

System Integration and Architecture (SIA301)

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Section: 3IT2

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1. **The Role of Application Interoperability in System Integration:** In the context of system integration, application interoperability is a critical concept for ensuring the smooth interaction of various applications within an organization. Discuss the importance of application interoperability in system integration, focusing on the processes involved, such as data gathering and retrieval. How do web services, XML, and CSV protocols facilitate the transformation of data in distributed databases? What are the potential risks associated with data mapping, and how can they be mitigated? (20 points)
 - Data mapping challenges include inconsistencies caused by variations in formats, structures, and units, leading to errors or misinterpretations, mitigated by standardized protocols and regular updates; data loss from improper field matching or truncations, addressed through rigorous validation and automated tools; security vulnerabilities exposing sensitive data, mitigated by encryption, access controls, and regular audits; compatibility issues from incompatible data types or formats, resolved using middleware and compatibility tests; and scalability challenges from growing data volumes, tackled with scalable solutions, optimized processes, and performance assessments.
2. **System Integration of Partial Data Infrastructure:** The integration of partial data infrastructure components into a unified public data infrastructure offers significant benefits in terms of data consistency and centralized management. However, this approach comes with its own set of challenges, including high initial costs and potential data migration risks. Analyze the advantages and disadvantages of integrating partial data infrastructure, and explain why this approach is often considered a better fit for achieving long-term success in system integration. (20 points)
 - Integrating partial data infrastructure into a unified public data system offers significant advantages, including data consistency for improved reliability, enhanced accessibility for better collaboration, and scalability to meet growing demands, but it also presents challenges such as high initial costs, data migration risks, and the complexity of the process, making it a strategically advantageous approach for long-term success by balancing immediate challenges with benefits like improved data quality, operational efficiency, and future-proofing.

3. SWOT Analysis in Selecting the Optimal System Integration Approach: Choosing the appropriate system integration approach is crucial for achieving business goals. A SWOT analysis provides a systematic method for evaluating different integration strategies. Compare the strengths, weaknesses, opportunities, and threats of "System Integration by Application Interoperability" and "System Integration of Partial Data Infrastructure." Which approach is more suitable for organizations aiming for scalability, long-term value, and improved decision-making? Justify your answer based on the results of the SWOT analysis. (20 points)

- A SWOT analysis comparing "System Integration by Application Interoperability" and "System Integration of Partial Data Infrastructure" reveals that while application interoperability offers flexibility, cost efficiency, and rapid implementation, it faces challenges with data consistency, scalability, and maintenance; in contrast, partial data infrastructure excels in data consistency, centralized management, and scalability but requires high initial investment and careful migration planning, making it the more suitable approach for scalability, long-term value, and improved decision-making due to its ability to ensure high-quality data, future-proof scalability, and sustained operational efficiency.

4. Risk Management in System Integration: Risk management is a vital aspect of any system integration process. Given the potential complexities and challenges, organizations must adopt effective strategies to mitigate risks. Discuss the various risk treatments and management strategies that can be employed during system integration. Consider the role of proactive monitoring, testing and validation, and backup and recovery plans in ensuring a successful integration process. How can organizations decide which risk management strategies are most appropriate for their specific integration projects? (20 points)

- To effectively manage risks in system integration, organizations should conduct comprehensive risk assessments, perform cost-benefit analyses, and involve key stakeholders, while implementing proactive monitoring, thorough testing and validation, and robust backup and recovery plans to ensure system reliability, early issue detection, and data protection; selecting the most appropriate strategies depends on assessing the project's scope, objectives, and past experiences, ensuring alignment with organizational priorities, and evaluating the potential costs and benefits of each approach.

5. **The Future of System Integration:** As technology evolves, organizations are faced with the decision of choosing between integrating existing systems through application interoperability or reengineering their data infrastructure into a unified system. Discuss the long-term implications of both approaches for businesses, considering factors such as scalability, data management, security, and future technological developments. Which approach do you believe offers the most sustainable benefits for businesses in the long run, and why? (20 points)

- Reengineering data infrastructure into a unified system offers the most sustainable benefits for businesses in the long run, as it provides a scalable foundation that supports future growth, ensures consistent data management, enhances security by simplifying control, and improves operational efficiency and decision-making, despite the higher initial costs and complexity, whereas integrating existing systems through application interoperability may face scalability, data management, and security challenges over time.