

A Personalized Approach to Experience-Aware Service Ranking and Selection

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Motivation





Motivation



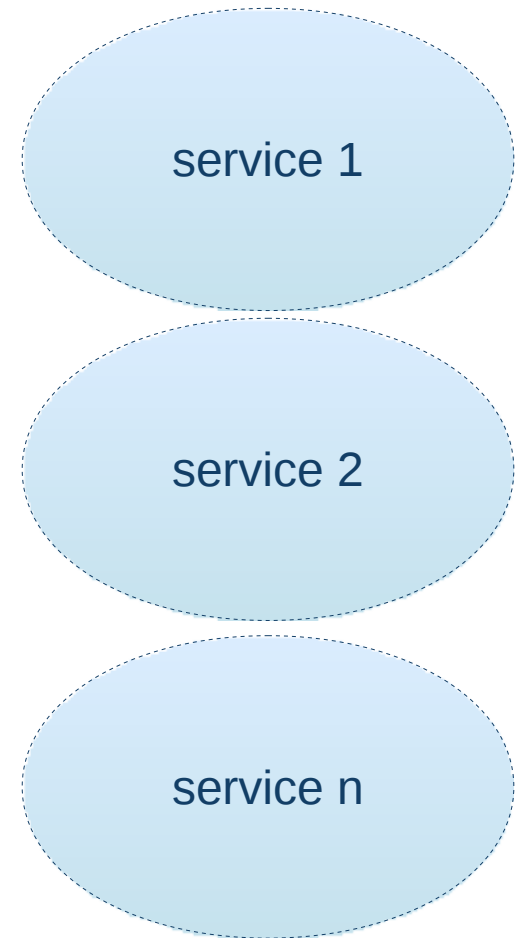
I'm looking for a mp3-file ...
... that contains the song „Over the rainbow“
... interpreter == „Stan Getz“
... encoder == LAME
... BitRate ~>= 128kbit/s
... size ~<= 3mb
... price < 1Euro



Motivation



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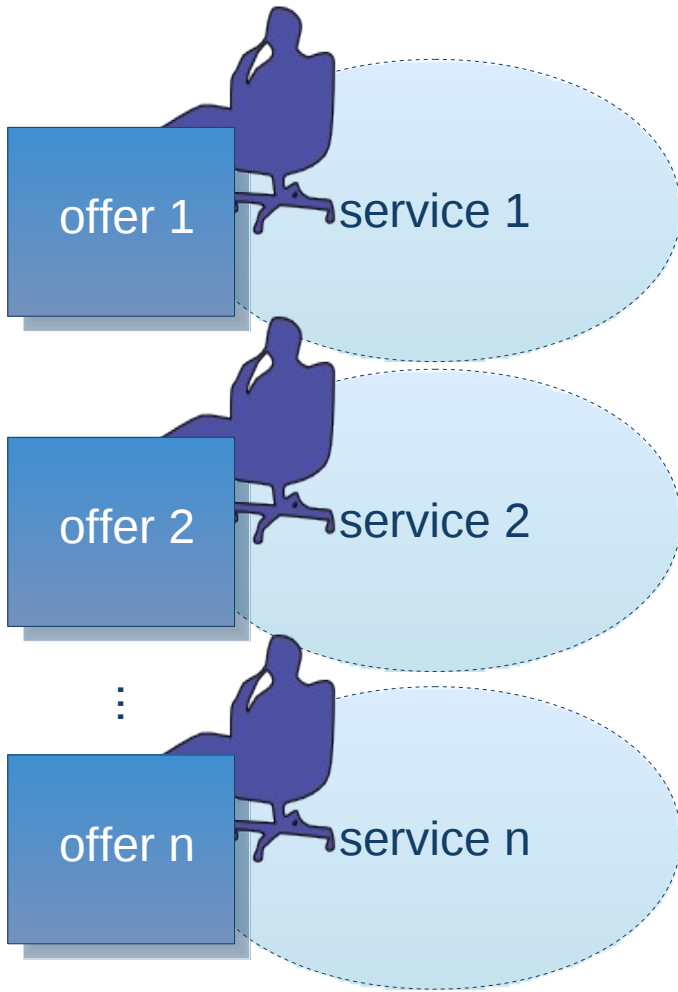


Motivation



request

I'm looking for a mp3-file ...
... that contains the song „Over the rainbow“
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offer 1

