

AP



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# *Architecture: The Hard Parts*

## Scenarios



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# The Sysops Squad

*Best Electronics* is a large electronics giant that has numerous retail stores throughout the country. When customers buy computers, TV's, stereos, and other electronic equipment, they can choose to purchase a support plan. Customer-facing technology experts (the “Sysops Squad”) will then come to the customers residence (or work office) to fix problems with the electronic device.



# Sysops Squad - A Bad Situation...

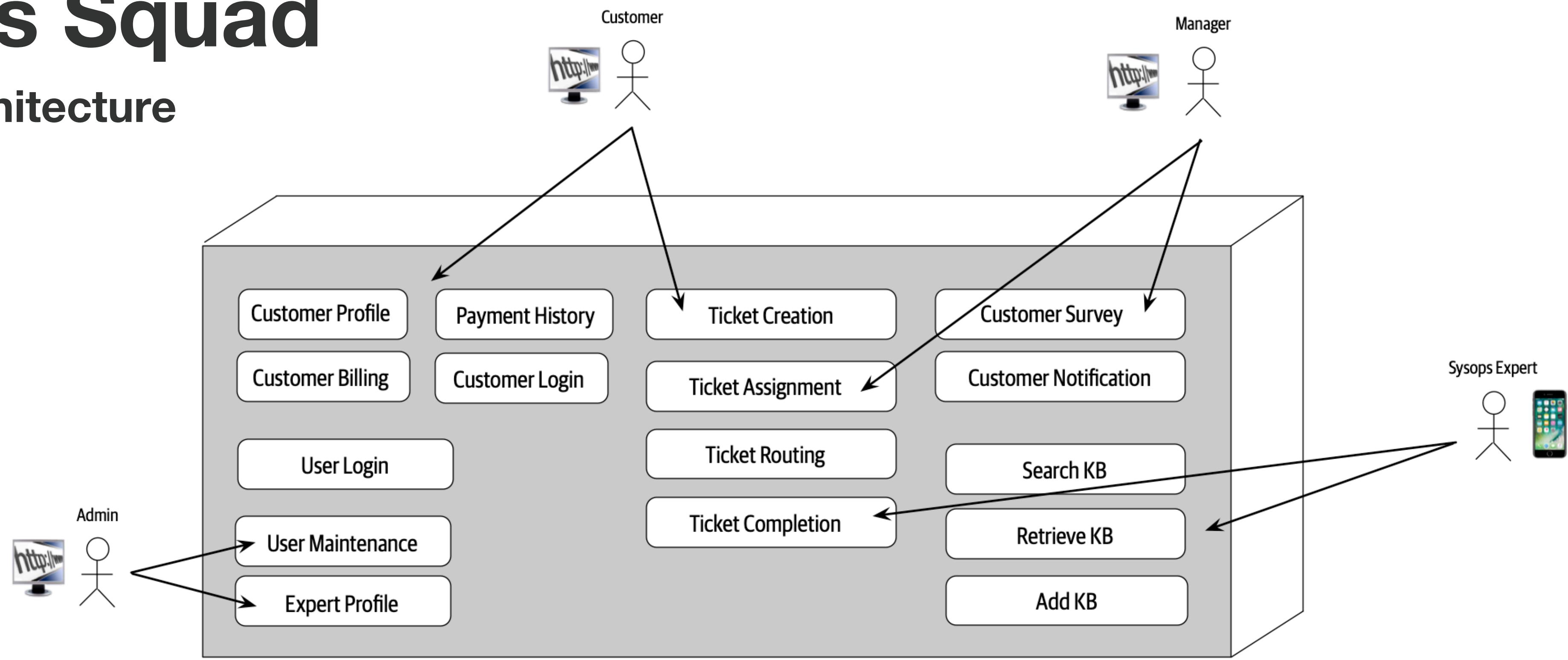
Things have not been good with the Sysops Squad lately. The current trouble ticket system is a large monolithic application that was developed many years ago. Customers are complaining that consultants are never showing up due to lost tickets, and often times the wrong consultant shows up to fix something they know nothing about. Customers and call-center staff have been complaining that the system is not always available for web-based or call-based problem ticket entry. Change is difficult and risky in this large monolith - whenever a change is made, it takes too long and something else usually breaks. Due to reliability issues, the monolithic system frequently “freezes up” or crashes - they think it’s mostly due a spike in usage and the number of customers using the system. If something isn’t done soon, Best Electronics will be forced to abandon this very lucrative business line and fire all of the experts (including you, the architect).

## **Current process in the monolithic system:**

1. Sysops squad experts are added and maintained in the system through an administrator, who enters in their locale, availability, and skills.
2. Customers who have purchased the support plan can enter a problem ticket using the sysops squad website. Customer registration for the support service is part of the system. The system bills the customer on an annual basis when their support period ends by charging their registered credit card.
3. Once a trouble ticket is entered in the system, the system then determines which sysops squad expert would be the best fit for the job based on skills, current location, service area, and availability (free or currently on a job).
4. The sysops squad expert is then notified via a text message that they have a new ticket. Once this happens an email or SMS text message is sent to the customer (based on their profile preference) that the expert is on their way.
5. The sysops squad expert then uses a custom mobile application on their phone to access the ticketing system to retrieve the ticket information and location. The sysops squad expert can also access a knowledge base through the mobile app to find out what things have been done in the past to fix the problem.
6. Once the sysops squad expert fixes the problem, they mark the ticket as “complete”. The sysops squad expert can then add information about the problem and fix to the knowledge base.
7. After the system receives notification that the ticket is complete, the system send an email to the customer with a link to a survey which the customer then fills out.

# Sysops Squad

## Current Architecture



contains sysops squad profiles (skill, location, etc.)

contains registered customer profile information  
(user id, password, address, email, text, preferences, credit card info, payment info, etc.)

contains all ticket information and the current status of each:  
[entered | assigned | in progress | completed]

contains survey results from customers

contains the knowledge base entered by experts after a job describing fixes to various problems

contains user id and password information for managers, admin staff, and sysops squad experts

contains customer billing history and statements

# Scenario Exercise - Architecture Characteristics

Identify which of the following architecture characteristics are critical for the success of the sysops squad system (select no more than 7)

