Software Analysis and Design CA 2

SA4101 - Prof. Yuen Kwan

PREPARED BY

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Introduction

FSTA is a small to medium-sized enterprise operating as a tour agency that currently supports booking for its tour packages exclusively through its physical outlet. To enhance its business operations, FSTA has commissioned the team to develop a Tour Reservation System, which aims to enable end-to-end operations via an online web application.

The online web application will introduce efficiency to core business use cases such as creating and approving tour packages, maintaining tour groups, enquiring tour packages, tour guide and tour costs, managing customer bookings, and assignments of tour guides.

This report serves as a technical document that outlines the analysis and design workflow to be proposed to FSTA prior to system implementation. Data models, including logical data model and data dictionary, analysis model including sequence and class diagrams for each use case, and design models, will be detailed to ensure alignment with FSTA's requirements and effective usage of analysis and design models with consideration of object reusability, cohesiveness, and loose coupling.

Assumptions

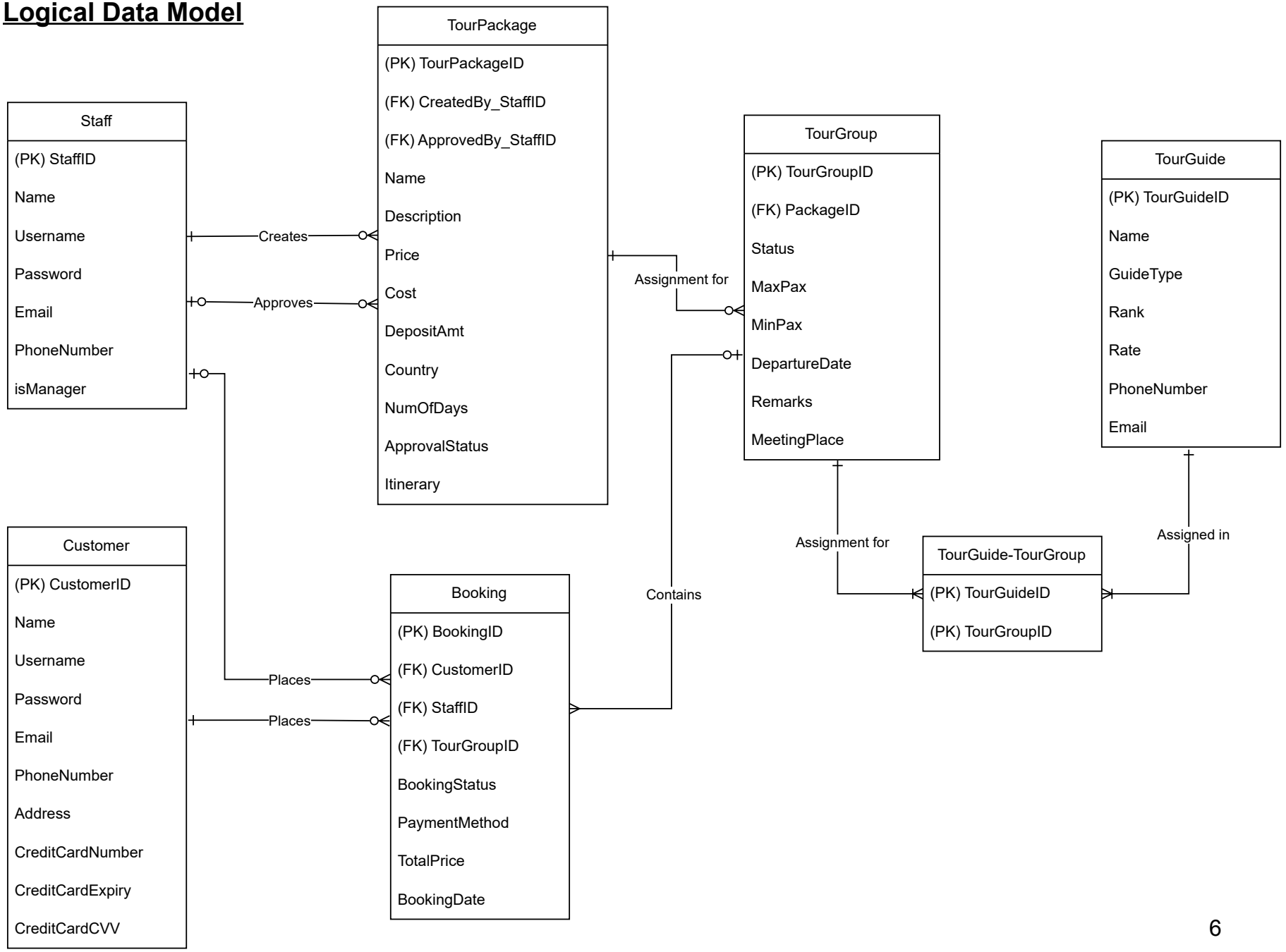
1. The proposed solution supports **one customer and one staff member reference per booking**.
2. **Bookings will be created** with the booking status “processing” after the customer or Ops Staff enters details such as the tour package and departure date, and **before the payment is made**. Status will change to “pending” when the deposit is paid and “confirmed” when full payment is made.
3. If **payment is unsuccessful** when the daily scheduler deducts the outstanding payments, the system will alert Ops Staff to handle these cases manually **via email notification**.
4. **Payment** is handled by an **external gateway** and will not be detailed in this report.
5. **Refunds** are currently not detailed in this report and reserved for future discussions.
6. **Creation of Staff and Customer accounts** is currently not detailed in this report and is reserved for future discussions.

System Actors

The following are the main system actors involved in the main use cases of the FSTA online system.

Actors	Description
Customer	View and enquire tour packages, place bookings and make payments through the online platform. They can also cancel their bookings and receive email notifications for confirmations, cancellation and payment updates.
Ops Staff	Manages daily operations, including creating and maintaining tour packages and tour groups. They can place bookings on behalf of customers, process payments, cancel bookings or tour groups, update departure and completion statuses, assign tour guides, and enquire on tour costs and tour guide costs.
Ops Manager	Reviews and approves tour packages created by Ops Staff before they become available for customer booking. They are also responsible for approving tour packages and managing tour operations.
Tour Guide	Assigned to specific tour groups to lead tours. The tour guide is also responsible for entering remarks or feedback into the system.
Payment System	Responsible for processing online credit card or deposit payments made during bookings or when the daily scheduler triggers automatic full payment collection one month before the tour's departure date.
Daily Scheduler	Automated background process that runs daily to check for outstanding payments for tour bookings . It triggers payment collection, updates booking status, and initiates email notifications for successful/failure in transactions.
Email System	Sends email notifications to customers and ops staff for updates related to booking confirmations, payment success/failure, and cancellation of tours.

Logical Data Model



Data Dictionary

Entity	Attribute Name	Type	Len	Definition and Business Rules
Booking	BookingID	string	6	Booking number. Unique for each booking. Follows the format “B” followed by “XXXXX” which represents incremental sequence number for booking created.
	CustomerID	string	6	Customer number. Unique for each customer. Follows the format “C” followed by “XXXXX” which represents incremental sequence number for customer created. Example: “C12345, C22222”.
	StaffID	string	6	Staff number. Unique for each staff member. Follows the format “S” followed by “XXXXX” which represents incremental sequence number for staff created.
	TourGroupID	string	6	Tour group number. Unique for each tour group. Follows the format “GR” followed by “XXXXX” which represents incremental sequence number for tour groups created. Example: GR12345, GR22222.
	BookingStatus	string	20	Status of the current booking. This can range from the following: “processing”, “confirmed”, “pending”, “cancelled”, “departed”.
	PaymentMethod	string	30	Payment Method of the tour package booked. This can be either “deposit” or “full payment”.
	TotalPrice	dec	6.2	Price of the tour package booked.

				(in the form of 999999.99)
	BookingDate	date	8	Booking date of the tour package (DDMMYYYY). Will be automatically set to the current date.
Tour Group	TourGroupID	string	7	Tour group number. Unique for each tour group. Follows the format “GR” followed by “XXXXX” which represents incremental sequence number for tour groups created. Example: GR12345, G22222.
	PackageID	string	6	Tour Package number. Unique for each tour package. Follows the format “P” followed by “XXXXX” which represents incremental sequence number for tour package created. Example: P55555, P10101.
	Status	string	10	Status of the tour group. This can range from the following: “new”, “departed”, “cancelled”, “completed”.
	MaxPax	integer	3	Maximum number of people for the tour group. Must be more than 0 and equal to or more than minPax.
	MinPax	integer	1	Minimum number of people for the tour group. Must be more than 0.
	DepartureDate	date	8	Departure date of the tour group (DDMMYYYY). Must be later than the current date.
	Remarks	string	255	Remarks given by the tour guide upon completion of the tour group.

	MeetingPlace	string	200	Meeting place and address of the tour group.
Tour Guide	TourGuideID	string	7	Tour guide number. Unique for each tour guide. Follows the format “GU” followed by “XXXXX” which represents incremental sequence number for tour guide created. Example: GU12345, G22222.
	Name	string	25	Full Name of tour guide
	GuideType	string	10	Employment type of tour guide. This can take one of the following values: “Full-time”, “Part-time”
	Rank	string	2	Employment rank of tour guide. This can take one of the following values: ”M1”, “M2”, “M3”
	Rate	dec	6.2	Daily rate of guide (SGD). Must be more than 0. (in the form of 999999.99)
	PhoneNumber	integer	10	Contact number of guide with country code.
	Email	string	40	Email address of tour guide. Follows the format XXXX@XXXXX.XXXX
TourGuide-TourGroup	TourGroupID	string	7	Tour group number. Unique for each tour group. Follows the format “GR” followed by “XXXXX” which represents incremental sequence number for tour groups created. Example: GR12345, G22222.

	TourGuideID	string	7	Tour guide number. Unique for each tour guide. Follows the format “GU” followed by “XXXXX” which represents incremental sequence number for tour guide created. Example: GU12345, G22222.
Customer	CustomerID	string	6	Customer number. Unique for each customer. Follows the format “C” followed by “XXXXX” which represents incremental sequence number for customer created. Example: “C12345, C22222”.
	Name	string	25	Customer Name (full name, start with the surname).
	Username	string	25	Username for logging into the system. Must be unique and at least 5 characters.
	Password	string	30	String of at least 8 characters that includes at least one uppercase letter, one number and a special character.
	Email	string	40	Email address of tour guide. Follows the format XXXX@XXXXX.XXXX
	PhoneNumber	int	10	Contact number of customer with country code.
	Address	string	200	Full residential address of the customer, including street, unit number, city, and postal code.
	CreditCardNumber	int	16	Customer’s credit card number used for payment transactions.
	CreditCardExpiry	string	4	Expiry date of the customer’s

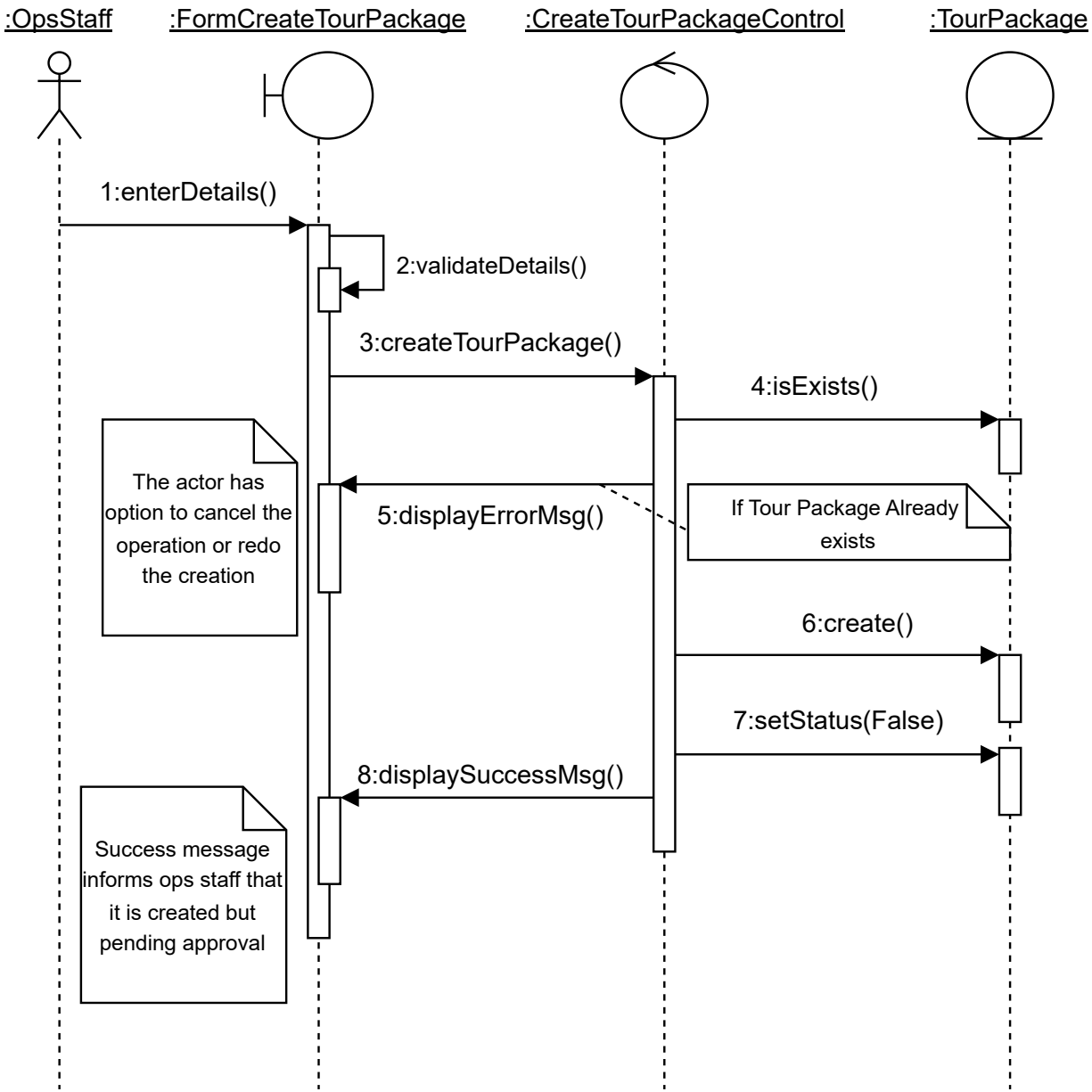
				credit card in MM/YY format
	CreditCardCVV	int	4	Three or four-digit security code printed on the credit card, used for transaction verification
Tour Package	TourPackageID	string	6	Tour Package number. Unique for each tour package. Follows the format “P” followed by “XXXXX” which represents incremental sequence number for tour package created. Example: P55555, P10101.
	CreatedBy_StaffID	string	6	Staff number who created the tour package. Follows the format “S” followed by “XXXXX” which represents incremental sequence number. Example: S12345, S22222.
	ApprovedBy_StaffID	string	6	Staff number who approved the tour package. Follows the format “S” followed by “XXXXX” which represents incremental sequence number. Example: S12345, S22222.
	Name	string	25	Unique full name assigned to the Tour package.
	Description	string	100	Short description of the tour package.
	Price	dec	6.2	Estimated price of the tour package allocated for the customer (in the form of 999999.99).