service 1

offer 2

service 2

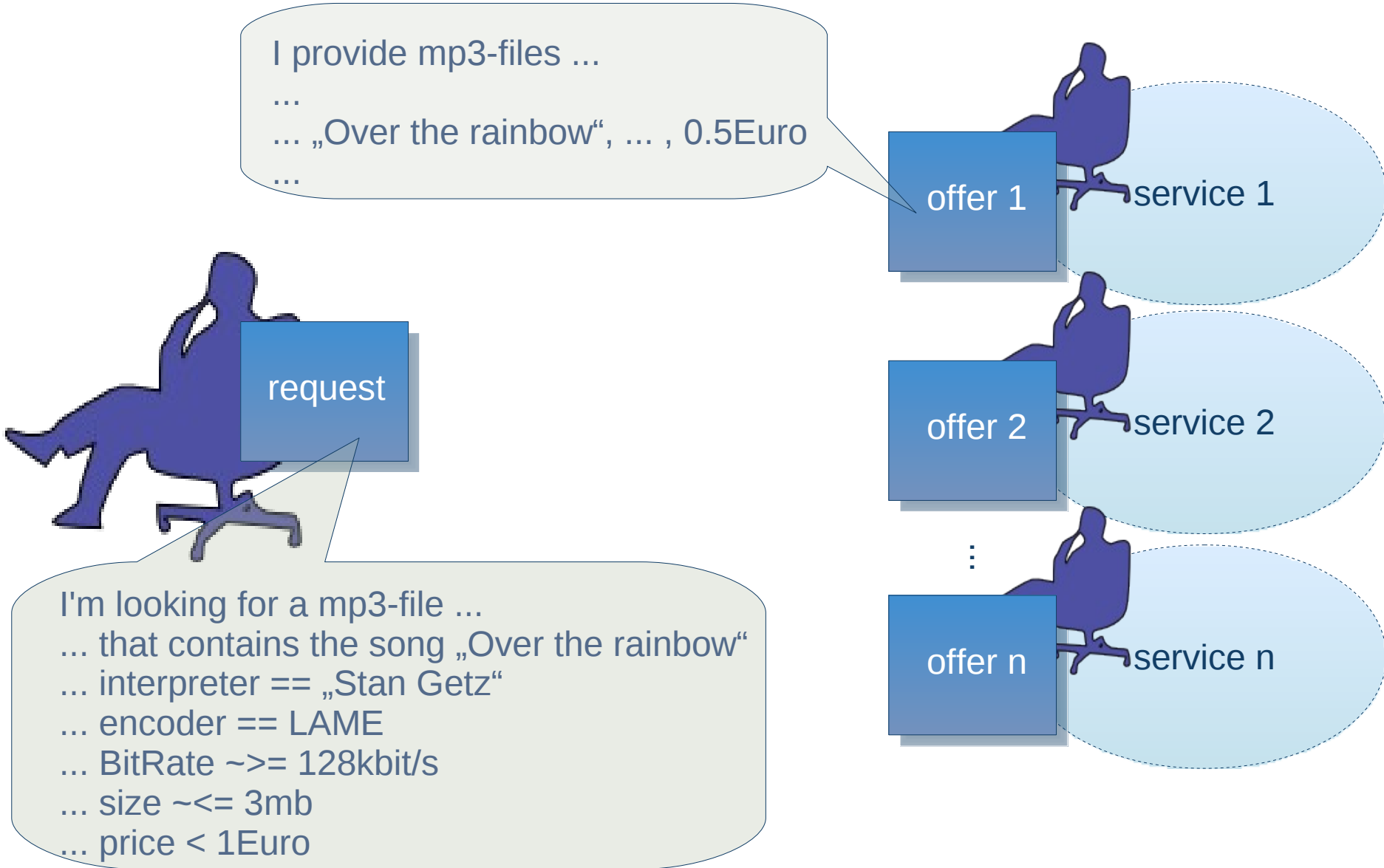
⋮

offer n

service n

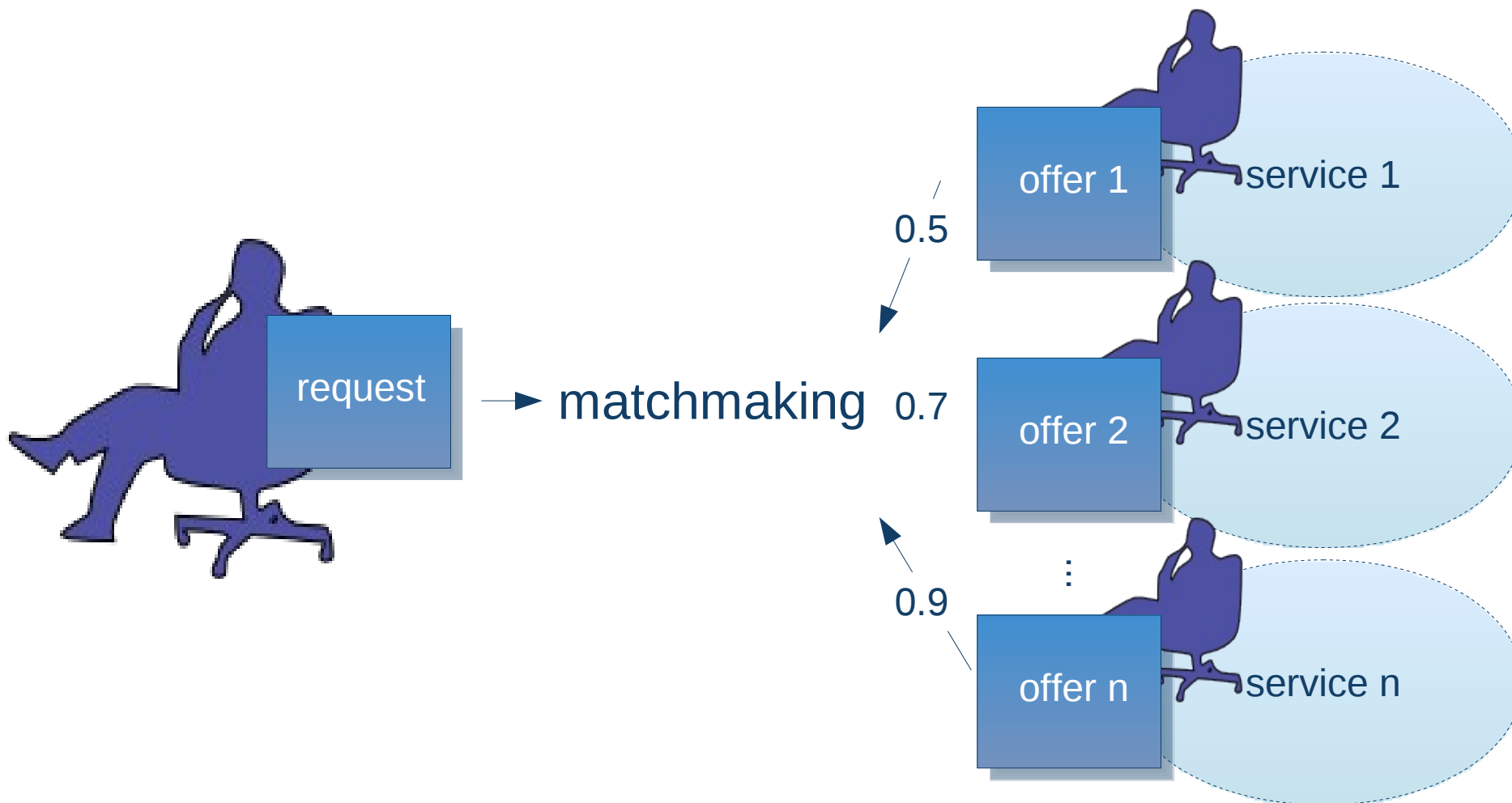


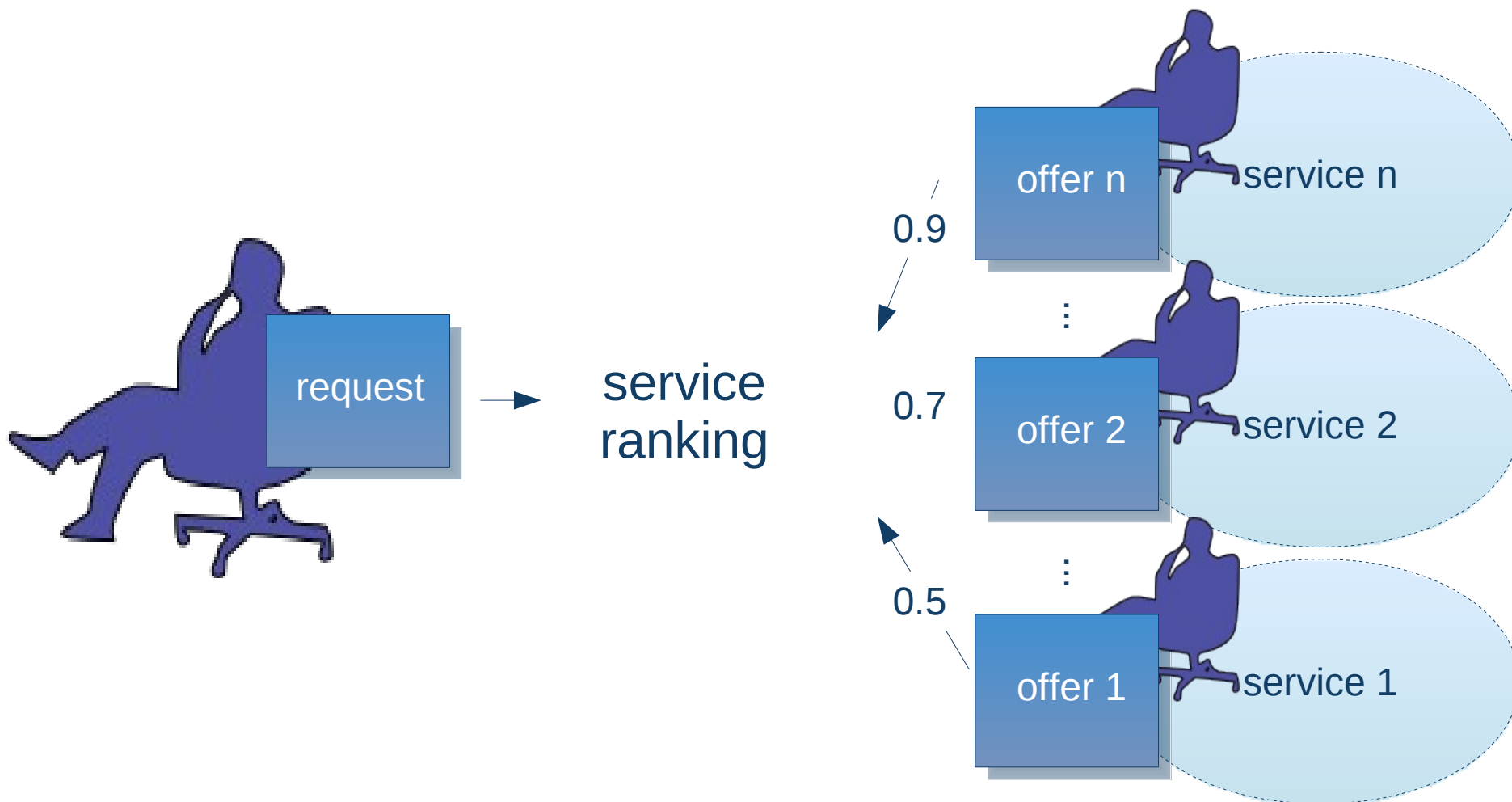
Motivation





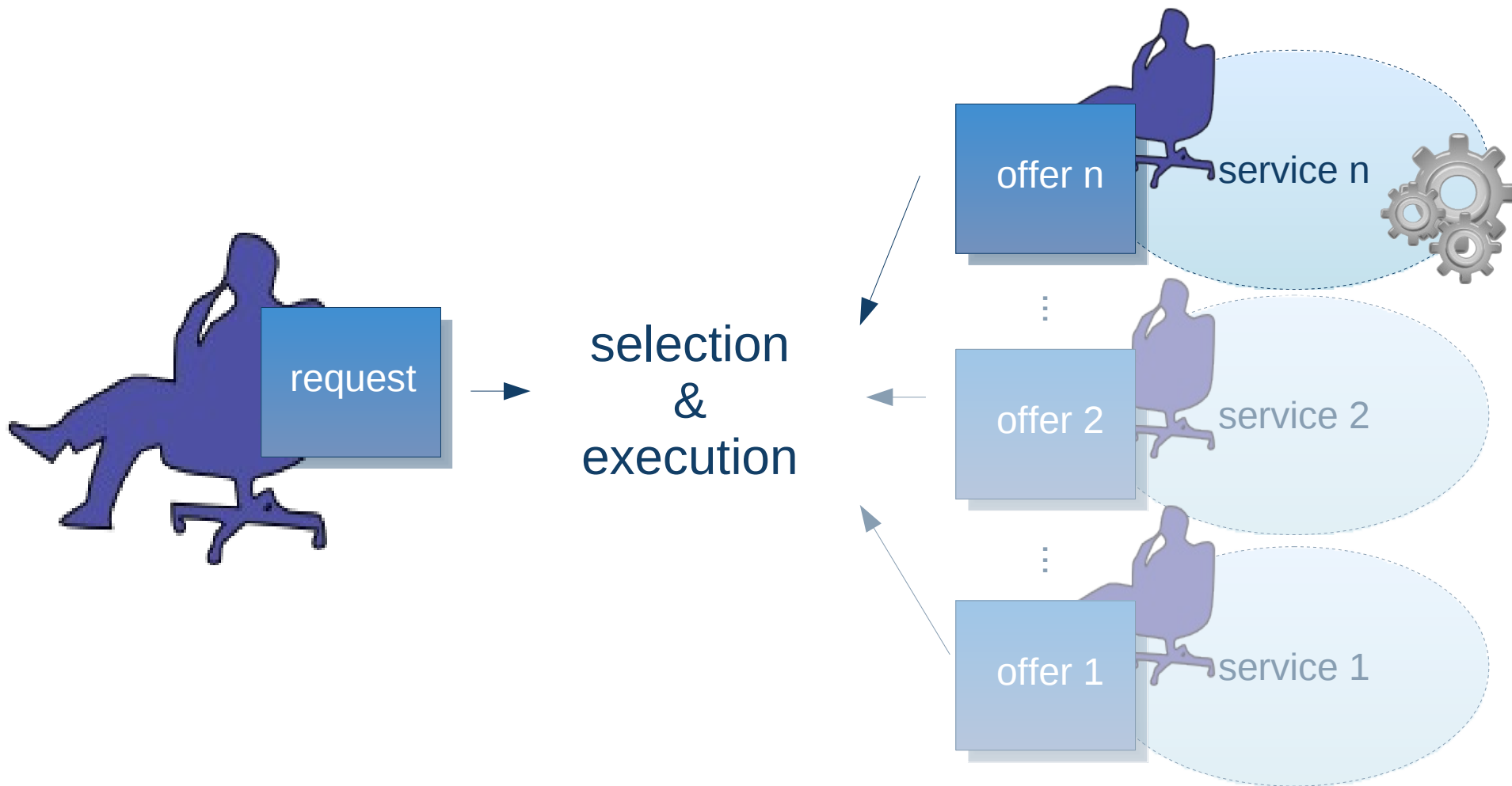
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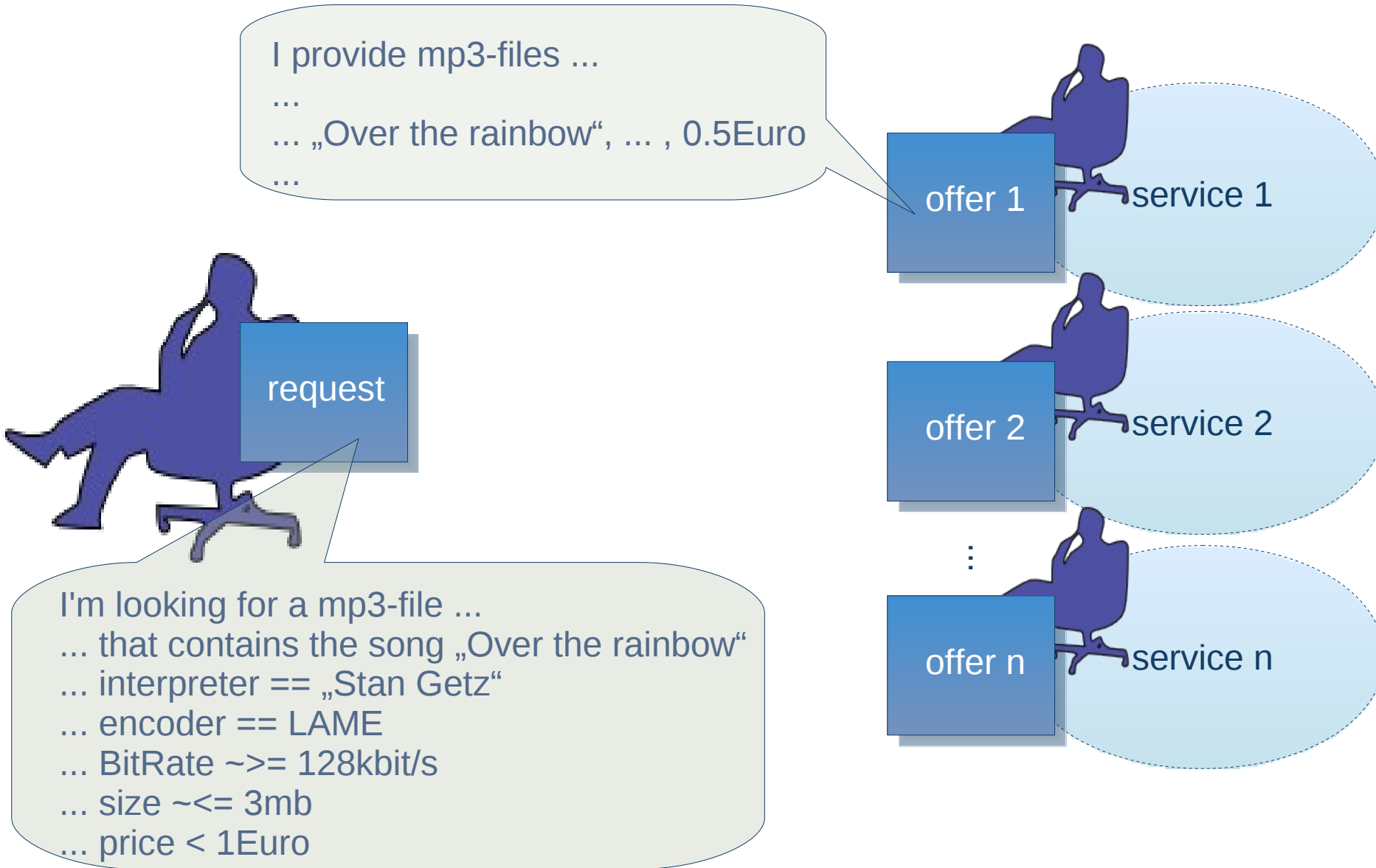


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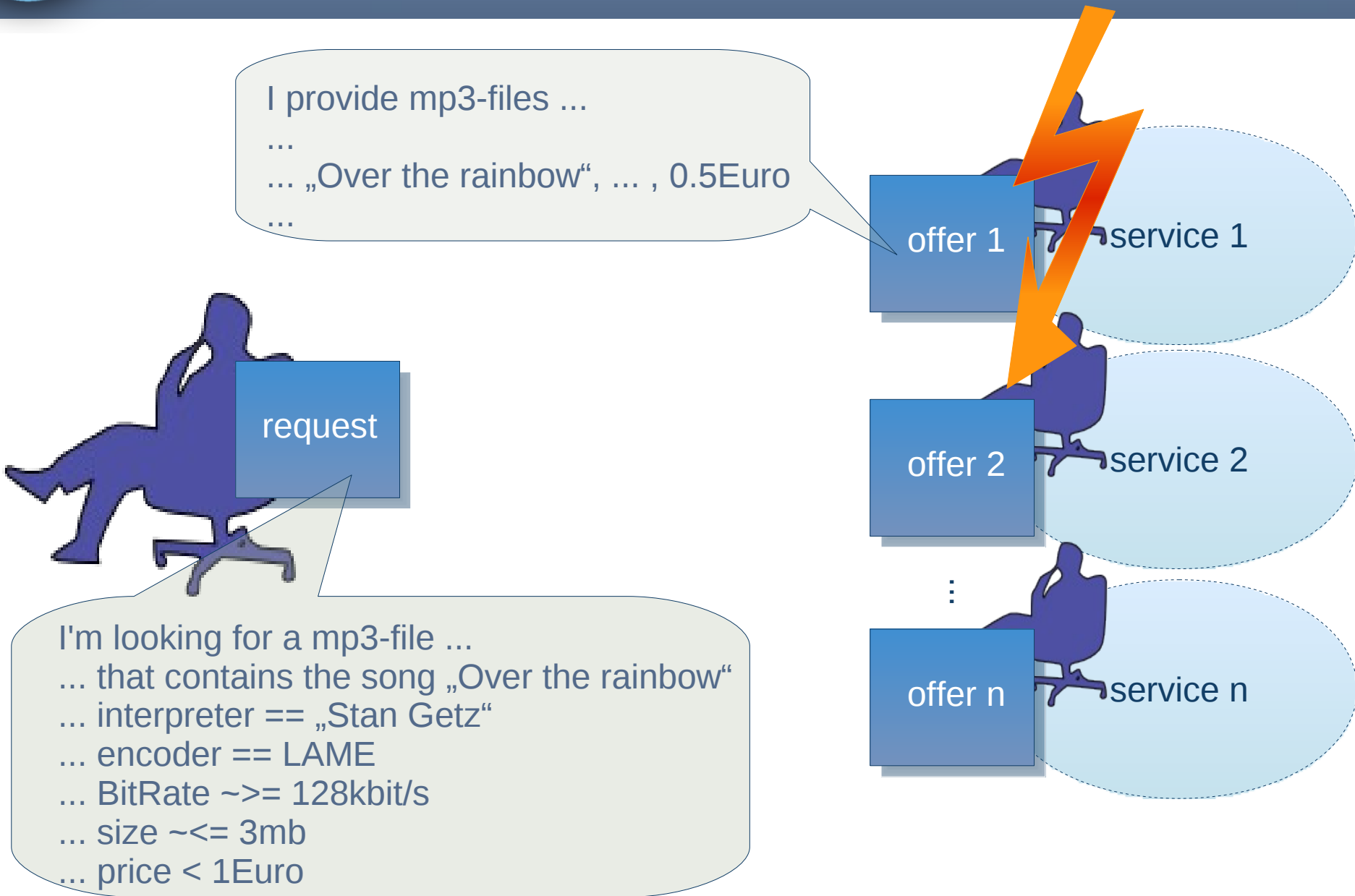


