Enhanced .NET Backend Developer Roadmap

Internet Basics

- How does the Internet work?
- What is HTTP?
- What is DNS?
- What is hosting?
- How do browsers work?
- HTTPS vs HTTP
- HTTP/2 and HTTP/3
- REST vs GraphQL (basic comparison)

.NET Essentials

- What is .NET?
- .NET CLR basics
- C# Language
- Essential .NET libraries and types
- Basic .NET CLI commands
- NuGet
- C# Advanced: Delegates, Events, Async/Await, Span
- Memory Management & Garbage Collection
- Value types vs Reference types

ASP.NET Core Fundamentals

- What is ASP.NET?
- App startup
- Dependency injection
- Middleware
- Host
- Web server
- Configuration
- Routing
- Error handling
- Environments (Development, Staging, Production)
- HTTP Pipeline customization
- Health checks

Web API Development

- What is a REST API?
- Controllers
- Minimal APIs
- Postman
- Swagger / Open API
- JSON
- DTO
- Validation
- API versioning
- Global exception handling
- Action Filters
- Rate Limiting
- Model binding and formatting

Version Control

- Git
- GitHub
- Git branching strategies
- GitHub CLI

Databases

- Relational
- MySQL
- Azure SQL Database
- NoSQL
- MongoDB
- Azure Cosmos DB
- Entity Framework Core
- Dapper
- Database Migrations
- Indexing and Query Optimization
- Database Transaction Management

Testing

- Unit testing
- xUnit
- Moq
- FluentAssertions
- TDD
- Integration testing
- WebApplicationFactory
- Test coverage tools
- Load Testing with Apache JMeter or k6

Security

- ASP.NET Core Authentication
- ASP.NET Core Authorization
- JSON Web Tokens (JWT)
- OAuth 2.0
- OpenID Connect
- IdentityServer
- Azure Active Directory
- .NET Secret Manager
- Azure Key Vault
- HTTPS
- TLS
- CORS
- XSS, CSRF, and SQL Injection mitigation
- Content Security Policy (CSP)
- Secure Headers
- Role-based & Policy-based Authorization

Deployment & Containers

- Docker
- Docker Compose
- Docker Hub
- Azure Container Registry
- Kubernetes
- Azure Kubernetes Service (AKS)
- Helm
- YARP

- NGINX
- Emissary-ingress
- Azure App Services
- GitHub Container Registry
- CI/CD integration with Docker

Infrastructure as Code

- Azure CLI
- Task Scheduling
- Terraform
- Bicep
- Azure Resource Manager Templates

Communication & Messaging

- HttpClient
- gRPC
- RabbitMQ
- Azure Service Bus
- Apache Kafka
- MassTransit
- WebSockets
- SignalR
- Event-Driven Architecture concepts
- CAP Theorem

Observability

- ILogger
- Serilog
- Seq
- Elastic Stack (ELK)
- OpenTelemetry
- Jaeger
- Prometheus
- Grafana
- Redis (Caching)
- Application Insights
- Structured logging best practices

DevOps & CI/CD

- Continuous integration
- Continuous deployment
- GitHub Actions
- GitHub Packages
- Azure DevOps Pipelines
- Environment secrets in CI/CD
- Infrastructure Scanning (e.g., Snyk)

Software Design Principles & Patterns

- SOLID
- DRY
- KISS
- YAGNI
- Domain Driven Design (DDD)
- Singleton

- Repository
- Retry with exponential backoff
- Circuit breaker
- Publisher-subscriber
- Saga
- Mediator
- Competing consumers
- Event sourcing
- Unit of Work
- Factory
- Adapter
- Decorator
- CQRS

Architectural Patterns

- Clean architecture
- Microservices
- Monolithic Apps
- Layered Architecture
- Onion Architecture
- Hexagonal Architecture
- Event-driven architecture

Essential Libraries

- Polly
- MediatR
- FluentValidation
- AutoMapper
- Mapster
- Hangfire
- Swashbuckle
- Serilog.Sinks

Keep Learning

- Microsoft Learn: https://learn.microsoft.com/
- Julio's Roadmap: https://juliocasal.com
- GitHub Repo: https://github.com/juliocesar-cf/dotnet-backend-developer-roadmap