Timecritical network syncronization and signaling

Jenny Olsson

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Abstract.

This bachelor thesis explores the possibility to synchronize rendering over a network. The need to synchronize rendering occurs since projectors have a limited resolution. To achieve a specific higher resolution the rendering of an animation needs to be divided over several projectors. If these projectors are connected to different computers the rendering needs to be synchronized.

The thesis will explore different teqniques and algorithms for achieving synchronization and present one possible solution in a demo program written i python. The design choices for the demo will be explained and evaluated as well as the choosen algorithms.

Summary

This thesis was written in the spring of 2013. It is an investigation into different solutions on how to sychronize rendering on different computers over a network. A possible use case is to manage projections that needs to combine a number of projectors to achieve a desired resolution, since projectors have a limited resolution. The specifications also required the possibility to distribute events to all rendering parts, for example by turning a knob on a mixer-table. The event message could for example contain parameters for the animation that the rendering parts should render. The rendering of these events should also be synchronized.

Different solutions on how to achieve synchronizations has been investigated, starting with the solution implemented using a combination of well known algorithms and solutions.

Preface

This thesis was written at 23c in Stockholm as the fulfilling of my bachelors degree in computer engineering from The Royal Institute of Technology in Kista. It was started in March of 2013 and consists of 15 ECTS points.

It presents a possible solution on how to synchronize the rendering processes on different computers over an network.

This thesis and the code presented has been written by me and in the cases where other sources has been used this is clearly citated.

Stockholm 2013

Jenny Olsson

Glossary

NTP

Network Time Protocol, used to synchronize computer clocks over an network.

Frameskipping

Skipping a certain amount of frames forward.

Tweening

Also known as inbetweening. Technique for creating linear animations by defining the start and the end states of the animation.

Timestep

Defining the amount of steps to skip forward in an animation, making the animation depend on time rather than framerate.

Round trip delay

The delay in time between sending and recieving a message.

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Finally I would like to thank Sanna Barsk for the extensive proof-reading of this thesis.

Contents

Chapter 1

About synchronization

You may delay, but time will not.

- Benjamin Franklin

1.1 Background

Because projectors and screens have a limited resolution, achieving a specific higher resolution requires combining several screens or projectors. This leads to a need to synchronize the graphics-rendering of an arbitrary number of computers, connected to these screens or projectors. This thesis will explore the possibility of synchronizing rendering.

The work of this thesis will ultimately be used in a system to synchronize the rendering in a platform for graphics visualisation written in C++, OpenGL3 and GLSL. According to the specification, specific events also need to be able to be sent to the clients, and the clients should be able to perform specific animations on recieving these events.

1.1.1 When is the rendering synchronized?

Research has been made into the maximum amount of delay acceptable for the human eye between audio and video[1], as this is important in the broadcasting of television. No research into what could be "acceptable" asychronization for the human eye in video to video synchronization will be made in this thesis, it will be assumed that it is a soft real time system and that the delay between the video should be as short as possible, a best effort system. For the sake of clarity we discuss delays in milliseconds.

1.1.2 What needs to be synchronized?

Since the clients rendering the animations will be distributed on different computers it cannot be assumed that the clocks on these computers are in sync with each other, this means that the computer clock time cannot be used directly for deciding the time of the animations. It also cannot be assumed that the computers rendering the animations are running at the same framerate.

Another part of the problem is that the clients will not recieve the event messages from the server at the same time since they are distributed over a network and can have very different delays. These animations that occur on recieving events also needs to be synchronized. This could be solved by giving the clients some notion of their delay in relation to the other clients.

1.1.3 What is specific for synchronizing rendering?

There are a few tools available when working with rendering, there is first of all the possibility to change the speed and start time of animations but also the possibility to frameskip. There is also the possibility to framestep and make the animations time dependent rather than dependent on framerate.

1.2 Synchronizing clocks over a network

The problem of synchronizing computer clocks over a network has been investigated since the early days of networks. There are a few well known algoritms, these are the ones looked into in the making of this thesis.

