An Agent-Based Simulation of Viral Marketing Effects in Social Networks

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eurosis

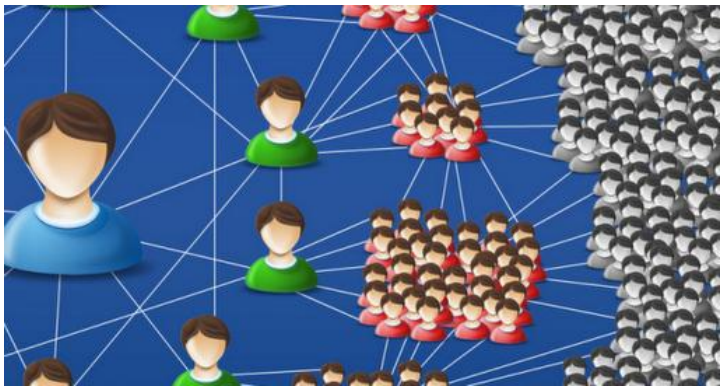
Outline

- Introduction
- Simulation model
  - The Facebook domain
  - Model structure
  - Behaviour of the agents
- Simulation results
- Conclusion and future work

Motivation

- Social networks connect friends
- Interesting news are send to the friends
- Viral effects provide new marketing possibilities

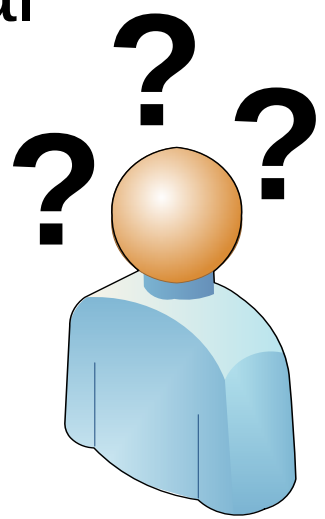
Source: http://www.squaremartinimedia.com/wp-content/uploads/2010/10/facebook-friends-box.jpg



Source: http://lh4.ggpht.com/-W1j4mm_HymI/Tem3N0f_B1I/AAAAAAAAB2o/l6TIAiPdmvU/Viral-Marketing%2525255B4%2525255D.png

Problem

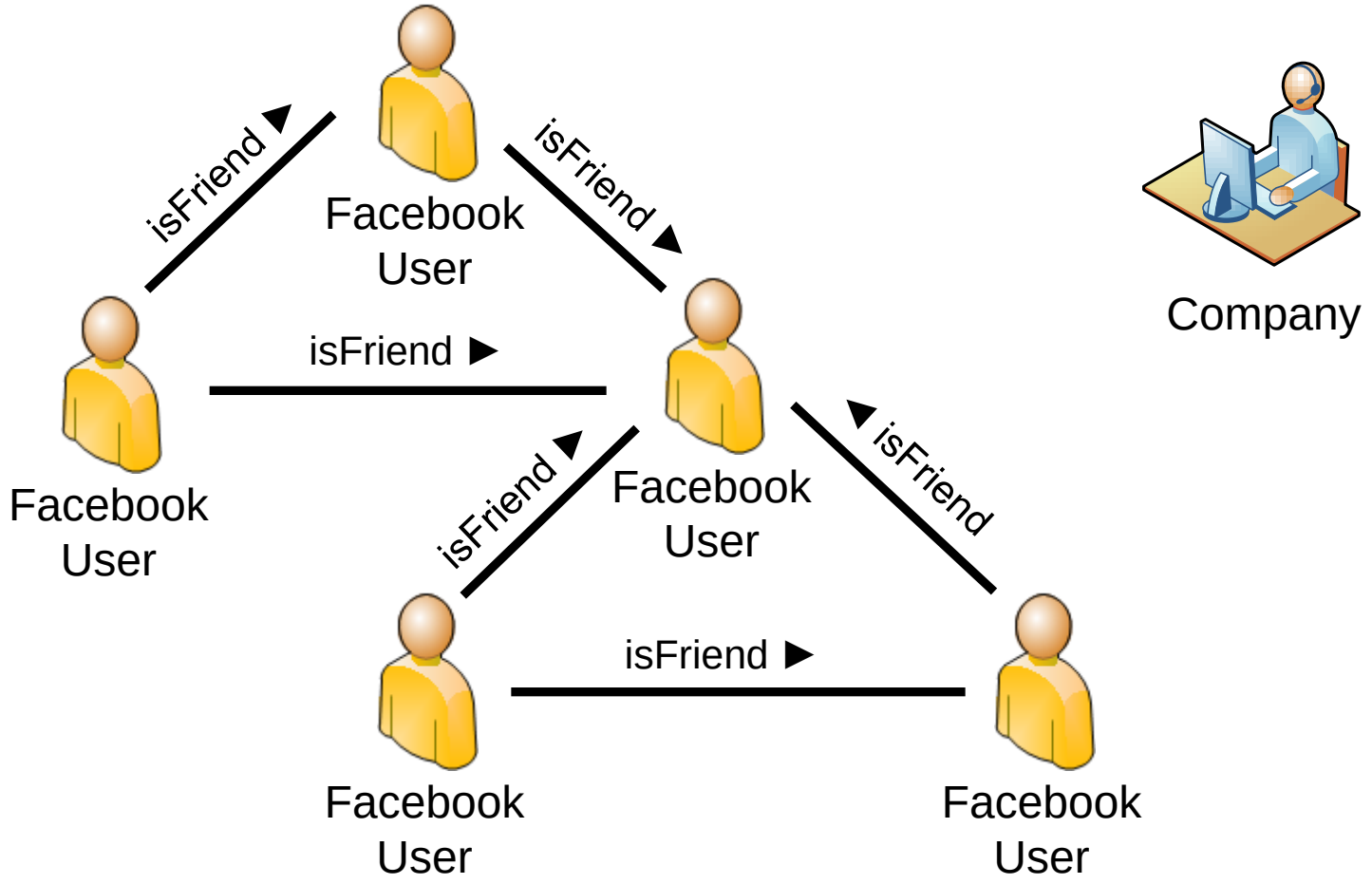
- Companies have a lack of experience with social networks
- They do not know how to use social networks for viral marketing
- Return on investment calculation is a challenging task [1]



