

Hyper-Aether: A Vision for AI-Native Computing Based on VM Fabric

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Abstract

We propose Hyper-Aether, a vision for AI-native computing in which software systems are constructed as dynamically generated execution structures.

At the core of Hyper-Aether is VM Fabric, which organizes AI-generated virtual machines into a structured execution graph.

VM Fabric enables ensemble computation as a native execution model, allowing improved reliability through structured redundancy.

1 Introduction

Modern computing systems rely on manually written programs and human-designed architectures. This approach introduces complexity, inflexibility, and high development cost.

Hyper-Aether proposes a new paradigm in which both computation and system structure are generated automatically from user specifications.

In this model, execution is no longer centered on a single program, but on a dynamically constructed structure of interacting components.

2 VM Fabric

VM Fabric is the core execution abstraction of the Hyper-Aether architecture.

It represents computation as a network of virtual machines (VMs) connected through controlled communication channels.

Formally, VM Fabric is defined as:



Figure 1: Comparison between conventional systems and VM Fabric. The proposed architecture replaces static programs with dynamically generated execution structures.

$$\mathcal{F} = (V, E)$$

where V is the set of VMs and E represents communication relationships.

This abstraction allows computation to be expressed as a graph structure rather than a sequential program.

3 Comparison with Conventional Systems

Conventional systems follow a linear pipeline from specification to program execution.

In contrast, Hyper-Aether replaces this pipeline with a generative process that produces execution structures directly.

4 Example: AI Ensemble

VM Fabric naturally supports ensemble computation, where multiple components independently solve a task and their outputs are combined.

This is particularly useful for AI workloads, where outputs are probabilistic.

5 Reliability Improvement

One advantage of ensemble computation is improved reliability.

If each component has probability p of producing a correct result, then combining multiple components increases overall correctness.

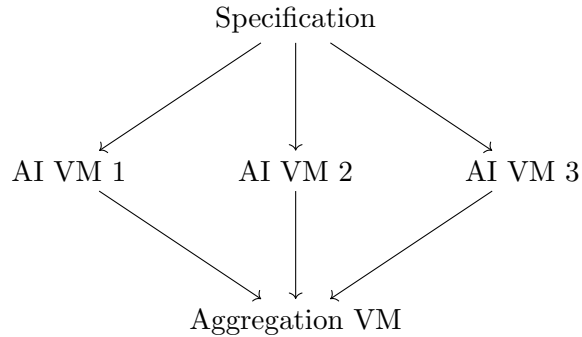


Figure 2: Ensemble computation in VM Fabric. Multiple AI VMs generate candidate outputs, which are aggregated into a final result.

This demonstrates that VM Fabric can improve system robustness through structured redundancy.

6 Cost-Reliability Trade-off

Increasing the number of VMs improves reliability, but also increases computational cost.

This introduces a trade-off between accuracy and efficiency.

This shows that VM Fabric enables systematic optimization of execution strategies.

7 Limitations

This work is conceptual and has several limitations.

- no implementation yet
- dependence on AI quality
- potential performance overhead

8 Conclusion

Hyper-Aether introduces a new computing paradigm based on VM Fabric.

By representing computation as dynamically generated structures, it enables flexible, modular, and reliable AI-native systems.

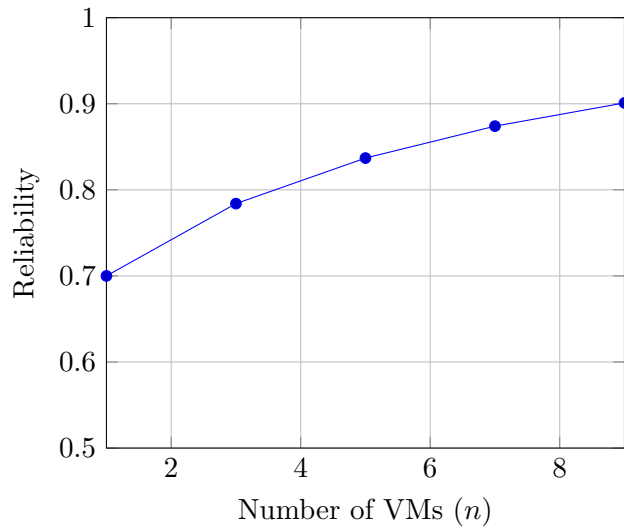


Figure 3: Reliability improves as the number of VMs increases.

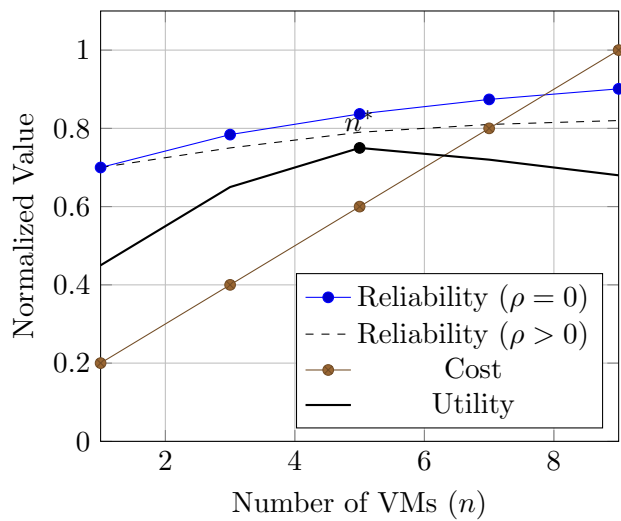


Figure 4: Trade-off between cost and reliability. An optimal ensemble size n^* exists.