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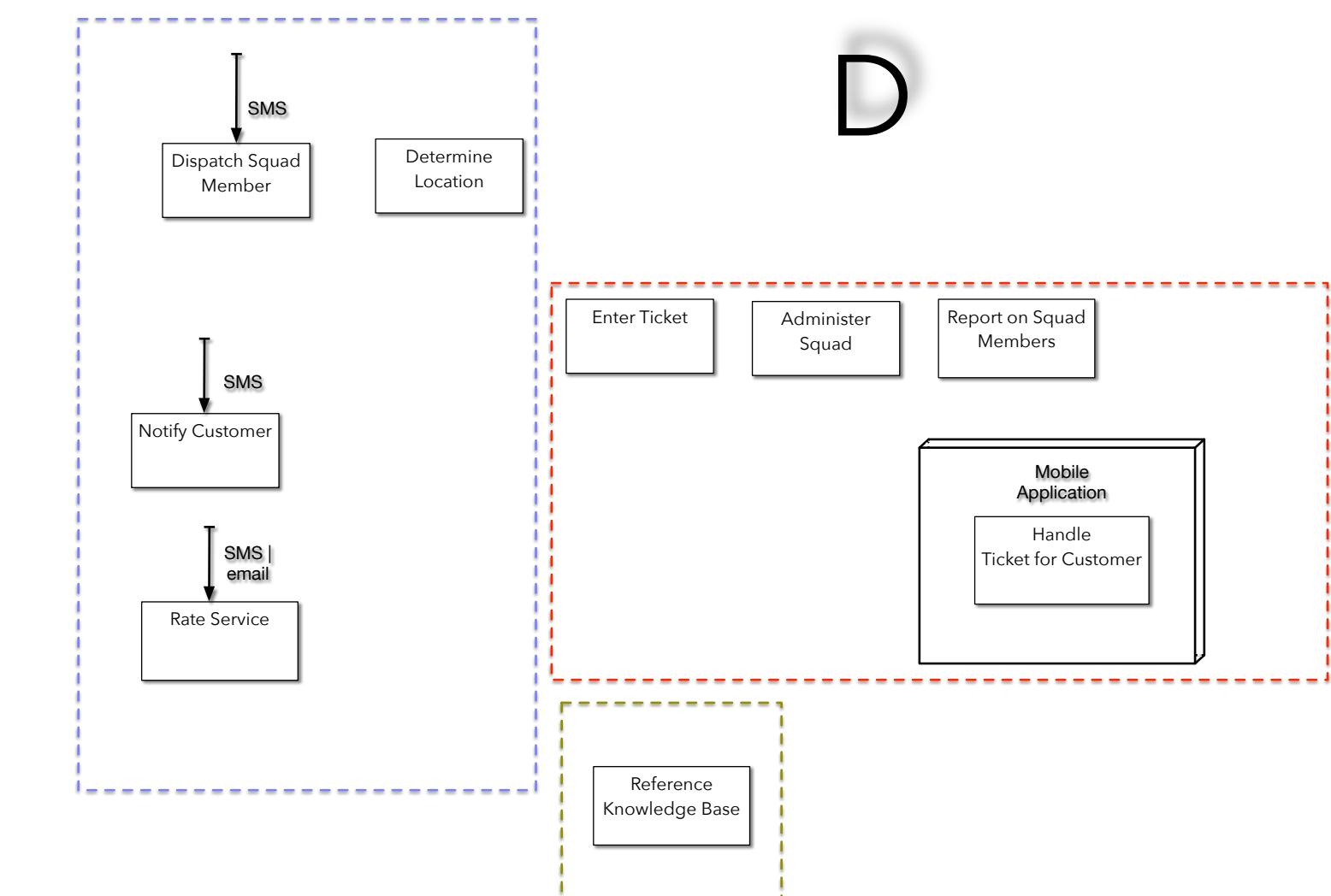
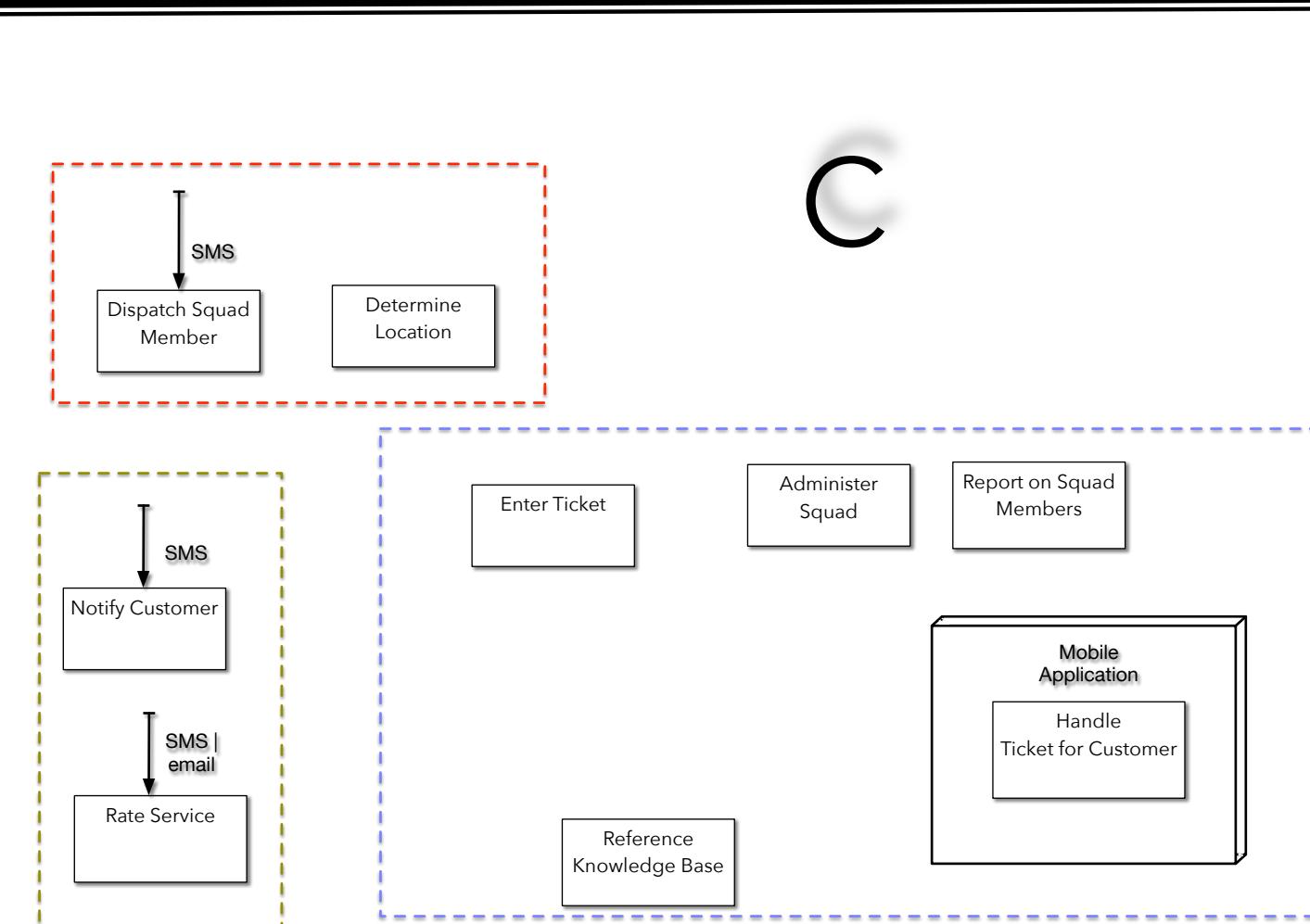
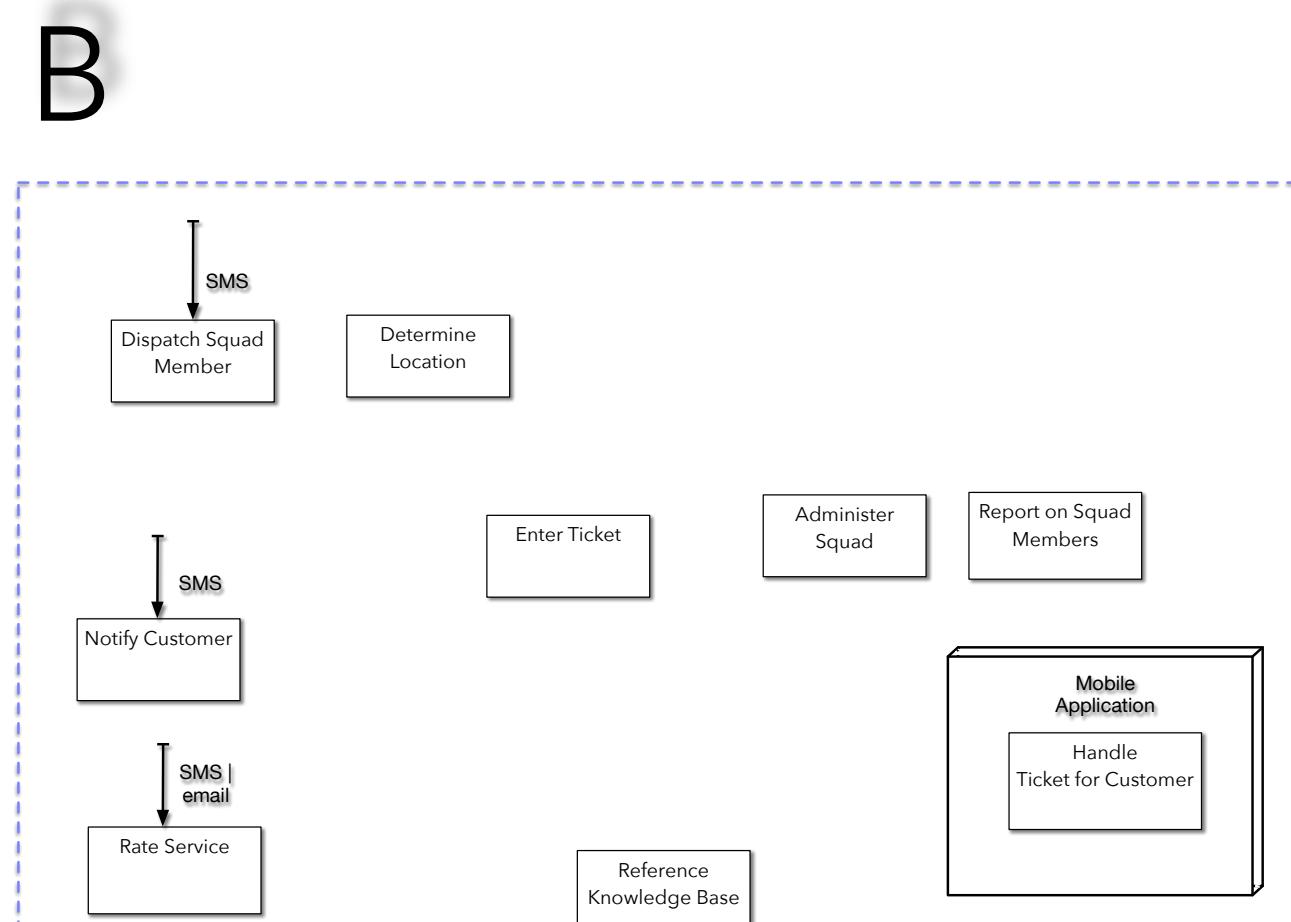
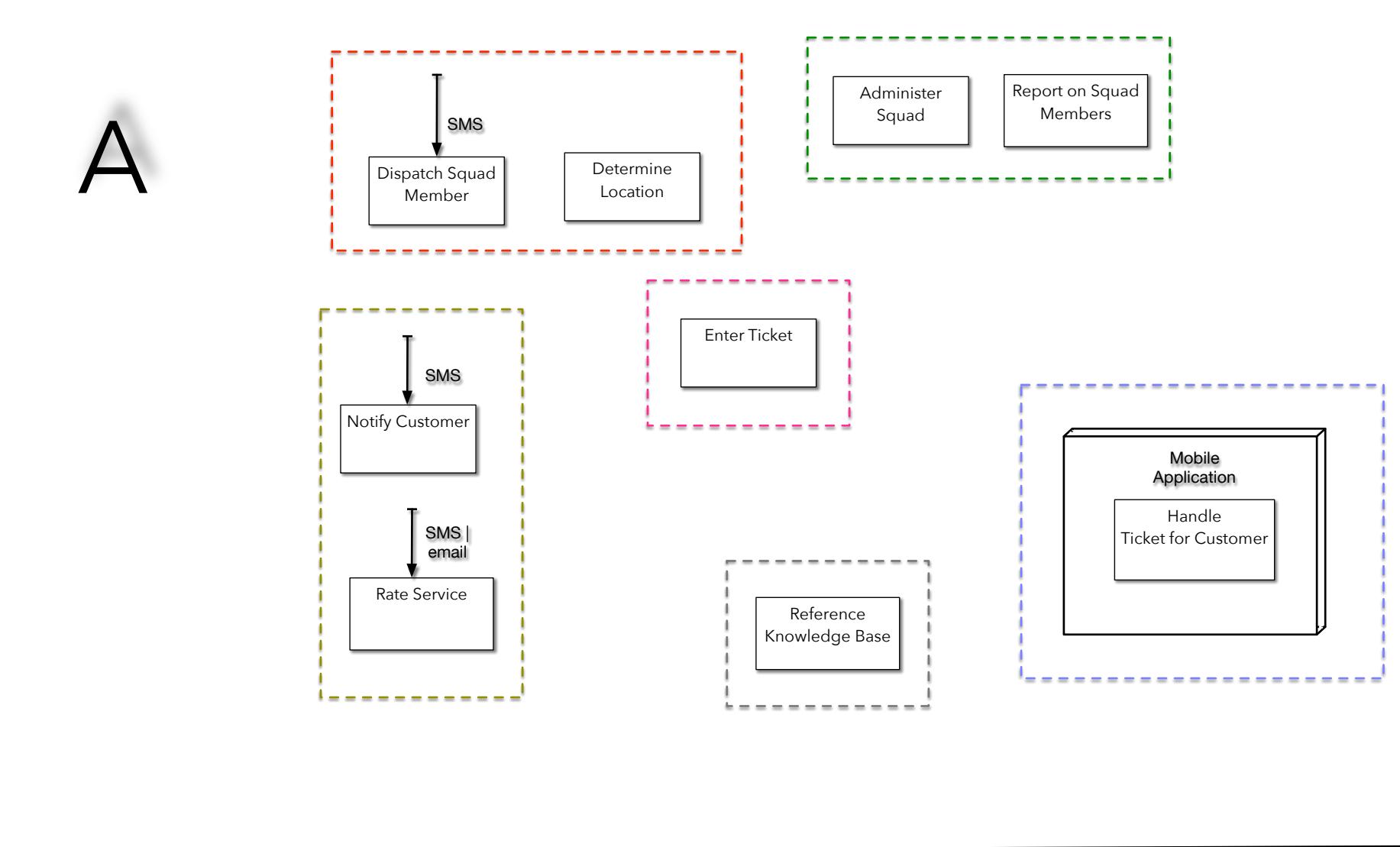
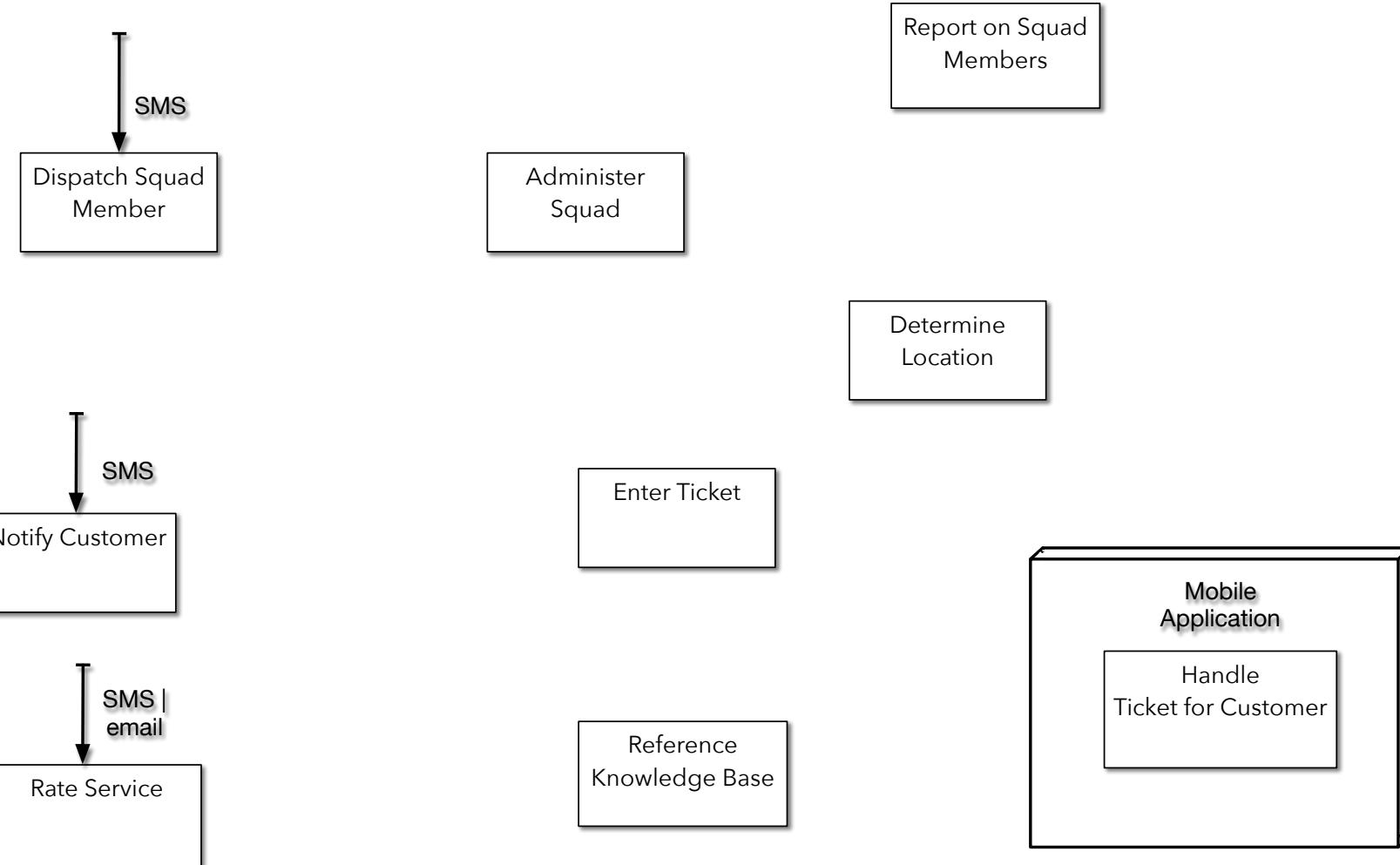
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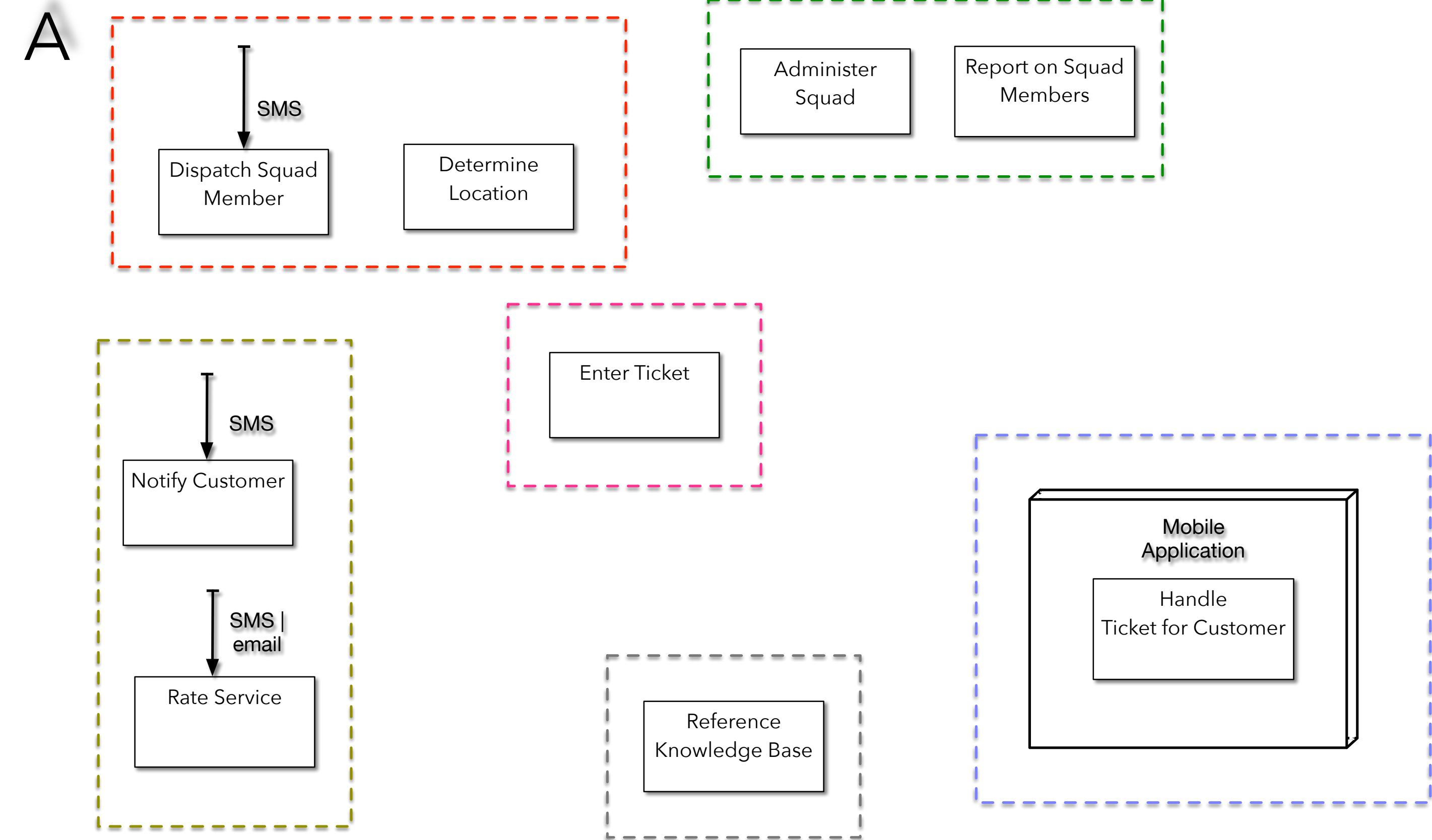
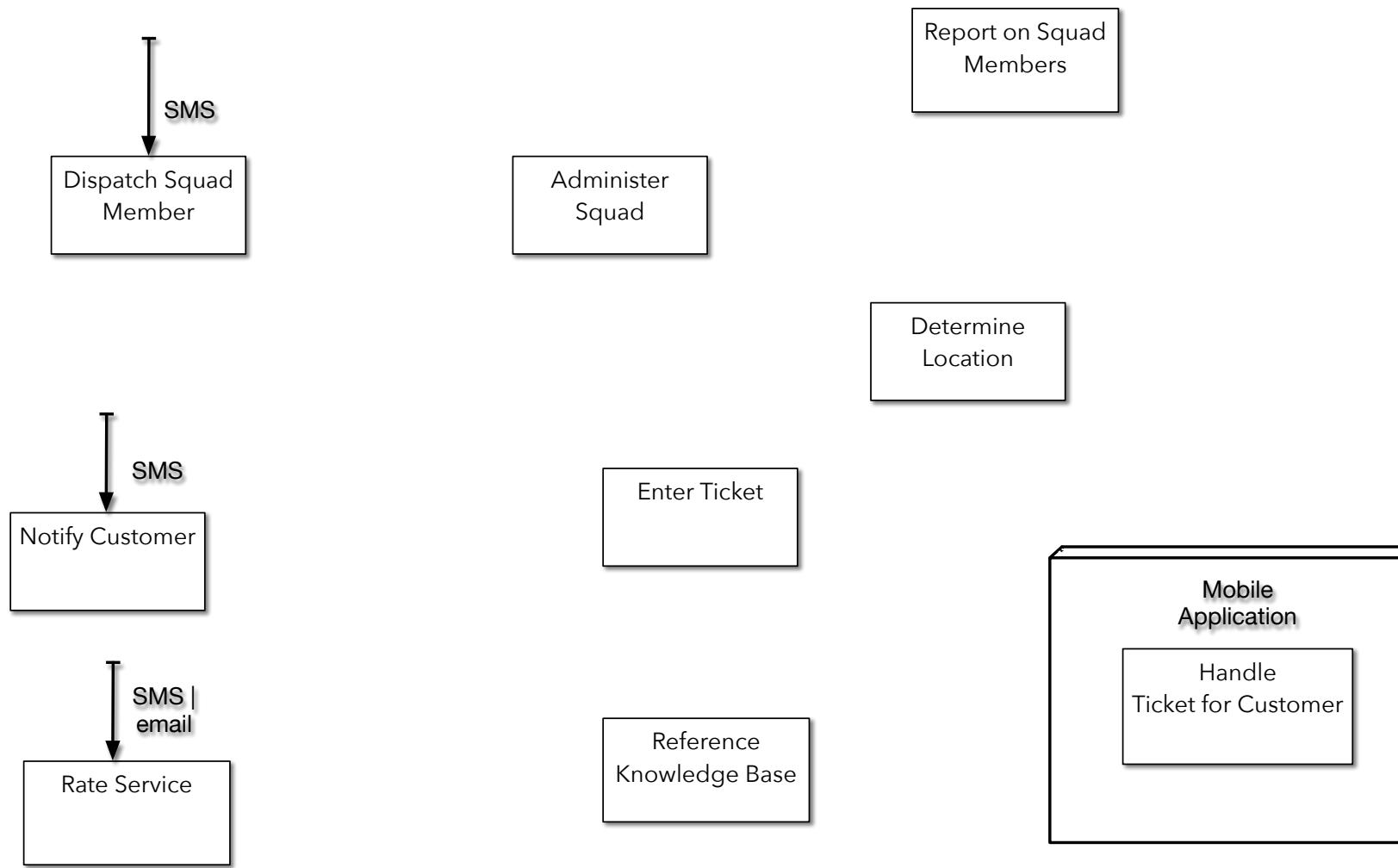
# Scenario Exercise - Architecture Quanta

Given the set of components identified below, where should the quantum boundaries lie?