[1] http://tech.ebu.ch/docs/r/r037.pdf, EBU

1.2.1 The NTP algorithm

The NTP protocol was originally devlopeded in 1985 by David L.Mills. It is used to synchronize clocks over a network by calculating the master offset using the round trip delay. NTP is still in use today, the latest RTC is from june 2010[2].

The NTP algorithm uses four different timestamps to calculate the round trip delay.

t0 is the time of the request packet transmission

t1 is the time of the request packet reception

t2 is the time of the response packet transmission

t3 is the time of the response packet reception.

The timestamps of t0 and t3 is set by the sender and t1 and t2 by the reciever. The sender then calculates the round trip delay, δ.

$$\delta = (\mathrm{t3} - \mathrm{t0}) - (\mathrm{t2} - \mathrm{t1})$$

NTP assumes that the delay on the sender and the reciever is equal, and thus calculate the master offset, θ, as below.

$$\theta = \frac{(\mathrm{t3} - \mathrm{t0}) - (\mathrm{t2} - \mathrm{t1})}{2}$$

Source [6].

1.2.2 The Berkley algorithm

The Berkley algorithm was written by Gusella and Zatti in 1989. A simplification of the steps of the algorithm is shown below.

[2] https://tools.ietf.org/html/rfc5905

1. A master polls slaves, the slaves replies with their time.
2. The master uses the round-trip time of the messages to estimate the time of each slave and the masters own time.
3. The master calculates an average of the clock times, ignoring extreme values.
4. The master sends the slaves their delta, which can be positive or negative.

The delta value is used in each slave to adapt their time to the choosen master time.

1.2.3 Cristians algorithm

Cristians algoritm, developed in 1989 by Flaviu Cristian, is used for synchronizing clocks by calculating the round trip time. It is a probabilistic algorithm[4], meaning that it it delivers a better accuracy the shorter the round trip delay time is.

The algorithm works so that the server sends a message to the client, and the client replies. When the server recieved the reply from the client it calculates the round trip delay time, the time passed between sending the request from the server and recieving the reply to the client divided by 2. This assumes that the latency of the server and the client is equal.

The server then sends the sum of its own time added with the round trip delay time to the client, and the client sets this as its own time.

$$\text{Client time} = \text{Server time} + \text{Round trip delay time}$$

Figure 1.1: Setting the time on the Client

Source[4].

1.2.4 PTP and GPS

The Precision Time Protocol, abbriviates PTP, is a protocol used for high accuracy synchronization in time critical systems. The first RTC is from 2002. Although PTP achieves a very high level of synchronization it was believed in the making of this thesis that synchronizing rendering would not require that kind of precision.

One other solution for synchronizing the time of distributed applications is to use GPS. This has not been investigated further in this thesis since this would require that all clients had a GPS-sender/reciever, something that seemed improbable.

1.3 Problem definition

- Can we synchronize the rendering on an arbitrary number of computers?
  - How can we solve the messaging of synchronization-events?
  - When and how often do we need to synchronize?
  - What techniques are available?
  - Which method gives the tightest synchronization?
  - Which method is the most efficient?
  - How can the synchronization be optimized?

Chapter 2

Design of the demo application

This section aims to explain the architecture and design choices made for the demo application.

All the code for the demo program described is available at github[1].

2.1 Overall architecture

The demo program consists of a server that continously accepts connecting clients and a client that connects with the server. An arbitrary number of clients can run and connect to the server.

[1] https://github.com/Rymdsnigel/thesis-demo

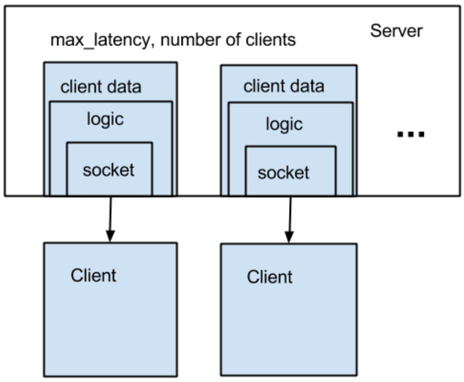


Figure 2.1: Overall architecture of the system.