Motivation



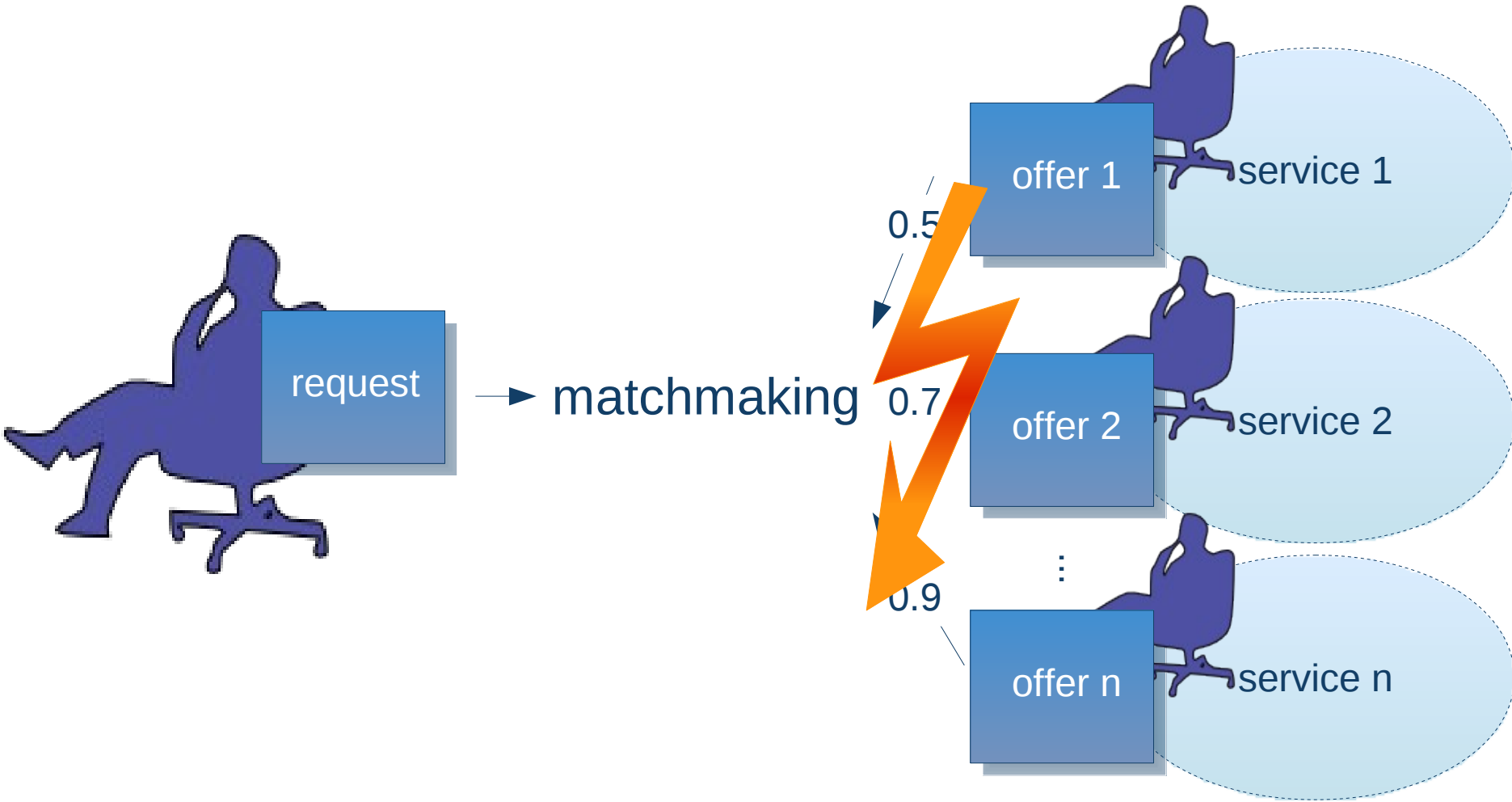


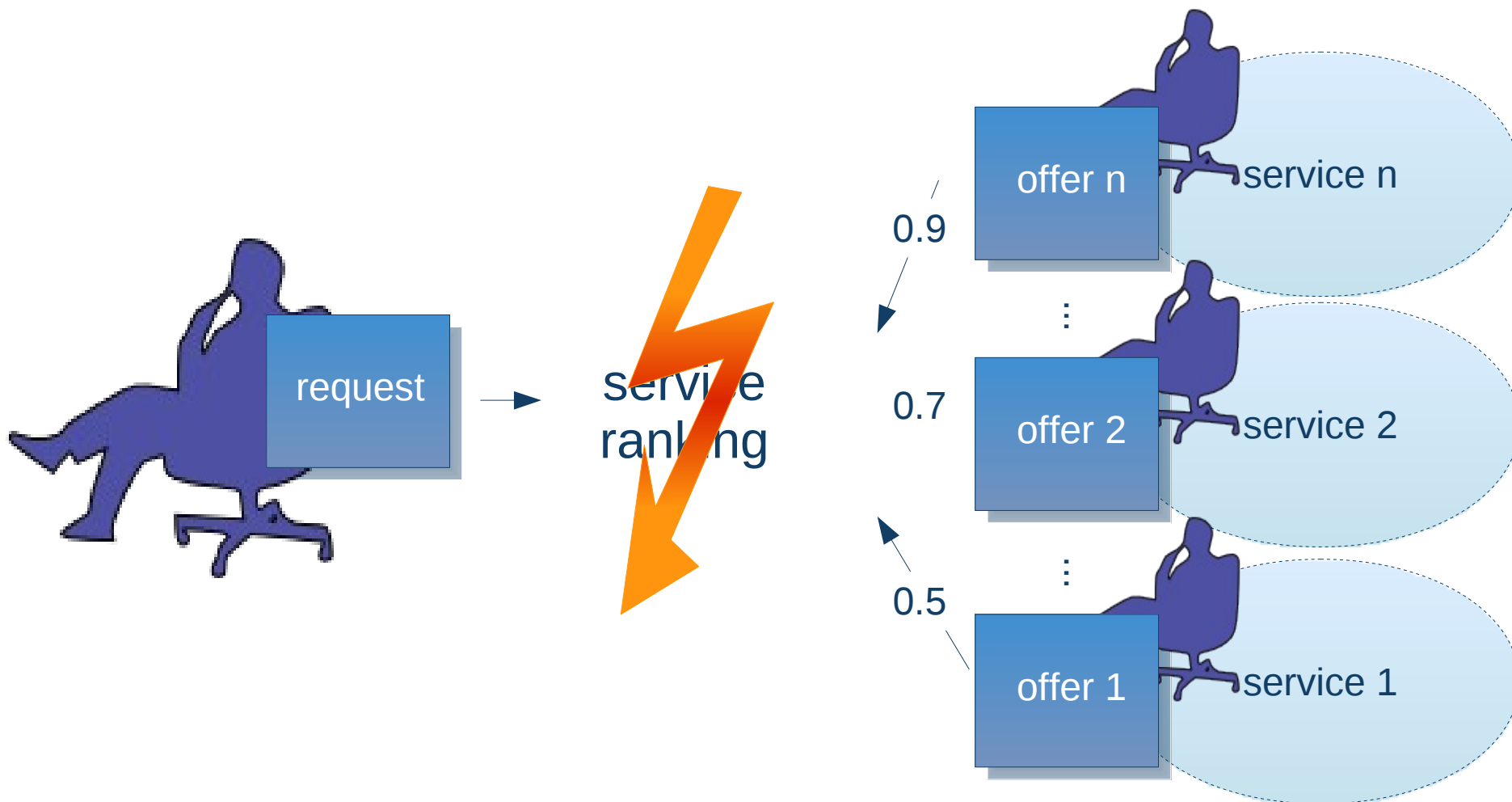
Motivation





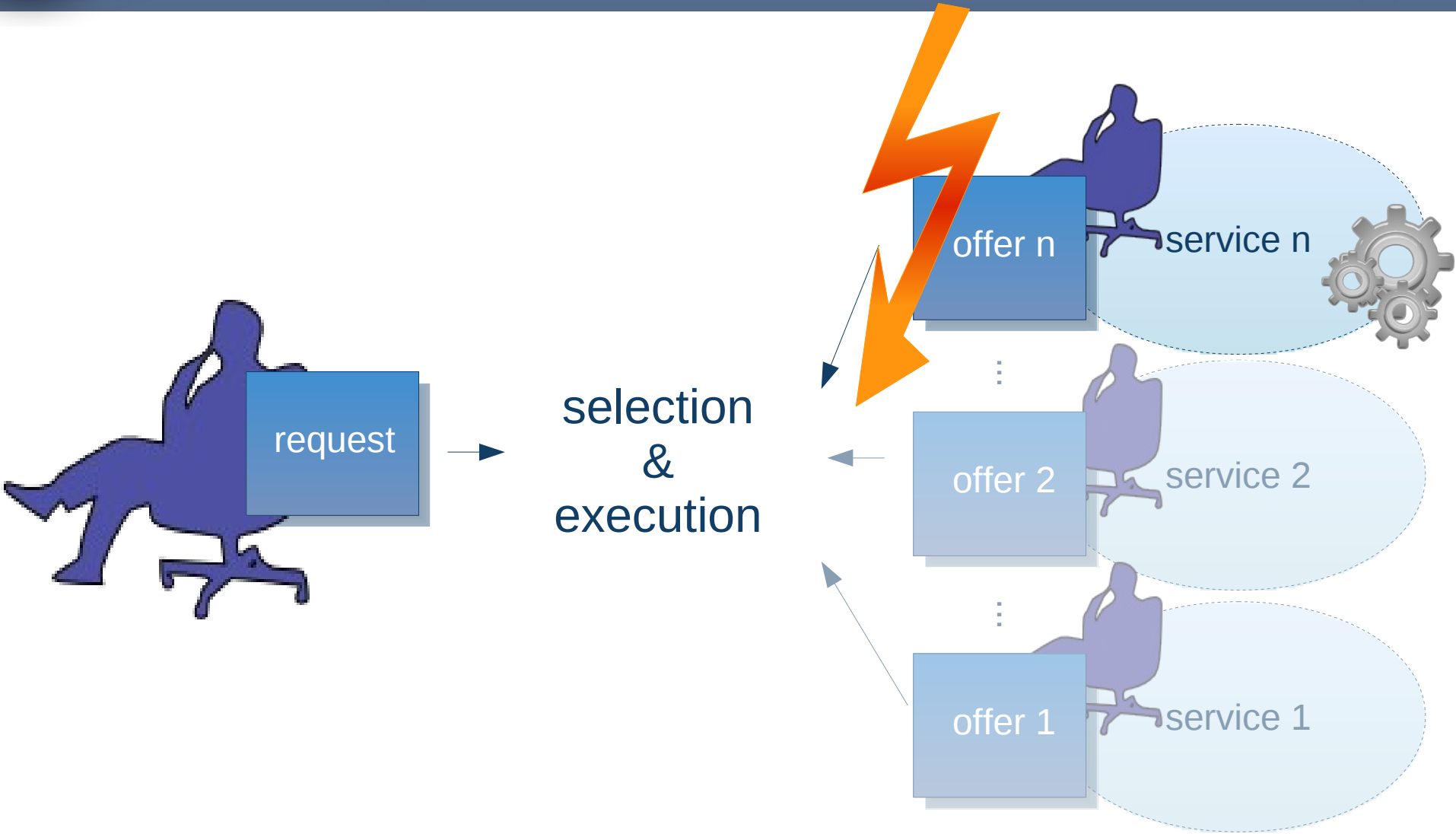
Motivation







Motivation





Agenda

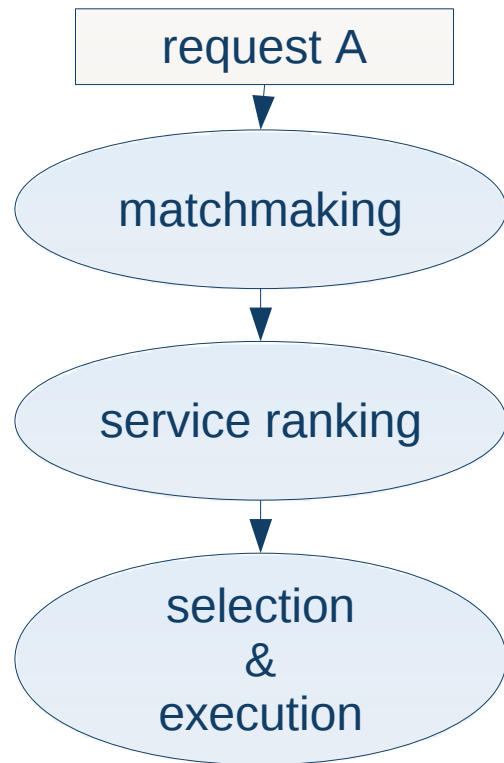
- 1) Motivation
- 2) Main Idea
- 3) Details
- 4) Evaluation
- 5) Conclusion