	Cost	dec	6.2	Estimated cost of the tour package (in the form of 999999.99).
	DepositAmt	dec	6.2	Amount that needs to be deposited by the customer (in the form of 999999.99).
	Country	string	2	Country code to which the tour package belongs.
	NumOfDays	int	2	Number of the days allocated to the tour package. Must be more than 0.
	ApprovalStatus	boolean	N/A	Approval status by the Ops Manager for the tour package created. The value can be True/False.
	Itinerary	string	255	URL of the pdf path which contains the Itinerary details.
Staff	StaffID	string	6	Staff number. Unique for each staff member. Follows the format “S” followed by “XXXXX” which represents incremental sequence number for staff created. Example: S12345, S22222.
	Name	string	25	Staff Name (full name, start with the surname).
	Username	string	25	Username for logging into the system. Must be unique and at least 5 characters.
	Password	string	8	String of at least 8 characters that includes at least one uppercase letter, one number and a special

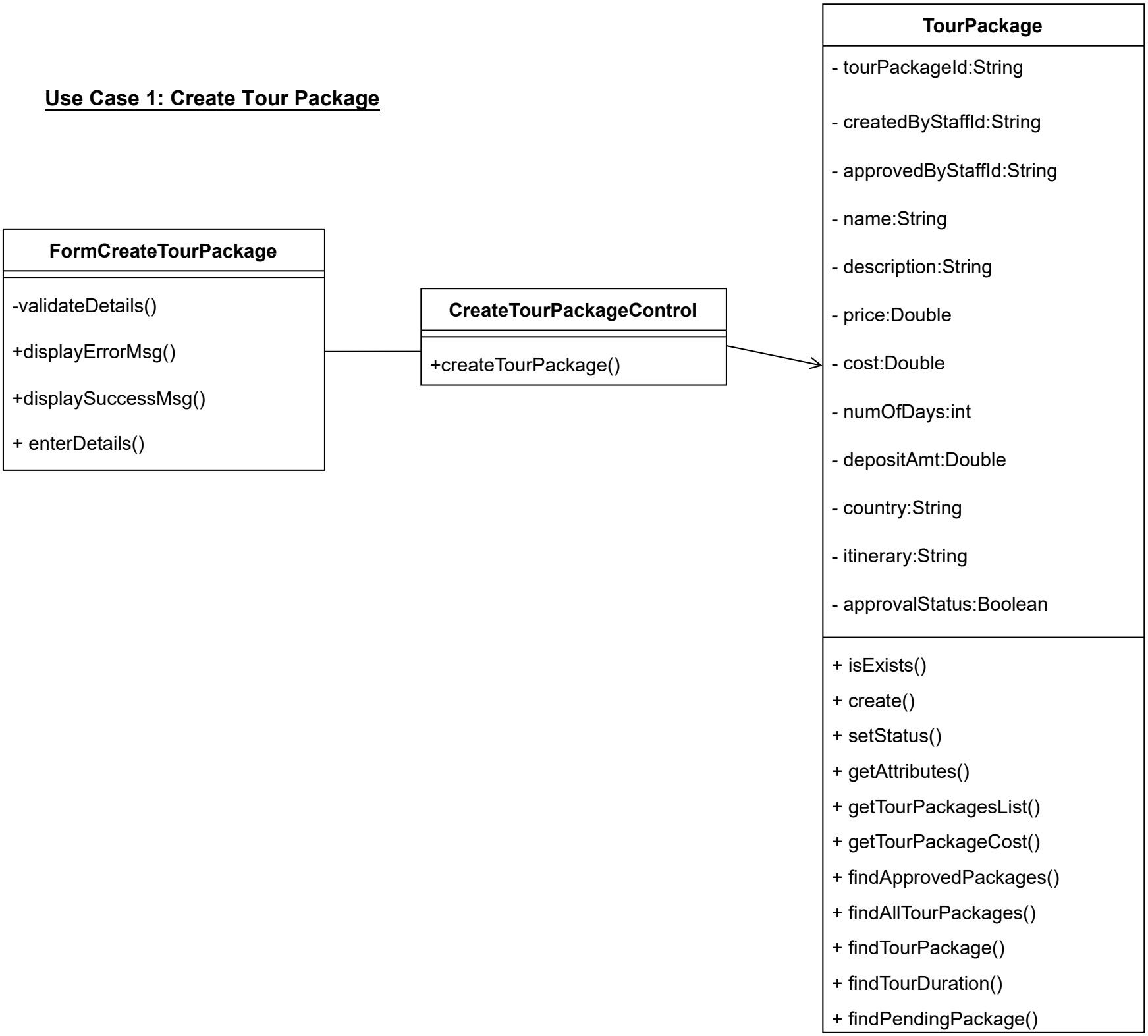
				character.
	Email	string	40	Email address of staff. Follows the format XXXX@XXXXX.XXXX
	PhoneNumber	int	10	Contact number of staff with country code.
	isManager	boolean	N/A	Defines the staff's role and permissions. The value can be True/False.

