly test / reproduce problems]

Site Reliability Engineering (SRE)



- Tenets of SRE
  - "SRE team is responsible for the **availability, latency, performance, efficiency, change management, monitoring, emergency response, and capacity planning** of their service(s)."
  - None is considered separately in principles and practices
    - Except Service Level Objectives

FinOps

- FinOps Foundation www.finops.org
  - Organization, framework, certifications, etc.
- Focus on cost
- The Foundation making drastic steps to expand
  - Cost-Aware Product Decisions
  - The Scope of FinOps Extends Beyond Public Cloud

AWS Cloud Financial Management

The four pillars of Cloud Financial Management.

- From Cost Optimization Pillar
- Cloud Financial Management with AWS

Summary

- Systems scale and sophistication skyrocket – performance gets more attention
- Performance engineering is adjusting to major industry trends
  - First of all, cloud computing and agile development
- Performance engineering gets more integrated
  - Both with development (“Shift Left”) and operations (“Shift Right”)
  - More difficult to define the performance engineering body of knowledge

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Thank you!

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