Networking Extension

For GameMaker Studio HTML5 Export

Why GameMaker?

GameMaker simplifies computer game development.

Duration to learn making a scrolling background:

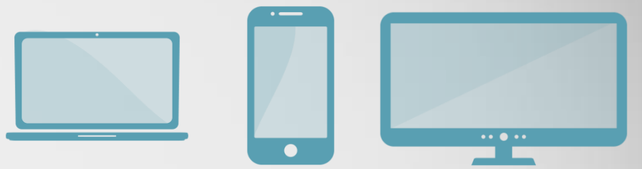
- **Gamemaker**: 5 minutes
- **Unity** (similar): 1 hour official tutorial video

Facts

- **Over 750,000 registered users** (16 Feb 2015)
- **Low cost** and **flexible** for **small teams** and **developers**
- **income** made from applications, games and engines
- **HTML5 Exportability** since September 2011

http://gamemaker.wiki/game-maker-versions

Browser Applications



- **Platform Independent**
- **Convenient**
- **Updates**
- **piracy-proof**
- **low system requirement**
- **malware-free**
- **low distribution cost**
- **wide potential audience**
- **available anywhere**

etc.

https://html5test.com/results/desktop.html

http://www.vinnylingham.com/top-20-reasons-why-web-apps-are-superior-to-desktop-apps.html