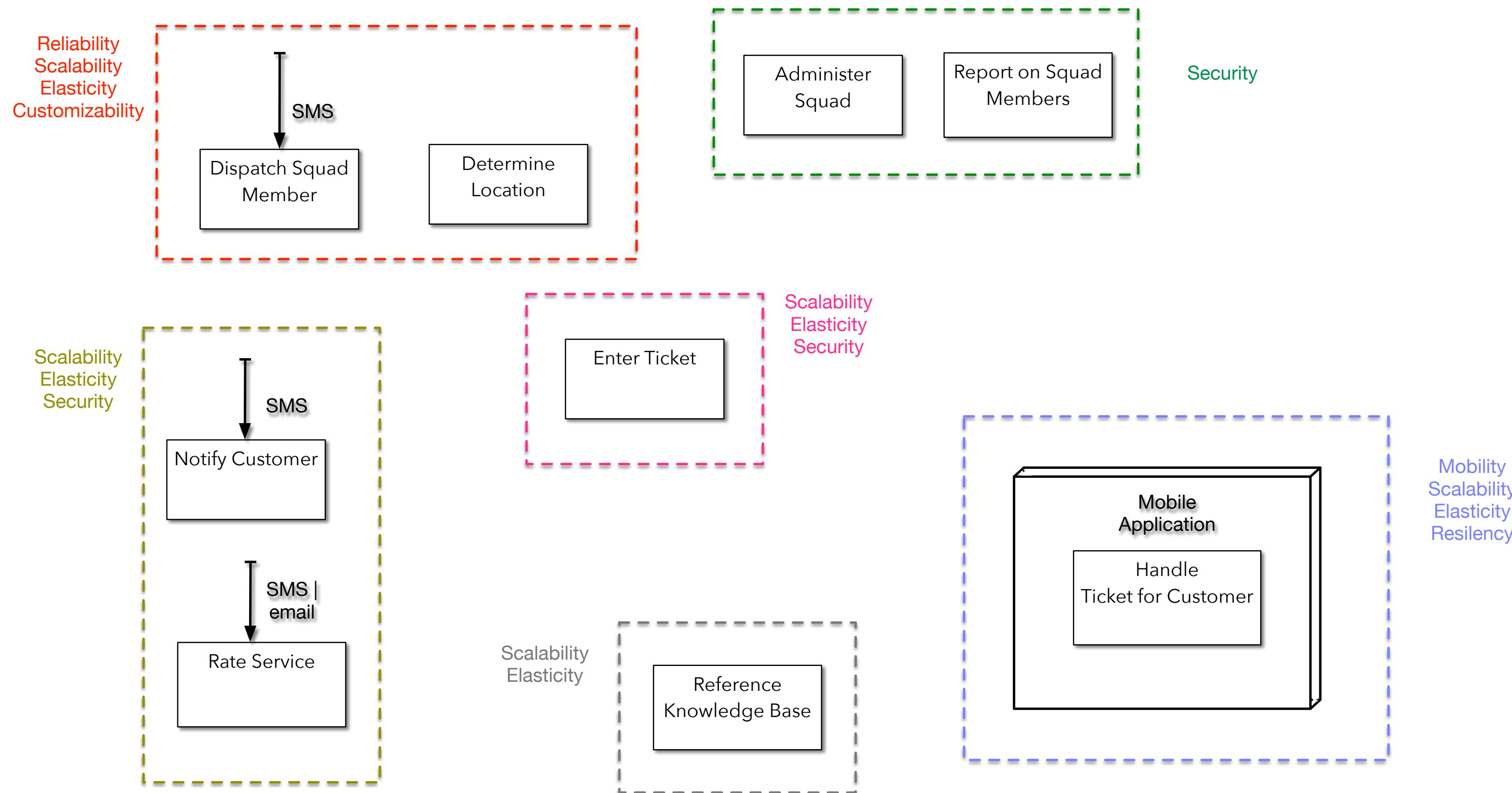
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Given the set of components identified below, where should the quantum boundaries lie?



# Scenario Exercise - Architecture Quanta(Instructor)

Given the set of components identified below, where should the quantum boundaries lie?



# Scenario Exercise – Choosing Monolithic versus Distributed Architecture

What style of architecture would be most appropriate for each set of quanta?

A  monolithic

distributed

B  monolithic

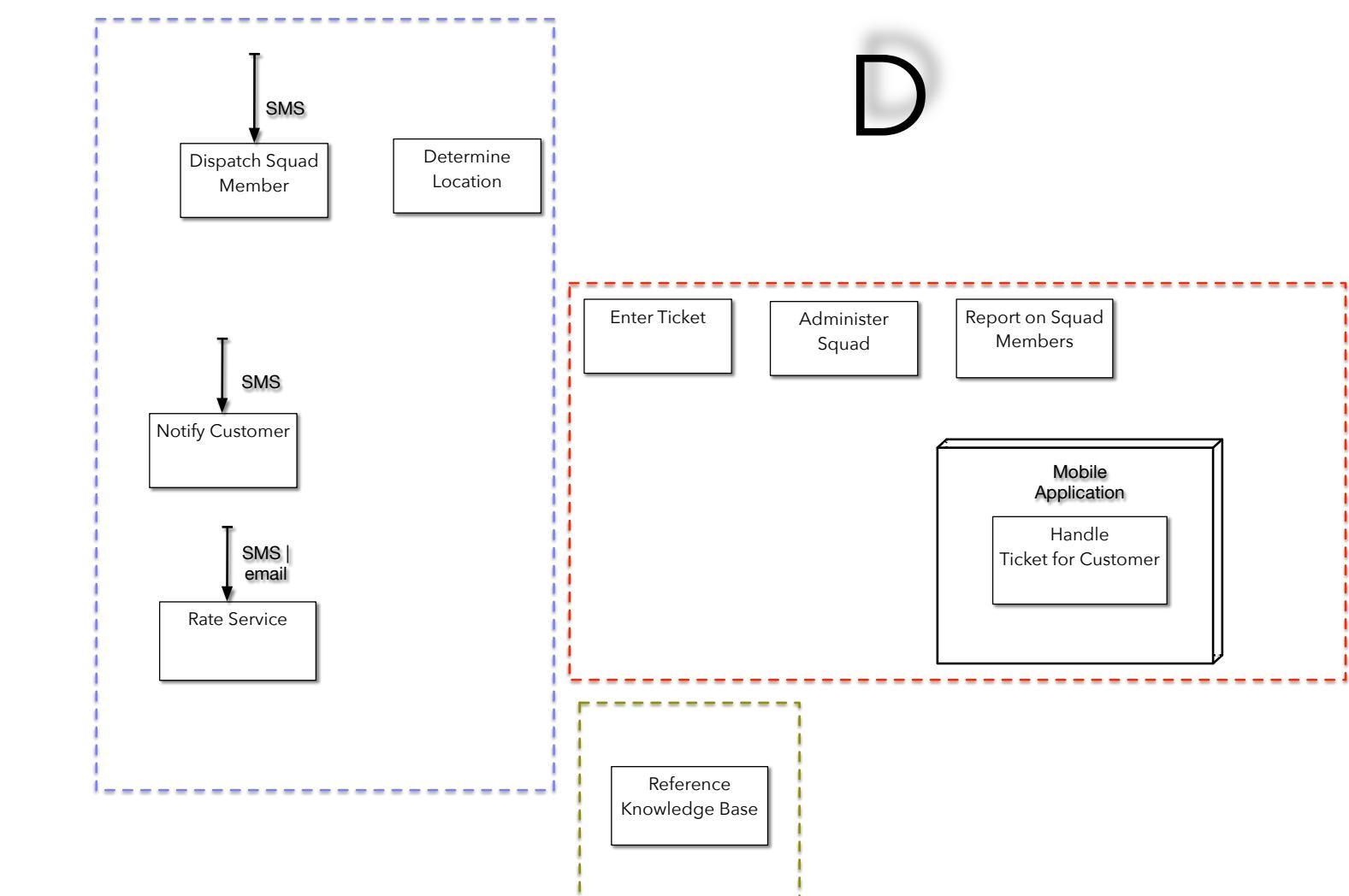
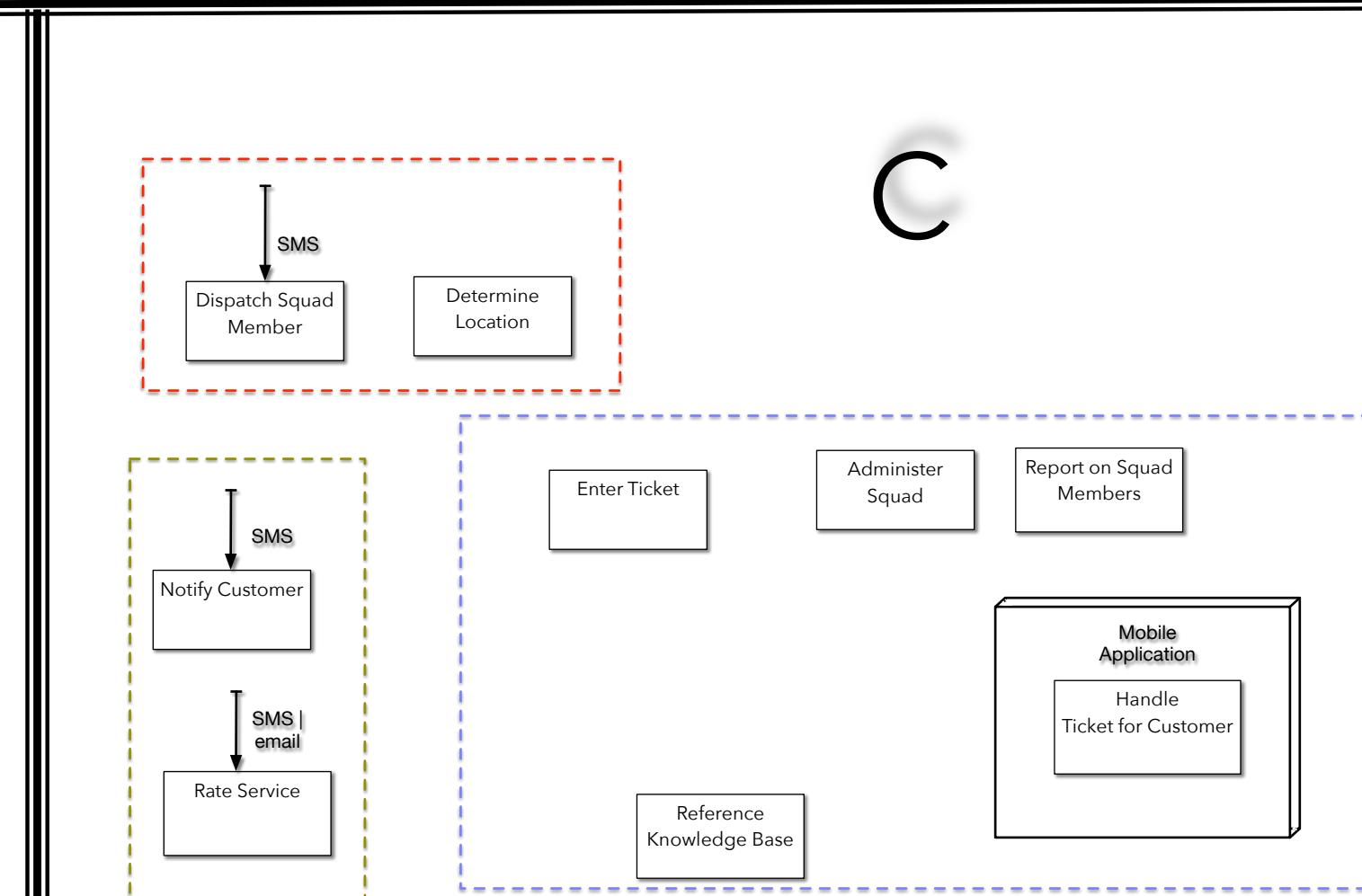
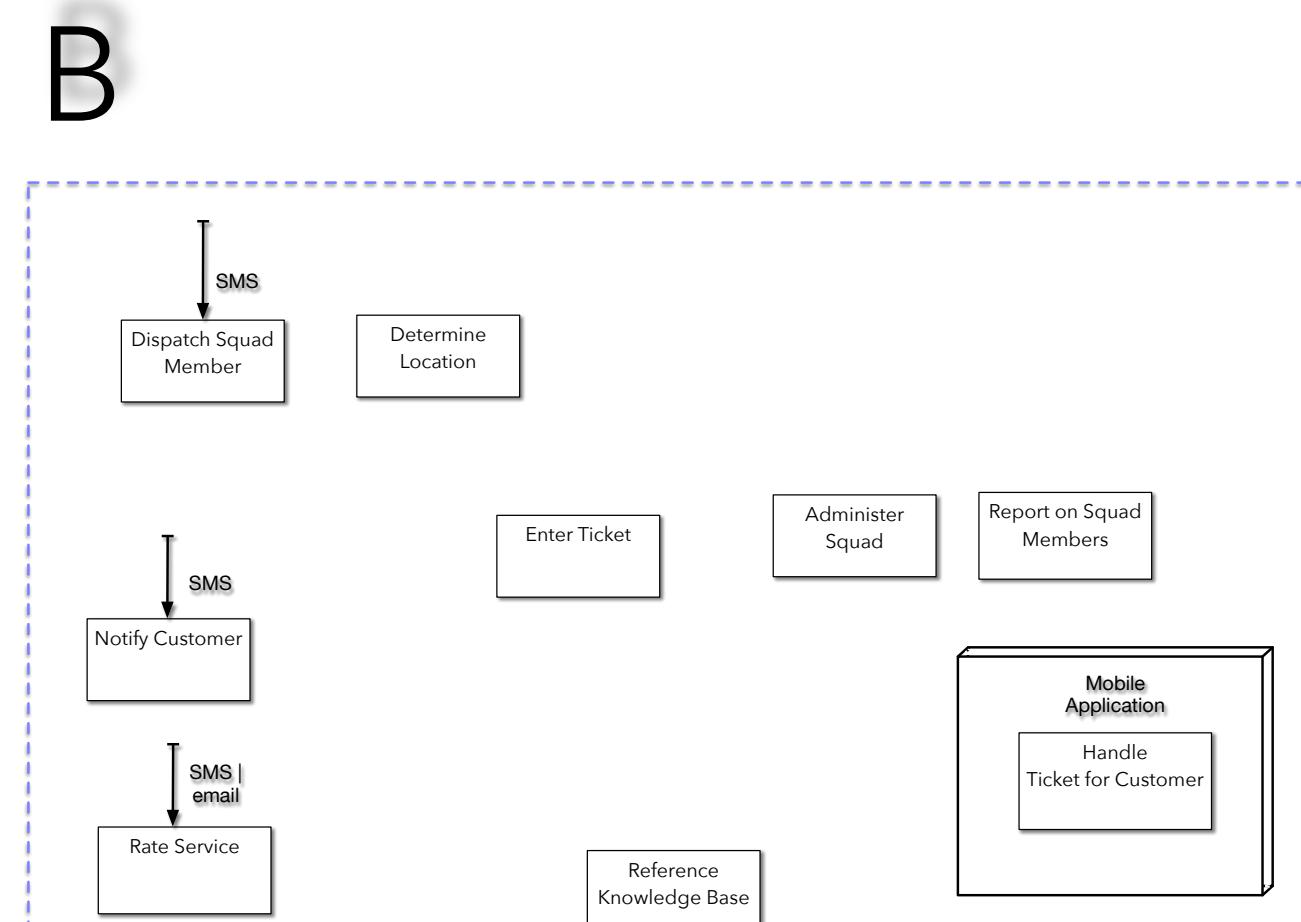
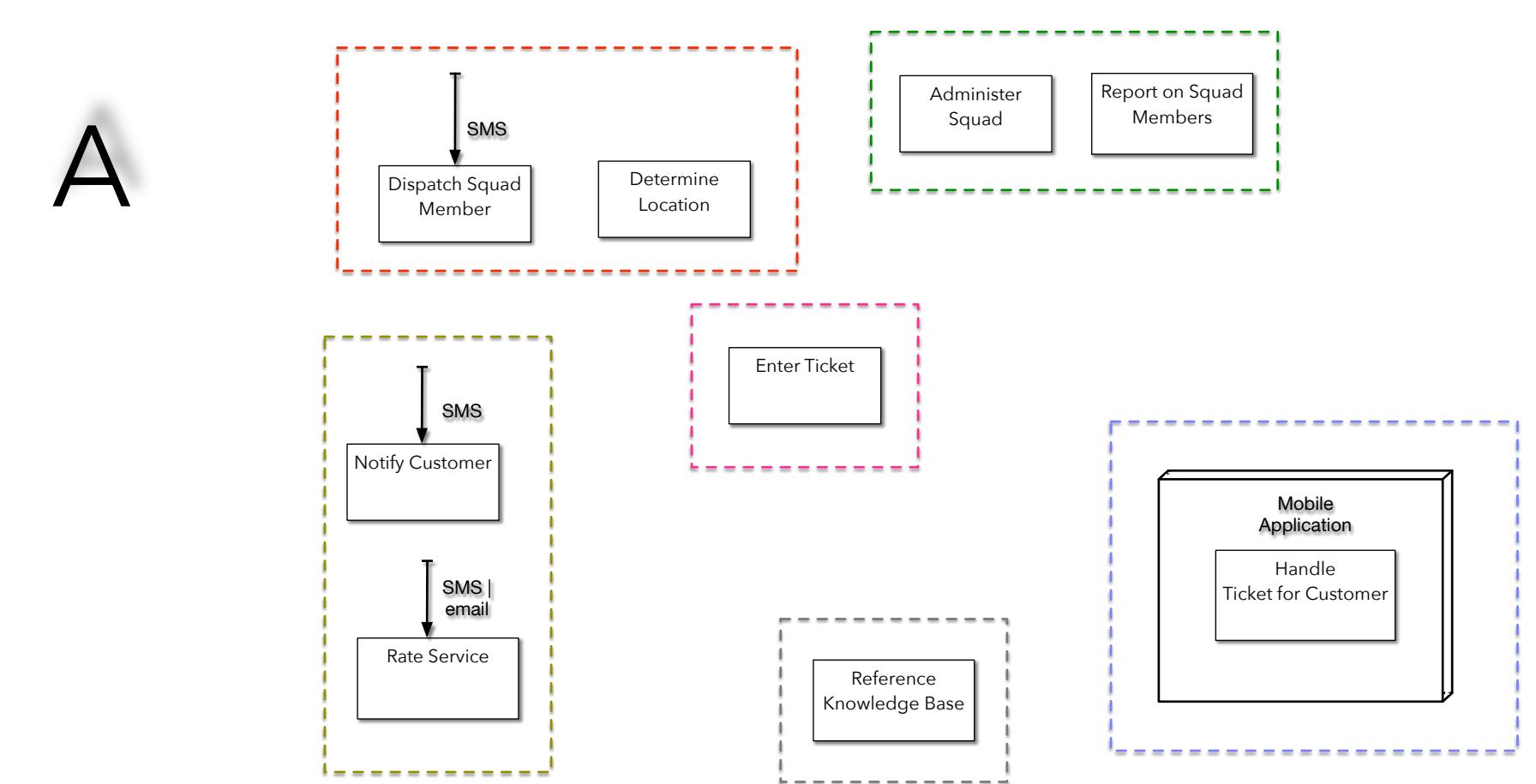
distributed

