

Towards Federated Architecture Knowledge Management: Practices for Scalable, Collaborative Modeling

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Abstract—

As architectural and organizational complexity grows, organizations increasingly struggle to maintain architecture repositories that remain accurate, coherent, and usable. In practice, monolithic repositories often fail to scale, becoming inflexible, outdated, and difficult to govern. This leads to inconsistencies, duplicated modeling efforts, and reduced trust in architectural documentation. We introduce a federated repository approach developed and implemented within a large organization with over fifty architects. The approach distributes architectural models across multiple separated repositories, supported by mechanisms such as the separation of ABBs and SBBs, the use of proxy elements for cross-repository referencing, and a unified publication layer based on a semantic wiki. This creates a modular yet integrated architectural knowledge repository that aligns more closely with the realities of distributed architectural work. The experience shows that this approach significantly improves maintainability, collaboration, and reuse, offering a practical and scalable alternative to traditional monolithic repositories.

I. INTRODUCTION

Organizations increasingly struggle with maintaining architecture repositories that are accurate, coherent, and usable across multiple teams and domains. As enterprise landscapes grow in architectural and organizational complexity, traditional monolithic repositories often become a barrier rather than a support mechanism. Teams depend on shared architectural knowledge, yet centralized modeling repositories frequently become too large, too inflexible, or too outdated to guide actual design work. This decreases the trust in documented architecture, and increases the risk of inconsistent architectures, duplicated modeling efforts, and poor decision transparency.

We introduce a federated approach to architectural knowledge management that has been designed and implemented in the context of a large organization with over fifty architects. The method is grounded in real world architectural practice and proves to be scalable, provide distributed responsibilities, and manage varying modeling styles. By structuring architectural knowledge across multiple independent yet connected repositories, the approach provides a practical alternative to

monolithic repositories and improves collaboration, maintainability, and reuse.

II. CONTEXT

The organization that serves as the context for this work has adopted ArchiMate 3.2 [5] for architectural modeling and TOGAF 10 [6] as architecture methodology and framework. Despite this clear methodological foundation, the central repository had gradually become outdated, inconsistent, and difficult to navigate. Architectural knowledge was fragmented across domains, and the lack of clear ownership of ArchiMate elements led to uncertainty about which parts of the model were approved and which were purely conceptual. Architects found it increasingly challenging to find accurate information and struggled to ensure alignment between domains.

This situation is familiar to many architecture teams. As organizations grow, architectural knowledge does not scale at equal pace. Different teams grow at different speeds, domain boundaries shift, and no central team can maintain a repository that remains aligned for all participants. This is especially true when architectural maturity varies across domains, or when resources for repository maintenance are limited. A monolithic ArchiMate model promises coherence, but in practice it often collapses under the weight of its own centralization.

The federated approach presented here emerged directly from these challenges. Instead of maintaining a single centralized repository, the architecture models are divided according to responsibility and purpose. Each repository serves a specific context, yet all repositories are part of an integrated architecture model. In this way, the modeling environment begins to reflect how architecture is actually practiced within the organization.

III. NEW PRACTICES

Our federated approach combines established architectural principles with practical mechanisms that make distributed modeling feasible in current tools. The separation of Architecture Building Blocks (ABBs) and Solution Building

Blocks (SBBs) [7] plays an important role. ABBs, stored in core repositories, represent abstract services and reusable concepts. SBBs, stored in domain repositories, contain the implementations that realize these services. This separation aligns with architectural responsibilities and creates a natural division between conceptual and solution-level knowledge.

A new practice we introduce is the use of proxy elements. Although most modeling tools do not support cross repository references [3], architects often need to use specific solutions developed in other domains. Proxy elements solve this by offering skeleton representations of SBBs in the core repository. These proxies carry minimal metadata but preserve identity and enable relationships across repositories without importing full models. They are essential for connecting detailed domain models while maintaining the independence of each repository. A modeling implementation is provided in Fig. 1, where the orange elements are managed in a core repository and the green element in a domain repository.

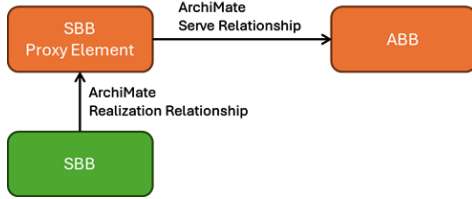


Fig. 1. Relations among the ABB, the SBB and the connecting SBB Proxy Element. The orange elements are located in the Core Repository; the green element in the Domain Repository.

