

SOFTWARE ARCHITECTURE AND PERFORMANCE RESEARCH:

Are we planning a Maginot Line to face a Blitz Krieg?

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Between the two World Wars France built subterranean fortresses from her eastern border up to Belgium- The Maginot Line. The German attack through the Belgian Ardennes in May 1940 by-passed the fortifications, allowing the Wehrmacht to sweep through and take the last fortress- Fort de Villy -la-Ferté - in the French Ardennes. The 105-men of the garrison refused to surrender, and died resisting the invader.



Where Do Things Sit Now?

Some Current Facts

- **Most modern software systems are integrated atop components**
- **Applications are moving to a web-based delivery paradigm, and this trend will accelerate**
- **Software platforms, their frameworks, and are continuously and independently updated, node-by-node, using web-based software download mechanisms**

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Implications

- **Architectures will increasingly consist of software frameworks intended to enable or support components yet to be written**
- **Software frameworks and components will evolve independently - the combinations of deployed software will be too large to analyze rigorously in advance of deployment**
- **Software will be deployed on a widely varying set of hardware nodes – so assumptions made about the capabilities of nodes might prove invalid in specific situations**

Where Will Things Move Tomorrow?

Some Current Trends

- **Industry developing self-configuring software paradigms where a software service can be deployed, discovered, and configured for use by any client.**
- **Even embedded systems will become extensible with new components downloaded over time.**
- **Distributed systems will increasingly operate within mobile and wireless networks where continuous connectivity can neither be assumed nor assured, and where the quality of communications bandwidth can vary greatly.**

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Implications

- **Clients can download various implementations for the same service interface, and see starkly different performance characteristics**
- **When software is designed to operate over network connectivity, which can vary in quality, performance predictions that depend on the characteristics of the communication channel can prove highly inaccurate**
- **Clients might wish to consider the performance characteristics of alternative implementations of discovered services; but the performance of the services will likely depend in part on the number of clients using the services**

Some Software-Performance-Prediction Questions for the coming Blitz-Krieg

- **Will all software frameworks, components, and node platforms need to have a model of their own performance embedded in them?**
- **Will node software need to maintain a current, executing simulation model of its own performance running in parallel with itself in order to predict the performance of the software frameworks and components downloaded into a node?**
- **Will software components need to inquire about the capabilities and expected performance among a set of nodes in order to select a node to execute on so that the performance requirements can be satisfied?**
- **Can application software predict performance expectations while also exploiting the potential robustness in redundant nodes and services in a distributed network?**
- **Will nodes and components benefit from built-in performance measurement gauges that can accumulate historical performance data in an effort to better inform predictions of future performance?**
- **Can software architectures be designed to adapt their deployment of components in different ways in order to provide specified performance guarantees in the face of varying capabilities and utilizations among the underlying physical resources ?**

Bottom Line

Tomorrow's software environment will look more like Today's trends and less like Yesterday's failures.

Is our current research aimed at solving yesterday's problems or at addressing tomorrow's software performance needs?

WOSP should aim to identify tomorrow's software performance needs and to discuss research directions to help meet those needs.