C  monolithic

distributed

D  monolithic

distributed

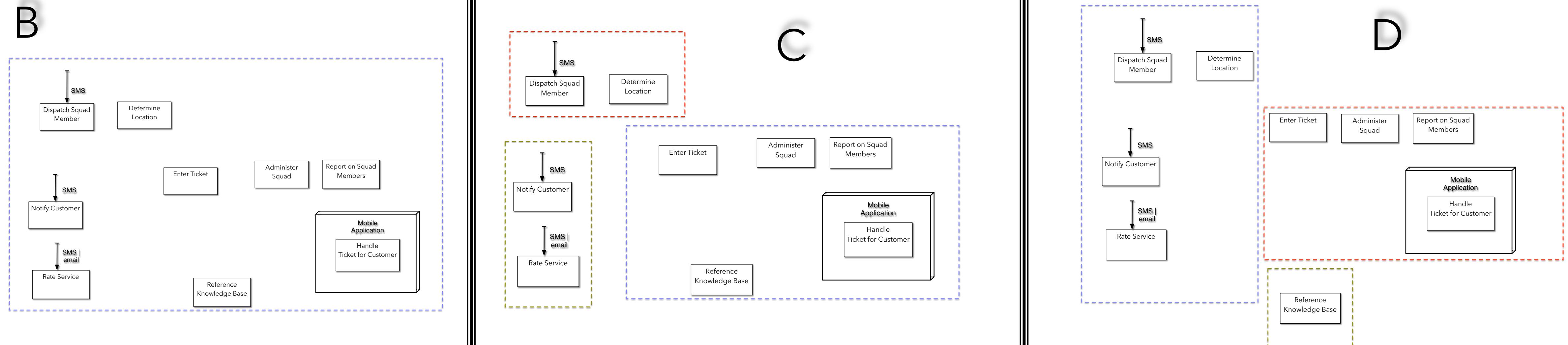
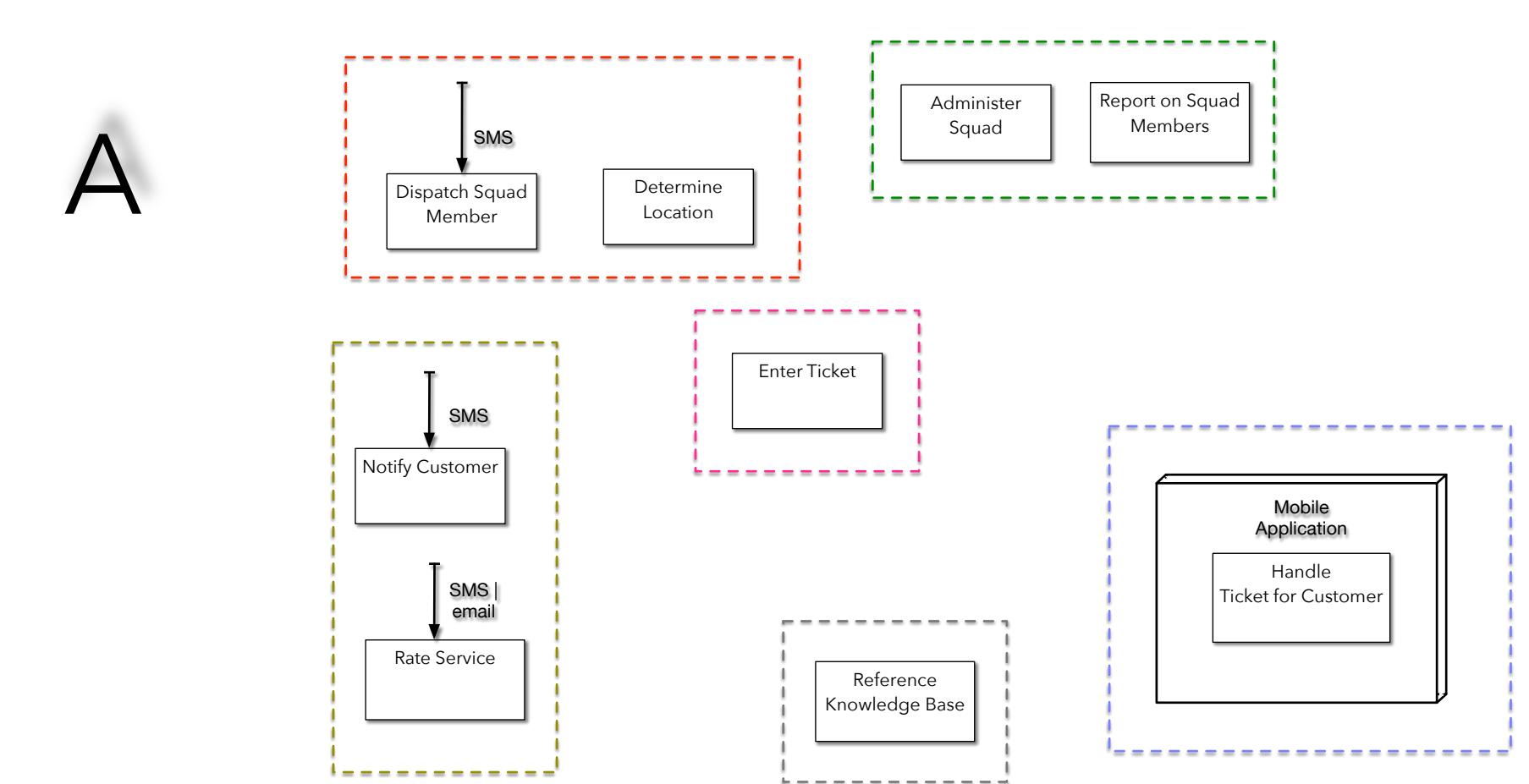


# Scenario Exercise – Choosing Monolithic versus Distributed Architecture

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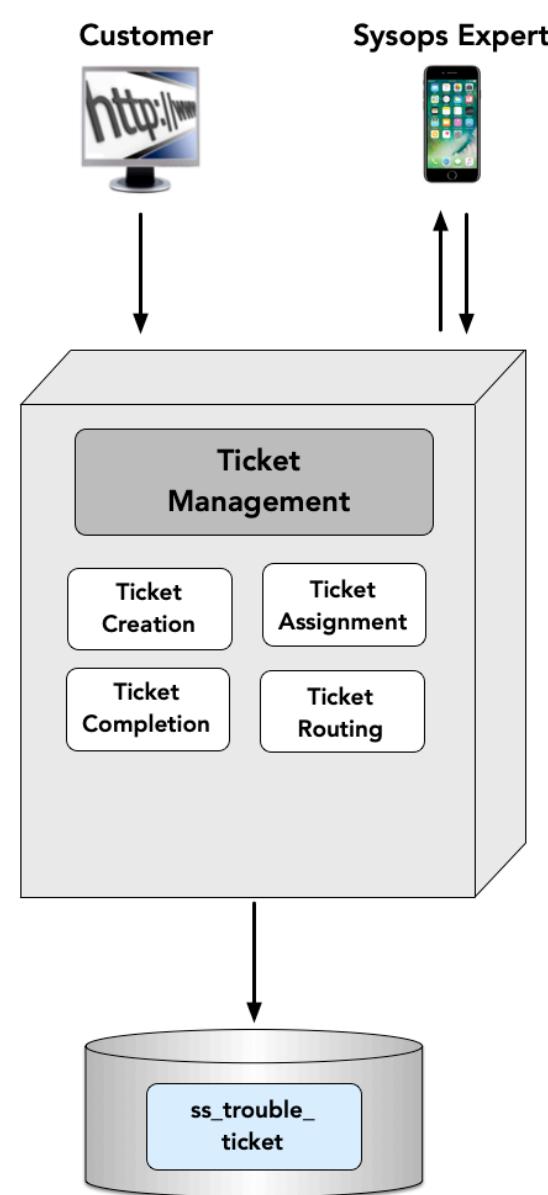
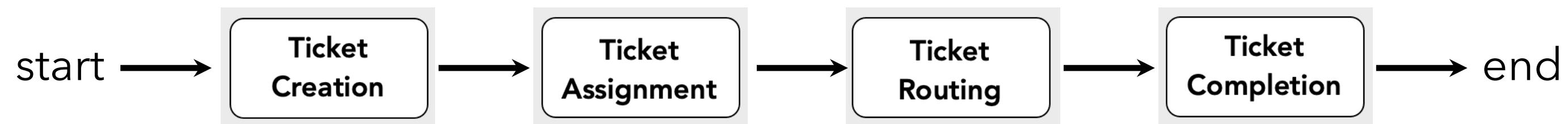
- A  monolithic
- B  monolithic
- C  monolithic
- D  monolithic

- distributed
- distributed
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- distributed

