Low Level Design

Team Gen ChimpanZ's

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Github: https://github.com/markfastner/Nuclei

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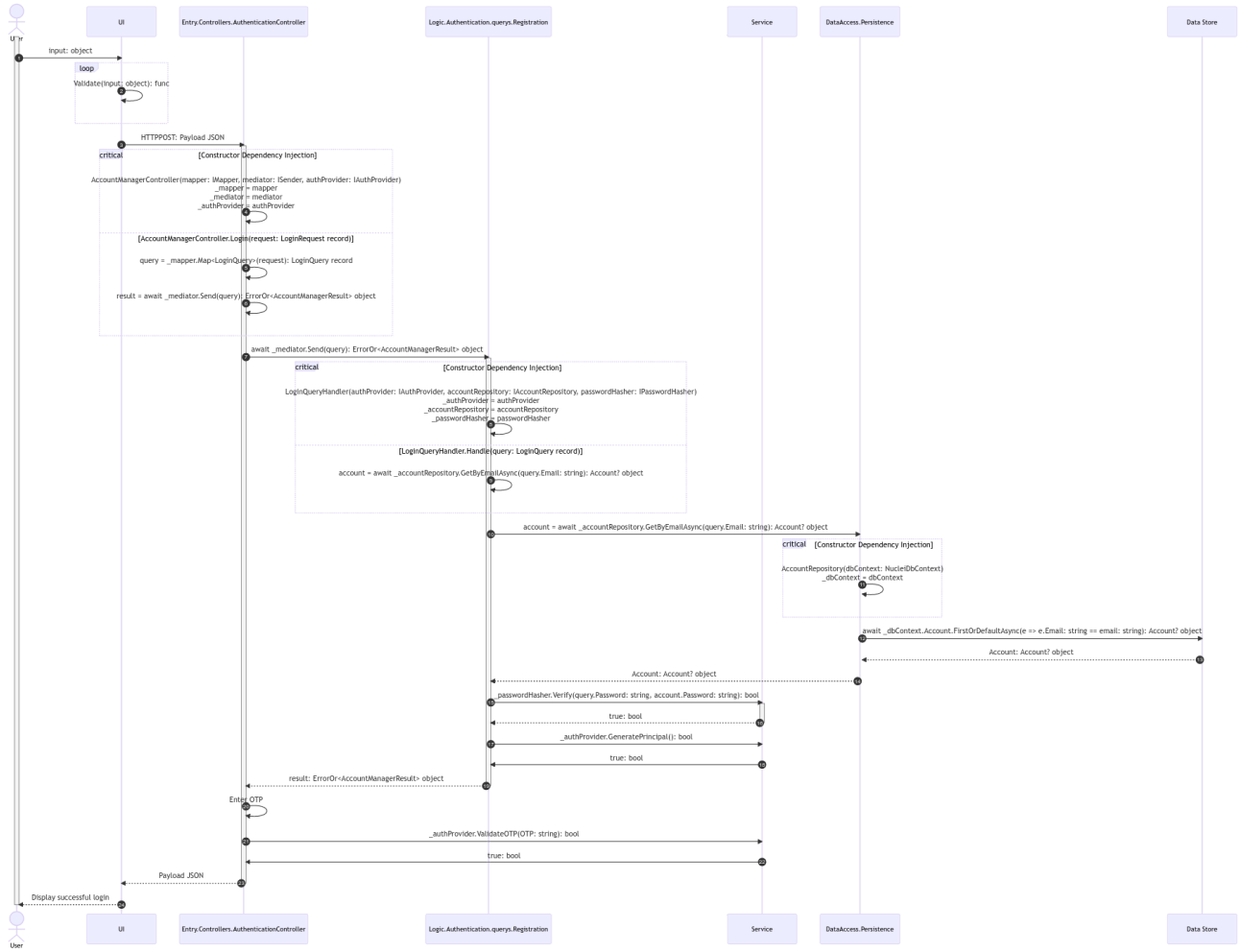
Authentication

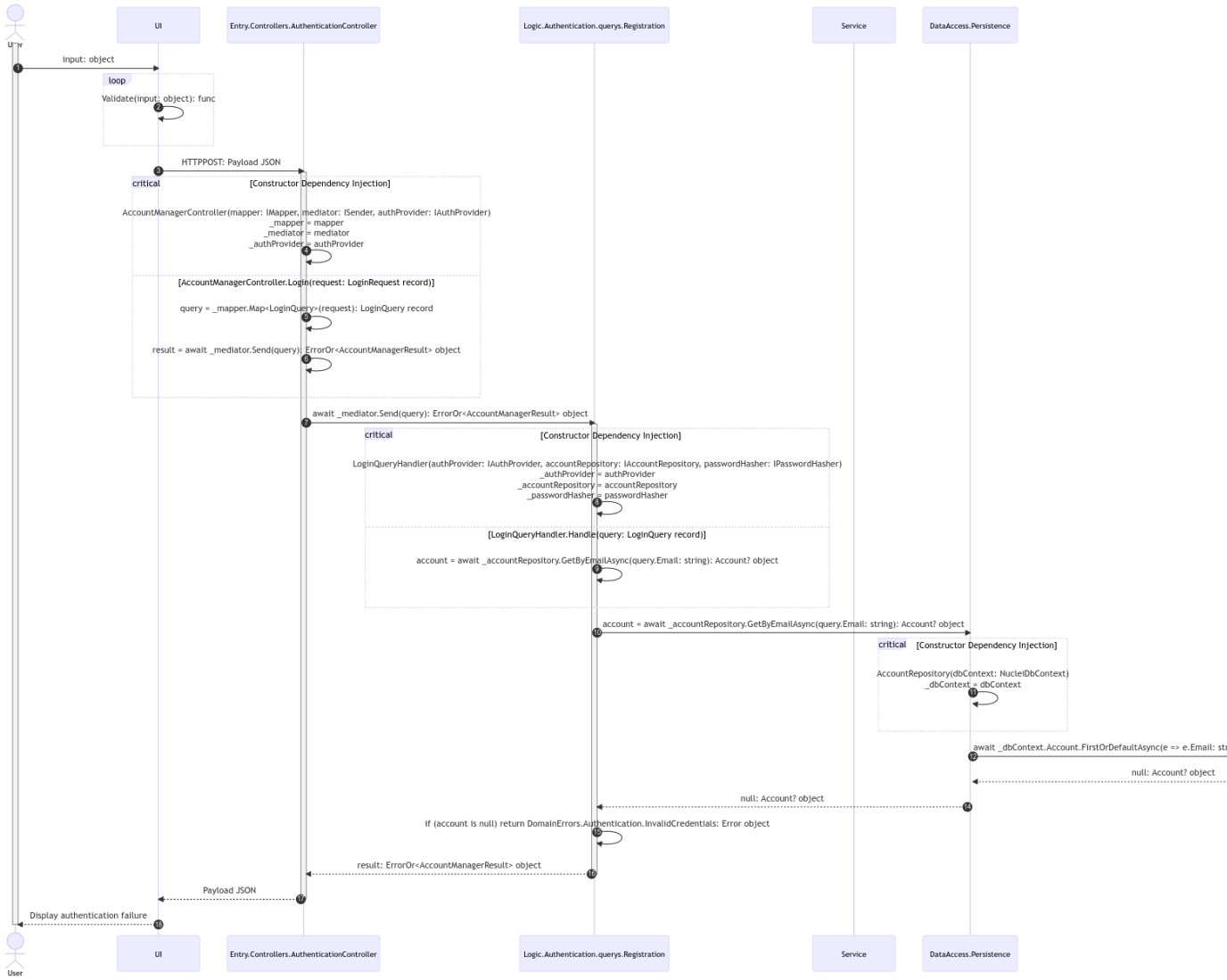
Success Case 1

User submits valid security credentials and is authenticated.



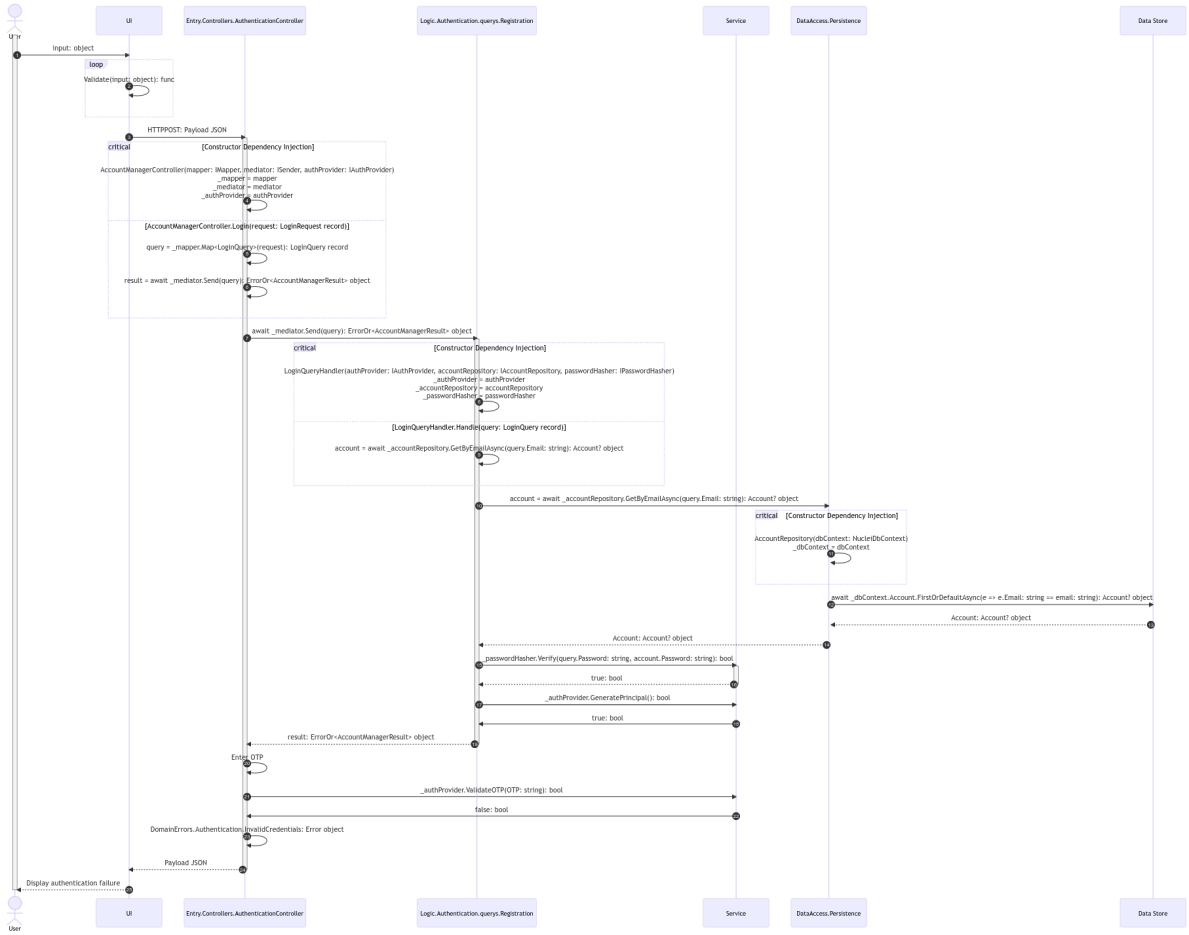
Failure Case 1

User submits invalid username.



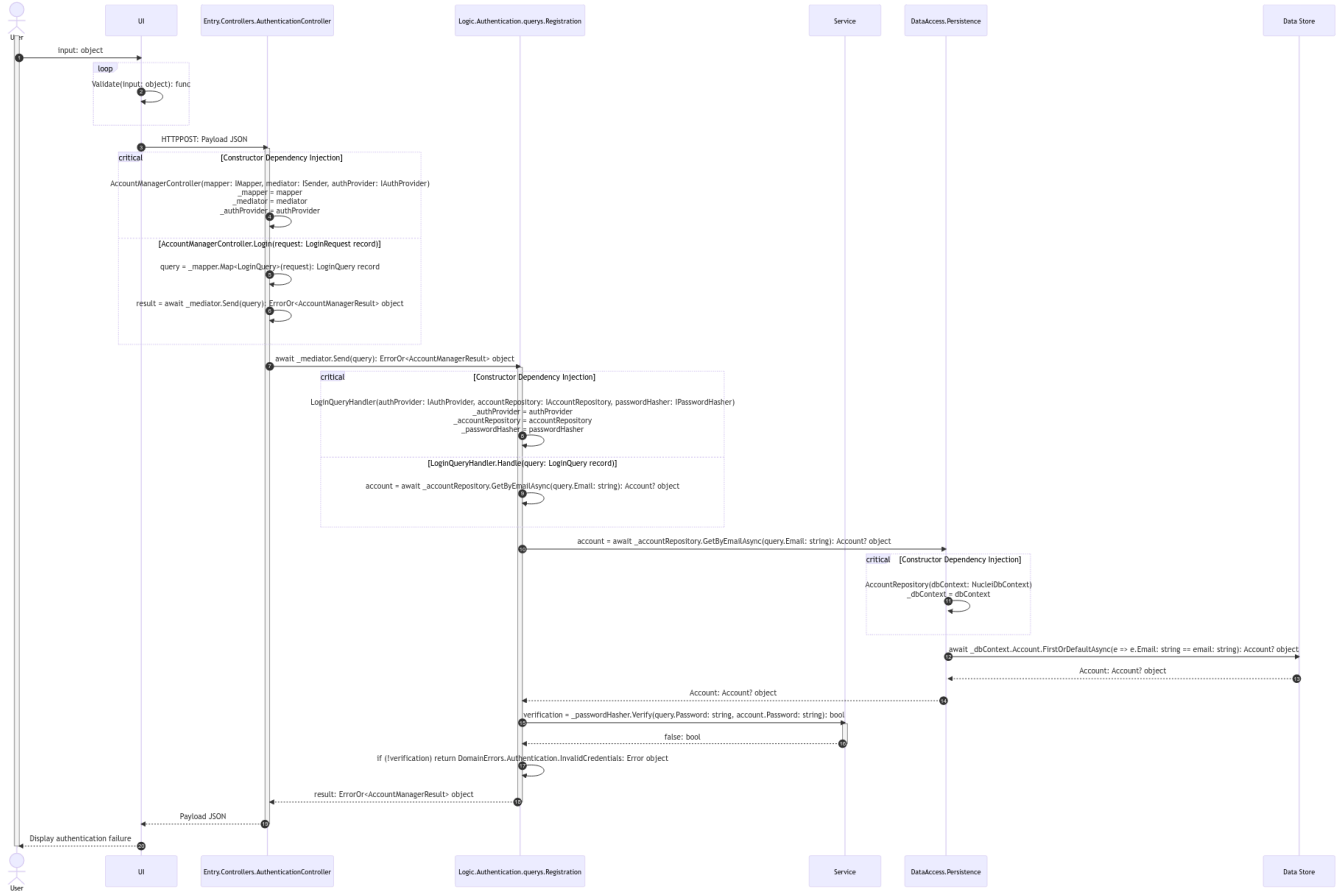
Failure Case 2

User submits invalid OTP.



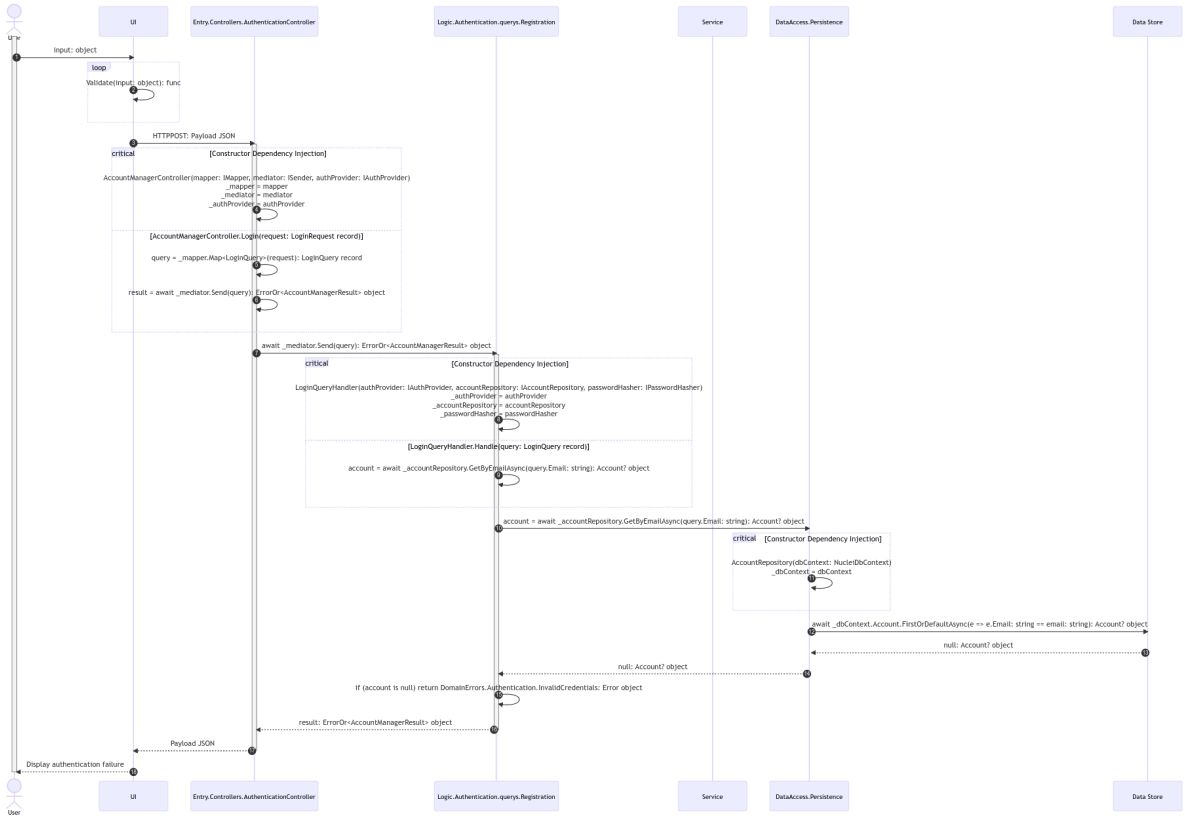
Failure Case 3

User submits invalid password.



Failure Case 4

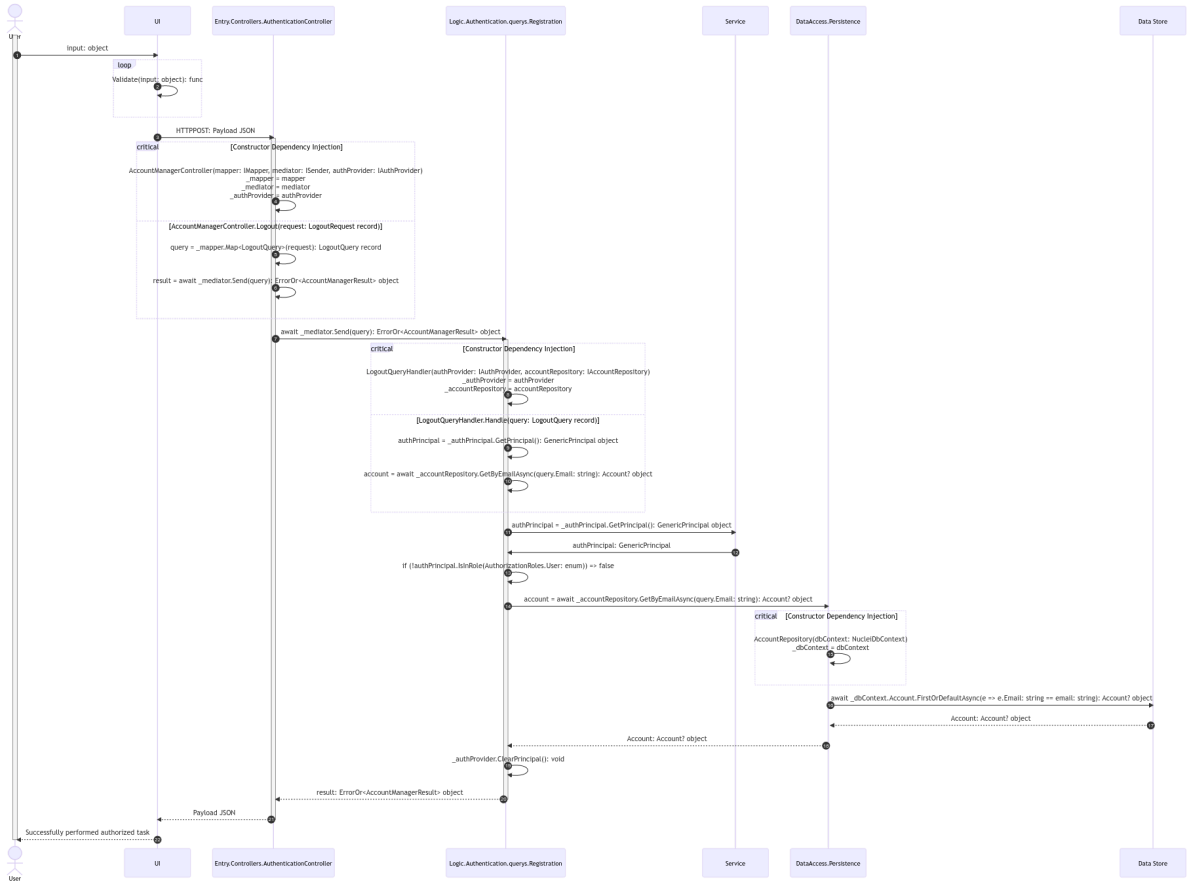
User submits valid security credentials for a disabled account.