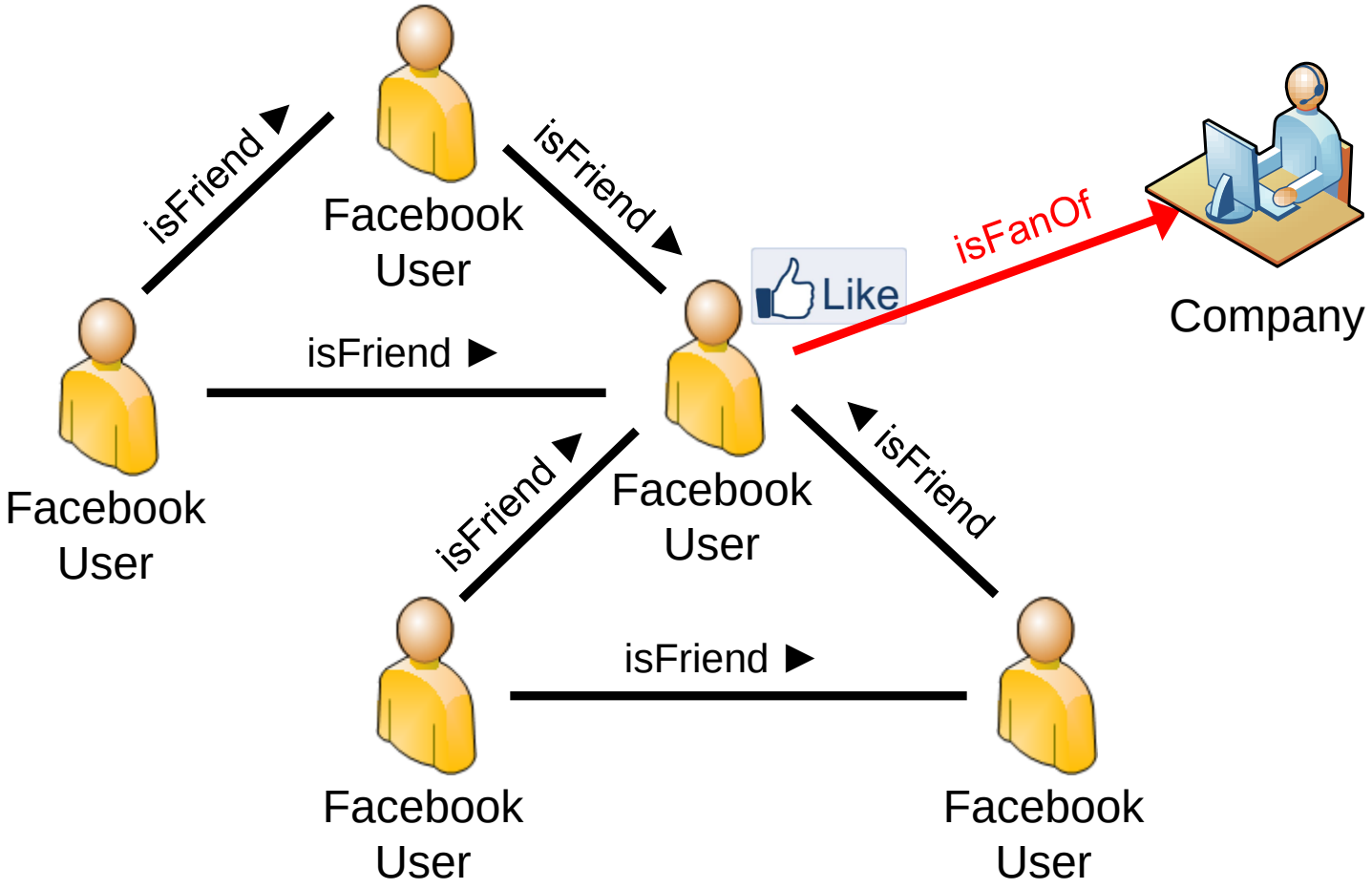
Solution

- We use agent-based simulation to forecast the effects of marketing campaigns
- The goal of the simulation is to answer the following questions
  1. How many Facebook fans are expected?
  2. What are the benefits for the online shop?
  3. What costs are incurred?