Analysis Model

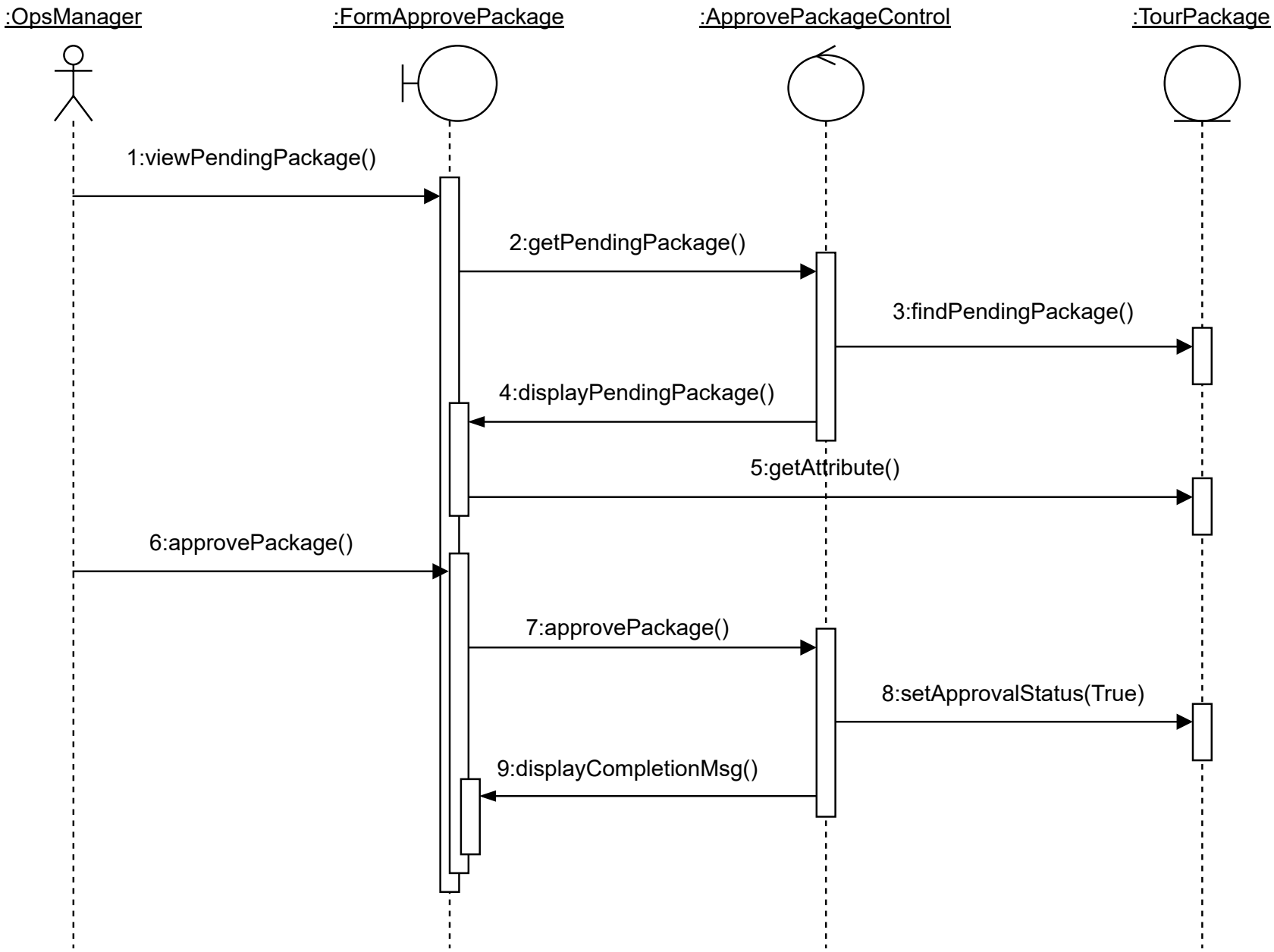
Use Case 1: Create Tour Package



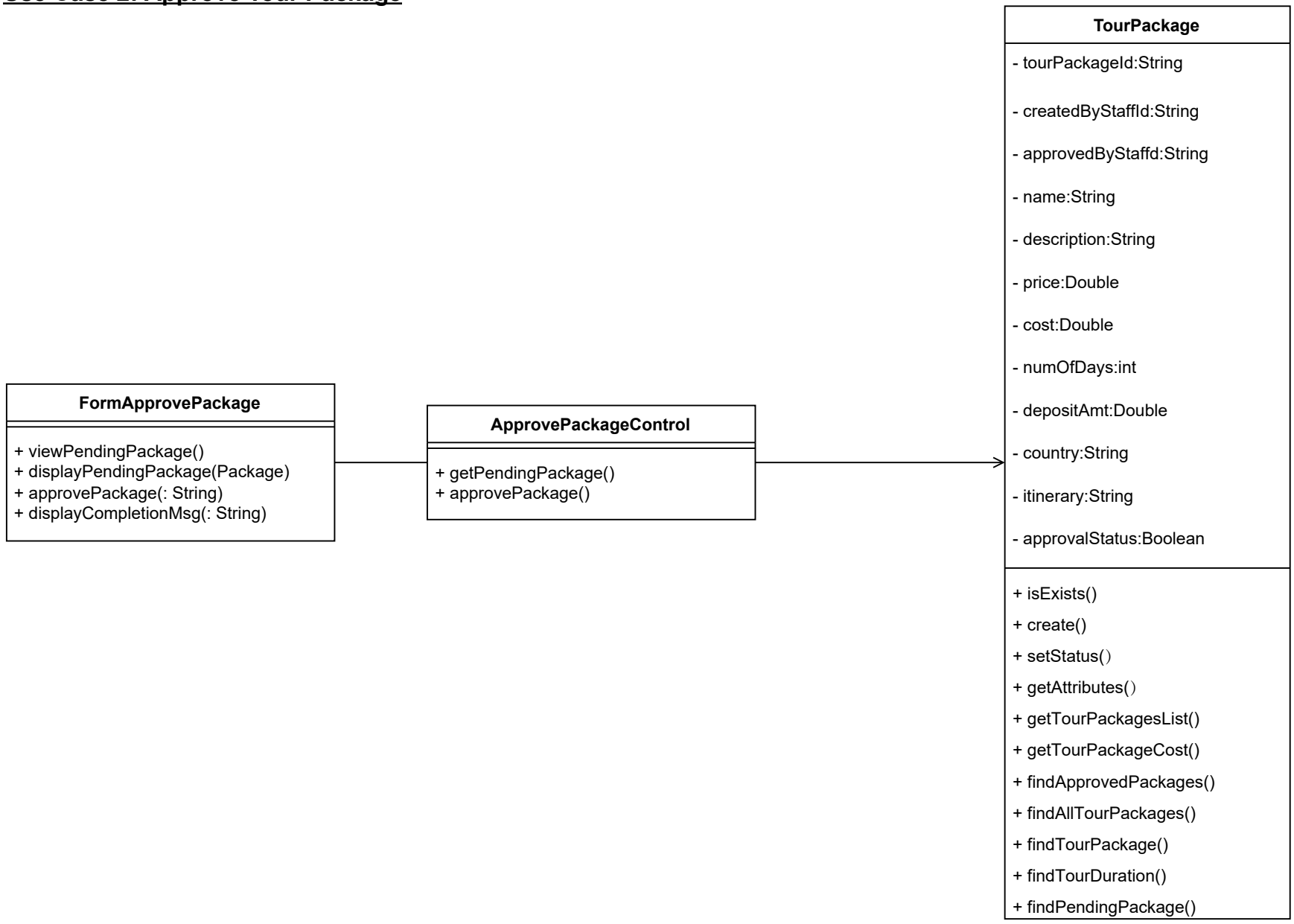
Use Case 1: Create Tour Package



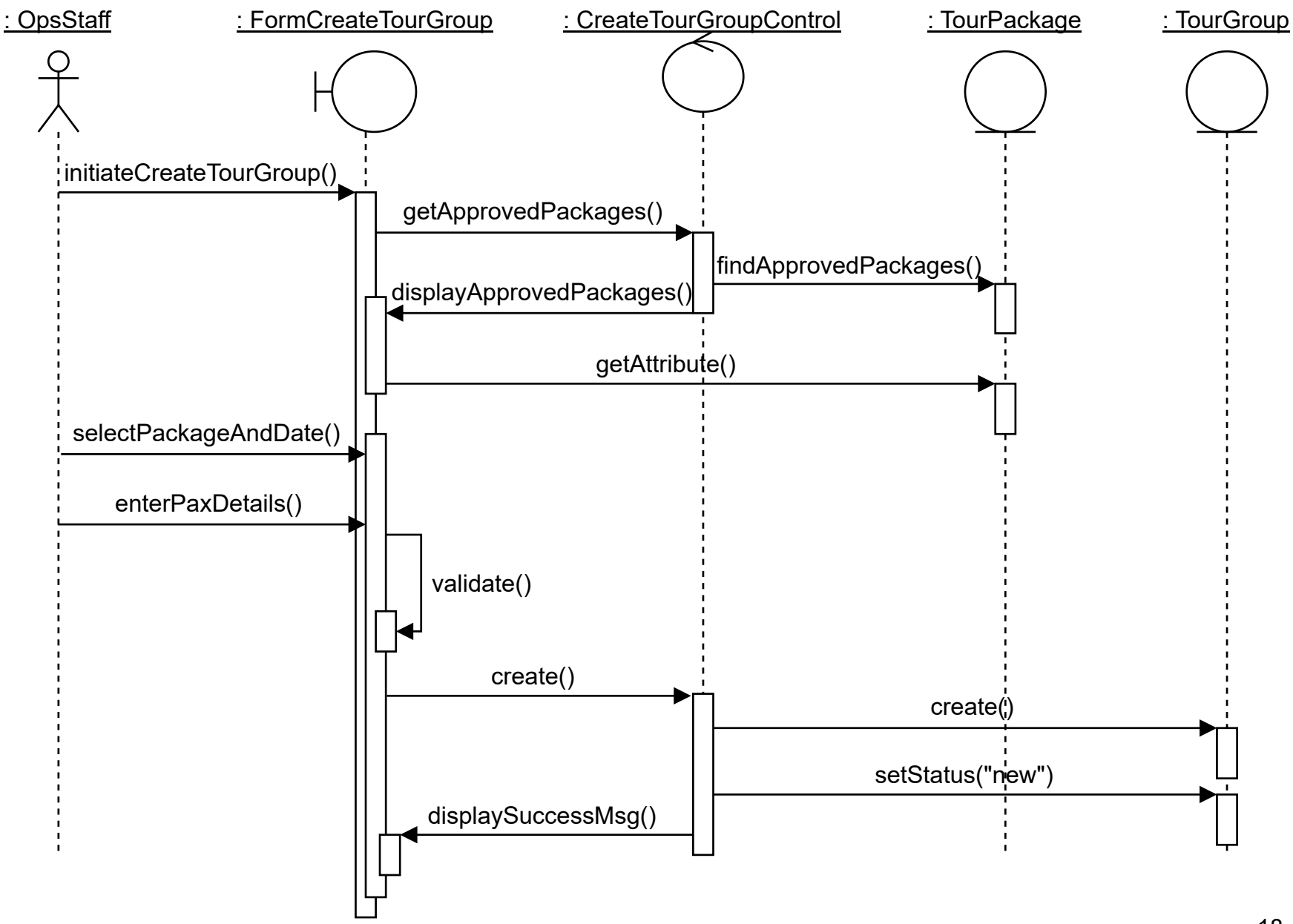
Use Case 2: Approve Tour Package



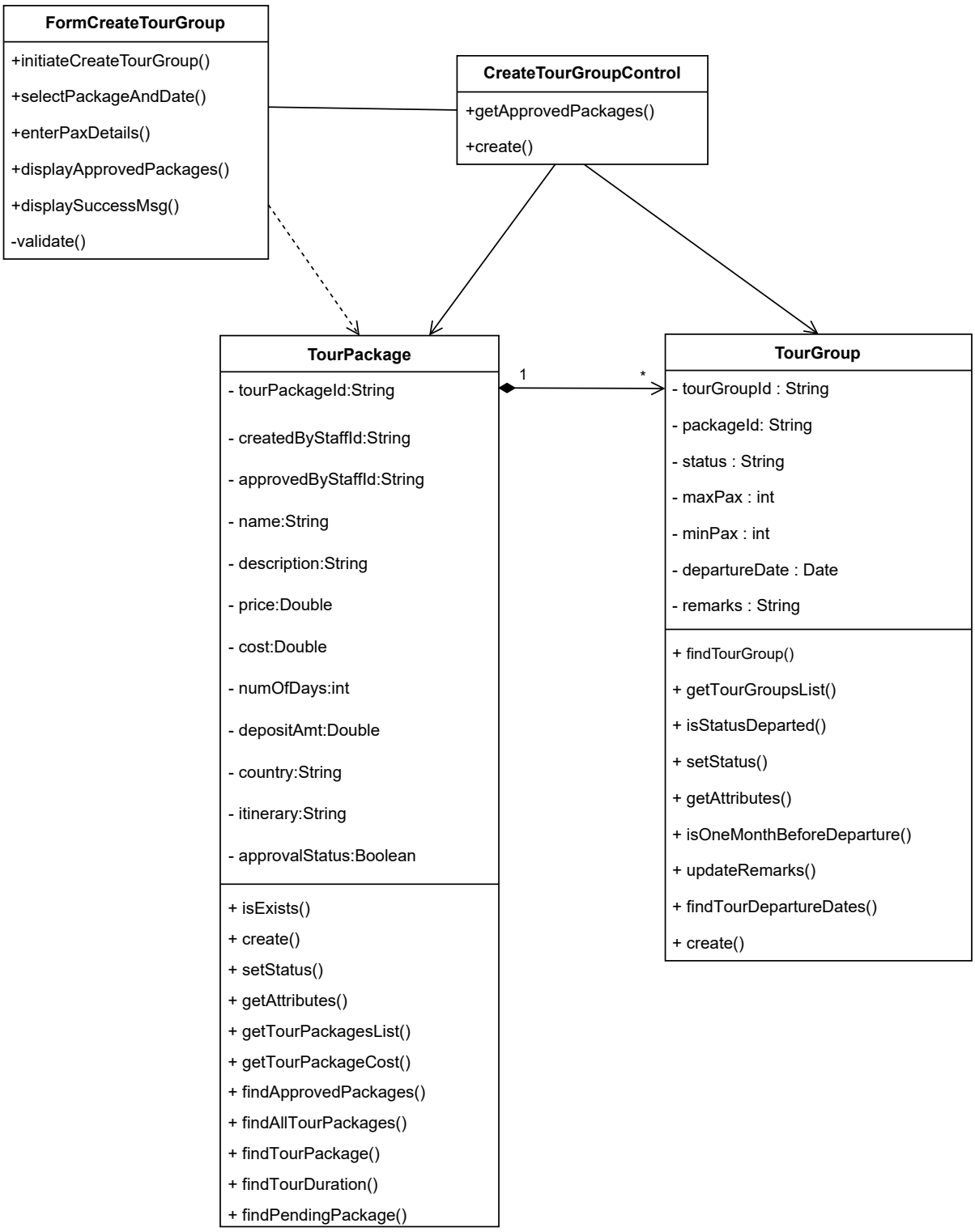
Use Case 2: Approve Tour Package



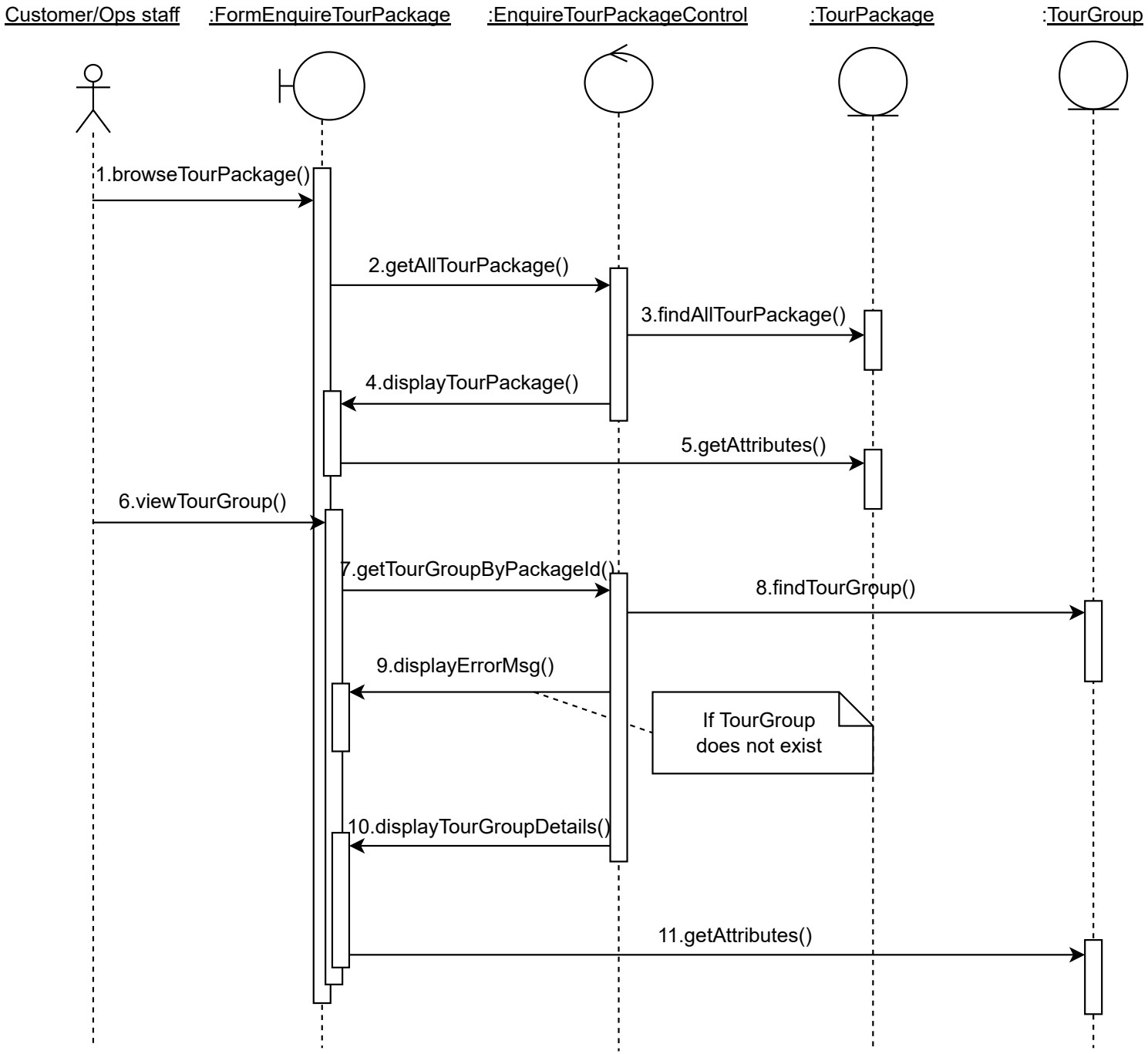
Use Case 3: Create Tour Group



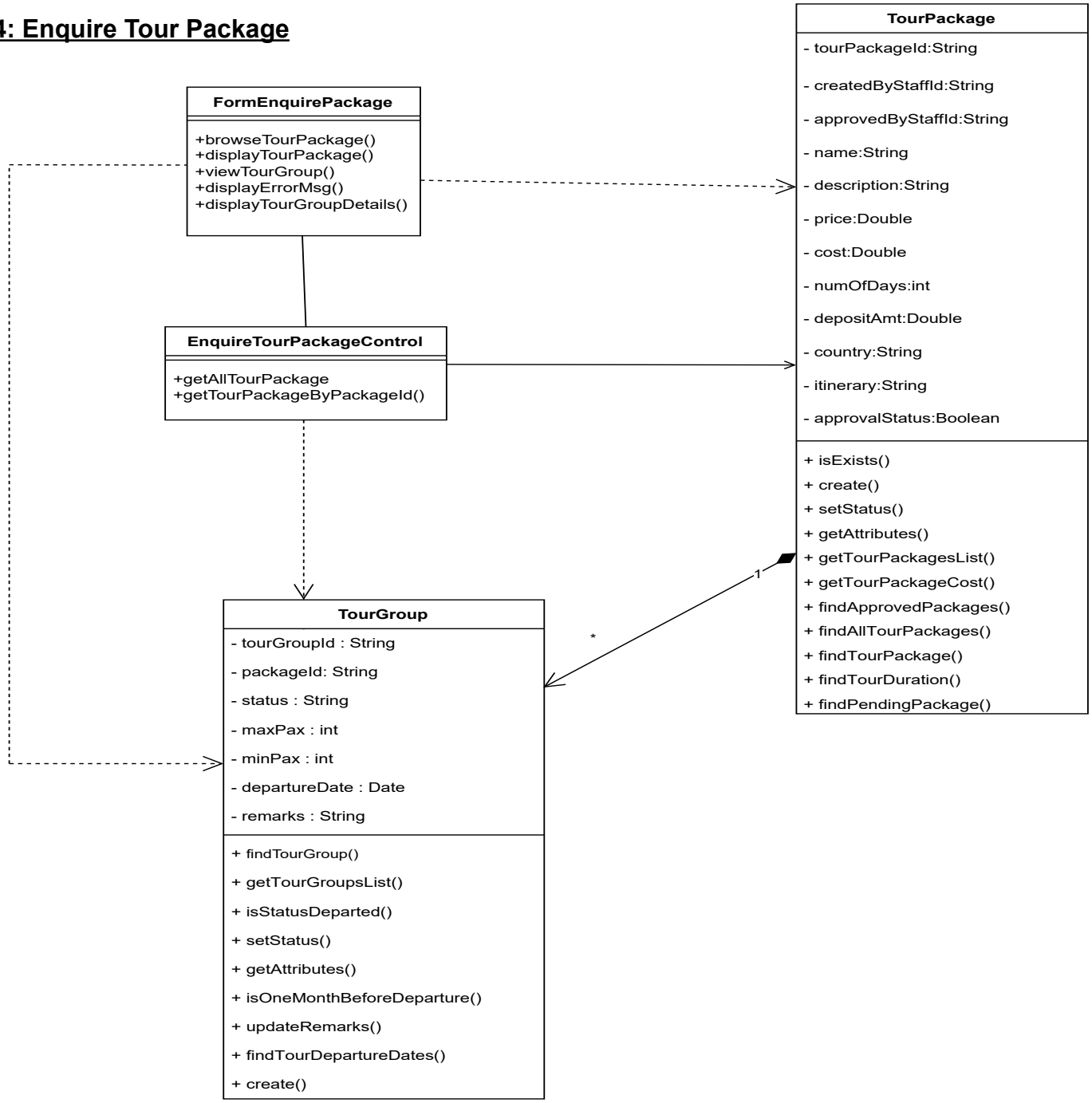
Use Case 3: Create Tour Group



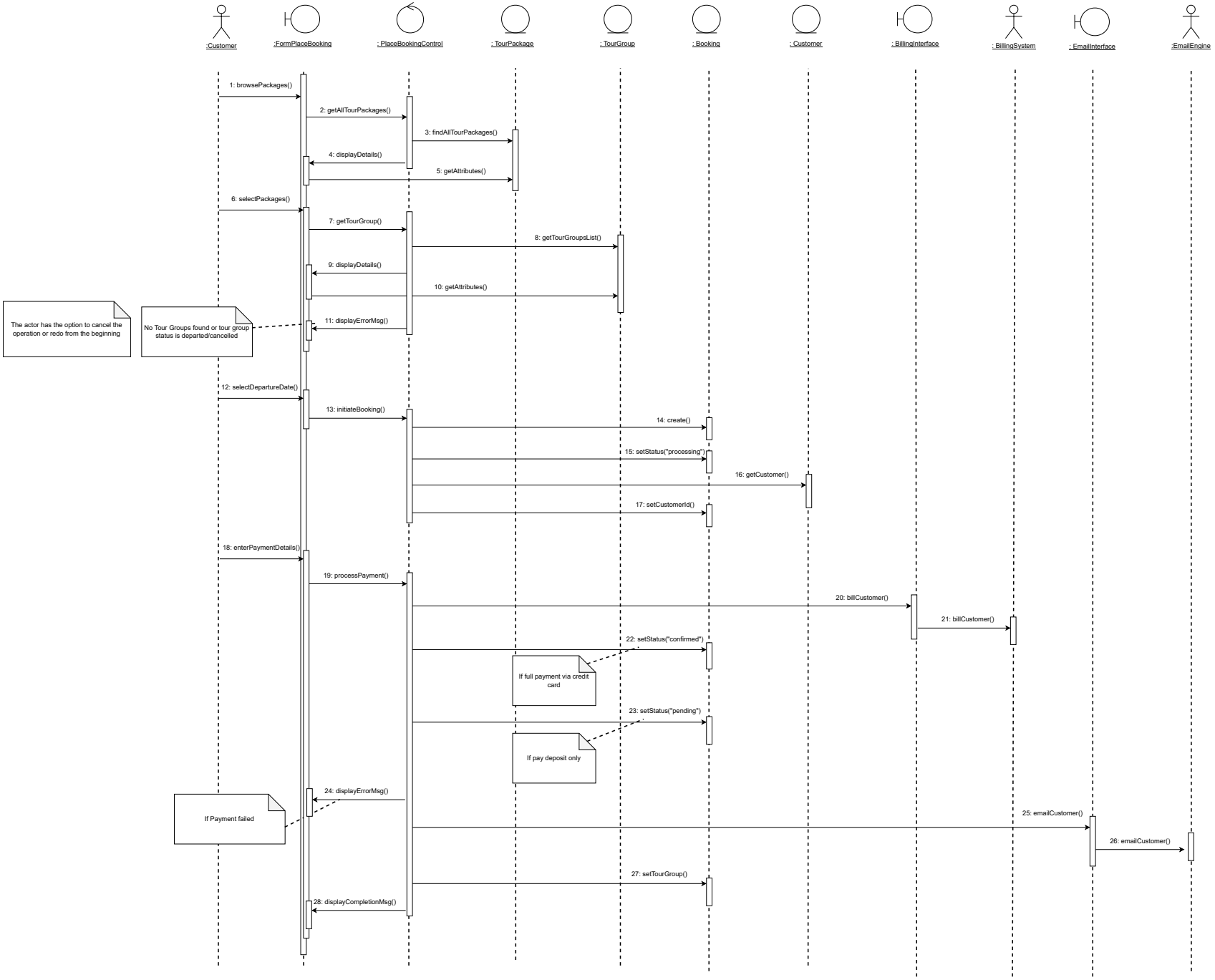
Use Case: 4: Enquire Tour Package



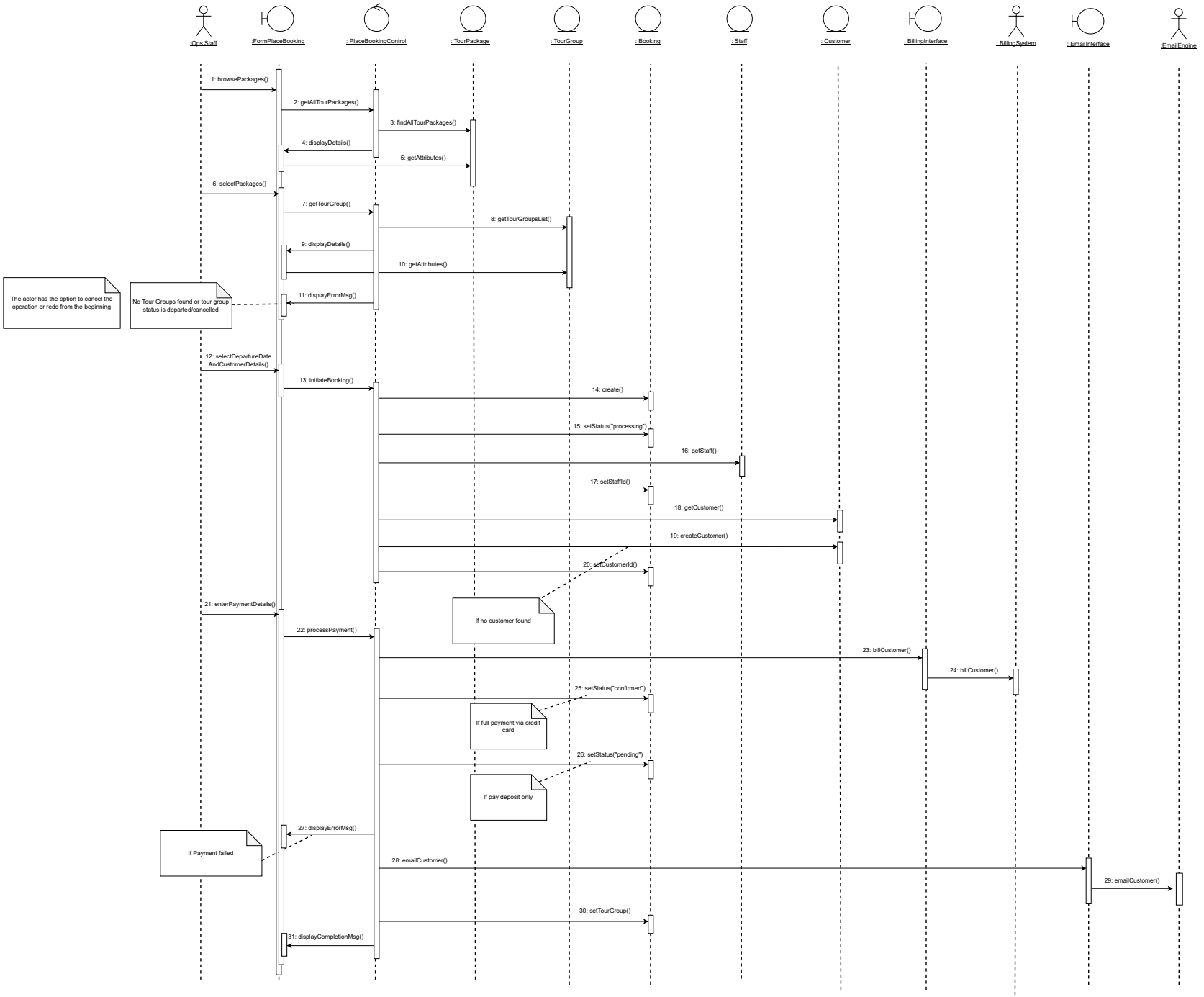
Use Case: 4: Enquire Tour Package



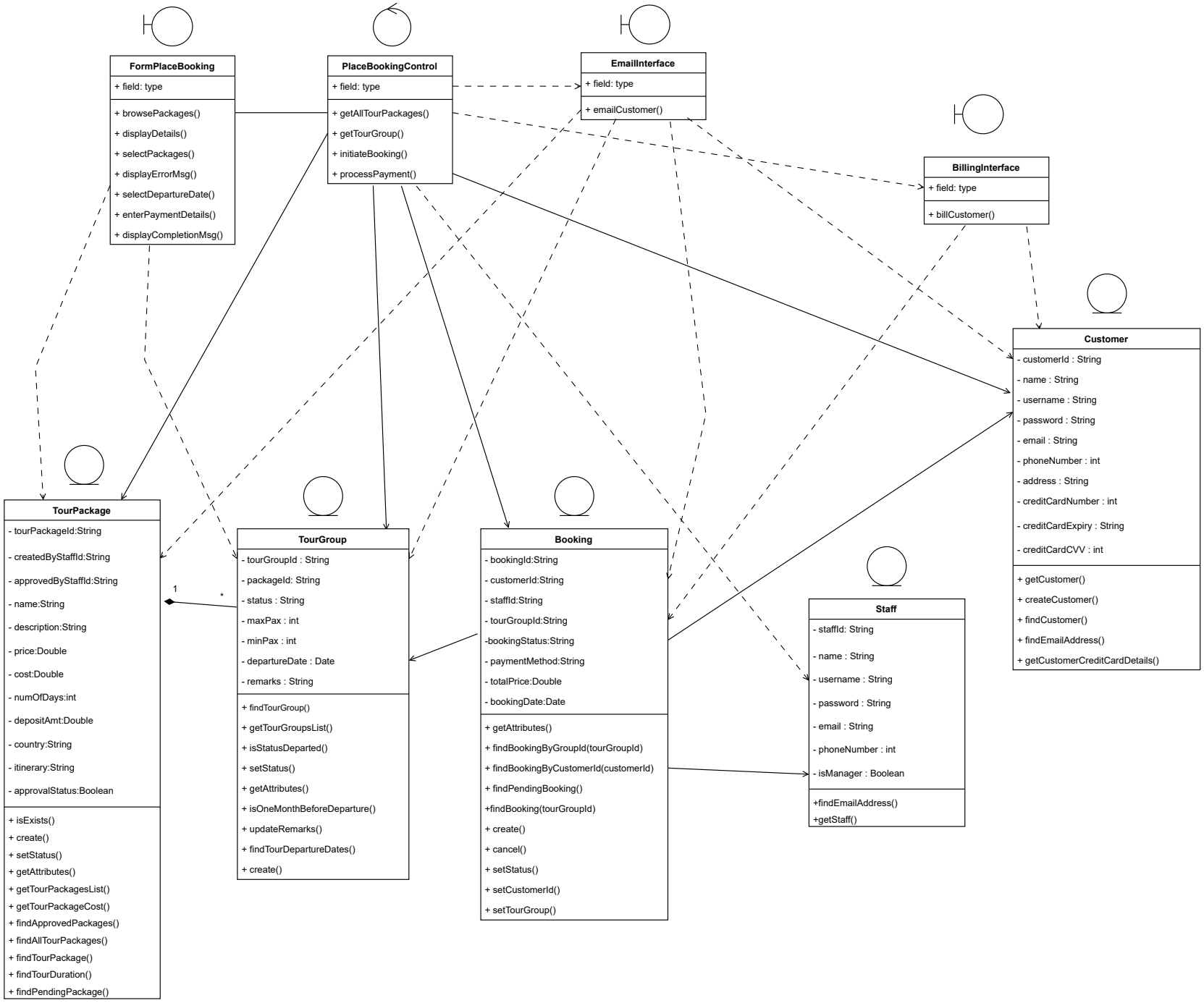
Use Case 5: Place Booking - (Customer)