Authorization

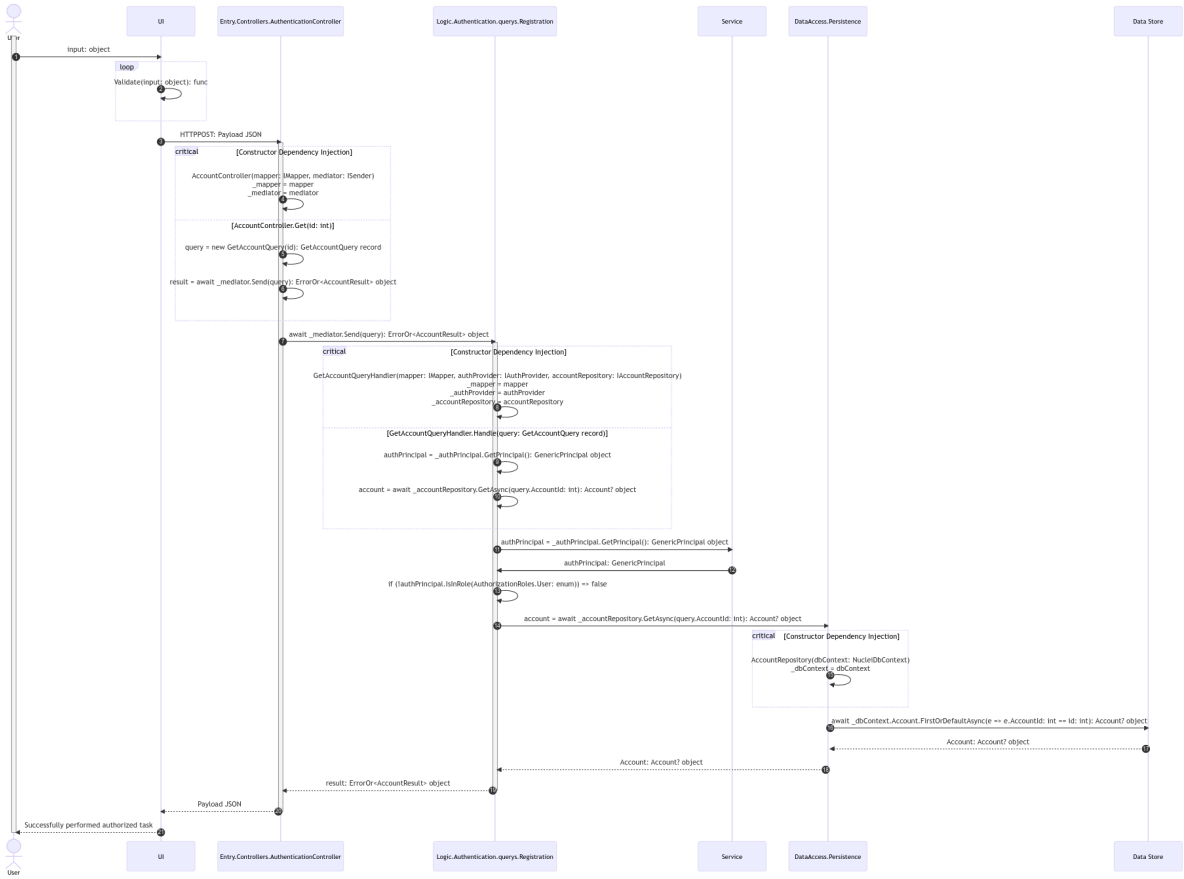
Success Case 1

User attempts to access a protected functionality within authorization scope. Access is granted to perform functionality.



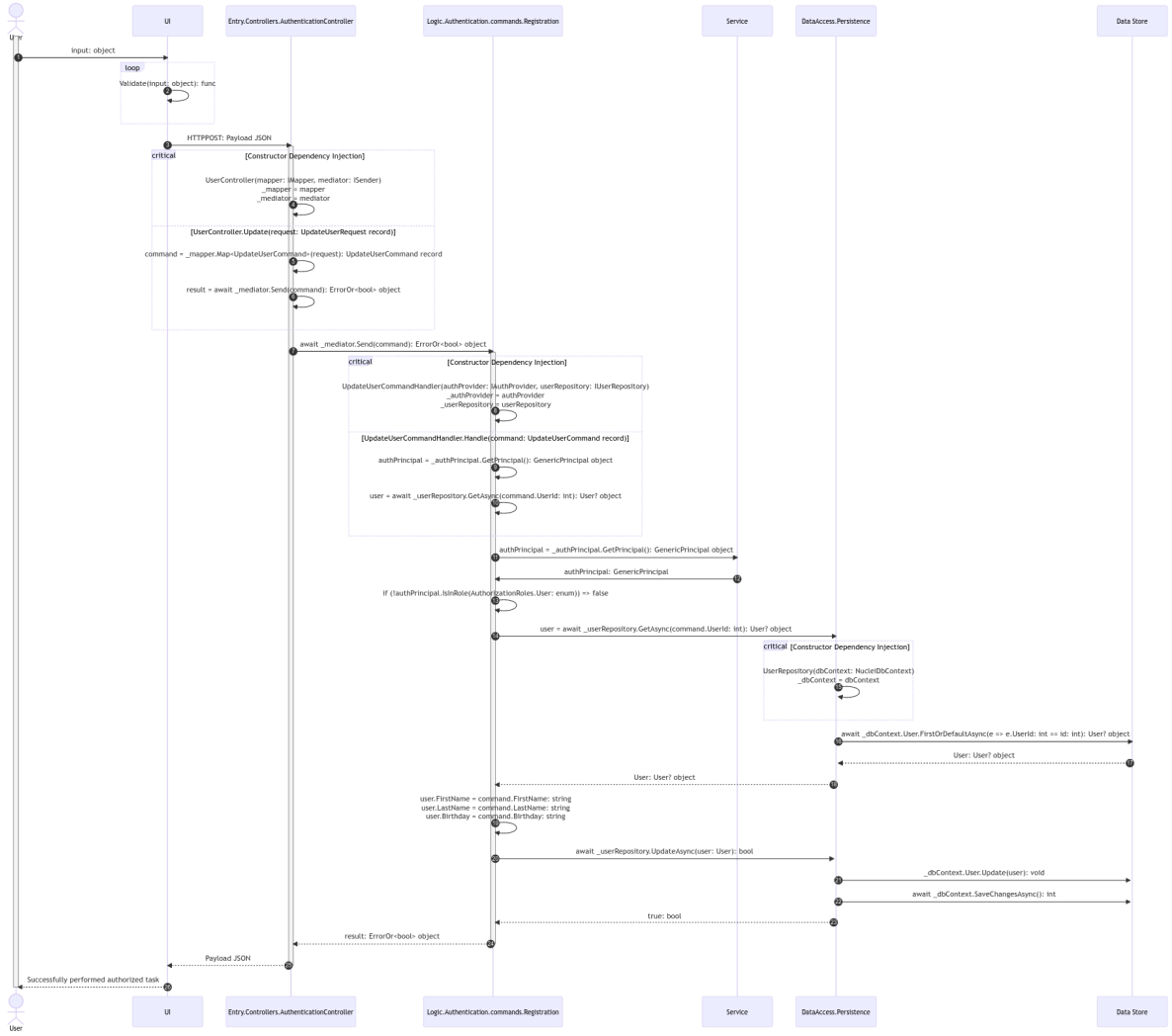
Success Case 2

User attempts to access protected data within authorization scope. Access is granted to perform read operations.


User
UI
Entry.Controllers.AuthenticationController
Logic.Authentication.queries.Registration
Service
DataAccess.Persistence
Data Store
input: object
loop
Validate(input: object): func
HTTPPOST: Payload JSON
critical
[Constructor Dependency Injection]
AccountController(mapper: IMapper, mediator: ISender)
_mapper = mapper
_mediator = mediator
[AccountController.Get(id: int)]
query = new GetAccountQuery(id): GetAccountQuery record
result = await _mediator.Send(query): ErrorOr<AccountResult> object
await _mediator.Send(query): ErrorOr<AccountResult> object
critical
[Constructor Dependency Injection]
GetAccountQueryHandler(mapper: IMapper, authProvider: IauthProvider, accountRepository: IAccountRepository)
_mapper = mapper
_authProvider = authProvider
_accountRepository = accountRepository
[GetAccountQueryHandler.Handle(query: GetAccountQuery record)]
authPrincipal = _authPrincipal.GetPrincipal(): GenericPrincipal object
account = await _accountRepository.GetAsync(query.AccountId: int): Account? object
authPrincipal = _authPrincipal.GetPrincipal(): GenericPrincipal object
authPrincipal: GenericPrincipal
If (!authPrincipal.IsInRole(AuthorizationRoles.User: enum)) => false
account = await _accountRepository.GetAsync(query.AccountId: int): Account? object
critical
[Constructor Dependency Injection]
AccountRepository(dbContext: NucleiDbContext)
_dbContext = dbContext
_await _dbContext.Account.FirstOrDefaultAsync(e => e.AccountId: int == id: int): Account? object
Account: Account? object
Account: Account? object
result: ErrorOr<AccountResult> object
Payload JSON
Successfully performed authorized task

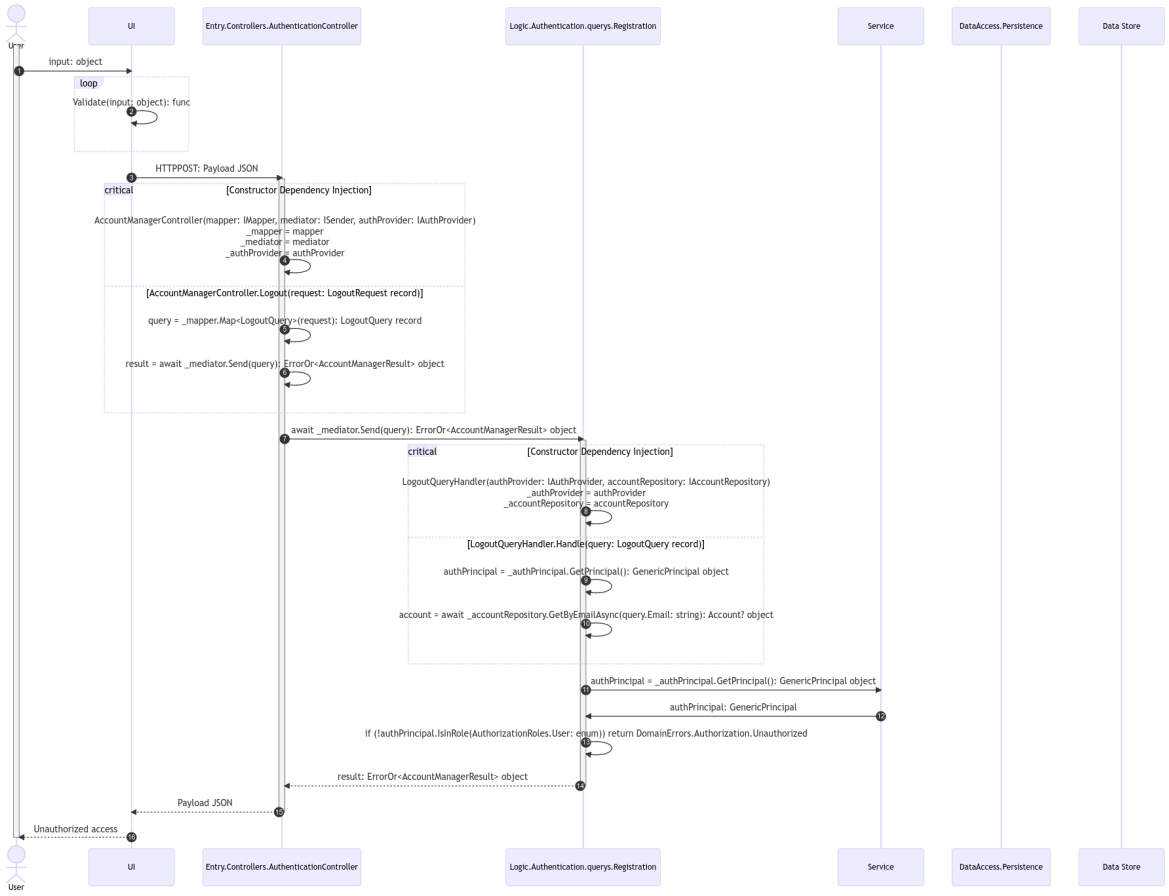
Success Case 3

User attempts to modify protected data within authorization scope. Access is granted to perform write operations.



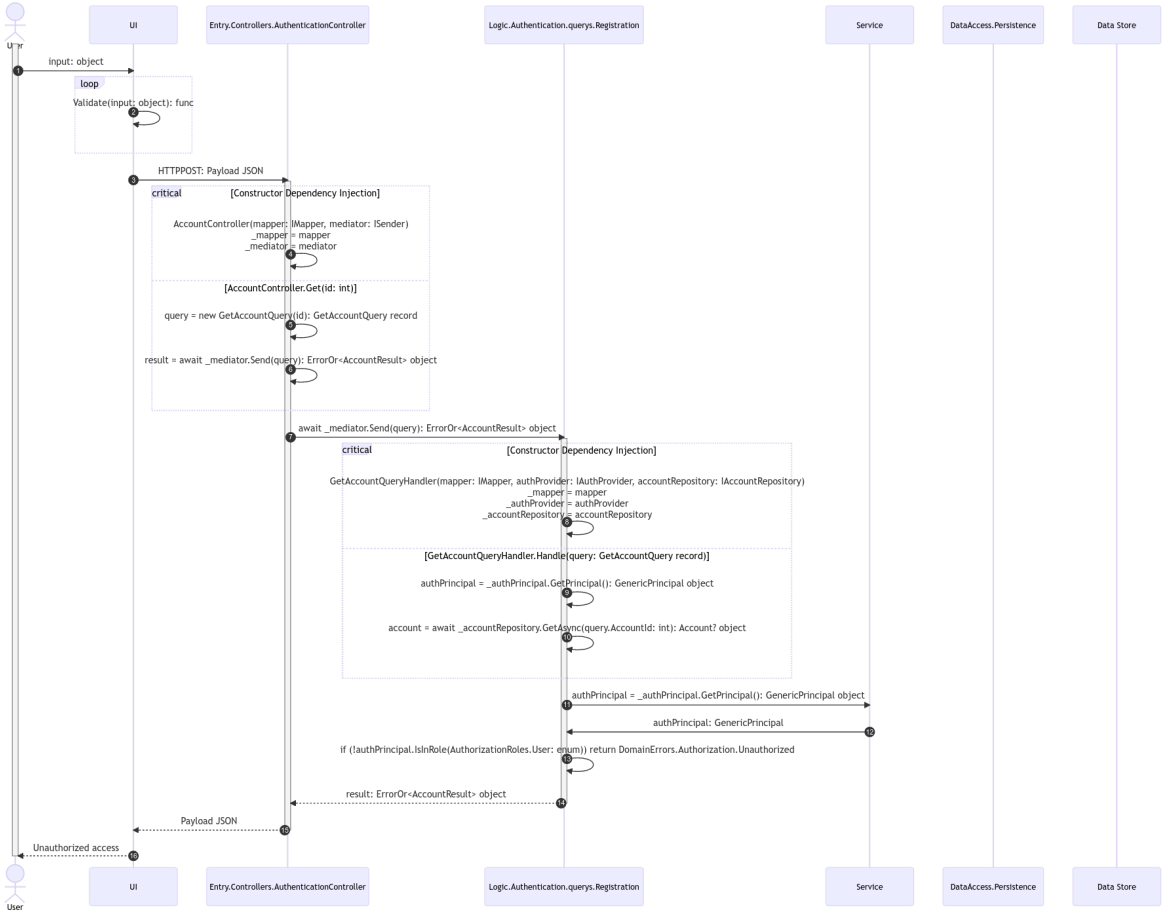
Failure Case 1

User attempts to access a protected functionality outside of authorization scope.



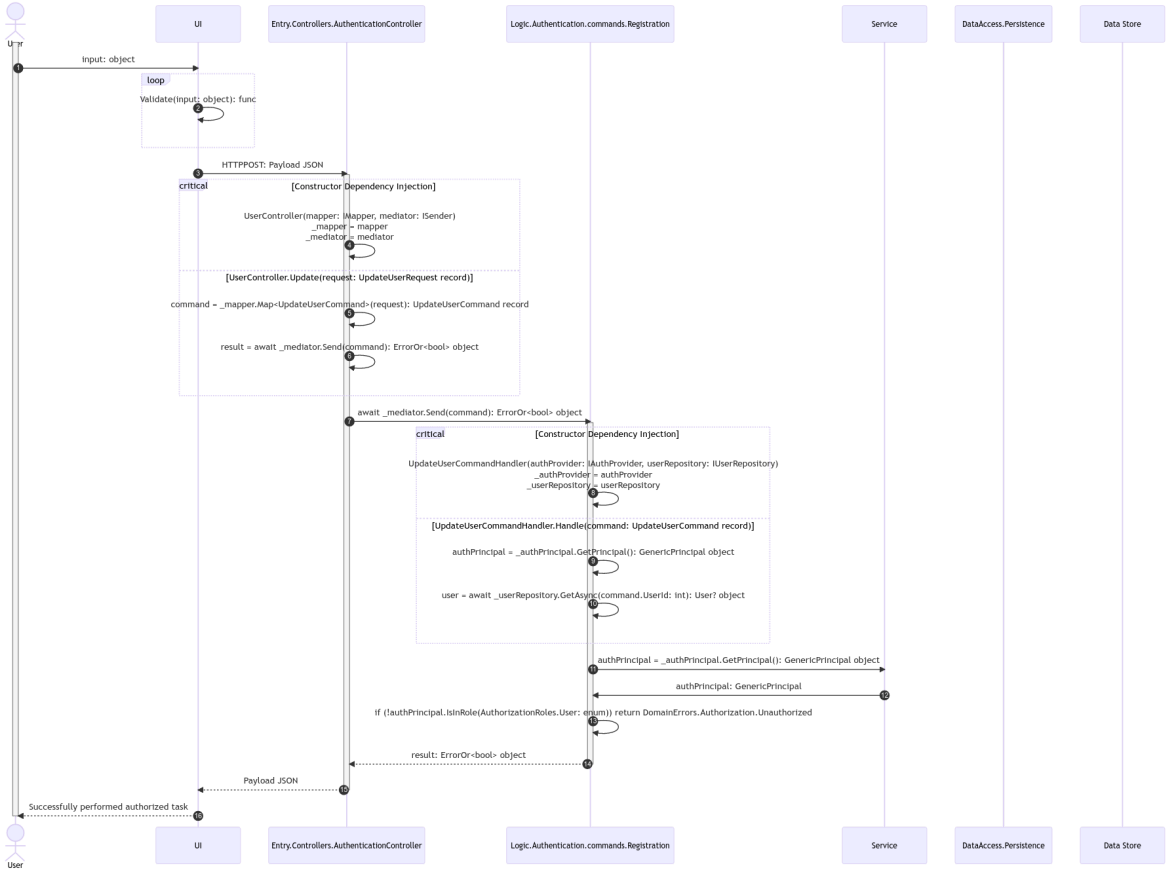
Failure Case 2

User attempts to access protected data outside of authorization scope.