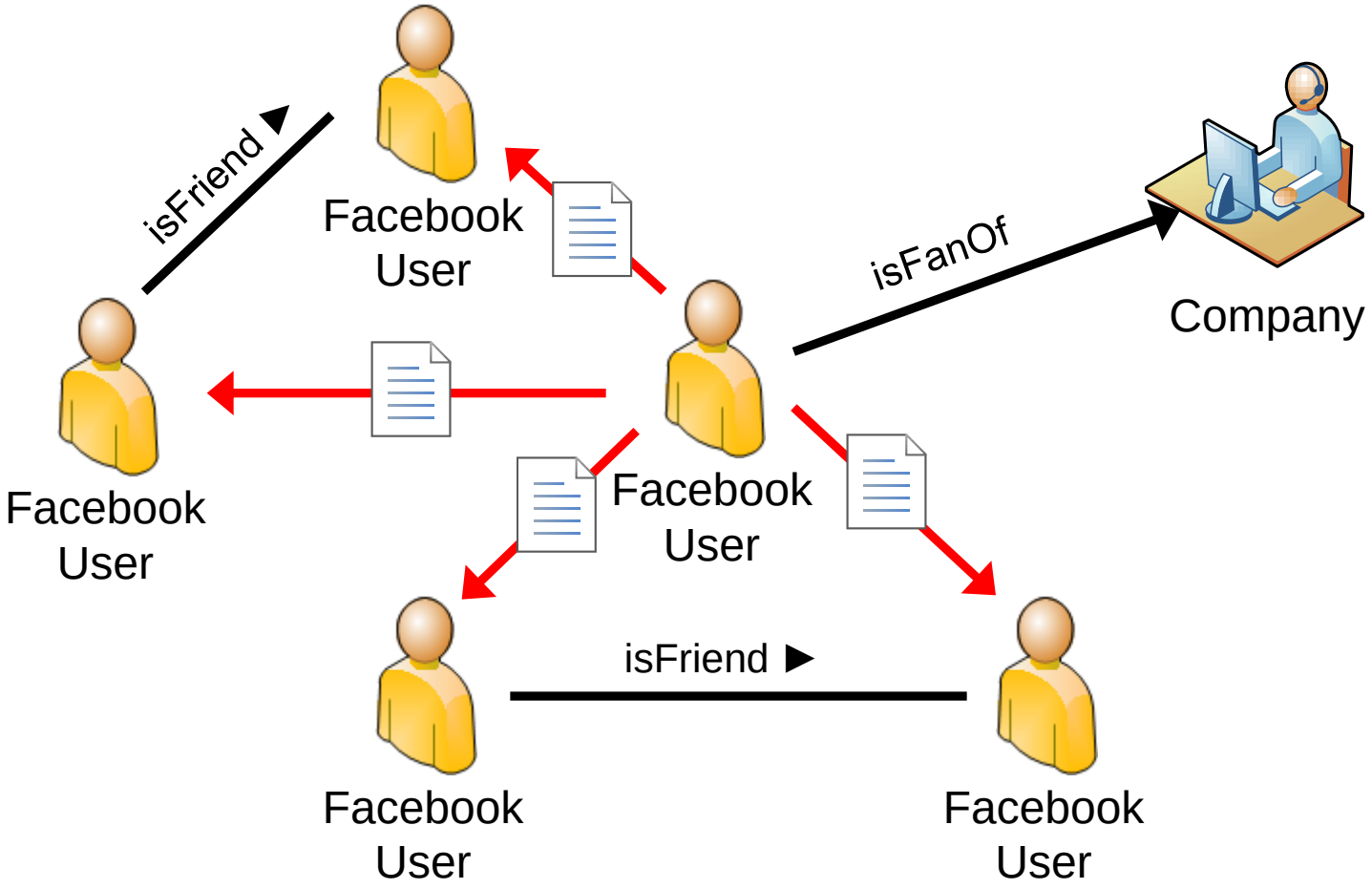
The Facebook domain



The Facebook domain

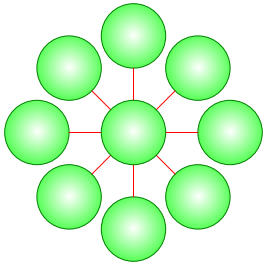


The Facebook domain

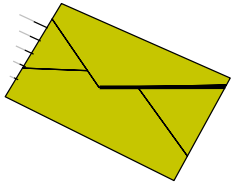


The Facebook domain

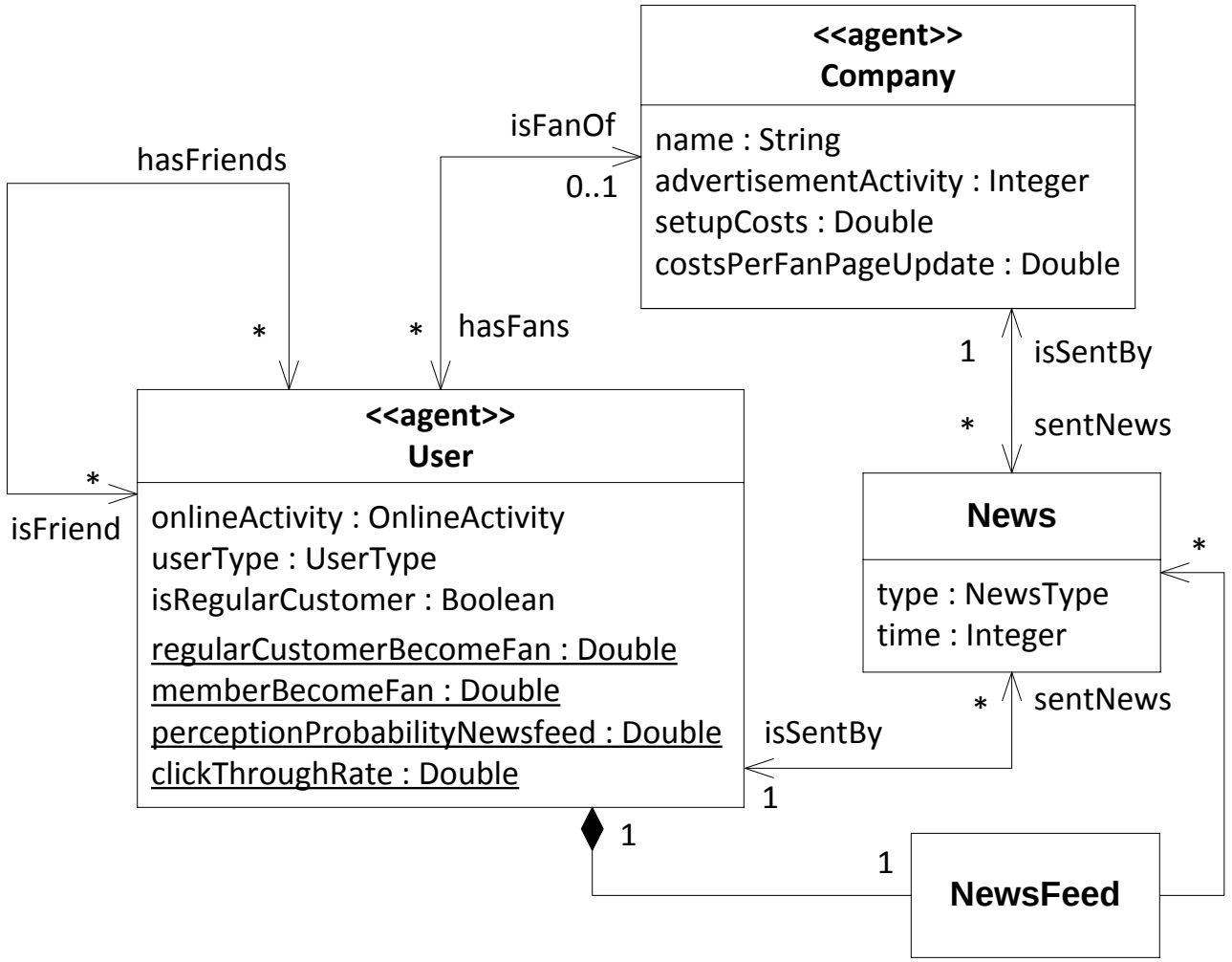
- Two main requirements for the simulation model
  - (1) Representation of the individual friendship relationships



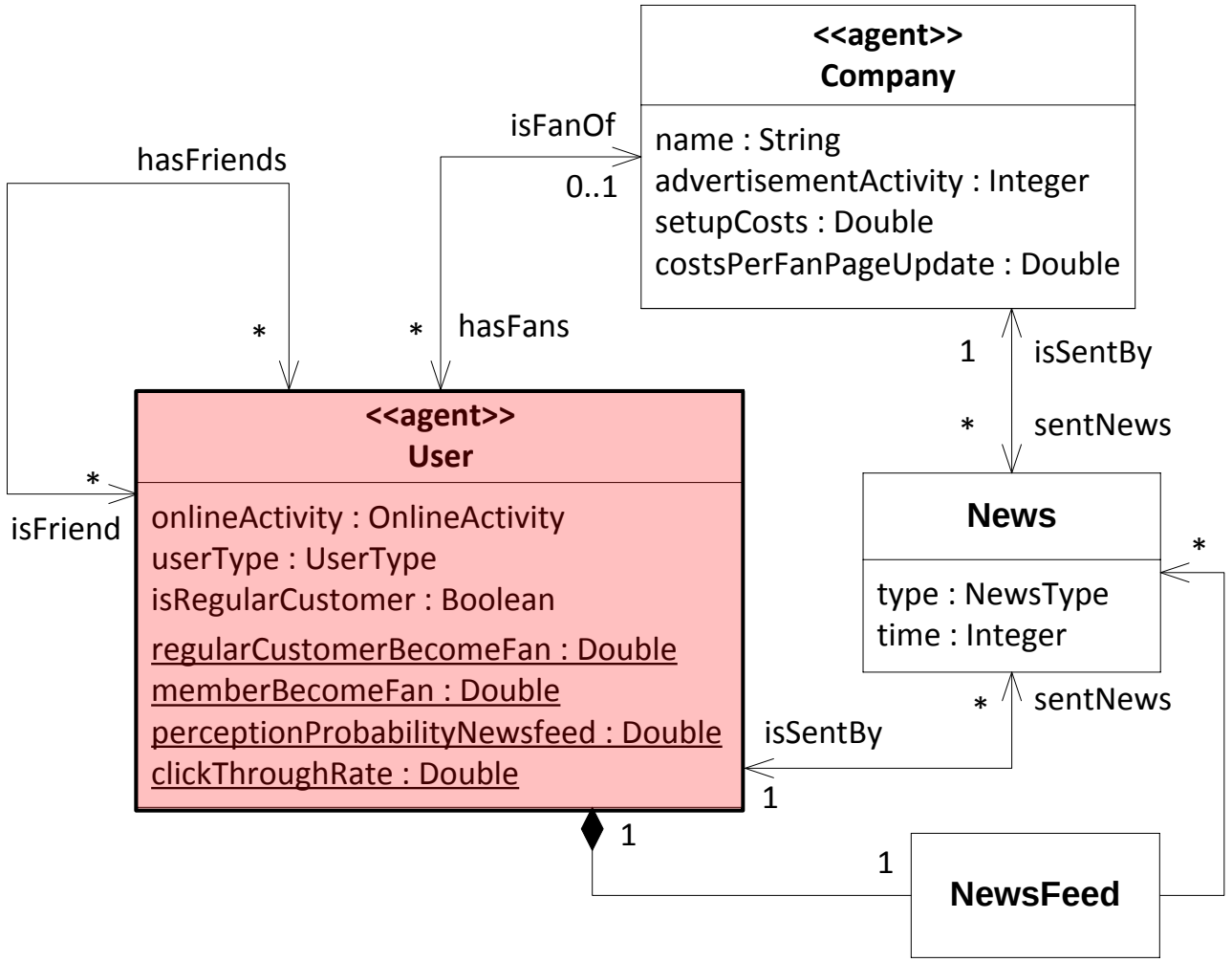
  - (2) Modelling of the communication process between
    - A company and its fans
    - The Facebook friends