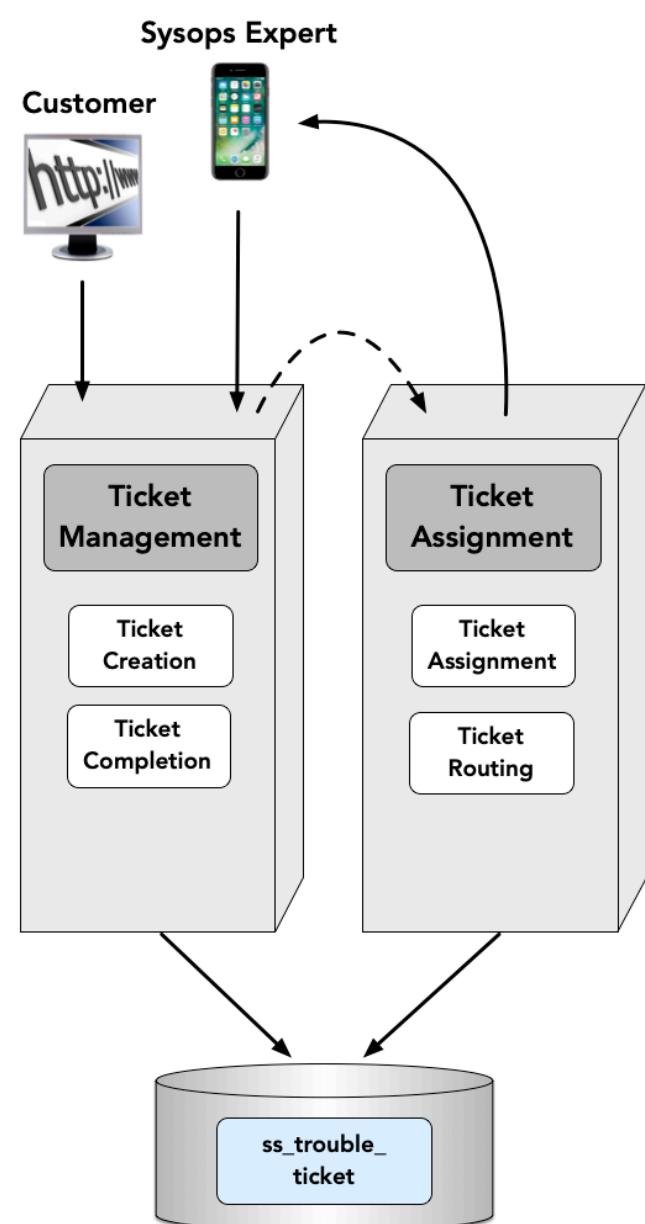


# Scenario Exercise - Service Granularity

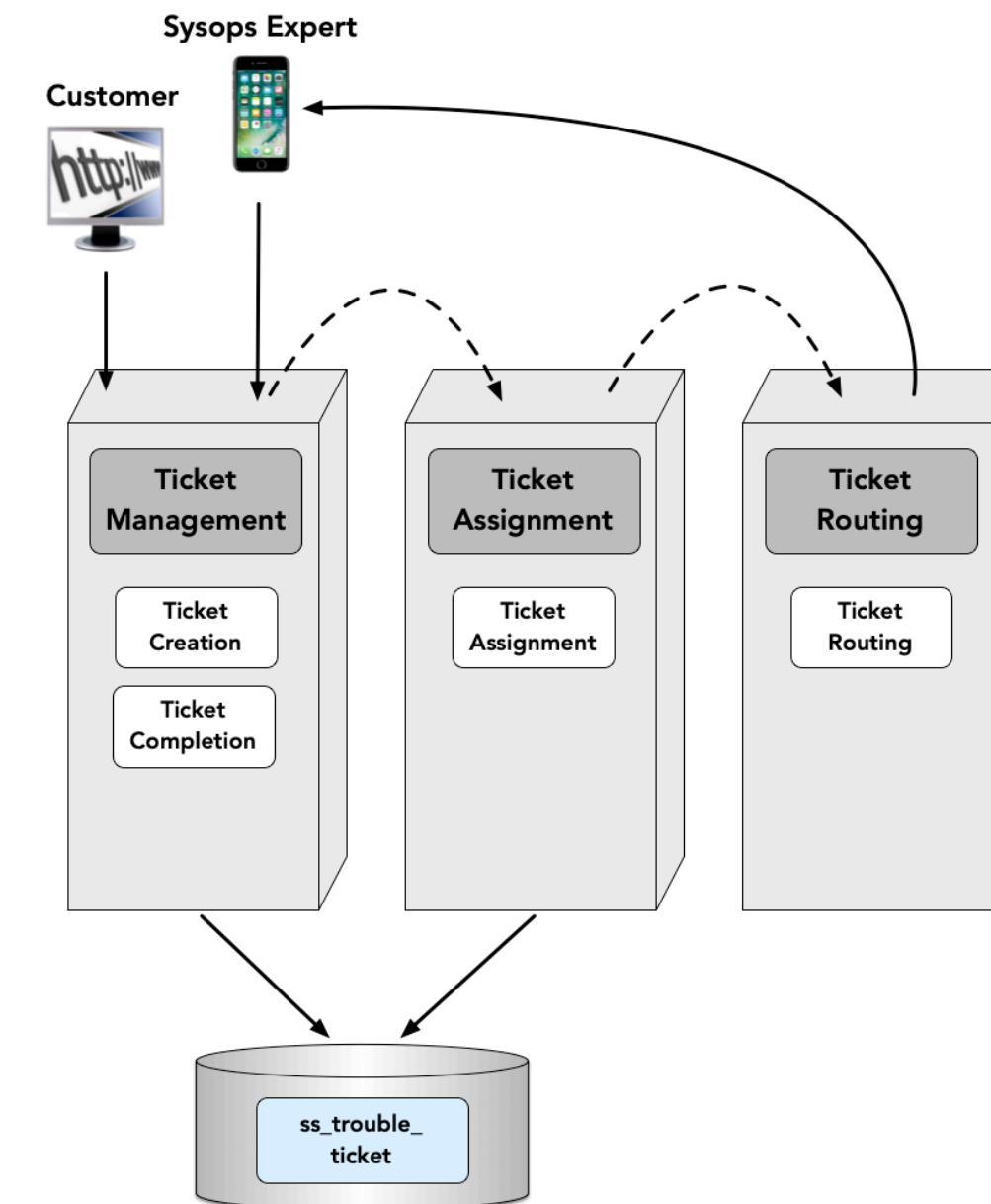
The primary ticket workflow uses the four components below. What service option would you choose and why?



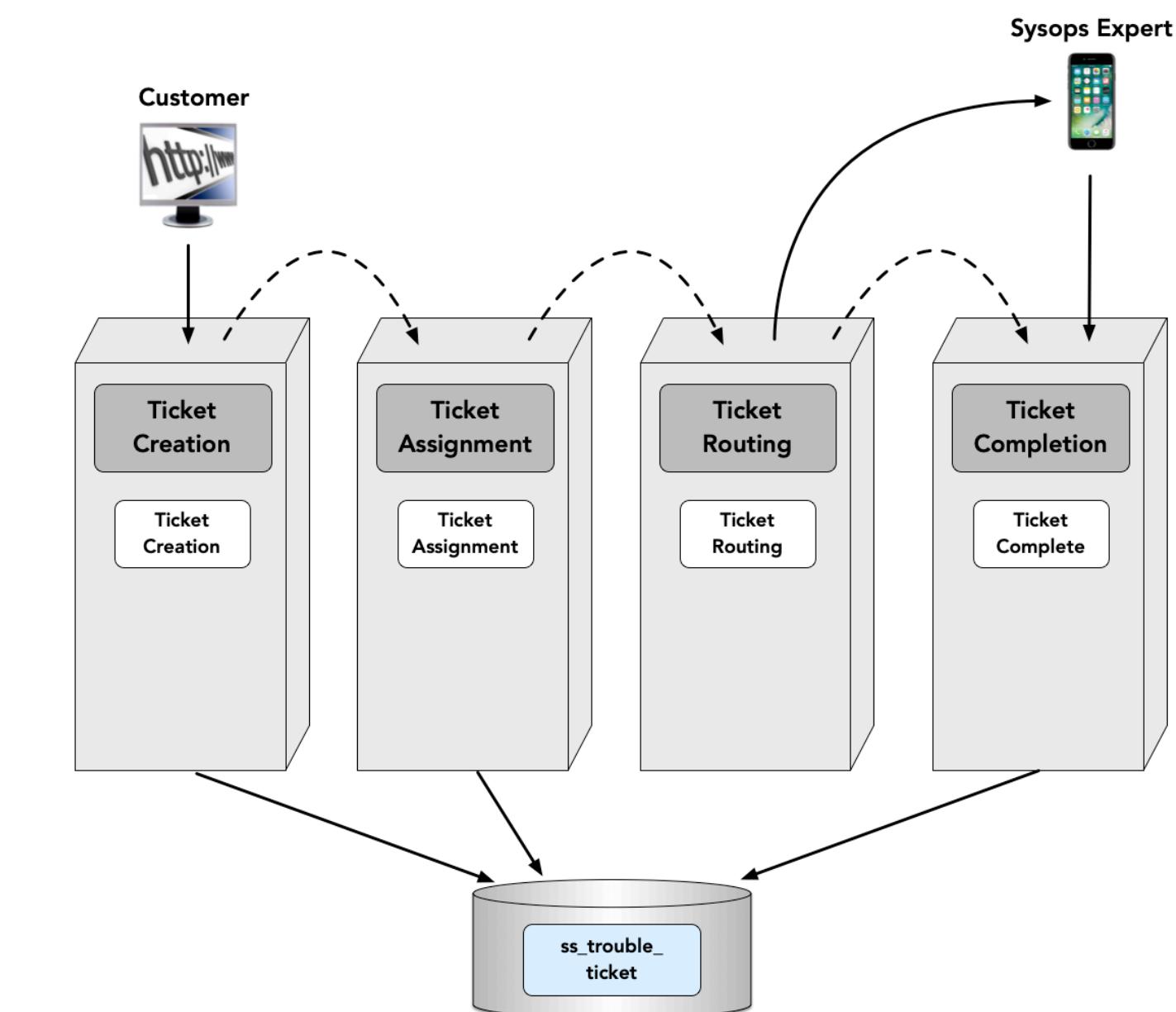
option 1



option 2



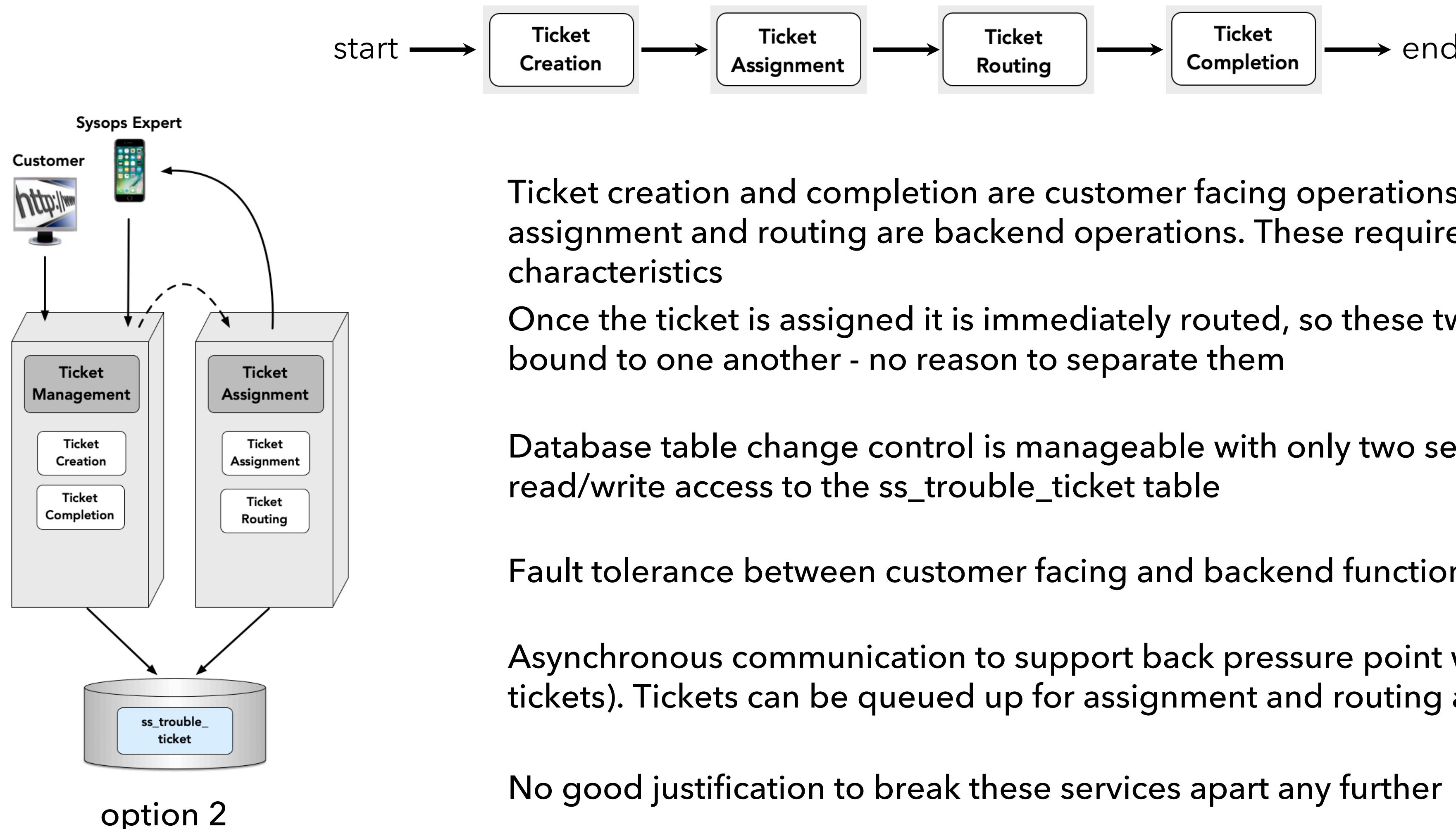
option 3



option 4

# Scenario Exercise - Service Granularity (Instructor)

The primary ticket workflow uses the four components below. What service option would you choose and why?



Ticket creation and completion are customer facing operations, whereas ticket assignment and routing are backend operations. These require different architecture characteristics

Once the ticket is assigned it is immediately routed, so these two operations are tightly bound to one another - no reason to separate them

Database table change control is manageable with only two services. Both services need read/write access to the **ss\_trouble\_ticket** table

Fault tolerance between customer facing and backend functionality

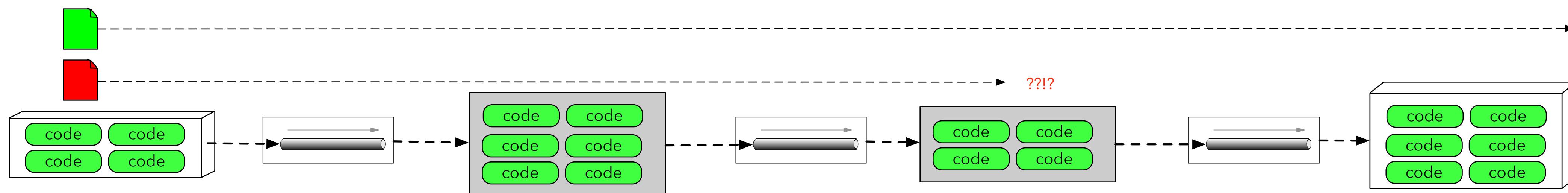
Asynchronous communication to support back pressure point within the workflow (too many tickets). Tickets can be queued up for assignment and routing as experts become available

No good justification to break these services apart any further

# Kata Exercise - Automating Architecture Governance

Sysop Squad has had a problem with lost / mis-routed tickets, and the architects have narrowed it down to lost messages in a message queue because of a hard to reproduce error.