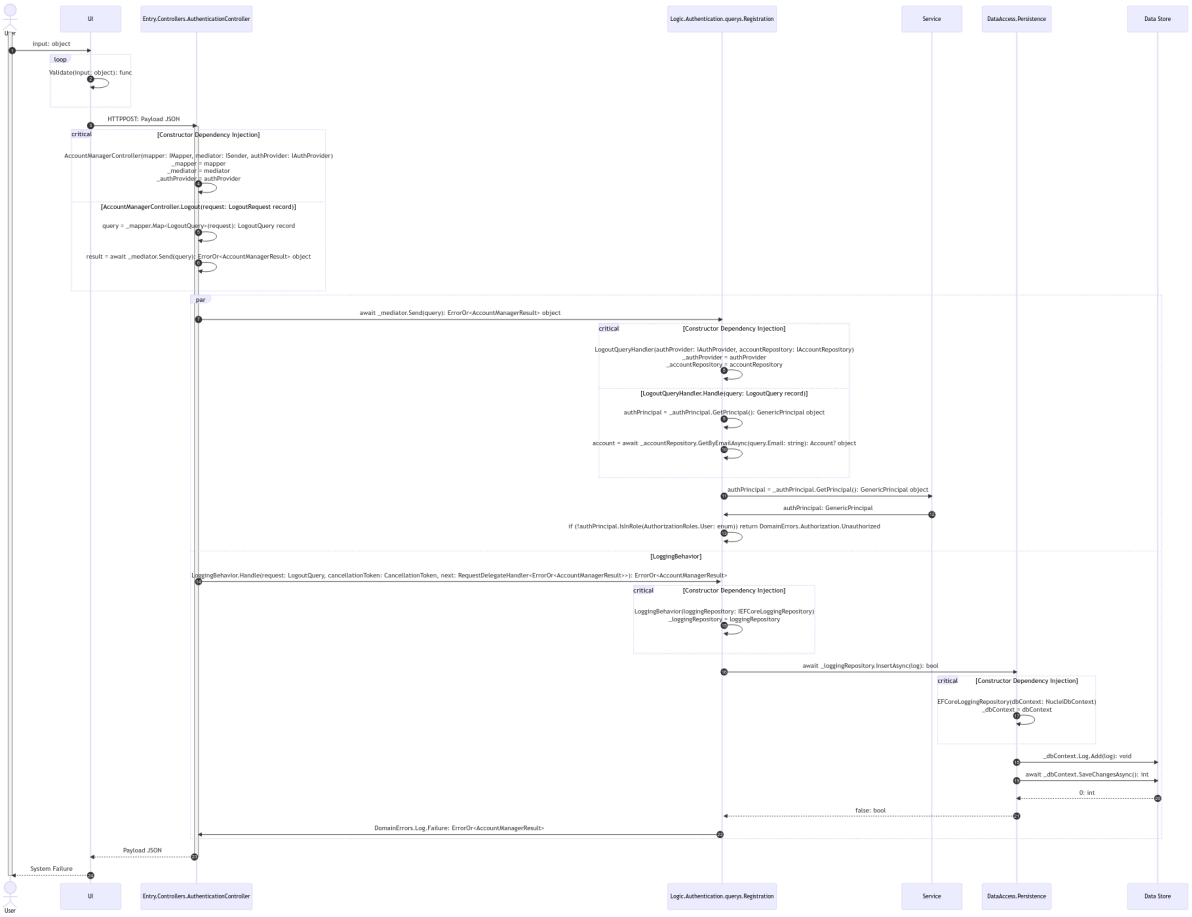
Failure Case 3

User attempts to modify protected data outside of authorization scope.



Failure Case 4

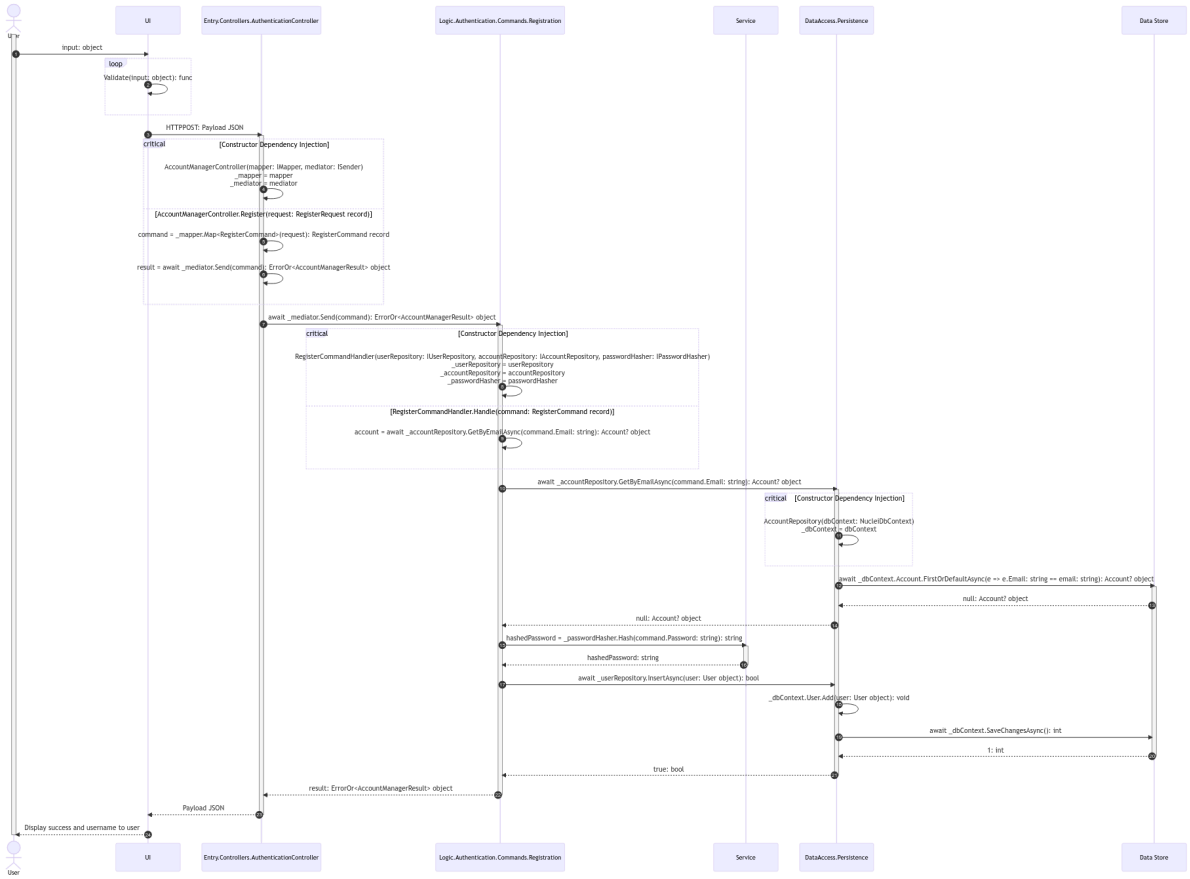
Unauthorized access fails to be logged.



Registration

Success Case

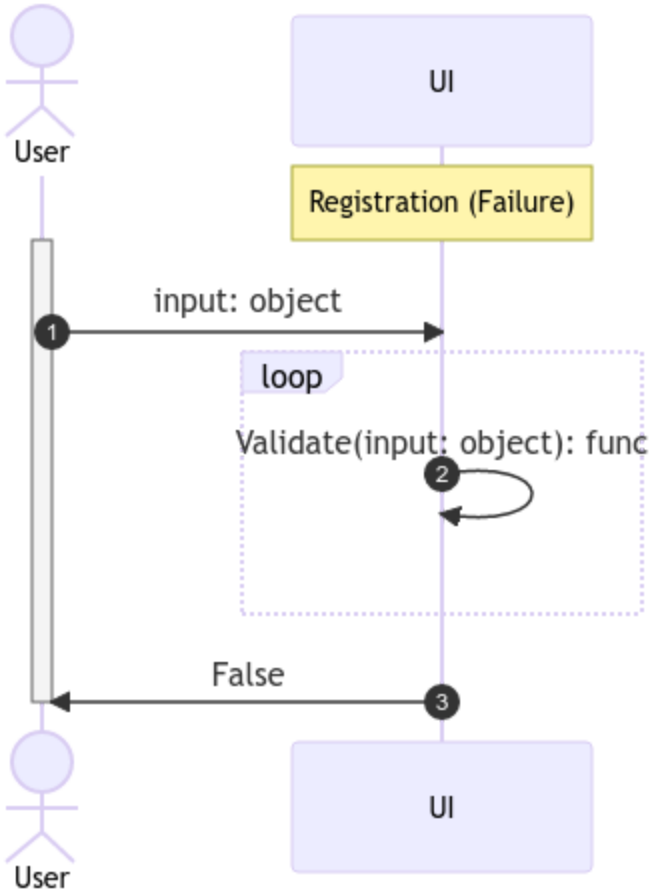
User registers with a valid email address and valid password. The system, without timing out, assigns the email as the user's unique username, displays a success message to the interface, and associates the unique username/email to the user.



Failure Case 1

User registers with an invalid email address

The user attempts to create an account but enters an incorrect email. Inside the UI layer we check to make sure that the information given by the user is of correct form. If the user inputs an incorrect email we will notify the user that the email is incorrect and they will need to enter a new one. We loop until the email that the user enters is a correct email(infinitely).
Fig. 2

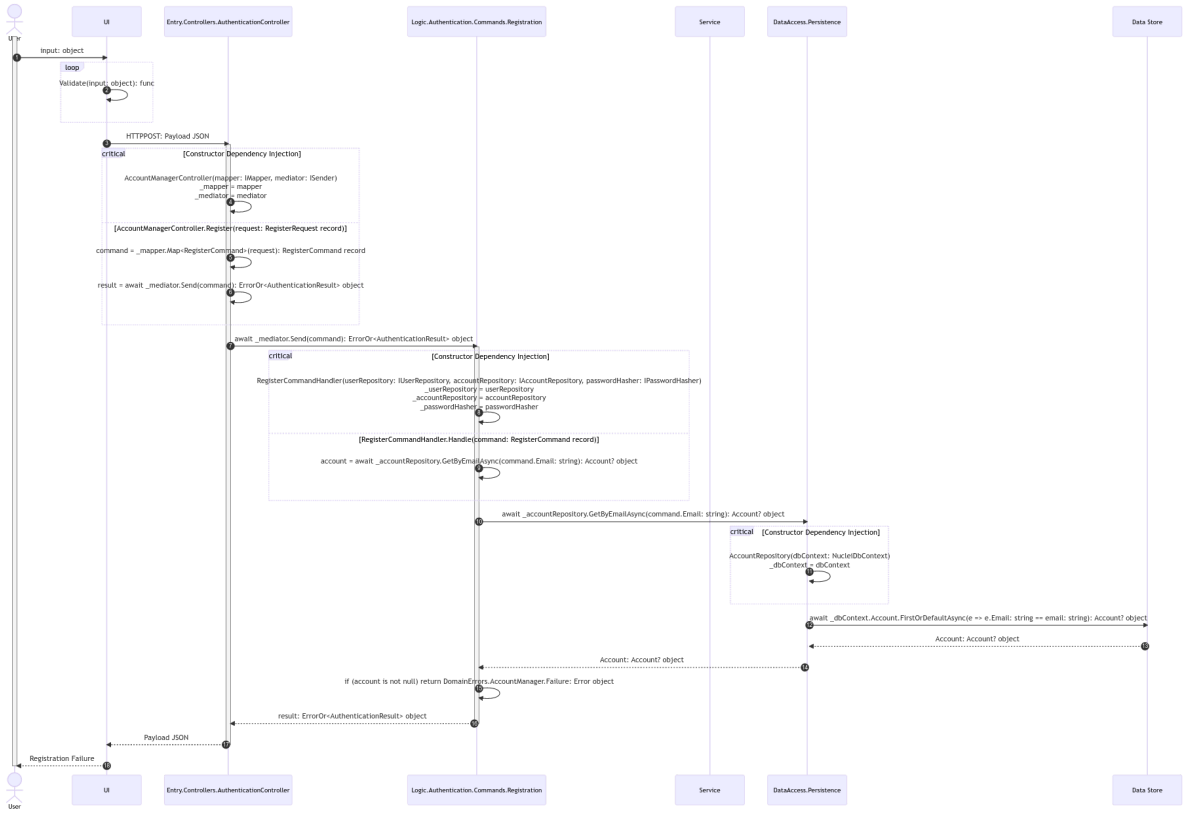


Failure Case 2

User registers with a valid email address, but it is not unique within the system. This causes our system to not assign a username.

After acceptable information is entered the UI layer sends an HTTP request to the entry layer. Upon receiving the HTTP request the Entry layer sends the request to the validator inside the business logic layer. In the business layer a check is made to see if the account already exists. To do this the business layer gives the information of the account to the data access layer which checks the data store if the account already exists inside the system. The email address already exists inside the data store so the account is not created and an “email already exists” failure response is sent back to the business logic layer. The business logic layer sends an invalid email failure response to the entry layer which sends the failure response to the ui notifying the user, “Invalid email provided. Retry again or contact system administrator”.

Fig. 3

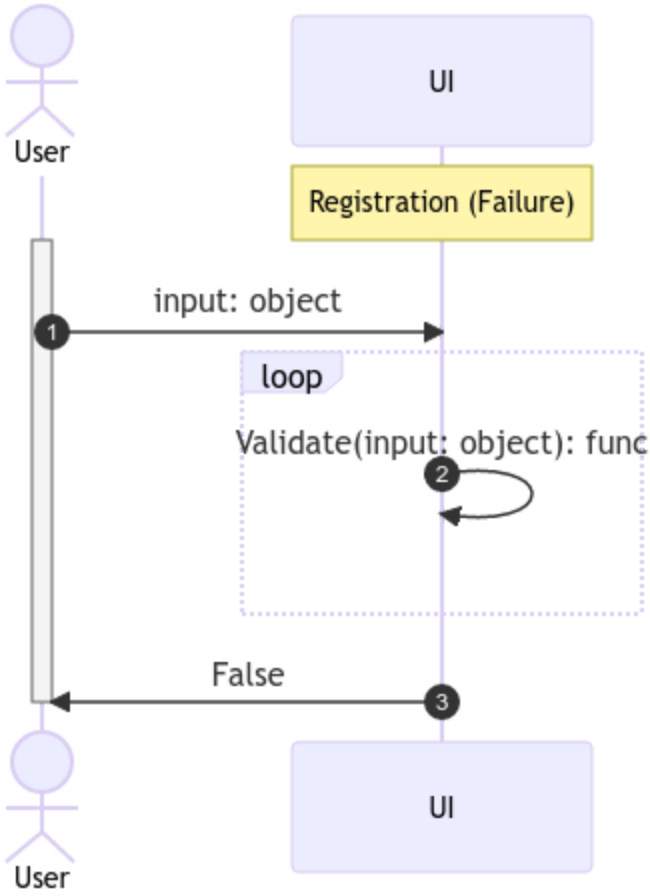


After acceptable information is entered by the user and an http request is made the mediation will find a handler for the respective request. The first thing the handler does is validate that the email exists inside our database. This is done through calling the GetUserByEmail function inside our business logic layer which has an email parameter. This function is a part of the data access layer which takes in the email and returns a nullable user object. Inside the getUserByEmail() function we use dbContext to query the database for the firstorDefault instance of the email. In this case the email already exists inside the database so the getUserByEmail() returns a user to the business logic layer. Inside the business logic layer we will have a condition that if the getUserByEmail function returns a user that an error of the type ErrorOr<AuthenticationResult> is sent back to the entry layer. This error is then sent to the ui layer which will display to the user the error message.

Failure Case 3

User registers with an invalid password

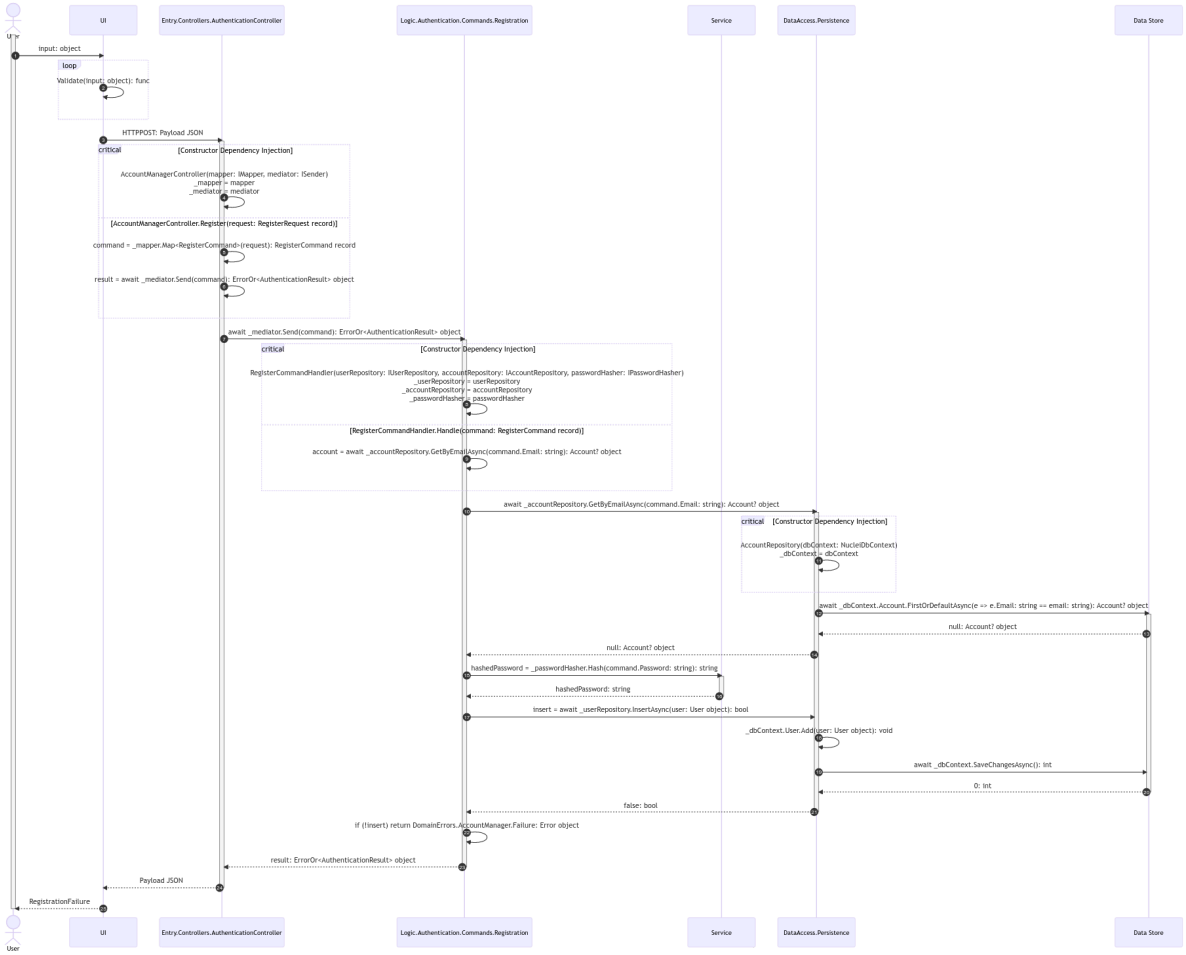
The user attempts to create an account but enters an incorrect password. Inside the UI layer we check to make sure that the information given by the user is of correct form. If the user inputs an incorrect password we will notify the user that the password is incorrect and they will need to enter a new one.