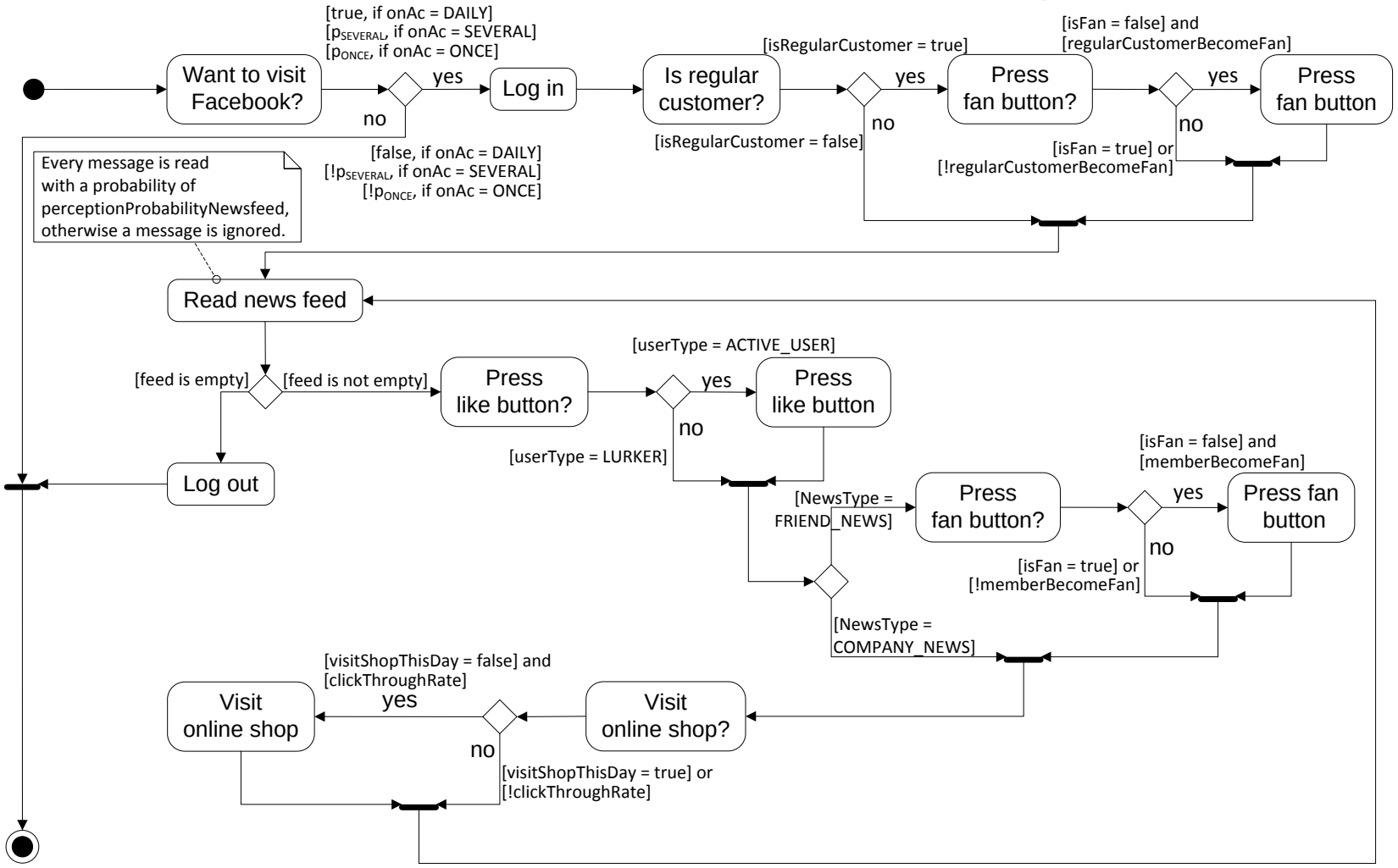
Overview of the model structure



User agent


<<agent>>
Company
name : String
advertisementActivity : Integer
setupCosts : Double
costsPerFanPageUpdate : Double
isFanOf
0..1
hasFriends
*
*
hasFans
1
isSentBy
*
sentNews
<<agent>>
User
onlineActivity : OnlineActivity
userType : UserType
isRegularCustomer : Boolean
