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Article

The Future of Enterprise Integration Leveraging Low-Code Middleware and Legacy Modernization Techniques

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Abstract: Enterprise architecture (EA) is a discipline that is becoming increasingly important for businesses that are undergoing digital transformation. EA encompasses the practice of designing and managing the entire architecture of an organization, including its business processes, information systems, and technology infrastructure. In this paper, we will explore the main objectives of EA in digital transformation and the ways in which EA can help businesses achieve their digital transformation goals. Enterprise architects can use MicroServices technology to enable digital transformation by designing the MicroServices architecture, establishing best practices and standards, supporting tools such as DevOps, aligning with the enterprise's cloud strategy, and enabling data integration. Decision makers can use enterprise architecture with MicroServices to make digital transformation by leveraging the benefts of MicroServices architecture to achieve their digital transformation goals.

Keywords: MicroServices, Digital transformation, Enterprise architect

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INTRODUCTION

The primary aim of Enterprise Architecture (EA) in the context of digital transformation is to synchronize an organization's technological framework with its strategic objectives. This entails developing a comprehensive and unified architectural design that allows the enterprise to remain agile amid ongoing technological advancements. One of the central functions of EA is to cultivate a dynamic and adaptable IT environment. Given the constant emergence of new technologies and shifting market dynamics, organizations must maintain the ability to pivot swiftly and efficiently.

To address this, EA offers a structured methodology for creating and sustaining infrastructure that is not only scalable and robust but also capable of evolving alongside organizational needs. Furthermore, EA contributes to ensuring that the digital infrastructure complements and enhances business operations. It emphasizes the integration of IT systems with operational workflows, avoiding the risk of technology becoming a barrier rather than a support system. By implementing well-aligned architectural practices, EA ensures that technological tools are cohesively embedded within the operational fabric of the enterprise.

Microservices architecture is instrumental in accelerating digital transformation. This modular approach decomposes software into independently deployable components, granting businesses greater flexibility and speed in embracing innovations and meeting consumer expectations. Additionally, it facilitates seamless interaction with external platforms and application programming interfaces (APIs), thereby improving operational efficiency and enriching the end-user experience. This interoperability is especially crucial in

sectors such as banking and healthcare, where streamlined data exchange is vital.

In the realm of digital transformation, EA also addresses the imperative of building secure and regulation-compliant systems. It guides the development of infrastructure that not only withstands cybersecurity threats but also adheres to industry-specific legal and procedural standards. By utilizing EA frameworks, organizations can systematically manage and evolve their IT environments in a manner that upholds security, reliability, and regulatory integrity.

This study is structured as follows: The introductory section provides an overview of digital transformation and explores how optimized architectural strategies can enhance infrastructure. The second section reviews prior research concerning enterprise architects, modular service design, and technological evolution. Section three presents a model that leverages Microservices within the EA framework to enhance system performance. Section four highlights experimental evaluations and their implications. The final section concludes the study and proposes directions for subsequent investigations.

Review of Existing Literature

In an era marked by continuous technological advancement, enterprises are increasingly driven to enhance their digital ecosystems to accommodate growing demands for efficiency, adaptability, and scalability. One of the prominent methodologies emerging in this context is the Enterprise Architecture (EA) model centered around Microservices. This architectural strategy has attracted considerable scholarly and practical interest for its capacity to modernize organizational infrastructure and align it with digital innovation initiatives [1, 20].

How Enterprise Architecture Supports Digital Innovation

Enterprise Architecture offers structured strategies and foundational principles that guide organizations through their digital evolution. By applying these structured models, enterprises can more effectively incorporate technology into their core operations, leading to meaningful business transformation. The contribution of EA to achieving digital milestones can be observed in various strategic areas:

- **Strategic Planning for Technological Advancement**

EA helps construct a clear and actionable blueprint that aligns IT capabilities with organizational vision. This strategic framework assists in identifying vital technologies and operational methods necessary for fulfilling digital ambitions and long-term objectives.

- **Boosting Responsiveness and Operational Fluidity**

Through EA, organizations can engineer IT systems that are modular, adaptable, and scalable. Such infrastructure promotes swift adaptation to evolving industry trends, customer expectations, and competitive pressures, ensuring organizational agility.

- **Encouraging Technological Innovation**

A core function of EA is to nurture an environment where creative solutions and experimental technologies can flourish. This enables quicker development of novel offerings and enhances the organization's responsiveness to emerging market demands.

- **Strengthening Internal Connectivity and Synergy**

EA frameworks support the creation of integrated systems that facilitate smooth interaction among various business functions. This minimizes departmental fragmentation, promotes cohesive teamwork, and enhances overall communication across the enterprise.

- **Maintaining Integrity and Regulatory Alignment**

Another significant benefit of EA lies in establishing robust and secure digital foundations that adhere to legal, ethical, and industry-specific regulations. These systems are designed to safeguard confidential information, ensure regulatory conformity, and minimize risk exposure, thereby maintaining trust and operational resilience [10].

