

# Simple Cruise Management System (SCMS)

CS4400: Introduction to Database Systems  
Course Project: Summer 2024 Semester

## Version History

Version	Date	Notes
0	May 27, 2024	Initial release

## Problem Description & Motivation

The following is a text description of the system you are being tasked with to develop. The system requirements – explicit and implicit – are included in this document, and they need to be identified and reflected in your system (i.e., source code), and in the associated design documents as required by the assignment instructions.

The cruise industry is booming, with millions of passengers embarking on cruise vacations each year. Efficiently managing cruise-related data is crucial for cruise lines and ports to provide exceptional customer experiences, optimize operations, and maximize revenue. A well-designed database system can streamline processes, enhance decision-making, and improve overall service quality.

As a port authority tasked with managing maritime traffic, your primary goal is to ensure the smooth and secure operation of cruise ships within your jurisdiction. The cruise industry plays a vital role in local economies, tourism, and trade, making efficient management essential.

Good luck with your assignment! 🚢🌙

- Problem Requirements: This section describes the main elements of the “cruise management” problem domain and contains the essential information that you must include in your design model.
- Sample Data Elements: This section includes some data values that you can use to help determine if your design artifacts are as correct, consistent, comprehensive, and concise as reasonably possible.

## Problem Requirements

Your system’s primary goal revolves around tracking cruise activities as a cruise line. To achieve this, your system must handle data and operations related to various entities: ships, ports, and others.

Attributes that are used to identify entities in your system will normally consist of fifty (50) or fewer alphanumeric characters in some regular pattern/format. This will be the default format for entity-identifying and "entity unique" attributes in your system unless otherwise noted. Dates will be provided in the "yyyy-mm-dd" date format by default unless otherwise noted, but you may store them internally in a different format if required. Your system must provide the dates in their default/original format as required. Some users might have relatively long first and/or last names, so your system must be able to manage first and last names that have one hundred (100) or fewer characters. Our default size for storing

"general purpose" descriptive attributes will be one hundred (100) or fewer characters unless otherwise noted. Please note that these "early" data type specifications might be superseded once we've received more sample data from the customer in later phases of the project.

Our system must track other cruise lines since we may, on rare occasions, loan ships from other cruise lines to support a cruise when we don't have any available ships. Cruise lines own one or more cruise ships, and each cruise line must have its own unique identifier.

Cruise ships are identified uniquely by the cruise line that owns them and their name. We must also track each ship's top speed and total capacity for passengers. There are several different types of ships, but for our system, we will only support river boats and ocean liners and they are mutually exclusive. Since ocean liners travel longer distances between ports, they must have additional space to store extra fuel, food, and other resources, hence the distinction between river boats and ocean liners. In terms of movement, riverboats typically use either propellers or paddles, while ocean liners usually just use propellers. Ocean liners often have several large lifeboats attached to them, and it is important to keep track of the number of lifeboats in case of an emergency. Currently we are only focused on these two types of ships, but we may add ships that aren't necessarily river boats or ocean liners.

Cruises can stop at several ports along their journey, and ports should have a unique identifier, a name, and an address which will consist of a city, state, and country. Each cruise must follow a single predetermined route which will have a unique identifier and consist of one or more legs. Other cruises may also share this route. A cruise may stop at several ports before returning, and the travel between two ports is referred to as a leg of the route. It is important that these legs must follow a specific sequence, and each leg has a unique identifier, distance travelled, and the source and destination ports. Your system must also track the total distance of a route. Multiple routes can traverse the same leg, but it is important to note the order in which we traverse a leg.

When a ship is assigned to a cruise, your system must track the status of the ship's progress along the cruise's route. You must track which leg of the route is currently being traversed and whether the ship is docked or on open water. You must also track when the next departure or arrival time will occur. Note that if a ship is docked, this would be a departure time and if it is on open water, it would be an arrival time.