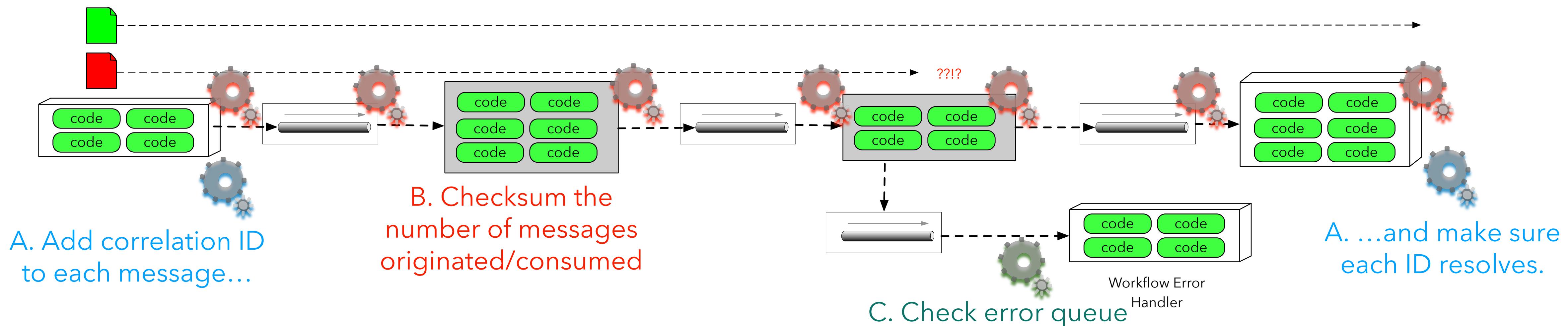
1. What kind of fitness function can the Sysop Squad architects write to track down the root cause?



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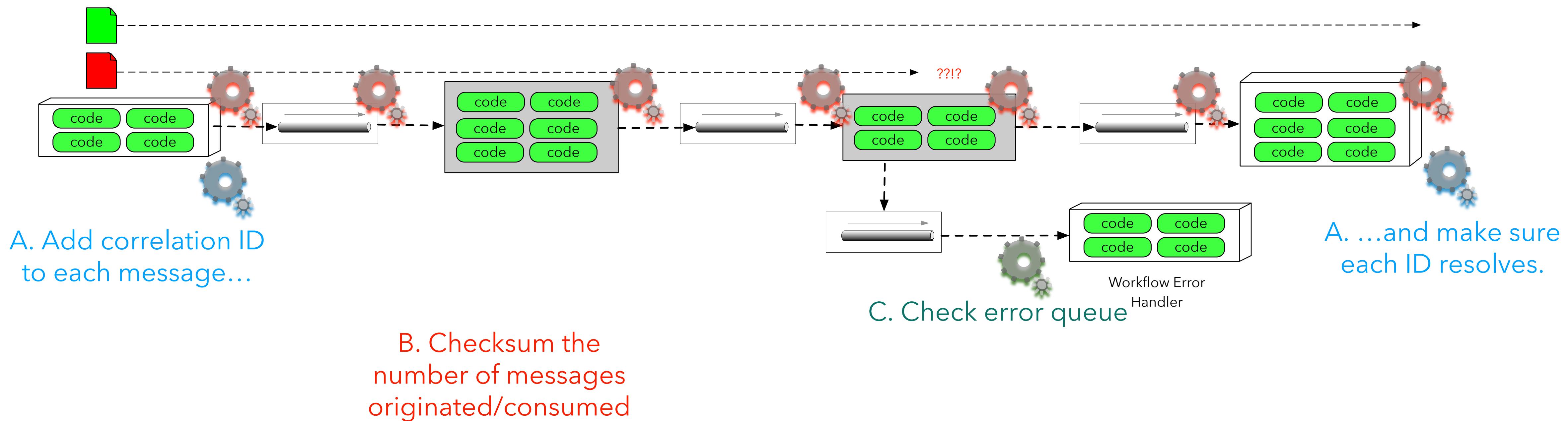
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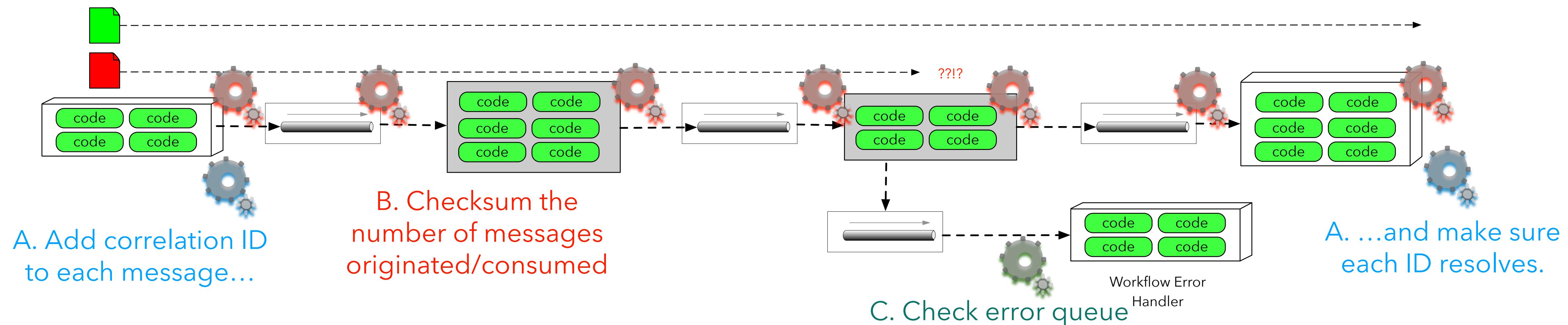
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# Kata Exercise - Automating Architecture Governance

Sysop Squad has had a problem with lost / mis-routed tickets, and the architects have narrowed it down to lost messages in a message queue because of a hard to reproduce error.

2. What fitness function could they write to prevent this from happening in the future?



# Scenario Exercise - Communication and Workflow

The primary ticket flow involves four services and is as follows:

Customer Facing Operations:

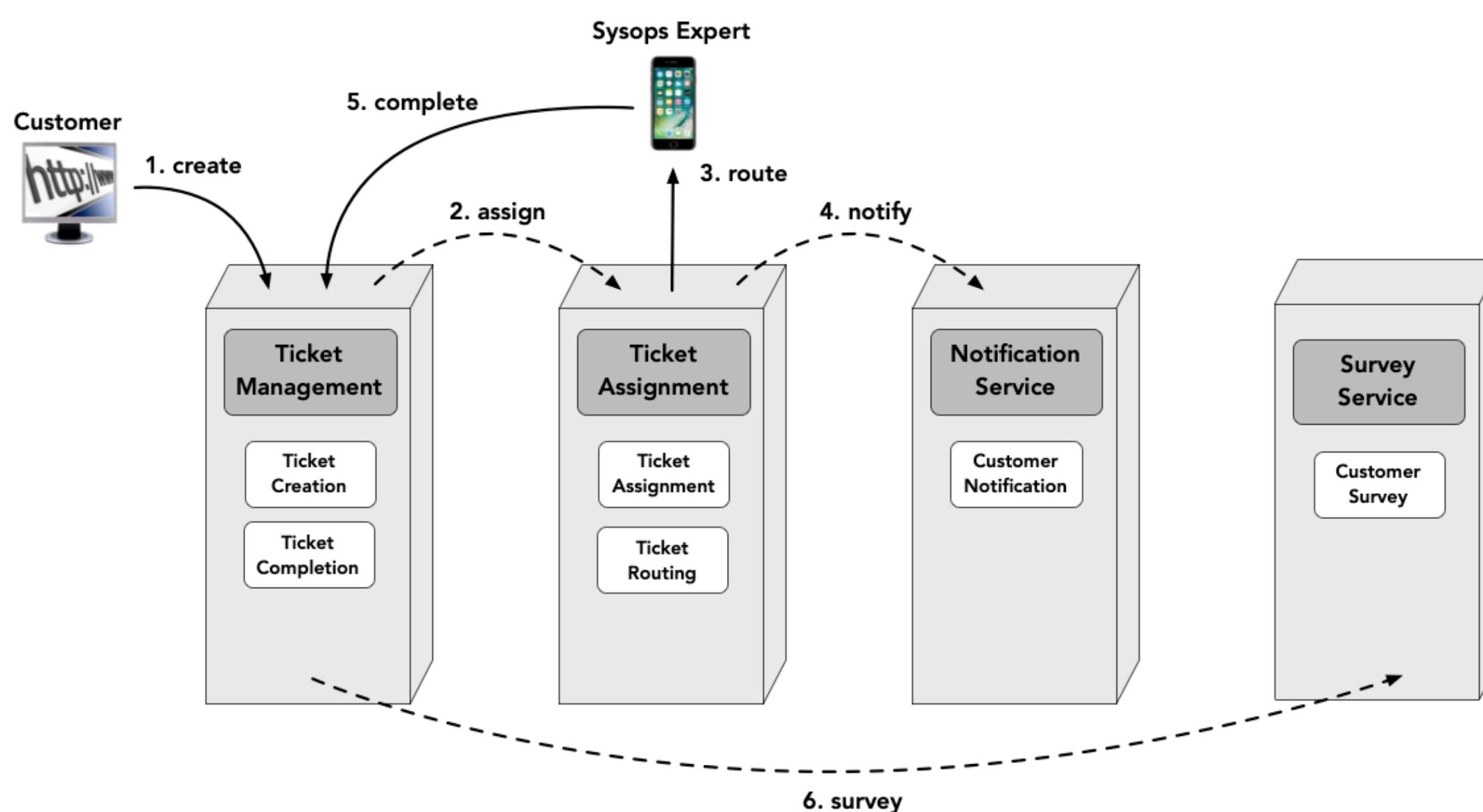
1. Customers submits a trouble ticket through the ***Ticket Management*** service and receive a ticket number.

Background Operations:

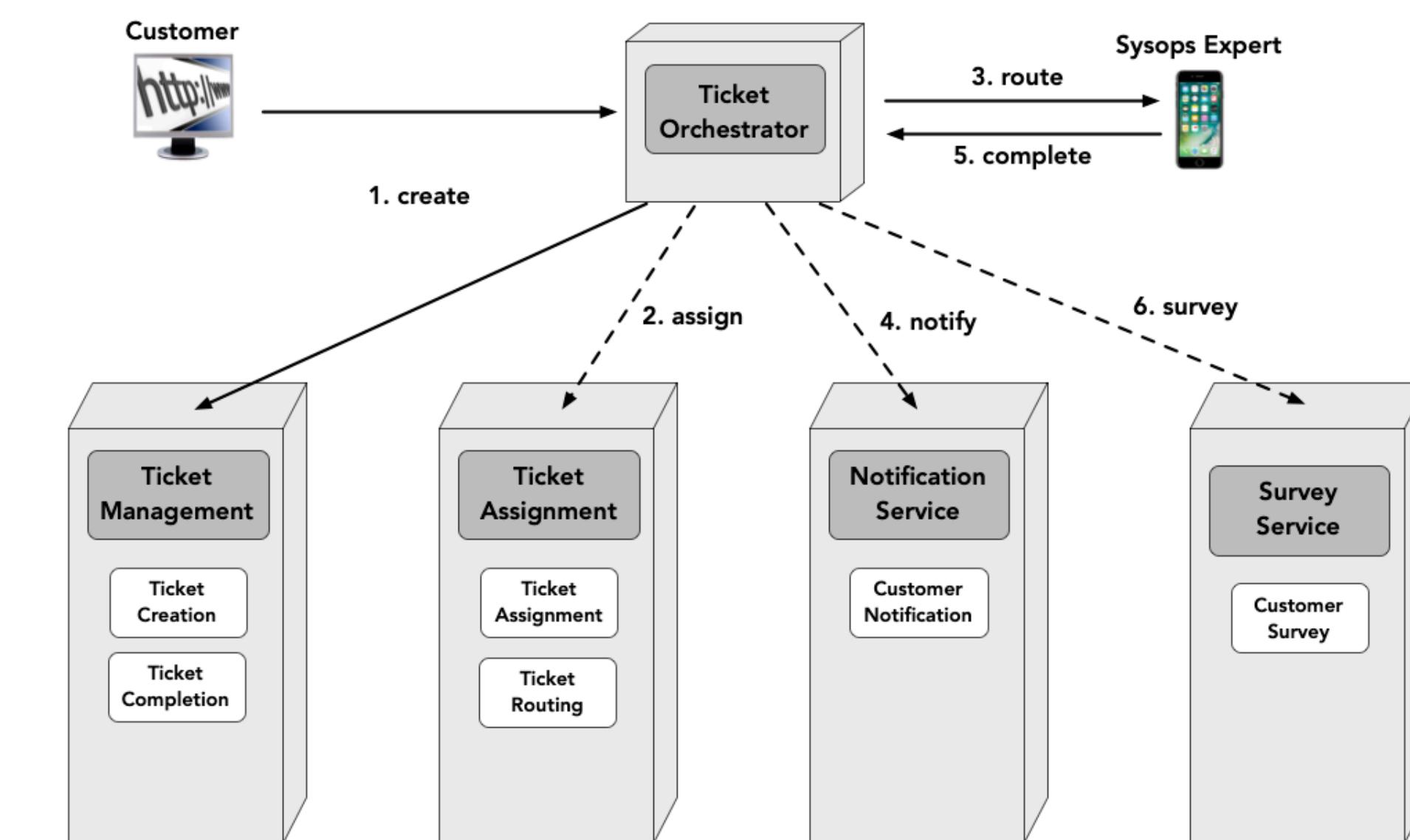
2. The ***Ticket Assignment*** service finds the right sysops expert for the trouble ticket.
3. The ***Ticket Assignment*** service routes the trouble ticket to the systems experts mobile device.
4. The customer is notified via the ***Notification Service*** that the sysops expert is on their way to fix the problem.
5. The expert fixes the problem and marks the ticket as complete, which is sent to the ***Ticket Management*** service.
6. The ***Ticket Management*** service communicates with the ***Survey Service*** to tell the customer to fill out the survey.

# Scenario Exercise - Communication and Workflow

Which of the following communication styles would you choose and why? (solid lines are synchronous communication, dotted lines are asynchronous).