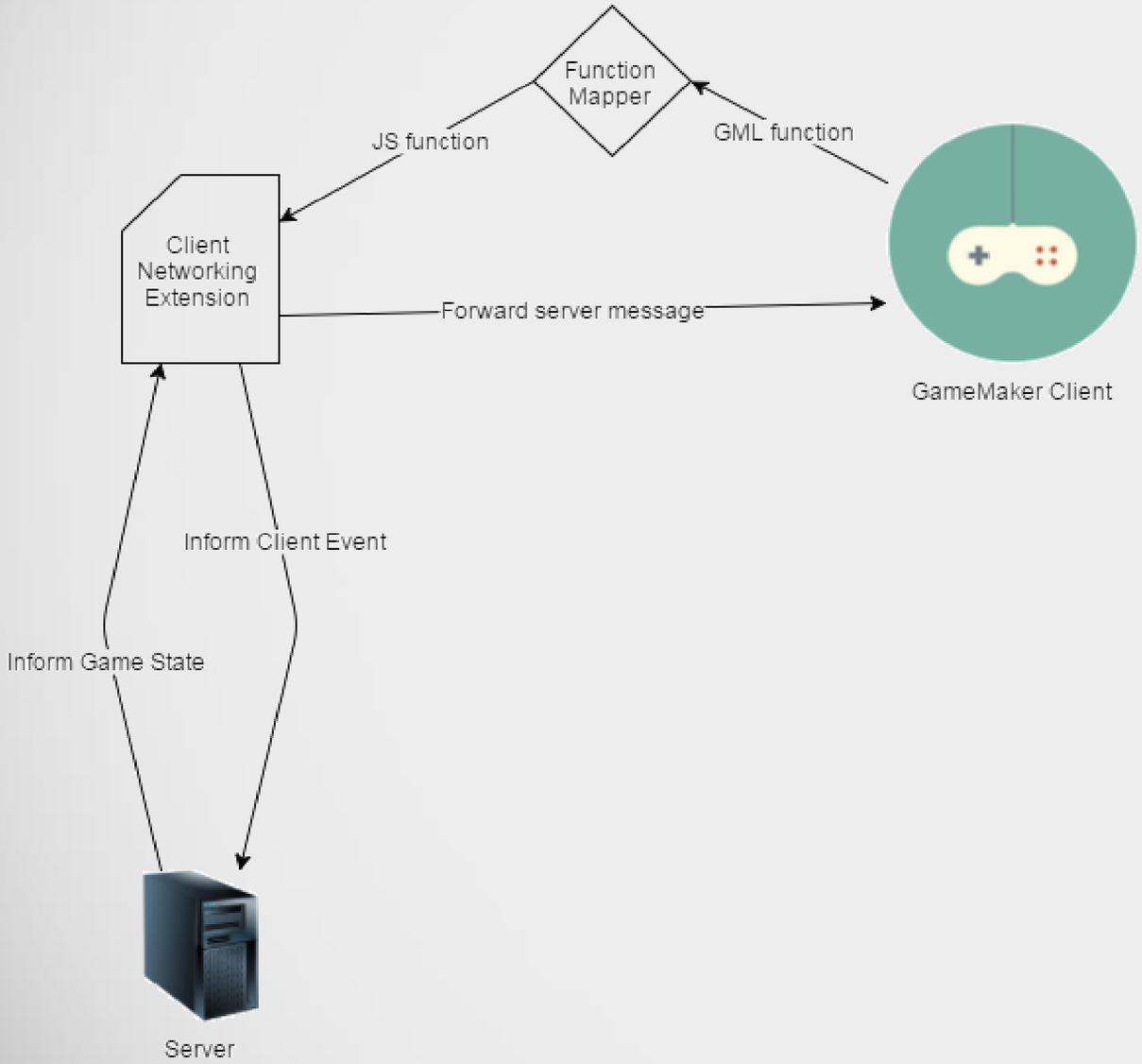
Issues

“HTML5 Exportability since September 2011”

- **Feature compatibility problem**: Networking functionality.
- **Effect**: Inability to develop multiplayer browser application.
- **Consequence:** Lost potential to become popular.

http://docs.yoyogames.com/source/dadiospice/002_reference/networking/index.html

Solution: Networking Extension



Technologies:

- NodeJS
- Socket.io

NodeJS

“Node.js shines in **real-time web applications** employing push technology over websockets.”

“Node.js operates on a single-thread, using non-blocking I/O calls, allowing it to **support tens of thousands of concurrent connections**”

Socket.io

socket.io is one of the **most common** websockets components out there today.

Previously encapsulations in Flash or **Java Applets**.

http://www.toptal.com/nodejs/why-the-hell-would-i-use-node-js
http://i-programmer.info/news/86-browsers/8783-death-of-flash-and-java.html

Evaluation Metrics

Delay

Game performance

Data

Simple variables

Equality

Treat players equally

Brian Carrig , David Denieffe , John Murphy, A relative delay minimization scheme for multiplayer gaming in differentiated services networks, p.36-es, October 30-31, 2006, Singapore

Delay Test

Setup

- Physical clients hosting x virtual clients
- Each virtual-client pings server every n seconds
- Each physical client runs on a separate machine
- **Single device**, separated from server's local network
- Ping rounds are synchronised