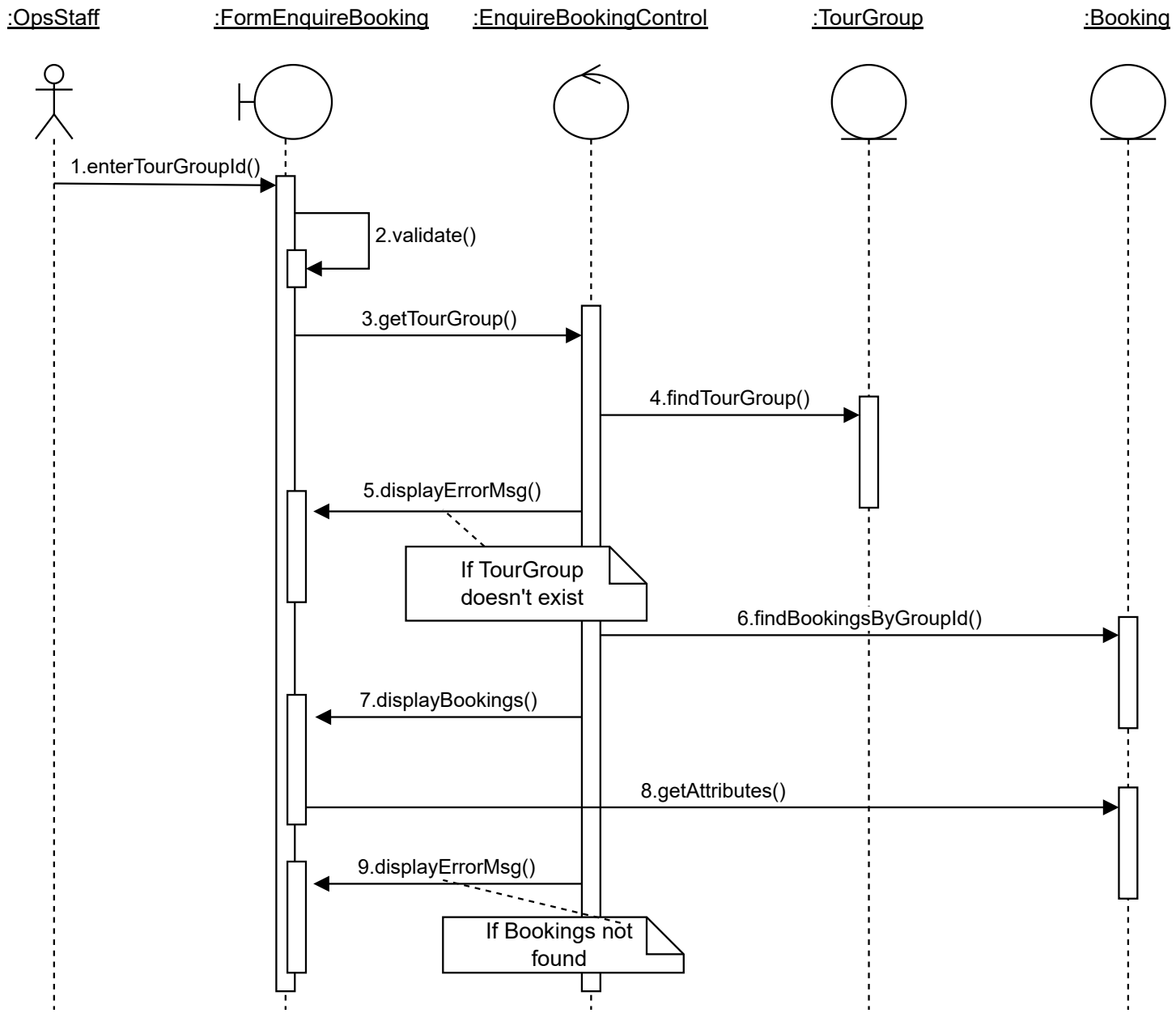
Use Case 5: Place Booking - (Ops Staff)



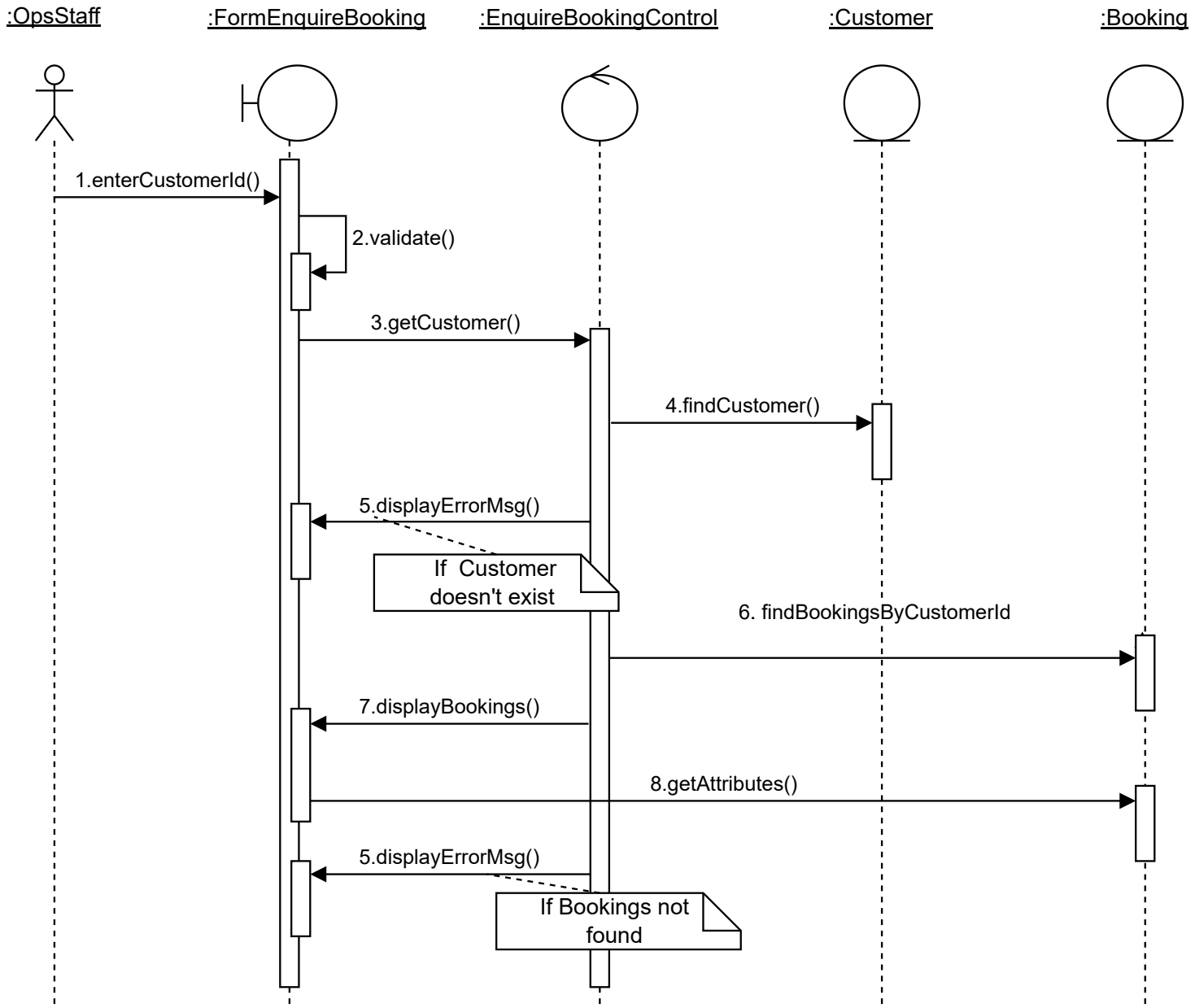
Use Case 5: Place Booking



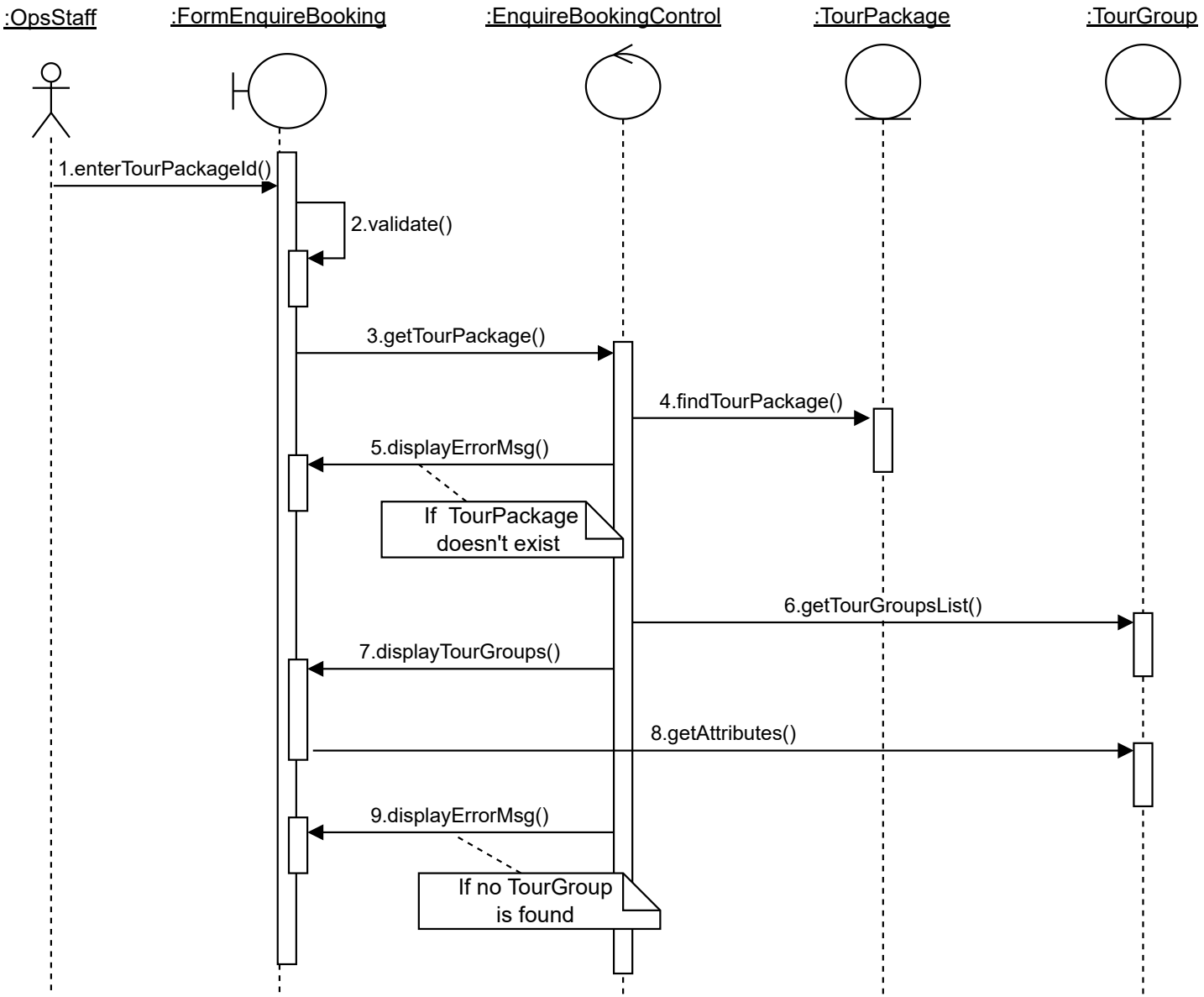
Use Case 6: Enquire Booking - (under a tour group)



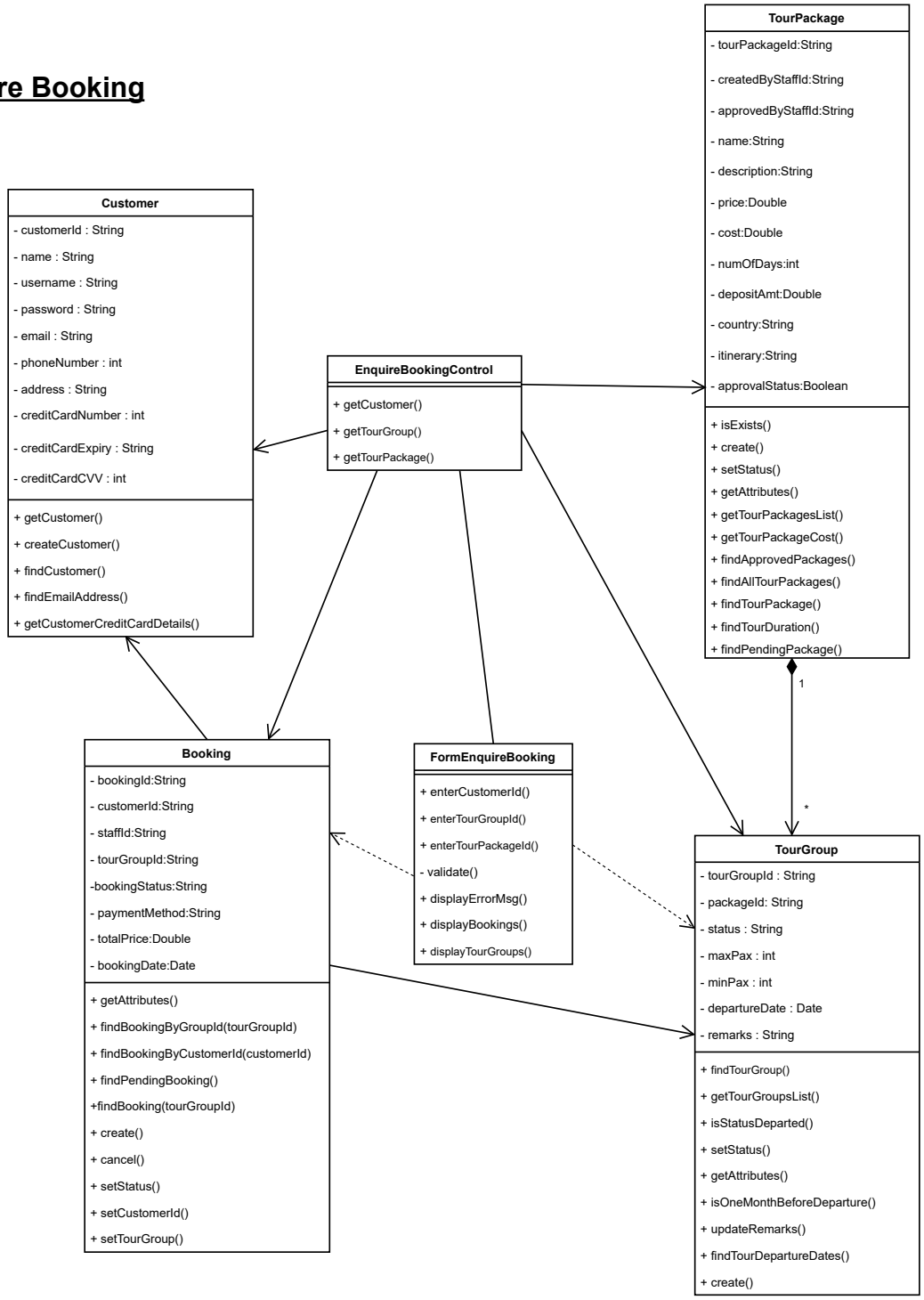
Use Case 6: Enquire Booking - (under a customer)



