6.033 Spring 2021

Lecture #1: Complexity, modularity, abstraction

plus an intro to client/server models

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what is a system?

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“a set of interconnected components that has an expected behavior observed at the interface with its environment.”

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what makes building systems difficult?

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with design principles such as **modularity** and **abstraction**

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one way is to use a **client/server model**

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how do we enforce modularity?

one way is to use a **client/server model**

the browser is the client in this example

`Class Browser`
(on machine 1)

```
def main():
  html = browser_load_url(URL)
  ...
```

`Class Server`
(on machine 2)

```
def server_load_url():
  ...
  return html
```

why do we care?

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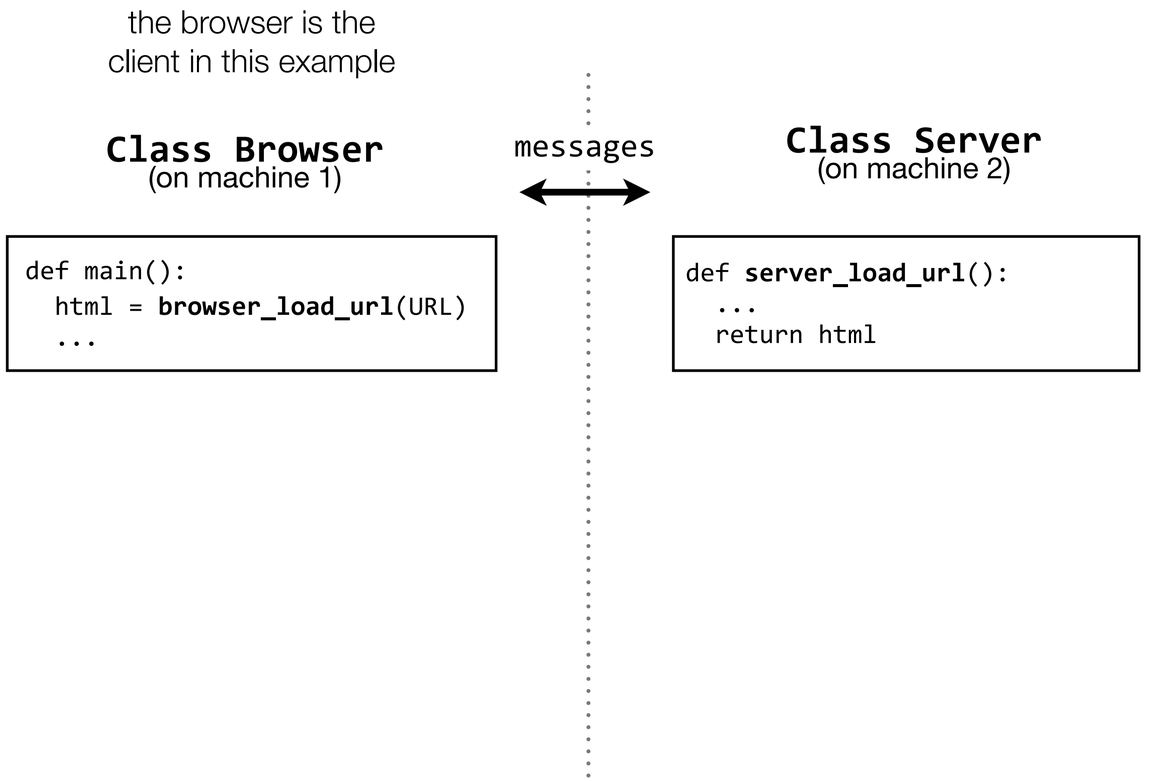
one way is to use a **client/server model**



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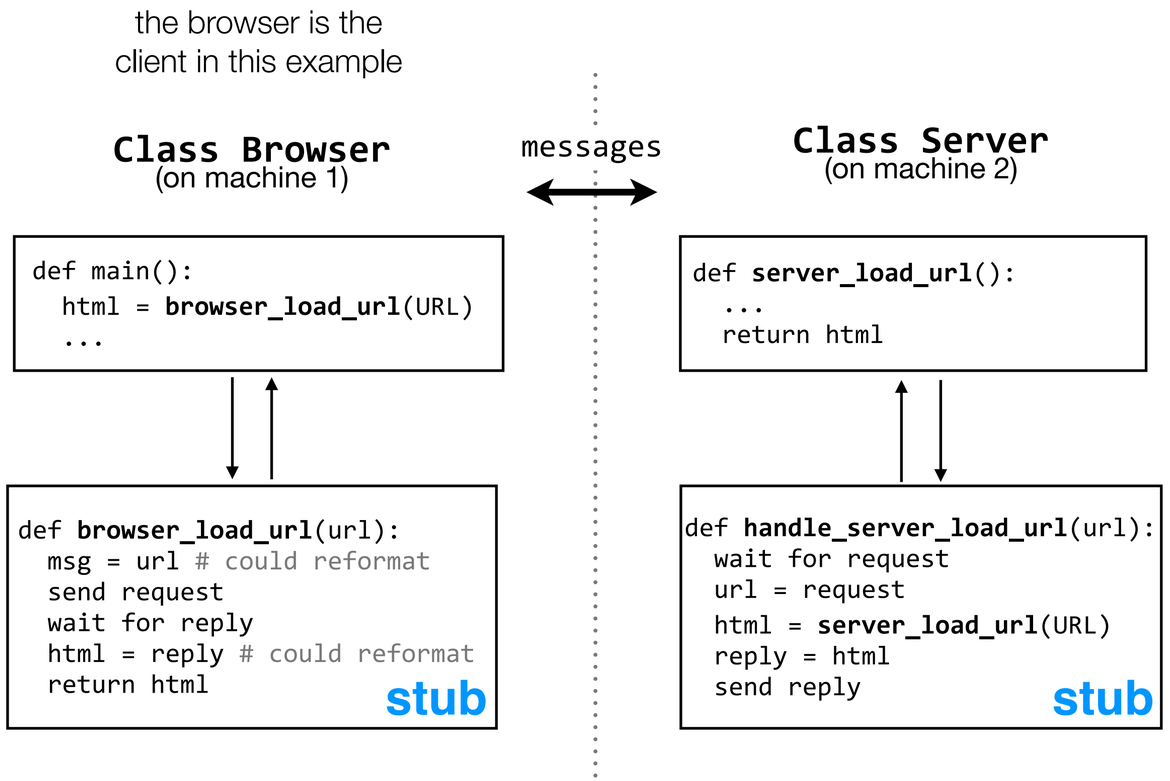

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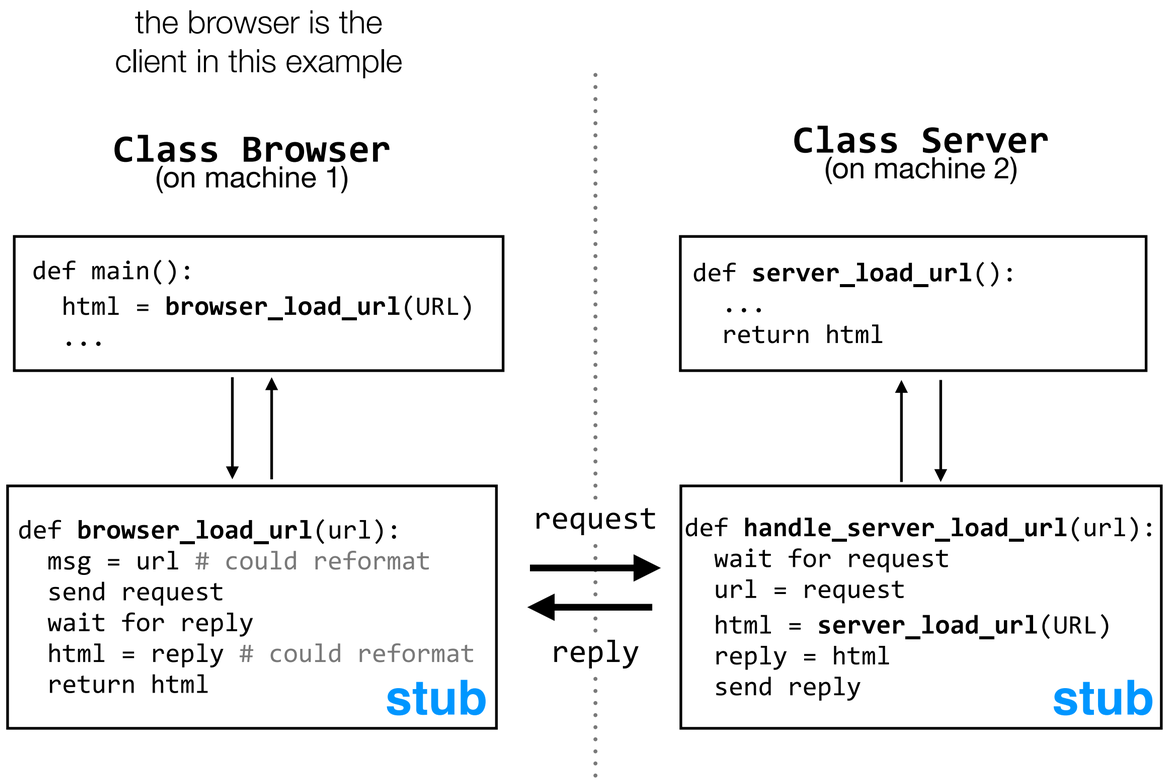