2.2 Why the Client-Server approach?

Since there was a need to both generate and distribute specific events the client-server approach was chosen, as opposed to choosing a master among the clients, which might have been a reasonable choice if the generation of events had not been in the specification.

2.3 Events

Both the client and the server create events, events that will be parsed to json and sent either from the server to the clients or from the client to the server. The server produces render events on input from the pygame widow, sync events on key input from the pygame window and latency update events as a reply to sych events from the client, while the client only produces sync events as reply to the server sync events. All three different types of events have an event type, an integer that identifies the event type.

The content of the sync event and the latency update event will be explained in chapter 4.

```
# Latency update event
{
   "event_type" : 0,
   "latency" : latency,
   "max_latency" : max_latency
}

# Sync event
{
   "event_type" : 1,
   "recieved_at" :recieved_at,
   "sent_at" : sent_at,
   "delta" : delta,
   "client_id" : id

# Render event
{
   "event_type" : 2,
   "id": id,
   "channel" : channel,
   "data_id" : data_id,
   "data_val" : data_val,
   "timestamp" : timestamp,
   "reserved" : reserved
}
```

Figure 2.2: Event types.

2.4 Event queues

Both the server and the clients have event queues, when they create an event they place it in their queue. Messages are then polled from the queue and sent one at the time, this works the same on the clients and the server. This is to not block other threads by sending data.

2.5 Messaging

The server and clients send and recieve json, the json is created using simplejson library functions (dumps() and loads()), creating json from dicts. The functions for generating the dicts that will be sent as the messages are specified in event.py, and the specified dicts are shown in the section about SOMETHING 2.2.

The choice of json for messaging, instead of using pickle or cpickle to read and write messages was made due to jsons speed of reading and writing [2] and to support future flexibility in language since pickle and cpickle is python-specific.

2.6 Communication

2.6.1 Protocols

The choice of TCP-sockets as opposed to UDP-sockets was made at an early stage of development. Although UDP is typically the ideal choice for time critical applications, it was belived that customizing the needed controlmechanisms would be outside the scope of this thesis.

The choice of TCP presented itself as an issue when it was discovered that TCP:s message buffering, using Nagels algoritm, generated a general delay in messaging, a delay of 20 ms both from the server as from the clients. This was discovered by measuring the delays of the applications over localhost, where networkdelays should be close to 0. It also resulted in that more than one json object could be put on the queue of recieved events, which lead to a json-parsing error when trying to load the objects. These errors and the buffer delays where removed by disabling Nagels algoritm[3].

```
self.s.setsockopt(socket.IPPROTO_TCP, socket.TCP_NODELAY, 1)
```

Figure 2.3: Disabling Nagels algorithm on a socket

[2] http://kovshenin.com/2010/pickle-vs-json-which-is-faster/, Kovshenin
[3] http://stackoverflow.com/questions/8617809/unstable-tcp-receive-times

2.6.2 Sockets

The demo server communicates with the clients via gevent sockets since the sockets need to be threaded not to block the other processes.

2.6.3 Replacing the networklayer

Functional cohesion has been strived for so that the transport-part of the code can easily be replaced by for example an implementation using UDP or implementation of a ready solution such as redis. Though this has not been entirely accomplished

2.7 Threading

Both the server and the client have to achieve concurrency. This is done by letting both the TransportServer and the TransportClient inherit from gevent Greenlets. Greenlets are pseudothreads that share the same OS-thread, and cooperatly multitask. Because it is cooperative the threads must release control of critical operations to not block all other threads.

2.8 Animations

For animations as well as server input Pygame was chosen. Pygame is built on SDL[4] and is a python library for game development. Pygame is easy to work with and was chosen for its simplicity to work with.