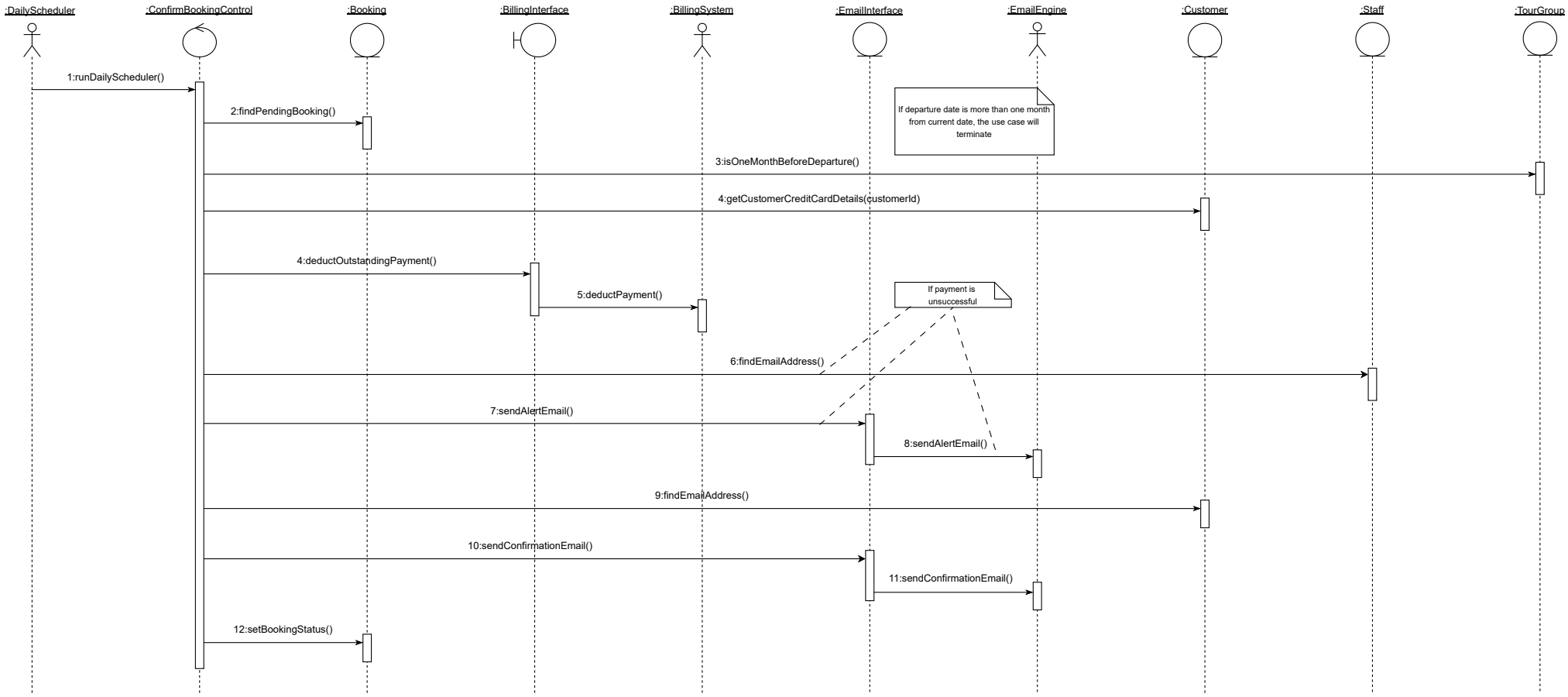
Use Case 6: Enquire Booking - (under a tour package)



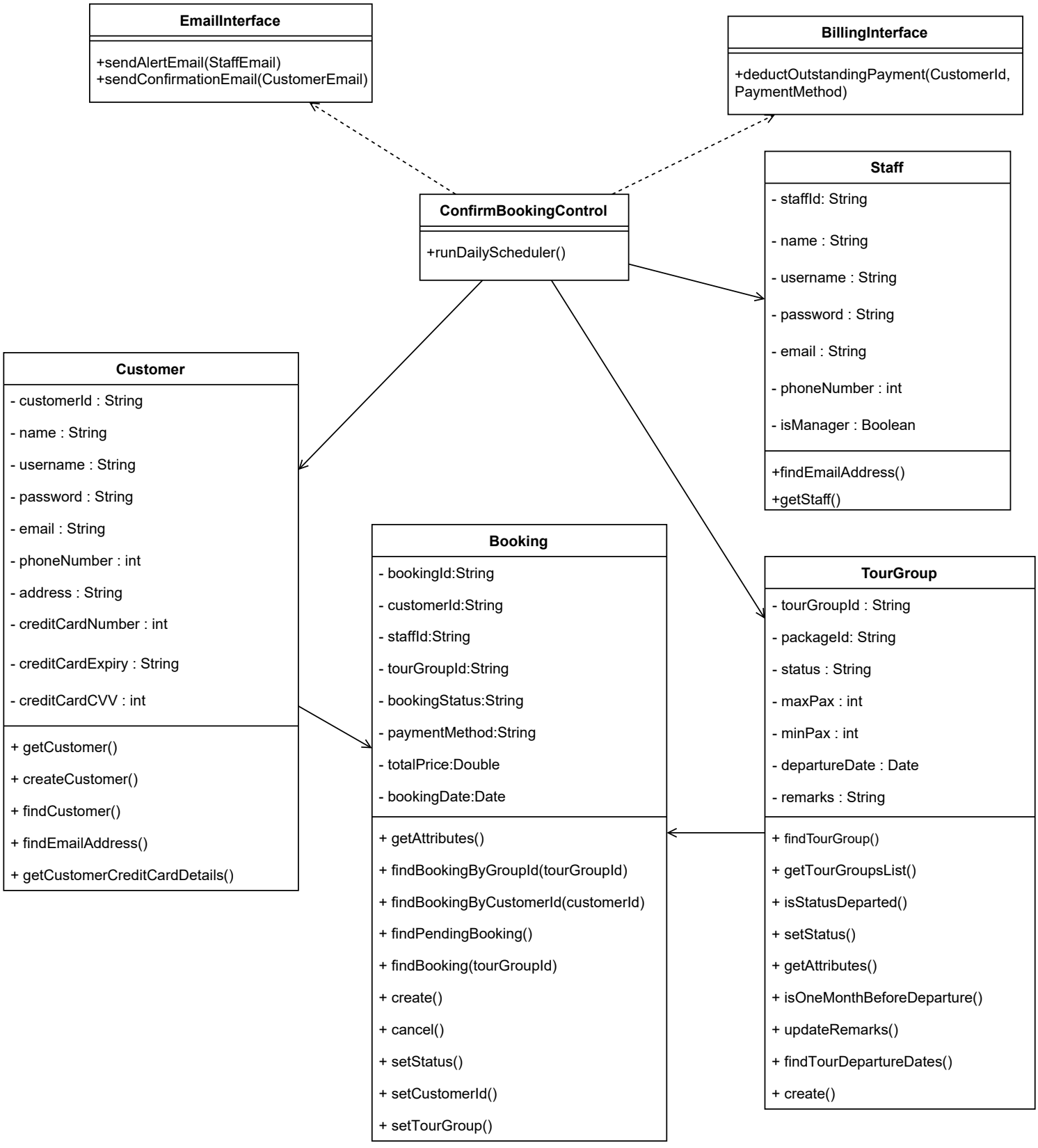
Use Case 6: Enquire Booking



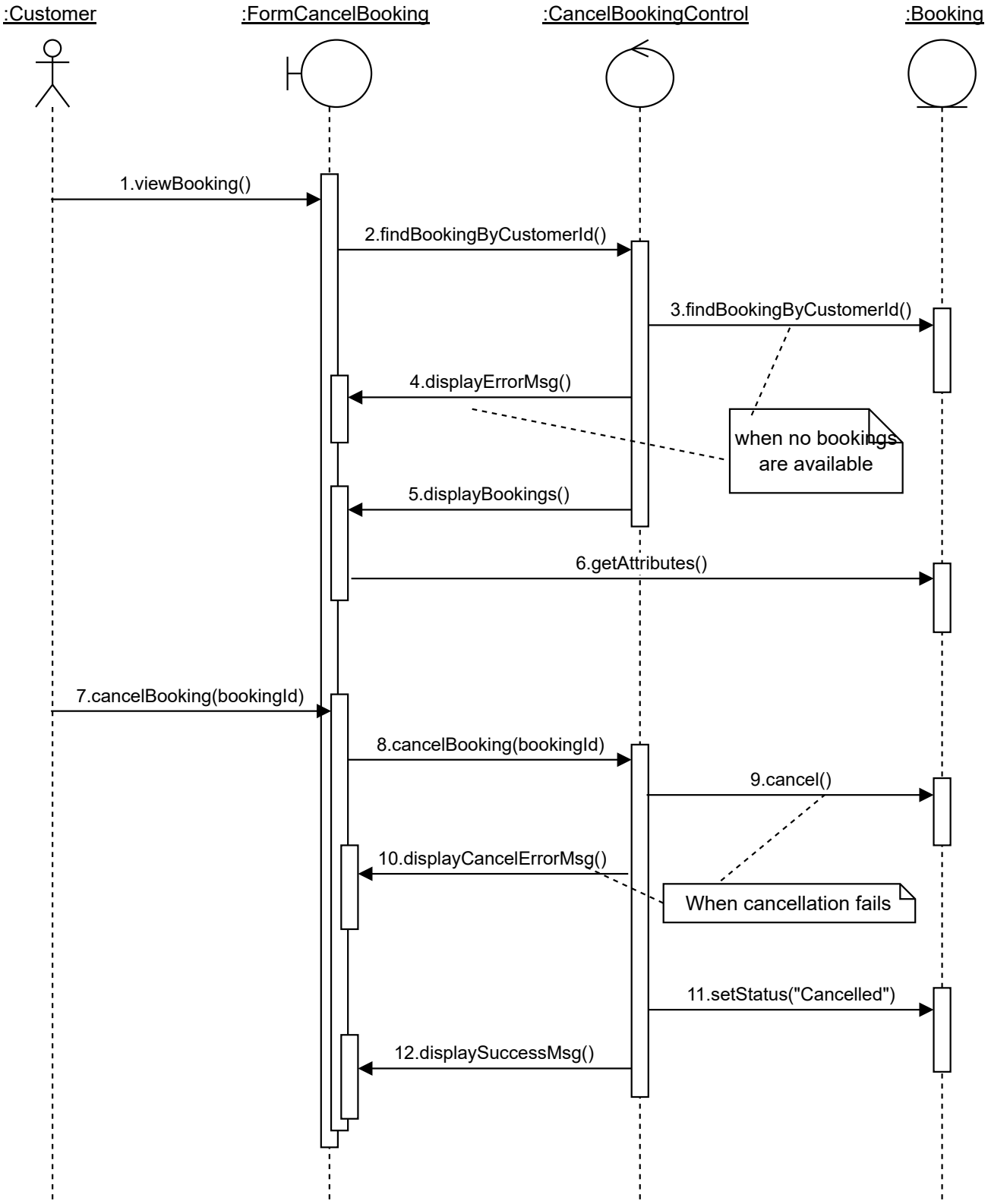
Use Case 7: Confirm Booking



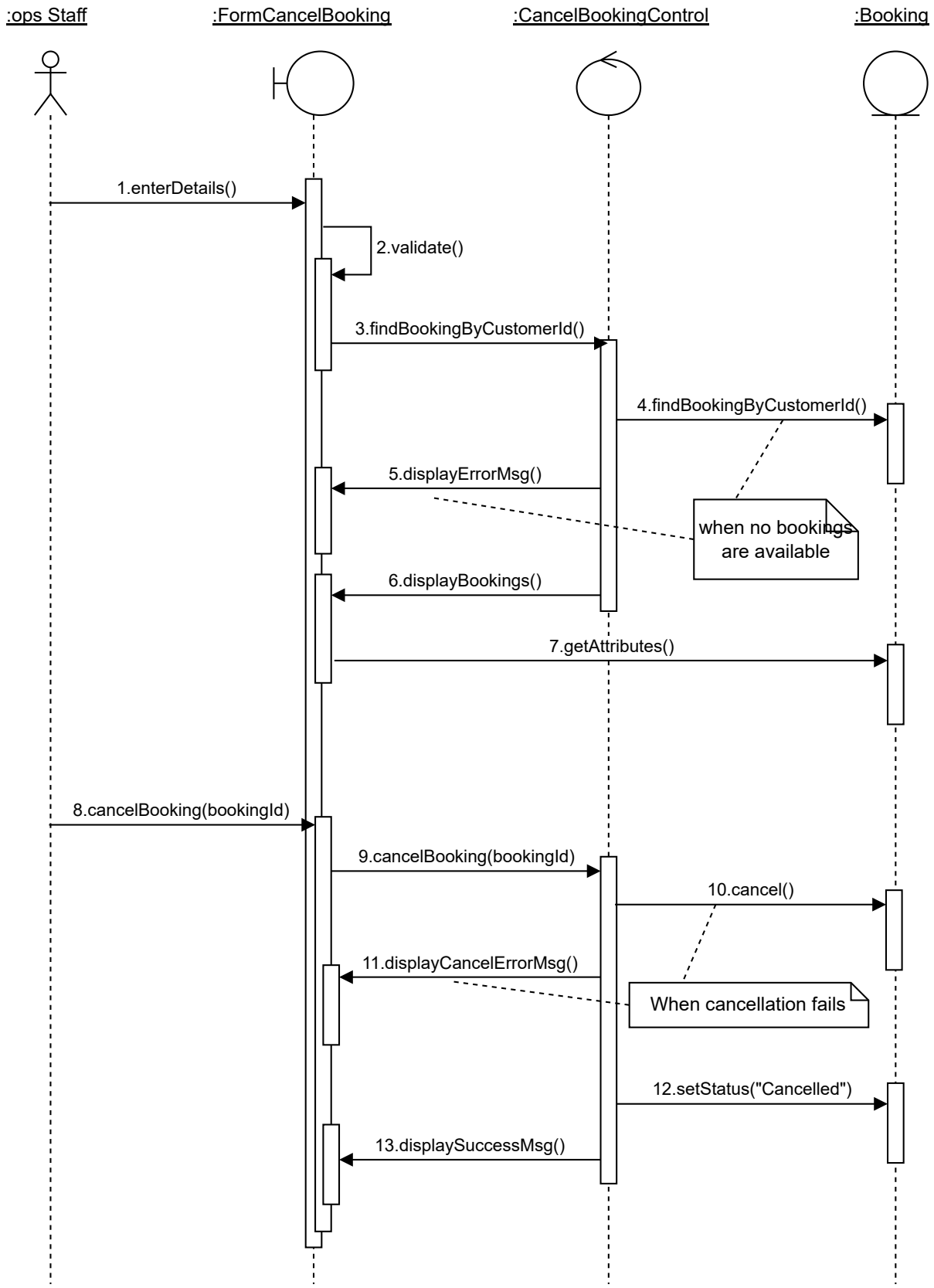
Use Case 7: Confirm Booking



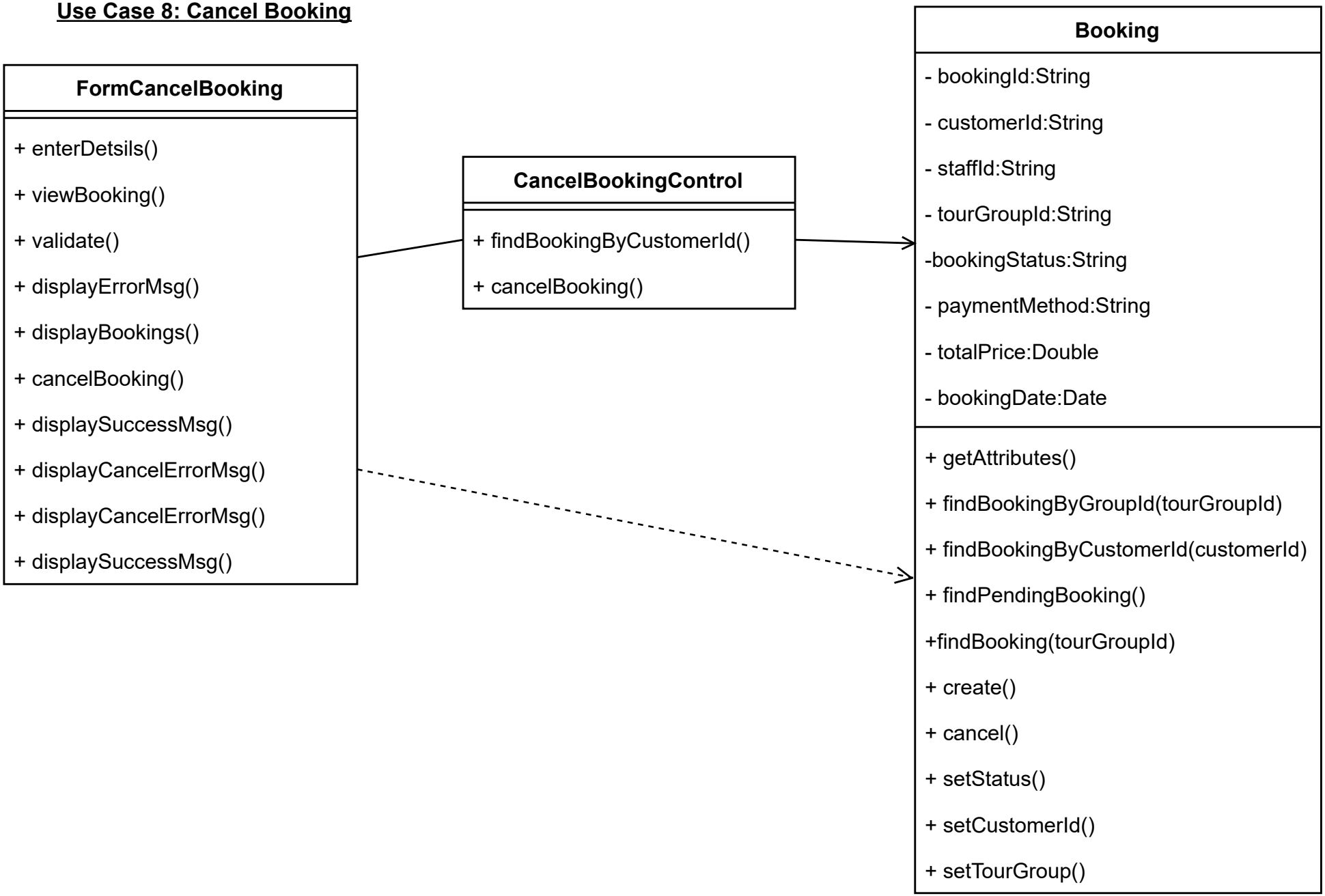
Use Case 8: Cancel Booking - (Customer)