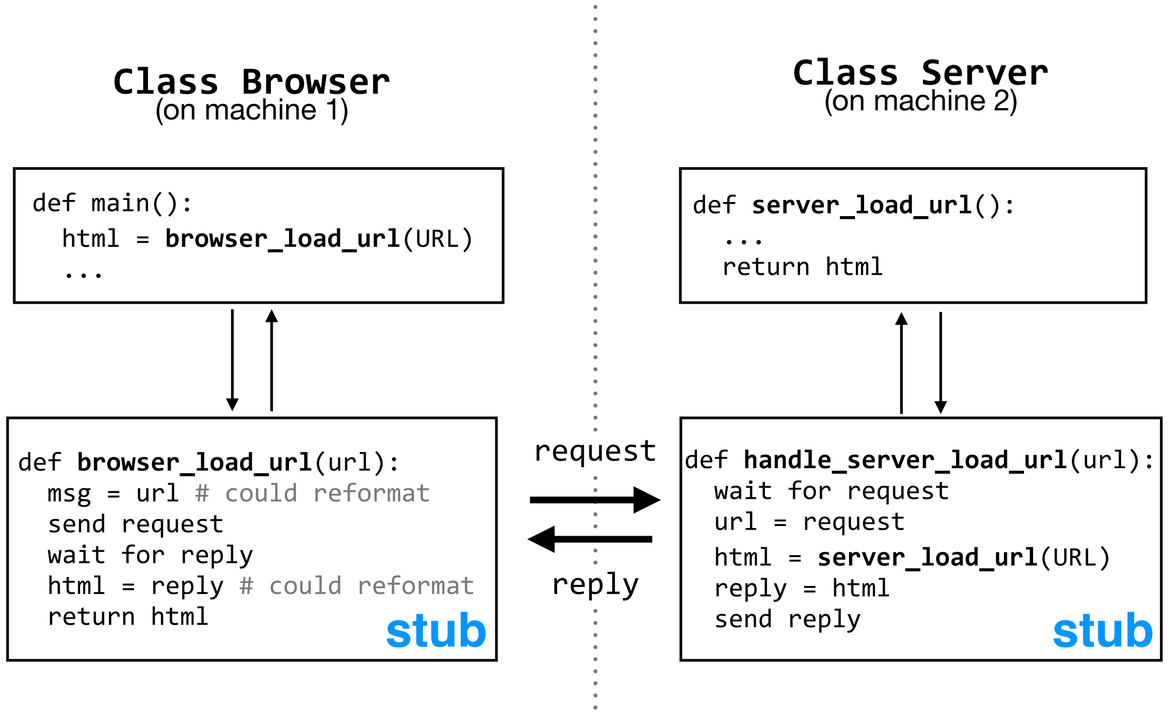
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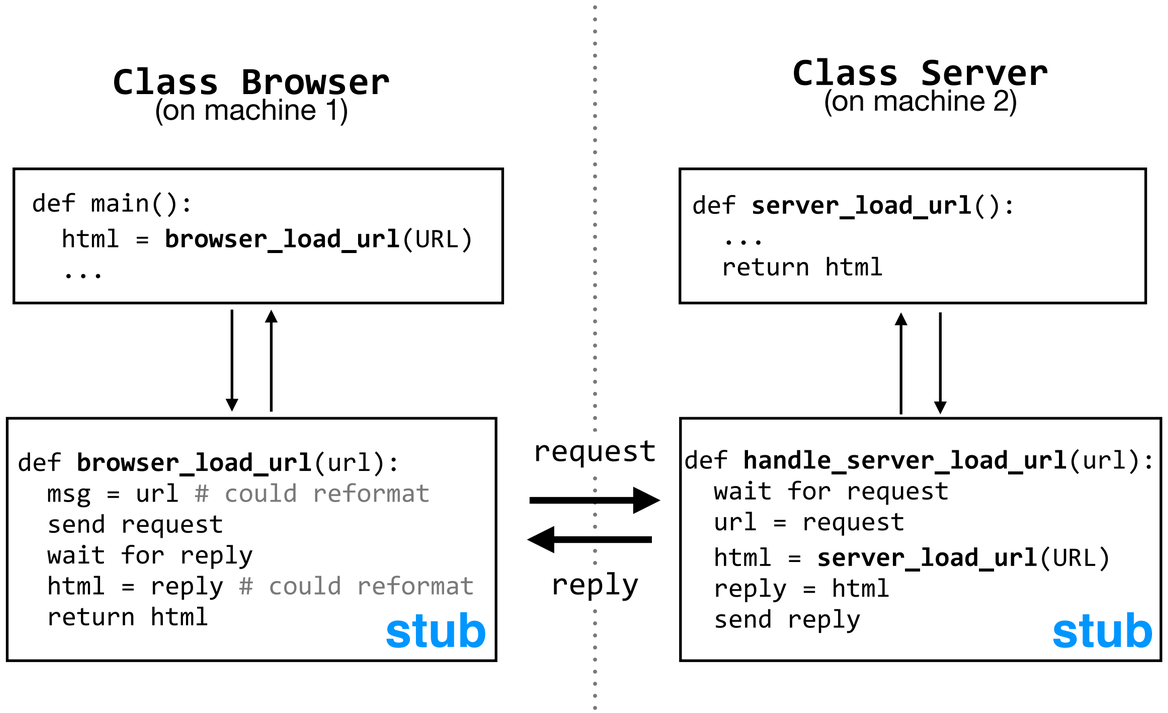
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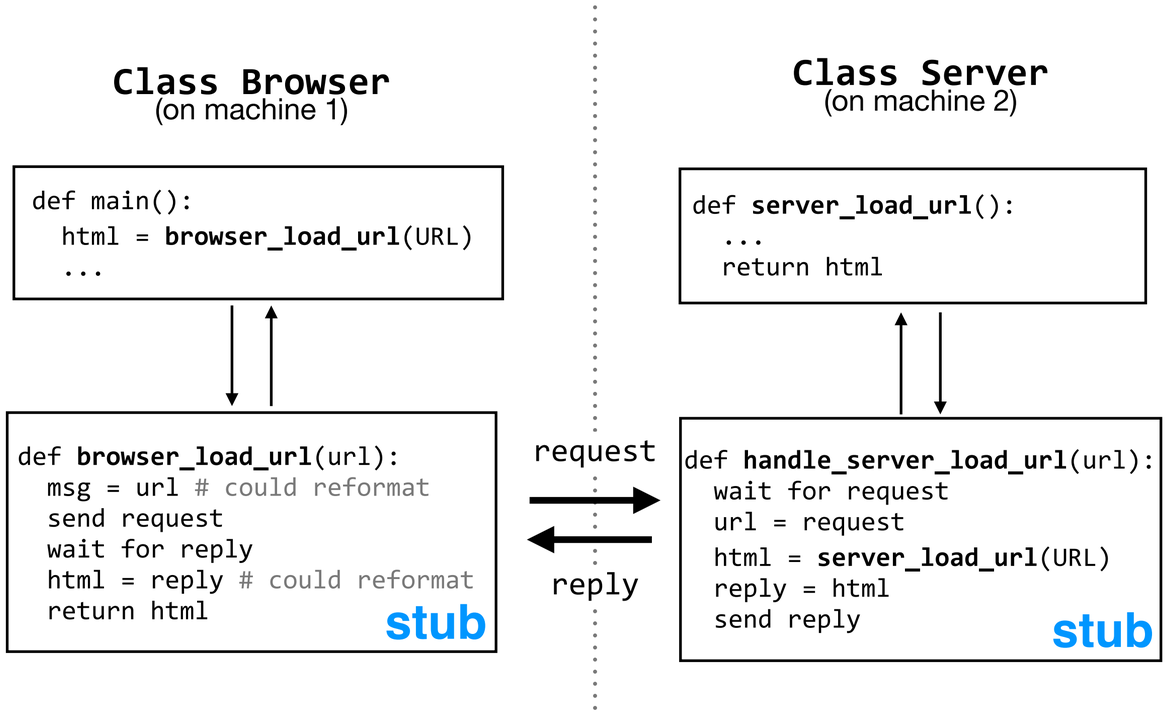
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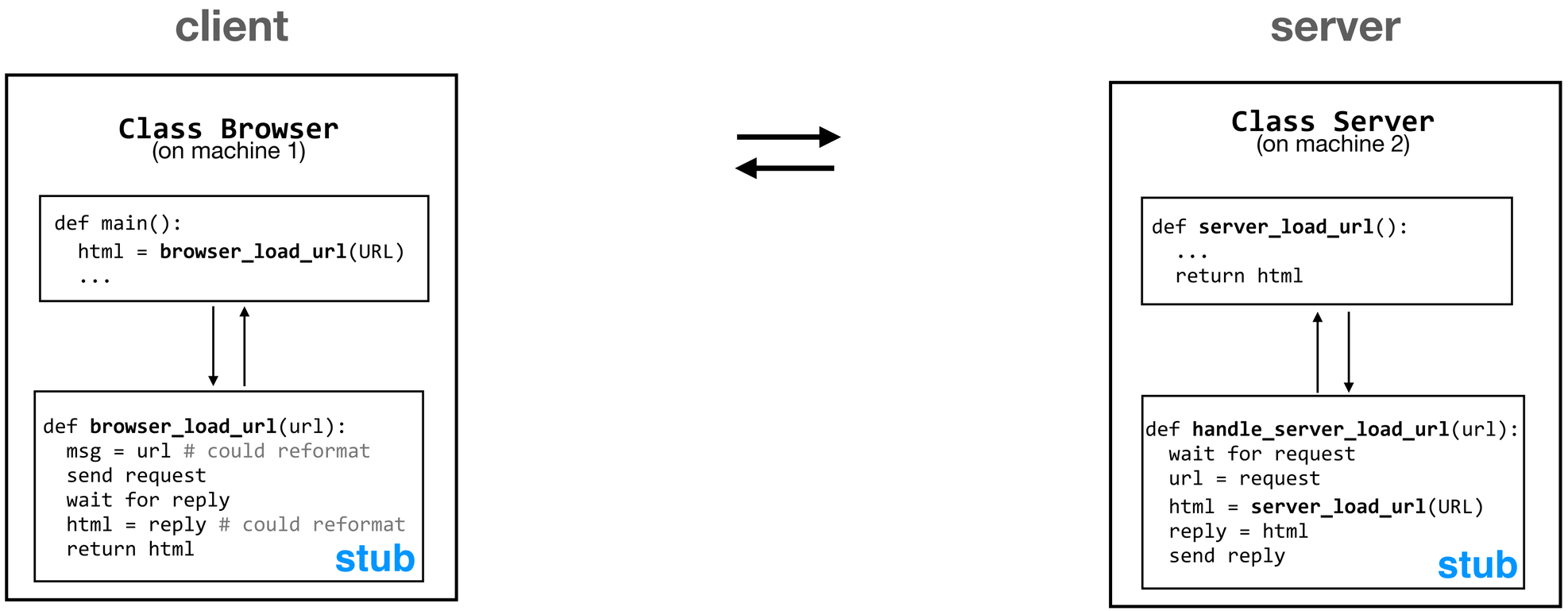
