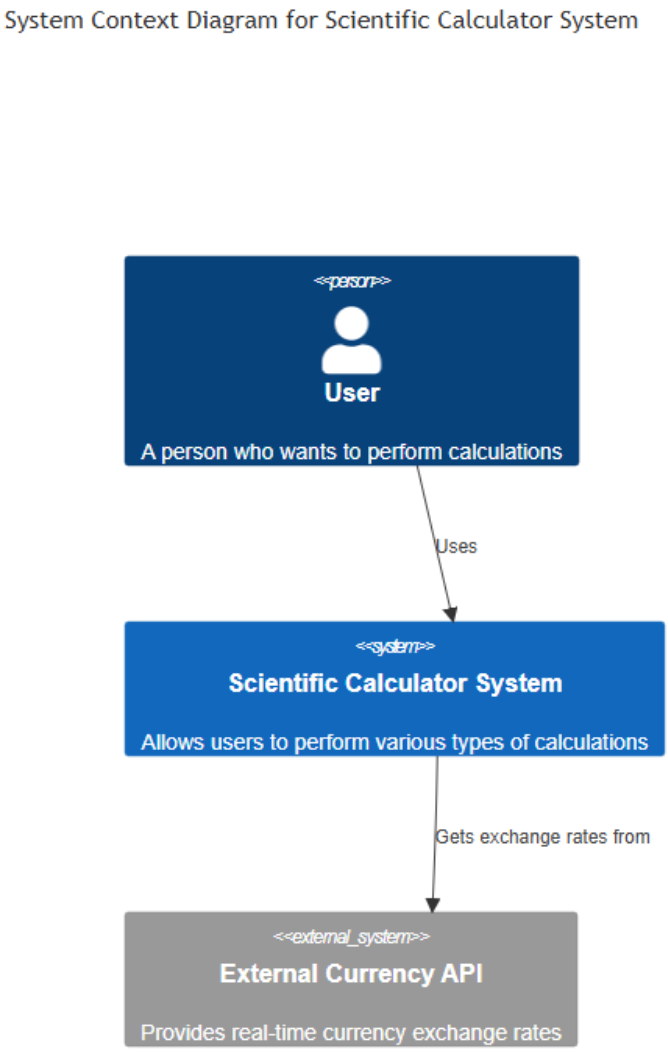
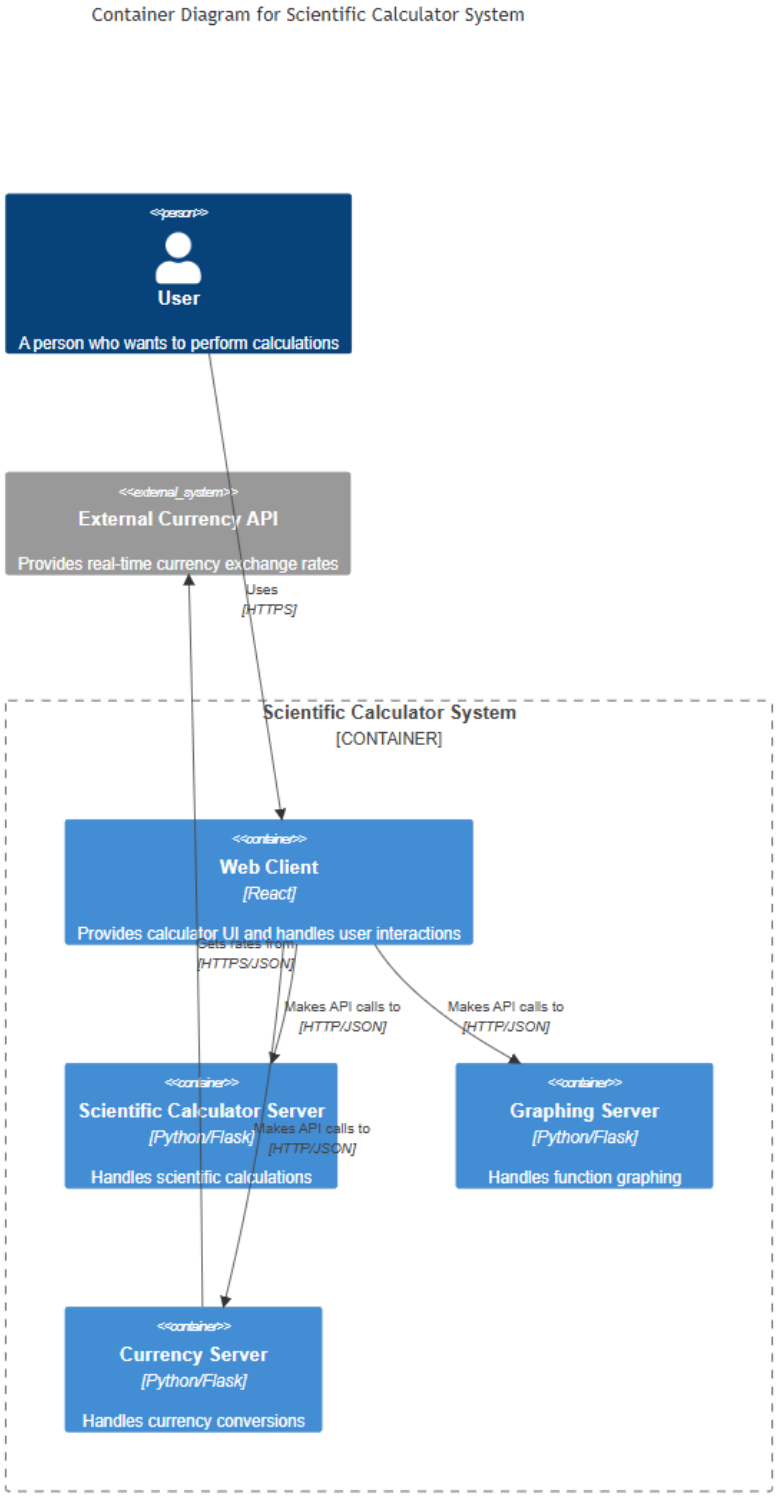
System Context Diagram



