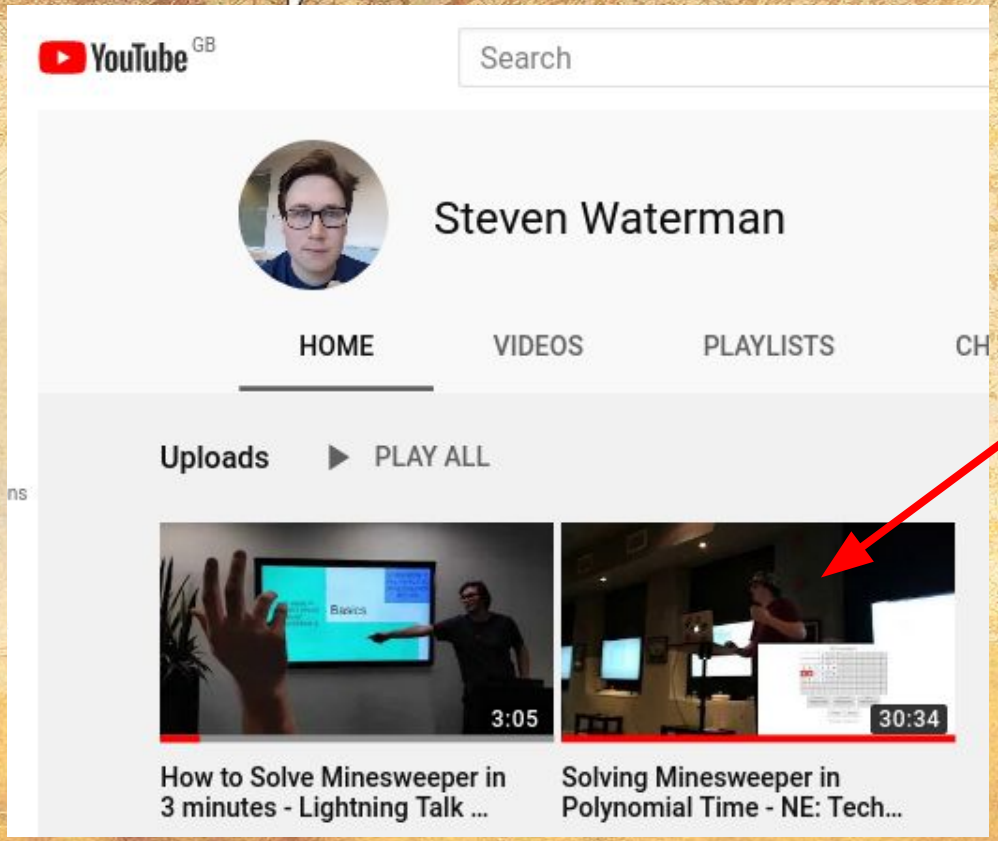
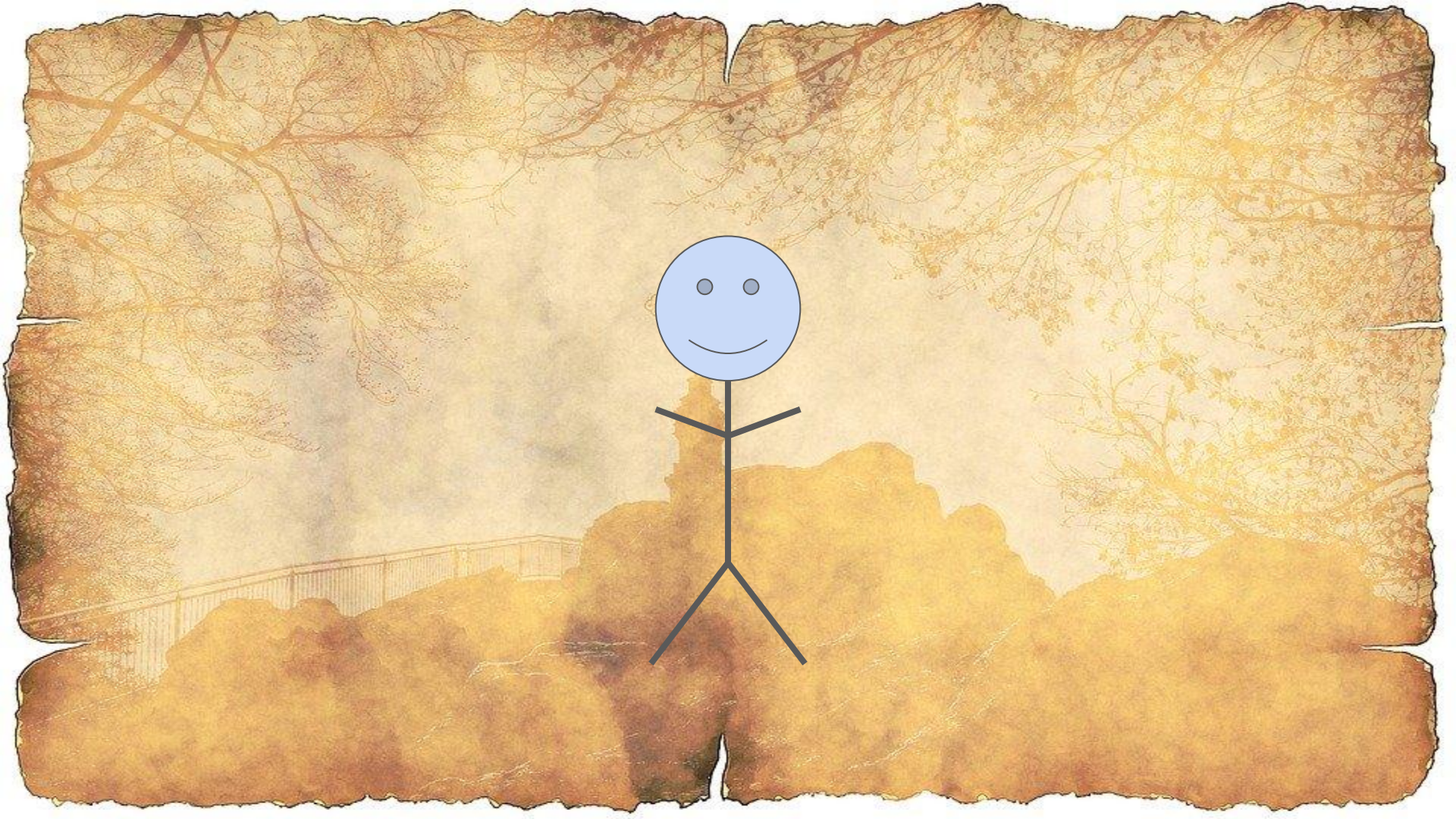
Stevie W

And the Quest for 60 fps

Stevie W


YouTube GB
Search
Steven Waterman
HOME
VIDEOS
PLAYLISTS
CH
Uploads
PLAY ALL
3:05
30:34
How to Solve Minesweeper in 3 minutes - Lightning Talk ...
Solving Minesweeper in Polynomial Time - NE: Tech...



