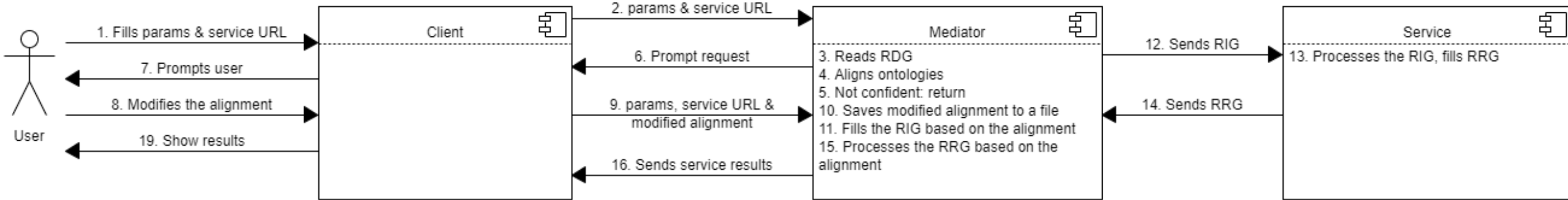# Cottage Booking Ontology Alignment
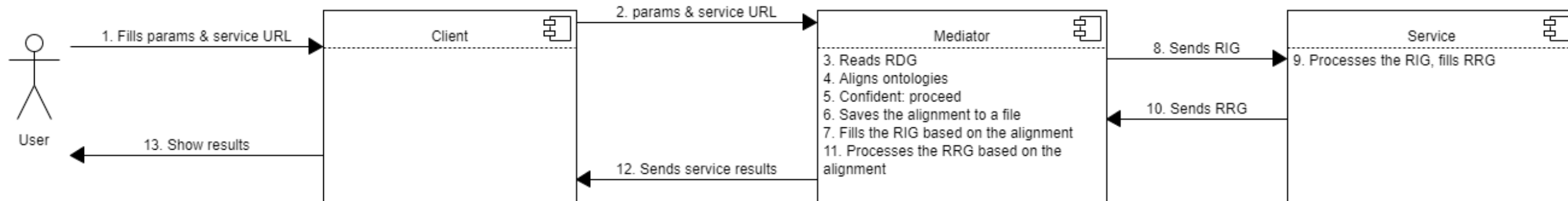
Joose Tikkanen

Solution

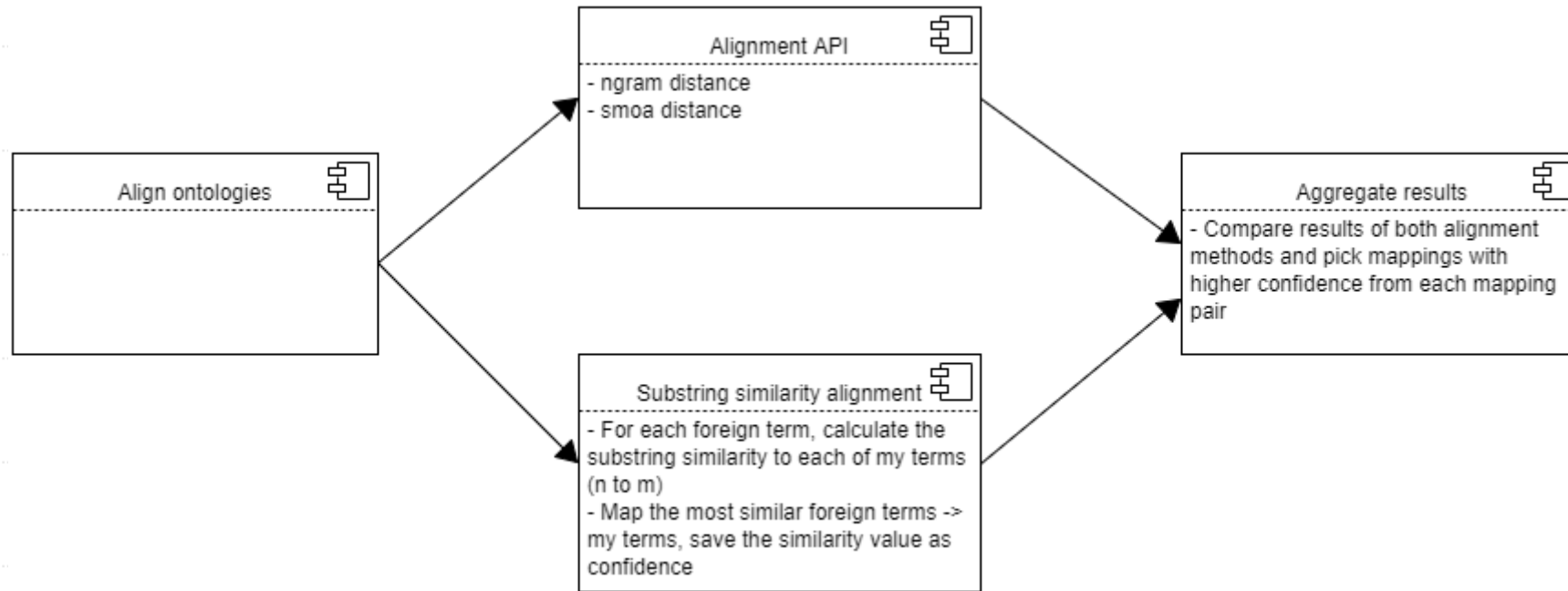Scenario 1: Mediator not confident enough about the automatic alignment