Uses of Enterprise architect with MicroServices technology enable digital transformation

Enterprise transformation in the digital age can be significantly advanced through the strategic deployment of Microservices by enterprise architects. These professionals can harness the capabilities of Microservices in numerous impactful ways, as outlined below:

- **Architectural Planning and Service Structuring**: Architects can collaborate with software engineering teams to outline a service-based infrastructure that supports organizational modernization goals. This involves deconstructing monolithic applications into independent service units, defining inter-service communication protocols, and setting up oversight mechanisms to guarantee the framework remains scalable and easy to maintain over time.
- **Developing Uniform Guidelines and Protocols**: Architects play a crucial role in establishing unified rules for creating service-based components. This includes formulating development protocols, implementing cybersecurity frameworks, and standardizing deployment workflows. Such measures foster consistency across development efforts and facilitate seamless integration with the organization's current technological ecosystem.
- **Promoting Agile Operations through DevOps**: Service-oriented development thrives in environments where continuous integration and delivery are prioritized. Architects can bolster agile operations by designing infrastructure and tooling that support automated testing, iterative releases, and streamlined deployments, ensuring development, validation, and rollouts occur efficiently and cohesively.
- **Incorporating Cloud-Native Principles**: The modular nature of service-oriented systems aligns well with cloud computing models. Architects can optimize service deployment by selecting suitable cloud platforms and ensuring that each

component leverages the cloud's elastic resources and distribution capabilities. This alignment enables responsive scaling and geographic distribution based on demand.

- **Facilitating Unified Data Access and Interoperability**: By dismantling isolated data repositories, architects can design systems that encourage enterprise-wide information flow. They can specify shared data frameworks, interaction interfaces, and regulatory policies to ensure that information circulates securely and seamlessly between services, supporting informed decision-making and operational cohesion.

Digital transformation with MicroServices

In the evolving landscape of financial technology, the adoption of Microservices has become a cornerstone in the journey toward digital transformation. Financial institutions, including banks and investment firms, are increasingly shifting from monolithic legacy systems to more modular and agile architectures. This transformation begins with a clear understanding of the strategic imperatives of the organization. It is critical for decision-makers to first pinpoint the fundamental objectives that the enterprise aims to accomplish. This involves a thorough examination of long-term goals, operational pain points, and areas where agility, scalability, or technological modernization is essential. The purpose of this initial step is to ensure that the transition to a Microservices-based ecosystem is not only technically sound but also aligned with the broader mission and competitive vision of the organization. A clear alignment between the technological evolution and the business strategy helps maintain focus, prioritize resource allocation, and measure success effectively.

Once the business drivers have been clearly articulated, the next phase involves the architectural redesign of the existing system. This entails deconstructing the large, monolithic application infrastructure into discrete, autonomous components that can function and evolve independently. These individual modules, each responsible for a specific functionality, are the building blocks of the Microservices architecture. Designing such a framework requires a deep understanding of system interdependencies, data flows, and functional boundaries. Each service should encapsulate a specific business capability and operate in isolation to ensure that changes or failures in one do not disrupt the functioning of others. Careful consideration must be given to how these services will communicate, manage data consistency, and handle errors to ensure reliability and robustness. The goal is to create an architecture that supports continuous integration and delivery, making the system more adaptable to evolving user needs and regulatory requirements.

Following the architectural blueprint, the development phase takes center stage. This involves building each Microservice using the most suitable programming languages, frameworks, and databases, based on the nature and requirements of the individual service. During this stage, developers focus on writing clean, maintainable code while embedding essential features such as security protocols, scalability mechanisms, and fault tolerance. Each Microservice must be capable of handling its workload under varying conditions and must recover gracefully in the event of system failures. Special emphasis is placed on ensuring that each module adheres to common standards and governance policies to maintain consistency across the distributed system. Incorporating automated testing and version control during development is also vital to uphold software quality and streamline future updates.

After the services are developed and have passed preliminary validation, they must be deployed to an operational environment. In contrast to traditional deployment methods where all components are installed as a single unit, Microservices require a more nuanced approach. Each service is typically deployed in its own lightweight container or virtualized instance. These containers ensure operational isolation, facilitate resource allocation, and simplify scalability by allowing individual services to be scaled up or down based on demand. This independent deployment also makes it easier to roll back faulty updates without impacting the rest of the system. Sophisticated orchestration tools such as Kubernetes or Docker Swarm may be employed to automate the deployment, scaling, and management of containers, enhancing system resilience and maintainability.

Once the services are live, an essential step is to establish efficient mechanisms for service discovery and external communication. Given the dynamic nature of Microservices, where instances can be frequently added or removed, service discovery tools help in maintaining an up-to-date registry of active services. These tools enable services to locate each other without hardcoding IP addresses or hostnames, fostering flexibility and dynamic scalability. Concurrently, implementing an API gateway becomes crucial. This acts as a single entry point for external clients to interact with various internal services. The gateway can handle tasks such as authentication, request routing, rate limiting, and load balancing, thereby simplifying the client-side interaction and enhancing system performance and security.

The next imperative in the transformation process is the integration of observability tools to monitor system health and gather actionable insights. Continuous monitoring and centralized logging provide real-time visibility into application performance, detect anomalies, and assist in proactive incident management. Metrics such as response times, throughput, error rates, and resource utilization are tracked to ensure that the system is performing within acceptable thresholds. Logging, on the other hand, captures detailed records of system activities, which are invaluable for debugging and post-incident analysis. Implementing solutions like Prometheus for monitoring and ELK stack for logging allows organizations to build a robust observability layer that contributes to operational excellence and service reliability.

Comprehensive testing is the next essential phase before the system can be considered production-ready. This involves validating each individual service to ensure it performs its intended function under normal and extreme conditions. Beyond unit and integration testing, emphasis is also placed on testing the interplay between multiple services, including how they handle data exchange, respond to API requests, and react to service failures. Simulations of real-world scenarios help identify

bottlenecks, latency issues, and potential points of failure. Testing also ensures that the implemented services meet the original business requirements and provide a seamless user experience.

Lastly, it is important to recognize that the implementation and deployment of Microservices is not a one-time activity but an ongoing journey. The system must be continually evaluated and refined based on performance feedback, business evolution, and technological advances. Agile methodologies and DevOps practices can facilitate rapid iterations and continuous improvement. Regular audits, code reviews, and performance tuning ensure that the Microservices ecosystem remains robust, secure, and aligned with organizational goals. Feedback loops should be established to collect insights from users, developers, and operators to guide future enhancements and innovations.