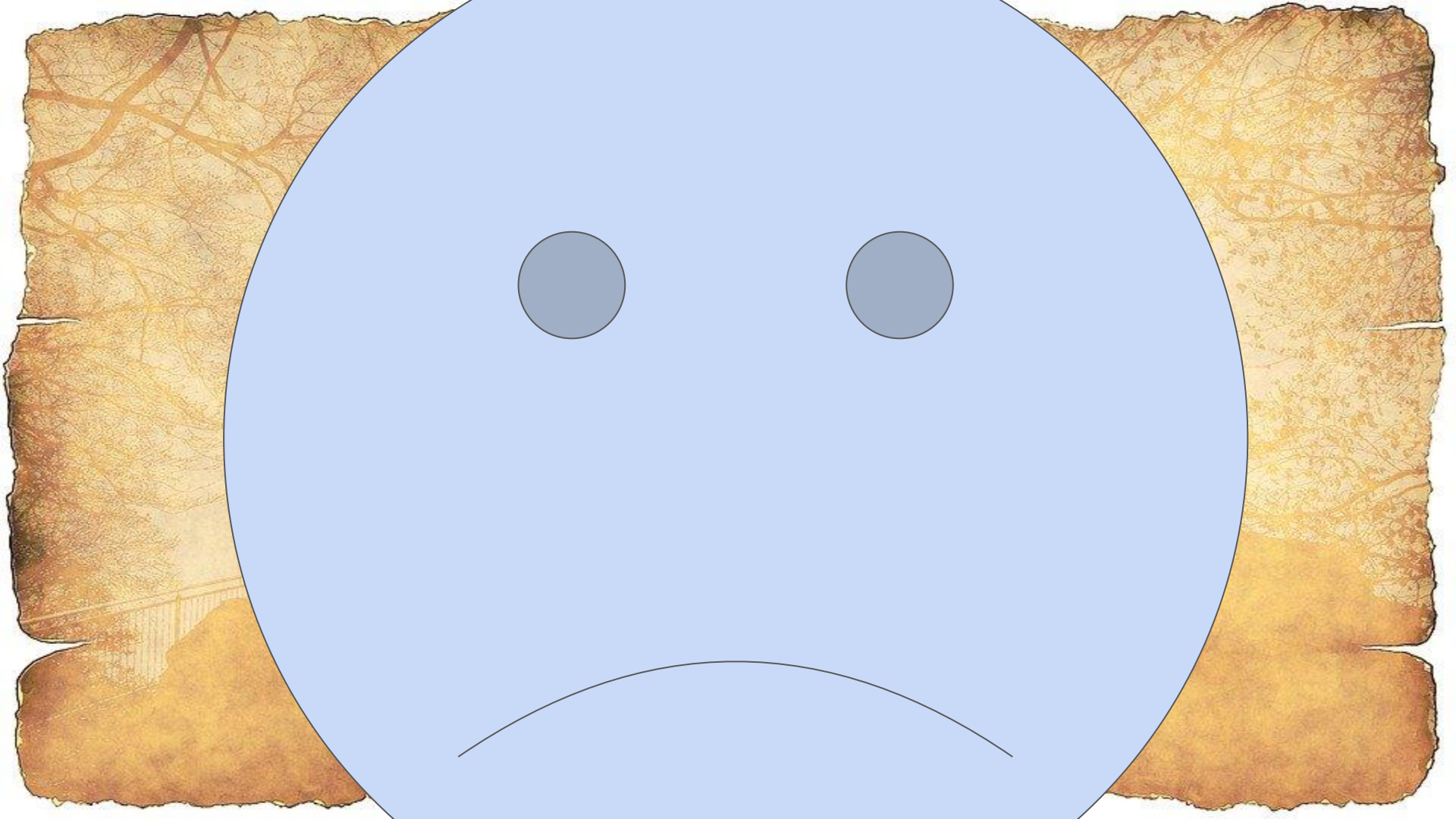
Minesweeper

			1										
			1		3								
2	2	1	1	1	4								
X	X	1	1		4								
	3	2	1										

Constraint 1	Constraint 2	Targets
Nothing selected	Nothing selected	Nothing selected

Deselect | Subtract | Reduce | Merge

Complex Constraints:



Minesweeper

			1										
			1		3								
2	2	1	1	1	4								
X	X	1	1		4								
	3	2	1										

Constraint 1	Constraint 2	Targets
Nothing selected	Nothing selected	Nothing selected

Deselect | Subtract | Reduce | Merge

Complex Constraints:

Minesweeper

			1										
			1		3								
2	2	1	1	1	4								
X	X	1	1		4								
	3	2	1										

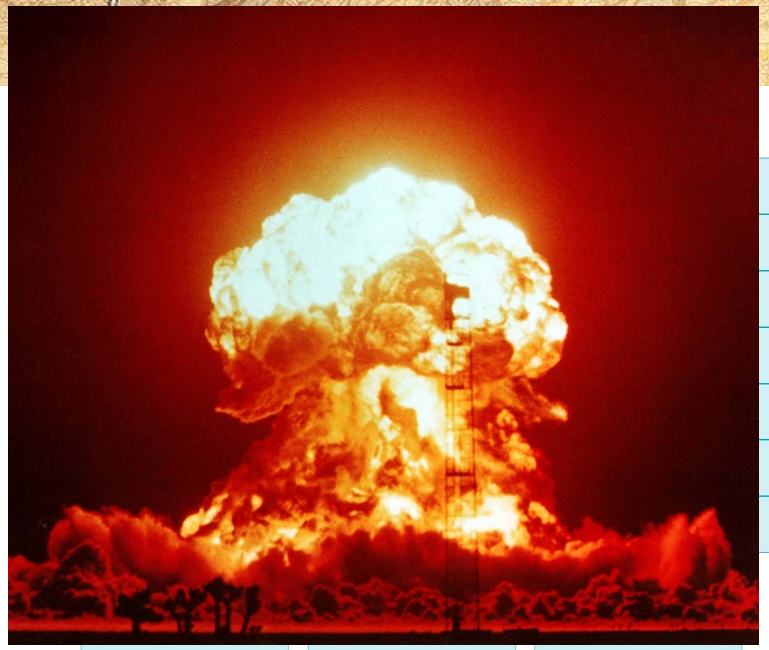
Constraint 1
Nothing selected

Constraint 2
Nothing selected

Targets
Nothing selected

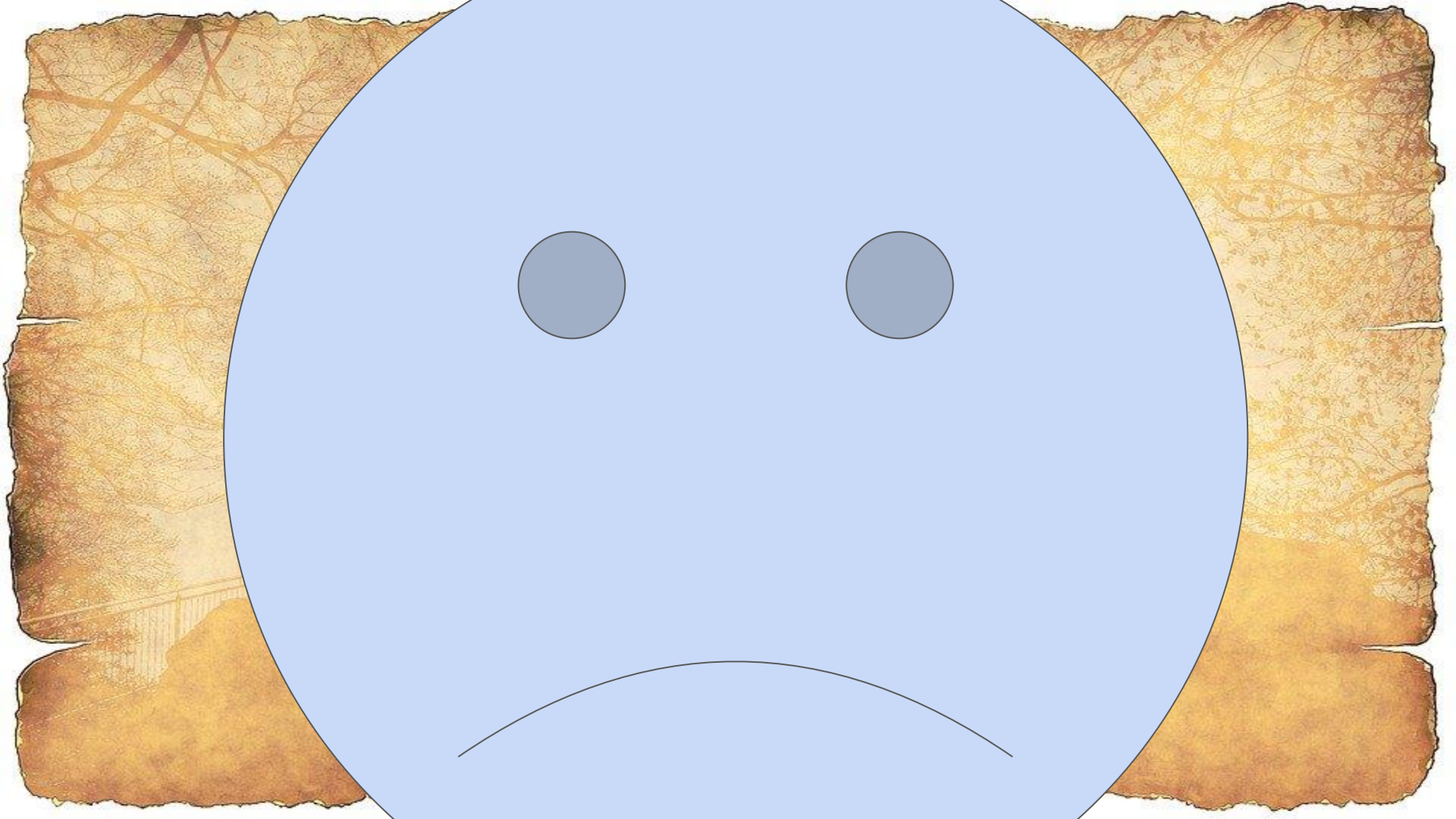
Deselect | Subtract | Reduce | Merge

Complex Constraints:



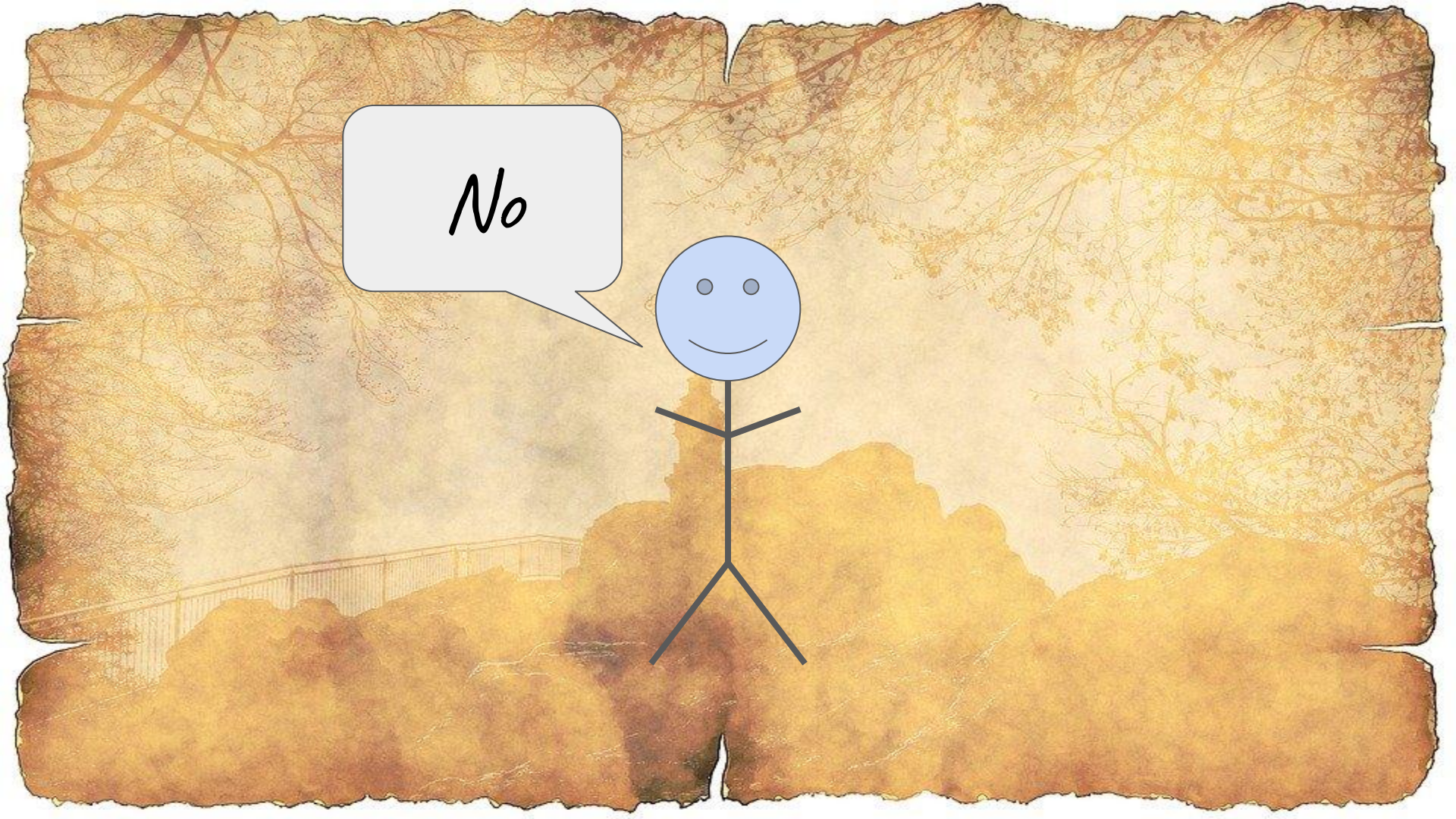
Deselect | Subtract | Reduce | Merge

Complex Constraints:



Well that's embarrassing

I should
OPTIMISE IT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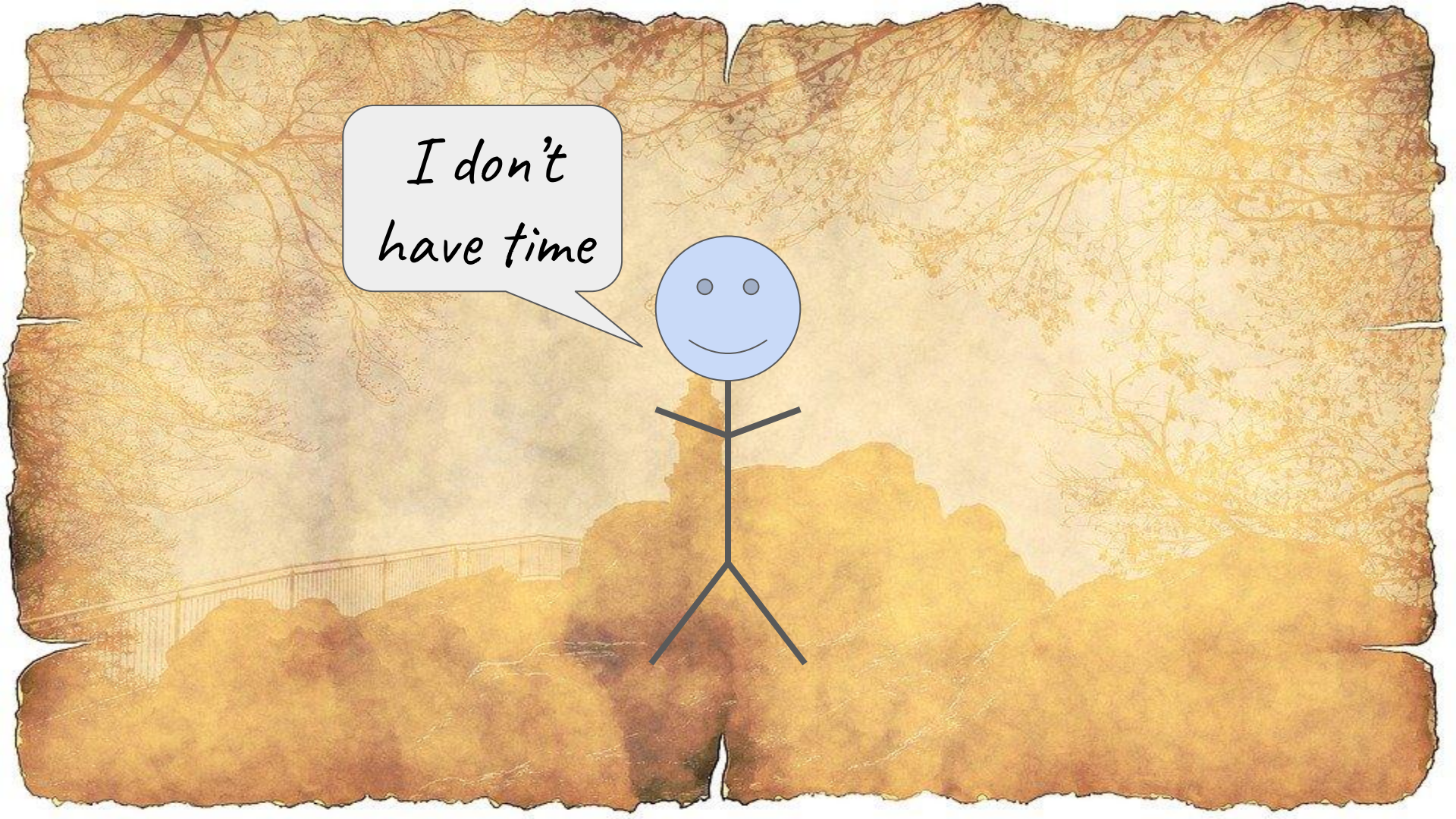
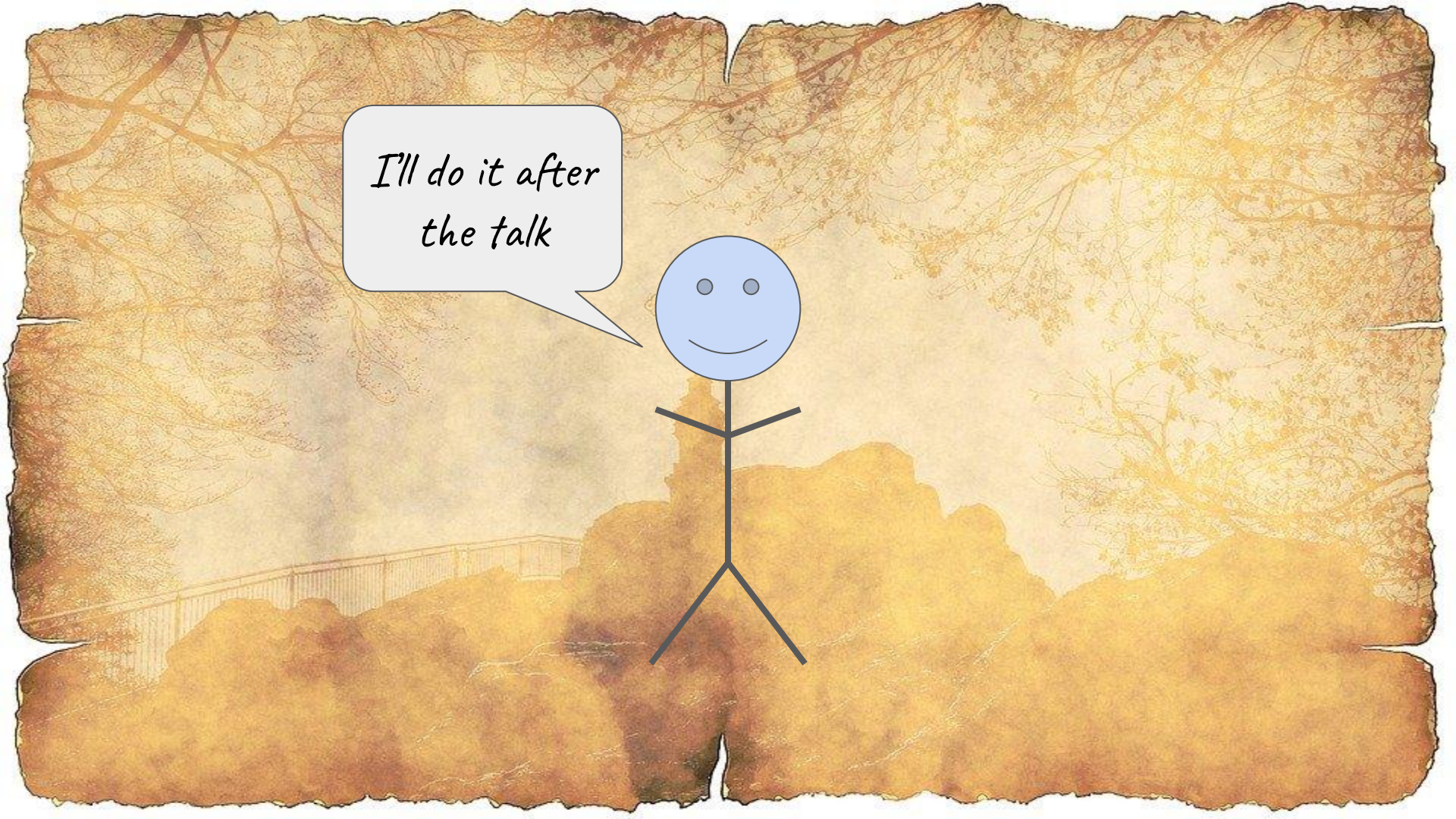
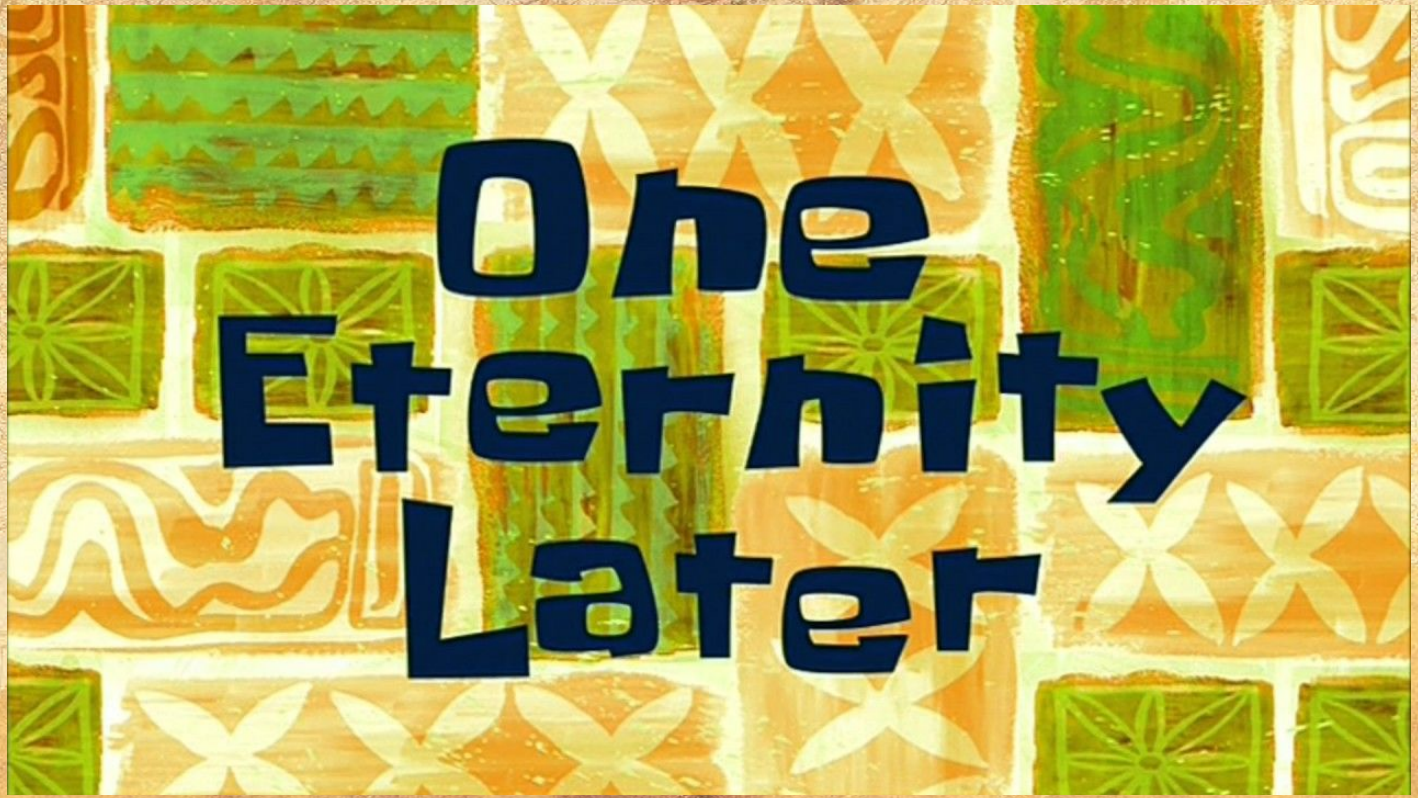