Scenario 2: Mediator is confident

Both cases: The required alignment for further queries to the same service is read from the saved file, skipping the ontology alignment, confidence check and saving the alignment –steps.

Solution: The alignment

Alignment API
- ngram distance
- smoa distance

Align ontologies

Aggregate results
- Compare results of both alignment methods and pick mappings with higher confidence from each mapping pair

Substring similarity alignment
- For each foreign term, calculate the substring similarity to each of my terms (n to m)
- Map the most similar foreign terms -> my terms, save the similarity value as confidence

o **Substring similarity** (*similarity function*):

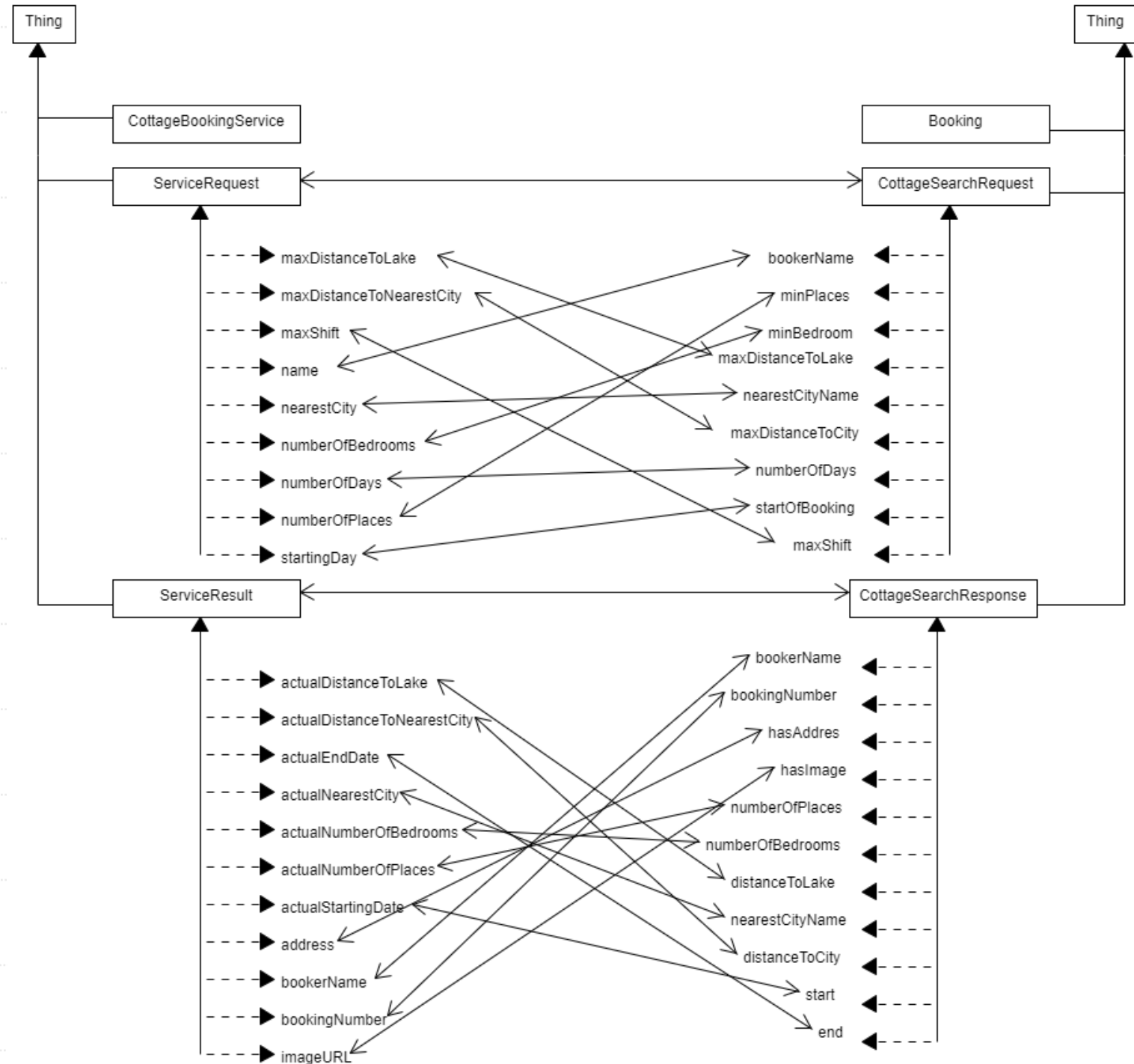$\sigma(s,t) = \frac{2*|k|}{|s|+|t|}$, where k is the longest common substring of s and t.