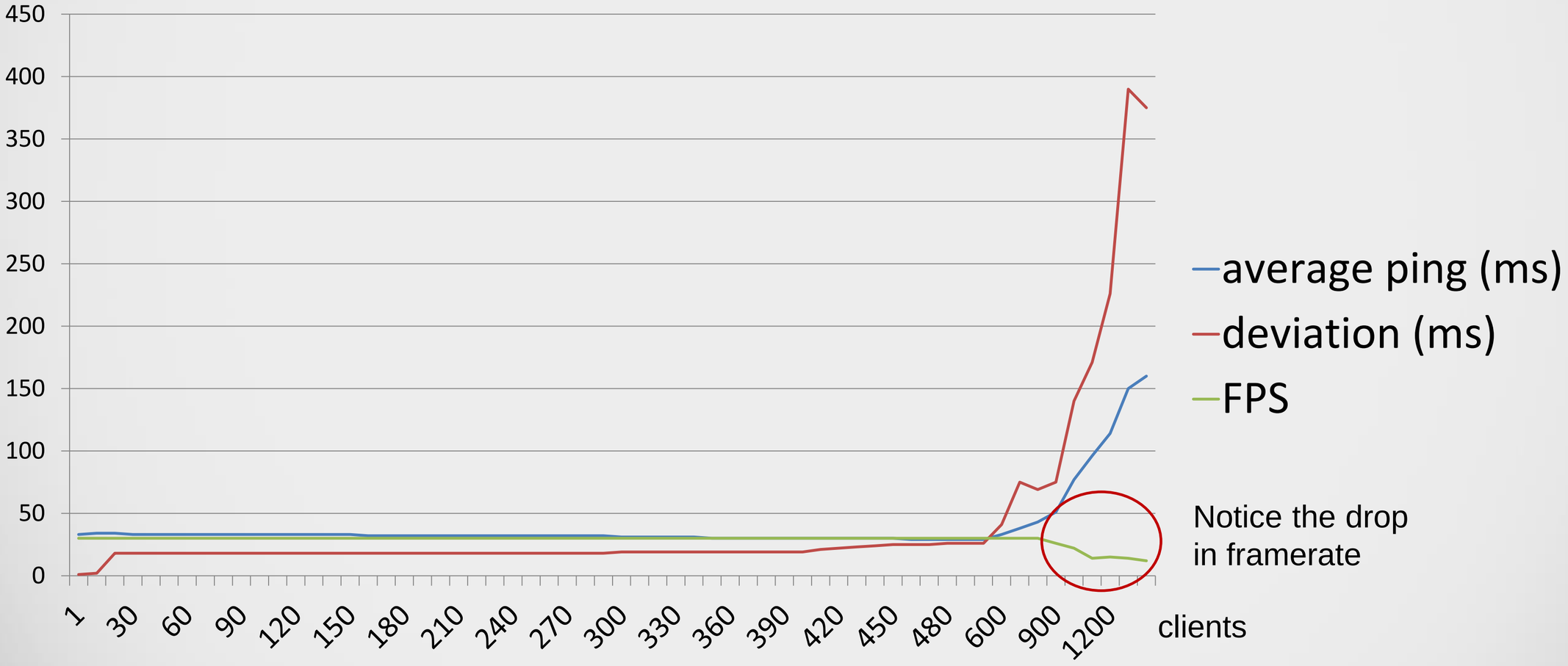
Records

- Ping values of all virtual clients averaged per round
- Ping deviation between all virtual clients per round

Results

x clients, each 1 requests per second

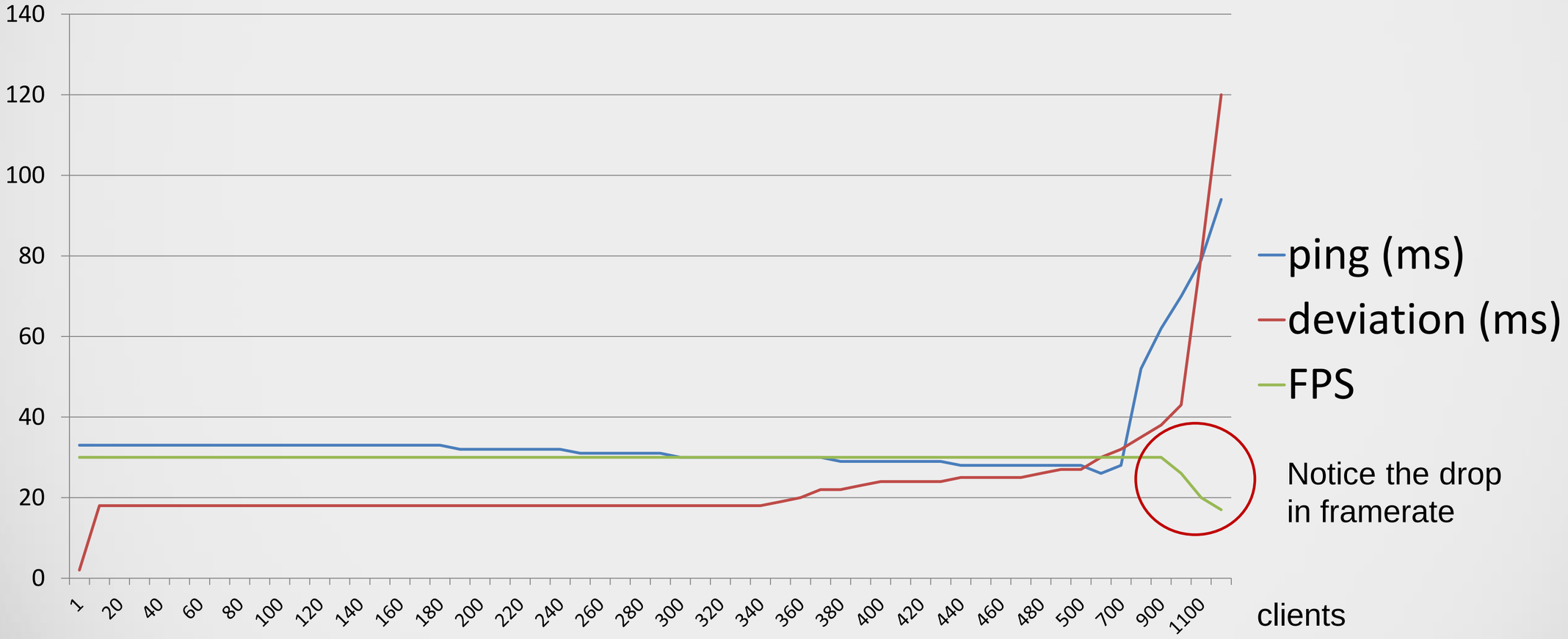
Ping and deviation start to shoot up after having roughly 1000 clients each sending a request every second
The application crashed after 1200 clients (1200 messages / second) due to a lack of processing power.