2.8.1 Tweening

Since the time when every client performs a specific animation needed to be able to be manipulated one of the first steps where to make the animations time dependent and independent from framerate. This is solved in the Tween class. The Tween class has two functions for generating input for the animations. This

[4] http://www.pygame.org/wiki/about

generated input can be used for, for example, deciding the position of an object or the color of a part of an object.

In every frame drawn on the client the current time is sent to the animations step function in the clients Tween instance. The animation saves the current time between frames and can then calculate the delay between two frames (delta). The animation then uses the delta value to interpolate between the start and the end values, ensuring that the animation runs for a set amount of time. This way the time of the animation can be manipulated by giving the Tween functions a value for current time that is in sync with the other clients.

Making the animations time dependant by timestepping is a major part of the chosen solution for synchronizing the animations presented in this thesis.

The functions for generating data for the animations are in the Tween class, see appendix B.

Chapter 3

Synchronizing the clients

The synchronization of the animations have two major steps. First of all we have a continously running animation that takes input from the Tween class. This animation could be synchronized by giving every client a notion of how much delay there is between that client and a master, a master that could be the server.

The second step where to adapt the time the clients played specific parts of the animation when recieving a render event message from the server. Here we also faced the challange that one client could have a latency bigger than we could accept so that we would have to adjust this client some other way. A solution for this was implemented using frameskipping.

3.1 Synchronizing the time

Because the clients may run on different computers the computer clock time cannot be used as a parameter to the animations since the computer clocks are unlikely to be in sync with each other. As shown in chapter 1 this is a well known problem in distributed systems, so the first step would be to implement one or several existing synchronization algorithms.

A combination of the Berkley algoritm (ref section) and NTP (ref section) was used to synchronize the time of the clients and the server. Both NTP and the Berkley algorithm are designed to be used in intranets since they assume an evenly distributed delay. The end product that the work in this thesis will be used for was assumed to run on an intranet. The accuracy given by these algoritms was assumed to be good enough.

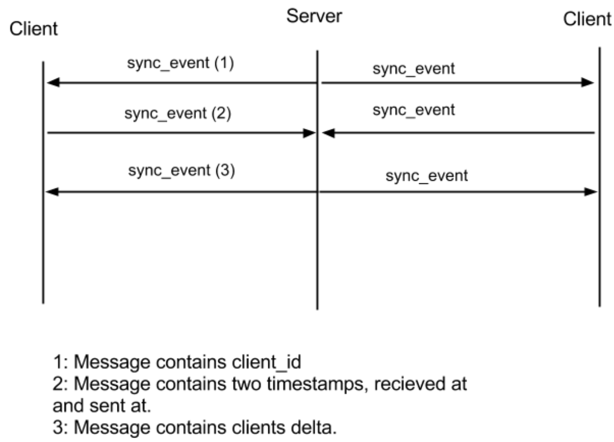
An artificial time is created both on the server and the clients on start and this time never manipulated. Instead a delta value added to the artificial time is used as input to the animations.

3.1.1 Distributing deltas

The server initiates the synchronization with the clients by sending a sync event message to the clients. The clients replies with the time they recieved the message, the time they send their reply and the clients old delta-value. The server then calculates each clients delta and sends each client a message containing their new delta.

If the value of the old delta of the client and the new delta calculated by the server differs more than 2 milliseconds the server will send a new sync event as a message to the client, repeating the procedure until the delta is stable.

Everytime a new client connects to the server this client needs to synchronize its time with the server.



3.1.2 Calculating deltas

An implementation of NTP was used to calculate each clients latency, shown below.

```
self.delta = ((self.t_1 - self.t_0) + (self.t_2 - self.t_3))/2
```

3.1.3 Using the delta values

All animations must take a timestamp as a parameter for playback. This is used to timestep through the animation. To create the timestamp the client uses the time aquired when delta is added to its own local time. This way all clients animations will be synchronized, they will be at the same stage in the animation at the same time given that they have their correct delta value.