Main Idea

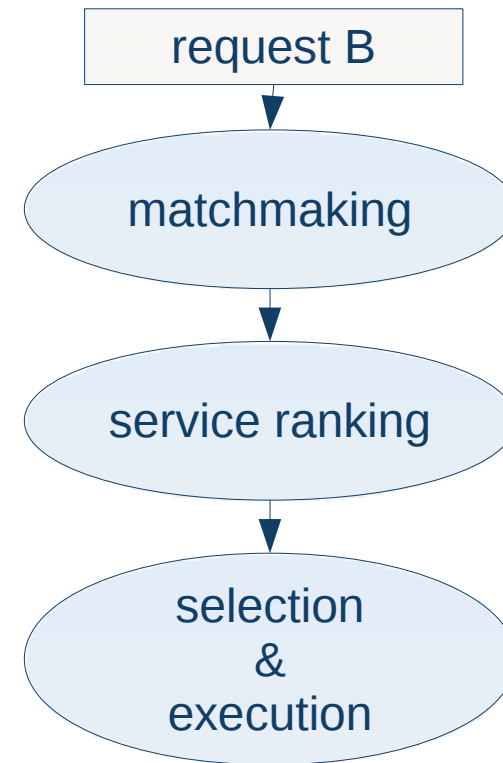


Main Idea

Consumer A



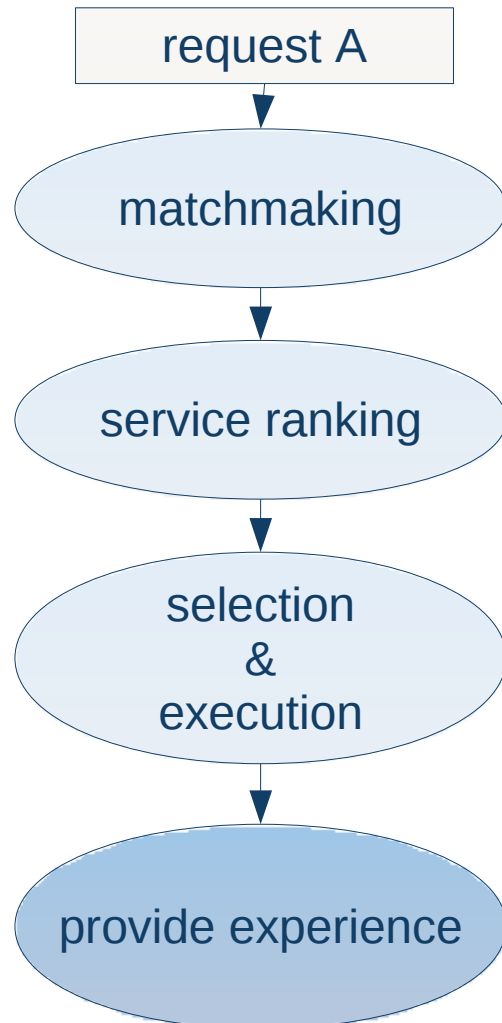
Consumer B



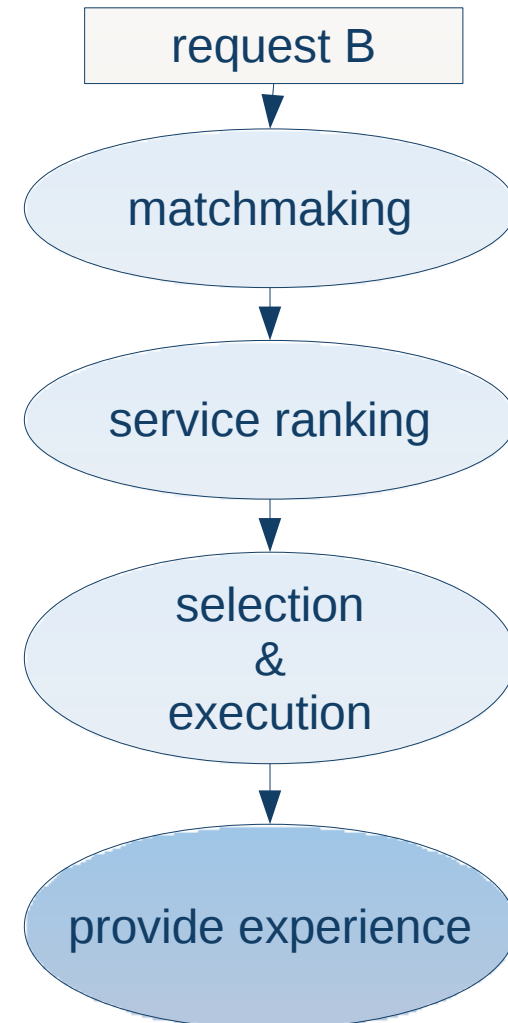


Main Idea

Consumer A

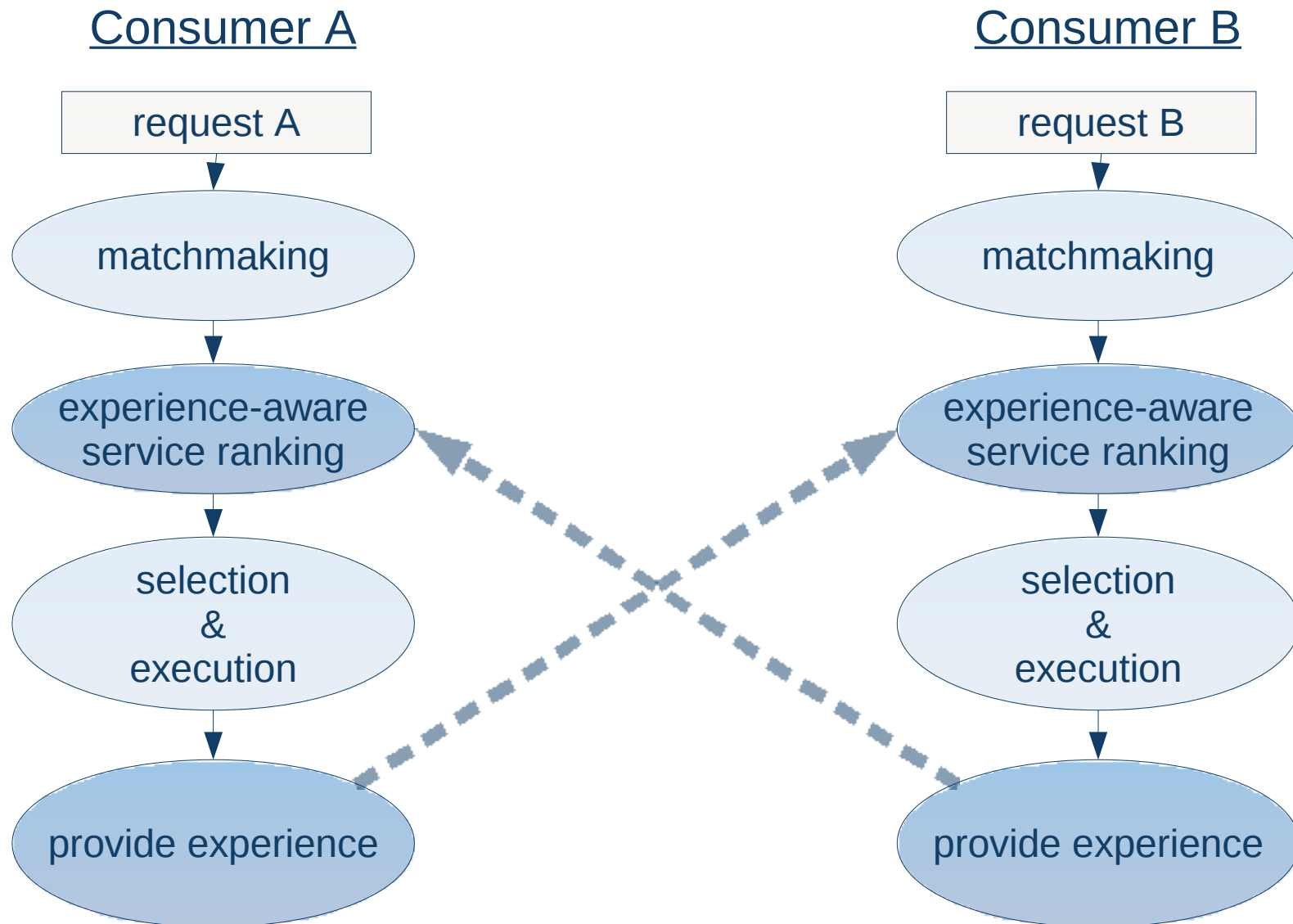


Consumer B





Main Idea





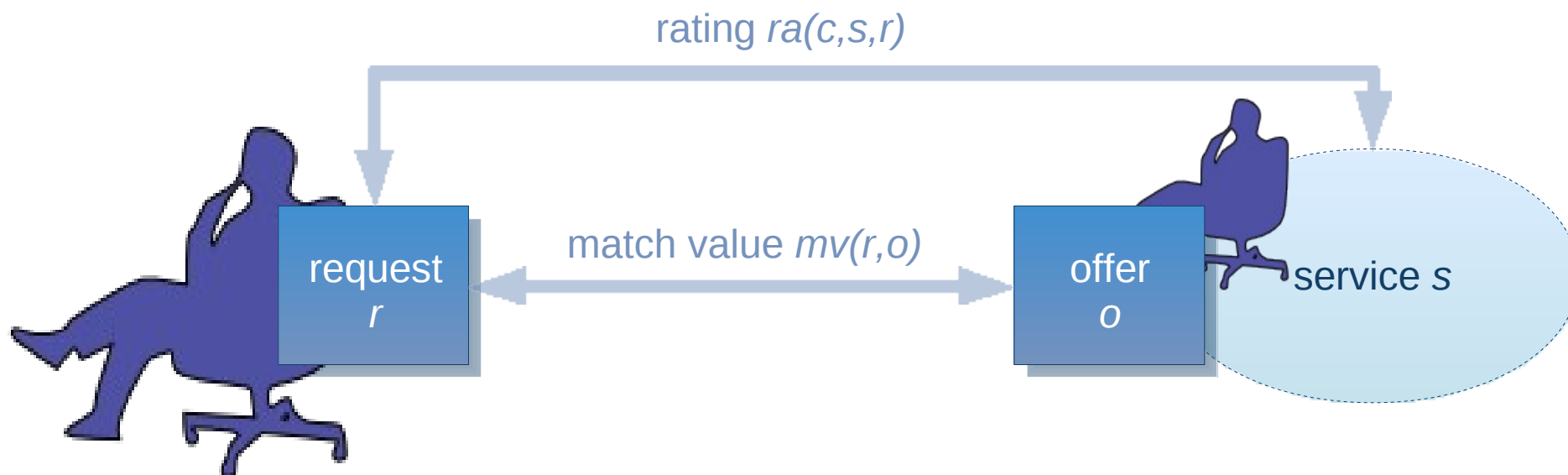
Main Idea

- ▶ approach provides
 - ▶ a measure of offer conformance
 - ▶ a definition of relevance and a mean to determine relevant experiences
 - ▶ a method to predict future offer conformance of a service provider
 - ▶ a ranking algorithm

Details



Offer Conformance



$$oc(c, s, r, o) = \begin{cases} \frac{ra(c,s,r)}{mv(r,o)} & \text{if } mv(r,o) \geq ra(c,s,r) \\ 1 & \text{otherwise} \end{cases}$$



Relevance of Experiences

- ▶ The experience e is relevant for the prediction of provider p 's offer conformance w.r.t. the request r ,
 - ▶ if e refers to a service stemming from p .
 - ▶ It is the more relevant, the more similar r and the request, e is based on, are.