regularCustomerBecomeFan : Double
memberBecomeFan : Double
perceptionProbabilityNewsfeed : Double
clickThroughRate : Double
*
isFriend
News
type : NewsType
time : Integer
*
*
sentNews
isSentBy
1
1
1
1
NewsFeed

Behaviour of the user agent



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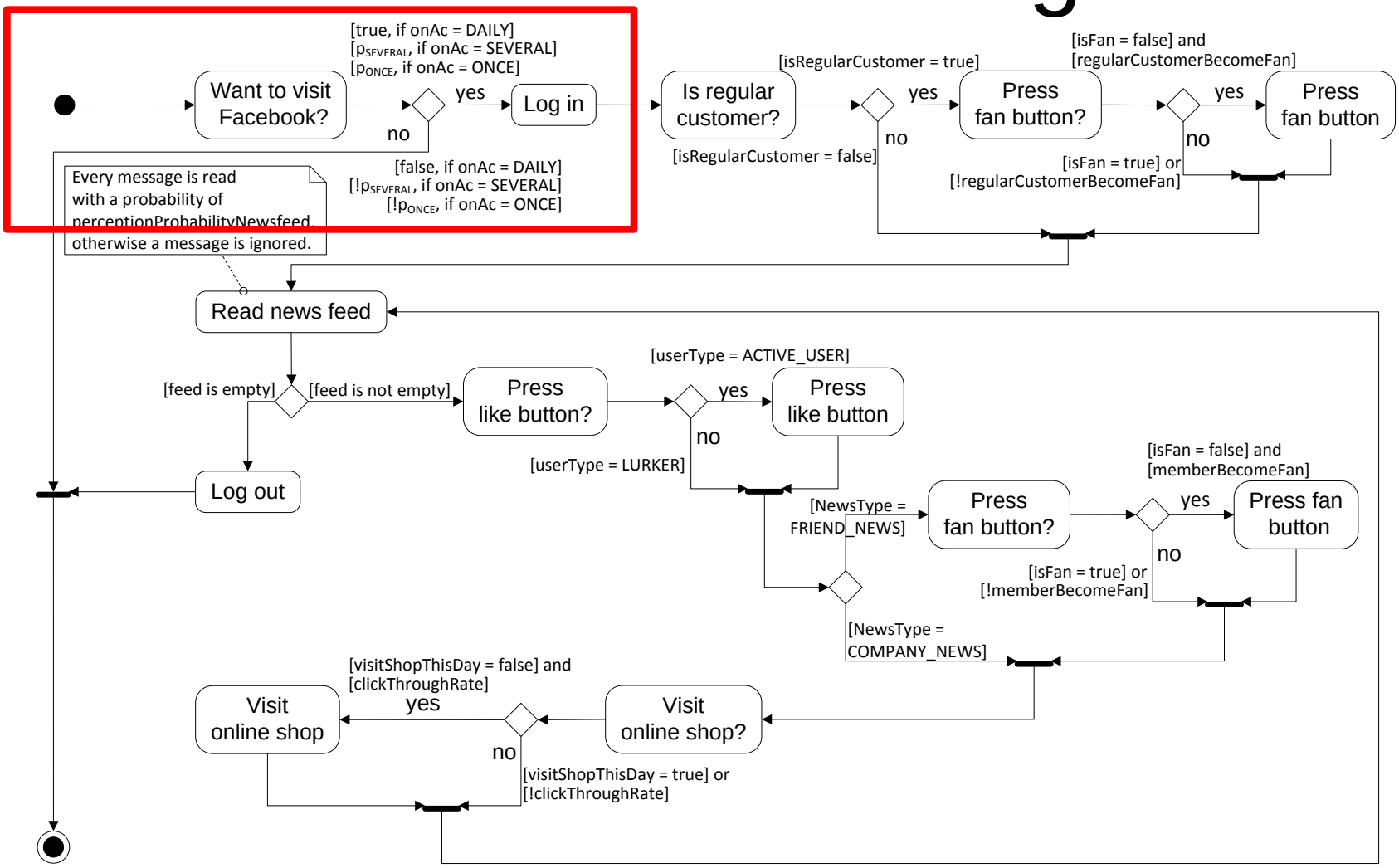
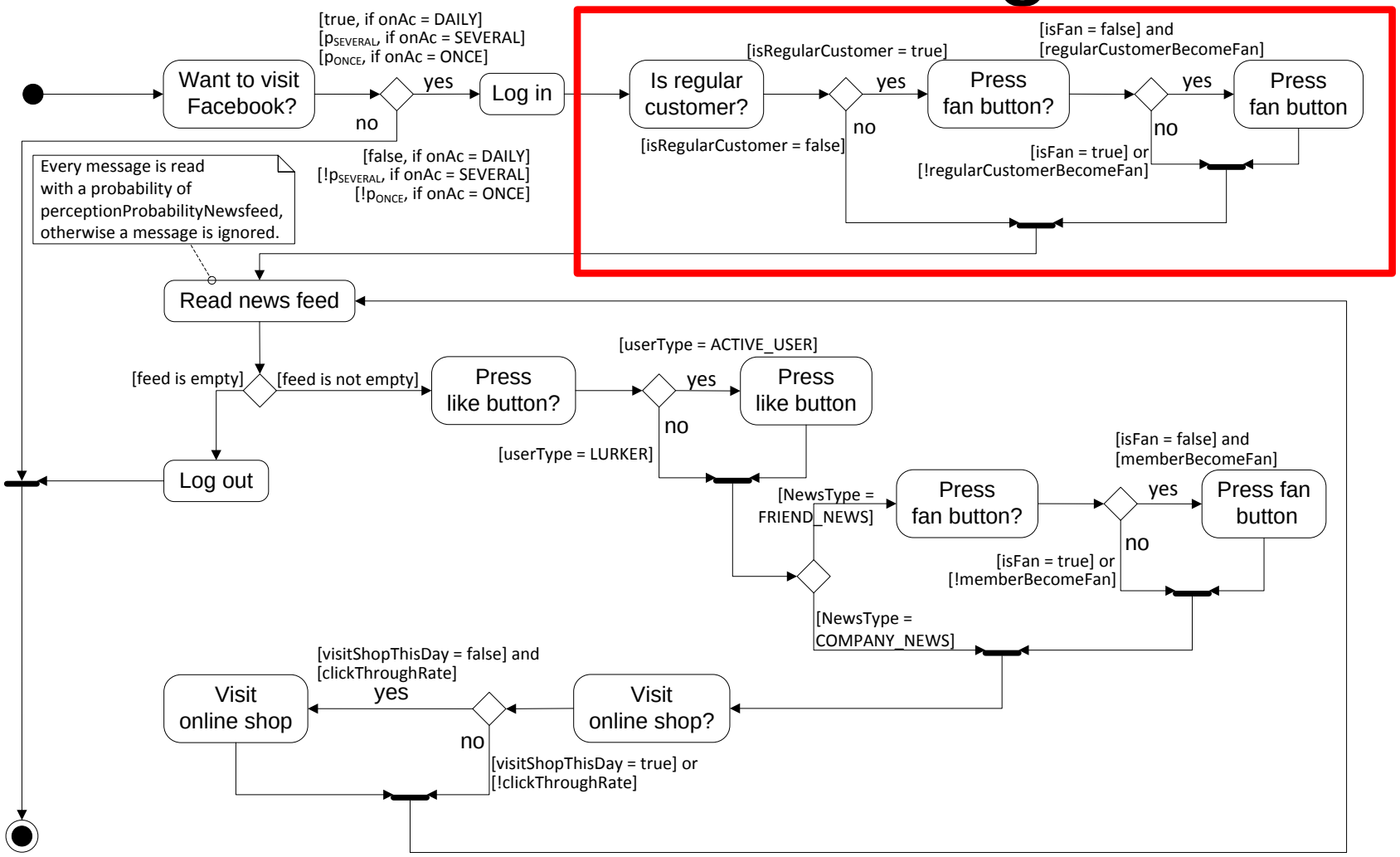