3.2 Distributing latencies

3.2.1 Finding the latency of a client

The latency of each client is calculated by the server and sent to the client in an latency_update_event, along with the maximum latecy. The maximum latency is the latency of the client with the greatest latency. The client then calculates the wait period to sync to the client with the highest latency by subtracting its own latency from the maximum latency.

Client latencies are stored in an array on the server, everytime a client latency is updated the value of that respective row in the array is updated. The maximum latency is simply the largest number in this array.

Every time a new client connects to the server the server must send latency_update_events to all clients since the new connecting clients latency might be bigger than the current maximum latency. The maximum latency then needs to be redistributed to all clients.

$$\text{applied\_latency} = \text{maximum\_latency} - \text{latency}$$

Figure 3.1: Calculating the applied latency

3.2.2 Delaying animation start based on latency

Before handling a new render event the client waits for the number of milliseconds specified by its applied latency. This way the faster clients will compensate for the slow ones.

3.2.3 Skipping frames if delay is to long

If a clients latency is higher than a set threshold, the highest latency under the treshold is selected as the maximum latency and the client(s) above the threshold skip ahead instead. The clients that skip ahead will use their latency to skip that amount of time ahead in the animation.

Chapter 4

Running the demo application

This section explains how to run, interact with the program, and how it works more specificly.

This section explains how the program works more specificly. It describes how to run it and how to interact with it.

4.1 Running the programs

The demo program is written in python 2.7.2. It requires pygame 1.9.1, simplejson 2.1.6, docopt 0.6.1 and gevent 0.13.0.

It is delivered with a bash-script named testrun_2clients.sh that starts the server and 2 clients. The server and clients can also be started separately, but the server must be started first since the clients have no autodiscovery.

The server takes no parameters and can be started as shown below.

```
$ python server.py
there is no soundcard
```

Starting the clients requires some flags to be specified. The –help flag displays the flags the client takes as arguments on startup.

```
$ python client.py --help
Client rendering graphics

Usage:
  client.py [--port=<nr>]
            [--framerate=<frame/s>]
            [--x=<pixels>]
            [--y=<pixels>]
            [--pos <x1> <y1> <x2> <y2>]
  client.py (-h | --help)
  client.py --version

Options:
  -h --help     Show this screen.
  --version     Show version.
  --port=<nr>   Port number to bind to client [default: 5007].
  --framerate=<frame/s> Client framerate [default: 0].
  --x=<pixels> Width of client screen [default: 300].
  --y=<pixels> Height of client screen [default: 300].
  --pos <x1> <y1> <x2> <y2> Position of the part of the animation the client shows.
```

4.2 Emulating network delays

In the beginning of the development the emulated network-delays where inserted using an gevent.sleep for a variable time in the code, this variable could then be specified from command line. This was then replaced by using netem [1], a more flexible solution. With netem, delays can be bound to specific ports. This requires the clients to be bound to these ports, the port to bind the client to must be specified when starting the client, using the –port flag.

4.3 Interacting with the server

The pygame window of the server captures the events. When clicked at it will display one animation, changing the color of a cube and changing it back. By

[1] http://www.linuxfoundation.org/collaborate/workgroups/networking/netem

```
[]
tc qdisc add dev lo handle 1: root htb

tc class add dev lo parent 1: classid 1:1 htb rate 1000Mbps

tc class add dev lo parent 1:1 classid 1:11 htb rate 100Mbps
tc class add dev lo parent 1:1 classid 1:12 htb rate 100Mbps
tc class add dev lo parent 1:1 classid 1:13 htb rate 100Mbps

tc qdisc add dev lo parent 1:11 handle 10: netem delay 40ms
tc qdisc add dev lo parent 1:12 handle 20: netem delay 20ms
tc qdisc add dev lo parent 1:13 handle 30: netem delay 0ms

tc filter add dev lo protocol ip prio 1 u32 match ip dport 10001 0xffff flowid 1:
tc filter add dev lo protocol ip prio 1 u32 match ip dport 10002 0xffff flowid 1:
tc filter add dev lo protocol ip prio 1 u32 match ip dport 10003 0xffff flowid 1:

tc filter add dev lo protocol ip prio 1 u32 match ip sport 10001 0xffff flowid 1:
tc filter add dev lo protocol ip prio 1 u32 match ip sport 10002 0xffff flowid 1:
tc filter add dev lo protocol ip prio 1 u32 match ip sport 10003 0xffff flowid 1:
```