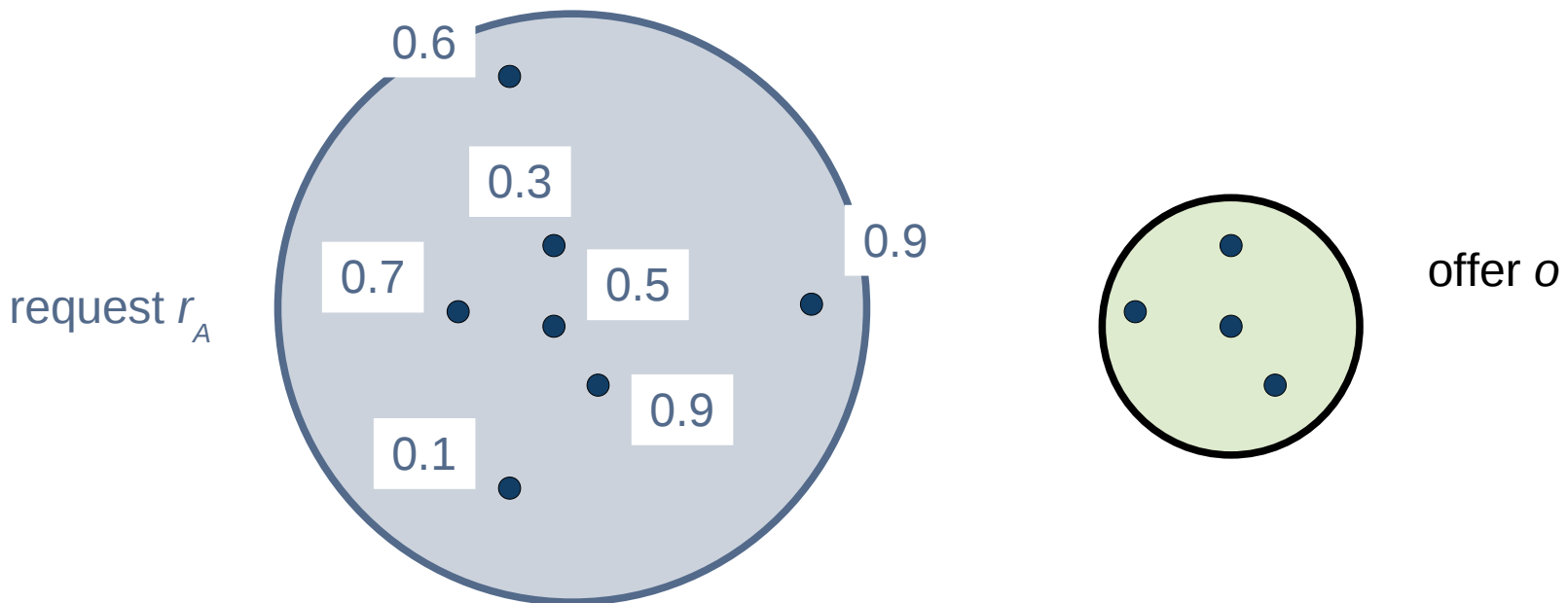


Determining Relevant Experiences

- ▶ The experience e is relevant for the prediction of provider p 's offer conformance w.r.t. the request r ,
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 - ✗ It is the more relevant, the more similar r and the request, e is based on, are.