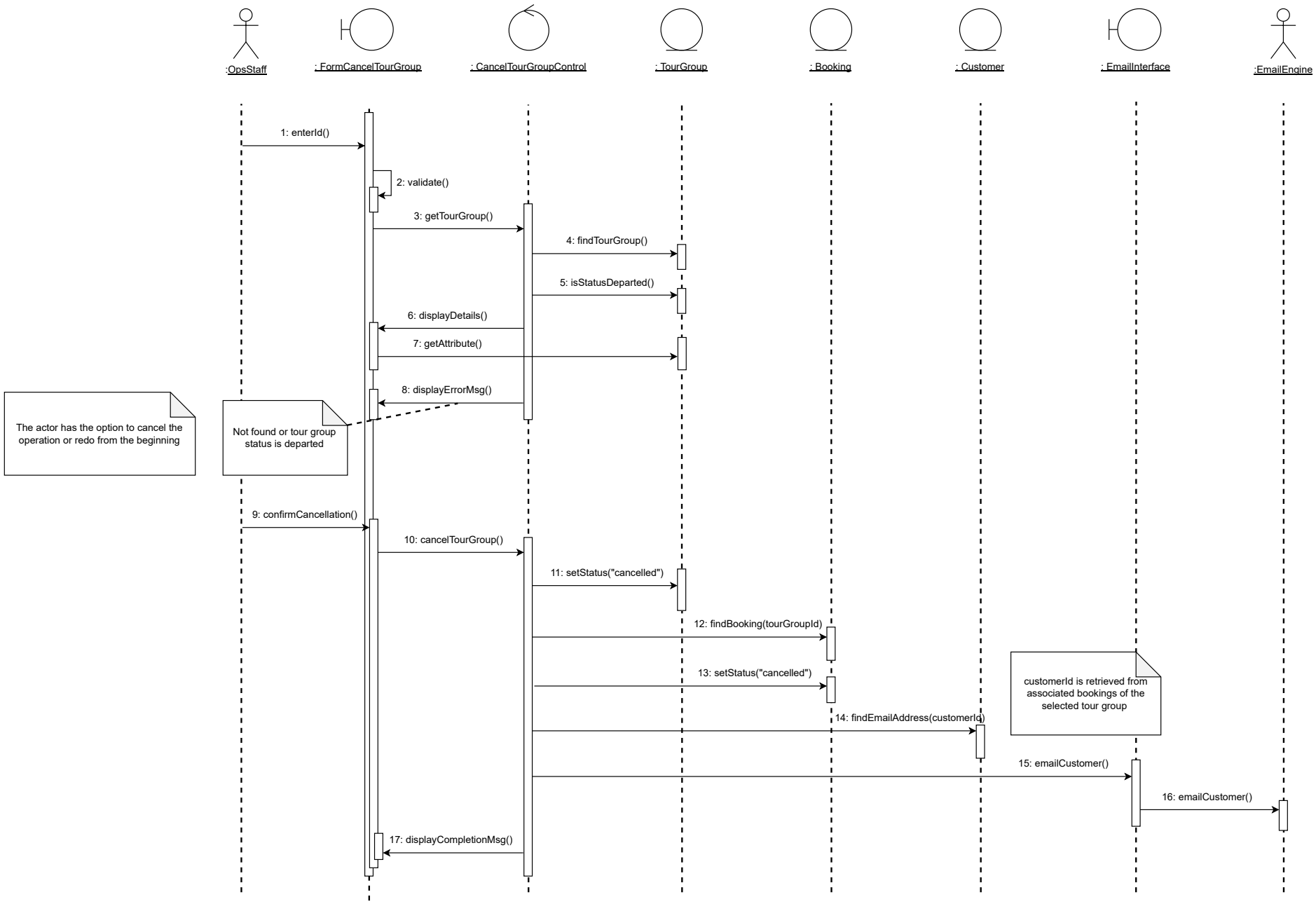
Use Case 8: Cancel Booking - (Ops Staff)