Figure 4.1: Setting delays on port 10001, 10002 and 10003

```
tc qdisc del dev lo root
```

Figure 4.2: Removing delays set on dev

holding down the right mouse button the cube can be moved. By pressing any keyboard key a sync event is sent from the server to all clients.

4.4 Communication

The server continously accepts new connections but if the clients lose connection with the server they will not automaticly reconnect. If the server should crash, the clients lose their connection and the connection wont be reestablished by restarting the server.

Chapter 5

Conclusions

The goal of this thesis was to implement an algorithm for synchronizing rendering on different computers over a network. This has been achieved combining well known algorithms for synchronization and adapting the rendering.

Some important steps in development:

1. Making the animations on the clients depend on the time.
2. Making sure that the client and the server agreed on a timestamp.
3. Using the agreed time in the animation.
4. Calculating the network latency of a specific client.
5. Using the network latency to delay animating.
6. Finding a convenient way to emulate network latencys.

5.1 Testing the application

The application has during development been tested over localhost, running the server and all clients on the same computer, applying delays using netem as descibed in section ???. It has also been run on a local network with the server running on one computer and the clients on other computers.

The synchronization has been evaluated by logging the time when each client plays a specific step in the animation. Logs are written to file for evaluation. An example of a log that shows delays of around 30 ms before applying the latencies can be found in appendix A. The client ports in this testrun have delays of 20 ms respectively 50 ms which makes a 30 ms async seems reasonable. After applying the latencies we get a time gap between the animations of between 0 and 3 ms.

Since the application is a distributed system, testing through logging of timestamps requires the clocks of the computers running the clients to be synchronized to make any use of the log. This is why the synchronization part only has been investigated with all parts of the application running on one computer.

Chapter 6

Limitations

Outlook – suggested improvements

The demo is a proof of concept and there are a few recommended improvements to it.

The first suggested step would be to evaluate the system using UDP or by replacing the network-layer with some solution like zeromq or redis. Both of these provides solutions for a publish/subscribe server.

The input for the server should be generalized so that it the input device could be replaced by for example a mixer-table.