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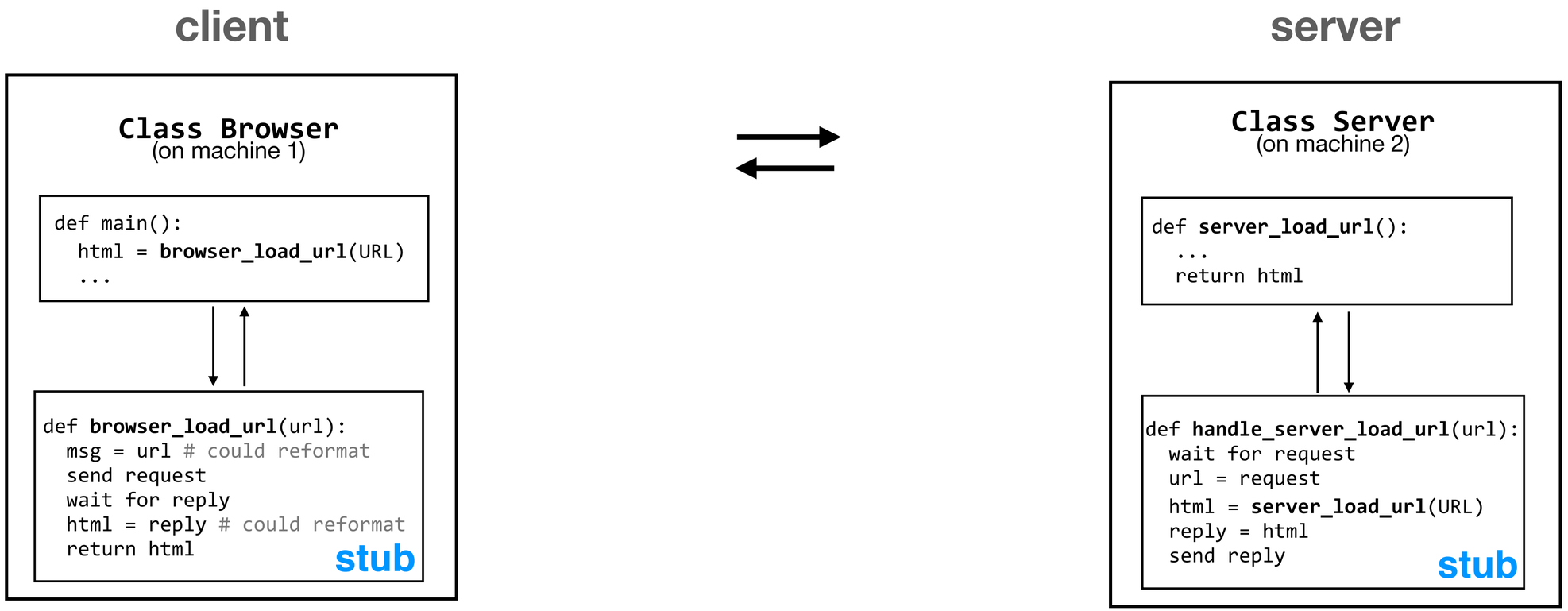
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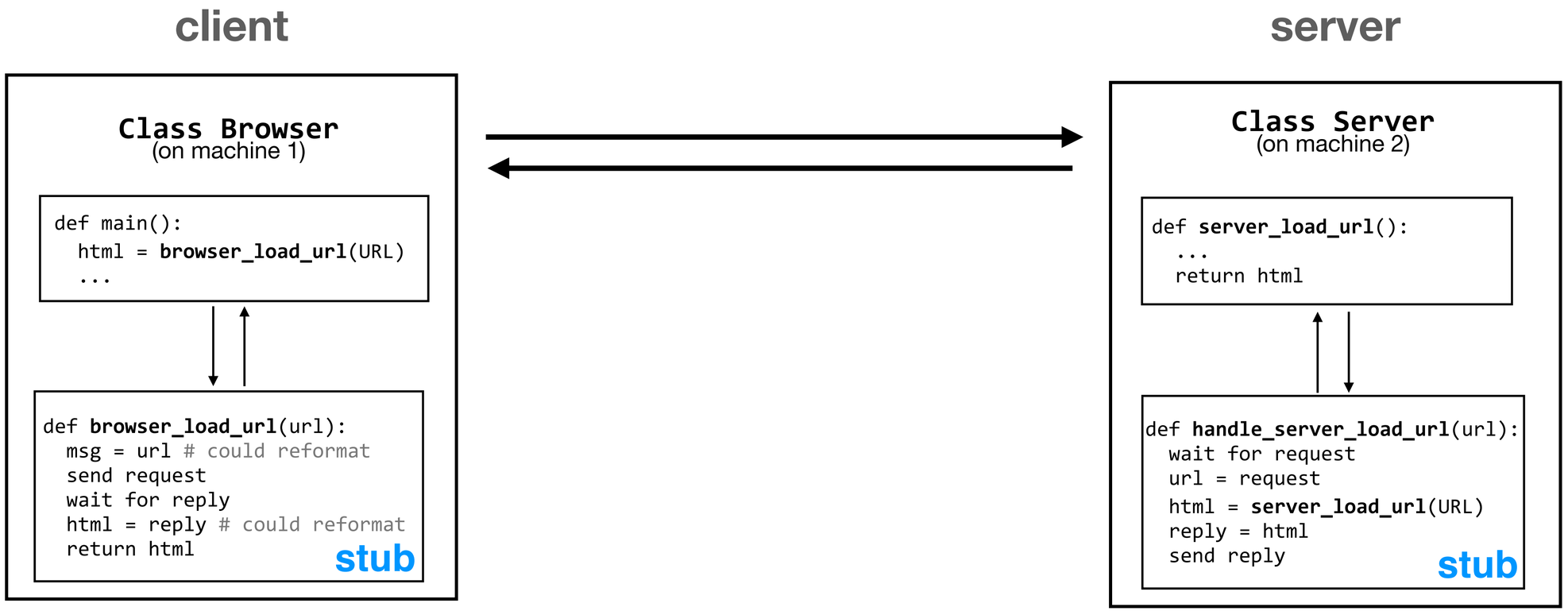
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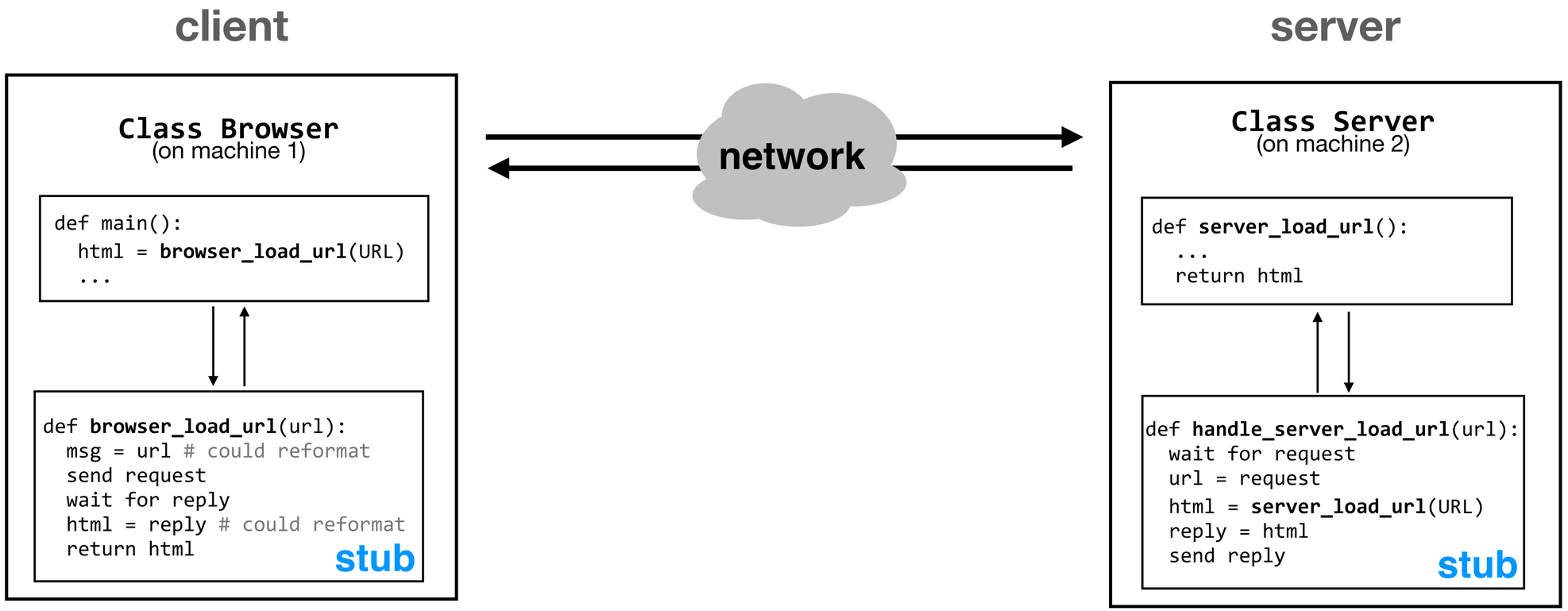