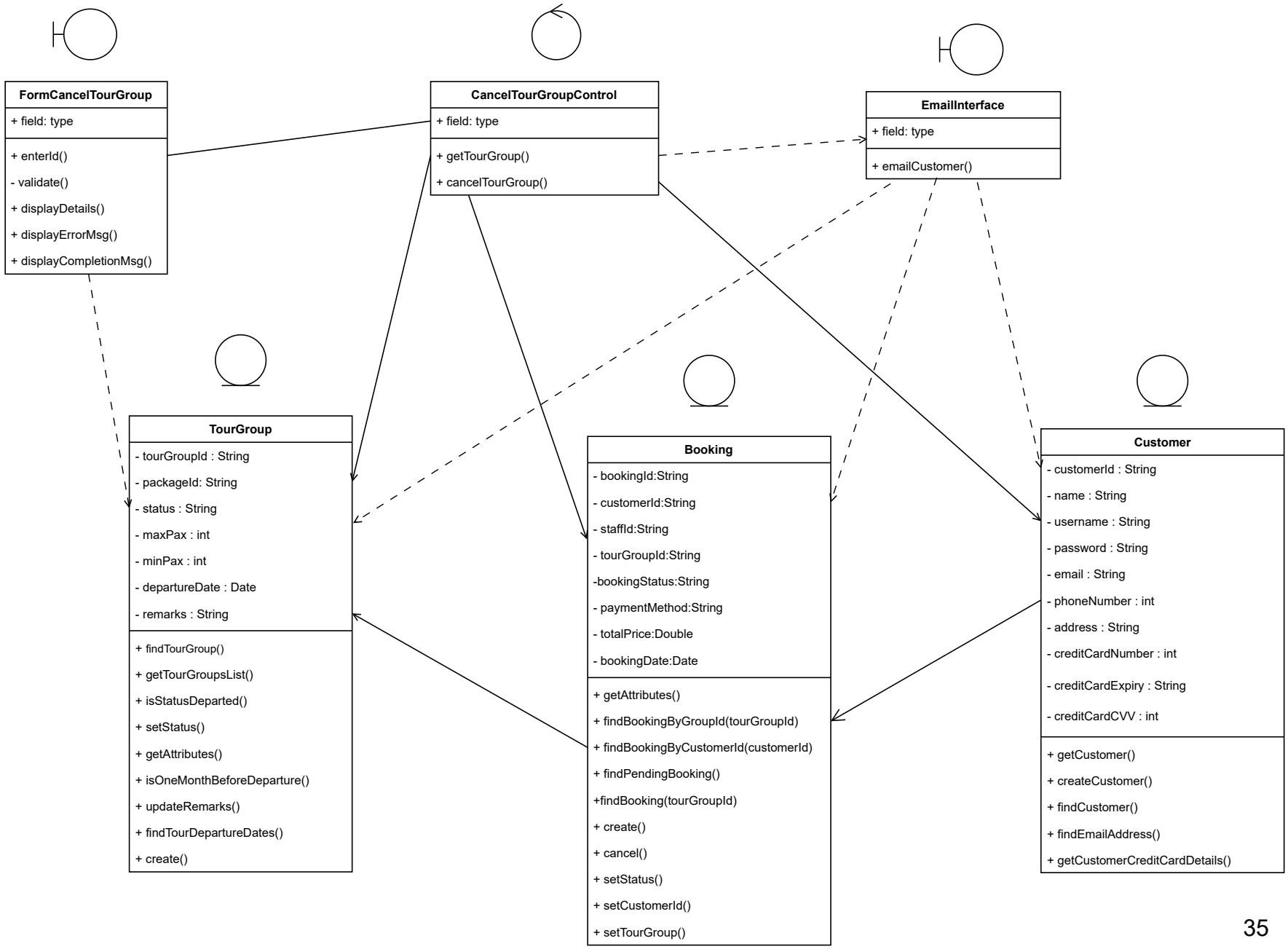
Use Case 8: Cancel Booking



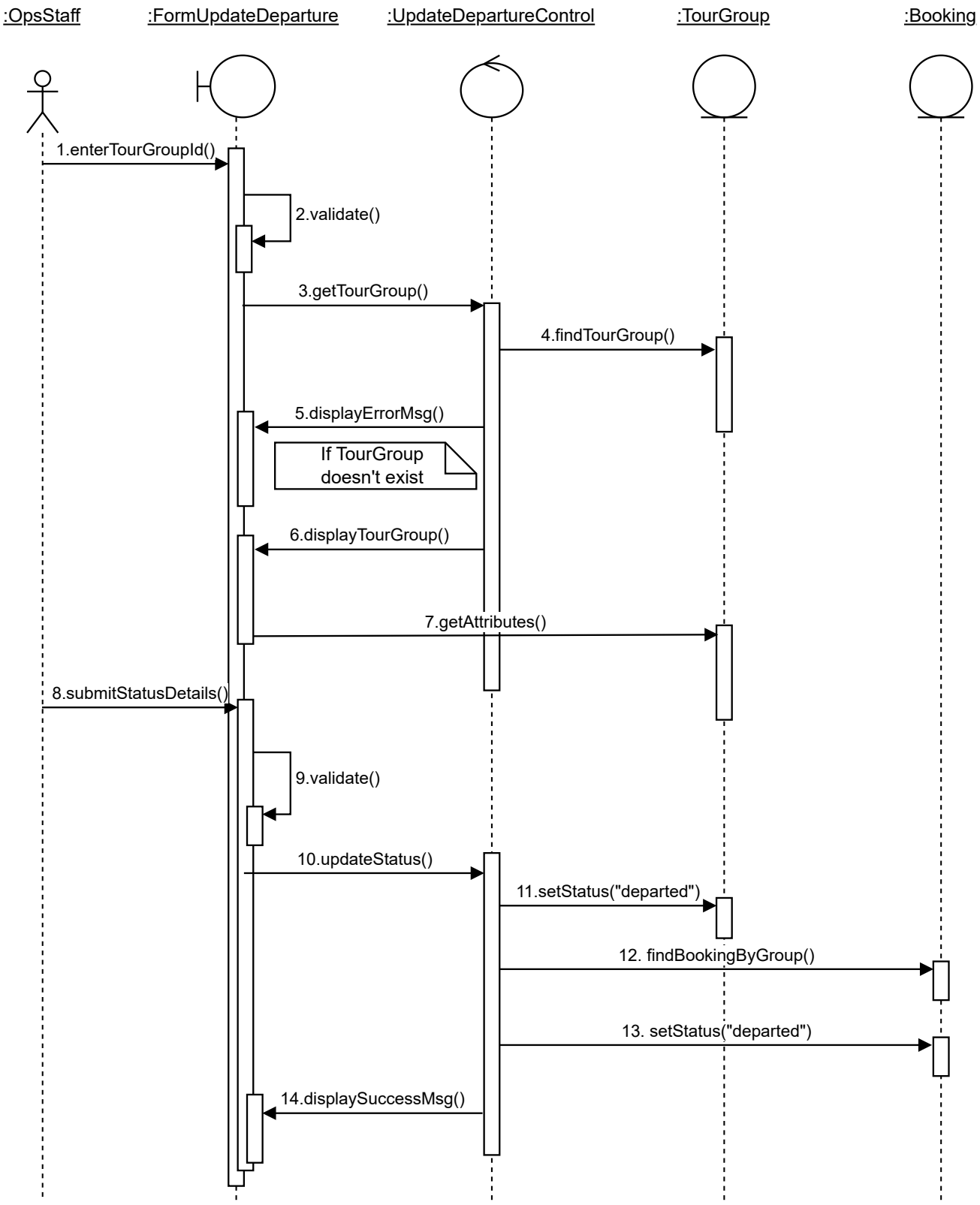
Use Case 9: Cancel Tour Group



Use Case 9: Cancel Tour Group



Use Case 10: Update Tour Group Departure



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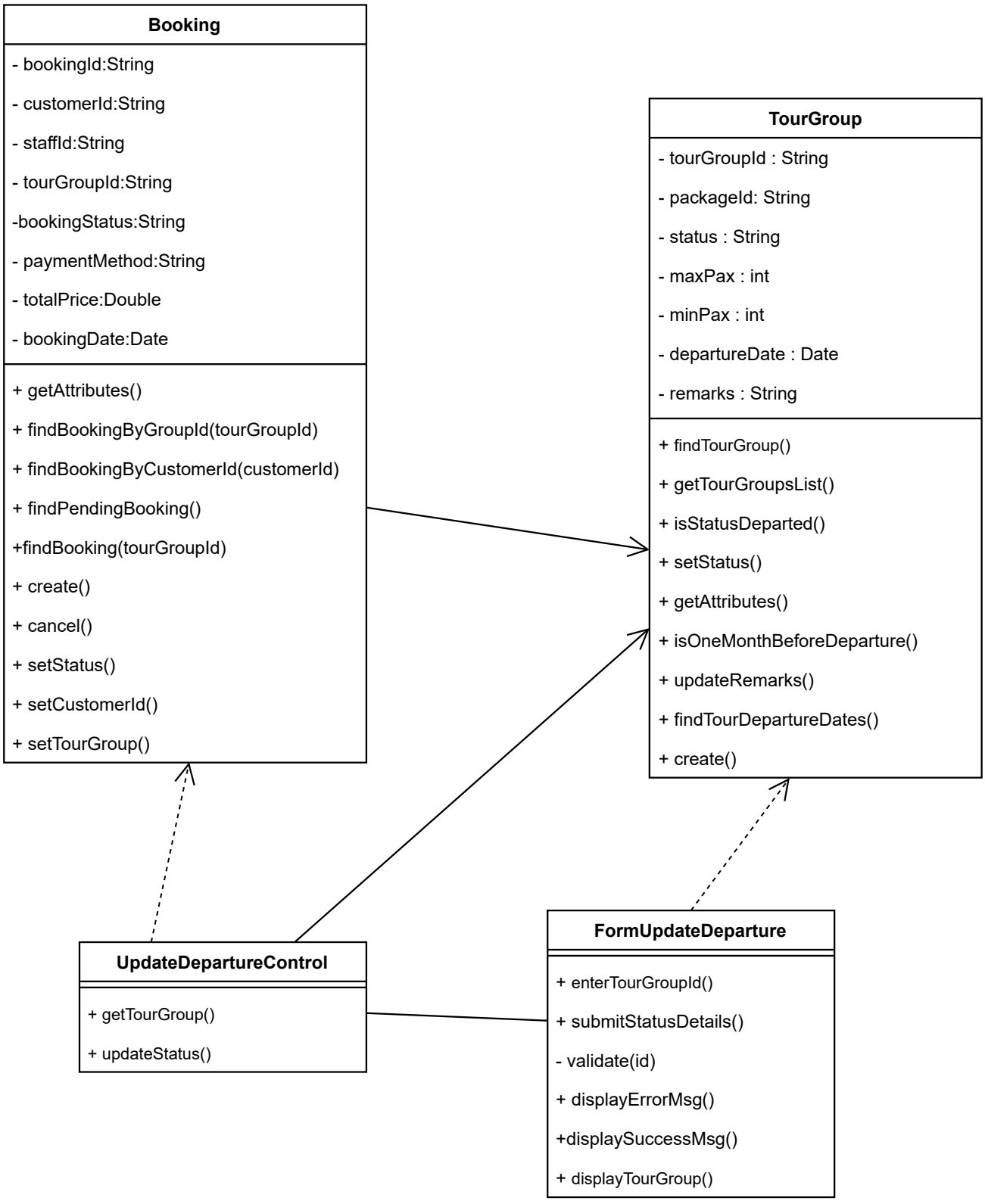
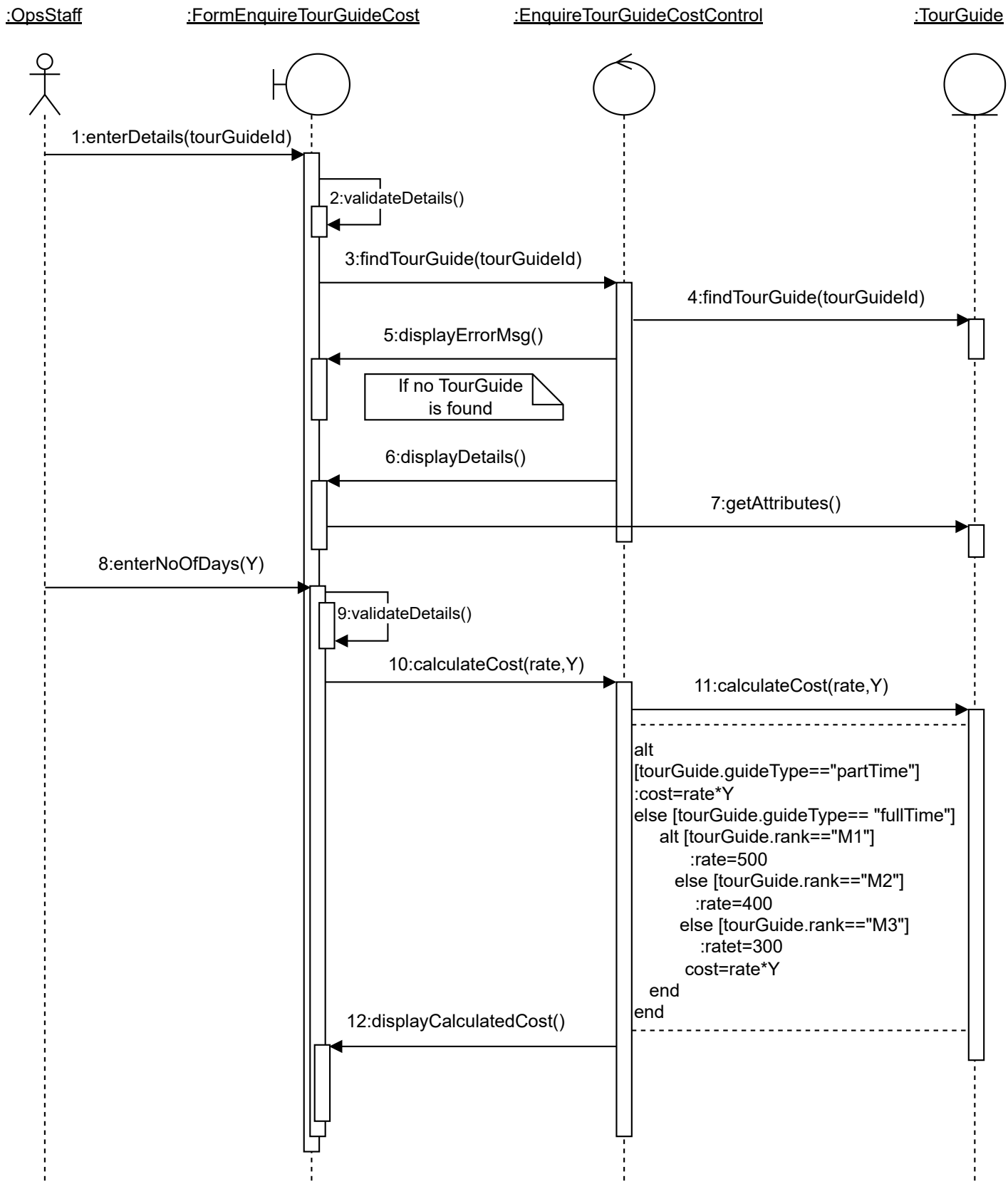
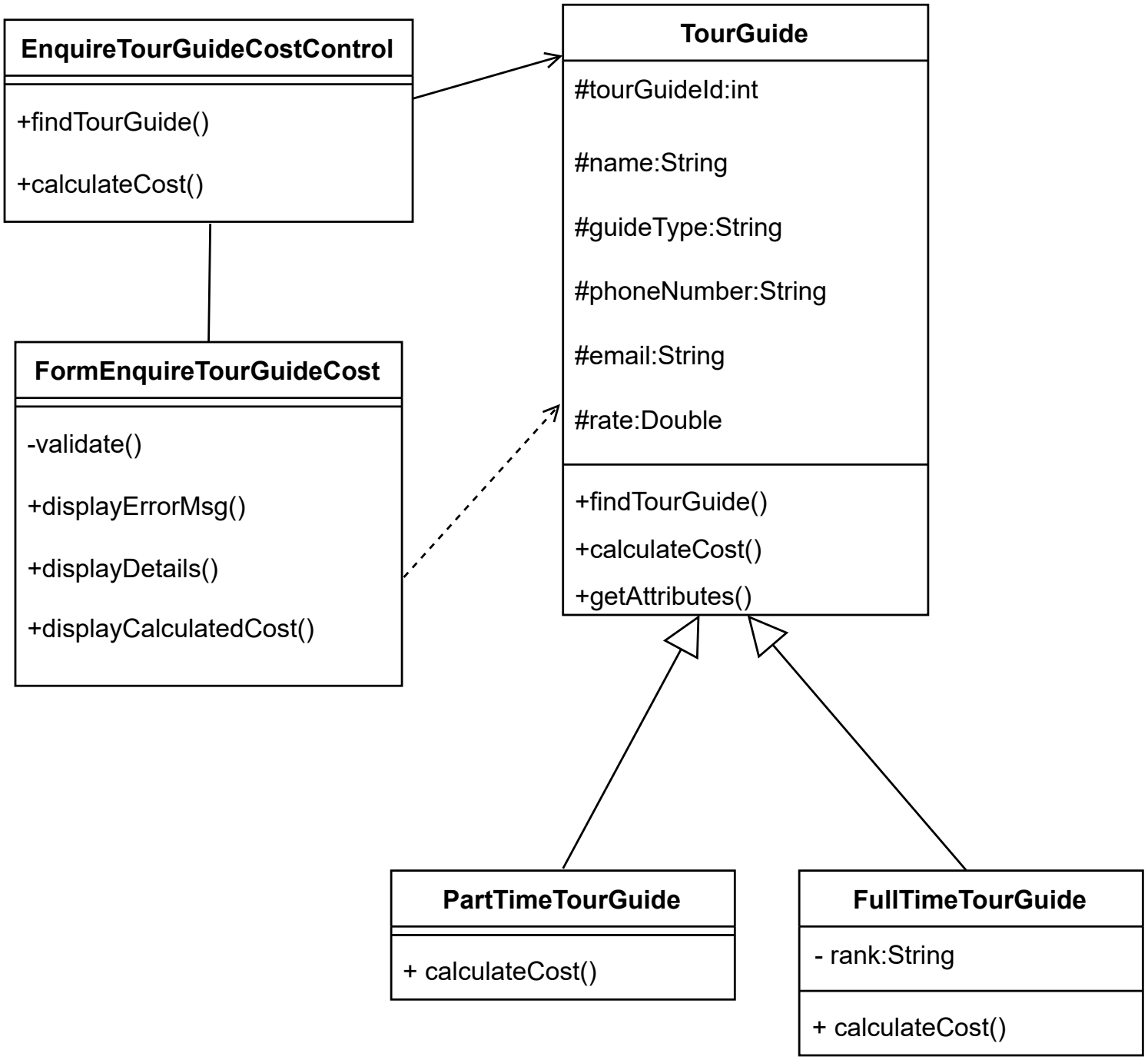


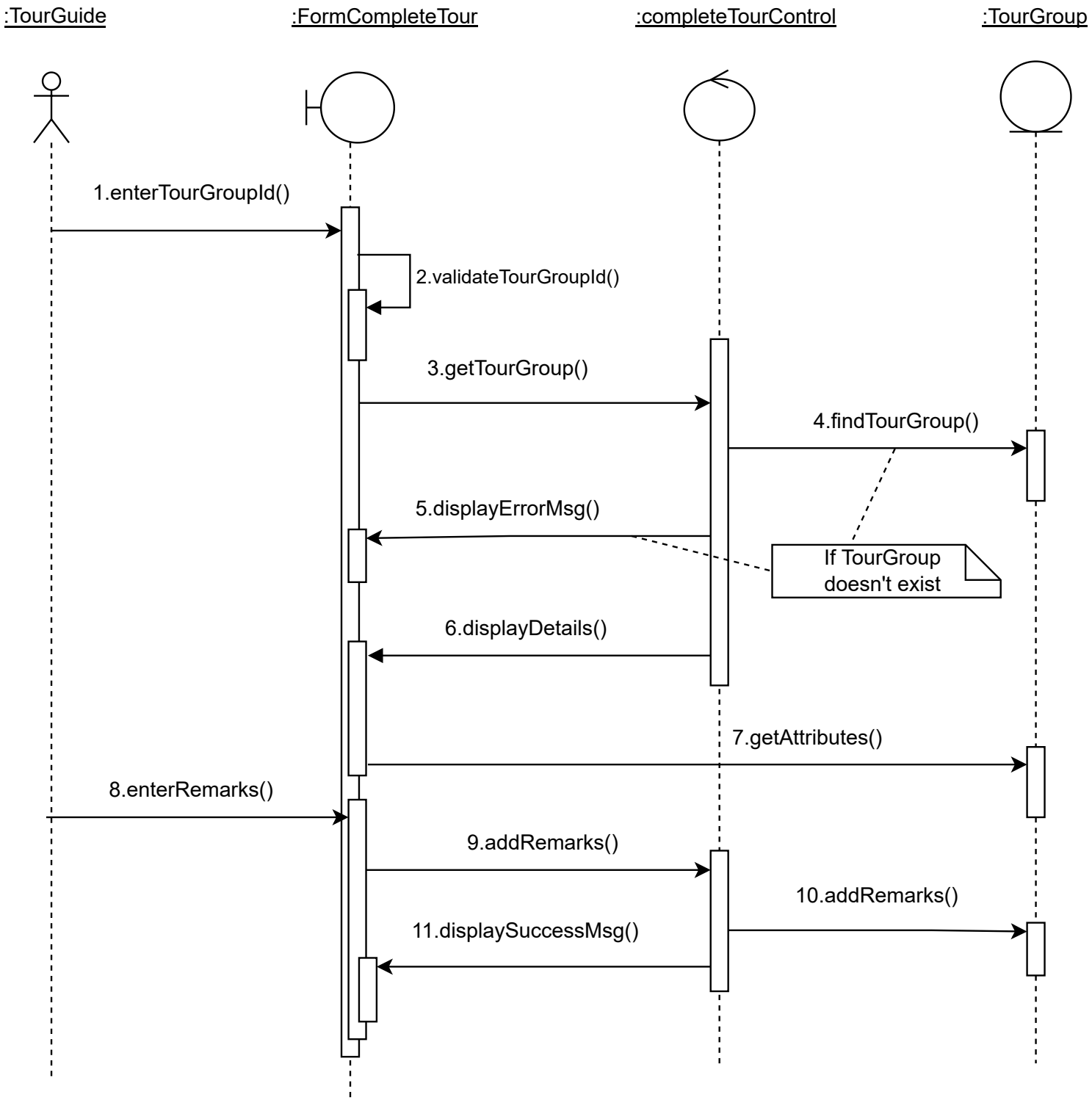
Use Case 11: Enquire Tour Guide Cost



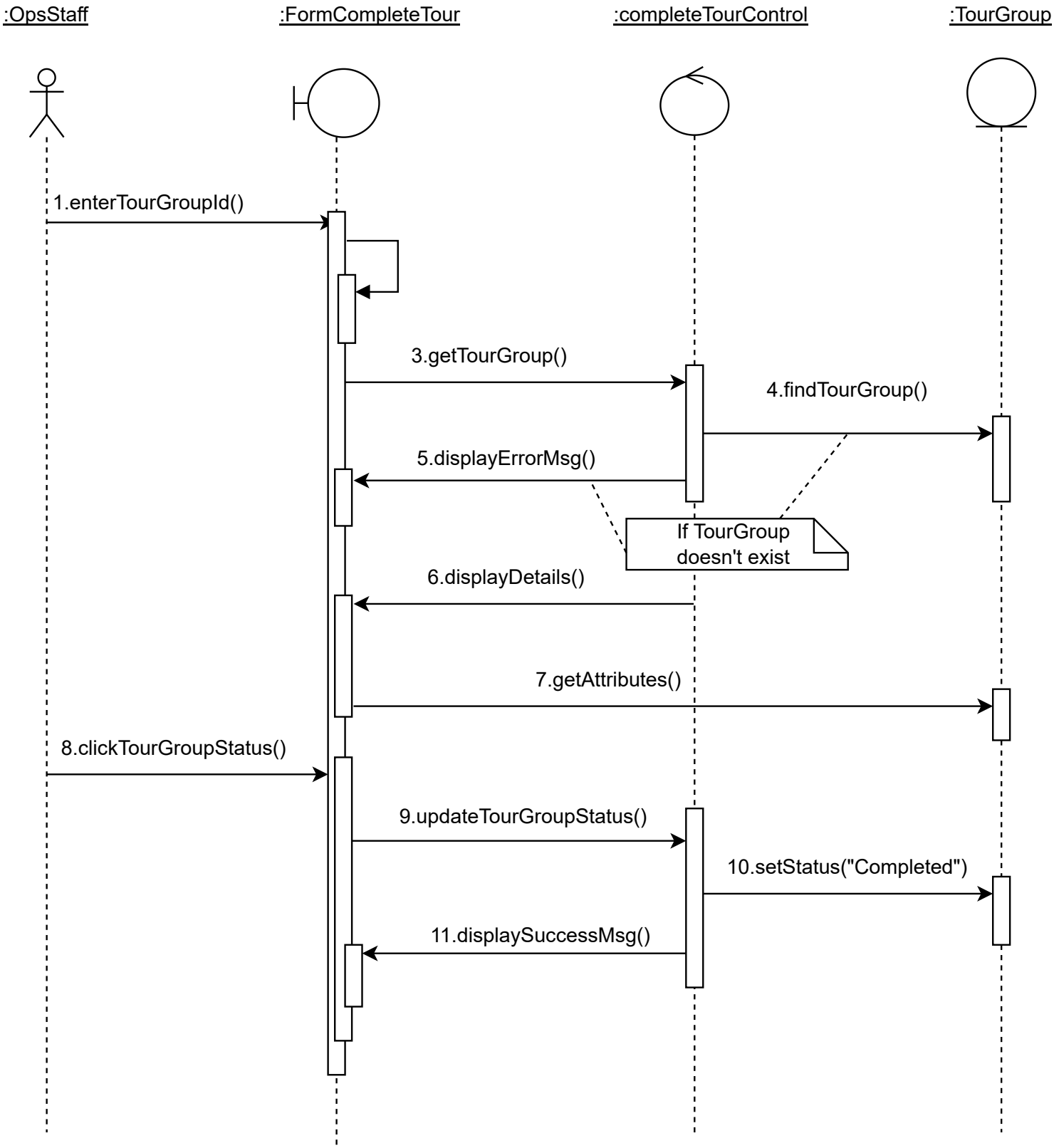
Use Case 11: Enquire Tour Guide Cost



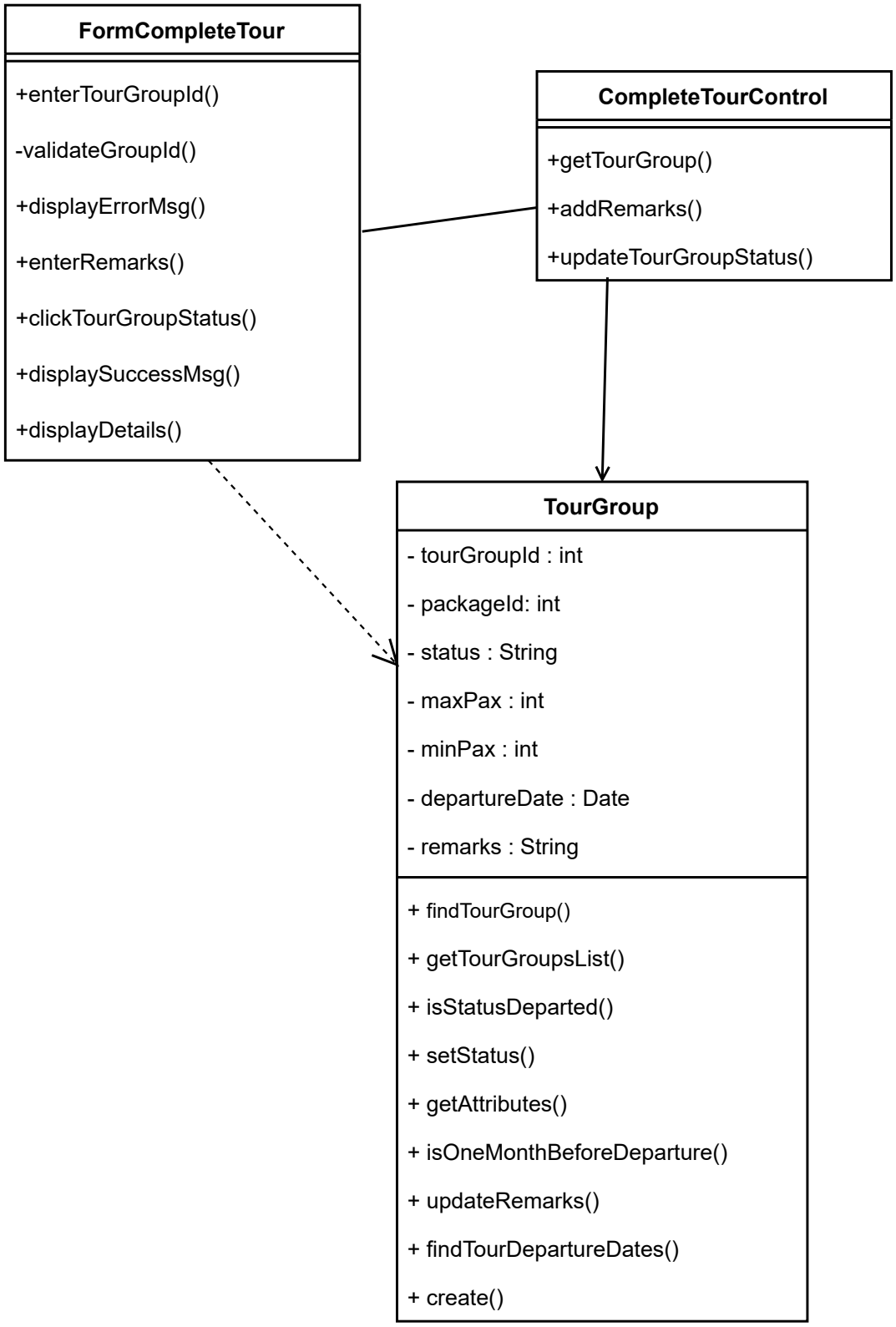
Use Case 12: Complete Tour - (Tour Guide)



