Understanding the API Gateway  
  
An API Gateway is a server that acts as the single entry point for all clients. It provides a unified interface to a set of microservices, simplifies the client-side code, and hides the internal structure of the application. Here is a detailed breakdown of its functions:  
  
1. Client Request Handling: The API Gateway receives HTTP requests from various client devices and applications.  
  
2. Request Validation: It checks that the incoming requests are well-formed and have correct format and necessary parameters.  
  
3. Access Control Lists: It implements allow-lists and deny-lists to control access to various services, preventing unauthorized requests from proceeding.  
  
4. Authentication and Authorization: It interacts with authentication services to verify the identity of the requester and checks permissions to ensure they are authorized to access the requested resources.  
  
5. Rate Limiting: It applies predefined rules to limit the number of requests a client can make within a certain time frame to prevent abuse and manage load.  
  
6. Service Discovery: It identifies the appropriate services required to fulfill the request based on the request path, parameters, or headers.  
  
7. Dynamic Routing: It directs the validated and authorized requests to the correct backend services.  
  
8. Protocol Translation: It converts the request from the web-friendly protocols like HTTP/HTTPS to the specific protocols used by the backend services, if necessary.  
  
9. Error Handling: It catches and handles any errors that may arise during the processing of requests, ensuring graceful degradation of service.  
  
10. Circuit Breaking: It implements patterns to detect failures and prevent overloading the system, avoiding cascading failures in interconnected services.  
  
11. Monitoring and Logging: It utilizes tools like the ELK stack for logging requests and responses, which is crucial for monitoring, tracing, and debugging.  
  
12. Caching: It optionally stores responses to common requests, reducing the number of calls to the backend services.  
  
The API Gateway is an orchestration layer that manages request routing, composition, and protocol translation to provide seamless integration and efficient management of backend services. This is particularly important in microservices architectures where it simplifies client interactions with many services and enables the system to operate cohesively.  
  
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