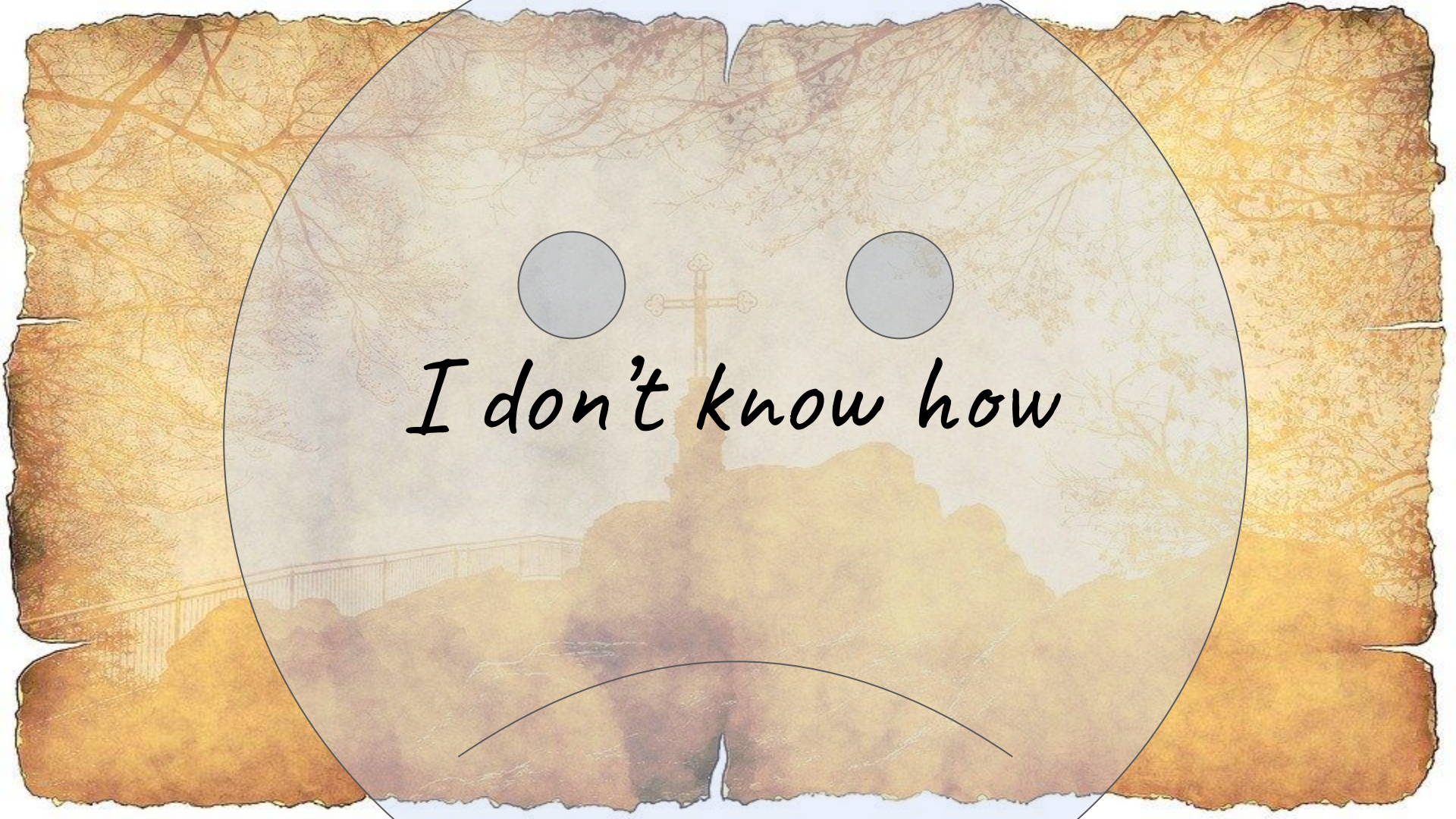
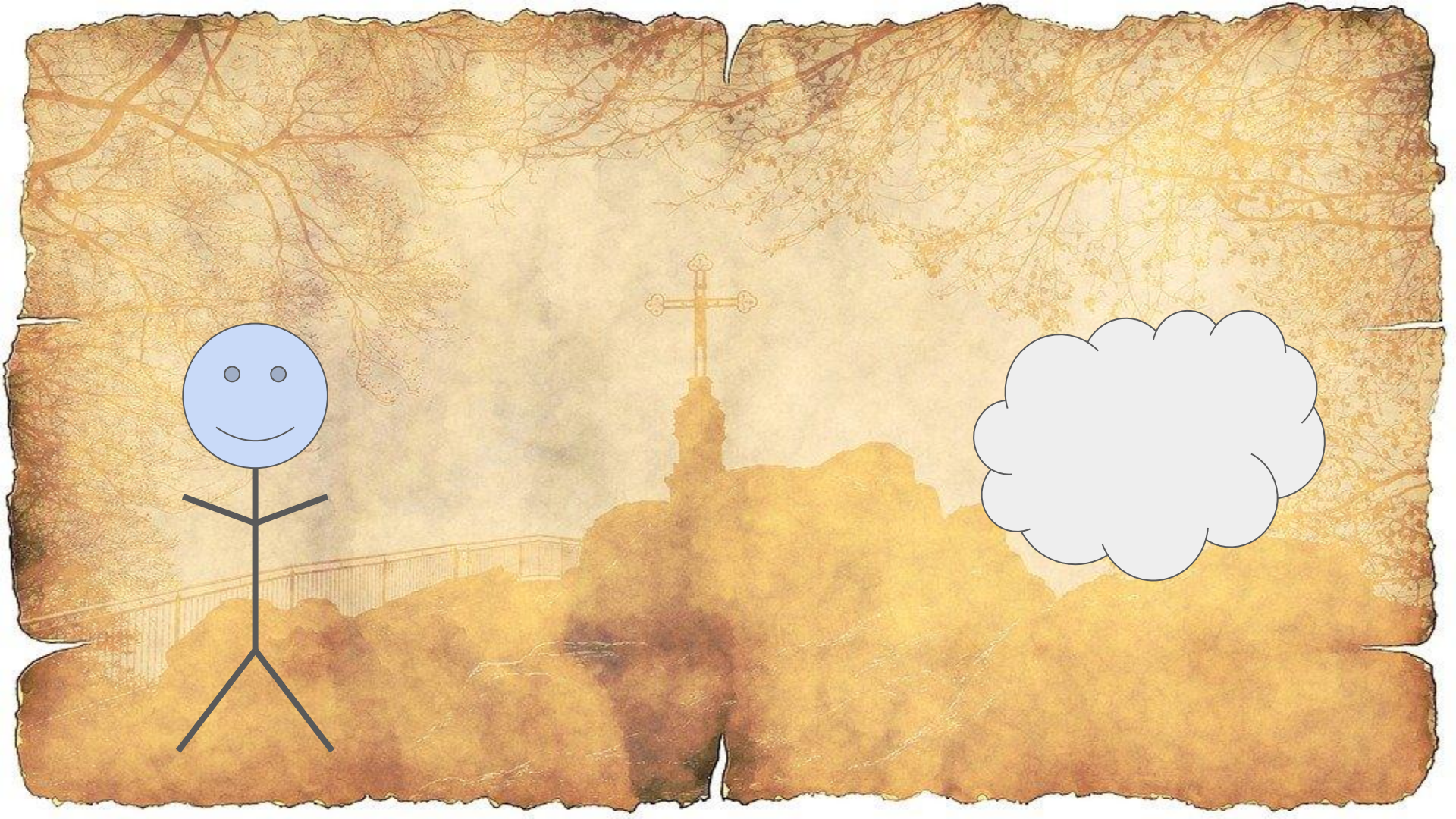
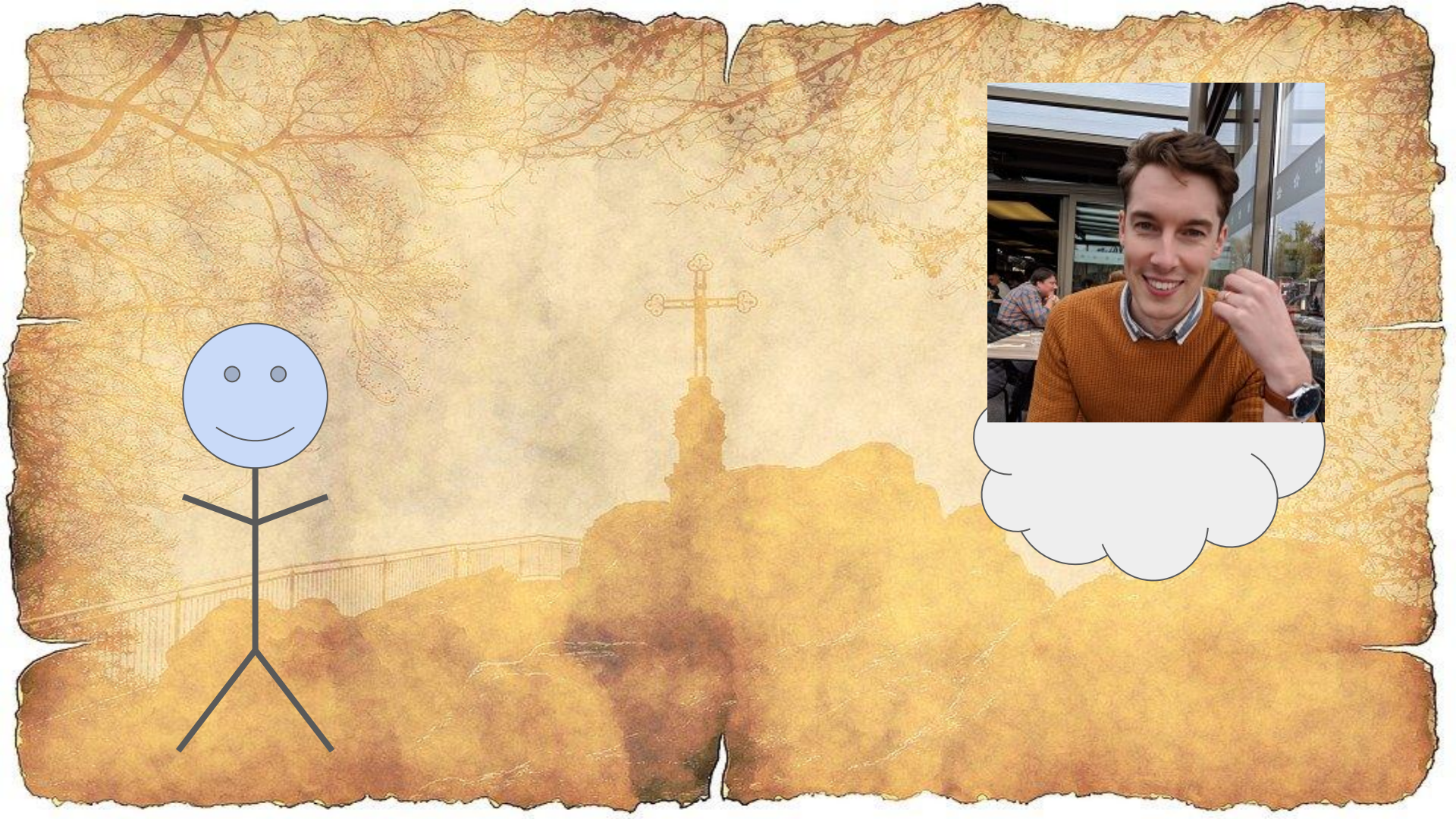