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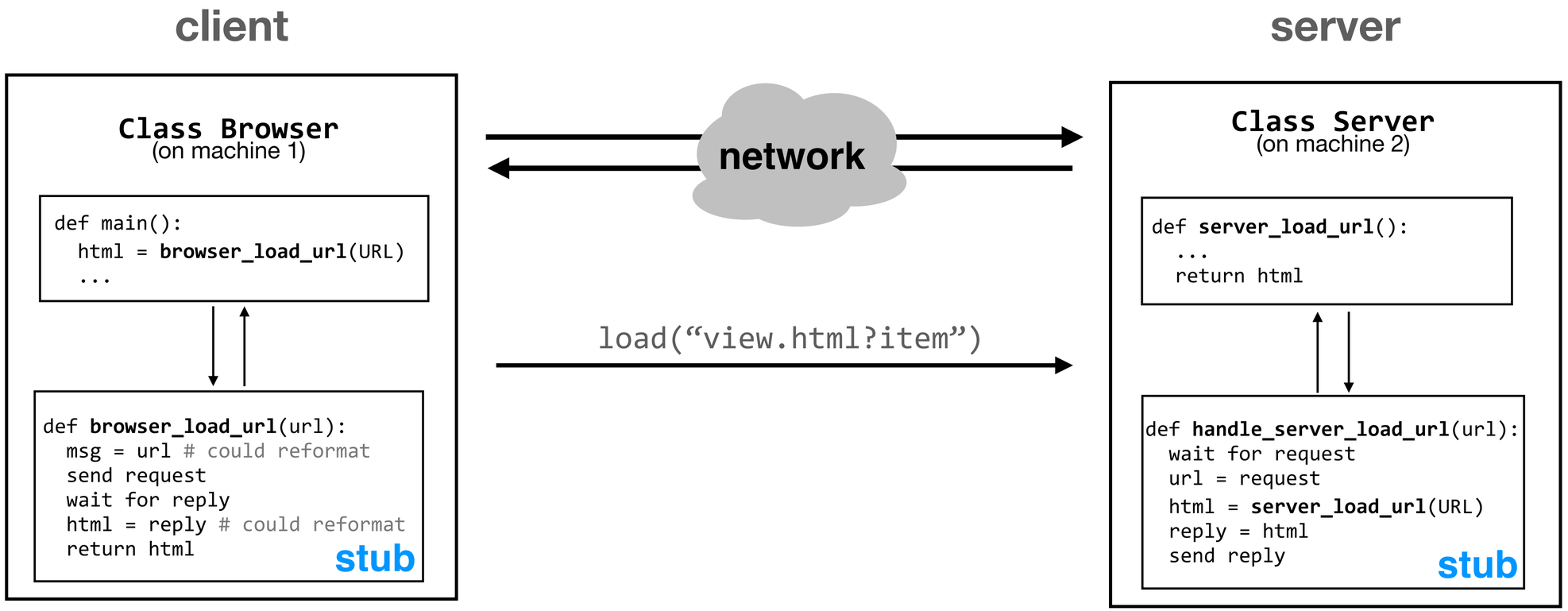
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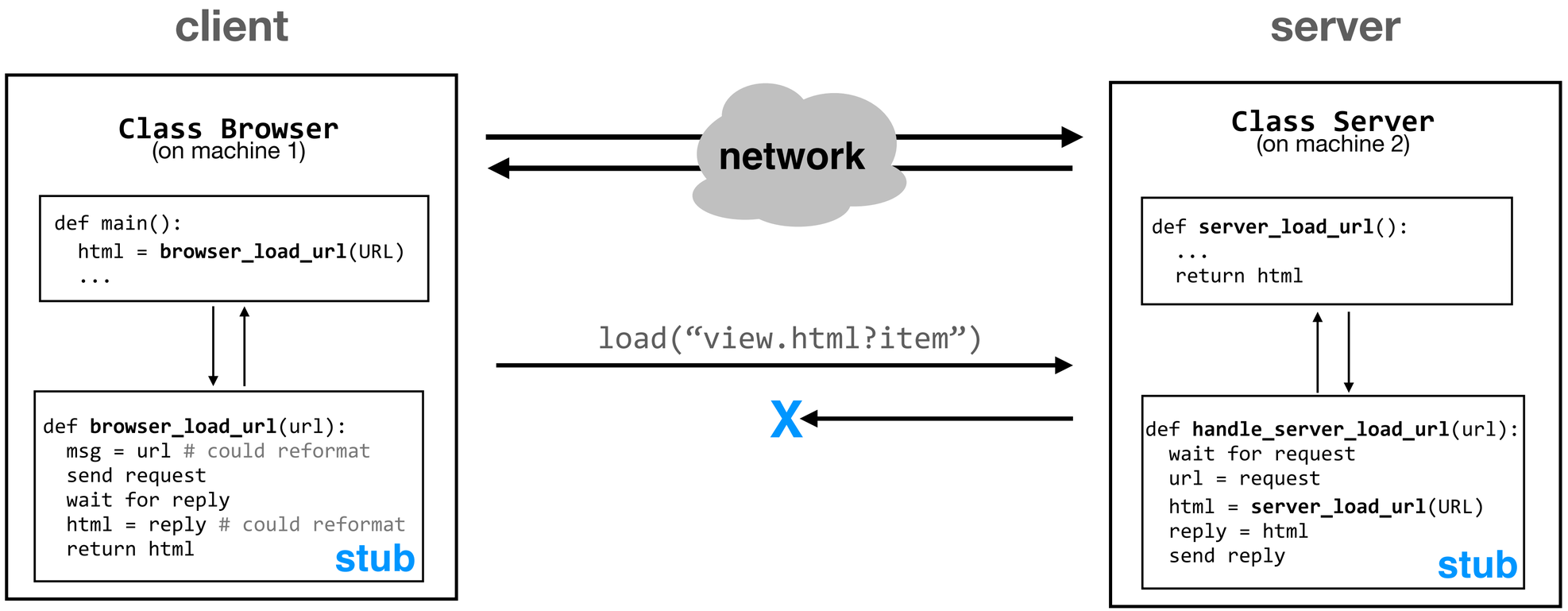
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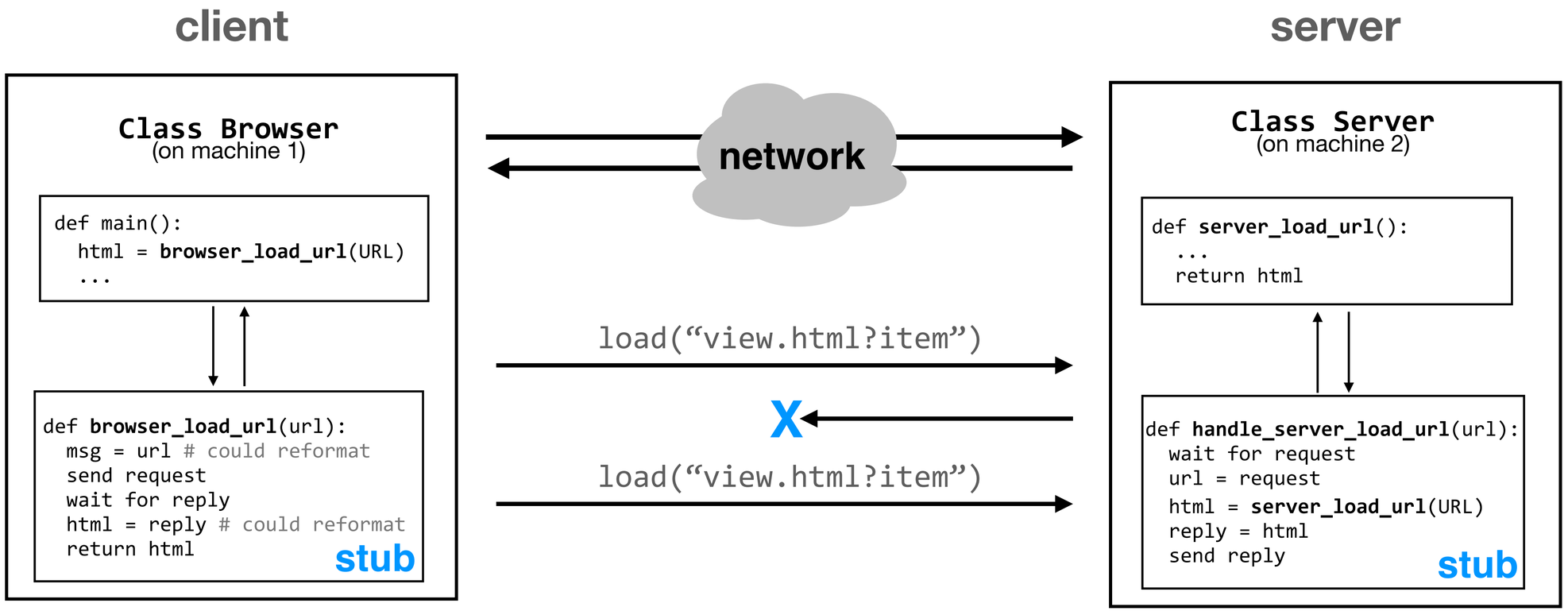
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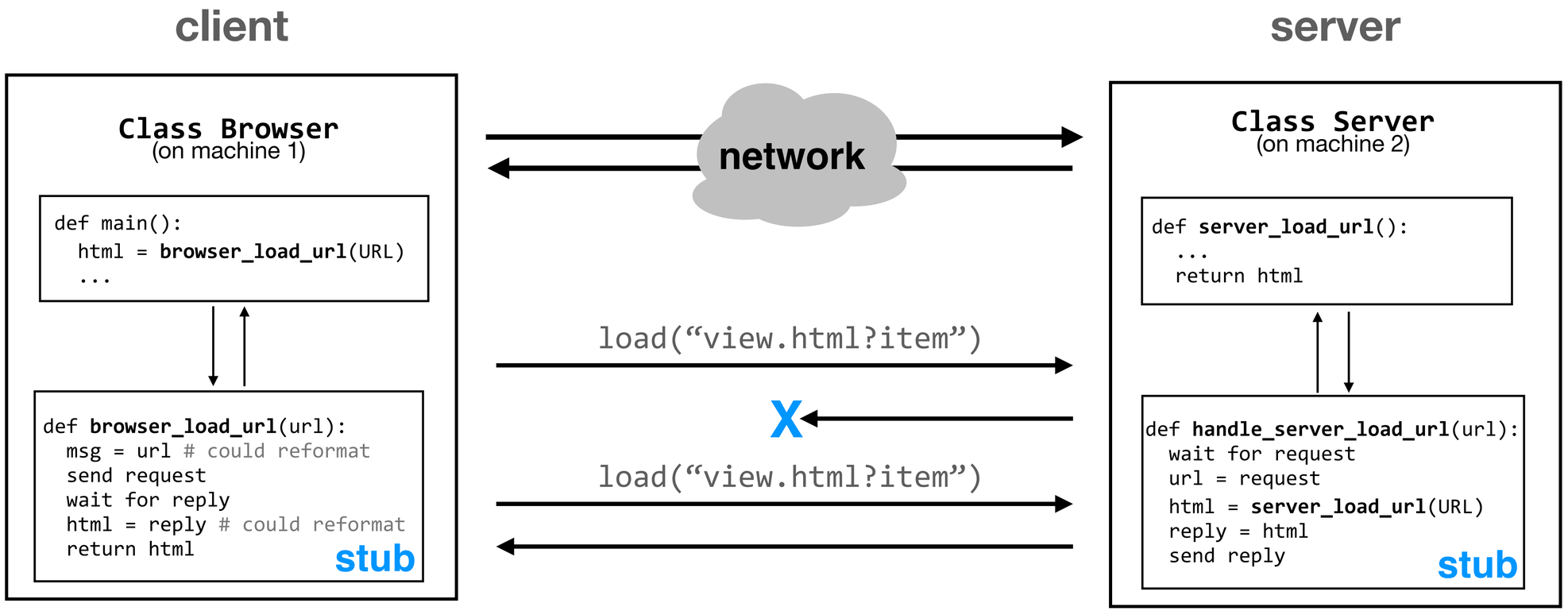