*The following is an example of a route for a 3-Night Italy & Spain cruise supported by Royal Caribbean IMO 9383936 (Oasis of the Seas).* This route has two legs and originates in Rome, Italy. The first leg takes passengers to Naples, Italy. The second leg takes passengers to Barcelona, Spain. The distances of the legs are 121 nautical miles and 608 nautical miles, respectively. The legs are also labeled as follows – legs #50 and #34, respectively. When keeping track of the ship's status, the ship always starts in state of "docked" at the departure seaport of the first leg, and the progress of the cruise is marked as 0. Once the ship sets sail, it is now in the state "sailing" and the progress of the cruise is marked as 1. When the ship arrives at the destination port, the state returns to a "docked" status, but the progress of the ship remains 1. The progress of the cruise is only incremented when we depart for the next leg of the journey.

Each person in your system must have a unique identifier. People will also have first and last names. Your system should track individuals who serve in distinct capacities—either as crew or passengers (but not both). Crew must be assigned to a cruise, and our system must store information like their job which will be a string which is at most 30 characters long, their experience which is the number of legs they have

completed, their tax-identifier stored using a “xxx-xx-xxxx” format, and one or more of their licenses and certifications stored as strings of at most 100 characters. Whether a person is waiting at a port for their ship, or on a ship at sea or in port, that person must always be associated with one or more of those valid types of locations. For example, a person can be on a ship docked at port in which case they are in both a ship and port location at the same time. Your system must keep track of where all people – passengers and crew – are always located. Your system is not required to track people at other locations, such as when they are out on excursions in the port city, for example.

For passengers, we need to track how much remaining credit they have in their account so we can ensure that they don’t overspend their available credit when purchasing a cruise package. If the passenger has the funds to cover the cruise cost, and the ship supporting that cruise has the capacity, then a passenger can book that cruise. Your system must also track the number of miles earned by each passenger during their cruise so that they can be given rewards for their loyalty to the cruise line.

Your system must also be able to display information that will help us keep track of the flow of ships and passengers throughout the system. Each ship has a maximum capacity of the number of people that be carried at any one time, and each cruise should be able to calculate the number of expected passengers using bookings. Similarly, your system must be able to determine how many people are on the ship at any given time and determine if the ship is filled. Before a ship departs for the next port along its route, we must check how many passengers are currently on the ship and make sure that the ship is filled, and it is safe to leave the port. Your system must also be able to determine the number of passengers at a port, so we can monitor how busy a port is at any given time and change itineraries accordingly to avoid overloading the port.

As an example, consider the normal progression of cruises as discussed above. ***For each cruise, there is a next\_time value that indicates when that cruise will "logically change state".*** If a cruise is out at sea, then the next\_time value indicates when the cruise will arrive at the destination port of the current leg. If a ship is docked, then the next\_time value indicates when the ship will depart for the following leg. ***If the ship is arriving at a port,*** then we must allow the ship to dock, and allow passengers to disembark. ***At the time the ship is departing from a port,*** then we must allow passengers to board the ship, and then allow for the ship to depart only when the total number of passengers on the ship is equal to the number of people who booked. And, for the case where ***the ship is at the final port in the route,*** we must ensure all the crew and passengers leave the ship, so that the ship and the next set of crew can prepare for their next cruise. We must also remove the cruise from our system once it has reached the end of its route.

## Sample Data Elements

The following data is provided to assist you in visualizing and/or validating the system design you are being tasked to develop. You are not required to submit this data. The intent is that you can use the data to check if your EERD can store the data values, relationships, etc. that we've provided in a reasonable manner. If there are elements of the data that can't be represented in an appropriate attribute, entity, or relationship, then perhaps you need to revise your design. Similarly, if there are attributes, entities, relationships, etc. that haven't been used after you've stored all the data, then perhaps your design has unnecessary elements. This exercise doesn't guarantee that your EERD is fully correct, but it does offer some validation that you are on the correct track.