In conclusion, transitioning to a Microservices-based architecture in the financial sector involves a meticulous, phased approach. From defining business imperatives to architecting modular services, developing and deploying them independently, implementing discovery and gateways, monitoring system behavior, conducting rigorous testing, and continuously improving the ecosystem—each stage contributes to building a responsive and future-ready digital infrastructure. This transformation not only enhances operational agility and system resilience but also positions financial institutions to better meet the demands of a fast-paced, technology-driven marketplace.

Challenges that face to implement EA in digital transformation

The adoption of Enterprise Architecture (EA) as a strategic enabler in digital modernization initiatives has become increasingly significant for organizations aiming to enhance efficiency, adaptability, and technological alignment. Despite the transformative potential EA offers, businesses often encounter multiple hurdles when attempting to embed it into their broader digital reinvention efforts. These impediments, if not addressed thoughtfully, can hinder progress and dilute the value derived from transformation initiatives.

One of the most pervasive barriers organizations encounter is the cultural and psychological resistance among internal stakeholders. The introduction of EA frameworks frequently necessitates a fundamental rethinking of long-established operational methods, workflows, and hierarchies. Employees, particularly those accustomed to legacy systems or manual processes, may feel threatened by the overhaul of their roles, tools, or responsibilities. This sense of uncertainty or fear can result in active or passive opposition to change. Leadership must therefore not only provide clear communication about the intended benefits but also engage in persistent advocacy and training to alleviate concerns and foster a culture that embraces innovation and flexibility. Without buy-in at multiple levels of the organization, even the most well-designed architectural strategies risk stagnation or rejection.

Equally pressing is the gap in technical competencies and architectural knowledge required to conceive, implement, and maintain complex enterprise-wide frameworks. Many organizations, particularly those in traditional sectors or smaller firms, may not have access to professionals with advanced knowledge in architecture modeling, digital systems integration, or IT governance. The shortage of talent familiar with modern architectural methodologies can lead to inefficient designs, inconsistent implementation, or costly errors. This challenge is compounded by the rapid evolution of technology, which demands that architectural teams continuously update their knowledge base and tools. When internal expertise is lacking, organizations may need to engage consultants or specialized firms, which introduces additional cost and dependency considerations.

Another significant obstacle arises from the presence of deeply entrenched legacy systems. These outdated platforms, often developed over years or even decades, are typically monolithic, poorly documented, and resistant to change. Integrating contemporary digital solutions with these older systems can be technically complex and financially burdensome. The inability to ensure seamless interoperability between existing and emerging technologies can significantly delay transformation timelines. Moreover, many legacy platforms were not designed with scalability or flexibility in mind, making it difficult to adapt them to newer business requirements without extensive re-engineering. Transitioning from these rigid infrastructures to agile and modular solutions calls for meticulous planning, risk management, and often, phased implementation strategies to avoid operational disruption.

Strategic ambiguity represents another key issue. While most organizations are motivated by the desire to evolve digitally, there is often a lack of clarity regarding what specific outcomes they are aiming for through EA. Without well-defined goals, milestones, and performance indicators, enterprise architecture initiatives can become misaligned or directionless. This vagueness can result in fragmented efforts where different departments pursue divergent priorities, ultimately leading to duplication of efforts, resource wastage, and suboptimal results. A successful implementation demands precise articulation of the transformation's objectives—whether the aim is cost optimization, improved customer experience, data-driven decision-making, or enhanced agility—so that architectural efforts are purpose-driven and measurable.

Budget limitations pose yet another formidable barrier. Rolling out a comprehensive enterprise architecture initiative entails substantial investment—not only in software tools and digital platforms but also in infrastructure upgrades, talent acquisition, and process reengineering. For organizations operating under tight fiscal conditions or dealing with competing financial obligations, allocating sufficient capital to such long-term endeavors can be difficult. In many cases, executives may be reluctant to commit resources without immediate returns, leading to piecemeal or underfunded implementations that fail to deliver strategic value. Developing a robust business case, complete with cost-benefit analyses and risk mitigation plans, becomes essential to justify investments and gain executive sponsorship.

In today's data-centric economy, the challenges related to information governance cannot be overstated. The growing volume, velocity, and variety of data that organizations must manage as part of their digital transformation present

significant issues around quality assurance, access control, and regulatory compliance. Implementing EA within such an environment necessitates stringent data stewardship policies. Concerns around data security, such as unauthorized access, breaches, or data misuse, are particularly pronounced in sectors like finance, healthcare, and government services. Inadequate data architecture within the EA framework can lead to data silos, inconsistent reporting, and vulnerability to cyber threats. Establishing clear policies on data ownership, encryption, lifecycle management, and compliance with international standards such as GDPR or HIPAA is essential for mitigating these risks and ensuring reliable, secure data flow across the enterprise.

The interplay of these challenges reveals that integrating enterprise architecture into the digital shift is a multifaceted endeavor that requires not only technical prowess but also strategic foresight, organizational maturity, and sustained commitment. It demands a cohesive roadmap that considers not just the technological building blocks but also the human and financial elements that influence transformation outcomes. Each of these obstacles—be it cultural inertia, resource inadequacy, technological debt, unclear direction, fiscal restraint, or data vulnerabilities—must be tackled through targeted strategies that balance ambition with pragmatism.