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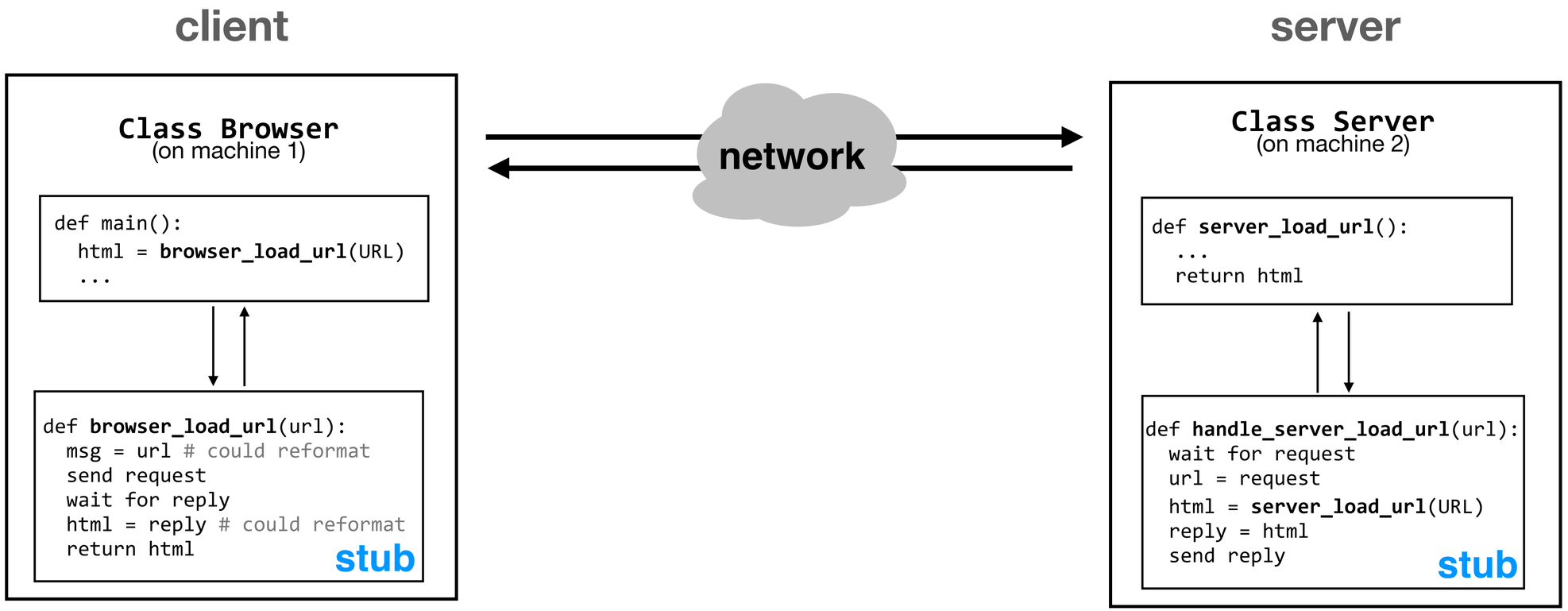
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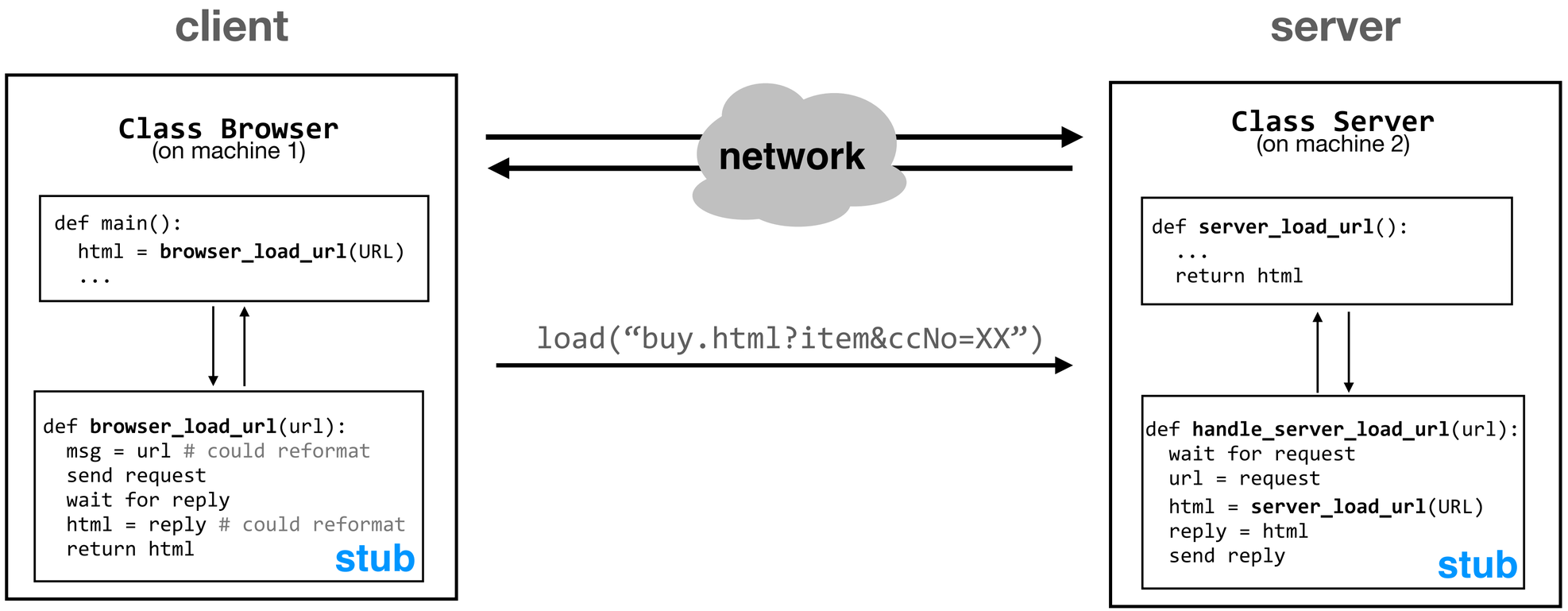
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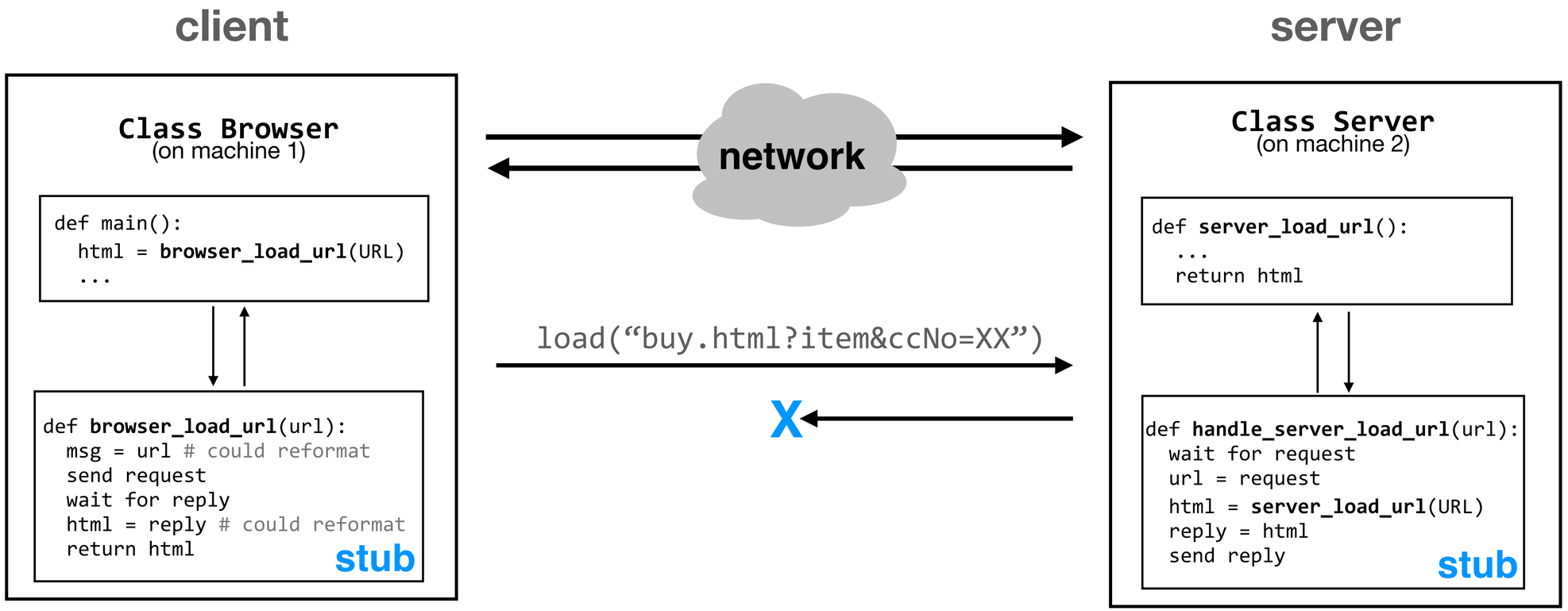