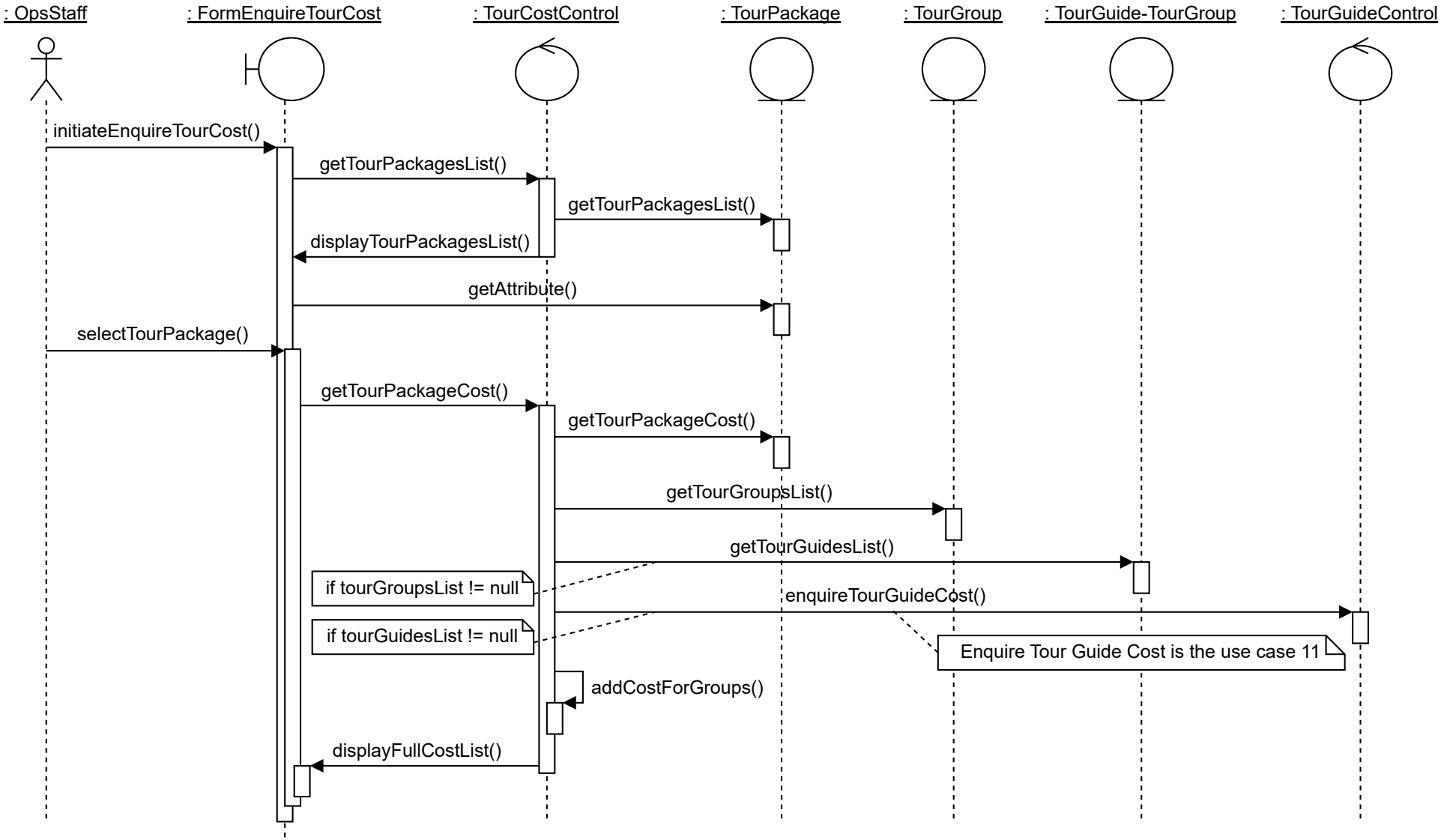
Use Case 12: Complete Tour - (Ops Staff)



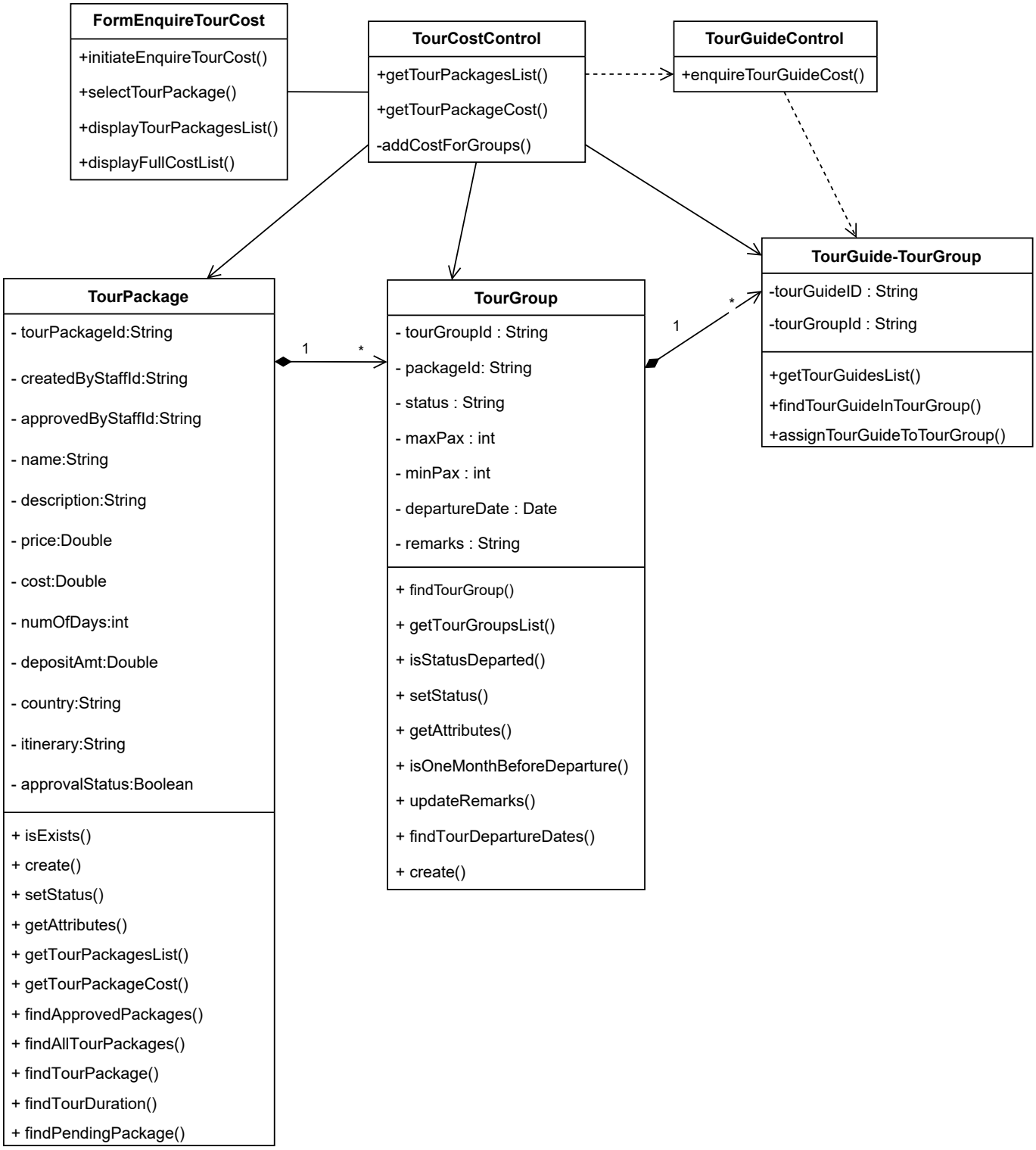
Use Case 12: Complete Tour



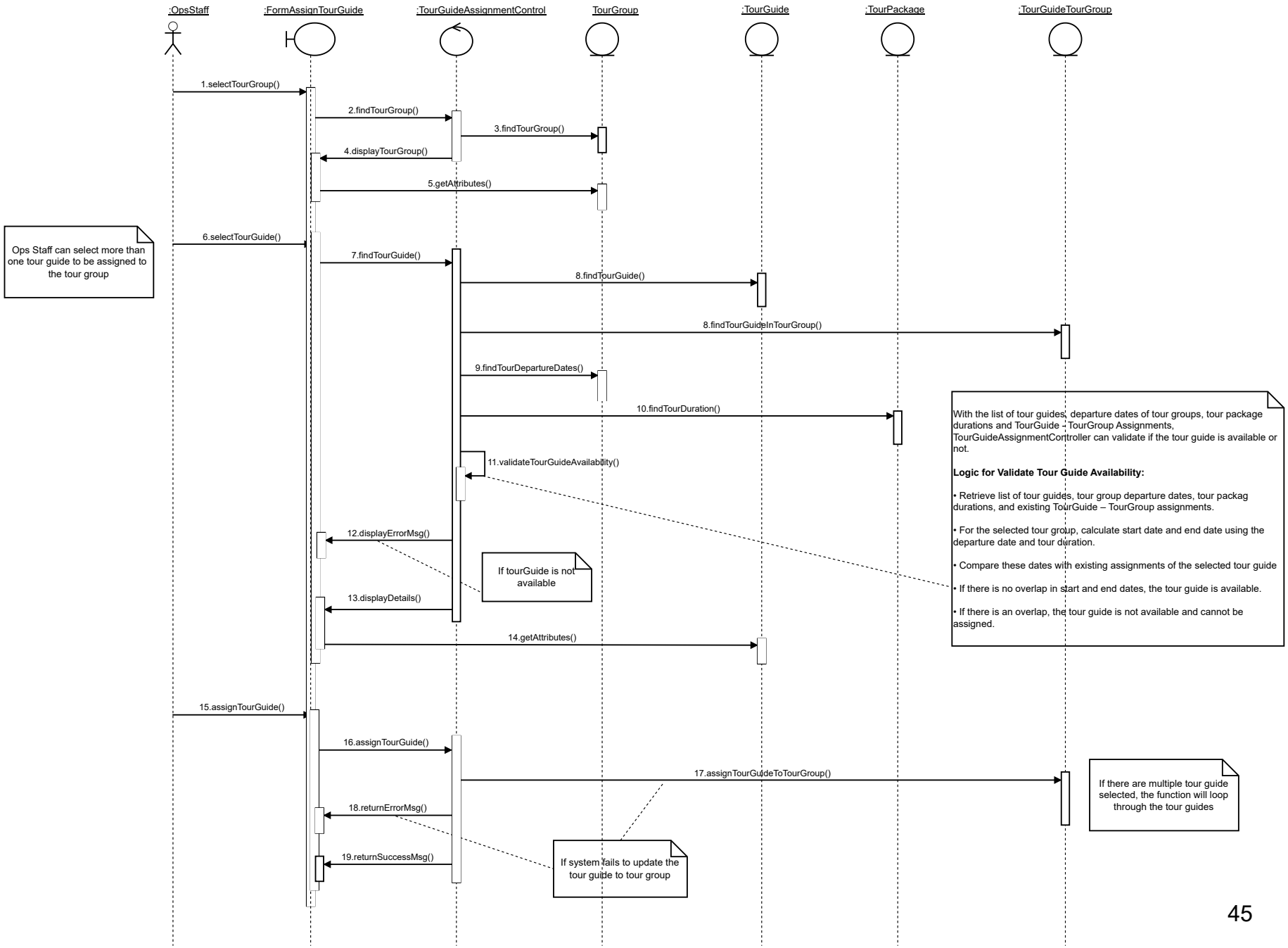
Use Case 13: Enquire Tour Cost



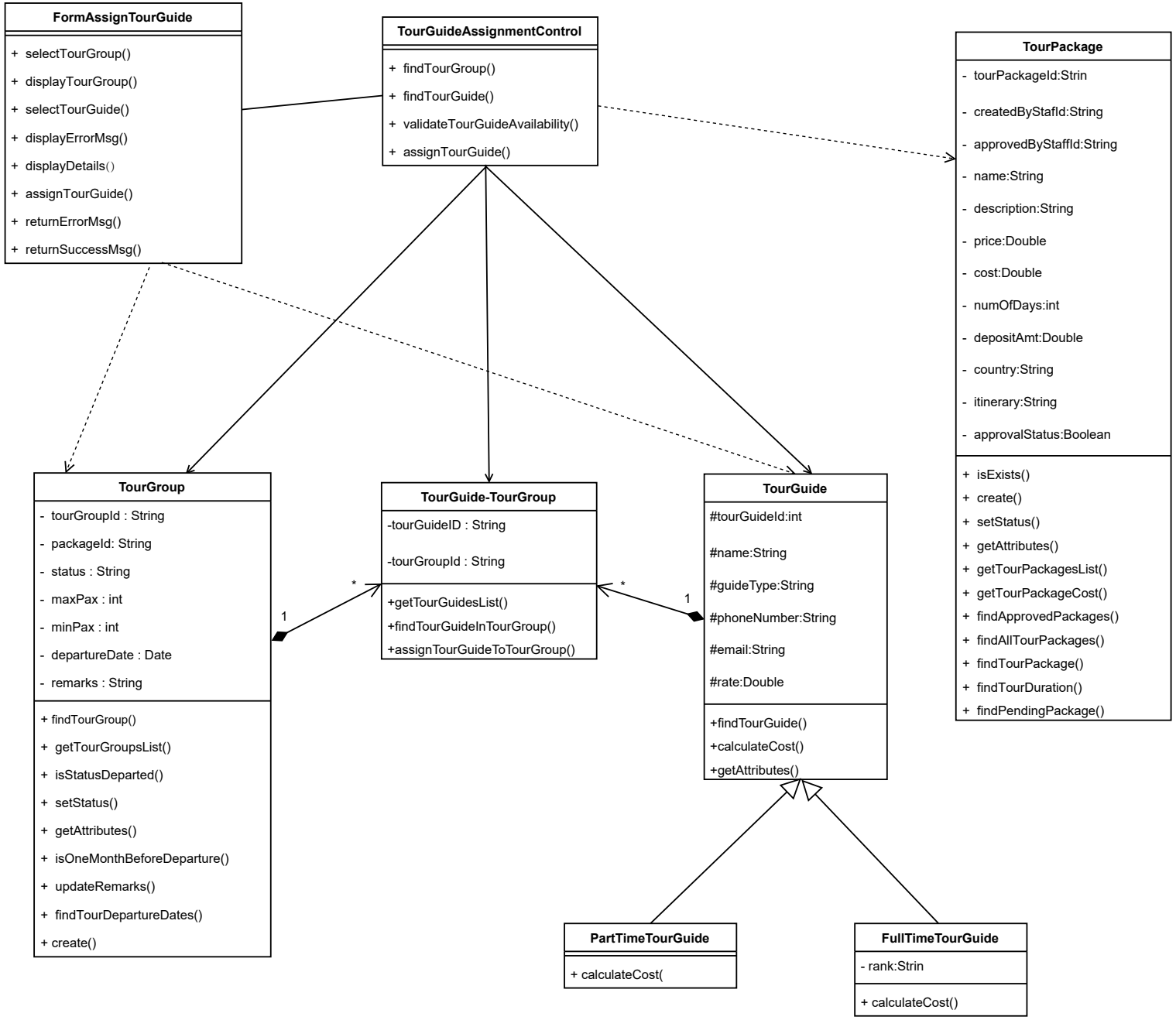
Use Case 13: Enquire Tour Cost



Use Case 14: Assign Tour Guide



Use Case 14: Assign Tour Guide



Additional Design Techniques

Polymorphism

In our system, the TourGuide class serves as an abstract superclass that defines the common attributes shared by all tour guides, such as name and phoneNumber. It also declares an abstract method calculateCost(), which specifies that every tour guide must have a cost calculation but allows each subclass to implement it differently.

Two subclasses, PartTimeTourGuide and FullTimeTourGuide, inherit from the TourGuide class. Both share the common attributes and behaviors defined in the superclass but implement their own version of calculateCost(), where the part time tour guide requires the use of rates and tour duration, while the full time tour guide requires the additional use of rank for their cost calculation.

This allows the system to define all tour guides similarly through the TourGuide class, while applying the individualized cost calculation method at runtime depending on whether the guide is part-time or full-time.