Appendix A

Log from two clients running on the same computer

```
2013-05-09 22:59:00,340 - INFO - 1- Client animation started, time for animation:
2013-05-09 22:59:00,374 - INFO - 2- Client animation started, time for animation:
2013-05-09 22:59:00,540 - INFO - 1- Client animation started, time for animation:
2013-05-09 22:59:00,573 - INFO - 2- Client animation started, time for animation:
2013-05-09 22:59:01,115 - INFO - 1- Client animation started, time for animation:
2013-05-09 22:59:01,146 - INFO - 2- Client animation started, time for animation:
2013-05-09 22:59:01,320 - INFO - 1- Client animation started, time for animation:
2013-05-09 22:59:01,346 - INFO - 2- Client animation started, time for animation:
2013-05-09 22:59:01,956 - INFO - 1- Client animation started, time for animation:
2013-05-09 22:59:01,986 - INFO - 2- Client animation started, time for animation:
2013-05-09 22:59:02,156 - INFO - 1- Client animation started, time for animation:
2013-05-09 22:59:02,186 - INFO - 2- Client animation started, time for animation:
2013-05-09 22:59:02,741 - INFO - 1- Client animation started, time for animation:
2013-05-09 22:59:02,772 - INFO - 2- Client animation started, time for animation:
2013-05-09 22:59:02,941 - INFO - 1- Client animation started, time for animation:
2013-05-09 22:59:02,973 - INFO - 2- Client animation started, time for animation:
2013-05-09 22:59:03,784 - INFO - 1- Client animation started, time for animation:
2013-05-09 22:59:03,826 - INFO - 2- Client animation started, time for animation:
2013-05-09 22:59:03,984 - INFO - 1- Client animation started, time for animation:
2013-05-09 22:59:04,026 - INFO - 2- Client animation started, time for animation:
2013-05-09 22:59:05,120 - INFO - 1- Client animation started, time for animation:
```

```
2013-05-09 22:59:05,159 - INFO - 2- Client animation started, time for animation: 20(
2013-05-09 22:59:05,321 - INFO - 1- Client animation started, time for animation: 20(
2013-05-09 22:59:05,358 - INFO - 2- Client animation started, time for animation: 20(
2013-05-09 22:59:05,932 - INFO - 1- Client animation started, time for animation: 20(
2013-05-09 22:59:05,964 - INFO - 2- Client animation started, time for animation: 20(
2013-05-09 22:59:06,132 - INFO - 1- Client animation started, time for animation: 20(
2013-05-09 22:59:06,166 - INFO - 2- Client animation started, time for animation: 20(
2013-05-09 22:59:11,041 - INFO - 1- Client applied latency: 29
2013-05-09 22:59:11,132 - INFO - 2- Client applied latency: 0
2013-05-09 22:59:12,464 - INFO - 1- Client applied latency: 30
2013-05-09 22:59:12,549 - INFO - 2- Client applied latency: 0
2013-05-09 22:59:13,751 - INFO - 1- Client applied latency: 29
2013-05-09 22:59:13,842 - INFO - 2- Client applied latency: 0
2013-05-09 22:59:15,048 - INFO - 1- Client applied latency: 29
2013-05-09 22:59:15,138 - INFO - 2- Client applied latency: 0
2013-05-09 22:59:16,771 - INFO - 1- Client animation started, time for animation: 20(
2013-05-09 22:59:16,772 - INFO - 2- Client animation started, time for animation: 20(
2013-05-09 22:59:16,971 - INFO - 2- Client animation started, time for animation: 20(
2013-05-09 22:59:16,971 - INFO - 1- Client animation started, time for animation: 20(
2013-05-09 22:59:17,614 - INFO - 1- Client animation started, time for animation: 20(
2013-05-09 22:59:17,615 - INFO - 2- Client animation started, time for animation: 20(
2013-05-09 22:59:17,814 - INFO - 1- Client animation started, time for animation: 20(
2013-05-09 22:59:17,815 - INFO - 2- Client animation started, time for animation: 20(
2013-05-09 22:59:18,431 - INFO - 1- Client animation started, time for animation: 20(
2013-05-09 22:59:18,432 - INFO - 2- Client animation started, time for animation: 20(
2013-05-09 22:59:18,631 - INFO - 1- Client animation started, time for animation: 20(
2013-05-09 22:59:18,631 - INFO - 2- Client animation started, time for animation: 20(
2013-05-09 22:59:19,271 - INFO - 2- Client animation started, time for animation: 20(
2013-05-09 22:59:19,272 - INFO - 1- Client animation started, time for animation: 20(
2013-05-09 22:59:19,471 - INFO - 2- Client animation started, time for animation: 20(
2013-05-09 22:59:19,473 - INFO - 1- Client animation started, time for animation: 20(
2013-05-09 22:59:20,176 - INFO - 1- Client animation started, time for animation: 20(
2013-05-09 22:59:20,176 - INFO - 2- Client animation started, time for animation: 20(
2013-05-09 22:59:20,375 - INFO - 2- Client animation started, time for animation: 20(
2013-05-09 22:59:20,376 - INFO - 1- Client animation started, time for animation: 20(
```

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