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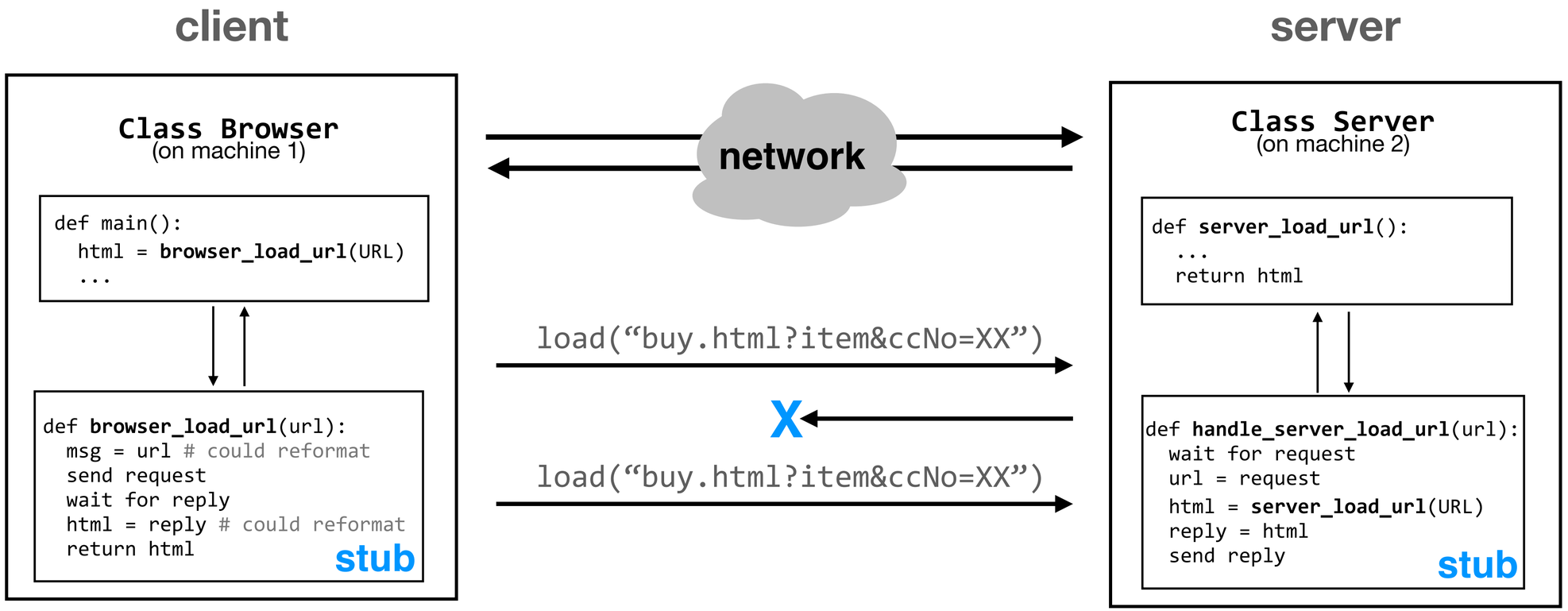
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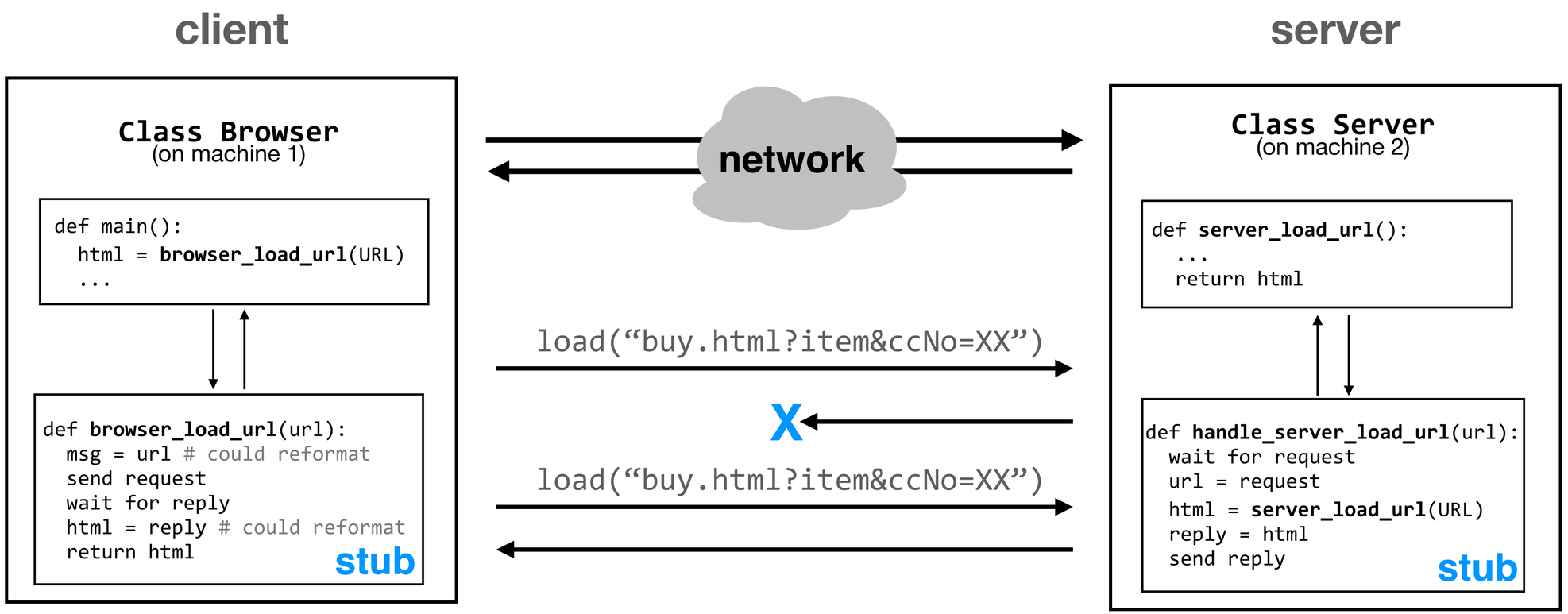
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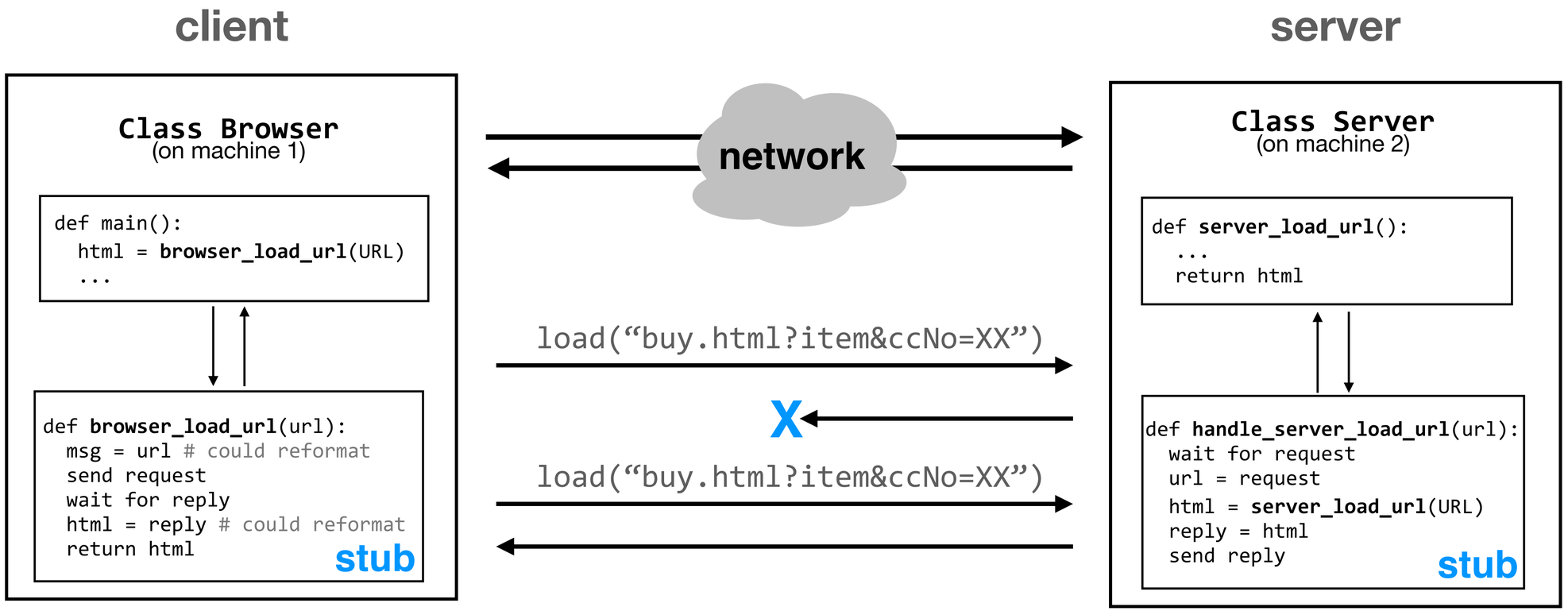
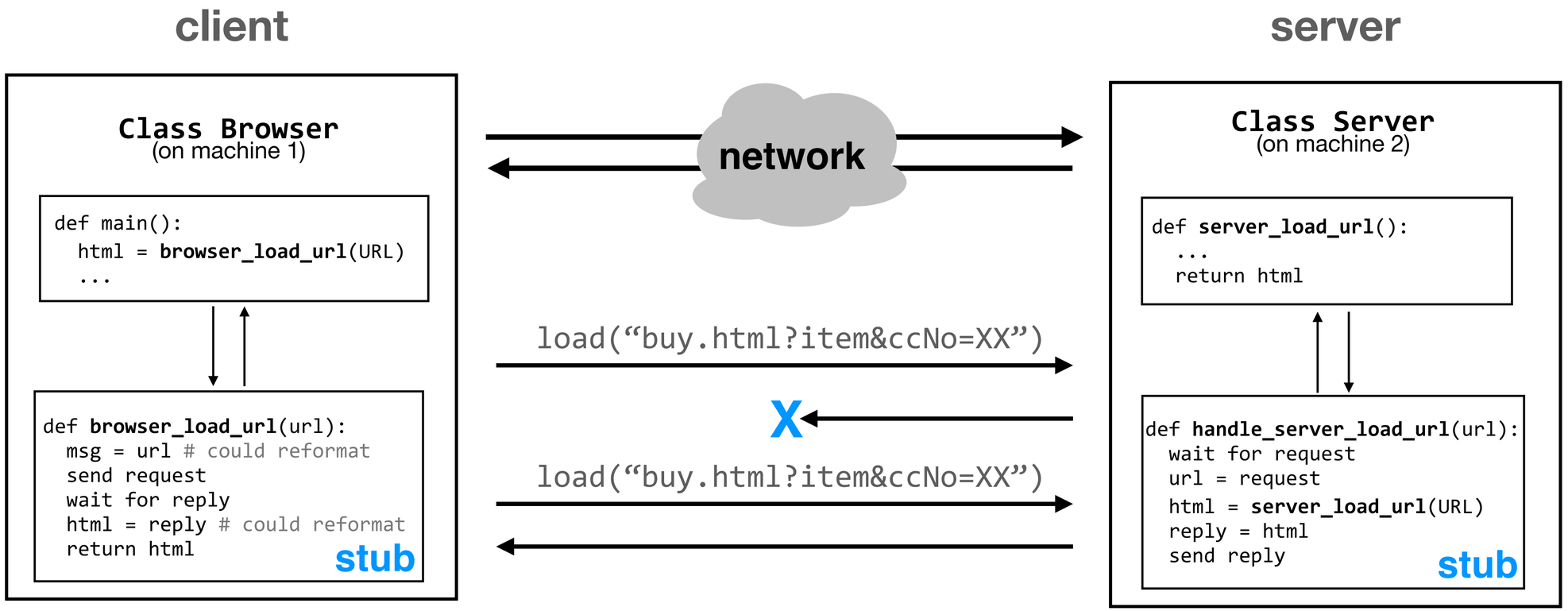