Results

x clients, each 2 requests per second

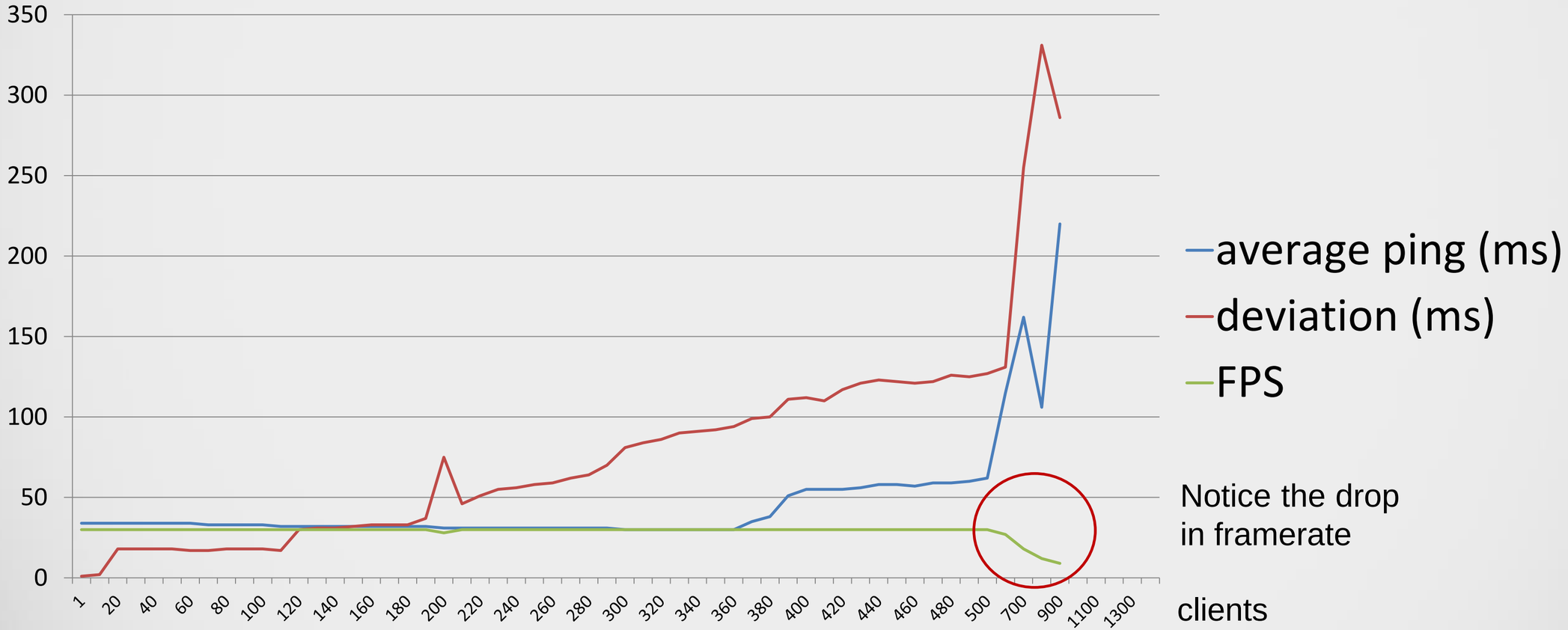
Ping and deviation again shoot up after having roughly 1000 clients each sending 2 requests every second
The application crashed after 1300 clients (2600 messages / second) due to a lack of processing power.