The Scientific Calculator System operates as a comprehensive calculation platform that serves individual users requiring various types of calculations. At the system context level:

- **Users** interact directly with the calculator system to perform calculations ranging from basic arithmetic to complex scientific computations, graphing, and currency conversions.
- The system integrates with an **External Currency API** to provide real-time currency exchange rates, ensuring accurate currency conversions.
- This high-level view demonstrates the system's primary purpose: providing a versatile calculation platform while maintaining simplicity in its external interactions.

Container Diagram



The Scientific Calculator System is structured into four main containers, each serving a specific purpose:

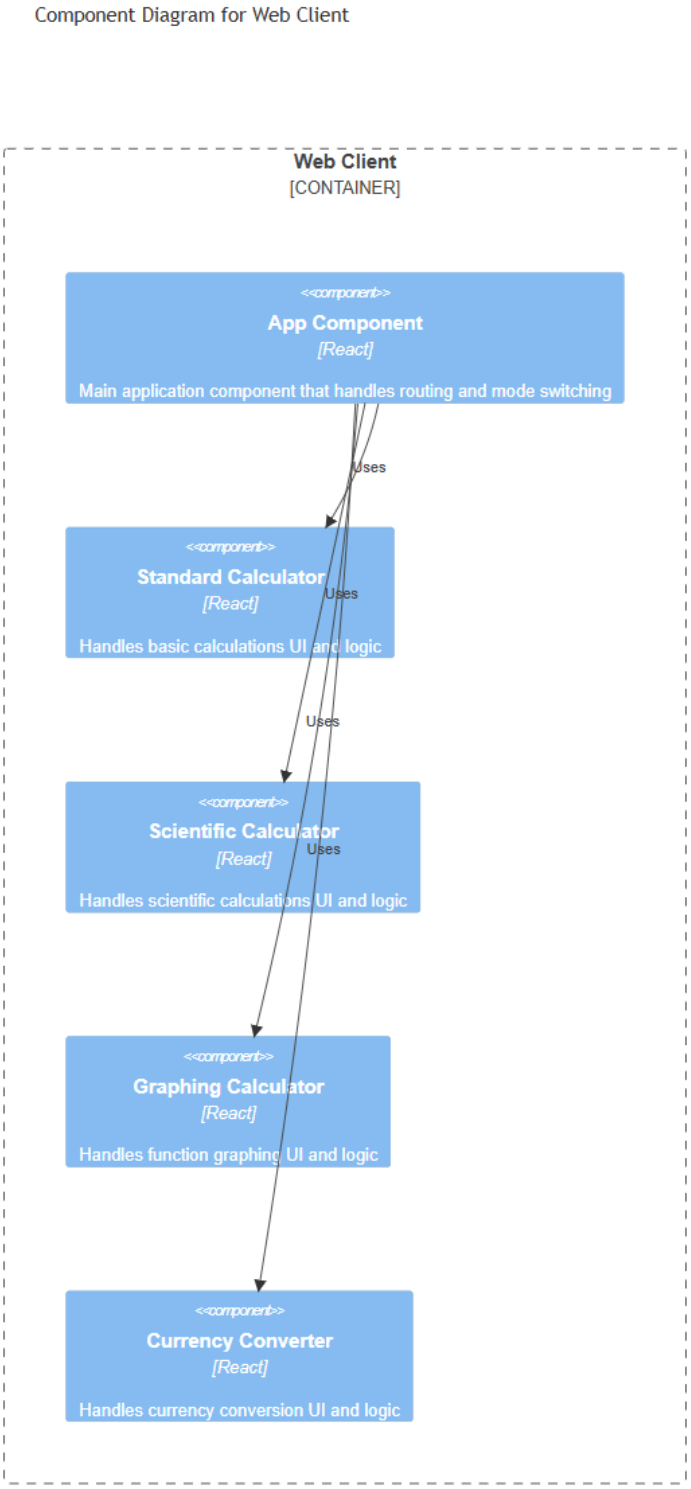
1. **Web Client (React)**
    - Provides the user interface for all calculator functionalities
    - Handles user interactions and input validation
    - Communicates with backend services via HTTP/JSON
2. **Scientific Calculator Server (Python/Flask)**
    - Processes complex scientific calculations
    - Provides mathematical function evaluation
    - Ensures accurate computation of scientific operations
3. **Graphing Server (Python/Flask)**
    - Handles function plotting and visualization
    - Processes mathematical expressions for graphing
    - Returns coordinate data for visual representation
4. **Currency Server (Python/Flask)**
    - Manages currency conversion operations
    - Interfaces with external currency API
    - Provides up-to-date exchange rate calculations