Claire Brown and Bryce Dunphy are passengers currently located at Port Canaveral (port ID: USPCV) in Brevard County, Florida, United States. Claire and Bryce have 300 miles and 600 miles in sailed miles with your cruise line, Majestic Seas (cruise line ID: MS), respectively. They will be riding on a Majestic Seas cruise across the Caribbean (cruise ID: MS-CBN-125), which is supported by the Majestic Seas Ocean liner with the name Jewel of the Seas. That cruise is commanded by captains Arthur Okonkwo and Karl Hein. Arthur and Karl are also located at the USPCV port. Arthur's tax ID is 235-71-1131 and he has 10 legs of experience. Karl's tax ID is 357-11-1317 and he has 37 legs of experience. They both have the following licenses and certifications: Transportation Work Identification Credential, Merchant Mariner Credential, and an OUPV/Six-Pack Captain's License. Cruise MS-CBN-125 is scheduled to depart at 9:30am.

Claire and Bryce have \$3000 and \$5670 in credit, and the cruise MS-CBN-125 cost is \$2700, so they can both purchase this cruise package. Cruise MS-CBN-125 is supported by the Jewel of the Seas which has 30 lifeboats in case of an emergency. It has a capacity of 5,606 people and a top speed of 28.2 mph. The cruise will depart at 3:00PM on May 31<sup>st</sup>, 2024. Its route will have 3 legs: the first leg is between Port Canaveral (USPCV) and Port San Juan (USPSJ) which has a distance of 1001 nautical miles, the second leg is between Port San Juan (USPSJ) and Port of Kingston (JMKIN) which has a distance of 635 nautical miles, and finally the third leg is from Port of Kingston (JMKIN) back to Port Canaveral (USPCV) which has a distance of 892 nautical miles. Let's now process each leg of the cruise to see how our system should work. Initially, all our crew and passengers will have their location set at Port Canaveral. First, we must ensure that Arthur Okonkwo and Karl Hein are assigned to the cruise. Then, we must ensure that Claire Brown and Bryce Dunphy also board the cruise before we depart, and we update their locations since they are at the port and on the ship.

Then, we must prepare for the first leg of the cruise by setting our progress to 1 from its initial value of 0 when we depart. Once we depart, we must also update our next\_time to be 5:00AM on June 2<sup>nd</sup>, 2024, when we dock at Port San Juan. Our status must also be set to "Sailing" from "Docked" when we depart Port Canaveral. We must also update each of our crew and passengers' locations to just be on the ship since they are no longer at the port.

Once we arrive at Port San Juan, we must update our status to "Docked". We must also set our next\_time to be 7:00PM on June 2<sup>nd</sup>, 2024, for when we depart from Port San Juan for Port of Kingston. We also must update all the crew and passengers' locations to be on the ship and at the port. Then, we track which crew members and passengers leave the ship and update their locations to just be at the port. At this port, Claire decides to leave the ship and explore the city, but Bryce decides to stay on the ship and enjoy its amenities.

Before we depart, we must ensure that all the crew and passengers are back on the ship by checking the locations of crew and passengers assigned/on the cruise. When we depart from Port San Juan, we must update our status to be "Sailing". We must also set our next\_time to be 3:00AM on June 4<sup>th</sup>, 2024. Finally, we also increment our progress to 2, since we are on the second leg of the journey.

When we arrive at Port of Kingston, we must update our status to "Docked". We must also set our next\_time to be 5:00PM on June 4<sup>th</sup>, 2024, for when we depart from Port of Kingston for Port Canaveral. We also must update all the crew and passengers' locations to be on the ship and at the port. Then, we track which crew members and passengers leave the ship and update their locations to just be at the port. At this port, both Bryce and Claire decide to leave the ship to explore the city.

Before we depart, we must once again ensure that all the crew and passengers are back on the ship by checking the locations of crew and passengers assigned/on the cruise. When we depart from Port of Kingston, we must update our status to be “Sailing”. We must also set our next\_time to be 10:00AM on June 6<sup>th</sup>, 2024. Finally, we also increment our progress to 3, since we are on the third and final leg of the journey.

When we arrive at Port Canaveral, we must update our status to “Docked”. We must also set our next\_time to be null since there is no new departure time. Then, we must first allow all passengers and crew to disembark the ship and update their locations accordingly, and then we can delete the cruise and all status/progress data.