Results

x clients, each 10 requests per second

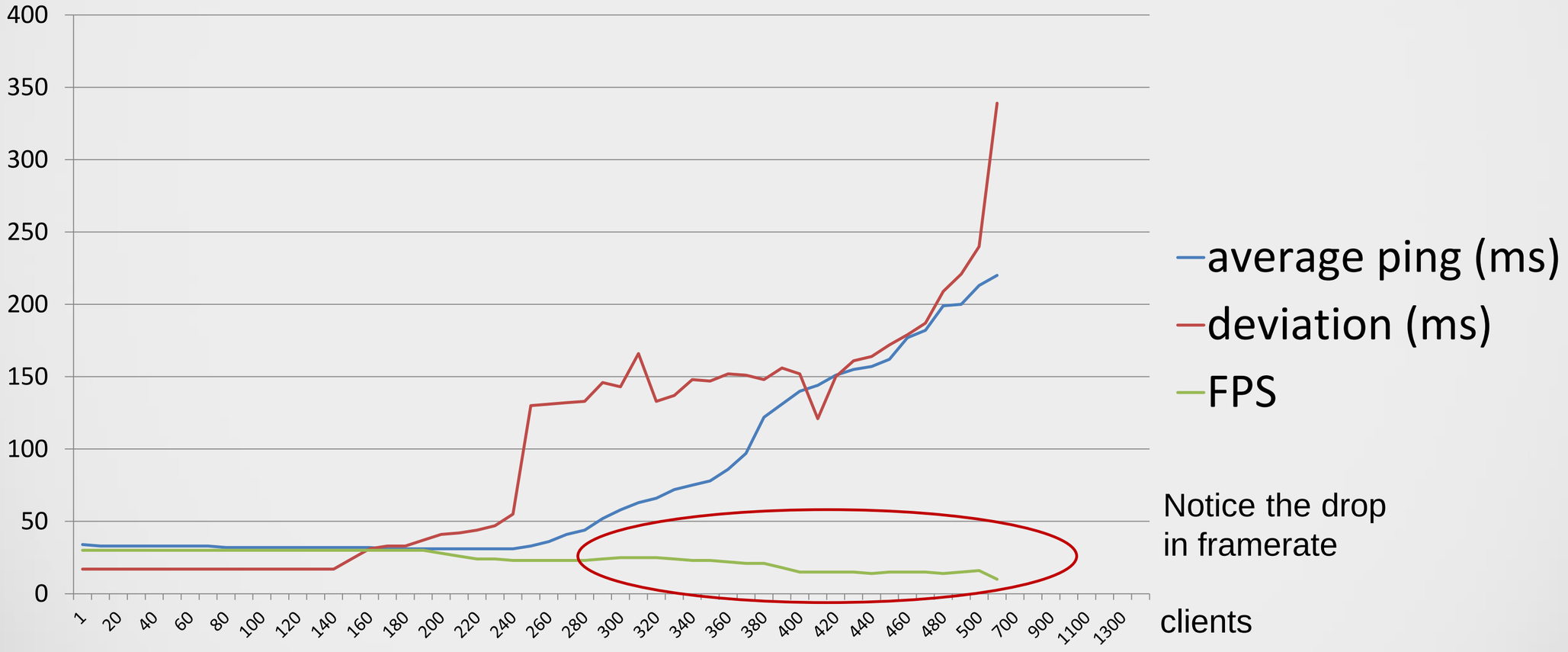
Ping and deviation again shoot up after having roughly 1000 clients each sending 10 requests every second
The application crashed after 950 clients (9500 messages / second) due to a lack of processing power.



Results

x clients, each 30 requests per second

Ping and deviation shoot up after having roughly 240 clients each sending 30 request every second.
The application crashed after 650 clients (19500 messages / second) due to a lack of processing power.



Conclusion

- GameMaker apps do not support more than 1000 instances.
- Thus far the server appears to handle well over 1000 messages per second
- Socket.io is suggested to handle up to 9.000 to 10.000 messages per second on a 3.3 GHz Xeon X5470 server using one core.