This containerization approach ensures:

- Clear separation of concerns
- Independent scaling and maintenance
- Modular system architecture

Component Diagrams

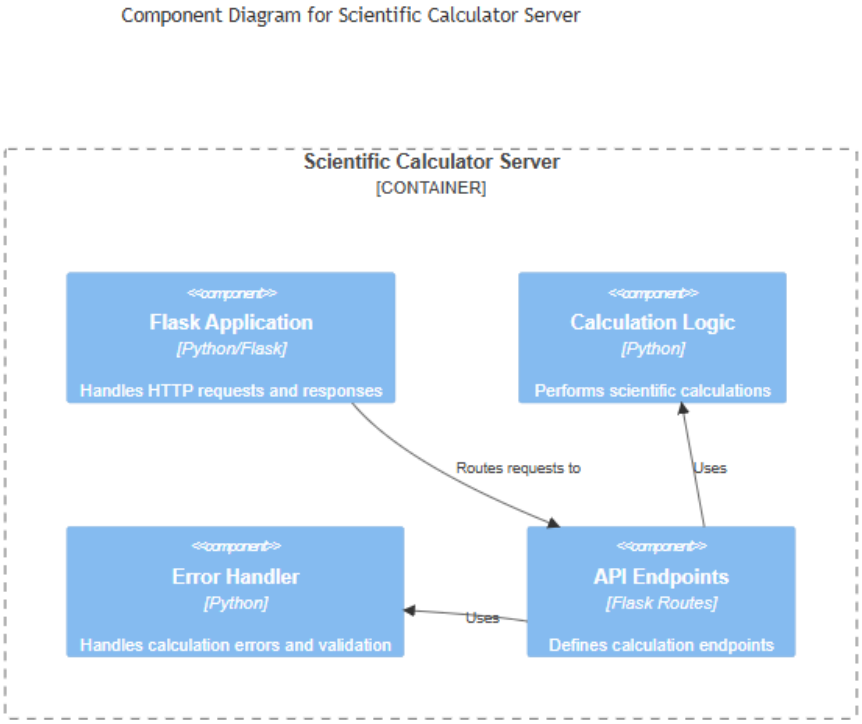
Web Client Components



The React-based web client is composed of several key components:

- **App Component**: Central routing and mode management
- **Scientific Calculator**: Handles complex mathematical operations
- **Standard Calculator**: Manages basic arithmetic calculations
- **Graphing Calculator**: Provides function visualization interface
- **Currency Converter**: Manages currency conversion interface