Organizations seeking to harness the full potential of EA in digital evolution should begin by cultivating a forward-thinking mindset across all levels of the business. Leadership should spearhead initiatives that promote adaptability, open dialogue, and continuous learning. Simultaneously, investing in training programs and knowledge-sharing platforms can bridge skill gaps and empower internal teams. With regard to legacy systems, adopting a modular approach to modernization—such as containerization, APIs, or middleware solutions—can ease integration pains while ensuring business continuity. To address the issue of unclear goals, leaders should work collaboratively with stakeholders to define clear value propositions, success metrics, and feedback loops that guide the transformation journey.

Budgetary constraints can be managed through phased rollouts and prioritization of high-impact use cases that demonstrate quick wins, thereby building momentum and credibility for broader investment. In parallel, strengthening data governance mechanisms and cybersecurity frameworks is crucial to establishing a secure, compliant, and trustworthy digital foundation.

While the road to embedding enterprise architecture into digital transformation is fraught with complexities, these challenges are not insurmountable. Through strategic planning, capacity building, and robust stakeholder engagement, businesses can overcome these barriers and unlock new levels of innovation, efficiency, and competitiveness. EA, when implemented thoughtfully, serves not just as a blueprint for technology integration but as a dynamic tool for navigating the digital age with resilience and clarity.

Practices for Enterprise Architecture in Digital Transformation

In the evolving landscape of digital transformation, adopting Enterprise Architecture (EA) as a core strategic capability demands meticulous planning and execution. For organizations to leverage EA effectively and align it with their broader transformation ambitions, a set of key practices must be thoughtfully implemented. These guiding principles ensure that EA not only supports but actively drives innovation, agility, and sustained value creation throughout the digital journey.

The first and foremost practice is anchoring architectural efforts in the organization's long-term vision and mission. Before initiating any architectural roadmap, leadership must possess a comprehensive insight into the enterprise's aspirations, market position, and anticipated growth trajectories. By doing so, decision-makers can ensure that architectural design is not operating in isolation but is intricately woven into the larger business narrative. This alignment facilitates prioritization of initiatives that deliver the highest strategic impact and ensures that technological developments serve real business needs rather than abstract innovation goals.

Equally critical is the establishment of a structured oversight mechanism to guide architectural activities. Effective EA implementation requires clearly defined processes for oversight, accountability, and decision-making. Setting up an appropriate governance model ensures that architectural plans are not derailed by ambiguity or misalignment. This model should outline who holds responsibility for what aspects of the architecture, how decisions are validated and escalated, and how consistency is maintained across initiatives. Having a robust oversight structure minimizes internal conflicts and promotes uniformity in architectural thinking, especially in large organizations with diverse business units.

Another best practice lies in promoting seamless cooperation across teams and functions. Successful digital transformation does not occur in silos—it thrives on integration and unity of purpose. EA should therefore act as a bridge between disparate departments, enabling synchronized planning and execution. Facilitating ongoing dialogue between technology experts, operational leads, and strategic planners ensures that architectural frameworks reflect the practical needs of end users and align with evolving business imperatives. By cultivating a culture of openness and collaboration, organizations can eliminate redundancies, enhance innovation, and ensure smoother implementation of enterprise-wide solutions.

Adaptability is also a cornerstone of modern architectural practice. In a digital environment where customer expectations, industry regulations, and technological trends shift rapidly, a rigid architectural approach can quickly become obsolete. Enterprises should design their architectural frameworks with flexibility in mind—favoring modular structures, scalable systems, and agile workflows that can evolve with the external landscape. This adaptability allows organizations to respond swiftly to disruption, experiment with emerging technologies, and iterate their digital services without major structural overhaul.

Moreover, any architectural initiative must give paramount attention to risk management, particularly in terms of data protection and regulatory compliance. In an era of increasing cyber threats and tightening data laws, architectural design must incorporate stringent safeguards

to protect sensitive information and maintain trust. This includes ensuring encryption standards, access control protocols, audit trails, and alignment with legal mandates such as GDPR or sector-specific regulations. Security should not be an afterthought but an integral aspect of the architecture, embedded from the planning phase through to deployment and monitoring.

The path to successful enterprise architecture in the context of digital transformation is guided by strategic alignment, robust governance, interdepartmental collaboration, structural flexibility, and a deep commitment to compliance and data integrity. Organizations that internalize and act on these foundational principles are far better positioned to navigate complexity, seize digital opportunities, and build a resilient future.

Practices for enterprise architecture in digital transformation

To achieve the objectives of EA in digital transformation, businesses should follow a number of best practices [12, 13]. These include:

- *Developing a clear understanding of the organization's strategic goals* Before embarking on an EA initiative, businesses should develop a clear understanding of

Table 1 Case No. 1

Operating system OS	CPU type	Service type
AIX	RISC	Web service

This experiment shows the performance of the CPU which has **RISC** CPU with web service work load, and the graph below shows performance of CPU and Memory their strategic goals and how EA can help to achieve them.

- *Establishing a governance framework* EA should be governed by a framework that includes clear roles and responsibilities, decision making processes, and communication.
- *Fostering collaboration and communication* EA should be designed and managed in a way that fosters collaboration and communication across different departments and business units. This can help break down silos and improve cross-functional collaboration.
- *Adopting a flexible and adaptable approach* EA should be designed and managed in a way that is flexible and adaptable in order to respond quickly to changing market conditions and emerging technologies.
- *Ensuring security and compliance* EA should be designed and managed in a way that ensures security and compliance with relevant regulations and standards.