Technical Description:
After the user chooses to register an account they are prompted to enter their information(first name, last name,email,password). The password they have entered is of incorrect form. Inside the front end component logic(.js) we use the yup library to define and check our input standards. The password does not meet the following standards: Passwords must be at least 8 characters, must contain at least 1 capital and 1 lowercase character, at least 1 number, and at least 1 special character. The validatInfo(User) returns false and the user is then prompted informing them of the mistake and they are able to enter new information. The user is able to enter their information however many times they want.

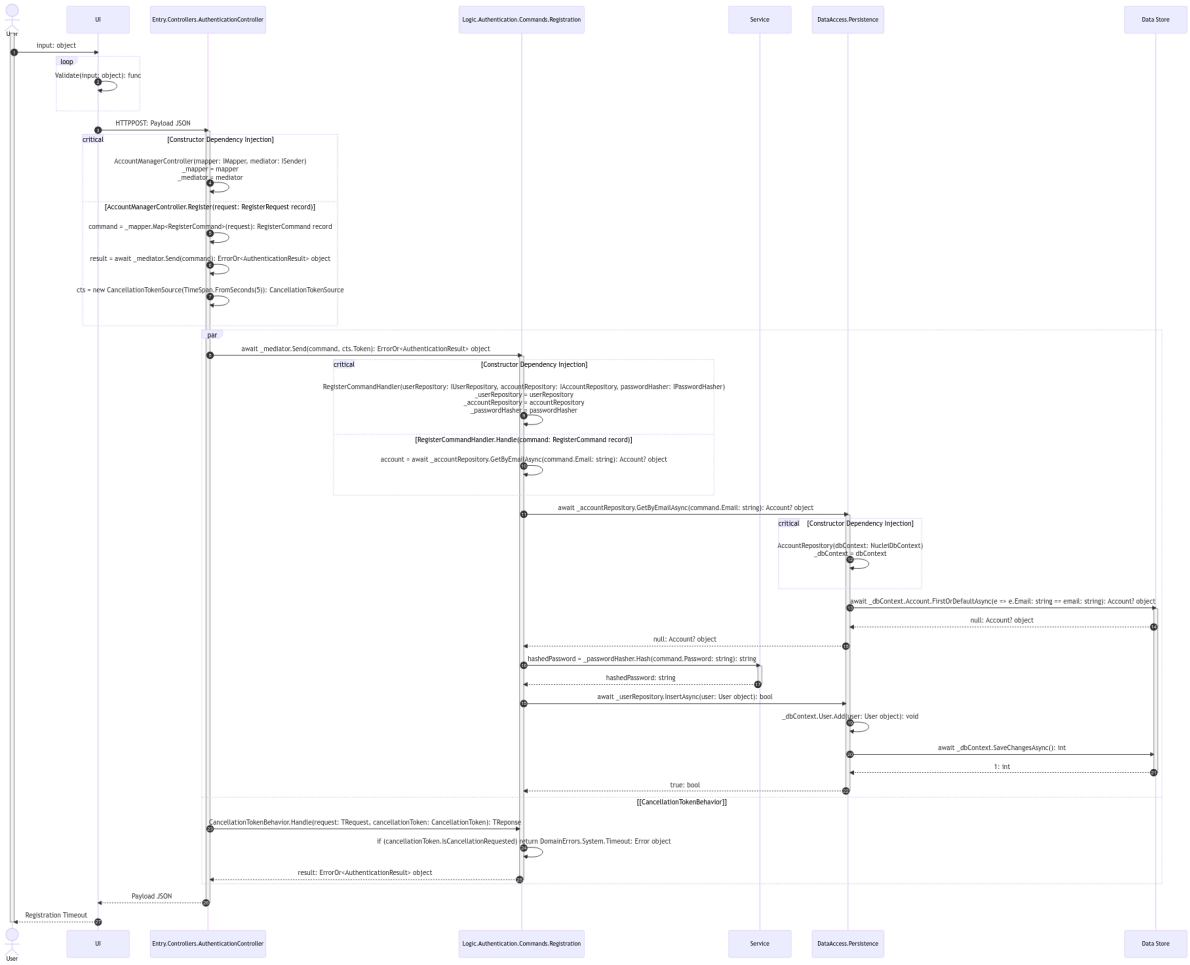
Failure Case 4

User enters correct information but the user is not able to be created inside the database.(database full)



Failure Case 5

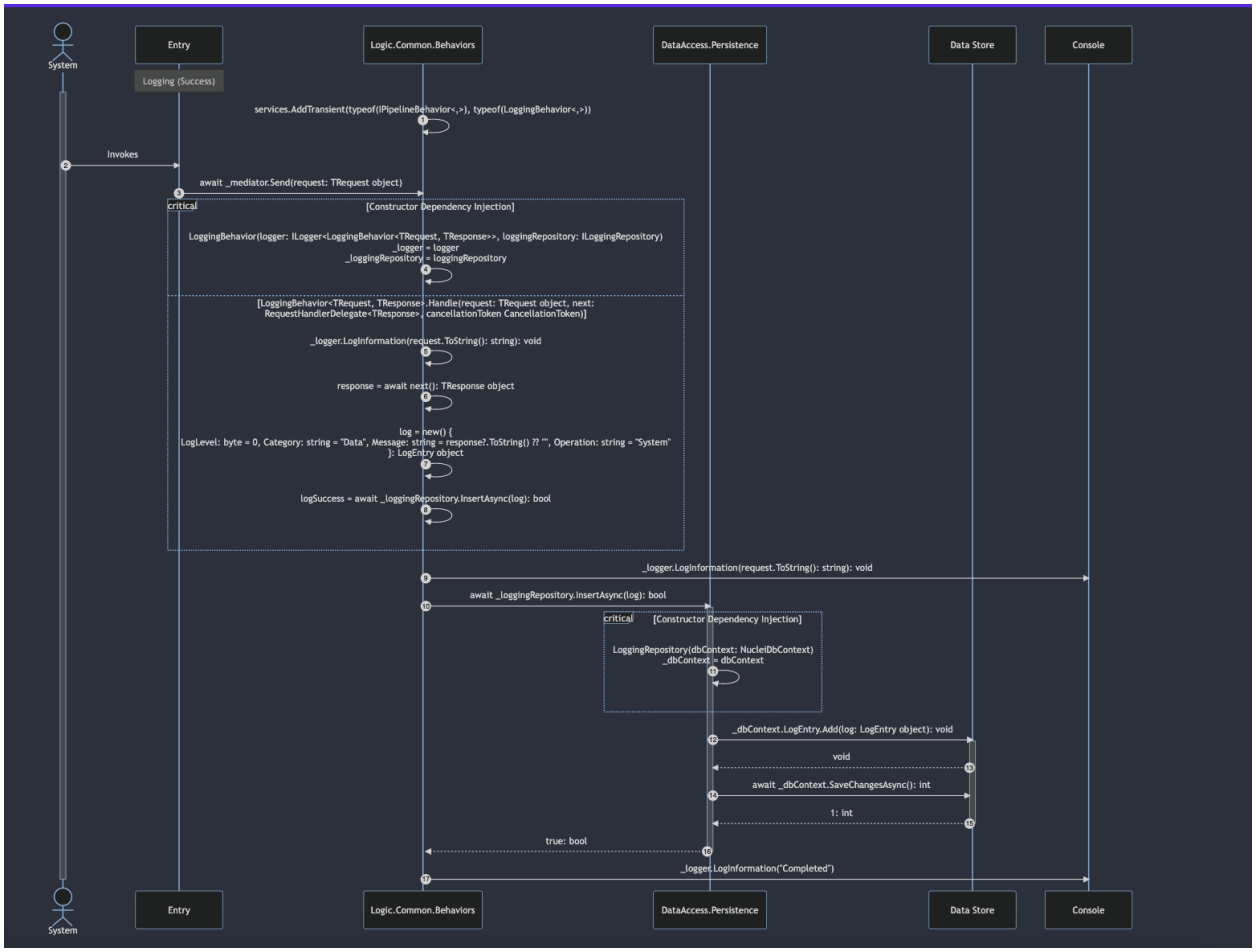
User registers, an account is created and the username is returned back to the user. Process takes longer than 5 seconds.