Another important practice is the integration of all repositories into a single publication environment: a semantic wiki [2], [4]. It brings together the approved ArchiMate elements of all repositories and presents it as an integrated whole, as shown in Fig. 2. This prevents fragmentation while keeping modeling activities distributed. Stakeholders can navigate business processes, services, data structures, applications, and technical components without needing to know which repository each item came from and without needing to access the modeling tool itself.

IV. RELEVANCE FOR PRACTITIONERS

We believe that the approach is highly relevant for practitioners who struggle with the scalability of their architectural knowledge repository. Many organizations face tool limitations, complex governance structures, and distributed architectural responsibilities. This federated approach provides a method for managing these challenges, without relying on idealized or unavailable tool capabilities. It also supports organizations that are transitioning from document centric architecture practices to model centric ones.

V. PRACTICAL INSIGHTS TO BE SHARED

The talk associated with this proposal will demonstrate a practical implementation of the federated repository approach using Archi [1] and a semantic wiki-based publication environment, but also techniques for managing architectural reuse

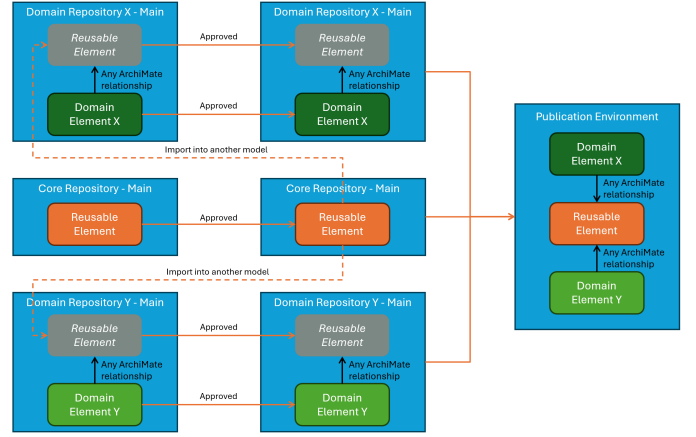


Fig. 2. A core repository and two domain repositories with reusable elements (orange; ABBs and SBB proxies) and domain elements (green; SBBs) that are published to an integrated publication environment.

across repositories, and workflows for maintaining consistency through Git version control. Special attention will be given to the process that supports distributed development, including approval cycles, domain autonomy, and the handling of changes in shared elements. The audience will gain insights into how architects can work in parallel without losing control over the overall architecture and how federated modeling can reduce complexity while improving collaboration.

VI. CONCLUSION

The federated approach to architectural knowledge management offers a practical and effective alternative to monolithic repositories. It embraces the divided nature of architectural work, improves the clarity and maintainability of architectural models, and prepares organizations for future developments. Although current tools impose limitations, the approach has already demonstrated its value in daily practice for a substantial group of architects.

REFERENCES

- [1] Beauvoir, P., Sarrodie, J.B.: Archi - Open Source ArchiMate Modeling (2025), <https://archimatetool.com>
- [2] de Boer, R.C.: Archimedes - publication and integration of architectural knowledge. In: 2017 IEEE International Conference on Software Architecture Workshops (ICSAW). pp. 268–271 (2017). <https://doi.org/10.1109/ICSAW.2017.22>
- [3] de Boer, R.C.: Architecture knowledge graphs-a next step in architecture knowledge management. In: Proceedings of the 1st International Workshop on New Trends in Software Architecture. pp. 22–25 (2024)
- [4] de Boer, R.C., van Vliet, H.: Experiences with semantic wikis for architectural knowledge management. In: 2011 Ninth Working IEEE/IFIP Conference on Software Architecture. pp. 32–41 (2011). <https://doi.org/10.1109/WICSA.2011.14>
- [5] The Open Group: ArchiMate 3.2 Specification (October 2022)
- [6] The Open Group: The TOGAF Standard. 10th edn. (2025)
- [7] The Open Group: The TOGAF Standard, chap. 5. Building blocks. 10th edn. (2025)