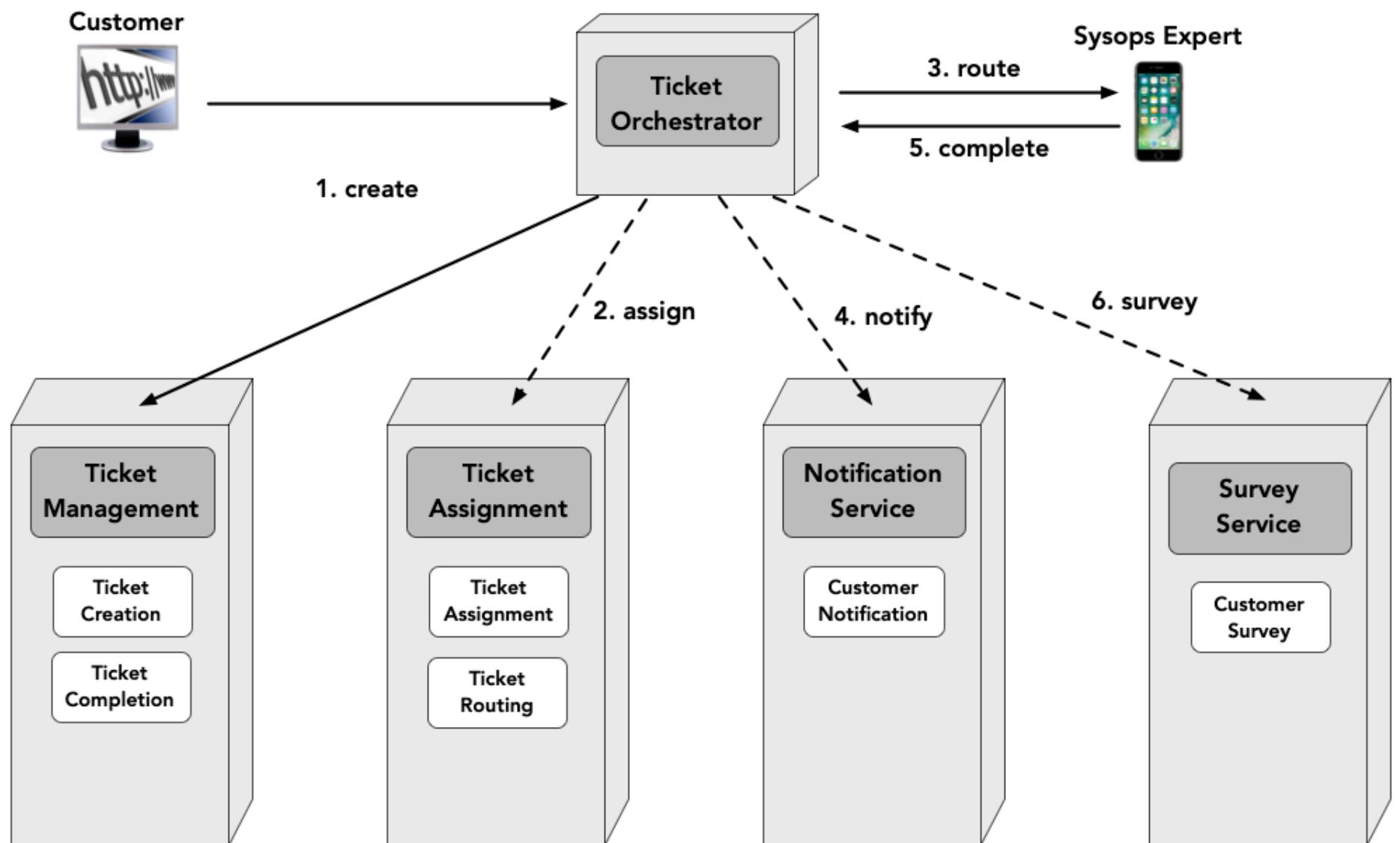
option 1: choreography



option 2: orchestration

# Scenario Exercise - Communication and Workflow (Instructor)

Which of the following communication styles would you choose and why? (solid lines are synchronous communication, dotted lines are asynchronous).



option 2: orchestration

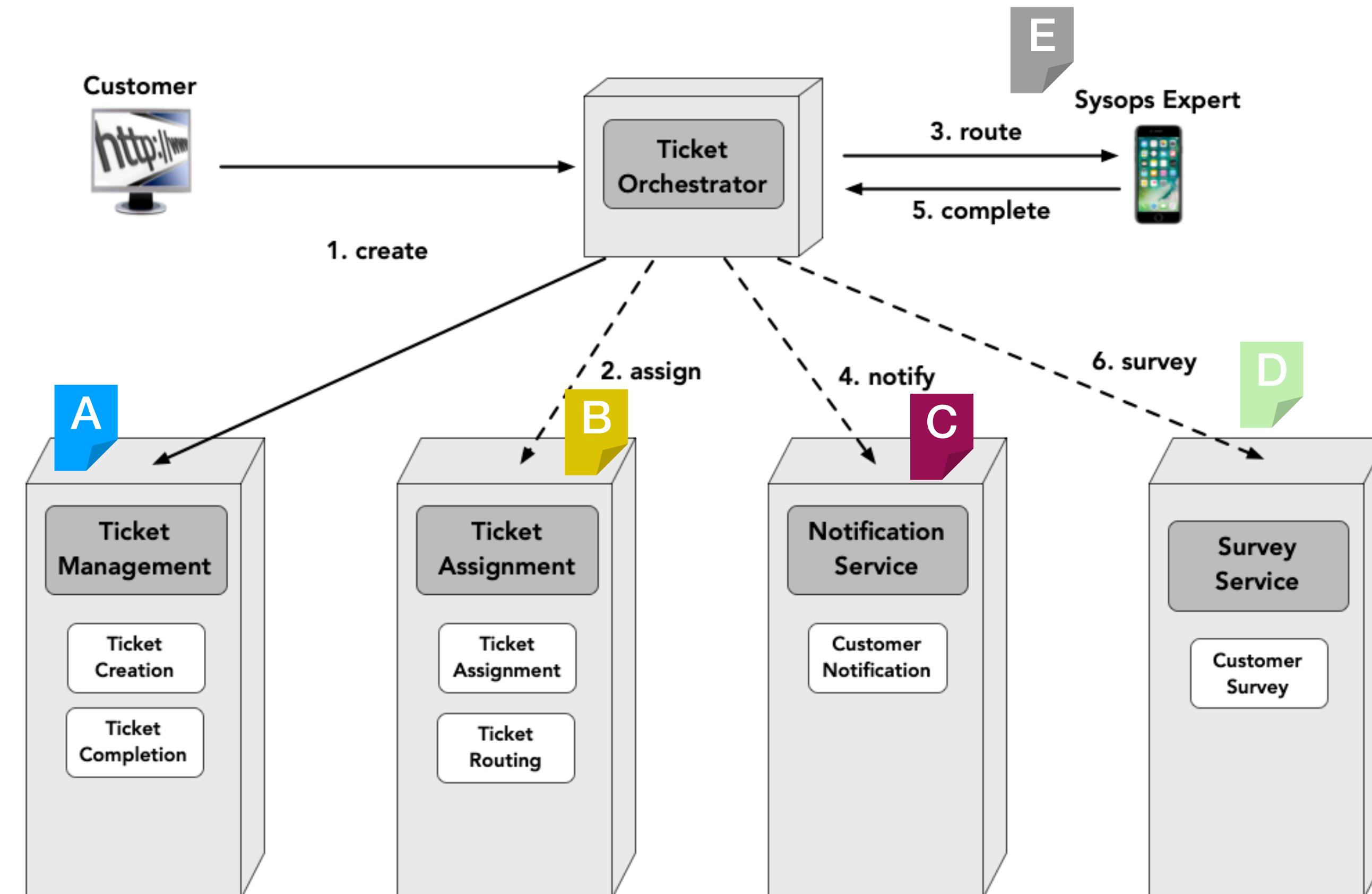
Justification:

Desire to always know ticket state (existing complaints about lost tickets and the wrong expert arriving for the job)

Error handling for reassignment, ticket cancellation, resend survey, lost connection to sysops expert on mobile phone (out of coverage area or dropped connection)

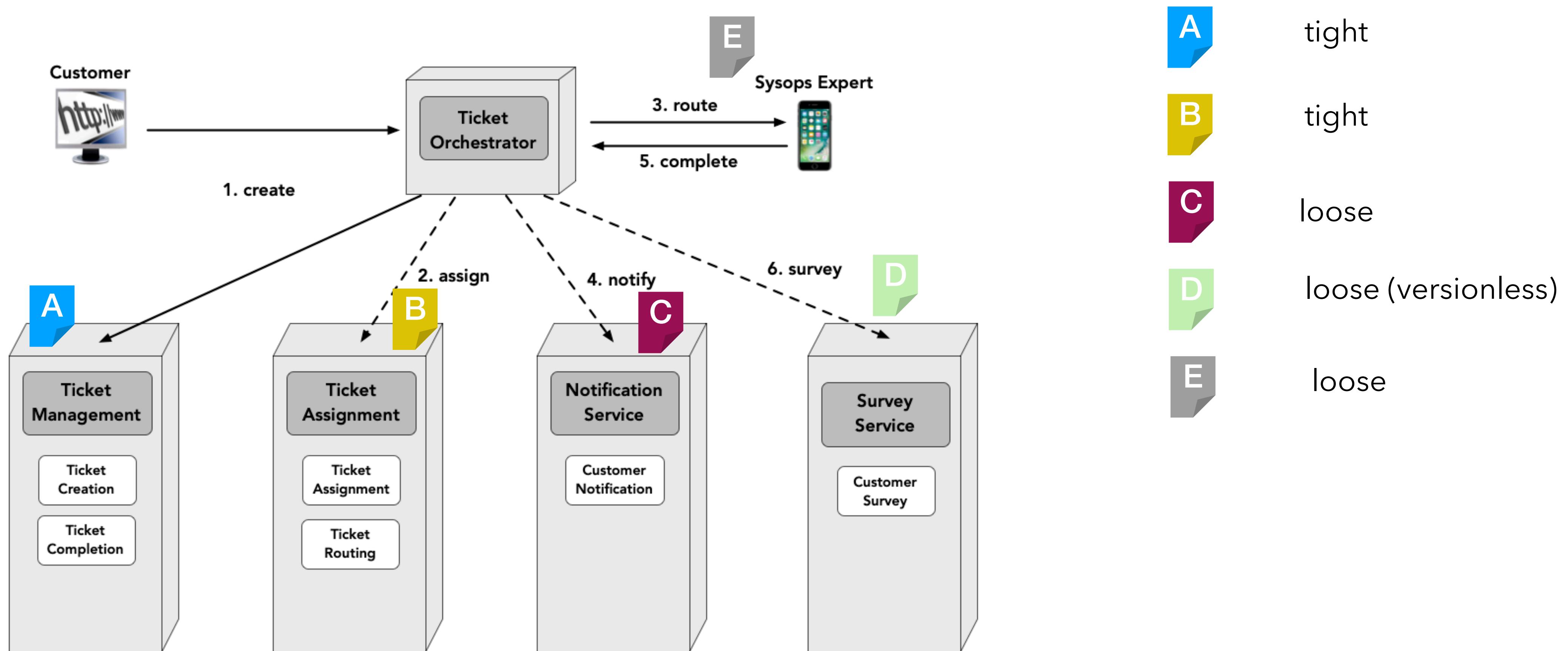
# Scenario Exercise - Semantic versus Syntactic Coupling

What type of contract (looser or tighter) should be applied to each of these interactions and why?



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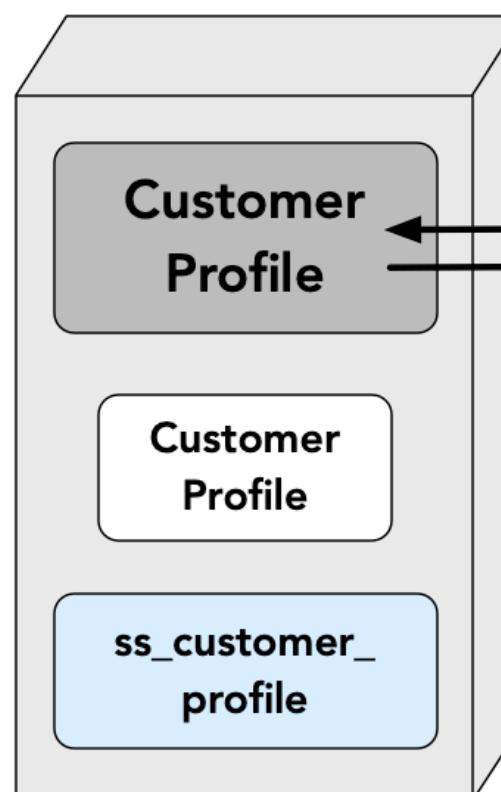
# Scenario Exercise - Data Access

The notification service needs the customer's contact info and name to notify them that the expert is on their way. How should the notification service get this information?

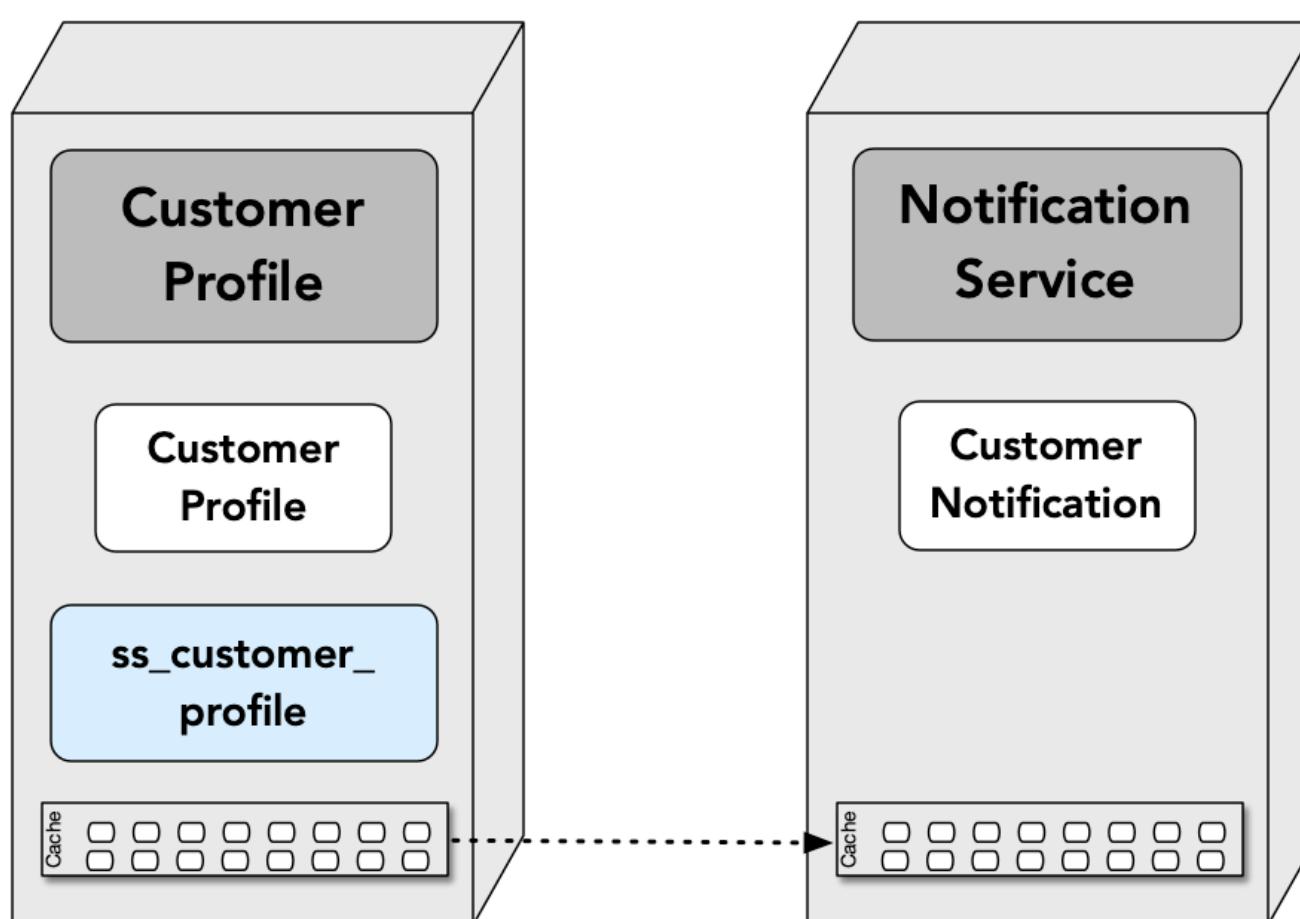
Additional Info: Number of customers: 10,000, growth rate 5%/year