problem: we just bought two copies of `item`



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there are ways to deal with this issue — for example, giving each request a unique ID, and keeping track of those IDs on the server — but then new problems arise: for example, what happens if the server crashes in the middle of handling a request?


client
network
server


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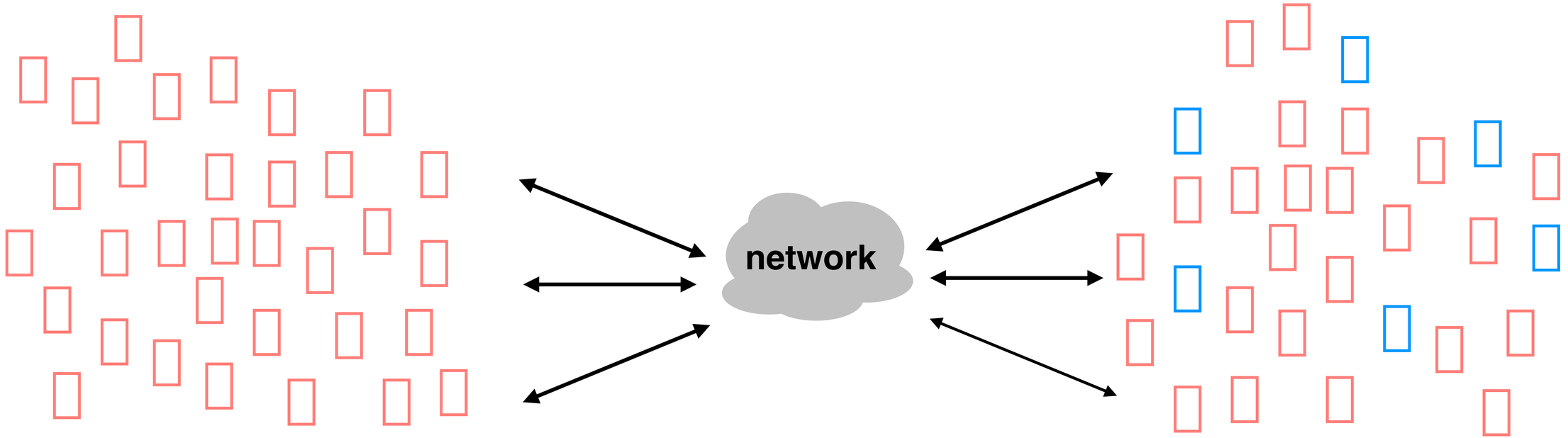
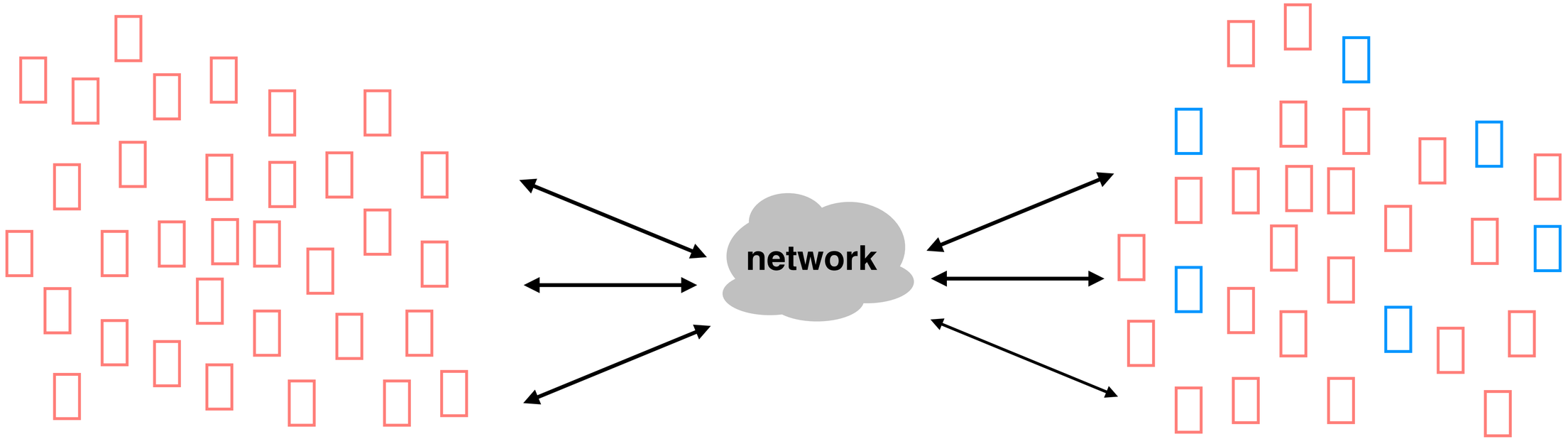

network

scalability: how does our system behave as we increase the number of machines, users, requests, data, etc.?



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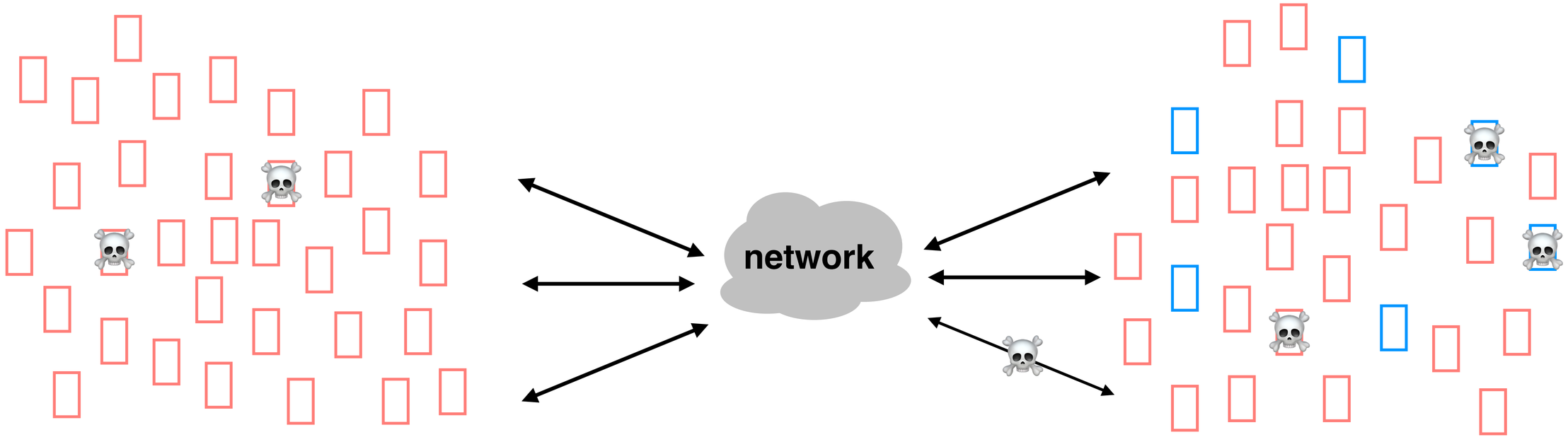
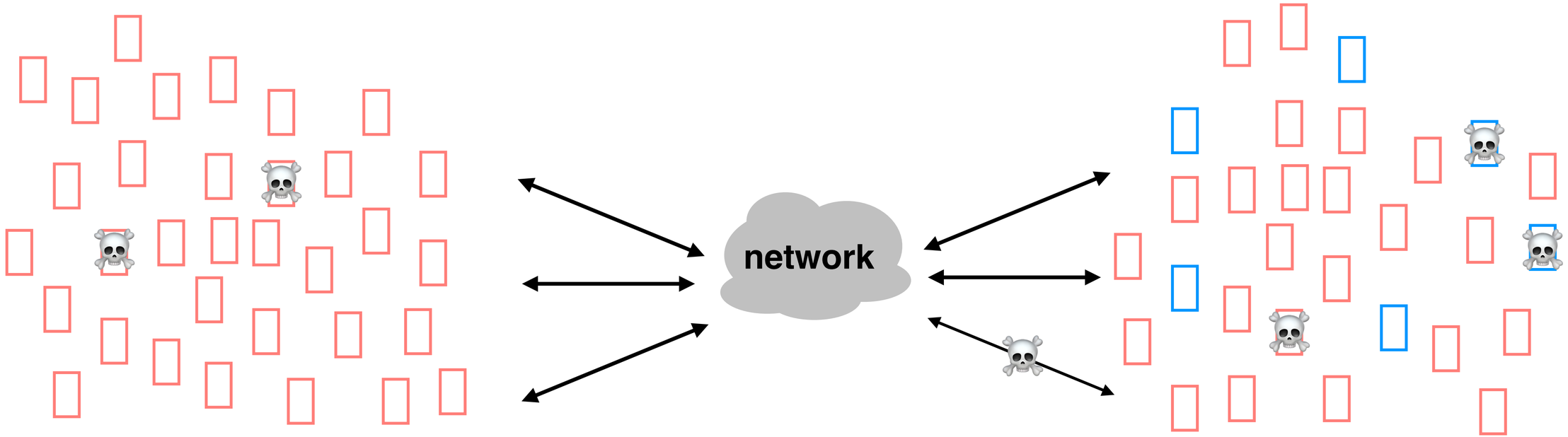


scalability: how does our system behave as we increase the number of machines, users, requests, data, etc.?

fault-tolerance/reliability: how does our system deal with failures (☠️)? machines crashing, network links breaking, etc.



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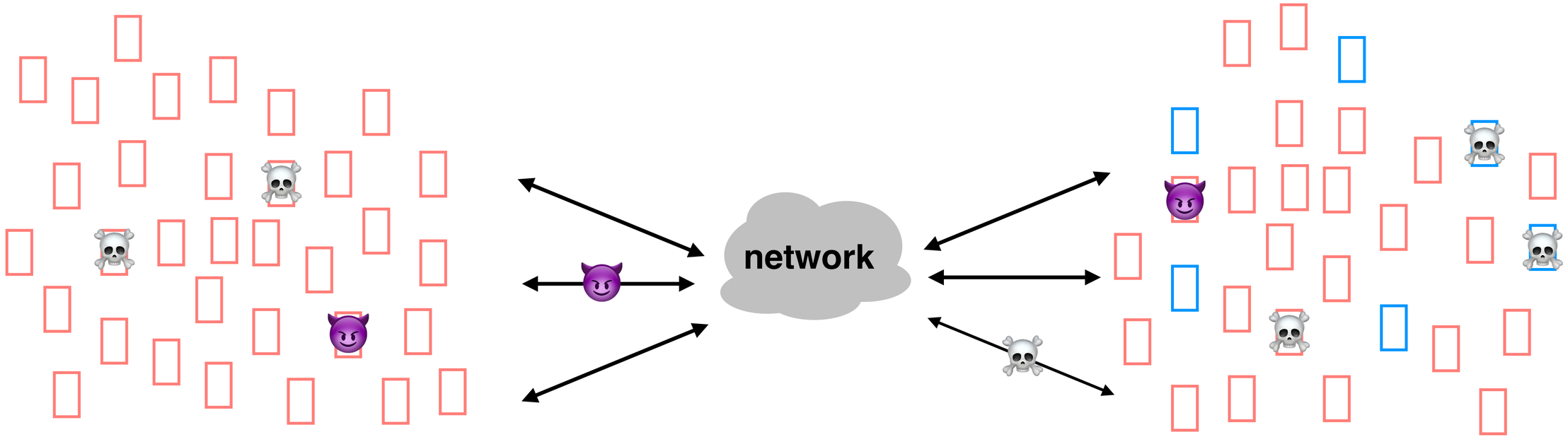

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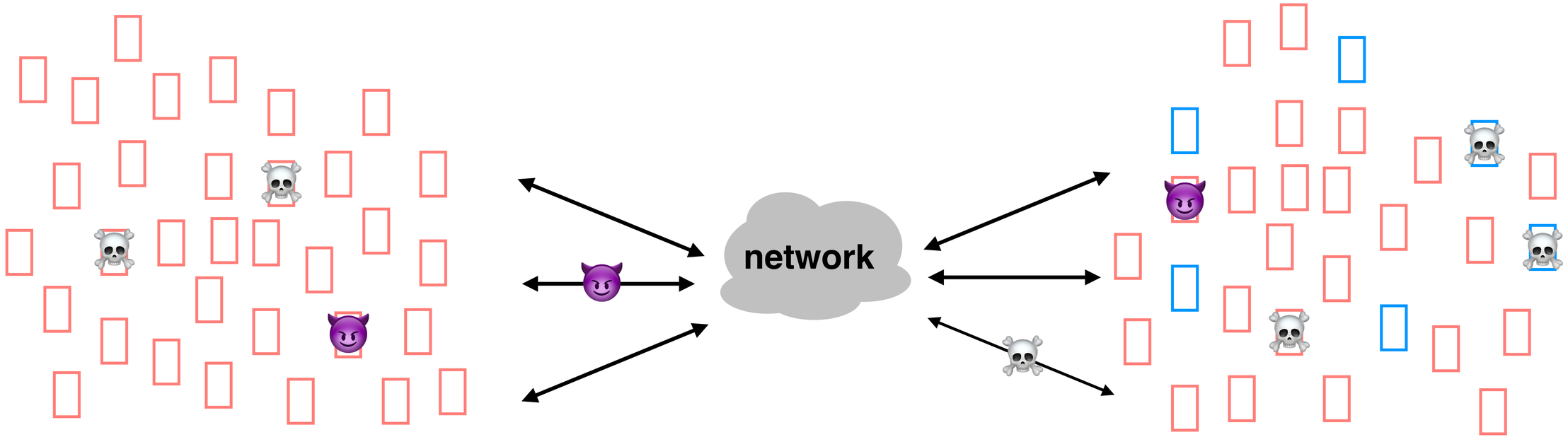

security: how does our system cope in the face of targeted attacks (😈)?

scalability: how does our system behave as we increase the number of machines, users, requests, data, etc.?