http://drewww.github.io/socket.io-benchmarking/

Re-evaluation

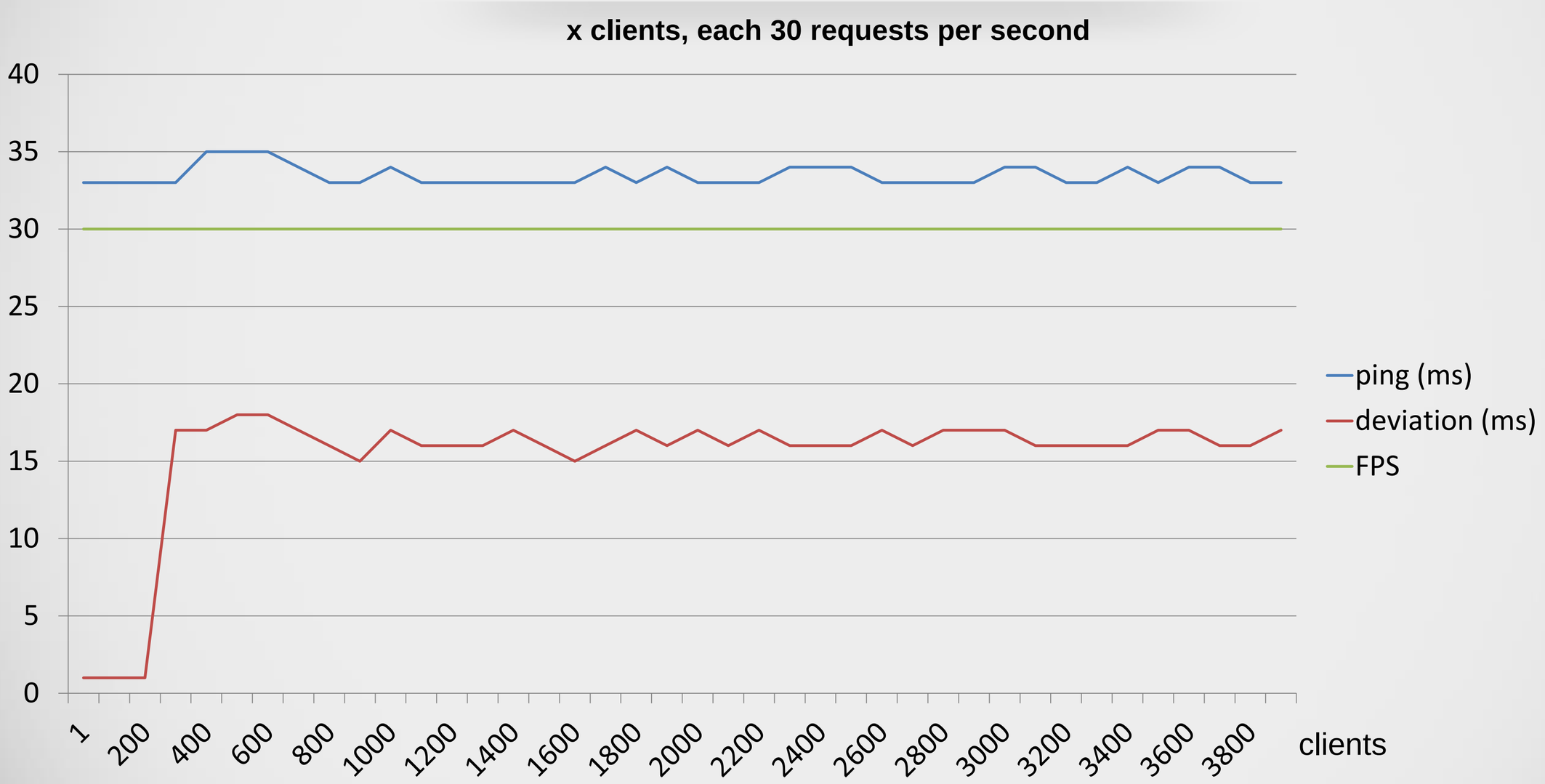
Setup

- Physical clients hosting x virtual clients
- Each virtual-client pings server every n seconds
- Each physical client runs on a separate machine
- **6 devices in total: 3 laptops, 2 smartphones, 1 desktop**
- Each device is located in Edinburgh, separated from server’s local network
- Ping rounds are synchronised

Records

- Ping values of all virtual clients averaged per round
- Ping deviation between all virtual clients per round

Results


x clients, each 30 requests per second
40
35
30
25
20
15
10
5
0
1
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
clients
ping (ms)
deviation (ms)
FPS

Conclusion (thus far)

- Stable connection with 3900 clients, each sending 30 requests/second.
- Stable connection when handling 3900 x 30 = 115500 messages per second
- More machines required to find connection / server hard limit

http://drewww.github.io/socket.io-benchmarking/

Yan Gu , Richard Fujimoto, Performance Evaluation of the ROSENET Network Emulation System, Simulation, v.85 n.5, p.319-333, May 2009

Timeline

Complete:
- Planning
- Realisation
- Research
- Implementation
- Develop Application

In Progress:
- Benchmarking
- Evaluation
- Dummynet

To-do:
- Optimisation
- Re-evaluation
- Comparison

December: **More detailed benchmarking** and **evaluation (Dummynet, User-friendliness (?), Research & Comparison)**
January: **Additional Research, Plan** and **develop improvements, contact GameMaker community**
February: **Re-evaluate with benchmarker, compare results** and **conclude**
March: **Finalise dissertation**

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Thank You For Lıstenıng