Customer ID is passed into the notification service

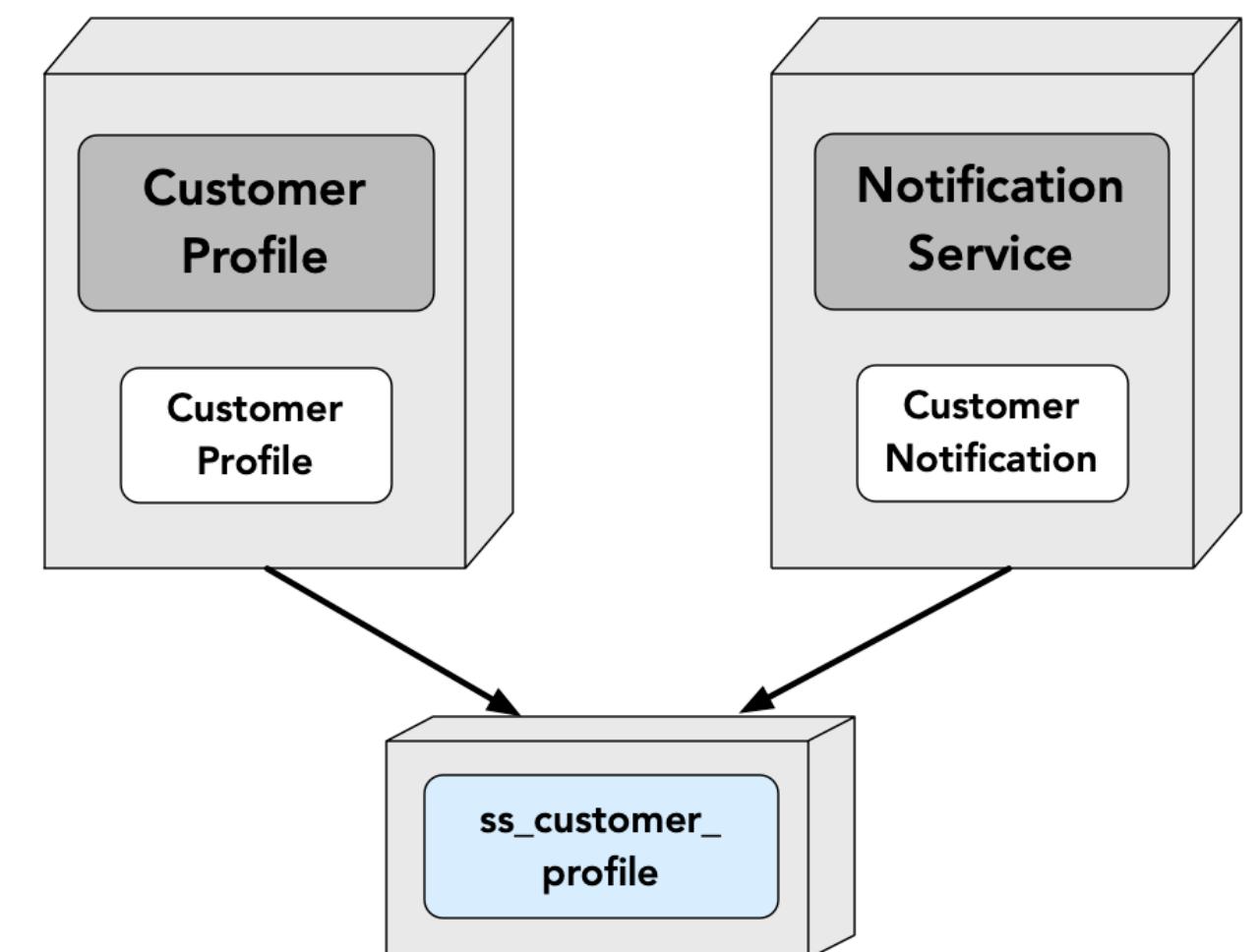
ss\_customer\_profile contains all name and contact info



option 1: interservice communication



option 2: replicated in-memory cache



option 3: data domain

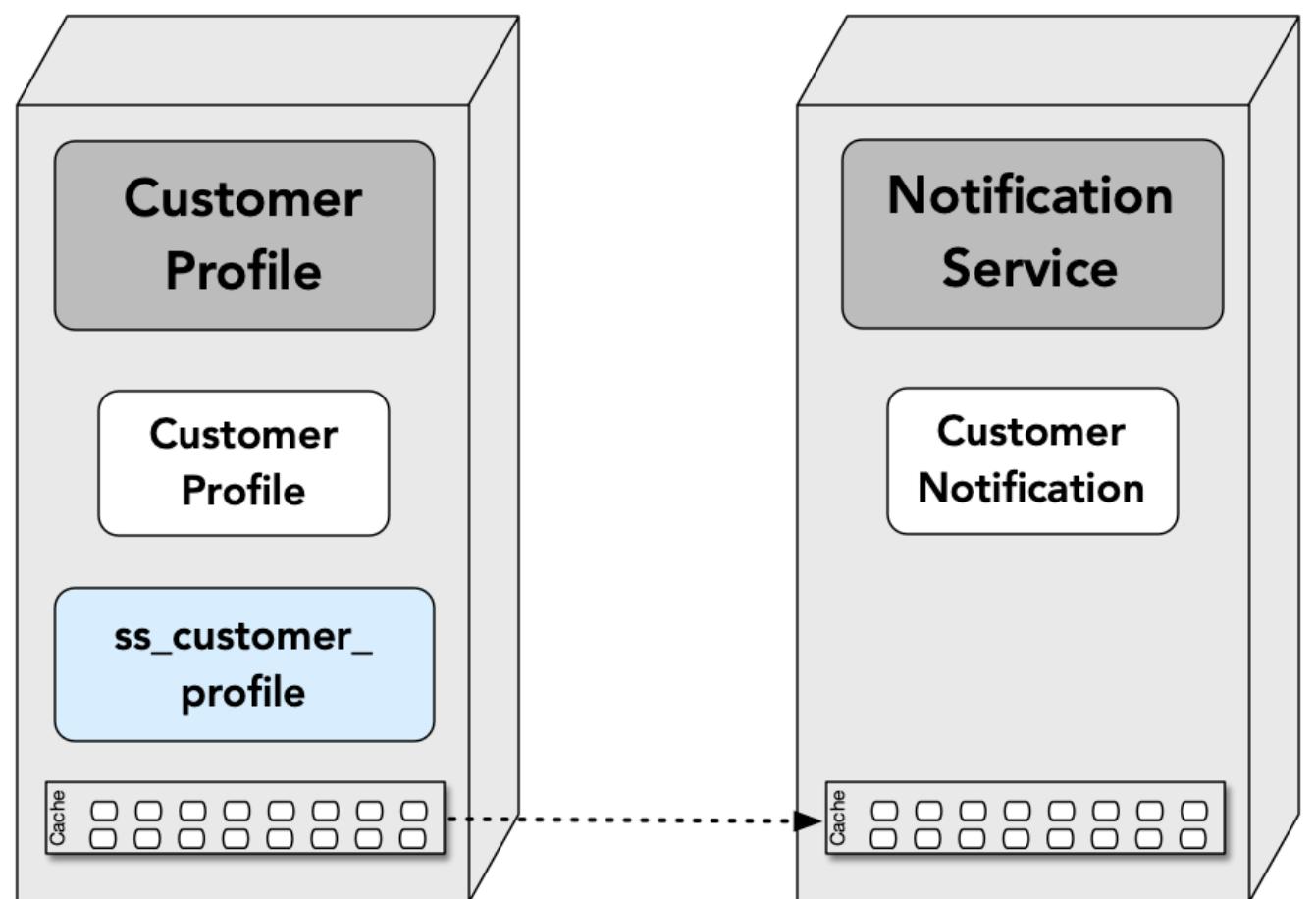
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Less service and data coupling, hence better responsiveness (no network and security latency) and fault tolerance

In-memory replicated cache creates a value-driven contract between the services

Relatively static data (low update rate), low data volume (~400MB)

option 2: replicated in-memory cache

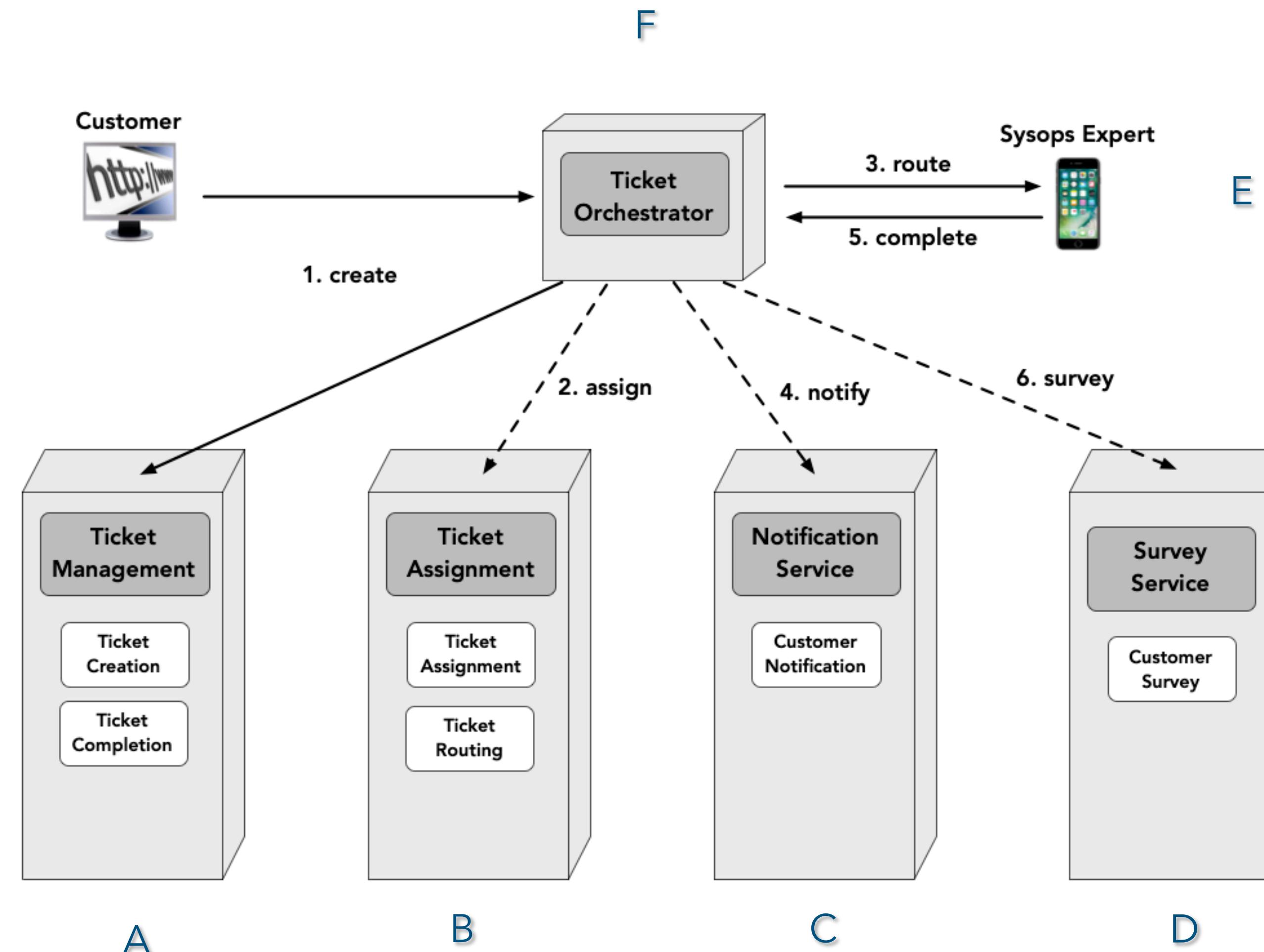
## Kata Exercise - Handling Elasticity

Due to a recent pandemic world cup soccer will only be televised. As a result, sales have gone through the roof for new TV's, computers, and other electronic equipment. Your manager is very worried about a significant increase in trouble tickets, all within a very short period of time. How can you modify the architecture to handle this anticipated peak in trouble tickets?



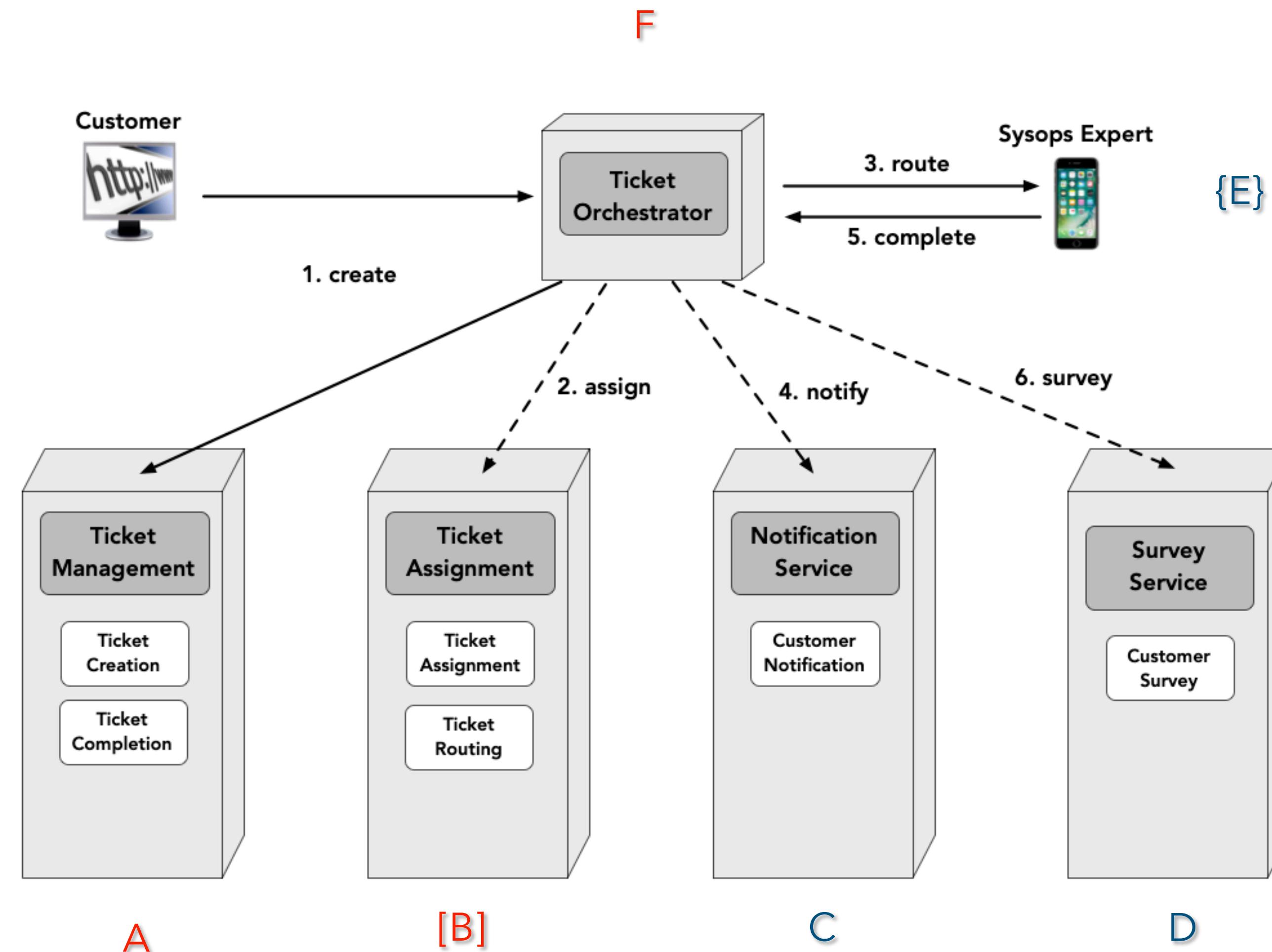
# Scenario Exercise - Handling Elasticity

Which parts of the architecture should the architect add caching, scale instances, or do domain sharding?



# Scenario Exercise - Handling Elasticity

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