Integrating new systems with legacy systems can be a significant challenge during digital transformation initiatives [14, 17]. Here are some strategies that businesses can use to address this challenge:

• *Develop a comprehensive integration strategy* A comprehensive integration strategy can help businesses to identify the most appropriate integration approach

Table 2 Case No. 2

Operating system OS	CPU type	Service type
AIX	RISC	MicroServices

This experiment shows the performance of the CPU which has **RISC** CPU with MicroServices work load and the graph below shows performance of the CPU and Memory and there is a difference between resources utilization MicroServices use and resources less than web service; the factor was change

in service type which here used MicroServices; the graph below shows enhancement performance

Table 3 Case No. 3

Operating system OS	CPU type	Service type
Windows	CISC	MicroServices

This experiment used the various OS with various types of CPU and the factor was change in service type which here used MicroServices; the graph below shows enhancement performance which led to saving resource, and just using resources on demand, this impacts quicker performance and faster I/O making the system highly responsive

Table 4 Case No. 4

Operating system OS	CPU type	Service type
Windows	CISC	Web service

Experiment used the same OS with the same type of CPU "CISC" CPU and the factor was change in service type which here used web service; the graph below shows difference in performance and resources utilization between web service and MicroServices; this display in the experiment web service consumed resources more than MicroServices; and this led to use of high resources and this led to more cost; the impact is slower performance and slower I/O making the system slower to respond and making organization consume resources more than needs

Table 5 Result case numbers 1, 2, 3 and 4

	OS	CPU type	Service type	Used CPU	Used Memory
Case No. 1	AIX	RISC	Web	2 Core	33 GB

			Service		
Case No. 2	AIX	RISC	MicroService	0.20 Core	6.7 GB
Case No. 3	Windows	CISC	MicroService	1.7 Core	20.3 GB
Case No. 4	Windows	CISC	Web Service	5.4 Core	48.6 GB

This table shows the difference of the performance results obtained in all experiments; we calculate the average CPU and Memory in 4 VM with the various aspects resources with different types of CPU and different types of Memory as observed in Table 5 between 4 VM with the various OS, and resources utilization in Case No. 2 is less than Case No. 1 and resources utilization in Case No. 3 is less than Case No. 4; this is because here MicroServices using this adaptive model assists to create infrastructure stable with recommended setup which needs each services and APP DB and WEB; this assists business to take right decision with fair cost without waste financial resources and infrastructure resources and gain the recommended performance that impacts market and client; and both of them gain the value from the highest quality of services and more profit with low cost for market

the same type of CPU and Memory which leads to saving cost for organizations. This helps to save resources and assists decision maker in making recommended decision; finally, its helps to assist application architecture in developing applications that use resources on demand; this impacts quicker performance and faster I/O making the system highly responsive

Table 6 Result case numbers 1 and 2

	OS	CPU type	Service type	Used CPU	Used Memory
Case No. 1	AIX	RISC	WEB Service	2 Core	33 GB
Case No. 2	AIX	RISC	MicroService	0.20 Core	6.7 GB

The comparison in Table 6 shows the result for case numbers 1 and 2 between web service and MicroServices in Case No. 1 and Case No. 2 with the same type of CPU and Memory; this experiment displays how MicroServices assist to save resources more than web service or traditional service with the same type of CPU and Memory; and this leads to a save cost for organizations; this assists to save resources and assists decision maker to make recommended decision finally assisting application architecture to develop applications that use resources on demand; this impacts quicker performance and faster I/O making the system highly respond

Table 7 Result case numbers 3 and 4

	OS	CPU type	Service type	Used CPU	Used Memory
Case No. 3	Windows	CISC	MicroService	1.7 Core	20.3 GB
Case No. 4	Windows	CISC	WEB Service	5.4 Core	48.6 GB

The comparison in Table 7 shows the result for case number 3 and 4 between web service and MicroServices in Case No. 3 and Case No. 4 with the same type of CPU and Memory; the various factor here is type of service; and this experiment displays how MicroServices assist in saving resource more than web service or traditional service with

Table 8 Result case numbers 1 and 4

	OS	CPU type	Service type	Used CPU	Used Memory
Case No. 1	AIX	RISC	WEB Service	2 Core	33 GB
Case No. 4	Windows	CISC	WEB Service	5.4 Core	48.6 GB

The comparison in Table 8 shows the result for case numbers 1 and 4 between web service and web service; the various factor here is CPU type in Case No. 1 and Case No. 4 with different types of CPU and Memory in Case No. 1 showing resources utilization less than Case No. 4 and this result shows how the type of CPU is considered an important factor in application architecture and infrastructure architecture which helps to save resources and this leads to save cost for organizations and assists decision maker in making recommended decision

Table 9 Result case numbers 2 and 3

	OS	CPU type	Service type	Used CPU	Used Memory
Case No. 2	AIX	RISC	MicroService	0.20 Core	6.7 GB
Case No. 3	Windows	CISC	MicroService	1.7 Core	20.3 GB

The comparison in Table 9 shows the result for case numbers 2 and 3 between

MicroServices and MicroServices; the various factor here is CPU type in Case No. 2 and Case No. 3 with different types of CPU and Memory in Case No. 2 showing less resources utilization than Case No. 3 and this result shows

how the type of CPU and service type are considered an important factor in application architecture and infrastructure architecture which helps to save resources and

this leads to save cost for organizations and assists decision maker in making recommended decision for each legacy system. This strategy should consider factors such as the age of the system, the complexity of the system, and the level of customization.

Implement middleware Middleware can help connect new systems with legacy systems, enabling data to flow seamlessly between the two. Middleware can also help to standardize data formats and protocols, which can simplify the integration process.

Leverage MicroServices architecture A MicroServices architecture can help businesses to break down legacy systems into smaller, modular components that can be updated and integrated more easily. This approach can help to reduce the complexity of integration and enable businesses to adopt new technologies more quickly.