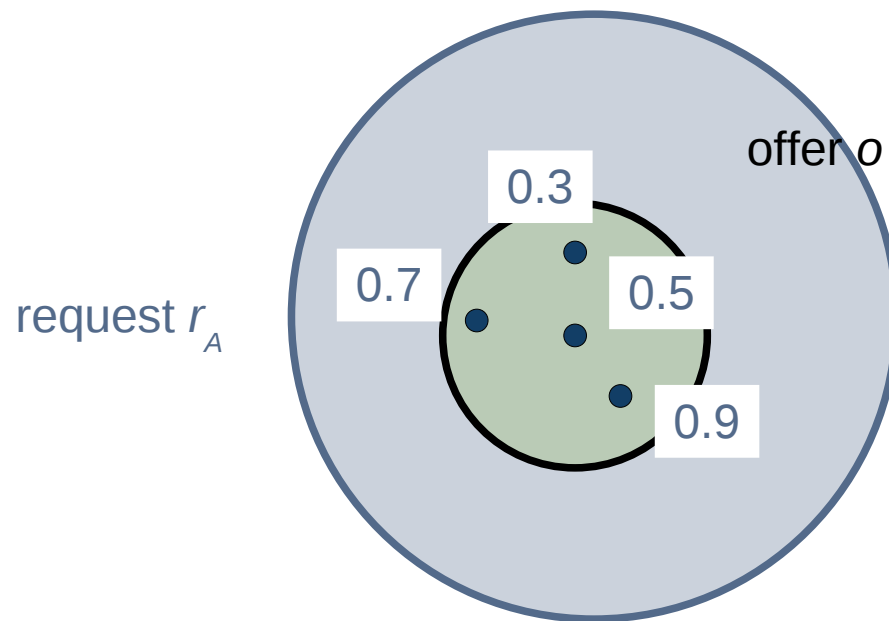


Assumptions





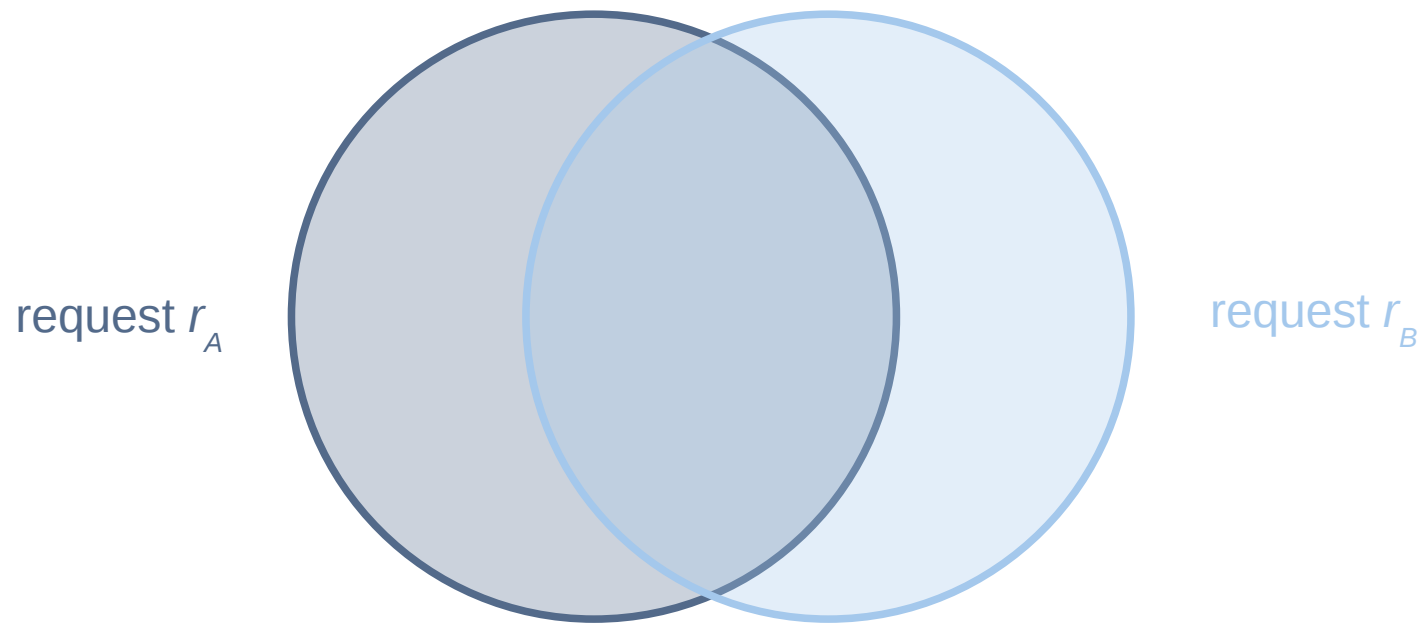
Assumptions



$$mv(r_A, o) = 0.3$$

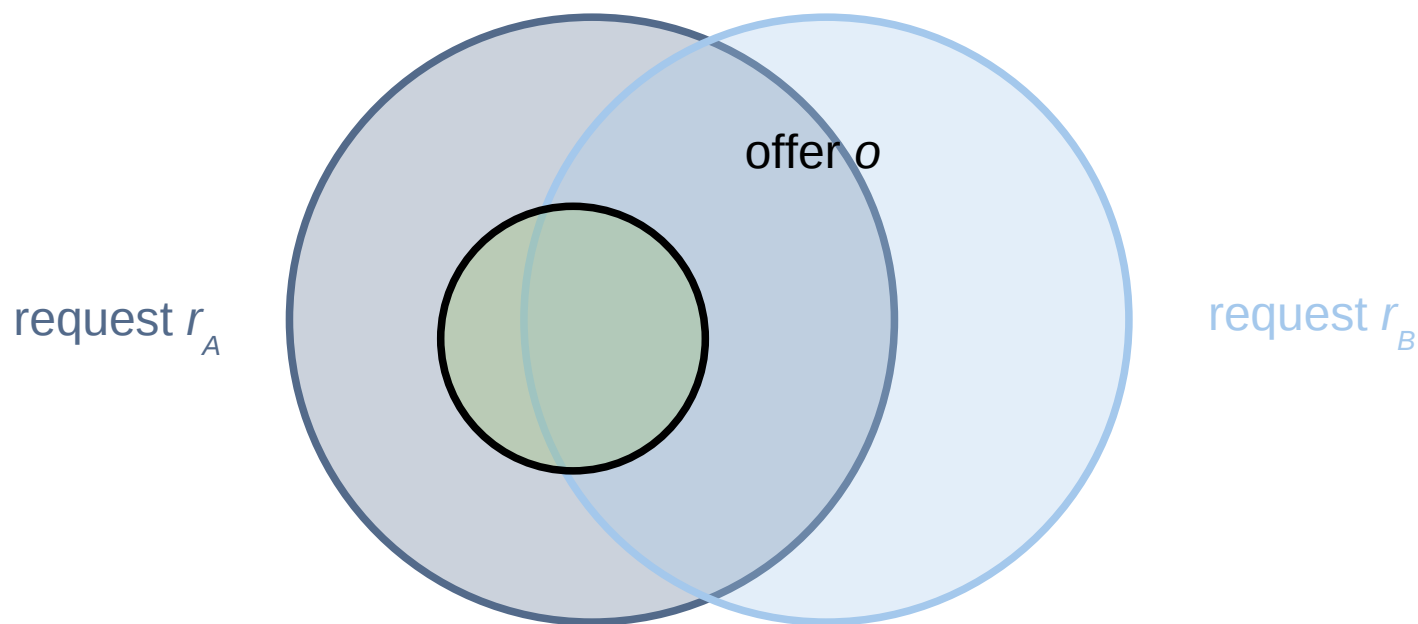


Approximating Request Similarity



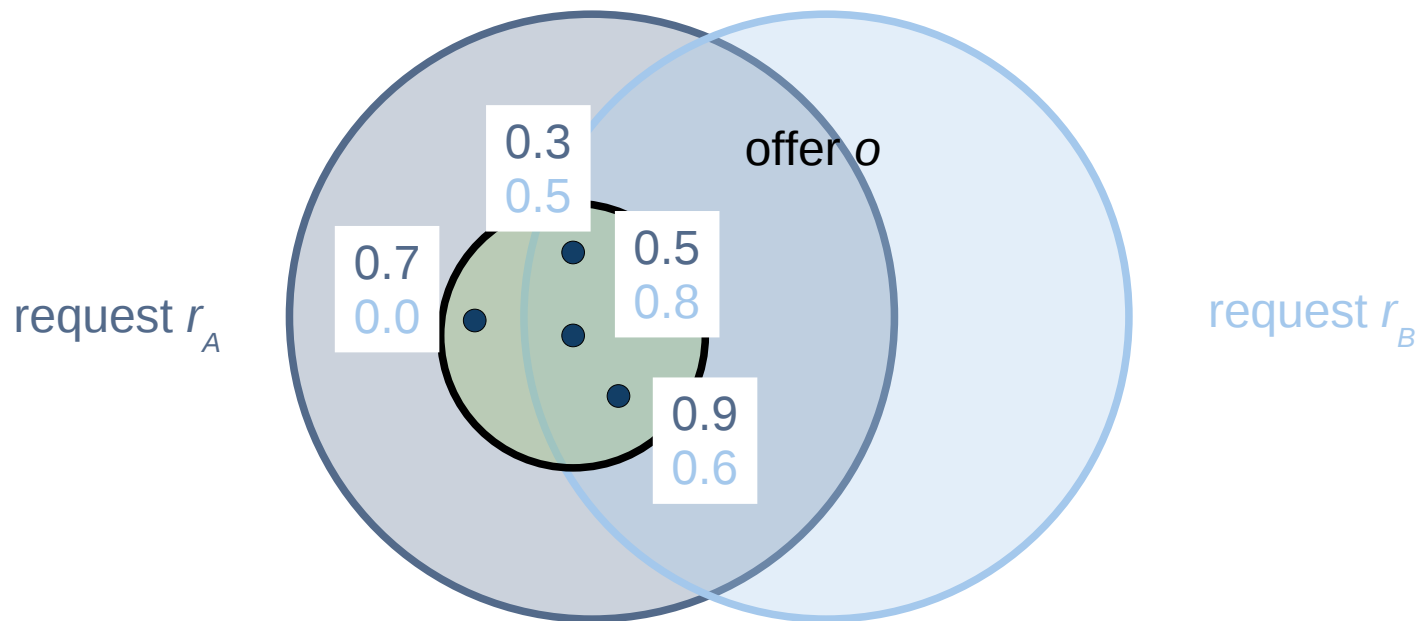


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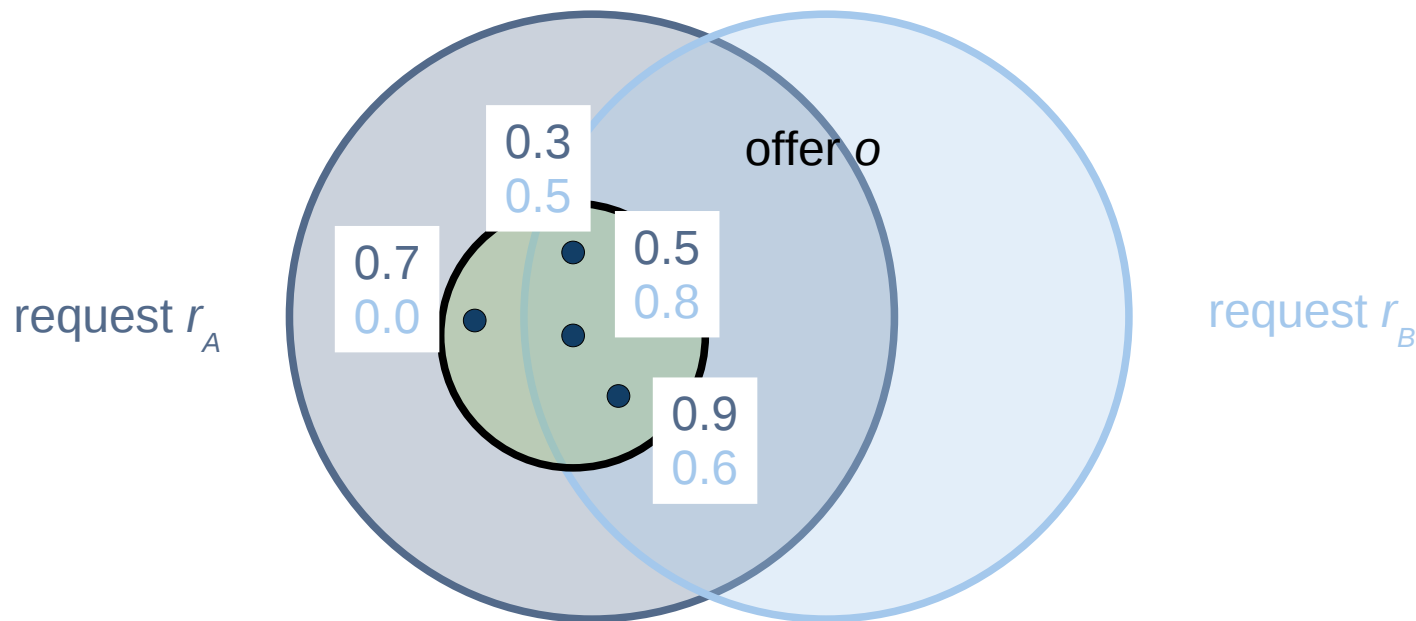


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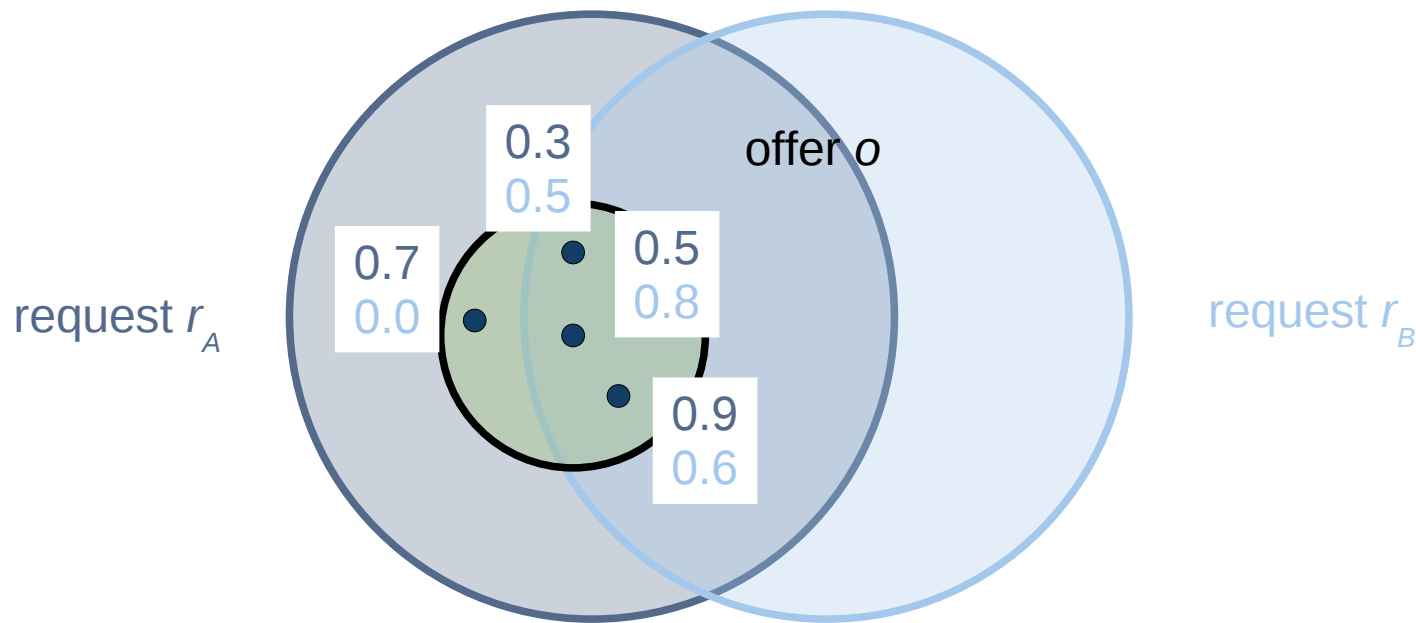


$$mv(r_A, o) = 0.3$$

$$mv(r_B, o) = 0.0$$



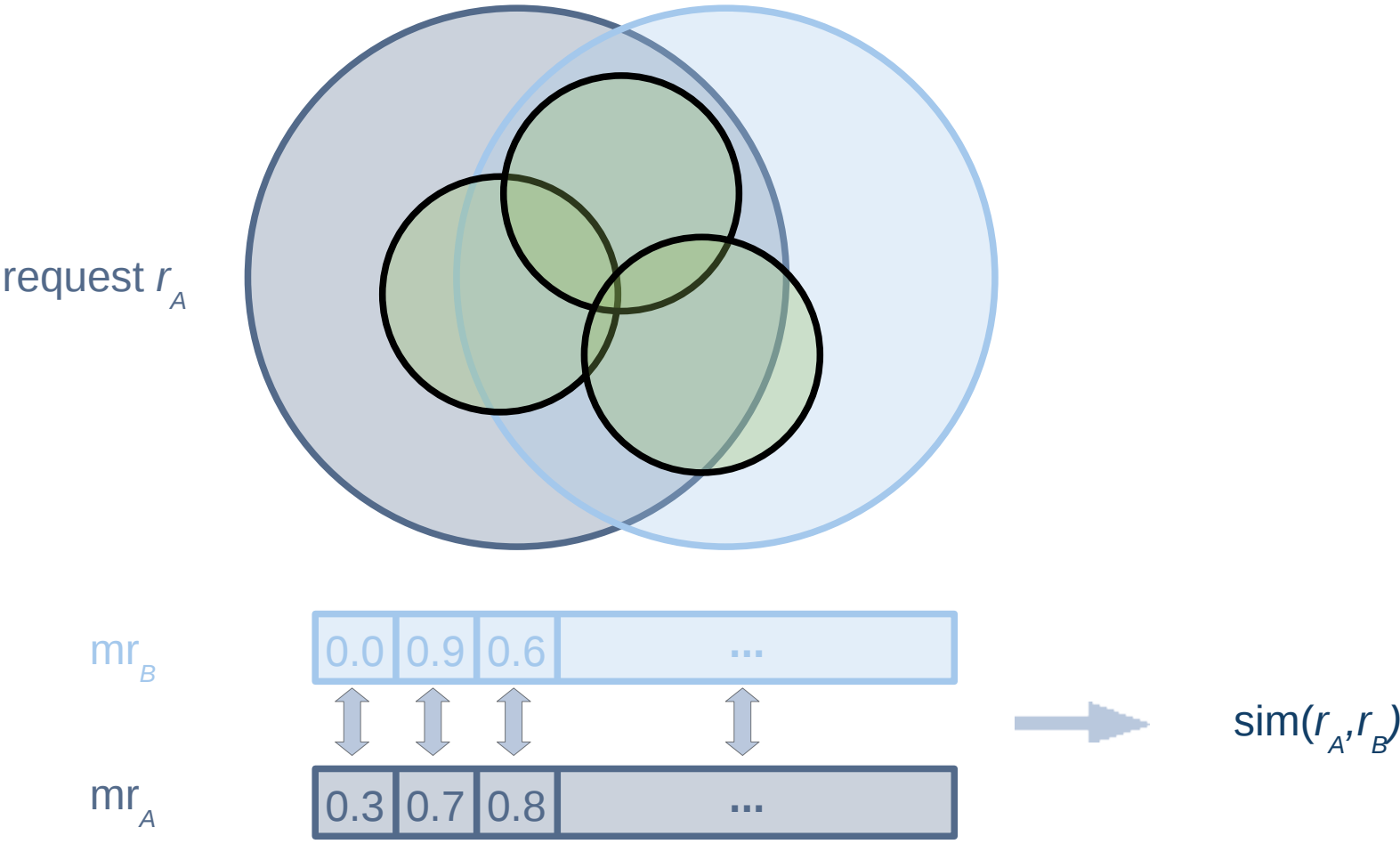
Approximating Request Similarity



$$mv(r_A, o) = 0.3 \iff mv(r_B, o) = 0.0$$

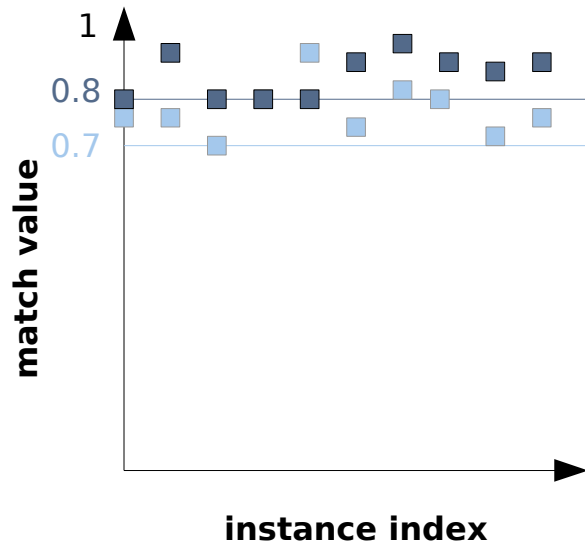


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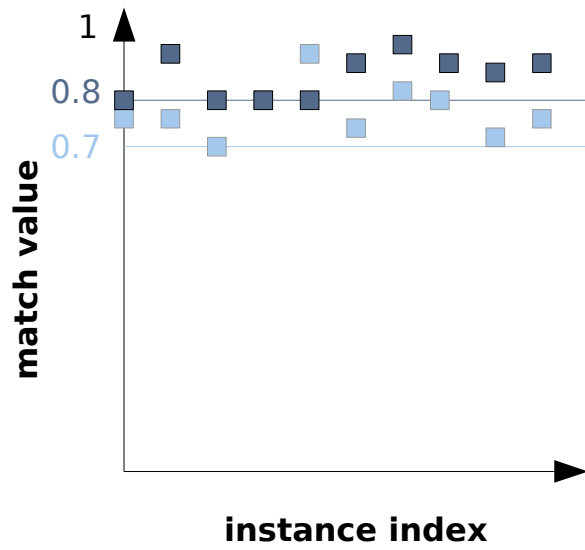