Logging

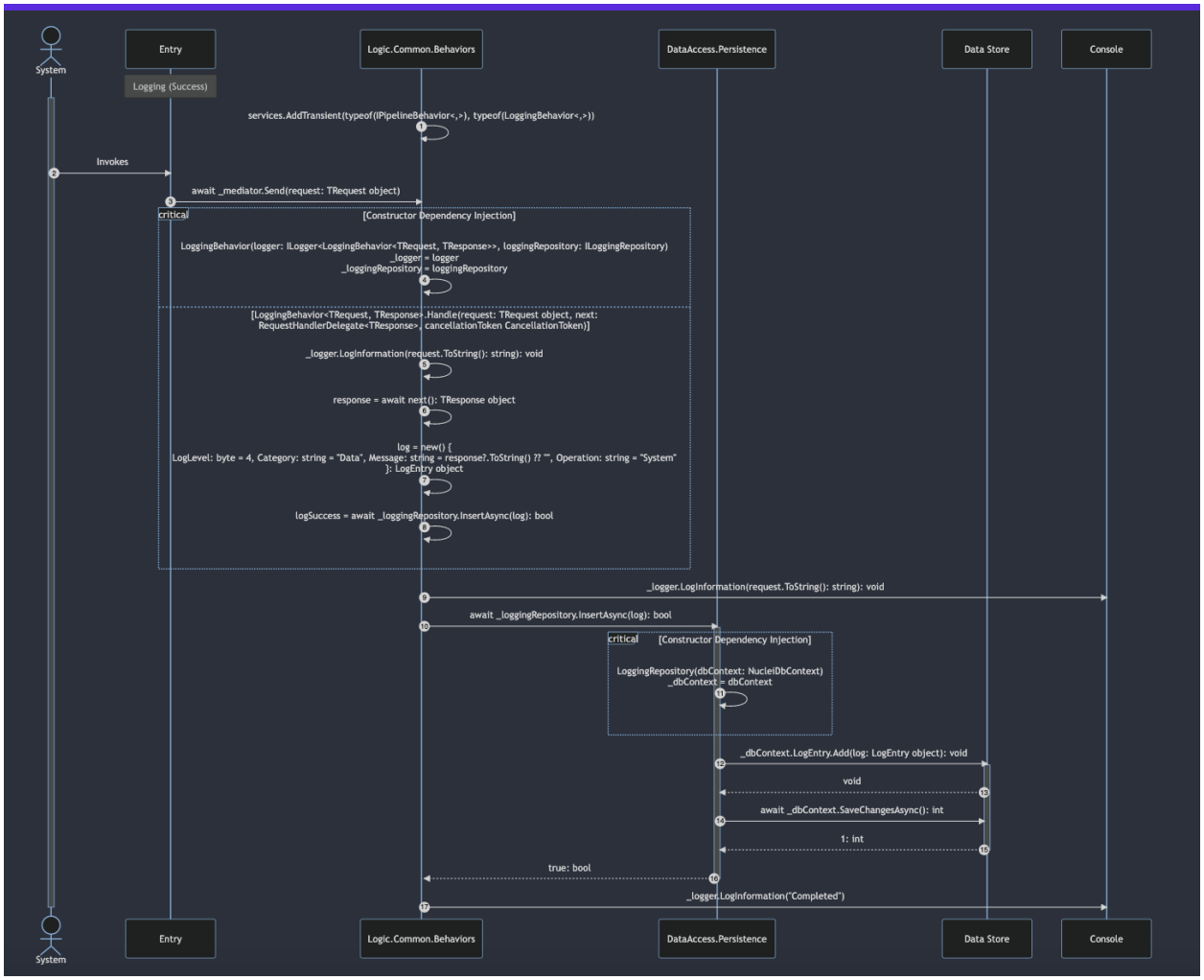
Success Case 1

The system logs system success events



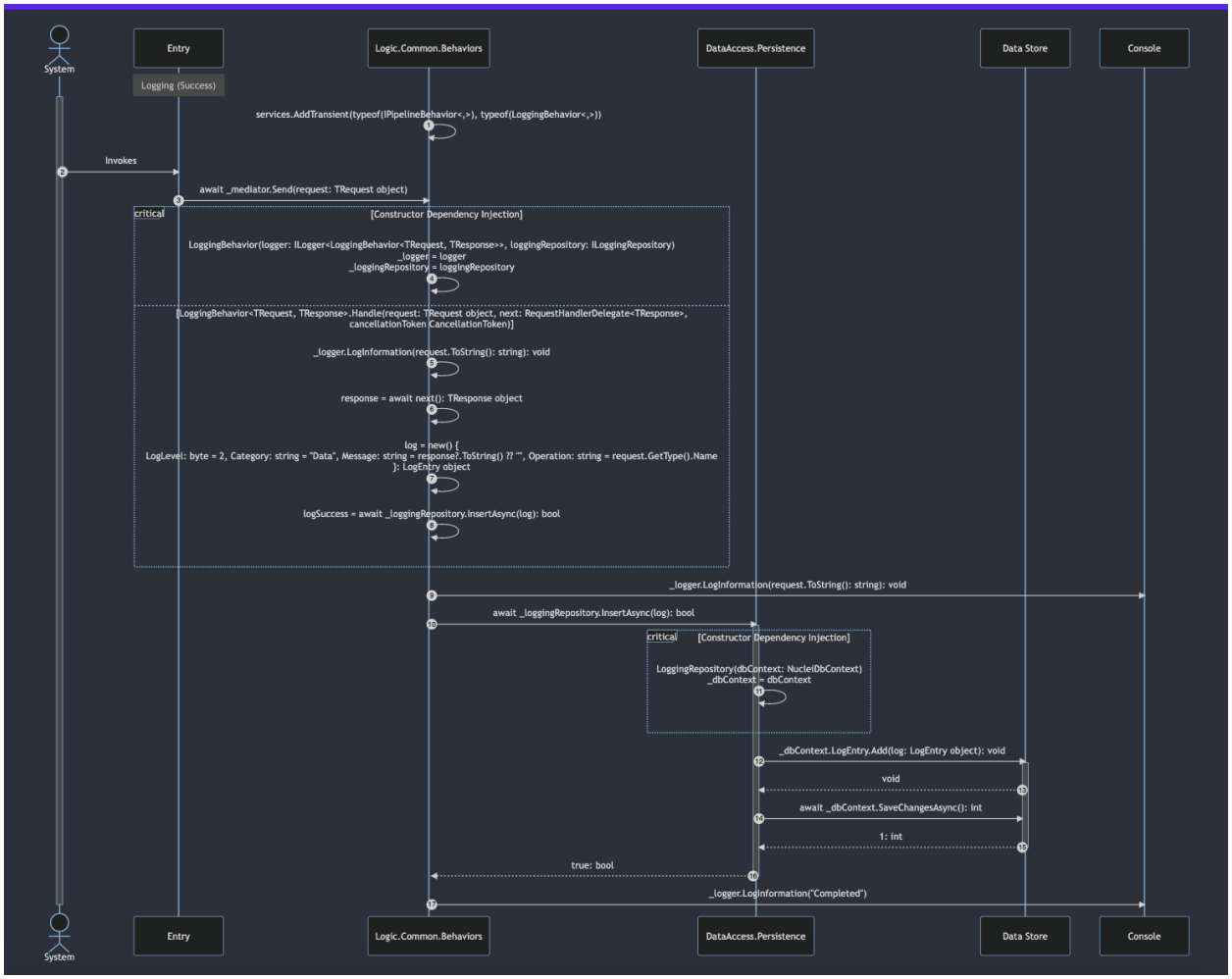
Success Case 2

The system logs system failure events



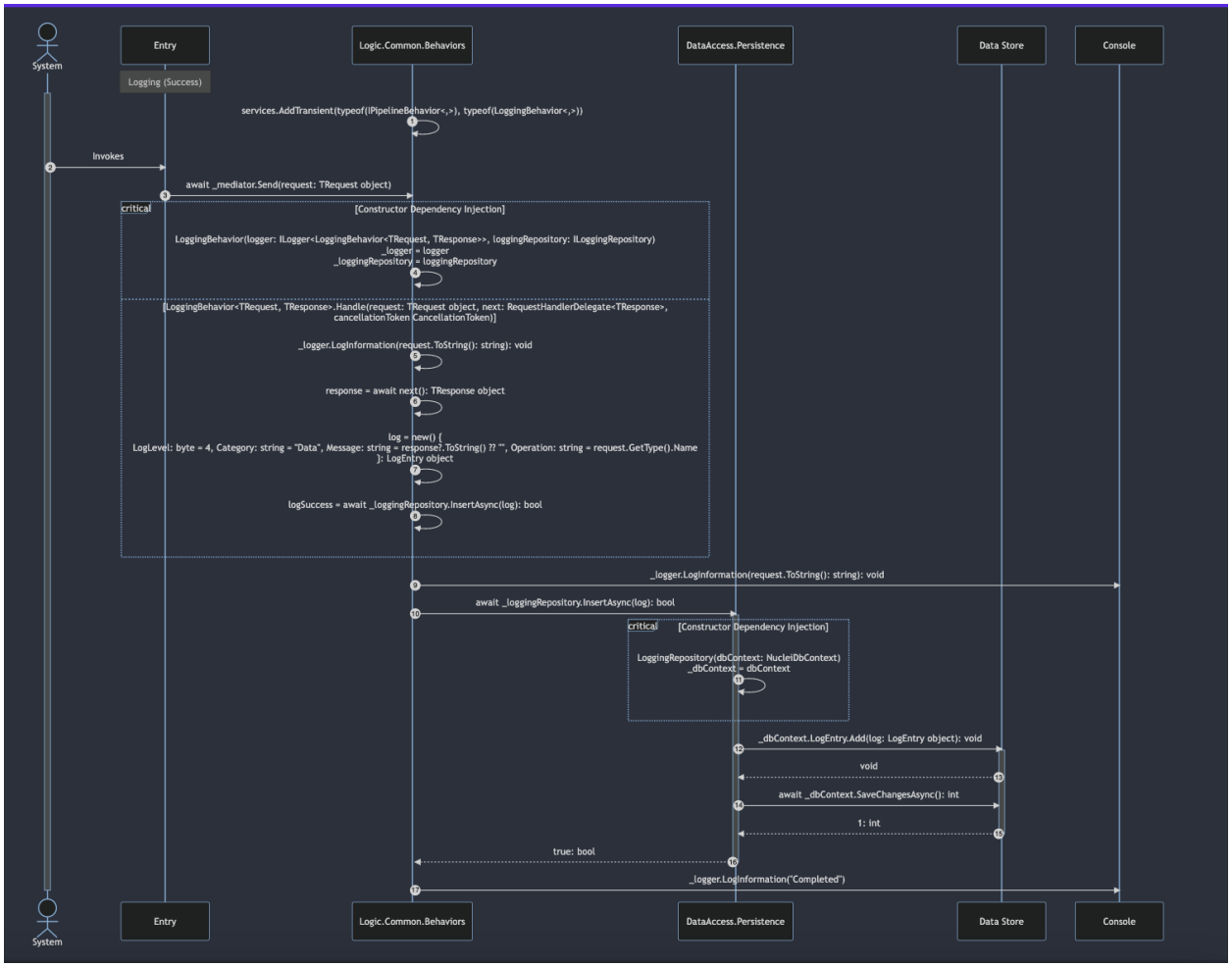
Success Case 3

The system logs user success events



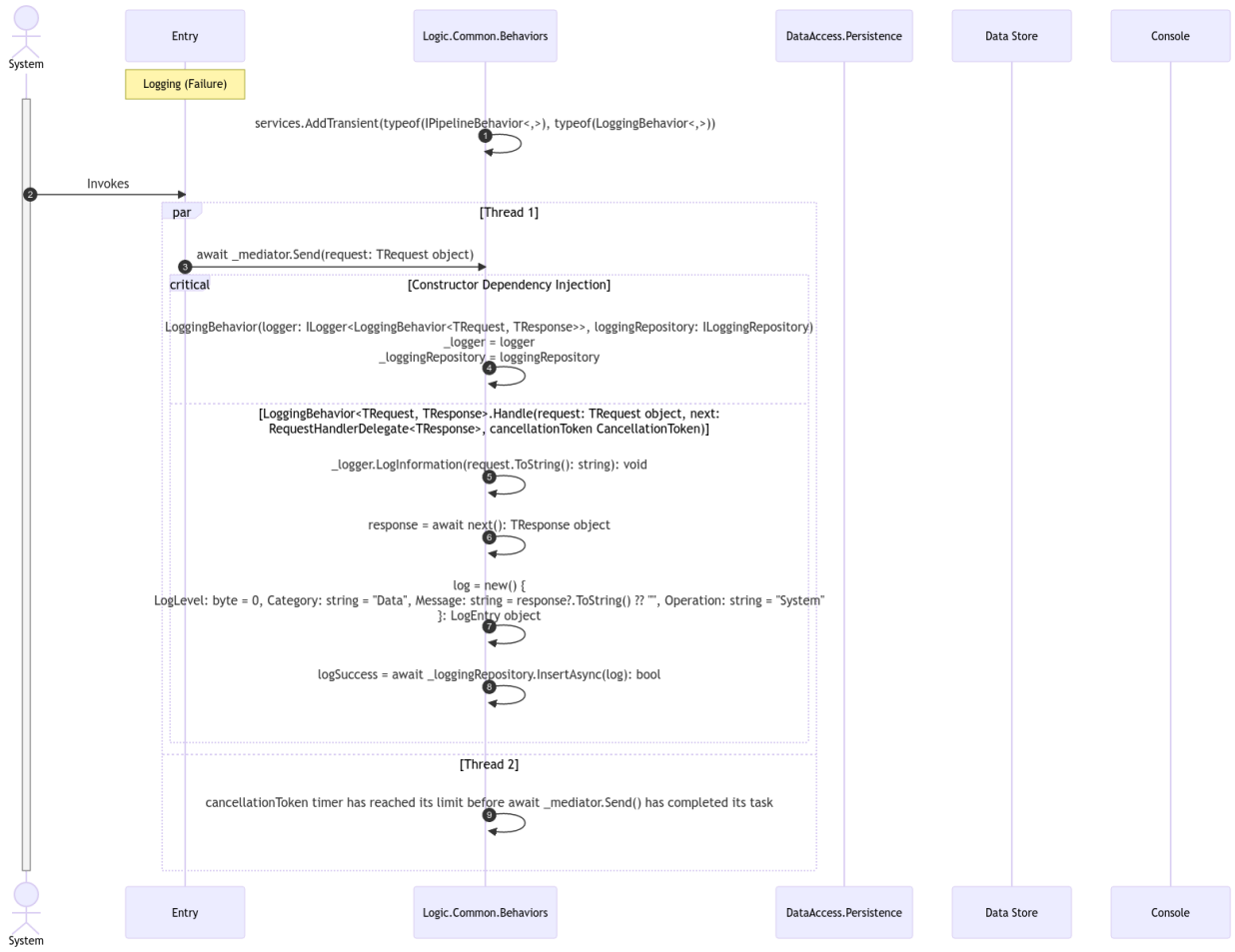
Success Case 4

The system logs user failure events



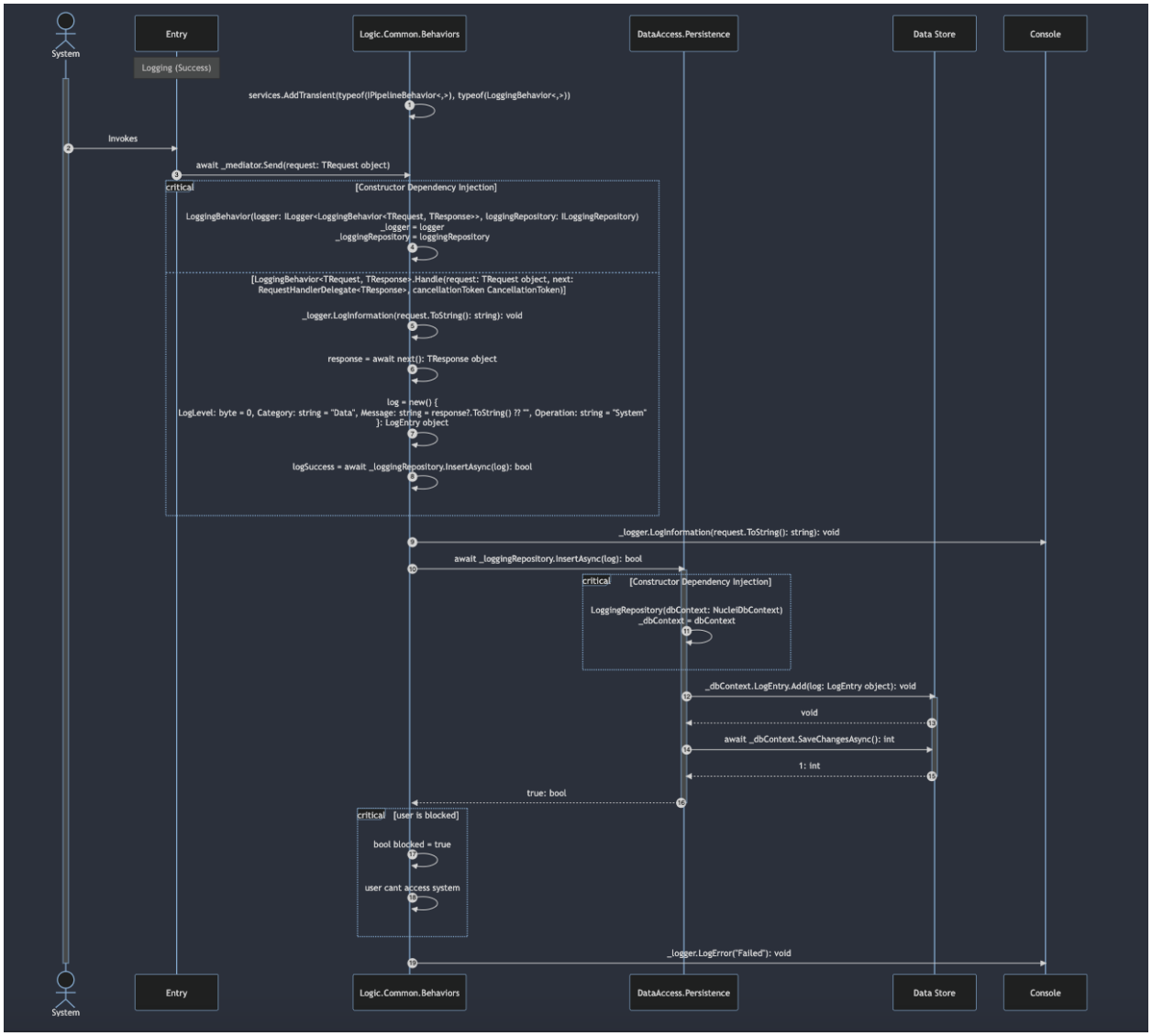
Failure Case 1

The logging pipeline timed out.



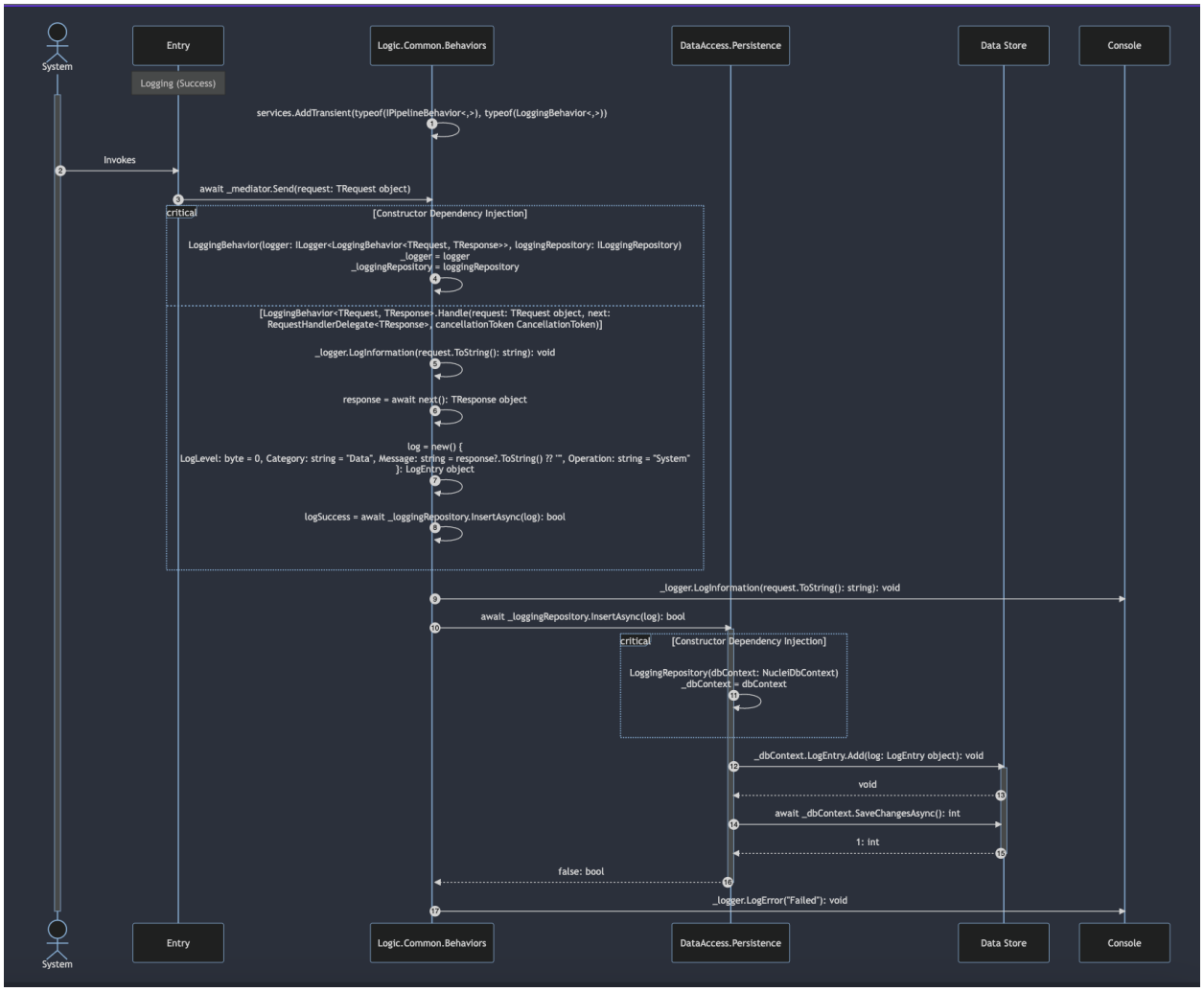
Failure Case 2

The logging process blocks a user from interacting with the system?



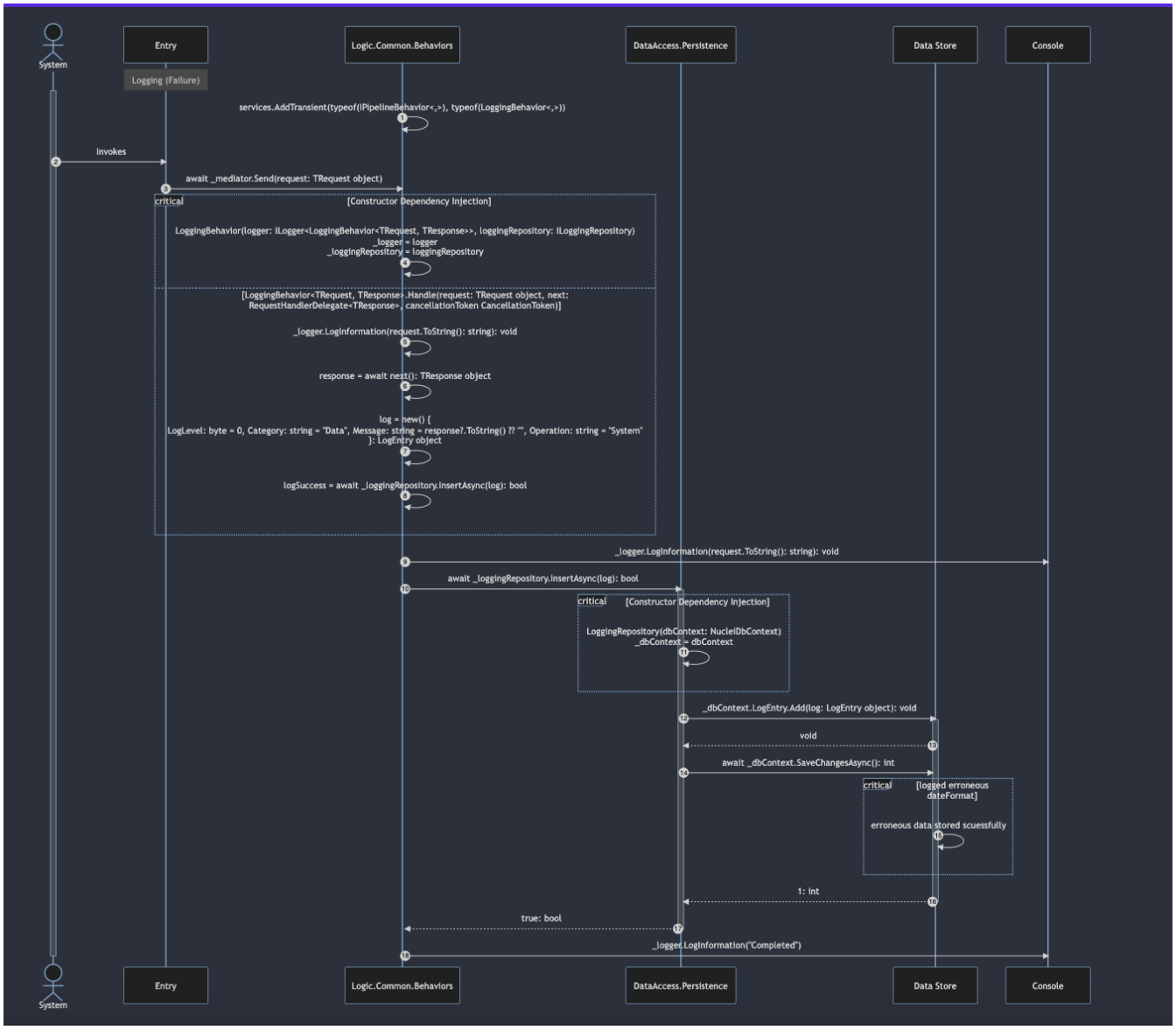
Failure Case 3

The logging pipeline did not time out, but did not save to persistent data storage.



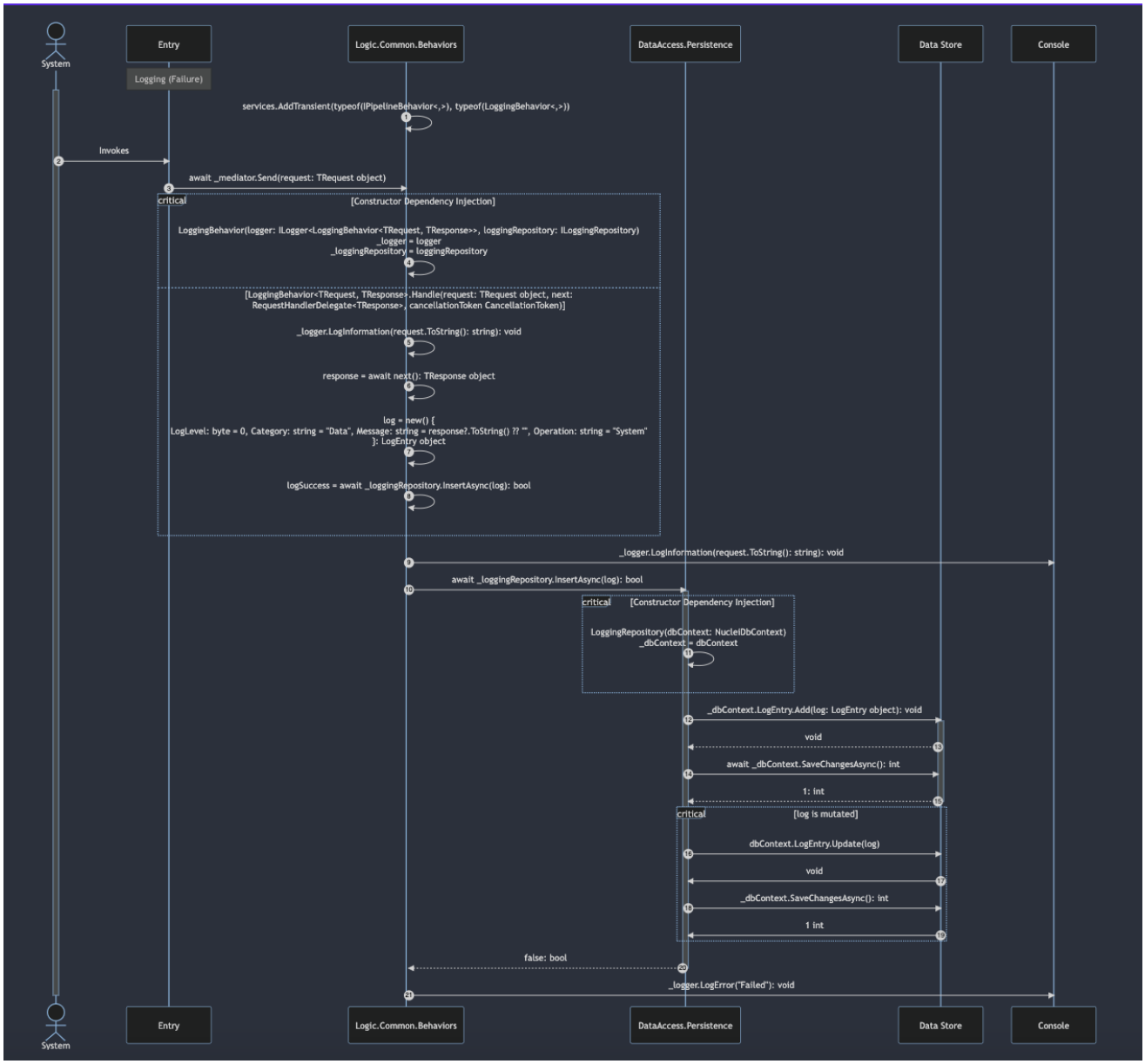
Failure Case 4

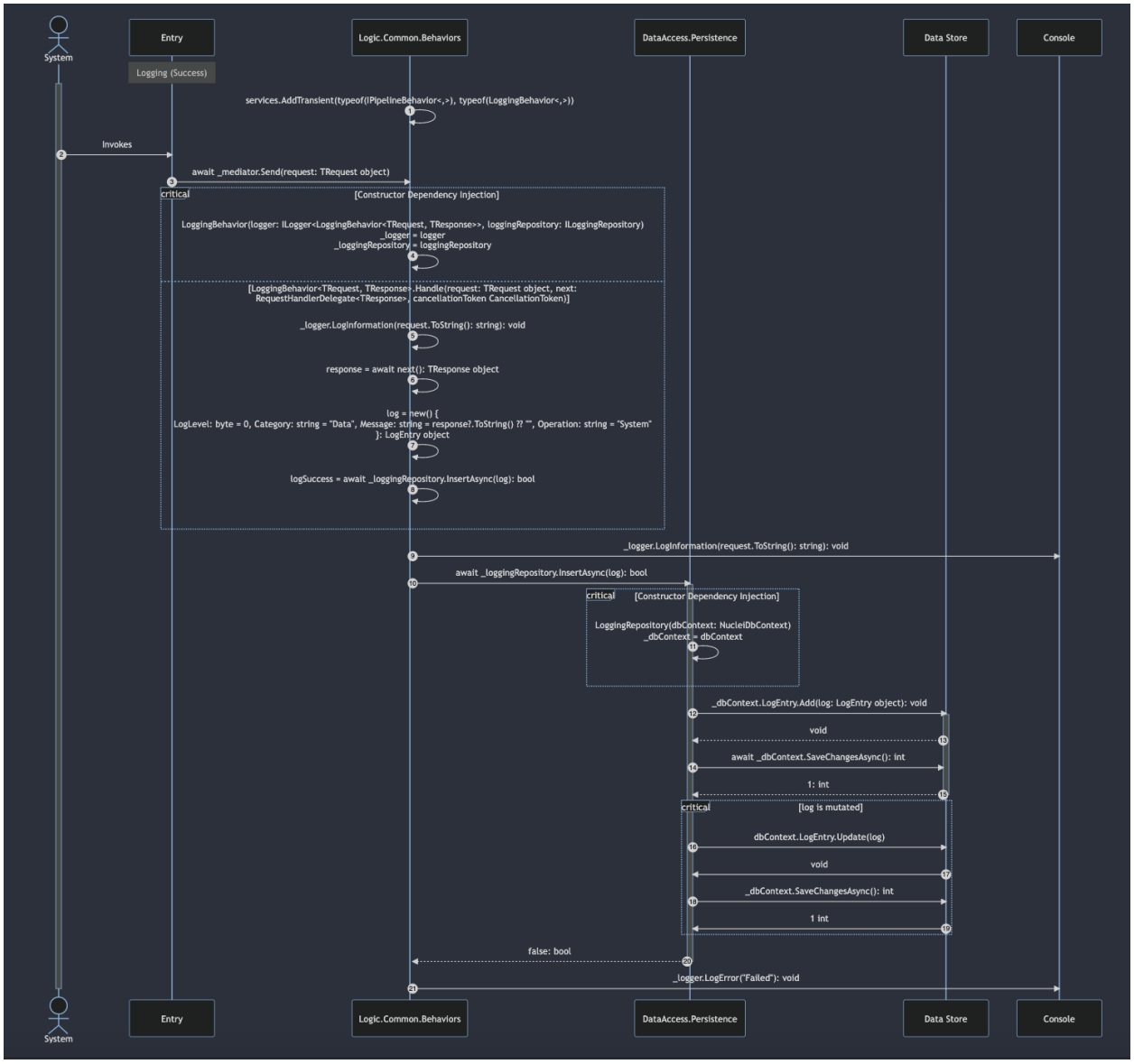
The logging pipeline did not time out, but there are erroneous discrepancies in the data which was stored.