Implement a data integration platform A data integration platform can help to integrate data from different systems, enabling businesses to gain a single view of their data. This can help improve decision

Fig. 1 Ways of using EA with digital transformation goals making and enable businesses to identify new opportunities for growth.

Use data mapping and transformation tools Data mapping and transformation tools can help to simplify the process of integrating data from different systems. These tools can enable businesses to map data fields from different systems and transform data into a format that can be easily integrated.

Best practices for implementing digital transformation

Fig. 2 Uses of EA with MicroServices technologies strategies

To successfully implement digital transformation strate-

help streamline business processes and reduce man- gies, businesses should follow a number of best practices ual work.[15, 16]. These include:

Adopt a phased approach Adopting a phased approach to integration can help minimize disrup- • *Develop a clear vision and strategy* Before embarktion to existing business processes. Businesses can ing on a digital transformation initiative, businesses start by integrating systems that are the least com- should develop a clear vision and strategy for how plex or that have the highest business value, and then they will use technology to achieve their goals. This gradually move on to more complex systems. should involve setting clear objectives, identify-

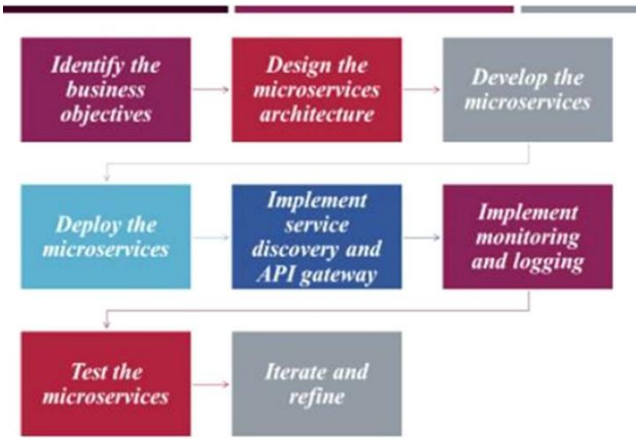

Fig. 3 The steps of implementation MicroServices in digital transformation

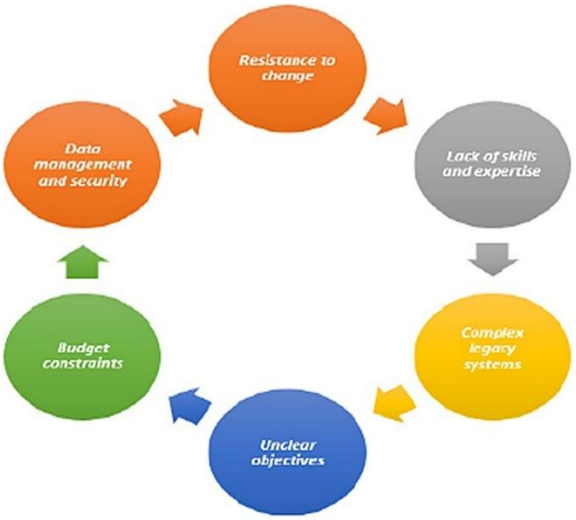

Fig. 4 The challenges of implementing EA in digital transformation

Fig. 5 EA practices for enterprise architecture in digital transformation

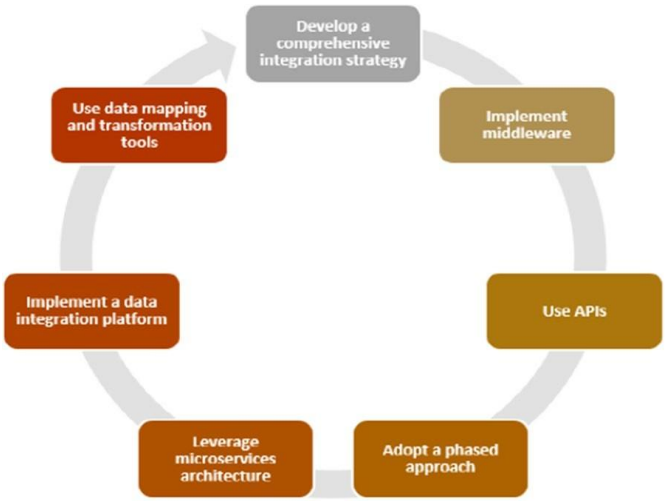

Fig. 6 Integrating strategies new systems with legacy systems

Engage employees Digital transformation requires the support and buy-in of employees at all levels of the organization. To achieve this, businesses should engage employees in the process and provide opportunities for training and development.

Fig. 7 Implementing digital transformation strategies

Fig. 8 Decision makers steps to achieve digital transformation

Fig. 9 Challenges that face decision makers during the implementing MicroServices architecture

Focus on the customer Digital transformation should be driven by a focus on the customer. Businesses should seek to understand customer needs and preferences and use this information to inform their technology adoption and implementation strategies.

Embrace innovation Digital transformation requires a willingness to embrace innovation and try new things. Businesses should encourage experimentation and risk-taking, and be willing to pivot if a particular strategy is not working.

Manage risks Digital transformation involves risks, and businesses must take steps to manage and mitigate these risks. This includes ensuring the security of sensitive data, complying with regulatory requirements, and managing the risks associated with new technologies.