Approximating Request Similarity





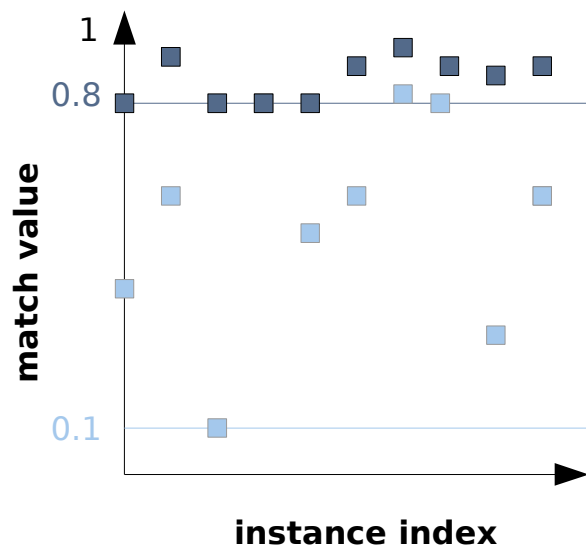
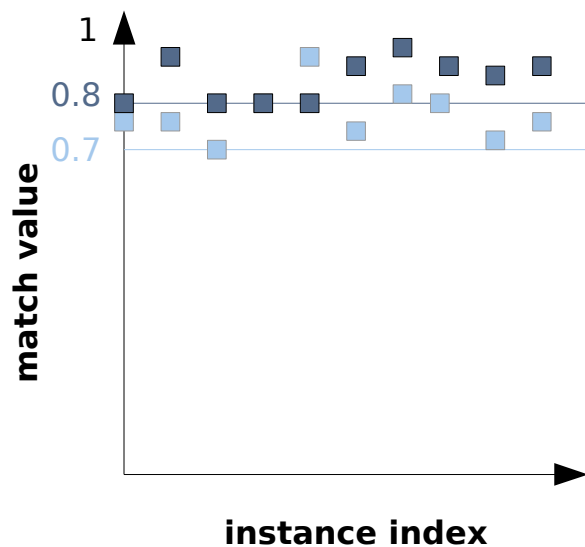
Approximating Request Similarity



similarity



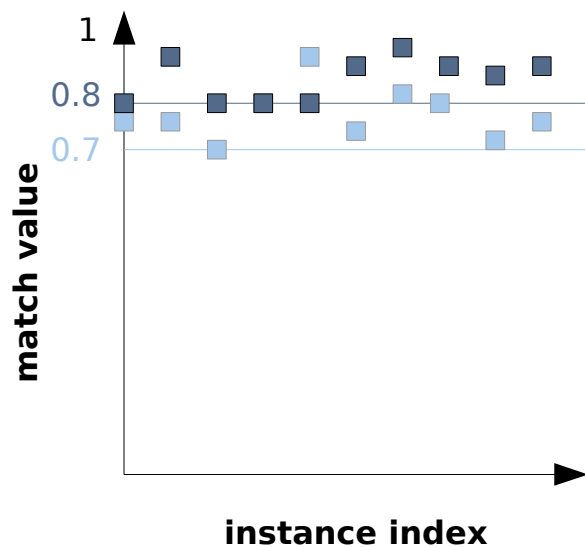
Approximating Request Similarity



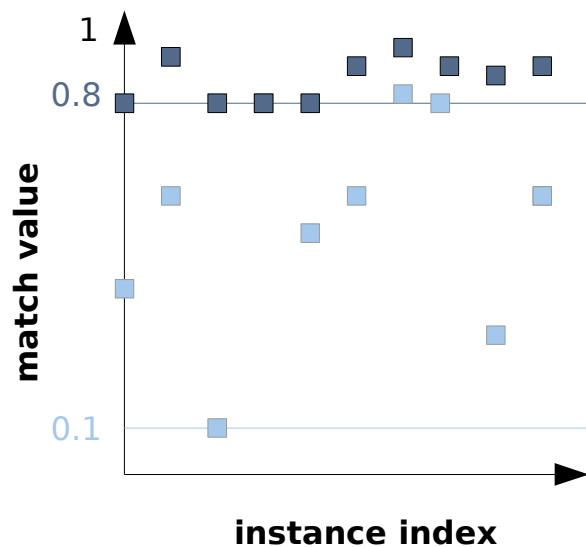
similarity



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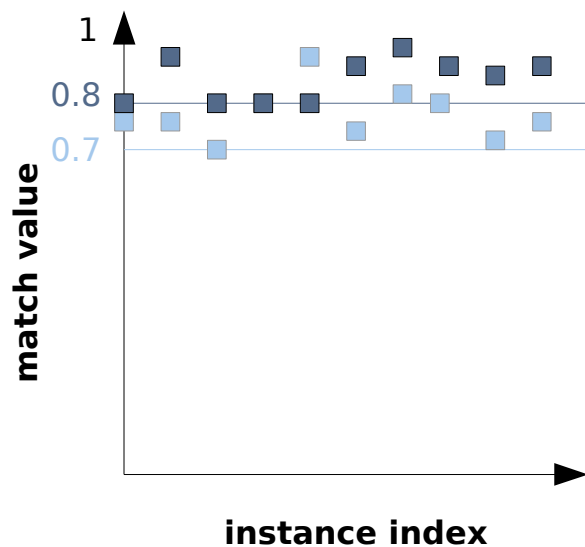
similarity



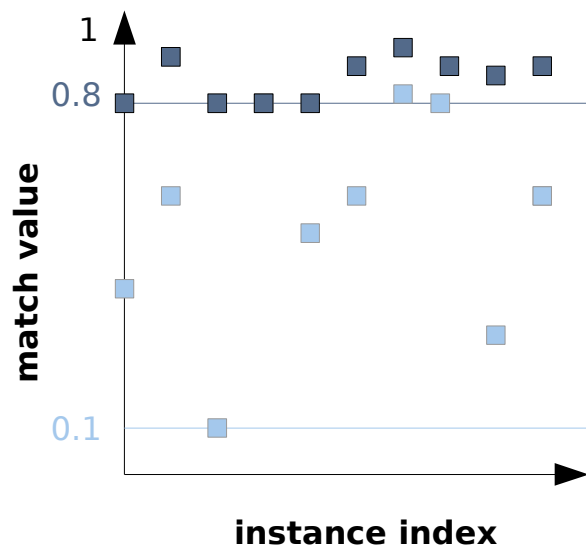
dissimilarity



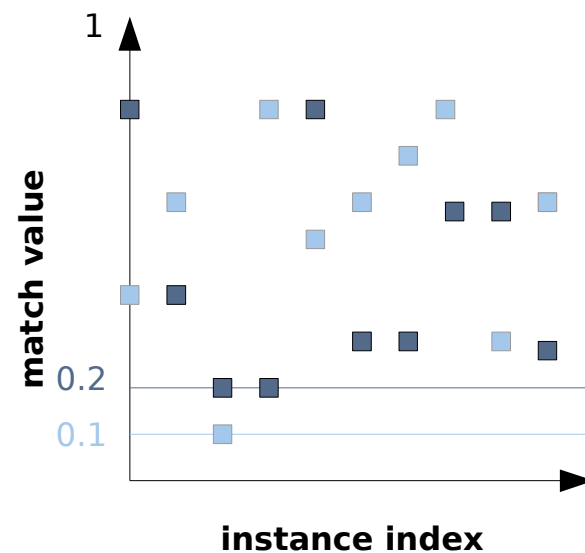
Approximating Request Similarity



similarity

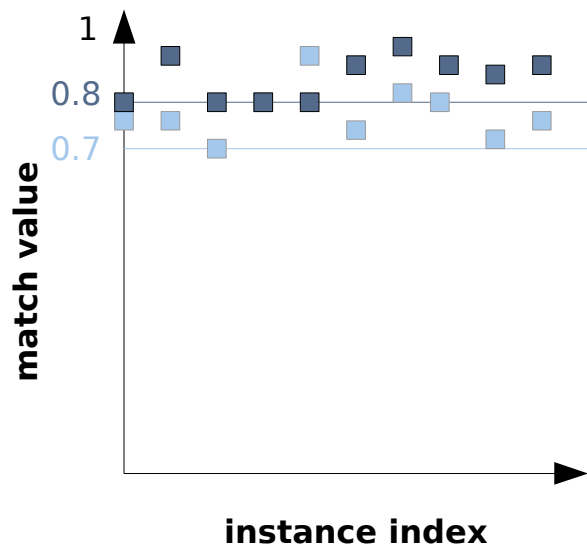


dissimilarity

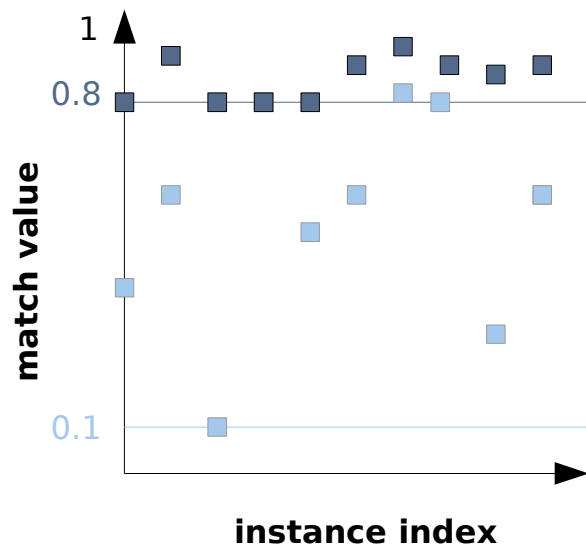




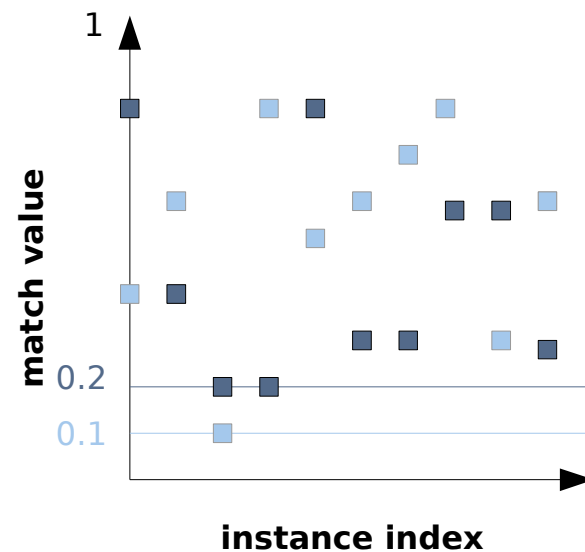
Approximating Request Similarity



similarity



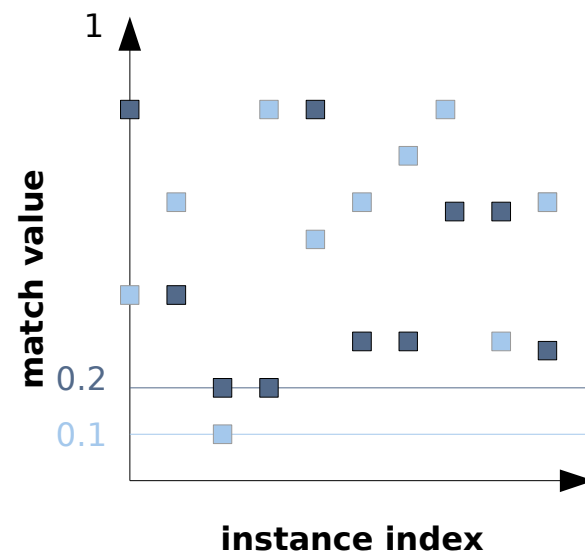
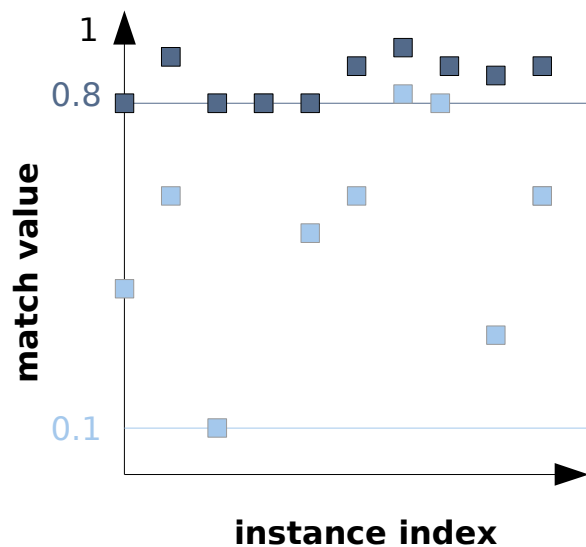
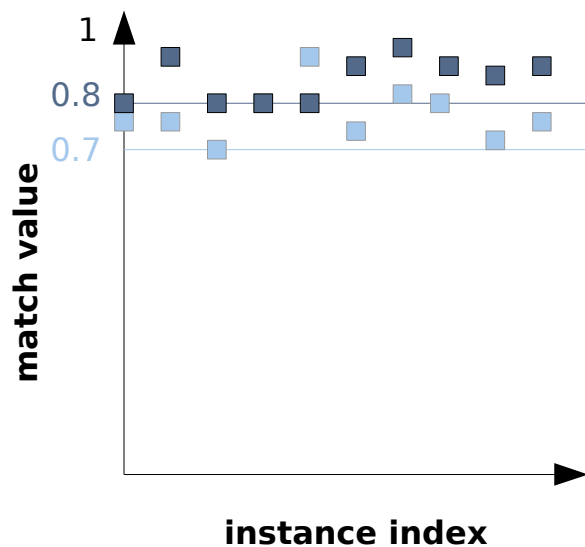
dissimilarity



?



