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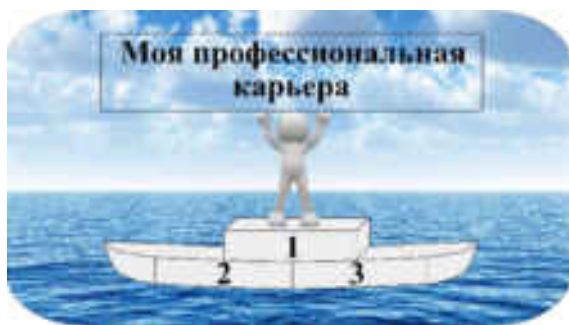


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**Международный научно-образовательный электронный журнал
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Abstract

Selection of appropriate software technologies is one of the most critical factors influencing the performance, scalability, maintainability, and long-term sustainability of modern software systems. Contemporary web applications increasingly require efficient frontend rendering, robust backend integration, strong type safety, lightweight database management, and advanced computational capabilities. This article presents a detailed scientific and technological rationale for selecting Next.js, React, TypeScript, SQLite, and mathematical libraries for modern application development. The discussion examines architectural characteristics, computational efficiency, rendering mechanisms, type systems, database performance, developer productivity, ecosystem maturity, and integration capabilities. Particular attention is devoted to scalability, security, maintainability, numerical computation, and scientific application development. The article demonstrates that the combined use of these technologies provides a highly efficient, flexible, and scalable software ecosystem suitable for data-driven and computation-intensive web applications.

1. Introduction

Modern software engineering increasingly demands technologies capable of supporting high-performance web applications, scalable architectures, responsive user interfaces, secure data management, and advanced computational processing. The rapid evolution of cloud computing, real-time data systems, scientific applications, and interactive web platforms has accelerated the need for integrated technology stacks that combine frontend efficiency with backend flexibility and computational reliability.

Technology selection directly influences:

- System scalability
- Development efficiency
- Maintainability
- Runtime performance
- Security
- Resource utilization
- Long-term project sustainability

In recent years, JavaScript-based ecosystems have become dominant in web application development because of their flexibility, cross-platform compatibility, and extensive developer communities. Within this ecosystem, Next.js, React, and TypeScript have emerged as leading technologies for frontend and full-stack application development.

Simultaneously, lightweight database systems such as SQLite provide efficient local data storage solutions for many modern applications, while specialized mathematical libraries enable implementation of scientific computation, statistical analysis, machine learning, and numerical processing.

This article presents a comprehensive rationale for selecting these technologies within modern software architectures.

2. Rationale for Selecting Next.js

2.1 Architectural Overview

Next.js is a full-stack framework built on top of React that provides advanced rendering capabilities and optimized application performance.

Major architectural features include:

- Server-side rendering
- Static site generation
- Incremental static regeneration
- API route integration
- Edge rendering

- Hybrid rendering models

These capabilities significantly improve application scalability and user experience.

2.2 Performance Optimization

One of the principal reasons for selecting Next.js is its advanced rendering architecture.

Traditional client-side rendering often produces:

- Slow initial page loads
- Reduced SEO performance
- High JavaScript bundle sizes

Next.js addresses these issues through:

- Pre-rendering mechanisms
- Dynamic code splitting
- Image optimization
- Automatic routing
- Efficient caching systems

Server-side rendering enables faster content delivery and improved search engine indexing.

2.3 Scalability and Maintainability

Next.js provides scalable project structures suitable for both small and enterprise-level applications.

Advantages include:

- Modular architecture
- Simplified deployment
- Built-in optimization
- Strong ecosystem support
- Integration with cloud infrastructure

Its compatibility with modern DevOps pipelines significantly improves maintainability and deployment efficiency.

3. Rationale for Selecting React

3.1 Component-Based Architecture

React is based on reusable component architecture, which improves code modularity and maintainability.

Component-based systems provide:

- Reusability
- Encapsulation
- Simplified debugging
- Efficient UI updates
- Scalable interface development

This architecture is particularly beneficial for complex interactive applications.

3.2 Virtual DOM Mechanism

React utilizes a virtual Document Object Model to optimize rendering performance.

The virtual DOM enables:

- Efficient state updates
- Reduced direct DOM manipulation
- Improved rendering speed
- Better application responsiveness

This mechanism significantly enhances user experience in dynamic web applications.

3.3 Ecosystem and Community Support

React possesses one of the largest ecosystems in modern software development.

The ecosystem includes:

- State management libraries

- UI component frameworks
- Visualization tools
- Routing systems
- Testing frameworks

Strong community support contributes to rapid problem resolution and continuous ecosystem development.

4. Conclusion

Next.js, React, TypeScript, SQLite, and modern mathematical libraries collectively provide a powerful and efficient ecosystem for development of scalable, maintainable, and computation-oriented web applications.

Their combined advantages include high rendering performance, modular architecture, strong type safety, lightweight data management, and advanced numerical computation capabilities. These technologies are particularly suitable for scientific platforms, engineering applications, analytical systems, and modern interactive web environments.

Continued advancements in frontend engineering, computational frameworks, and web technologies are expected to further strengthen the relevance and effectiveness of this technology stack in future software development.

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