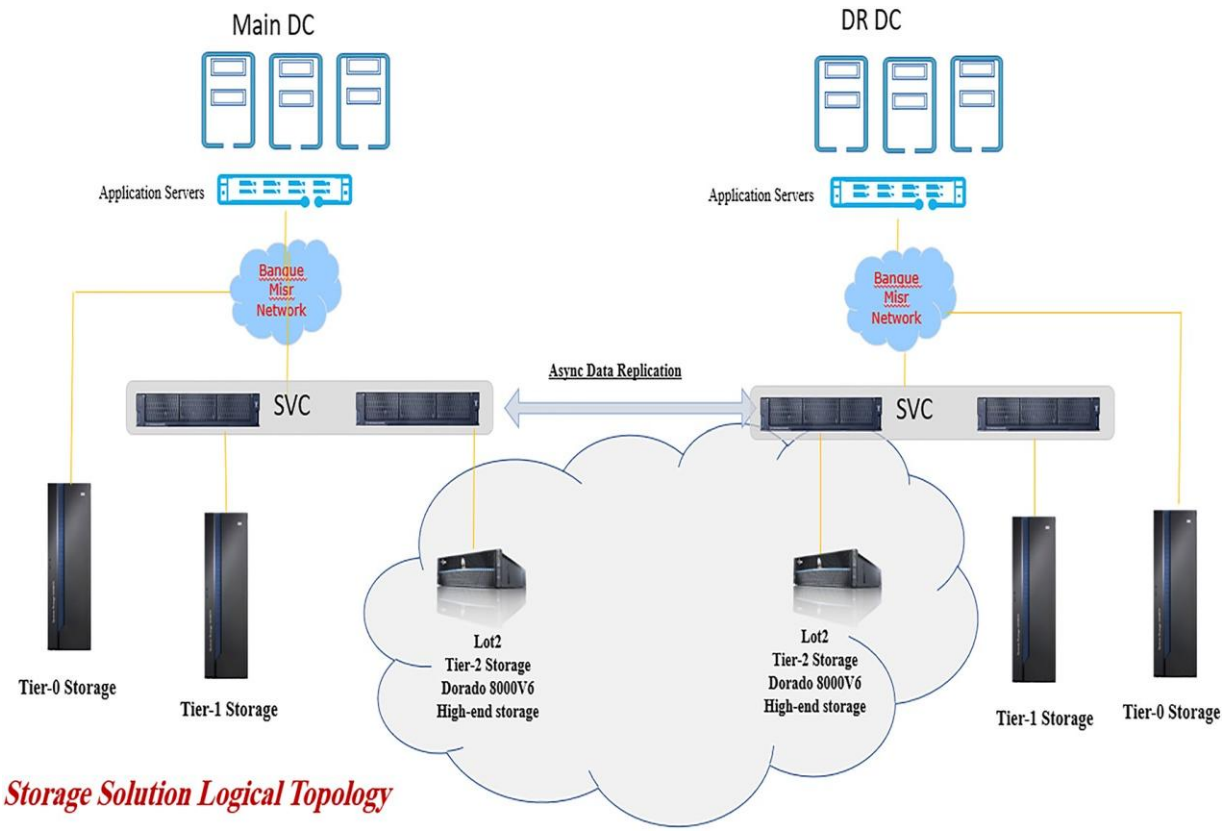

Fig. 10 Storage solution logical topology [21]

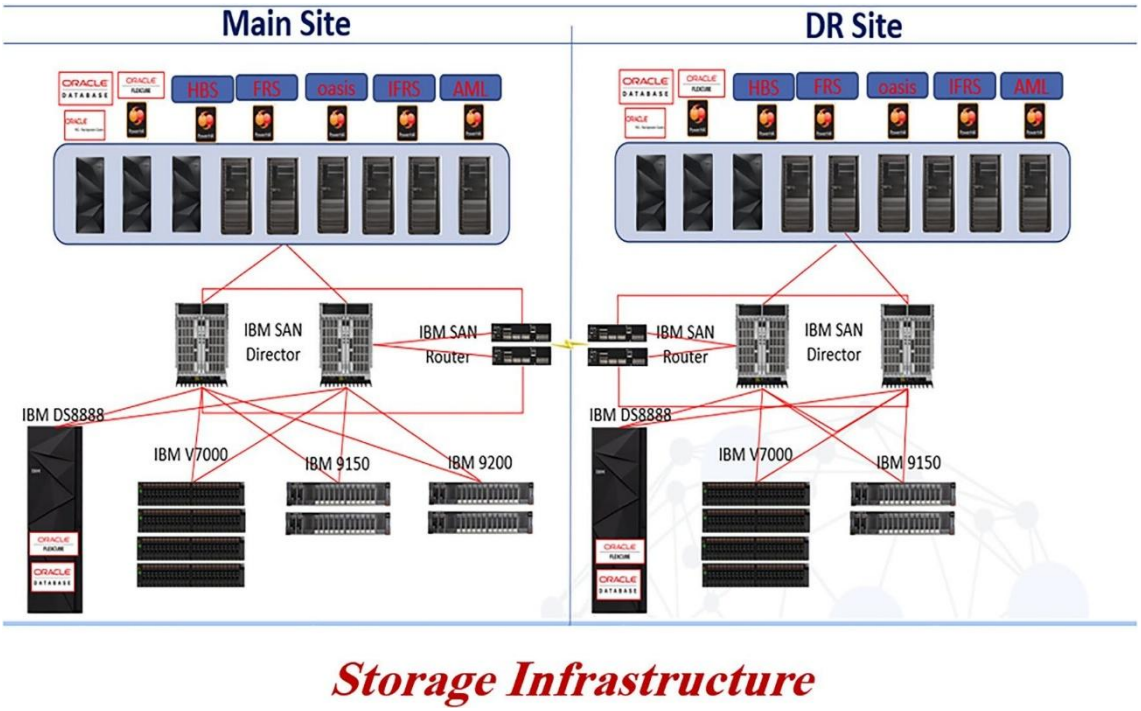

Fig. 11 Storage Infrastructure

Decision makers use enterprise architect with MicroServices to make digital transformation Decision makers can use enterprise architecture with MicroServices to drive digital transformation by leveraging the benefits of MicroServices architecture to achieve their digital transformation goals [12, 16].