Approximating Request Similarity



meaningful, if at least one match value is reasonably high



Approximating Request Similarity

Algorithm 2 ApproximateSimilarity(*minimalMV*, *threshold*, *mr_A*, *mr_B*)

```
1: sumOfDeviations = 0;
2: sumOfWeights = 0;
3: for (i < mrA.length) do
4:   maximum = max(mrA[i], mrB[i]);
5:   if (maximum ≥ minimalMV) then
6:     maximum = maximum2;
7:     sumOfDeviations += | mrA[i] - mrB[i] | · maximum;
8:     sumOfWeights += maximum;
9:   end if
10: end for
11: if (sumOfWeights ≥ threshold) and (sumOfWeights > 0) then
12:   return 1-(sumOfDeviations/sumOfWeights);
13: else
14:   return 0;
15: end if
```



Offer Conformance Prediction

$$oc_p(r) = \begin{cases} \frac{\sum_{i \in E_{rel}(p,r)} w(i) \cdot oc(i)}{\sum_{i \in E_{rel}(p,r)} w(i)} & \text{if } E_{rel}(p,r) \neq \emptyset \\ 0 & \text{otherwise} \end{cases}$$

$$w(i) = w_a(\text{age}(i)) \cdot \text{sim}_{approx}(r_i, r)$$

$$\text{conf}(oc_p(r)) = \begin{cases} f(|E_{rel}(p,r)|, \min_{i \in E_{rel}(p,r)} w(i)) & \text{if } E_{rel}(p,r) \neq \emptyset \\ 0 & \text{otherwise,} \end{cases}$$

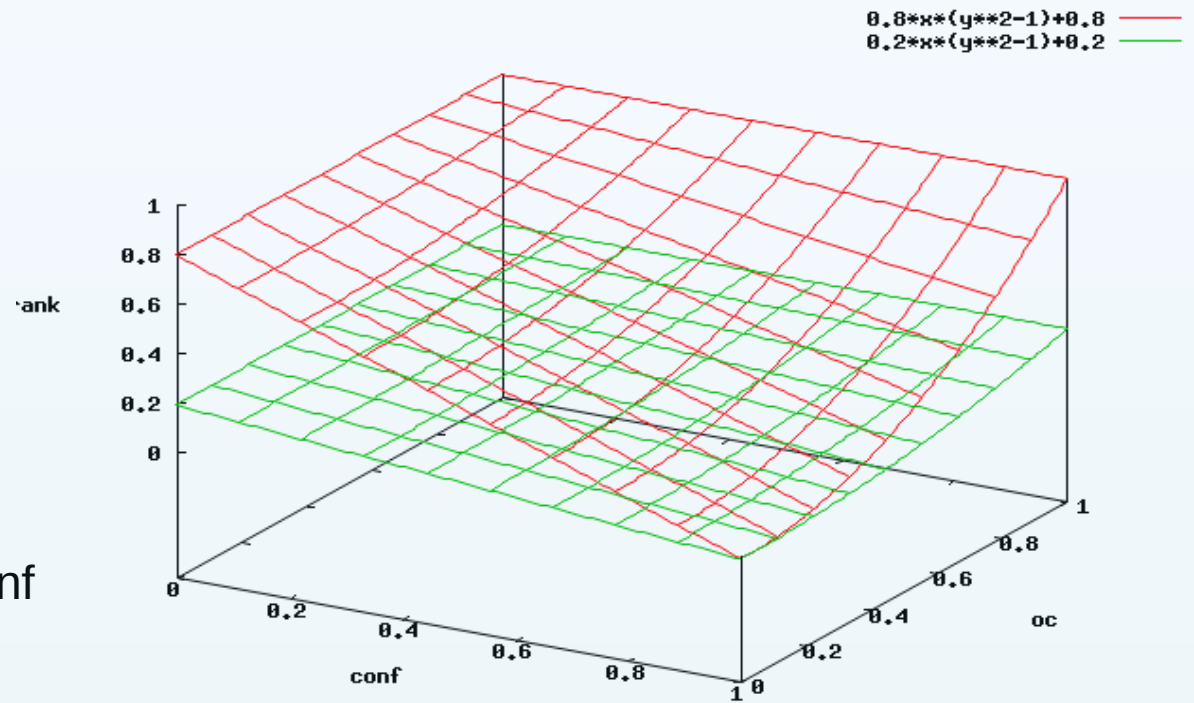
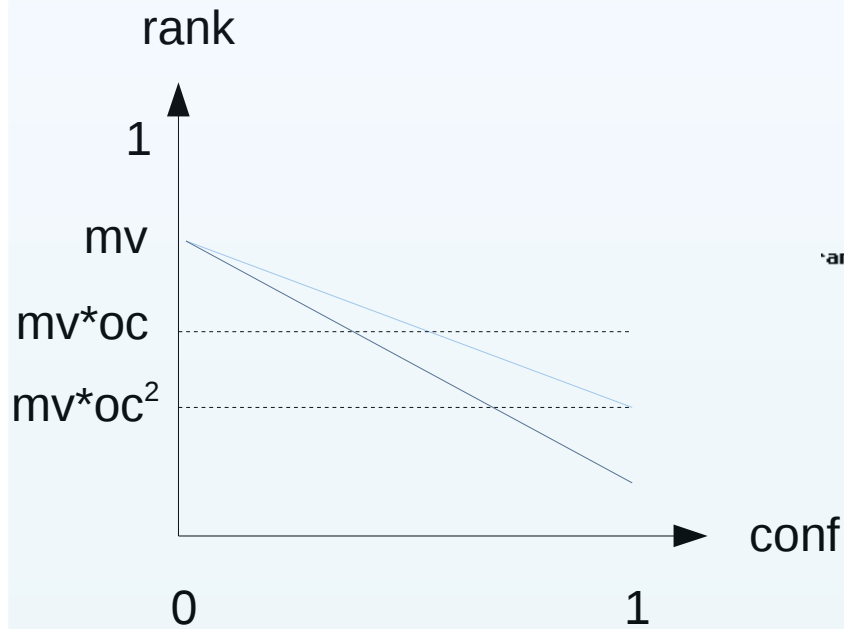
predicted offer conformance

confidence



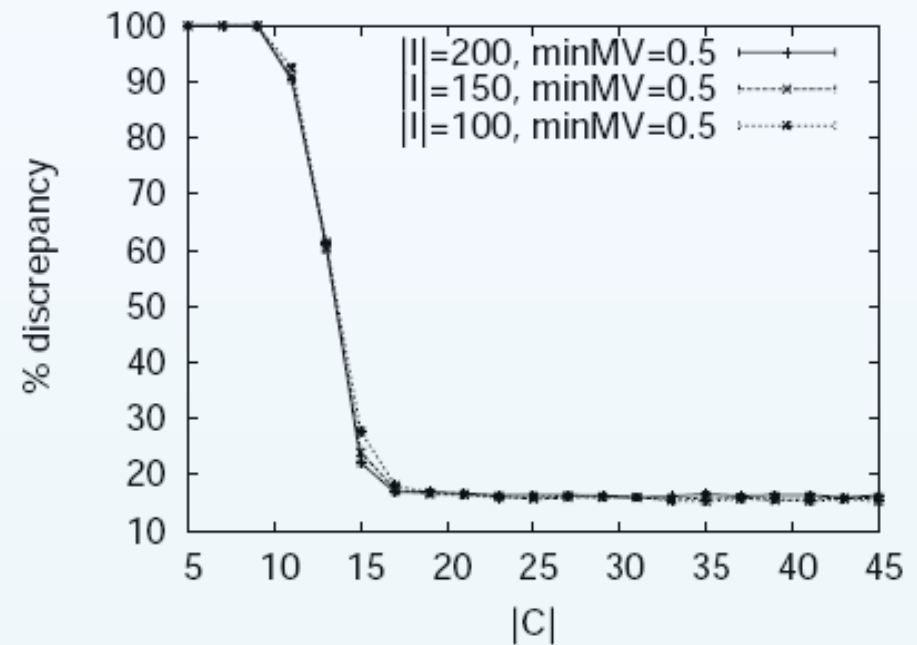
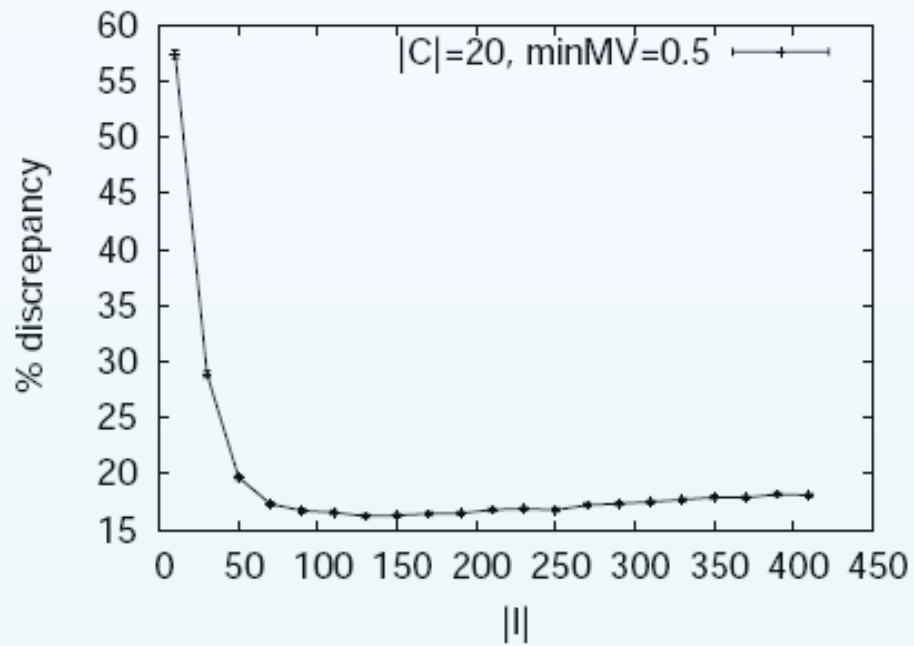
Service Ranking

$$\text{rank}(o_p) = mv(r, o_p) \cdot \text{conf}(oc_p(r)) \cdot (oc_p(r)^2 - 1) + mv(r, o_p)$$



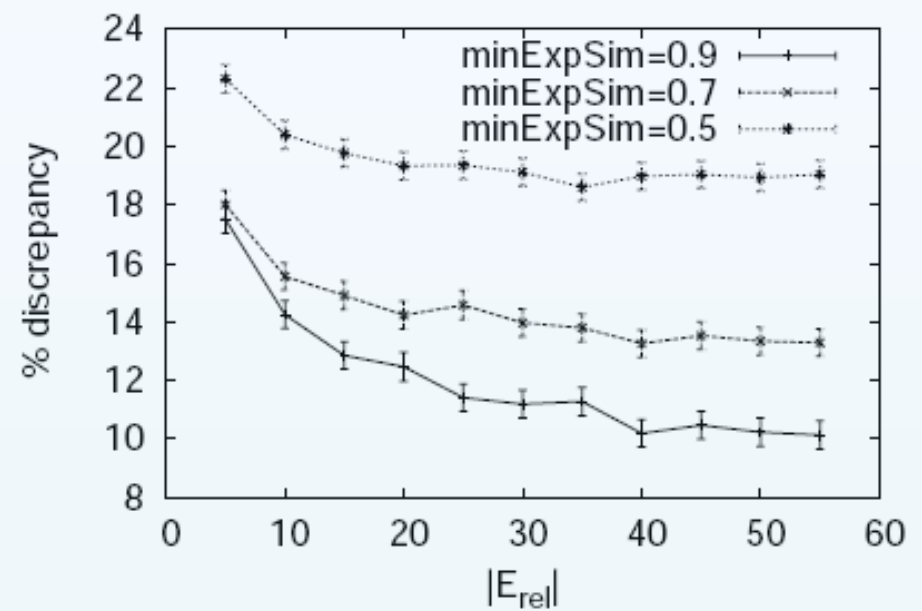
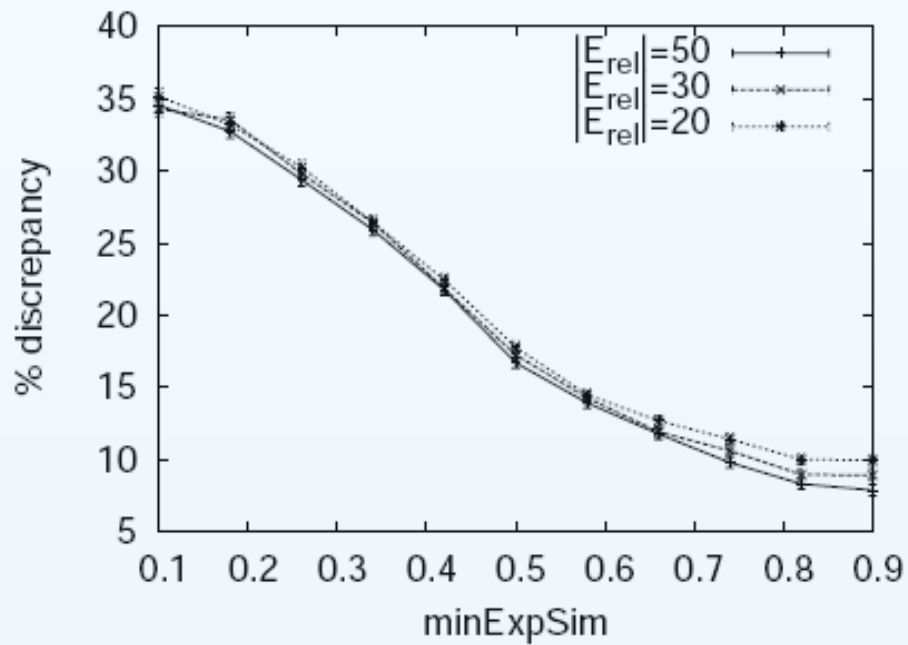
Evaluation

► approximate similarity measure



threshold = 10, minimalMV = 0.5

- ▶ offer conformance prediction



threshold = 10, minimalMV = 0.5



Evaluation

Assuming a similarity deviation of 20% the average deviation of the offer conformance prediction is between 7% and 14% when having a minimal similarity of 0.8 and a number of 20 experiences.

Conclusion



Conclusion

- ▶ The approach
 - ▶ assesses the reliability of matching results by utilizing consumer experiences
 - ▶ considers those results when ranking services
 - ▶ accounts for the subjective nature of rating-based experiences
 - ▶ exploits available experiences effectively
 - ▶ avoids explicit sharing of personal information

Thank you for your attention!

Questions?
Comments?
Suggestions?

Friederike Klan
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