Behaviour of the user agent



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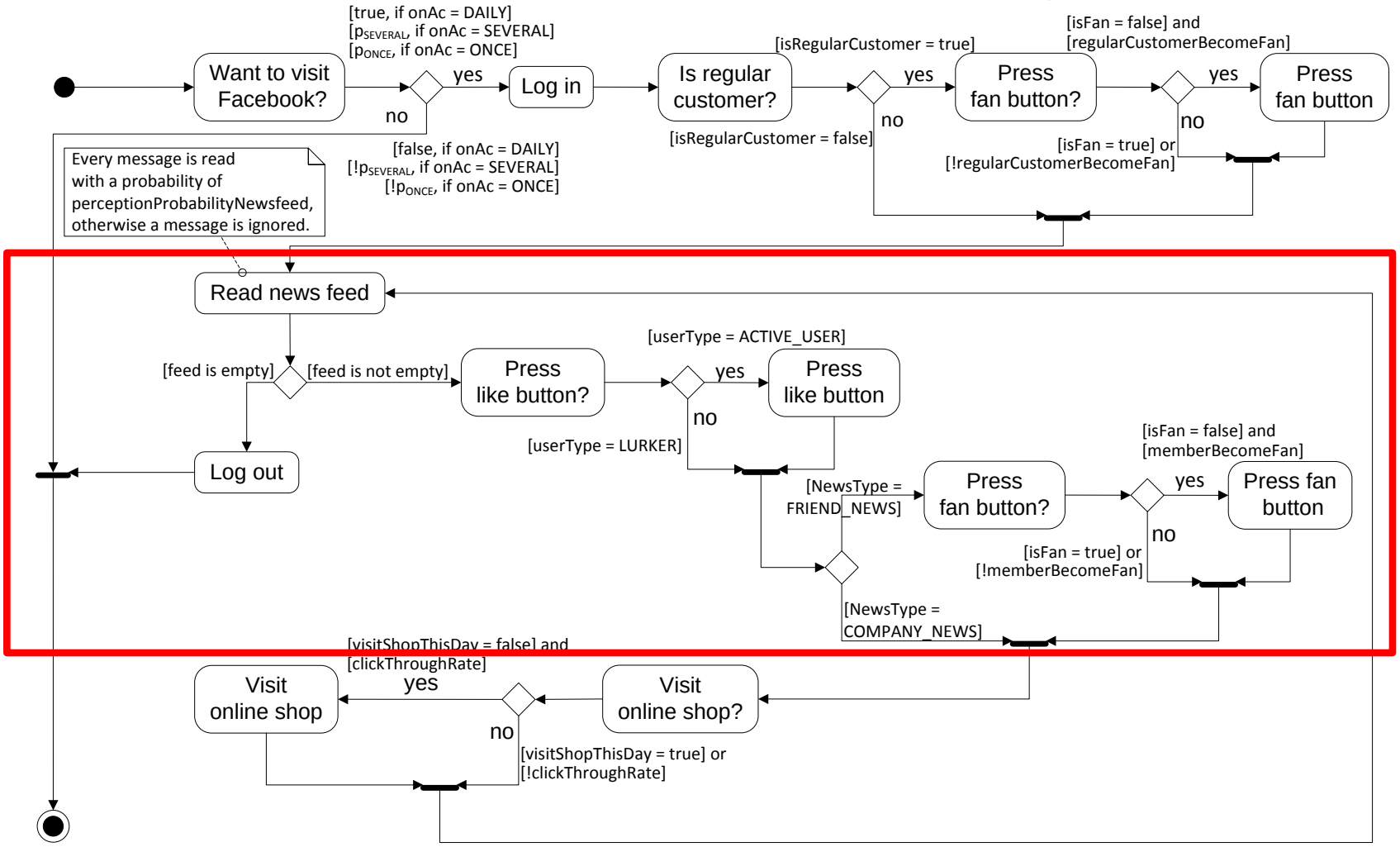
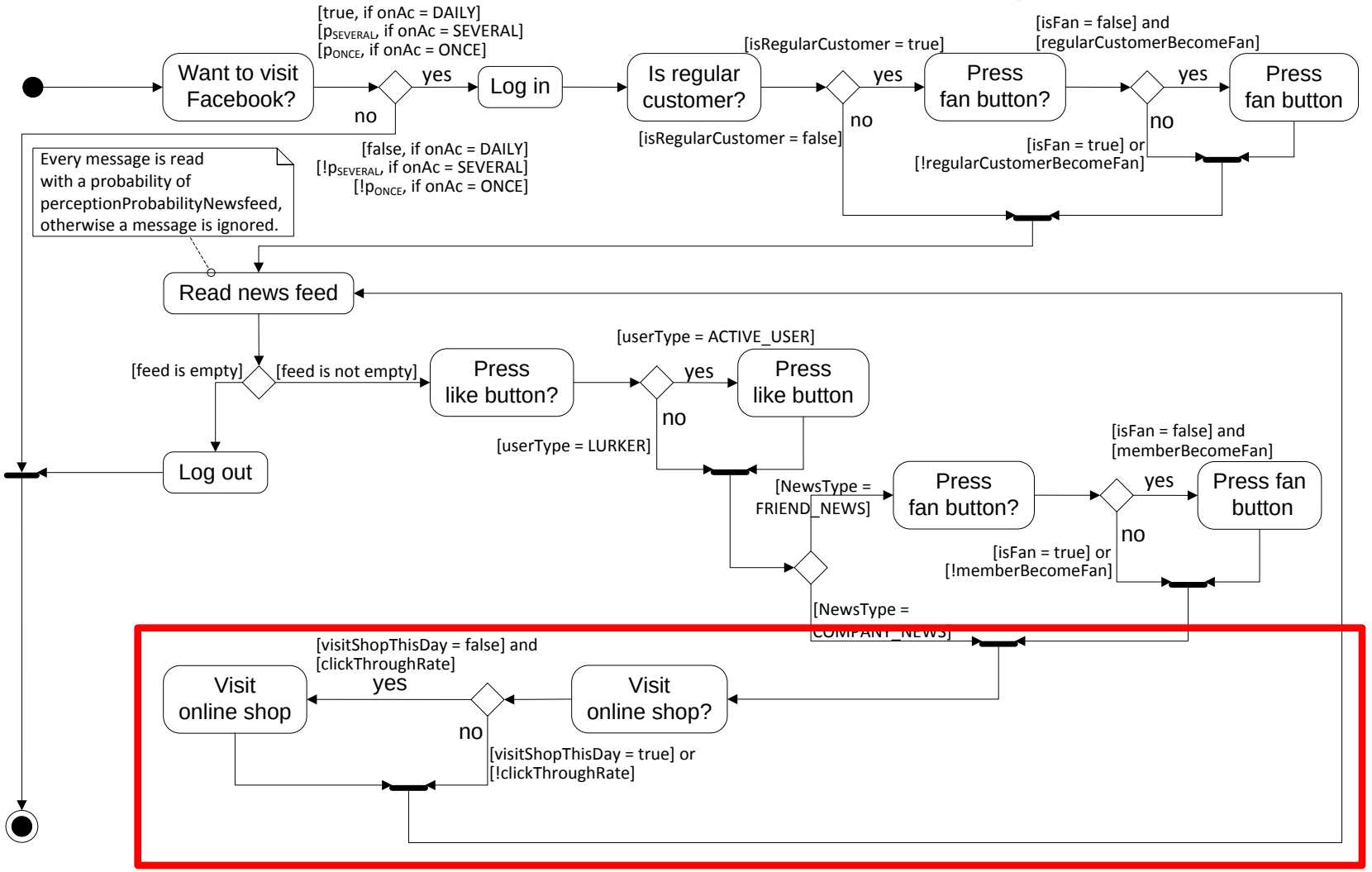
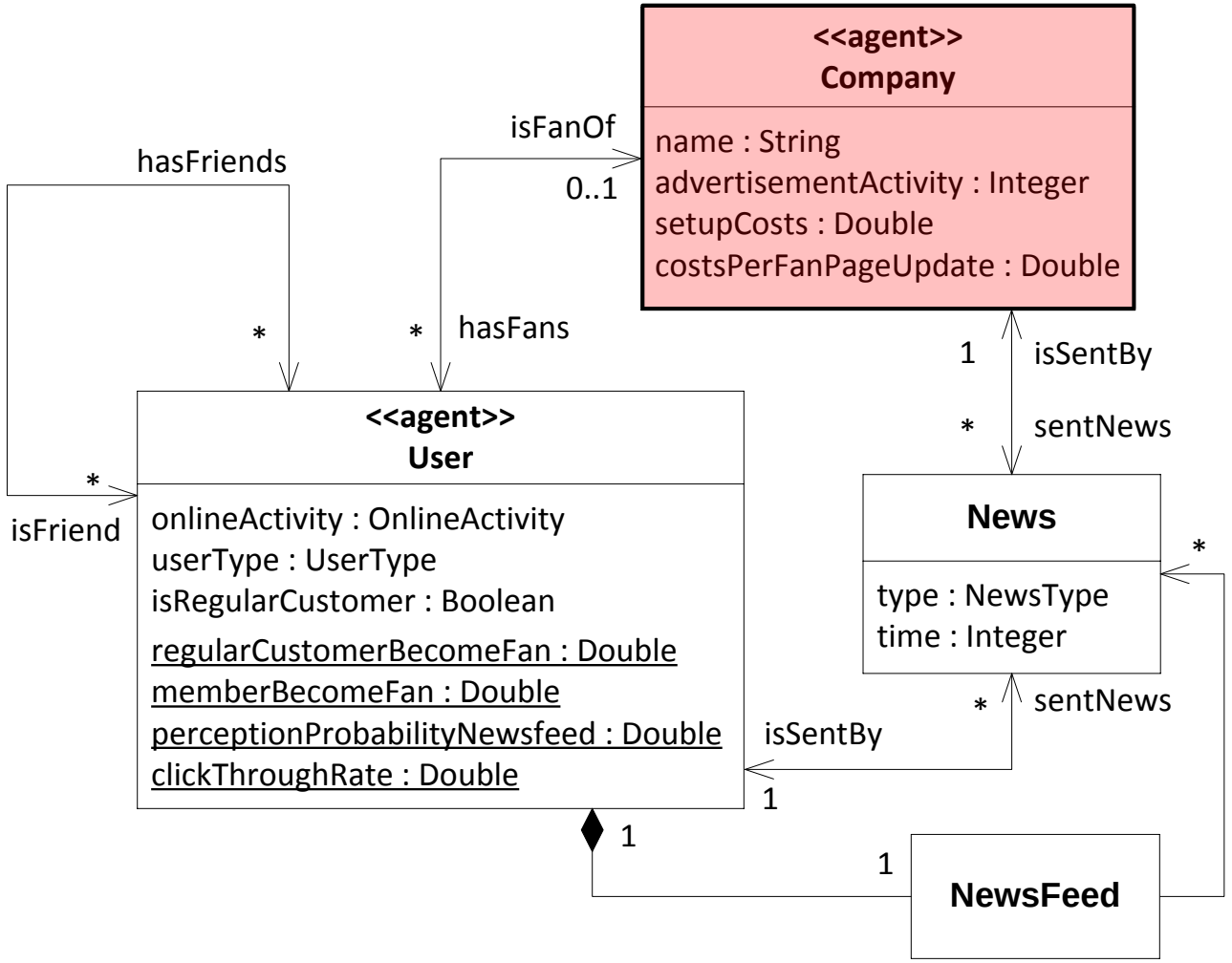