Here are some ways decision makers can use enterprise architecture with MicroServices to make digital transformation:

- *Aligning business goals with technical capabilities*

Decision makers can work with enterprise archi-tects to ensure that the MicroServices architecture aligns with the enterprise's digital transformation goals. This includes

understanding the business goals, identifying the key capabilities required to achieve those goals, and designing the MicroServices architecture to support those capabilities.

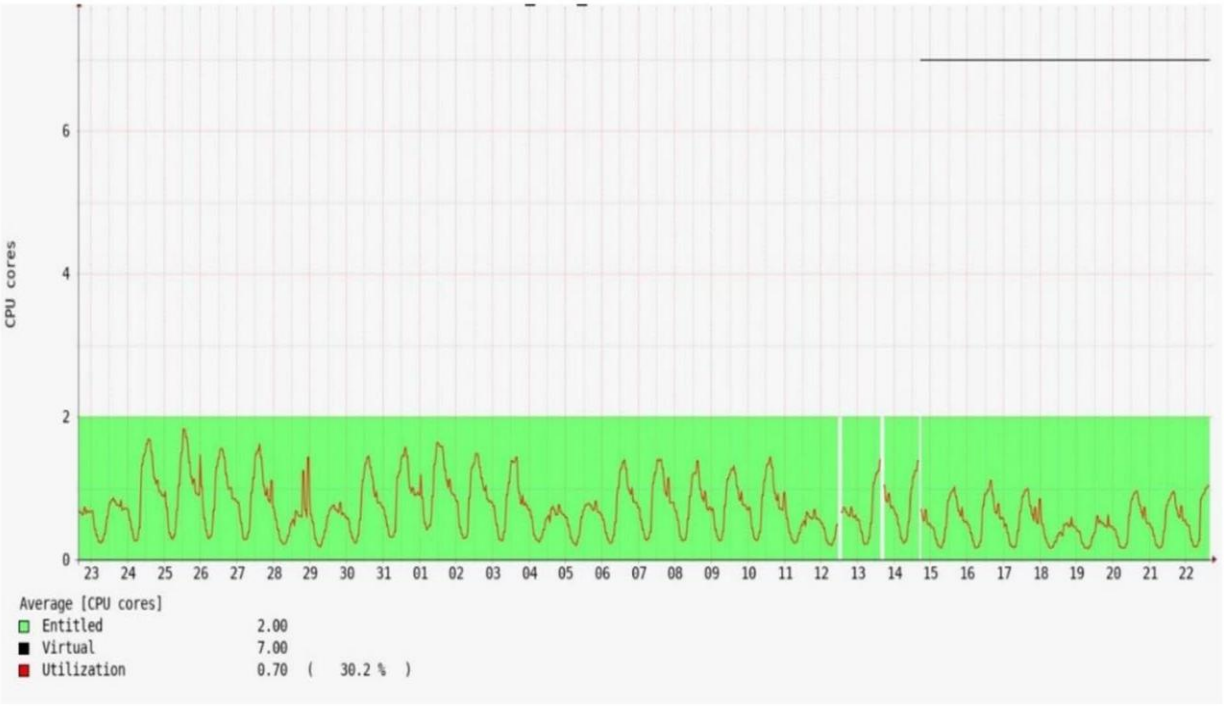

Fig. 12 Case No. 1 CPU utilization

Prioritizing development efforts**:** Decision makers can use enterprise architecture with MicroServices to prioritize development efforts based on business value. By breaking down monolithic applications into smaller, modular pieces, decision makers can focus development efforts on the most critical services, enabling them to deliver value to customers more quickly.

Accelerating innovation Decision makers can use enterprise architecture with MicroServices to accelerate innovation by adopting an agile development approach. MicroServices architecture enables teams to develop and deploy services independently, allowing them to innovate quickly and respond to changing customer needs.

Conclusion

In conclusion, enterprise architecture (EA) plays a pivotal role in shaping the trajectory of digital transformation within modern organizations. As the pace of technological evolution accelerates, businesses are increasingly required to modernize their legacy systems, adopt cloud-native strategies, and embrace innovative integration approaches. Microservices architecture, supported by EA, provides a robust foundation for such digital evolution by offering scalability, flexibility, and modularity—key attributes that enable organizations to respond quickly to changing business environments. Low-code middleware platforms further complement this transformation by simplifying the integration of legacy systems and enabling rapid deployment of new services with minimal manual coding, thus accelerating innovation while reducing time-to-market.

Enterprise architects serve as critical enablers in this transformation journey by aligning business goals with technology strategies. Their role extends beyond system design to include the governance of architectural standards, guidance on DevOps practices, and orchestration of service-driven architecture across the enterprise. By leveraging Microservices, EA not only facilitates the decomposition of monolithic applications into manageable services but also ensures seamless data flow and interoperability between systems, which is essential for real-time analytics and decision-making. In tandem with cloud computing, this architectural approach provides a scalable and resilient digital ecosystem that supports continuous delivery and operational agility.

Moreover, the integration of emerging technologies like artificial intelligence and edge computing within the EA framework amplifies the benefits of Microservices, offering organizations intelligent automation and enhanced user experiences. The synergy between legacy modernization, low-code development, and Microservices-based EA enables enterprises to reimagine their operational models, embrace digital innovation, and maintain competitive advantage in a rapidly transforming market. Therefore, the future of enterprise integration lies in the strategic convergence of these technologies, underpinned by a robust EA methodology that bridges the gap between traditional systems and cutting-edge digital solutions. This integrated approach ensures sustained growth, resilience, and alignment with long-term digital transformation goals.

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