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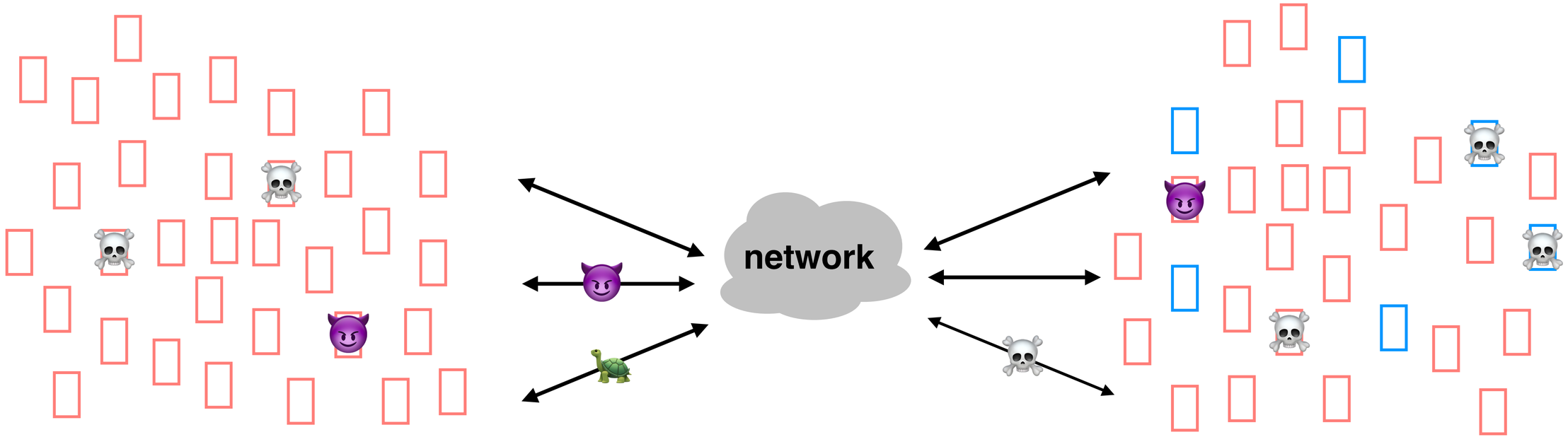

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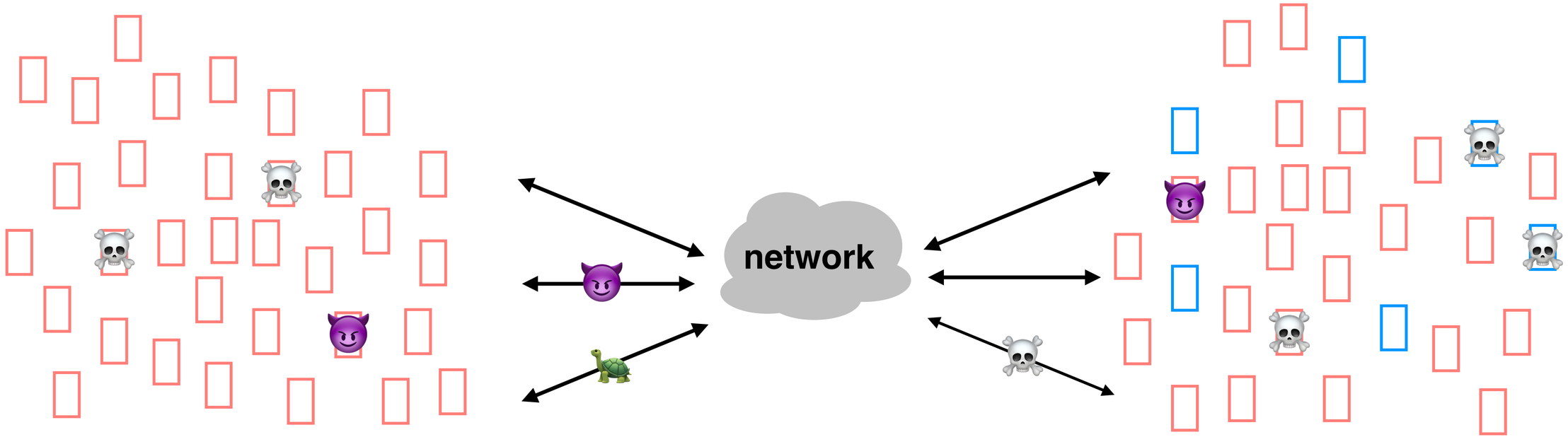

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performance: how do we define our performance requirements, and know if our system is meeting them? what do we do if performance is subpar (🐢)?

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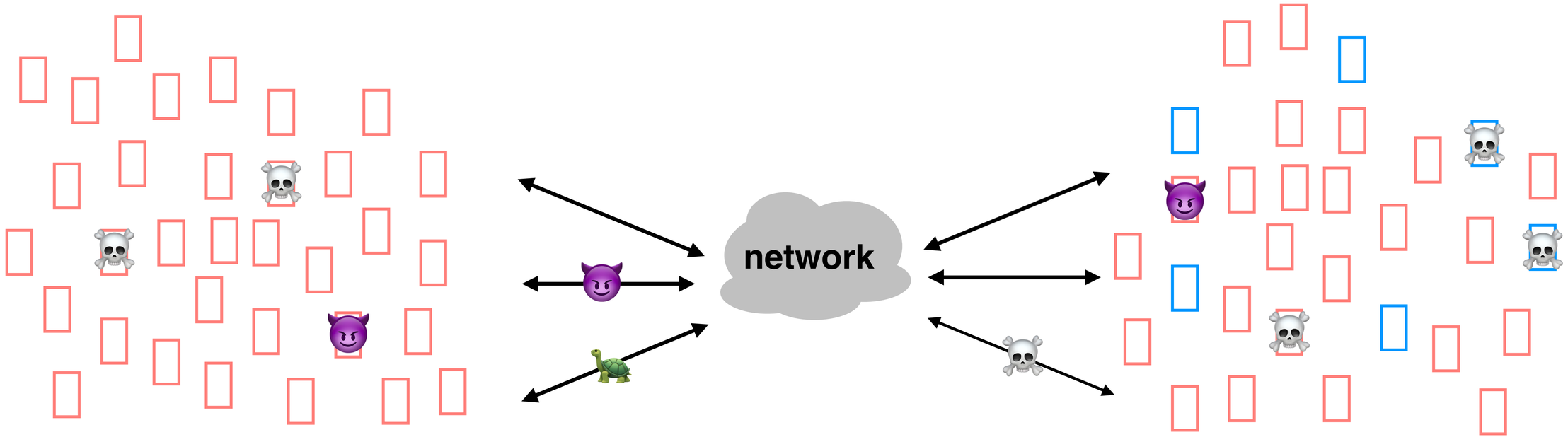


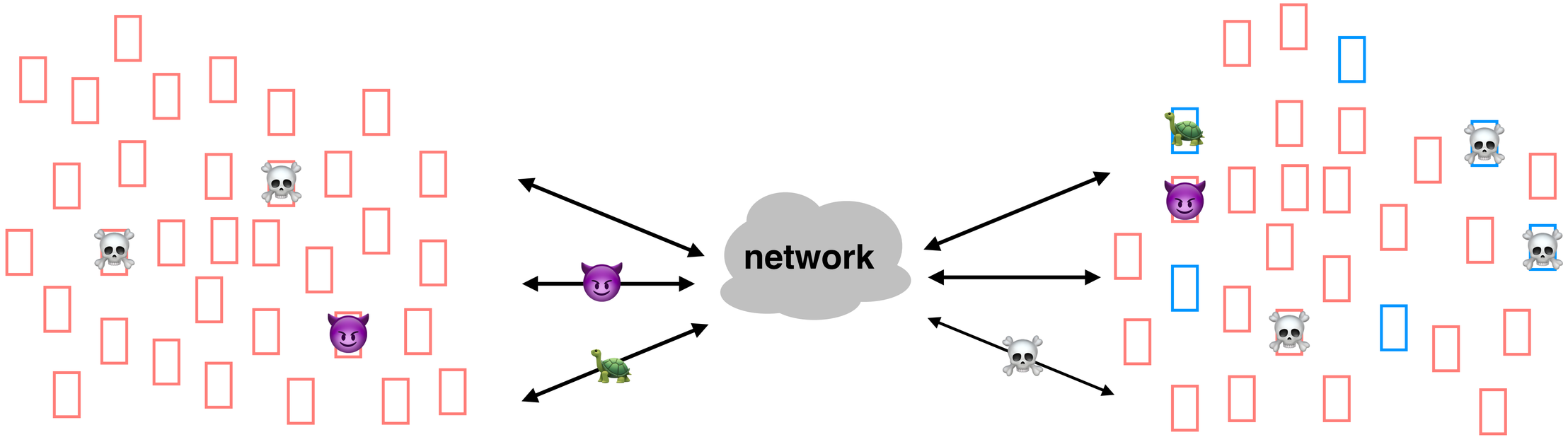
security: how does our system cope in the face of targeted attacks (😈)?

performance: how do we define our performance requirements, and know if our system is meeting them? what do we do if performance is subpar (🐢)?

how do our design and implementation choices affect people and communities? who makes those choices?

scalability: how does our system behave as we increase the number of machines, users, requests, data, etc.?

fault-tolerance/reliability: how does our system deal with failures (☠️)? machines crashing, network links breaking, etc.



security: how does our system cope in the face of targeted attacks (😈)?

performance: how do we define our performance requirements, and know if our system is meeting them? what do we do if performance is subpar (🐢)?

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has all of the class material, due dates, deadlines, etc.

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Piazza

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Piazza

this is where announcements happen. there will be things that we post on Piazza that aren't on the website (e.g., zoom links)

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next lecture: naming, which allows modules to communicate

after that: operating systems, which enforce modularity on a single machine