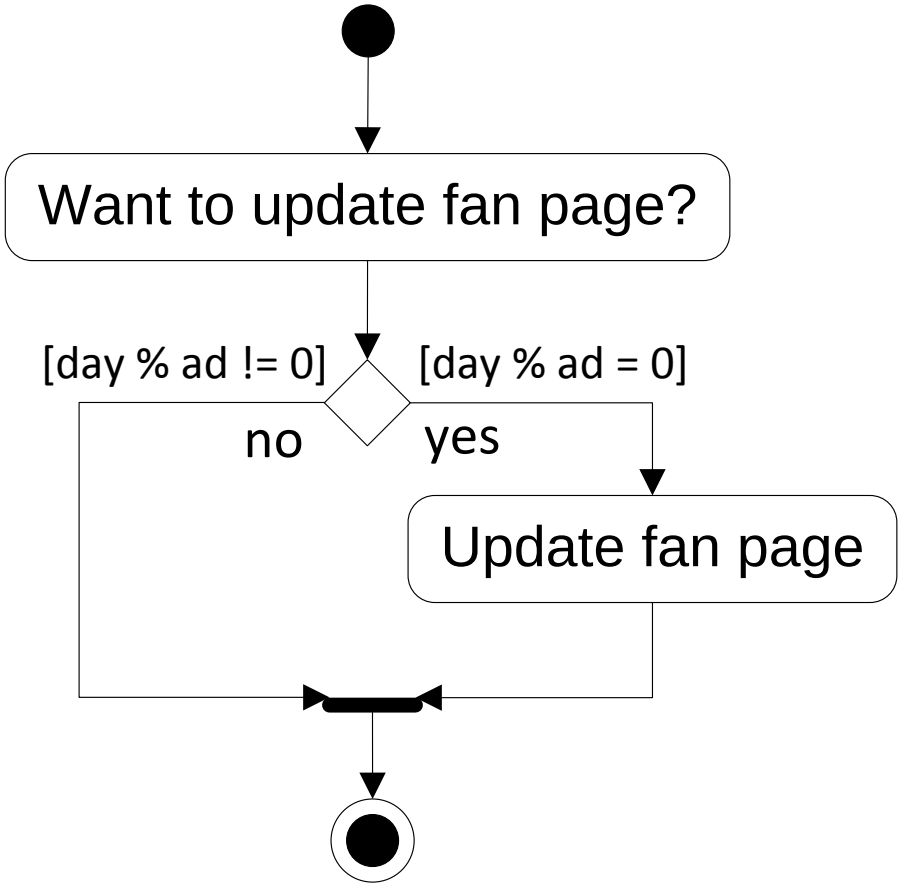
Behaviour of the user agent



Company agent



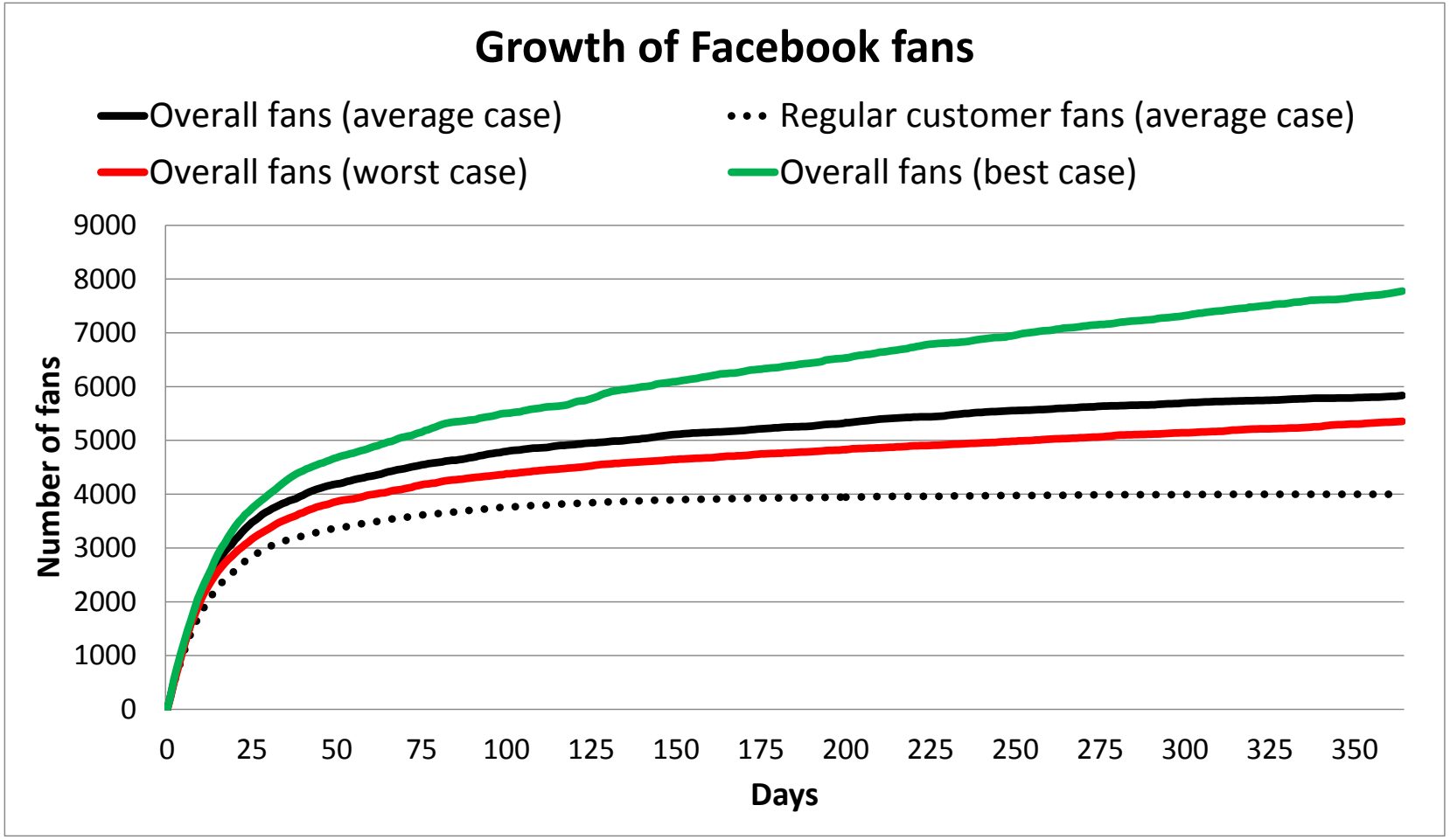
Behaviour of the company agent



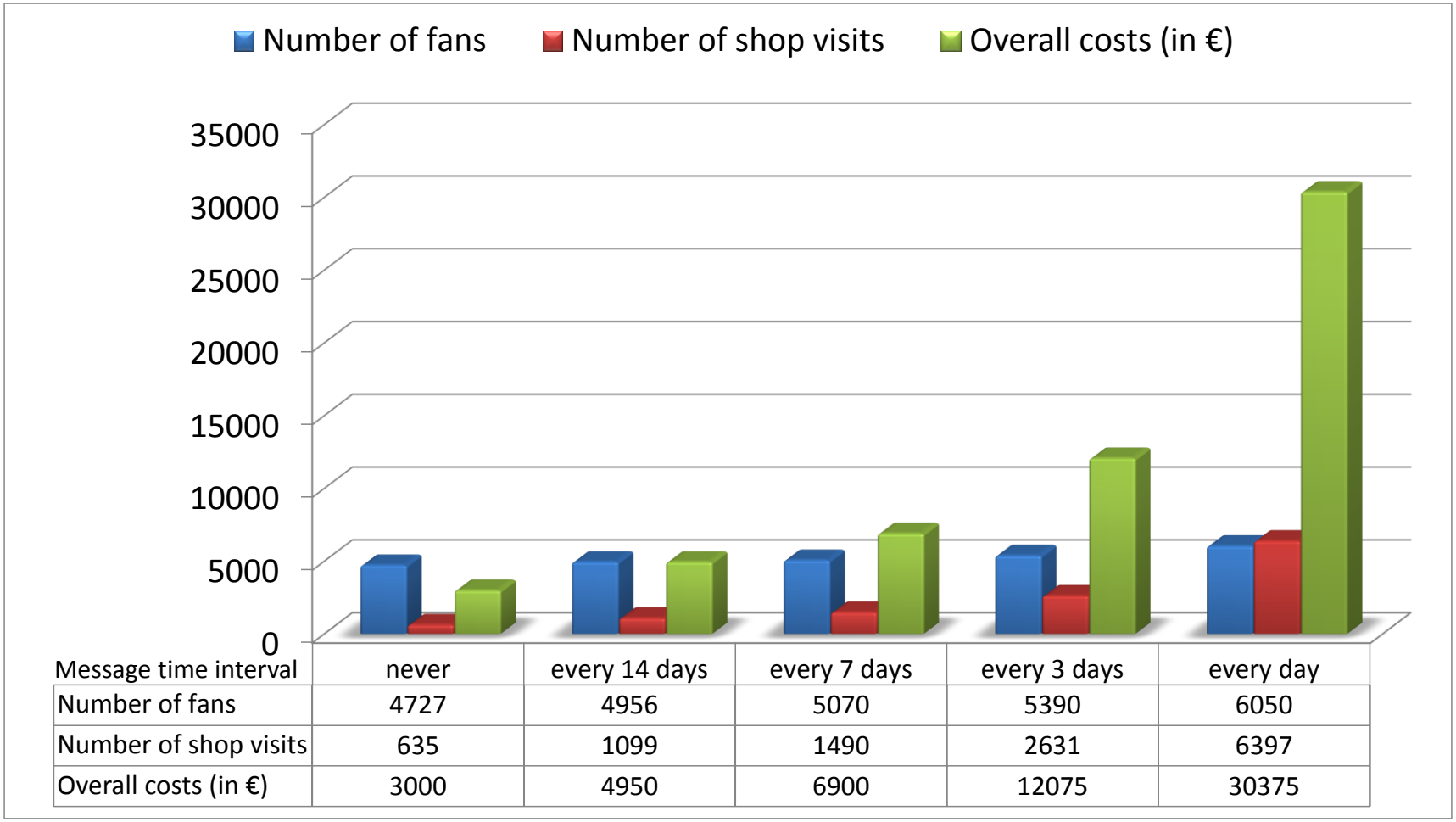
Model configuration

- 3 groups of input parameters
  - Company-specific parameters
    - Advertisement activity, setup costs, …
  - Facebook-specific parameters
    - Daily online rate, lurker rate, …
  - Social structure of the user agents
    - Facebook sub network of the University of Pennsylvania [2]
      - 41,554 users, 1,362,229 friendship relations

Simulation results – growth of Facebook fans (365 days, 10 runs)

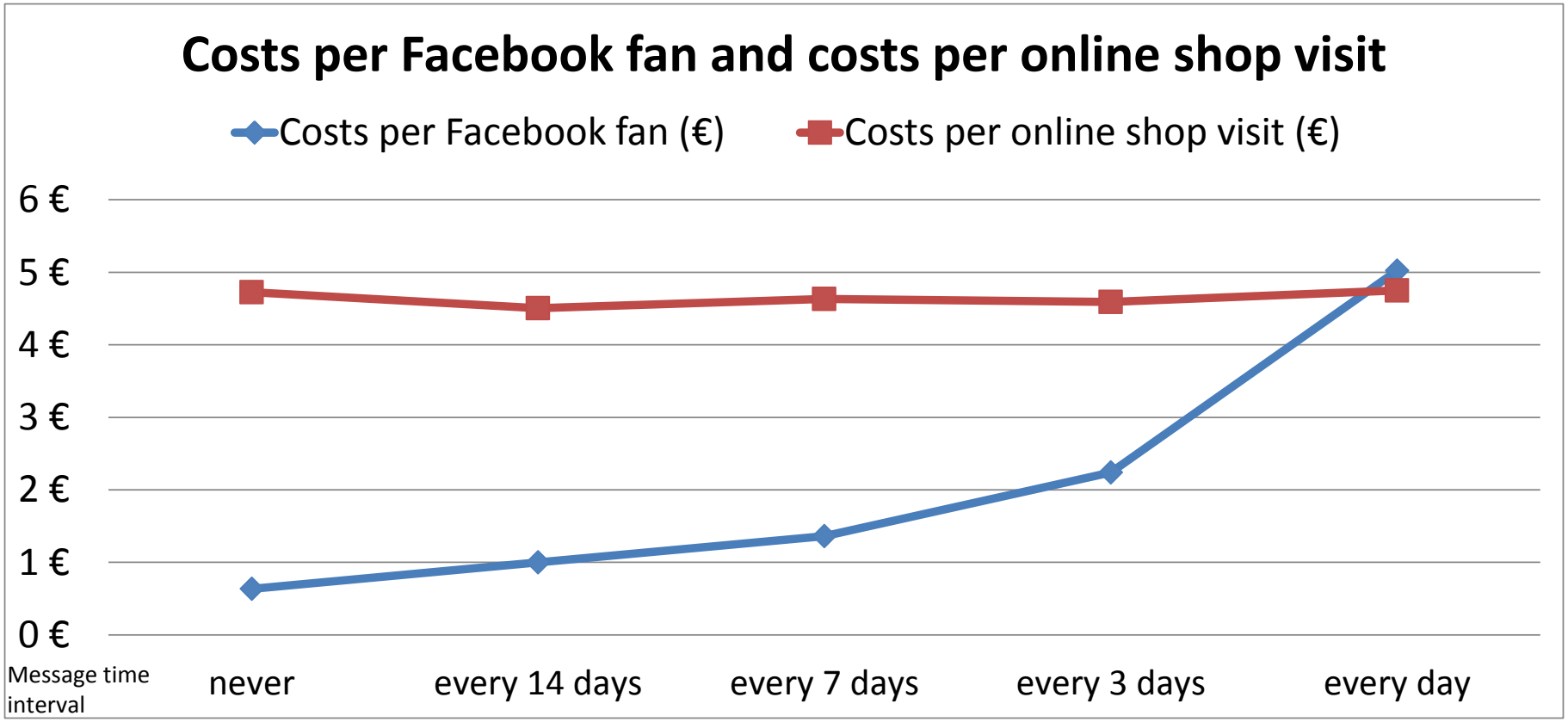


Simulation results – different advertisement strategies



Message time interval	never	every 14 days	every 7 days	every 3 days	every day
Number of fans	4727	4956	5070	5390	6050
Number of shop visits	635	1099	1490	2631	6397
Overall costs (in €)	3000	4950	6900	12075	30375

Costs per Facebook fan & costs per online shop visit



Conclusion

- Number of Facebook fans and number of shop visits depend on the message time interval
- A continuous stream of visitors requires high Facebook activities
- This results in high costs

Summary

- Agent-based simulation technique is applied to the social networks domain
- Model is calibrated and validated by real data and the outcome of several studies
- Online shop managers can optimize their Facebook marketing activities

Future work

- Limitations
  - Special marketing events are not considered (advertisements, prize competitions, …)
  - The decrease of fans is excluded
- Other topics
  - Refinement of user relationships and their influence on the user behaviour (trust model)
  - Refinement of the EdgeRank Algorithm

References

[1] Intershop Communications AG, 2011. SimProgno study: Decision Support in E-Commerce. URL: http://simprogno.de/downloads/Auswertung_Simprogno_Studie_2011.pdf. (in German).

[2] Traud A.L.; Mucha P.J.; and Porter M.A., 2011. Social Structure of Facebook Networks. CoRR, abs/1102.2166.

Thank you for your attention!

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