Failure Case 5

Saved log entries in the data store are mutated in some way.


System
Entry
Logic.Common.Behaviors
DataAccess.Persistence
Data Store
Console
Logging (Failure)
services.AddTransient(typeof(IPipelineBehavior<,>), typeof(LoggingBehavior<,>))
Invokes
await _mediator.Send(request: TRequest object)
critical
[Constructor Dependency Injection]
LoggingBehavior(logger: ILogger<LoggingBehavior<TRequest, TResponse>>, loggingRepository: ILoggingRepository)
_logger = logger
_loggingRepository = loggingRepository
[LoggingBehavior<TRequest, TResponse>.Handle(request: TRequest object, next:
RequestHandlerDelegate<TResponse>, cancellationToken CancellationToken)]
_logger.LogInformation(request.ToString(): string): void
response = await next(): TResponse object
log = new() {
LogLevel: byte = 0, Category: string = "Data", Message: string = response?.ToString() ?? "", Operation: string = "System"
}: LogEntry object
logSuccess = await _loggingRepository.InsertAsync(log): bool
_logger.LogInformation(request.ToString(): string): void
await _loggingRepository.InsertAsync(log): bool
critical
[Constructor Dependency Injection]
LoggingRepository(dbContext: NucleiDbContext)
_dbContext = dbContext
_dbContext.LogEntry.Add(log: LogEntry object): void
void
await _dbContext.SaveChangesAsync(): int
1: int
critical
[log is mutated]
dbContext.LogEntry.Update(log)
void
_dbContext.SaveChangesAsync(): int
1 int
false: bool
_logger.LogError("Failed"): void
System
Entry
Logic.Common.Behaviors
DataAccess.Persistence
Data Store
Console


System
Entry
Logic.Common.Behaviors
DataAccess.Persistence
Data Store
Console
Logging (Success)
services.AddTransient(typeof(IPipelineBehavior<,>), typeof(LoggingBehavior<,>))
1
Invokes
2
await _mediator.Send(request: TRequest object)
3
critical
[Constructor Dependency Injection]
LoggingBehavior(logger: ILogger<LoggingBehavior<TRequest, TResponse>>, loggingRepository: ILoggingRepository)
_logger = logger
_loggingRepository = loggingRepository
4
[LoggingBehavior<TRequest, TResponse>.Handle(request: TRequest object, next:
RequestHandlerDelegate<TResponse>, cancellationToken CancellationToken)]
_logger.LogInformation(request.ToString(): string): void
5
response = await next(): TResponse object
6
log = new() {
LogLevel: byte = 0, Category: string = "Data", Message: string = response?.ToString() ?? "", Operation: string = "System"
}: LogEntry object
7
logSuccess = await _loggingRepository.InsertAsync(log): bool
8
_logger.LogInformation(request.ToString(): string): void
9
await _loggingRepository.InsertAsync(log): bool
10
critical
[Constructor Dependency Injection]
LoggingRepository(dbContext: NucleiDbContext)
_dbContext = dbContext
11
_dbContext.LogEntry.Add(log: LogEntry object): void
12
void
13
await _dbContext.SaveChangesAsync(): int
14
1: int
15
critical
[log is mutated]
dbContext.LogEntry.Update(log)
16
void
17
_dbContext.SaveChangesAsync(): int
18
1 int
19
false: bool
20
_logger.LogError("Failed"): void
21

Authorization Code

Success Case 1

```
sequenceDiagram
    actor User
    participant ui as UI
    participant e as Entry.Controllers.AuthenticationController
    participant bl as Logic.Authentication.querys.Registration
    participant s as Service
    participant da as DataAccess.Persistence
    participant ds as Data Store
    autonumber
    activate User
    User->>ui: input: object
    loop
        ui->>ui: Validate(input: object): func
    end
    ui->>+e: HTTPPOST: Payload JSON
    critical Constructor Dependency Injection
        e->>e: AccountManagerController(mapper: IMapper, mediator:
ISender, authProvider: IAuthProvider)<br/>_mapper = mapper<br/>_mediator =
mediator<br/>_authProvider = authProvider
    option AccountManagerController.Logout(request: LogoutRequest record)
        e->>e: query = _mapper.Map<LogoutQuery>(request): LogoutQuery
record
        e->>e: result = await _mediator.Send(query):
ErrorOr<AccountManagerResult> object
    end
    e->>+bl: await _mediator.Send(query): ErrorOr<AccountManagerResult>
object
    critical Constructor Dependency Injection
        bl->>bl: LogoutQueryHandler(authProvider: IAuthProvider,
accountRepository: IAccountRepository)<br/>_authProvider =
authProvider<br/>_accountRepository = accountRepository
    option LogoutQueryHandler.Handle(query: LogoutQuery record)
        bl->>bl: authPrincipal = _authPrincipal.GetPrincipal():
GenericPrincipal object
        bl->>bl: account = await
_accountRepository.GetByEmailAsync(query.Email: string): Account? object
    end
```

```
    bl->>s: authPrincipal = _authPrincipal.GetPrincipal():
GenericPrincipal object
    s->>bl: authPrincipal: GenericPrincipal
    bl->>bl: if (!authPrincipal.IsInRole(AuthorizationRoles.User: enum))
=> false
    bl->>+da: account = await
_accountRepository.GetByEmailAsync(query.Email: string): Account? object
    critical Constructor Dependency Injection
        da->>da: AccountRepository(dbContext:
NucleiDbContext)<br/>_dbContext = dbContext
    end
    da->>+ds: await _dbContext.Account.FirstOrDefaultAsync(e => e.Email:
string == email: string): Account? object
    ds-->>da: Account: Account? object
    da-->>bl: Account: Account? object
    bl->>bl: _authProvider.ClearPrincipal(): void
    bl-->>-e: result: ErrorOr<AccountManagerResult> object
    e-->>-ui: Payload JSON
    ui-->>User: Successfully performed authorized task
deactivate User
```

Success Case 2

```
sequenceDiagram
    actor User
    participant ui as UI
    participant e as Entry.Controllers.AuthenticationController
    participant bl as Logic.Authentication.querys.Registration
    participant s as Service
    participant da as DataAccess.Persistence
    participant ds as Data Store
    autonumber
    activate User
    User->>ui: input: object
    loop
        ui->>ui: Validate(input: object): func
    end
    ui->>+e: HTTPPOST: Payload JSON
    critical Constructor Dependency Injection
        e->>e: AccountController(mapper: IMapper, mediator:
ISender)<br/>_mapper = mapper<br/>_mediator = mediator
    option AccountController.Get(id: int)
```

```
        e->>e: query = new GetAccountQuery(id): GetAccountQuery record
        e->>e: result = await _mediator.Send(query):
ErrorOr<AccountResult> object
    end
    e->>+bl: await _mediator.Send(query): ErrorOr<AccountResult> object
    critical Constructor Dependency Injection
        bl->>bl: GetAccountQueryHandler(mapper: IMapper, authProvider:
IAuthProvider, accountRepository: IAccountRepository)<br/>_mapper =
mapper<br/>_authProvider = authProvider<br/>_accountRepository =
accountRepository
    option GetAccountQueryHandler.Handle(query: GetAccountQuery record)
        bl->>bl: authPrincipal = _authPrincipal.GetPrincipal():
GenericPrincipal object
        bl->>bl: account = await
_accountRepository.GetAsync(query.AccountId: int): Account? object
    end
    bl->>s: authPrincipal = _authPrincipal.GetPrincipal():
GenericPrincipal object
    s->>bl: authPrincipal: GenericPrincipal
    bl->>bl: if (!authPrincipal.IsInRole(AuthorizationRoles.User: enum))
=> false
    bl->>+da: account = await _accountRepository.GetAsync(query.AccountId:
int): Account? object
    critical Constructor Dependency Injection
        da->>da: AccountRepository(dbContext:
NucleiDbContext)<br/>_dbContext = dbContext
    end
    da->>+ds: await _dbContext.Account.FirstOrDefaultAsync(e =>
e.AccountId: int == id: int): Account? object
    ds-->>da: Account: Account? object
    da-->>bl: Account: Account? object
    bl-->>-e: result: ErrorOr<AccountResult> object
    e-->>-ui: Payload JSON
    ui-->>User: Successfully performed authorized task
deactivate User
```

Success Case 3

```
sequenceDiagram
    actor User
    participant ui as UI
    participant e as Entry.Controllers.AuthenticationController
```

```
    participant bl as Logic.Authentication.commands.Registration
    participant s as Service
    participant da as DataAccess.Persistence
    participant ds as Data Store
    autonumber
    activate User
    User->>ui: input: object
    loop
        ui->>ui: Validate(input: object): func
    end
    ui->>+e: HTTPPOST: Payload JSON
    critical Constructor Dependency Injection
        e->>e: UserController(mapper: IMapper, mediator:
ISender)<br/>_mapper = mapper<br/>_mediator = mediator
    option UserController.Update(request: UpdateUserRequest record)
        e->>e: command = _mapper.Map<UpdateUserCommand>(request):
UpdateUserCommand record
        e->>e: result = await _mediator.Send(command): ErrorOr<bool>
object
    end
    e->>+bl: await _mediator.Send(command): ErrorOr<bool> object
    critical Constructor Dependency Injection
        bl->>bl: UpdateUserCommandHandler(authProvider: IAuthProvider,
userRepository: IUserRepository)<br/>_authProvider =
authProvider<br/>_userRepository = userRepository
    option UpdateUserCommandHandler.Handle(command: UpdateUserCommand
record)
        bl->>bl: authPrincipal = _authPrincipal.GetPrincipal():
GenericPrincipal object
        bl->>bl: user = await _userRepository.GetAsync(command.UserId:
int): User? object
    end
    bl->>s: authPrincipal = _authPrincipal.GetPrincipal():
GenericPrincipal object
    s->>bl: authPrincipal: GenericPrincipal
    bl->>bl: if (!authPrincipal.IsInRole(AuthorizationRoles.User: enum))
=> false
    bl->>+da: user = await _userRepository.GetAsync(command.UserId: int):
User? object
    critical Constructor Dependency Injection
```

```
        da->>da: UserRepository(dbContext: NucleiDbContext)<br/>_dbContext
= dbContext
    end
    da->>+ds: await _dbContext.User.FirstOrDefaultAsync(e => e.UserId: int
== id: int): User? object
    ds-->>da: User: User? object
    da-->>bl: User: User? object
    bl->>bl: user.FirstName = command.FirstName: string<br/>user.LastName
= command.LastName: string<br/>user.Birthday = command.Birthday: string
    bl->>da: await _userRepository.UpdateAsync(user: User): bool
    da->>ds: _dbContext.User.Update(user): void
    da->>ds: await _dbContext.SaveChangesAsync(): int
    da-->>bl: true: bool
    bl-->>-e: result: ErrorOr<bool> object
    e-->>-ui: Payload JSON
    ui-->>User: Successfully performed authorized task
deactivate User
```

Failure Case 1

```
sequenceDiagram
    actor User
    participant ui as UI
    participant e as Entry.Controllers.AuthenticationController
    participant bl as Logic.Authentication.querys.Registration
    participant s as Service
    participant da as DataAccess.Persistence
    participant ds as Data Store
    autonumber
    activate User
    User->>ui: input: object
    loop
        ui->>ui: Validate(input: object): func
    end
    ui->>+e: HTTPPOST: Payload JSON
    critical Constructor Dependency Injection
        e->>e: AccountManagerController(mapper: IMapper, mediator:
ISender, authProvider: IAuthProvider)<br/>_mapper = mapper<br/>_mediator =
mediator<br/>_authProvider = authProvider
    option AccountManagerController.Logout(request: LogoutRequest record)
        e->>e: query = _mapper.Map<LogoutQuery>(request): LogoutQuery
record
```

```
        e->>e: result = await _mediator.Send(query):
ErrorOr<AccountManagerResult> object
    end
    e->>+bl: await _mediator.Send(query): ErrorOr<AccountManagerResult>
object
    critical Constructor Dependency Injection
        bl->>bl: LogoutQueryHandler(authProvider: IAuthProvider,
accountRepository: IAccountRepository)<br/>_authProvider =
authProvider<br/>_accountRepository = accountRepository
    option LogoutQueryHandler.Handle(query: LogoutQuery record)
        bl->>bl: authPrincipal = _authPrincipal.GetPrincipal():
GenericPrincipal object
        bl->>bl: account = await
_accountRepository.GetByEmailAsync(query.Email: string): Account? object
    end
    bl->>s: authPrincipal = _authPrincipal.GetPrincipal():
GenericPrincipal object
    s->>bl: authPrincipal: GenericPrincipal
    bl->>bl: if (!authPrincipal.IsInRole(AuthorizationRoles.User: enum))
return DomainErrors.Authorization.Unauthorized

    bl-->>-e: result: ErrorOr<AccountManagerResult> object
    e-->>-ui: Payload JSON
    ui-->>User: Unauthorized access
deactivate User
```

Failure Case 2

```
sequenceDiagram
    actor User
    participant ui as UI
    participant e as Entry.Controllers.AuthenticationController
    participant bl as Logic.Authentication.querys.Registration
    participant s as Service
    participant da as DataAccess.Persistence
    participant ds as Data Store
    autonumber
    activate User
    User->>ui: input: object
    loop
        ui->>ui: Validate(input: object): func
    end
```

```
    ui->>+e: HTTPPOST: Payload JSON
    critical Constructor Dependency Injection
        e->>e: AccountController(mapper: IMapper, mediator:
ISender)<br/>_mapper = mapper<br/>_mediator = mediator
    option AccountController.Get(id: int)
        e->>e: query = new GetAccountQuery(id): GetAccountQuery record
        e->>e: result = await _mediator.Send(query):
ErrorOr<AccountResult> object
    end
    e->>+bl: await _mediator.Send(query): ErrorOr<AccountResult> object
    critical Constructor Dependency Injection
        bl->>bl: GetAccountQueryHandler(mapper: IMapper, authProvider:
IAuthProvider, accountRepository: IAccountRepository)<br/>_mapper =
mapper<br/>_authProvider = authProvider<br/>_accountRepository =
accountRepository
    option GetAccountQueryHandler.Handle(query: GetAccountQuery record)
        bl->>bl: authPrincipal = _authPrincipal.GetPrincipal():
GenericPrincipal object
        bl->>bl: account = await
_accountRepository.GetAsync(query.AccountId: int): Account? object
    end
    bl->>s: authPrincipal = _authPrincipal.GetPrincipal():
GenericPrincipal object
    s->>bl: authPrincipal: GenericPrincipal
    bl->>bl: if (!authPrincipal.IsInRole(AuthorizationRoles.User: enum))
return DomainErrors.Authorization.Unauthorized
    bl-->>-e: result: ErrorOr<AccountResult> object
    e-->>-ui: Payload JSON
    ui-->>User: Unauthorized access
deactivate User
```

Failure Case 3

```
sequenceDiagram
    actor User
    participant ui as UI
    participant e as Entry.Controllers.AuthenticationController
    participant bl as Logic.Authentication.commands.Registration
    participant s as Service
    participant da as DataAccess.Persistence
    participant ds as Data Store
    autonumber
```

```
    activate User
    User->>ui: input: object
    loop
        ui->>ui: Validate(input: object): func
    end
    ui->>+e: HTTPPOST: Payload JSON
    critical Constructor Dependency Injection
        e->>e: UserController(mapper: IMapper, mediator:
ISender)<br/>_mapper = mapper<br/>_mediator = mediator
    option UserController.Update(request: UpdateUserRequest record)
        e->>e: command = _mapper.Map<UpdateUserCommand>(request):
UpdateUserCommand record
        e->>e: result = await _mediator.Send(command): ErrorOr<bool>
object
    end
    e->>+bl: await _mediator.Send(command): ErrorOr<bool> object
    critical Constructor Dependency Injection
        bl->>bl: UpdateUserCommandHandler(authProvider: IAuthProvider,
userRepository: IUserRepository)<br/>_authProvider =
authProvider<br/>_userRepository = userRepository
    option UpdateUserCommandHandler.Handle(command: UpdateUserCommand
record)
        bl->>bl: authPrincipal = _authPrincipal.GetPrincipal():
GenericPrincipal object
        bl->>bl: user = await _userRepository.GetAsync(command.UserId:
int): User? object
    end
    bl->>s: authPrincipal = _authPrincipal.GetPrincipal():
GenericPrincipal object
    s->>bl: authPrincipal: GenericPrincipal
    bl->>bl: if (!authPrincipal.IsInRole(AuthorizationRoles.User: enum))
return DomainErrors.Authorization.Unauthorized
    bl-->>-e: result: ErrorOr<bool> object
    e-->>-ui: Payload JSON
    ui-->>User: Successfully performed authorized task
deactivate User
```