article and *aricle*: $\frac{2*4}{13} = \frac{8}{13} = 0,615$

particle and *article*: $\frac{2*7}{15} = \frac{14}{15} = 0,933$

Ontologies and the desired alignment

Note:
1. `numberOfBedrooms` and `numberOfPlaces` will always be aligned incorrectly by mere string comparisons
2. `bookerName` and `nearestCityName` has two possible alignments.

Comparison of the alignment methods

- Success rate of Alignment API methods (merged smoa and ngram distances) is 13/20 = 65%.

- Success rate of substring similarity method is 12/20 = 60%.

- Success rate of aggregated results is also 65%.

- API was more confident: 12/13 ~ 92% meaningful alignments were picked by API, and only 1/13 ~ 8% by substring similarity method (7 perfect matches).

- Neither of the methods were strictly "better"; both got different terms right.

```
---- Aggregated results ----
SUBSTR: numberOfPlaces | numberOfPlaces | 1.0
API: hasAddress | address | 0.9117647058823529
API: hasName | name | 0.8636363636363636
SUBSTR: Booker | bookerName | 0.75
SUBSTR: maxDistanceToLake | maxDistanceToLake | 1.0
API: hasImage | imageURL | 0.7291666666666667
SUBSTR: numberOfDays | numberOfDays | 1.0
API: CottageSearchRequest | CottageBookingService | 0.5751662971175167
API: startOfBooking | startingDay | 0.8219065420560747
API: end | actualEndDate | 0.6875
SUBSTR: maxShift | maxShift | 1.0
API: distanceToCity | maxDistanceToNearestCity | 0.86842105263157
SUBSTR: numberOfBedrooms | numberOfBedrooms | 1.0
API: maxDistanceToCity | maxDistanceToNearestCity | 0.94878048780487
API: minBedrooms | numberOfBedrooms | 0.7165090622537431
API: start | startingDay | 0.8875
API: Booking | CottageBookingService | 0.75
SUBSTR: bookerName | bookerName | 1.0
SUBSTR: City | nearestCity | 0.5333333333333333
API: hasBooker | bookerName | 0.7364243943191311
API: maxBookingDays | bookingNumber | 0.629948914431673
SUBSTR: nearestCity | nearestCity | 1.0
API: minPlaces | numberOfPlaces | 0.6533426834969611
SUBSTR: distanceToLake | maxDistanceToLake | 0.903225806516129
API: nearestCityName | nearestCity | 0.9538461538461538
SUBSTR: hasCottage | CottageBookingService | 0.4516129032580644
API: Cottage | CottageBookingService | 0.85
API: CottageSearchResponse | CottageBookingService | 0.5674418604651164
SUBSTR: bookingNumber | bookingNumber | 1.0
```

```
---- Substring similarity results ----
-- Classes --
Booker | CottageBookingService | 0.2962962962962963
CottageSearchRequest | ServiceRequest | 0.4117647058823529
Cottage | CottageBookingService | 0.5
Booking | CottageBookingService | 0.5
City | ServiceResult | 0.11764705882352941
CottageSearchResponse | CottageBookingService | 0.3333333333333333
-- Properties by classes --
-- [foreign class] -> [my class] --
Could not find proper class alignment for:
hasName | name | 0.7272727272727273
------------------------------------
CottageSearchRequest -> ServiceRequest :
maxDistanceToLake | maxDistanceToLake | 1.0
------------------------------------
CottageSearchRequest -> ServiceRequest :
startOfBooking | startingDay | 0.4
------------------------------------
CottageSearchRequest -> ServiceRequest :
minPlaces | numberOfPlaces | 0.5217391304347826
------------------------------------
CottageSearchRequest -> ServiceRequest :
bookerName | name | 0.5714285714285714
------------------------------------
CottageSearchRequest -> ServiceRequest :
nearestCityName | nearestCity | 0.8461538461538461