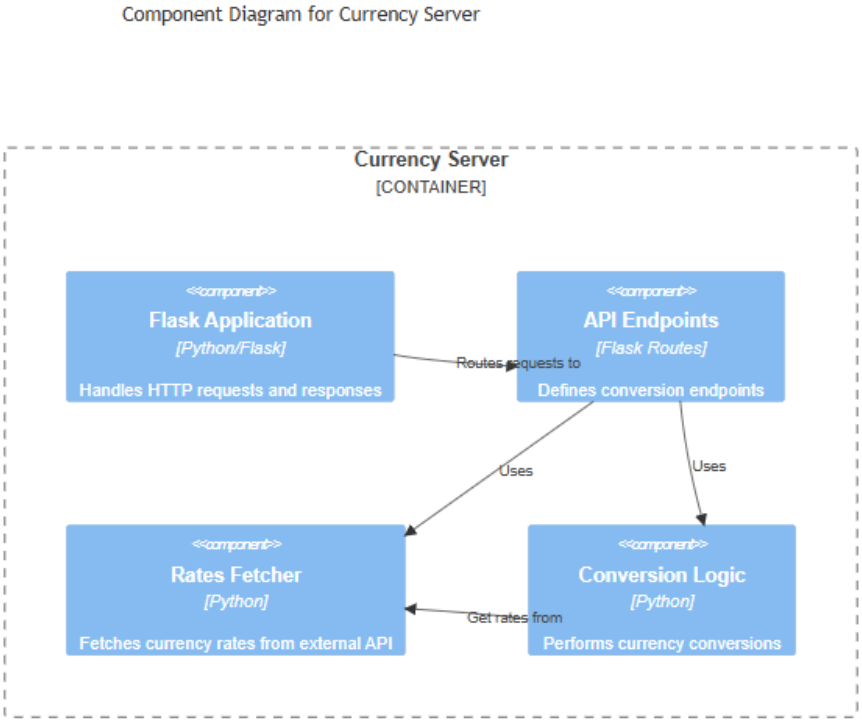
Scientific Calculator Server Components



The scientific calculation service consists of:

- **Flask Application**: HTTP request handler
- **API Endpoints**: Defines available calculation operations
- **Calculation Logic**: Core mathematical computation engine
- **Error Handler**: Manages calculation errors and validation

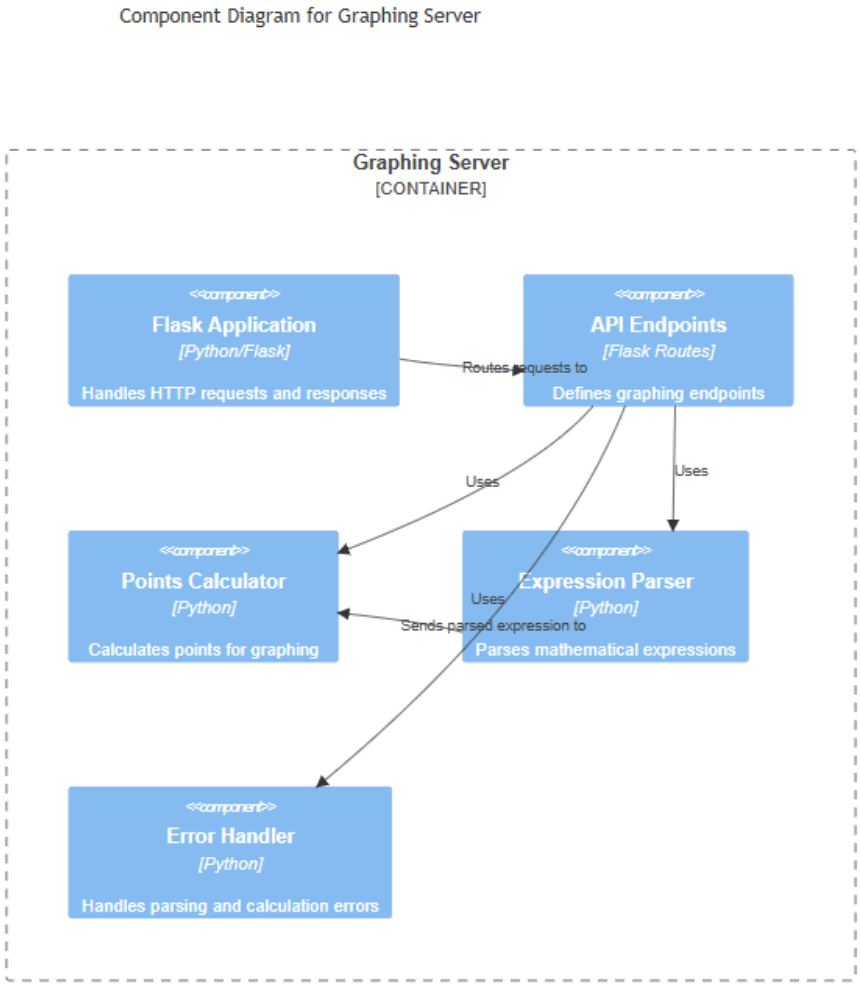
Currency Server Components



The currency service is structured with:

- **Flask Application**: HTTP request handler
- **API Endpoints**: Currency operation interfaces
- **Rates Fetcher**: External API communication
- **Conversion Logic**: Currency conversion engine

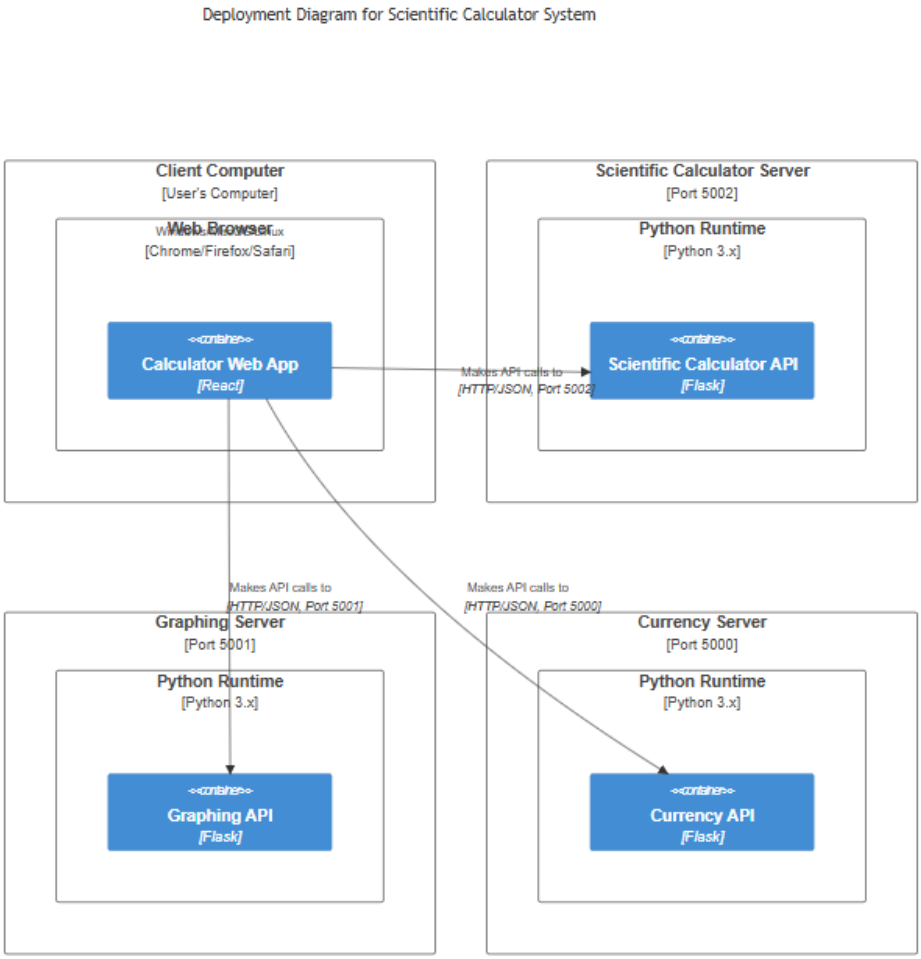
Graphing Server Components



The graphing service includes:

- **Flask Application**: HTTP request handler
- **API Endpoints**: Graphing operation interfaces
- **Expression Parser**: Mathematical expression processing
- **Points Calculator**: Coordinate generation
- **Error Handler**: Expression validation and error management

Deployment Diagram



The calculator system employs a microservices architecture with separate deployment for each service:

1. **Client Deployment**
   - Runs in user's web browser
   - React-based SPA providing unified interface
   - Communicates with all services via HTTP/JSON
2. **Scientific Calculator Server (Port 5002)**
   - Independent Python environment
   - Flask-based API service
   - Handles scientific calculations independently
3. **Graphing Server (Port 5003)**
   - Independent Python environment
   - Specialized for function plotting

   - Isolated graphing computation service
4. **Currency Server (Port 5001)**
   - Independent Python environment
   - Manages currency operations
   - Responsible for crawling exchange rate

Benefits of this deployment strategy:

- Independent scaling and maintenance
- Isolated service updates
- Clear network boundaries
- Flexible resource allocation
- Enhanced fault isolation