Failure Case 4

```
sequenceDiagram
    actor User
    participant ui as UI
```

```
    participant e as Entry.Controllers.AuthenticationController
    participant bl as Logic.Authentication.querys.Registration
    participant s as Service
    participant da as DataAccess.Persistence
    participant ds as Data Store
    autonumber
    activate User
    User->>ui: input: object
    loop
        ui->>ui: Validate(input: object): func
    end
    ui->>+e: HTTPPOST: Payload JSON
    critical Constructor Dependency Injection
        e->>e: AccountManagerController(mapper: IMapper, mediator:
ISender, authProvider: IAuthProvider)<br/>_mapper = mapper<br/>_mediator =
mediator<br/>_authProvider = authProvider
    option AccountManagerController.Logout(request: LogoutRequest record)
        e->>e: query = _mapper.Map<LogoutQuery>(request): LogoutQuery
record
        e->>e: result = await _mediator.Send(query):
ErrorOr<AccountManagerResult> object
    end
    par
    e->>+bl: await _mediator.Send(query): ErrorOr<AccountManagerResult>
object
    critical Constructor Dependency Injection
        bl->>bl: LogoutQueryHandler(authProvider: IAuthProvider,
accountRepository: IAccountRepository)<br/>_authProvider =
authProvider<br/>_accountRepository = accountRepository
    option LogoutQueryHandler.Handle(query: LogoutQuery record)
        bl->>bl: authPrincipal = _authPrincipal.GetPrincipal():
GenericPrincipal object
        bl->>bl: account = await
_accountRepository.GetByEmailAsync(query.Email: string): Account? object
    end
    bl->>s: authPrincipal = _authPrincipal.GetPrincipal():
GenericPrincipal object
    s->>bl: authPrincipal: GenericPrincipal
    bl->>bl: if (!authPrincipal.IsInRole(AuthorizationRoles.User: enum))
return DomainErrors.Authorization.Unauthorized
```

```
    and LoggingBehavior
        e->>bl: LoggingBehavior.Handle(request: LogoutQuery,
cancellationToken: CancellationToken, next:
RequestDelegateHandler<ErrorOr<AccountManagerResult>>):
ErrorOr<AccountManagerResult>
        critical Constructor Dependency Injection
            bl->>bl: LoggingBehavior(loggingRepository:
IEFCoreLoggingRepository)<br/>_loggingRepository = loggingRepository
        end
        bl->>da: await _loggingRepository.InsertAsync(log): bool
    critical Constructor Dependency Injection
        da->>da: EFCoreLoggingRepository(dbContext:
NucleiDbContext)<br/>_dbContext = dbContext
    end
        da->>ds: _dbContext.Log.Add(log): void
        da->>ds: await _dbContext.SaveChangesAsync(): int
        ds-->>da: 0: int
        da-->>bl: false: bool
        bl->>e: DomainErrors.Log.Failure: ErrorOr<AccountManagerResult>
    end
    e-->>-ui: Payload JSON
    ui-->>User: System Failure
deactivate User
```

Authentication Code

Success Case 1

```
sequenceDiagram
    actor User
    participant ui as UI
    participant e as Entry.Controllers.AuthenticationController
    participant bl as Logic.Authentication.querys.Registration
    participant s as Service
    participant da as DataAccess.Persistence
    participant ds as Data Store
    autonumber
    activate User
    User->>ui: input: object
    loop
        ui->>ui: Validate(input: object): func
```

```
    end
    ui->>+e: HTTPPOST: Payload JSON
    critical Constructor Dependency Injection
        e->>e: AccountManagerController(mapper: IMapper, mediator:
ISender, authProvider: IAuthProvider)<br/>_mapper = mapper<br/>_mediator =
mediator<br/>_authProvider = authProvider
    option AccountManagerController.Login(request: LoginRequest record)
        e->>e: query = _mapper.Map<LoginQuery>(request): LoginQuery record
        e->>e: result = await _mediator.Send(query):
ErrorOr<AccountManagerResult> object
    end
    e->>+bl: await _mediator.Send(query): ErrorOr<AccountManagerResult>
object
    critical Constructor Dependency Injection
        bl->>bl: LoginQueryHandler(authProvider: IAuthProvider,
accountRepository: IAccountRepository, passwordHasher:
IPasswordHasher)<br/>_authProvider = authProvider<br/>_accountRepository =
accountRepository<br/>_passwordHasher = passwordHasher
    option LoginQueryHandler.Handle(query: LoginQuery record)
        bl->>bl: account = await
_accountRepository.GetByEmailAsync(query.Email: string): Account? object
    end
    bl->>+da: account = await
_accountRepository.GetByEmailAsync(query.Email: string): Account? object
    critical Constructor Dependency Injection
        da->>da: AccountRepository(dbContext:
NucleiDbContext)<br/>_dbContext = dbContext
    end
    da->>+ds: await _dbContext.Account.FirstOrDefaultAsync(e => e.Email:
string == email: string): Account? object
    ds-->>da: Account: Account? object
    da-->>bl: Account: Account? object
    bl->>+s: _passwordHasher.Verify(query.Password: string,
account.Password: string): bool
    s-->>-bl: true: bool
    bl->>s: _authProvider.GeneratePrincipal(): bool
    s->>bl: true: bool
    bl-->>-e: result: ErrorOr<AccountManagerResult> object
    e->>e: Enter OTP
    e->>s: _authProvider.ValidateOTP(OTP: string): bool
```

```
    s->>e: true: bool
    e-->>-ui: Payload JSON
    ui-->>User: Display successful login
deactivate User
```

Failure Case 1

```
sequenceDiagram
    actor User
    participant ui as UI
    participant e as Entry.Controllers.AuthenticationController
    participant bl as Logic.Authentication.querys.Registration
    participant s as Service
    participant da as DataAccess.Persistence
    participant ds as Data Store
    autonumber
    activate User
    User->>ui: input: object
    loop
        ui->>ui: Validate(input: object): func
    end
    ui->>+e: HTTPPOST: Payload JSON
    critical Constructor Dependency Injection
        e->>e: AccountManagerController(mapper: IMapper, mediator:
ISender, authProvider: IAuthProvider)<br/>_mapper = mapper<br/>_mediator =
mediator<br/>_authProvider = authProvider
    option AccountManagerController.Login(request: LoginRequest record)
        e->>e: query = _mapper.Map<LoginQuery>(request): LoginQuery record
        e->>e: result = await _mediator.Send(query):
ErrorOr<AccountManagerResult> object
    end
    e->>+bl: await _mediator.Send(query): ErrorOr<AccountManagerResult>
object
    critical Constructor Dependency Injection
        bl->>bl: LoginQueryHandler(authProvider: IAuthProvider,
accountRepository: IAccountRepository, passwordHasher:
IPasswordHasher)<br/>_authProvider = authProvider<br/>_accountRepository =
accountRepository<br/>_passwordHasher = passwordHasher
    option LoginQueryHandler.Handle(query: LoginQuery record)
        bl->>bl: account = await
_accountRepository.GetByEmailAsync(query.Email: string): Account? object
```

```
    end
    bl->>+da: account = await
_accountRepository.GetByEmailAsync(query.Email: string): Account? object
    critical Constructor Dependency Injection
        da->>da: AccountRepository(dbContext:
NucleiDbContext)<br/>_dbContext = dbContext
    end
    da->>+ds: await _dbContext.Account.FirstOrDefaultAsync(e => e.Email:
string == email: string): Account? object
    ds-->>da: null: Account? object
    da-->>bl: null: Account? object
    bl->>bl: if (account is null) return
DomainErrors.Authentication.InvalidCredentials: Error object
    bl-->>-e: result: ErrorOr<AccountManagerResult> object
    e-->>-ui: Payload JSON
    ui-->>User: Display authentication failure
deactivate User
```

Failure Case 2

```
sequenceDiagram
    actor User
    participant ui as UI
    participant e as Entry.Controllers.AuthenticationController
    participant bl as Logic.Authentication.querys.Registration
    participant s as Service
    participant da as DataAccess.Persistence
    participant ds as Data Store
    autonumber
    activate User
    User->>ui: input: object
    loop
        ui->>ui: Validate(input: object): func
    end
    ui->>+e: HTTPPOST: Payload JSON
    critical Constructor Dependency Injection
        e->>e: AccountManagerController(mapper: IMapper, mediator:
ISender, authProvider: IAuthProvider)<br/>_mapper = mapper<br/>_mediator =
mediator<br/>_authProvider = authProvider
    option AccountManagerController.Login(request: LoginRequest record)
        e->>e: query = _mapper.Map<LoginQuery>(request): LoginQuery record
```

```
        e->>e: result = await _mediator.Send(query):
ErrorOr<AccountManagerResult> object
    end
    e->>+bl: await _mediator.Send(query): ErrorOr<AccountManagerResult>
object
    critical Constructor Dependency Injection
        bl->>bl: LoginQueryHandler(authProvider: IAuthProvider,
accountRepository: IAccountRepository, passwordHasher:
IPasswordHasher)<br/>_authProvider = authProvider<br/>_accountRepository =
accountRepository<br/>_passwordHasher = passwordHasher
    option LoginQueryHandler.Handle(query: LoginQuery record)
        bl->>bl: account = await
_accountRepository.GetByEmailAsync(query.Email: string): Account? object
    end
    bl->>+da: account = await
_accountRepository.GetByEmailAsync(query.Email: string): Account? object
    critical Constructor Dependency Injection
        da->>da: AccountRepository(dbContext:
NucleiDbContext)<br/>_dbContext = dbContext
    end
    da->>+ds: await _dbContext.Account.FirstOrDefaultAsync(e => e.Email:
string == email: string): Account? object
    ds-->>da: Account: Account? object
    da-->>bl: Account: Account? object
    bl->>+s: _passwordHasher.Verify(query.Password: string,
account.Password: string): bool
    s-->>-bl: true: bool
    bl->>s: _authProvider.GeneratePrincipal(): bool
    s->>bl: true: bool
    bl-->>-e: result: ErrorOr<AccountManagerResult> object
    e->>e: Enter OTP
    e->>s: _authProvider.ValidateOTP(OTP: string): bool
    s->>e: false: bool
    e->>e: DomainErrors.Authentication.InvalidCredentials: Error object
    e-->>-ui: Payload JSON
    ui-->>User: Display authentication failure
deactivate User
```

Failure Case 3

```
sequenceDiagram
```

```
    actor User
    participant ui as UI
    participant e as Entry.Controllers.AuthenticationController
    participant bl as Logic.Authentication.querys.Registration
    participant s as Service
    participant da as DataAccess.Persistence
    participant ds as Data Store
    autonumber
    activate User
    User->>ui: input: object
    loop
        ui->>ui: Validate(input: object): func
    end
    ui->>+e: HTTPPOST: Payload JSON
    critical Constructor Dependency Injection
        e->>e: AccountManagerController(mapper: IMapper, mediator:
ISender, authProvider: IAuthProvider)<br/>_mapper = mapper<br/>_mediator =
mediator<br/>_authProvider = authProvider
    option AccountManagerController.Login(request: LoginRequest record)
        e->>e: query = _mapper.Map<LoginQuery>(request): LoginQuery record
        e->>e: result = await _mediator.Send(query):
ErrorOr<AccountManagerResult> object
    end
    e->>+bl: await _mediator.Send(query): ErrorOr<AccountManagerResult>
object
    critical Constructor Dependency Injection
        bl->>bl: LoginQueryHandler(authProvider: IAuthProvider,
accountRepository: IAccountRepository, passwordHasher:
IPasswordHasher)<br/>_authProvider = authProvider<br/>_accountRepository =
accountRepository<br/>_passwordHasher = passwordHasher
    option LoginQueryHandler.Handle(query: LoginQuery record)
        bl->>bl: account = await
_accountRepository.GetByEmailAsync(query.Email: string): Account? object
    end
    bl->>+da: account = await
_accountRepository.GetByEmailAsync(query.Email: string): Account? object
    critical Constructor Dependency Injection
        da->>da: AccountRepository(dbContext:
NucleiDbContext)<br/>_dbContext = dbContext
    end
```

```
    da->>+ds: await _dbContext.Account.FirstOrDefaultAsync(e => e.Email:
string == email: string): Account? object
    ds-->>da: Account: Account? object
    da-->>bl: Account: Account? object
    bl->>+s: verification = _passwordHasher.Verify(query.Password: string,
account.Password: string): bool
    s-->>-bl: false: bool
    bl->>bl: if (!verification) return
DomainErrors.Authentication.InvalidCredentials: Error object
    bl-->>-e: result: ErrorOr<AccountManagerResult> object
    e-->>-ui: Payload JSON
    ui-->>User: Display authentication failure
deactivate User
```

Failure Case 4

```
sequenceDiagram
    actor User
    participant ui as UI
    participant e as Entry.Controllers.AuthenticationController
    participant bl as Logic.Authentication.querys.Registration
    participant s as Service
    participant da as DataAccess.Persistence
    participant ds as Data Store
    autonumber
    activate User
    User->>ui: input: object
    loop
        ui->>ui: Validate(input: object): func
    end
    ui->>+e: HTTPPOST: Payload JSON
    critical Constructor Dependency Injection
        e->>e: AccountManagerController(mapper: IMapper, mediator:
ISender, authProvider: IAuthProvider)<br/>_mapper = mapper<br/>_mediator =
mediator<br/>_authProvider = authProvider
    option AccountManagerController.Login(request: LoginRequest record)
        e->>e: query = _mapper.Map<LoginQuery>(request): LoginQuery record
        e->>e: result = await _mediator.Send(query):
ErrorOr<AccountManagerResult> object
    end
```

```
    e->>+bl: await _mediator.Send(query): ErrorOr<AccountManagerResult>
object
    critical Constructor Dependency Injection
        bl->>bl: LoginQueryHandler(authProvider: IAuthProvider,
accountRepository: IAccountRepository, passwordHasher:
IPasswordHasher)<br/>_authProvider = authProvider<br/>_accountRepository =
accountRepository<br/>_passwordHasher = passwordHasher
    option LoginQueryHandler.Handle(query: LoginQuery record)
        bl->>bl: account = await
_accountRepository.GetByEmailAsync(query.Email: string): Account? object
    end
    bl->>+da: account = await
_accountRepository.GetByEmailAsync(query.Email: string): Account? object
    critical Constructor Dependency Injection
        da->>da: AccountRepository(dbContext:
NucleiDbContext)<br/>_dbContext = dbContext
    end
    da->>+ds: await _dbContext.Account.FirstOrDefaultAsync(e => e.Email:
string == email: string): Account? object
    ds-->>da: null: Account? object
    da-->>bl: null: Account? object
    bl->>bl: if (account is null) return
DomainErrors.Authentication.InvalidCredentials: Error object
    bl-->>-e: result: ErrorOr<AccountManagerResult> object
    e-->>-ui: Payload JSON
    ui-->>User: Display authentication failure
deactivate User
```

Registration Code

Success Case

```
sequenceDiagram
    actor User
    participant ui as UI
    participant e as Entry.Controllers.AuthenticationController
    participant bl as Logic.Authentication.Commands.Registration
    participant s as Service
    participant da as DataAccess.Persistence
    participant ds as Data Store
    autonumber
```

```
    activate User
    User->>ui: input: object
    loop
        ui->>ui: Validate(input: object): func
    end
    ui->>+e: HTTPPOST: Payload JSON
    critical Constructor Dependency Injection
        e->>e: AccountManagerController(mapper: IMapper, mediator:
ISender)<br/>_mapper = mapper<br/>_mediator = mediator
    option AccountManagerController.Register(request: RegisterRequest
record)
        e->>e: command = _mapper.Map<RegisterCommand>(request):
RegisterCommand record
        e->>e: result = await _mediator.Send(command):
ErrorOr<AccountManagerResult> object
    end
    e->>+bl: await _mediator.Send(command): ErrorOr<AccountManagerResult>
object
    critical Constructor Dependency Injection
        bl->>bl: RegisterCommandHandler(userRepository: IUserRepository,
accountRepository: IAccountRepository, passwordHasher:
IPasswordHasher)<br/>_userRepository =
userRepository<br/>_accountRepository =
accountRepository<br/>_passwordHasher = passwordHasher
    option RegisterCommandHandler.Handle(command: RegisterCommand record)
        bl->>bl: account = await
_accountRepository.GetByEmailAsync(command.Email: string): Account? object
    end
    bl->>+da: await _accountRepository.GetByEmailAsync(command.Email:
string): Account? object
    critical Constructor Dependency Injection
        da->>da: AccountRepository(dbContext:
NucleiDbContext)<br/>_dbContext = dbContext
    end
    da->>+ds: await _dbContext.Account.FirstOrDefaultAsync(e => e.Email:
string == email: string): Account? object
    ds-->>da: null: Account? object
    da-->>bl: null: Account? object
    bl->>+s: hashedPassword = _passwordHasher.Hash(command.Password:
string): string
```

```
    s-->>-bl: hashedPassword: string
    bl->>da: await _userRepository.InsertAsync(user: User object): bool
    da->>da: _dbContext.User.Add(user: User object): void
    da->>ds: await _dbContext.SaveChangesAsync(): int
    ds-->>-da: 1: int
    da-->>-bl: true: bool
    bl-->>-e: result: ErrorOr<AccountManagerResult> object
    e-->>-ui: Payload JSON
    ui-->>User: Display success and username to user
deactivate User
```

Failure Case 1

```
sequenceDiagram
    actor User
    participant ui as UI
    autonumber
    note over ui: Registration (Failure)
    activate User
    User->>ui: input: object
    loop
        ui->>ui: Validate(input: object): func
    end
    ui->>User: False
deactivate User
```

Failure Case 2

```
sequenceDiagram
    actor User
    participant ui as UI
    participant e as Entry.Controllers.AuthenticationController
    participant bl as Logic.Authentication.Commands.Registration
    participant s as Service
    participant da as DataAccess.Persistence
    participant ds as Data Store
    autonumber
    activate User
    User->>ui: input: object
    loop
```

```
        ui->>ui: Validate(input: object): func
    end
    ui->>+e: HTTPPOST: Payload JSON
    critical Constructor Dependency Injection
        e->>e: AccountManagerController(mapper: IMapper, mediator:
ISender)<br/>_mapper = mapper<br/>_mediator = mediator
    option AccountManagerController.Register(request: RegisterRequest
record)
        e->>e: command = _mapper.Map<RegisterCommand>(request):
RegisterCommand record
        e->>e: result = await _mediator.Send(command):
ErrorOr<AuthenticationResult> object
    end
    e->>+bl: await _mediator.Send(command): ErrorOr<AuthenticationResult>
object
    critical Constructor Dependency Injection
        bl->>bl: RegisterCommandHandler(userRepository: IUserRepository,
accountRepository: IAccountRepository, passwordHasher:
IPasswordHasher)<br/>_userRepository =
userRepository<br/>_accountRepository =
accountRepository<br/>_passwordHasher = passwordHasher
    option RegisterCommandHandler.Handle(command: RegisterCommand record)
        bl->>bl: account = await
_accountRepository.GetByEmailAsync(command.Email: string): Account? object
    end
    bl->>+da: await _accountRepository.GetByEmailAsync(command.Email:
string): Account? object
    critical Constructor Dependency Injection
        da->>da: AccountRepository(dbContext:
NucleiDbContext)<br/>_dbContext = dbContext
    end
    da->>+ds: await _dbContext.Account.FirstOrDefaultAsync(e => e.Email:
string == email: string): Account? object
    ds-->>da: Account: Account? object
    da-->>bl: Account: Account? object
    bl->>bl: if (account is not null) return
DomainErrors.AccountManager.Failure
    bl-->>-e: result: ErrorOr<AuthenticationResult> object
    e-->>-ui: Payload JSON
    ui-->>User: Registration Failure
```

```
deactivate User
```

Failure Case 3

```
sequenceDiagram
    actor User
    participant ui as UI
    autonumber
    note over ui: Registration (Failure)
    activate User
    User->>ui: input: object
    loop
        ui->>ui: Validate(input: object): func
    end
    ui->>User: False
deactivate User
```

Failure Case 4

```
sequenceDiagram
    actor User
    participant ui as UI
    participant e as Entry.Controllers.AuthenticationController
    participant bl as Logic.Authentication.Commands.Registration
    participant s as Service
    participant da as DataAccess.Persistence
    participant ds as Data Store
    autonumber
    activate User
    User->>ui: input: object
    loop
        ui->>ui: Validate(input: object): func
    end
    ui->>+e: HTTPPOST: Payload JSON
    critical Constructor Dependency Injection
        e->>e: AccountManagerController(mapper: IMapper, mediator:
ISender)<br/>_mapper = mapper<br/>_mediator = mediator
```

```
    option AccountManagerController.Register(request: RegisterRequest
record)
        e->>e: command = _mapper.Map<RegisterCommand>(request):
RegisterCommand record
        e->>e: result = await _mediator.Send(command):
ErrorOr<AuthenticationResult> object
    end
    e->>+bl: await _mediator.Send(command): ErrorOr<AuthenticationResult>
object
    critical Constructor Dependency Injection
        bl->>bl: RegisterCommandHandler(userRepository: IUserRepository,
accountRepository: IAccountRepository, passwordHasher:
IPasswordHasher)<br/>_userRepository =
userRepository<br/>_accountRepository =
accountRepository<br/>_passwordHasher = passwordHasher
    option RegisterCommandHandler.Handle(command: RegisterCommand record)
        bl->>bl: account = await
_accountRepository.GetByEmailAsync(command.Email: string): Account? object
    end
    bl->>+da: await _accountRepository.GetByEmailAsync(command.Email:
string): Account? object
    critical Constructor Dependency Injection
        da->>da: AccountRepository(dbContext:
NucleiDbContext)<br/>_dbContext = dbContext
    end
    da->>+ds: await _dbContext.Account.FirstOrDefaultAsync(e => e.Email:
string == email: string): Account? object
    ds-->>da: null: Account? object
    da-->>bl: null: Account? object
    bl->>+s: hashedPassword = _passwordHasher.Hash(command.Password:
string): string
    s-->>-bl: hashedPassword: string
    bl->>da: insert = await _userRepository.InsertAsync(user: User
object): bool
    da->>da: _dbContext.User.Add(user: User object): void
    da->>ds: await _dbContext.SaveChangesAsync(): int
    ds-->>-da: 0: int
    da-->>-bl: false: bool
    bl->>bl: if (!insert) return DomainErrors.AccountManager.Failure:
Error object
```

```
    bl-->>-e: result: ErrorOr<AuthenticationResult> object
    e-->>-ui: Payload JSON
    ui-->>User: RegistrationFailure
deactivate User
```