------------------------------------
CottageSearchRequest -> ServiceRequest :
maxDistanceToCity | maxDistanceToLake | 0.7647058823529411
------------------------------------
CottageSearchRequest -> ServiceRequest :
numberOfDays | numberOfDays | 1.0
------------------------------------
CottageSearchRequest -> ServiceRequest :
minBedrooms | numberOfBedrooms | 0.5925925925925926
------------------------------------
CottageSearchRequest -> ServiceRequest :
maxShift | maxShift | 1.0
------------------------------------
Could not find proper class alignment for:
distanceToLake | maxDistanceToLake | 0.9032258064516129
------------------------------------
Could not find proper class alignment for:
hasImage | imageURL | 0.625
------------------------------------
Could not find proper class alignment for:
numberOfPlaces | numberOfPlaces | 1.0
------------------------------------
Could not find proper class alignment for:
distanceToCity | maxDistanceToLake | 0.6451612903225806
------------------------------------
Could not find proper class alignment for:
hasAddress | address | 0.8235294117647058
------------------------------------
Could not find proper class alignment for:
numberOfBedrooms | numberOfBedrooms | 1.0
```

```
Could not find proper class alignment for:
maxBookingDays | bookingNumber | 0.5185185185185185
------------------------------------
Could not find proper class alignment for:
nearestCity | nearestCity | 1.0
------------------------------------
Could not find proper class alignment for:
bookingNumber | bookingNumber | 1.0
------------------------------------
Could not find proper class alignment for:
start | startingDay | 0.625
------------------------------------
Could not find proper class alignment for:
end | actualEndDate | 0.375
------------------------------------
Could not find proper class alignment for:
hasCottage | CottageBookingService | 0.45161290322580644
------------------------------------
Could not find proper class alignment for:
hasBooker | bookerName | 0.631578947368421
------------------------------------
Could not find proper class alignment for:
distanceToLake | maxDistanceToLake | 0.9032258064516129
------------------------------------
Could not find proper class alignment for:
bookingNumber | bookingNumber | 1.0
------------------------------------
Could not find proper class alignment for:
hasImage | imageURL | 0.625
------------------------------------
Could not find proper class alignment for:
start | startingDay | 0.625
------------------------------------
Could not find proper class alignment for:
bookerName | bookerName | 1.0
------------------------------------
Could not find proper class alignment for:
nearestCityName | nearestCity | 0.8461538461538461
------------------------------------
Could not find proper class alignment for:
end | actualEndDate | 0.375
------------------------------------
Could not find proper class alignment for:
numberOfPlaces | numberOfPlaces | 1.0
------------------------------------
Could not find proper class alignment for:
distanceToCity | maxDistanceToLake | 0.6451612903225806
------------------------------------
Could not find proper class alignment for:
hasAddress | address | 0.8235294117647058
------------------------------------
Could not find proper class alignment for:
numberOfBedrooms | numberOfBedrooms | 1.0
------------------------------------
```