Failure Case 5

```
sequenceDiagram
    actor User
    participant ui as UI
    participant e as Entry.Controllers.AuthenticationController
    participant bl as Logic.Authentication.Commands.Registration
    participant s as Service
    participant da as DataAccess.Persistence
    participant ds as Data Store
    autonumber
    activate User
    User->>ui: input: object
    loop
        ui->>ui: Validate(input: object): func
    end
    ui->>+e: HTTPPOST: Payload JSON
    critical Constructor Dependency Injection
        e->>e: AccountManagerController(mapper: IMapper, mediator:
ISender)<br/>_mapper = mapper<br/>_mediator = mediator
    option AccountManagerController.Register(request: RegisterRequest
record)
        e->>e: command = _mapper.Map<RegisterCommand>(request):
RegisterCommand record
        e->>e: result = await _mediator.Send(command):
ErrorOr<AuthenticationResult> object
        e->>e: cts = new CancellationTokenSource(TimeSpan.FromSeconds(5)):
CancellationTokenSource
    end
    par
    e->>+bl: await _mediator.Send(command, cts.Token):
ErrorOr<AuthenticationResult> object
    critical Constructor Dependency Injection
        bl->>bl: RegisterCommandHandler(userRepository: IUserRepository,
accountRepository: IAccountRepository, passwordHasher:
IPasswordHasher)<br/>_userRepository =
```

```
userRepository<br/>_accountRepository =
accountRepository<br/>_passwordHasher = passwordHasher
    option RegisterCommandHandler.Handle(command: RegisterCommand record)
        bl->>bl: account = await
_accountRepository.GetByEmailAsync(command.Email: string): Account? object
    end

    bl->>+da: await _accountRepository.GetByEmailAsync(command.Email:
string): Account? object
    critical Constructor Dependency Injection
        da->>da: AccountRepository(dbContext:
NucleiDbContext)<br/>_dbContext = dbContext
    end
    da->>+ds: await _dbContext.Account.FirstOrDefaultAsync(e => e.Email:
string == email: string): Account? object
    ds-->>da: null: Account? object
    da-->>bl: null: Account? object
    bl->>+s: hashedPassword = _passwordHasher.Hash(command.Password:
string): string
    s-->>-bl: hashedPassword: string
    bl->>da: await _userRepository.InsertAsync(user: User object): bool
    da->>da: _dbContext.User.Add(user: User object): void
    da->>ds: await _dbContext.SaveChangesAsync(): int
    ds-->>-da: 1: int
    da-->>-bl: true: bool

    and [CancellationTokenBehavior]
        e->>bl: CancellationTokenBehavior.Handle(request: TRequest,
cancellationToken: CancellationToken): TReponse
        bl->>bl: if (cancellationToken.IsCancellationRequested) return
DomainErrors.System.Timeout: Error object
        bl-->>-e: result: ErrorOr<AuthenticationResult> object
    end
    e-->>-ui: Payload JSON
    ui-->>User: Registration Timeout
deactivate User
```

Logging Code

Success Case 1

```
sequenceDiagram
    actor System
    participant e as Entry
    participant bl as Logic.Common.Behaviors
    participant da as DataAccess.Persistence
    participant ds as Data Store
    participant c as Console
    autonumber
    note over e: Logging (Success)
    activate System
    bl->>bl: services.AddTransient(typeof(IPipelineBehavior<,>),
typeof(LoggingBehavior<,>))
    System->>e: Invokes
    e->>+bl: await _mediator.Send(request: TRequest object)
    critical Constructor Dependency Injection
        bl->>bl: LoggingBehavior(logger: ILogger<LoggingBehavior<TRequest,
TResponse>>, loggingRepository: ILoggingRepository)<br/>_logger =
logger<br/>_loggingRepository = loggingRepository
    option LoggingBehavior<TRequest, TResponse>.Handle(request: TRequest
object, next: RequestHandlerDelegate<TResponse>, cancellationToken
CancellationToken)
        bl->>bl: _logger.LogInformation(request.ToString(): string): void
        bl->>bl: response = await next(): TResponse object
        bl->>bl: log = new() {<br/>LogLevel: byte = 0, Category: string =
"Data", Message: string = response?.ToString() ?? "", Operation: string =
"System"<br/>}: LogEntry object
        bl->>bl: logSuccess = await _loggingRepository.InsertAsync(log):
bool
    end
    bl->>c: _logger.LogInformation(request.ToString(): string): void
    bl->>+da: await _loggingRepository.InsertAsync(log): bool
    critical Constructor Dependency Injection
        da->>da: LoggingRepository(dbContext:
NucleiDbContext)<br/>_dbContext = dbContext
```

```
    end
    da->>+ds: _dbContext.LogEntry.Add(log: LogEntry object): void
    ds-->>da: void
    da->>ds: await _dbContext.SaveChangesAsync(): int
    ds-->>-da: 1: int
    da-->>-bl: true: bool
    bl->>c: _logger.LogInformation("Completed");
deactivate System
```

Success Case 2

```
sequenceDiagram
    actor System
    participant e as Entry
    participant bl as Logic.Common.Behaviors
    participant da as DataAccess.Persistence
    participant ds as Data Store
    participant c as Console
    autonumber
    note over e: Logging (Success)
    activate System
    bl->>bl: services.AddTransient(typeof(IPipelineBehavior<,>),
typeof(LoggingBehavior<,>))
    System->>e: Invokes
    e->>+bl: await _mediator.Send(request: TRequest object)
    critical Constructor Dependency Injection
        bl->>bl: LoggingBehavior(logger: ILogger<LoggingBehavior<TRequest,
TResponse>>, loggingRepository: ILoggingRepository)<br/>_logger =
logger<br/>_loggingRepository = loggingRepository
    option LoggingBehavior<TRequest, TResponse>.Handle(request: TRequest
object, next: RequestHandlerDelegate<TResponse>, cancellationToken
CancellationToken)
        bl->>bl: _logger.LogInformation(request.ToString(): string): void
        bl->>bl: response = await next(): TResponse object
        bl->>bl: log = new() {<br/>LogLevel: byte = 4, Category: string =
"Data", Message: string = response?.ToString() ?? "", Operation: string =
"System"<br/>}: LogEntry object
        bl->>bl: logSuccess = await _loggingRepository.InsertAsync(log):
bool
```

```
    end
    bl->>c: _logger.LogInformation(request.ToString(): string): void
    bl->>+da: await _loggingRepository.InsertAsync(log): bool
    critical Constructor Dependency Injection
        da->>da: LoggingRepository(dbContext:
NucleiDbContext)<br/>_dbContext = dbContext
    end
    da->>+ds: _dbContext.LogEntry.Add(log: LogEntry object): void
    ds-->>da: void
    da->>ds: await _dbContext.SaveChangesAsync(): int
    ds-->>-da: 1: int
    da-->>-bl: true: bool
    bl->>c: _logger.LogInformation("Completed");
deactivate System
```

Success Case 3

```
sequenceDiagram
    actor System
    participant e as Entry
    participant bl as Logic.Common.Behaviors
    participant da as DataAccess.Persistence
    participant ds as Data Store
    participant c as Console
    autonumber
    note over e: Logging (Success)
    activate System
    bl->>bl: services.AddTransient(typeof(IPipelineBehavior<,>),
typeof(LoggingBehavior<,>))
    System->>e: Invokes
    e->>+bl: await _mediator.Send(request: TRequest object)
    critical Constructor Dependency Injection
        bl->>bl: LoggingBehavior(logger: ILogger<LoggingBehavior<TRequest,
TResponse>>, loggingRepository: ILoggingRepository)<br/>_logger =
logger<br/>_loggingRepository = loggingRepository
    option LoggingBehavior<TRequest, TResponse>.Handle(request: TRequest
object, next: RequestHandlerDelegate<TResponse>, cancellationToken
CancellationToken)
        bl->>bl: _logger.LogInformation(request.ToString(): string): void
```

```
        bl->>bl: response = await next(): TResponse object
        bl->>bl: log = new() {<br/>LogLevel: byte = 2, Category: string =
"Data", Message: string = response?.ToString() ?? "", Operation: string =
request.GetType().Name<br/>}: LogEntry object
        bl->>bl: logSuccess = await _loggingRepository.InsertAsync(log):
bool
    end
    bl->>c: _logger.LogInformation(request.ToString(): string): void
    bl->>+da: await _loggingRepository.InsertAsync(log): bool
    critical Constructor Dependency Injection
        da->>da: LoggingRepository(dbContext:
NucleiDbContext)<br/>_dbContext = dbContext
    end
    da->>+ds: _dbContext.LogEntry.Add(log: LogEntry object): void
    ds-->>da: void
    da->>ds: await _dbContext.SaveChangesAsync(): int
    ds-->>-da: 1: int
    da-->>-bl: true: bool
    bl->>c: _logger.LogInformation("Completed");
deactivate System
```

Success Case 4

```
sequenceDiagram
    actor System
    participant e as Entry
    participant bl as Logic.Common.Behaviors
    participant da as DataAccess.Persistence
    participant ds as Data Store
    participant c as Console
    autonumber
    note over e: Logging (Success)
    activate System
    bl->>bl: services.AddTransient(typeof(IPipelineBehavior<,>),
typeof(LoggingBehavior<,>))
    System->>e: Invokes
    e->>+bl: await _mediator.Send(request: TRequest object)
    critical Constructor Dependency Injection
```

```
        bl->>bl: LoggingBehavior(logger: ILogger<LoggingBehavior<TRequest,
TResponse>>, loggingRepository: ILoggingRepository)<br/>_logger =
logger<br/>_loggingRepository = loggingRepository
    option LoggingBehavior<TRequest, TResponse>.Handle(request: TRequest
object, next: RequestHandlerDelegate<TResponse>, cancellationToken
CancellationToken)
        bl->>bl: _logger.LogInformation(request.ToString(): string): void
        bl->>bl: response = await next(): TResponse object
        bl->>bl: log = new() {<br/>LogLevel: byte = 4, Category: string =
"Data", Message: string = response?.ToString() ?? "", Operation: string =
request.GetType().Name<br/>}: LogEntry object
        bl->>bl: logSuccess = await _loggingRepository.InsertAsync(log):
bool
    end
    bl->>c: _logger.LogInformation(request.ToString(): string): void
    bl->>+da: await _loggingRepository.InsertAsync(log): bool
    critical Constructor Dependency Injection
        da->>da: LoggingRepository(dbContext:
NucleiDbContext)<br/>_dbContext = dbContext
    end
    da->>+ds: _dbContext.LogEntry.Add(log: LogEntry object): void
    ds-->>da: void
    da->>ds: await _dbContext.SaveChangesAsync(): int
    ds-->>-da: 1: int
    da-->>-bl: true: bool
    bl->>c: _logger.LogInformation("Completed");
deactivate System
```

Failure Case 1

```
sequenceDiagram
    actor System
    participant e as Entry
    participant bl as Logic.Common.Behaviors
    participant da as DataAccess.Persistence
    participant ds as Data Store
    participant c as Console
    autonumber
    note over e: Logging (Failure)
    activate System
```

```
    bl->>bl: services.AddTransient(typeof(IPipelineBehavior<,>),
typeof(LoggingBehavior<,>))
    System->>e: Invokes
    par Thread 1
        e->>+bl: await _mediator.Send(request: TRequest object)
        critical Constructor Dependency Injection
            bl->>bl: LoggingBehavior(logger:
ILogger<LoggingBehavior<TRequest, TResponse>>, loggingRepository:
ILoggingRepository)<br/>_logger = logger<br/>_loggingRepository =
loggingRepository
        option LoggingBehavior<TRequest, TResponse>.Handle(request:
TRequest object, next: RequestHandlerDelegate<TResponse>,
cancellationToken CancellationToken)
            bl->>bl: _logger.LogInformation(request.ToString(): string):
void
            bl->>bl: response = await next(): TResponse object
            bl->>bl: log = new() {<br/>LogLevel: byte = 0, Category:
string = "Data", Message: string = response?.ToString() ?? "", Operation:
string = "System"<br/>}: LogEntry object
            bl->>bl: logSuccess = await
_loggingRepository.InsertAsync(log): bool
        end
    and Thread 2
        bl->>bl: cancellationToken timer has reached its limit before
await _mediator.Send() has completed its task
    end
deactivate System
```

Failure Case 2

Failure Case 3

```
sequenceDiagram
   actor System
   participant e as Entry
   participant bl as Logic.Common.Behaviors
   participant da as DataAccess.Persistence
```

```
   participant ds as Data Store
   participant c as Console
   autonumber
   note over e: Logging (Success)
   activate System
   bl->>bl: services.AddTransient(typeof(IPipelineBehavior<,>),
typeof(LoggingBehavior<,>))
   System->>e: Invokes
   e->>+bl: await _mediator.Send(request: TRequest object)
   critical Constructor Dependency Injection
       bl->>bl: LoggingBehavior(logger: ILogger<LoggingBehavior<TRequest,
TResponse>>, loggingRepository: ILoggingRepository)<br/>_logger =
logger<br/>_loggingRepository = loggingRepository
   option LoggingBehavior<TRequest, TResponse>.Handle(request: TRequest
object, next: RequestHandlerDelegate<TResponse>, cancellationToken
CancellationToken)
       bl->>bl: _logger.LogInformation(request.ToString(): string): void
       bl->>bl: response = await next(): TResponse object
       bl->>bl: log = new() {<br/>LogLevel: byte = 0, Category: string =
"Data", Message: string = response?.ToString() ?? "", Operation: string =
"System"<br/>}: LogEntry object
       bl->>bl: logSuccess = await _loggingRepository.InsertAsync(log):
bool
   end
   bl->>c: _logger.LogInformation(request.ToString(): string): void
   bl->>+da: await _loggingRepository.InsertAsync(log): bool
   critical Constructor Dependency Injection
       da->>da: LoggingRepository(dbContext:
NucleiDbContext)<br/>_dbContext = dbContext
   end
```

```
   da->>+ds: _dbContext.LogEntry.Add(log: LogEntry object): void
   ds-->>da: void
   da->>ds: await _dbContext.SaveChangesAsync(): int
   ds-->>-da: 1: int
   da-->>-bl: false: bool
   bl->>c: _logger.LogError("Failed"): void
deactivate System
```

Failure Case 4

```
sequenceDiagram
   actor System
   participant e as Entry
   participant bl as Logic.Common.Behaviors
   participant da as DataAccess.Persistence
   participant ds as Data Store
   participant c as Console
   autonumber
   note over e: Logging (Success)
   activate System
   bl->>bl: services.AddTransient(typeof(IPipelineBehavior<,>),
typeof(LoggingBehavior<,>))
   System->>e: Invokes
   e->>+bl: await _mediator.Send(request: TRequest object)
   critical Constructor Dependency Injection
       bl->>bl: LoggingBehavior(logger: ILogger<LoggingBehavior<TRequest,
TResponse>>, loggingRepository: ILoggingRepository)<br/>_logger =
logger<br/>_loggingRepository = loggingRepository
   option LoggingBehavior<TRequest, TResponse>.Handle(request: TRequest
object, next: RequestHandlerDelegate<TResponse>, cancellationToken
CancellationToken)
       bl->>bl: _logger.LogInformation(request.ToString(): string): void
       bl->>bl: response = await next(): TResponse object
```

```
        bl->>bl: log = new() {<br/>LogLevel: byte = 0, Category: string =
"Data", Message: string = response?.ToString() ?? "", Operation: string =
"System"<br/>}: LogEntry object
        bl->>bl: logSuccess = await _loggingRepository.InsertAsync(log):
bool
    end
    bl->>c: _logger.LogInformation(request.ToString(): string): void
    bl->>+da: await _loggingRepository.InsertAsync(log): bool
    critical Constructor Dependency Injection
        da->>da: LoggingRepository(dbContext:
NucleiDbContext)<br/>_dbContext = dbContext
    end
    da->>+ds: _dbContext.LogEntry.Add(log: LogEntry object): void
    ds-->>da: void
    da->>ds: await _dbContext.SaveChangesAsync(): int
    critical logged erroneous dateFormat
        ds->>ds: erroneous data stored scuessfully
    end
    ds-->>-da: 1: int
    da-->>-bl: true: bool
    bl->>c: _logger.LogInformation("Completed");

deactivate System
```

Failure Case 5

```
sequenceDiagram
    actor System
    participant e as Entry
    participant bl as Logic.Common.Behaviors
    participant da as DataAccess.Persistence
    participant ds as Data Store
    participant c as Console
    autonumber
    note over e: Logging (Success)
```

```
    activate System
    bl->>bl: services.AddTransient(typeof(IPipelineBehavior<,>),
typeof(LoggingBehavior<,>))
    System->>e: Invokes
    e->>+bl: await _mediator.Send(request: TRequest object)
    critical Constructor Dependency Injection
        bl->>bl: LoggingBehavior(logger: ILogger<LoggingBehavior<TRequest,
TResponse>>, loggingRepository: ILoggingRepository)<br/>_logger =
logger<br/>_loggingRepository = loggingRepository
    option LoggingBehavior<TRequest, TResponse>.Handle(request: TRequest
object, next: RequestHandlerDelegate<TResponse>, cancellationToken
CancellationToken)
        bl->>bl: _logger.LogInformation(request.ToString(): string): void
        bl->>bl: response = await next(): TResponse object
        bl->>bl: log = new() {<br/>LogLevel: byte = 0, Category: string =
"Data", Message: string = response?.ToString() ?? "", Operation: string =
"System"<br/>}: LogEntry object
        bl->>bl: logSuccess = await _loggingRepository.InsertAsync(log):
bool
    end
    bl->>c: _logger.LogInformation(request.ToString(): string): void
    bl->>+da: await _loggingRepository.InsertAsync(log): bool
    critical Constructor Dependency Injection
        da->>da: LoggingRepository(dbContext:
NucleiDbContext)<br/>_dbContext = dbContext
    end
    da->>+ds: _dbContext.LogEntry.Add(log: LogEntry object): void
    ds-->>da: void
    da->>ds: await _dbContext.SaveChangesAsync(): int
    ds-->>-da: 1: int
    critical log is mutated
        da->>ds:  dbContext.LogEntry.Update(log);
        ds->>da: void
        da->>ds: _dbContext.SaveChangesAsync(): int
        ds->>da: 1 int
```

```
    end
    da-->>-bl: false: bool
    bl->>c: _logger.LogError("Failed"): void
deactivate System
```

References

1. https://mermaid-js.github.io
2. https://github.com/amantinband
3. Email, “Core Components Requirements - Professor Vatanak Vong”, 10/17/2022

Version Changelog

Version	Submission Date	Changelog
1	10/28/22	Initial Draft Version. Added Success Cases of Registration and Logging.
2	11/02/22	Added Failure Cases of Registration. Changed Success Cases of Registration and Logging.
3	11/09/22	Added Failure Cases of Logging. Finalization.
4	12/14/22	Updated for Milestone 3, Added Success and Failure Cases for Authentication and Authorization.