I don't have time


I'll do it after the talk


One
Eternity
Later

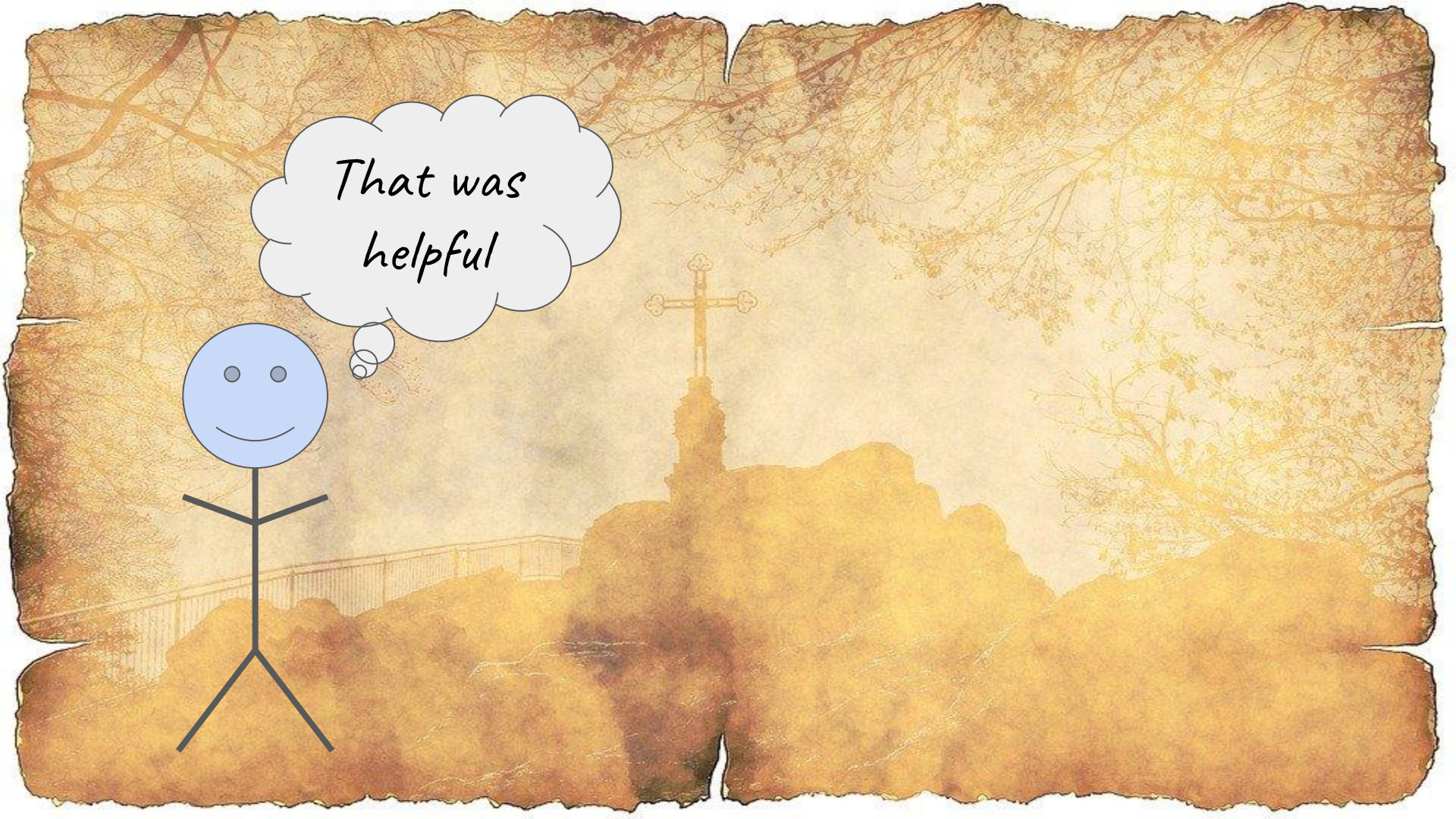

I don't know how

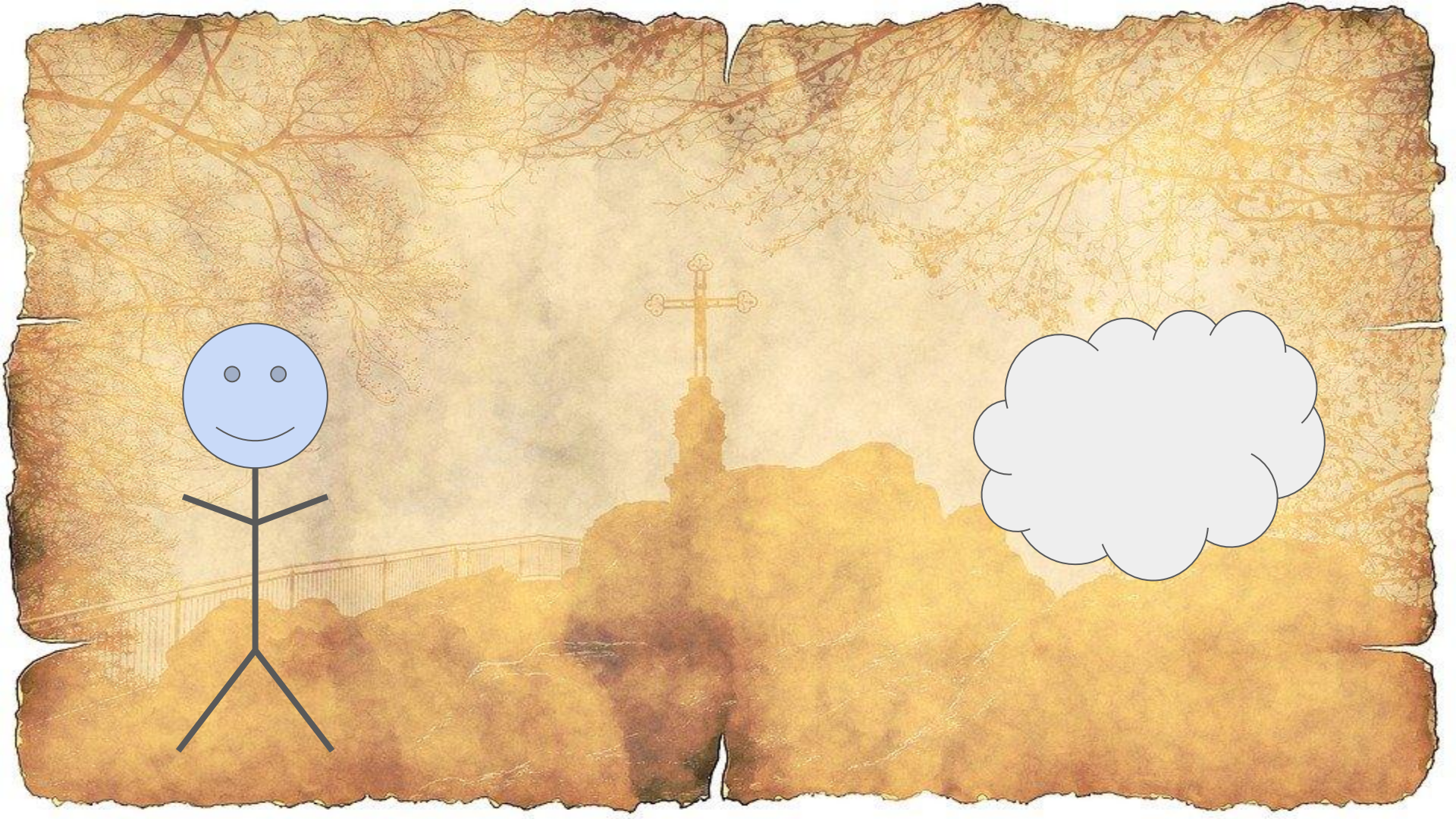


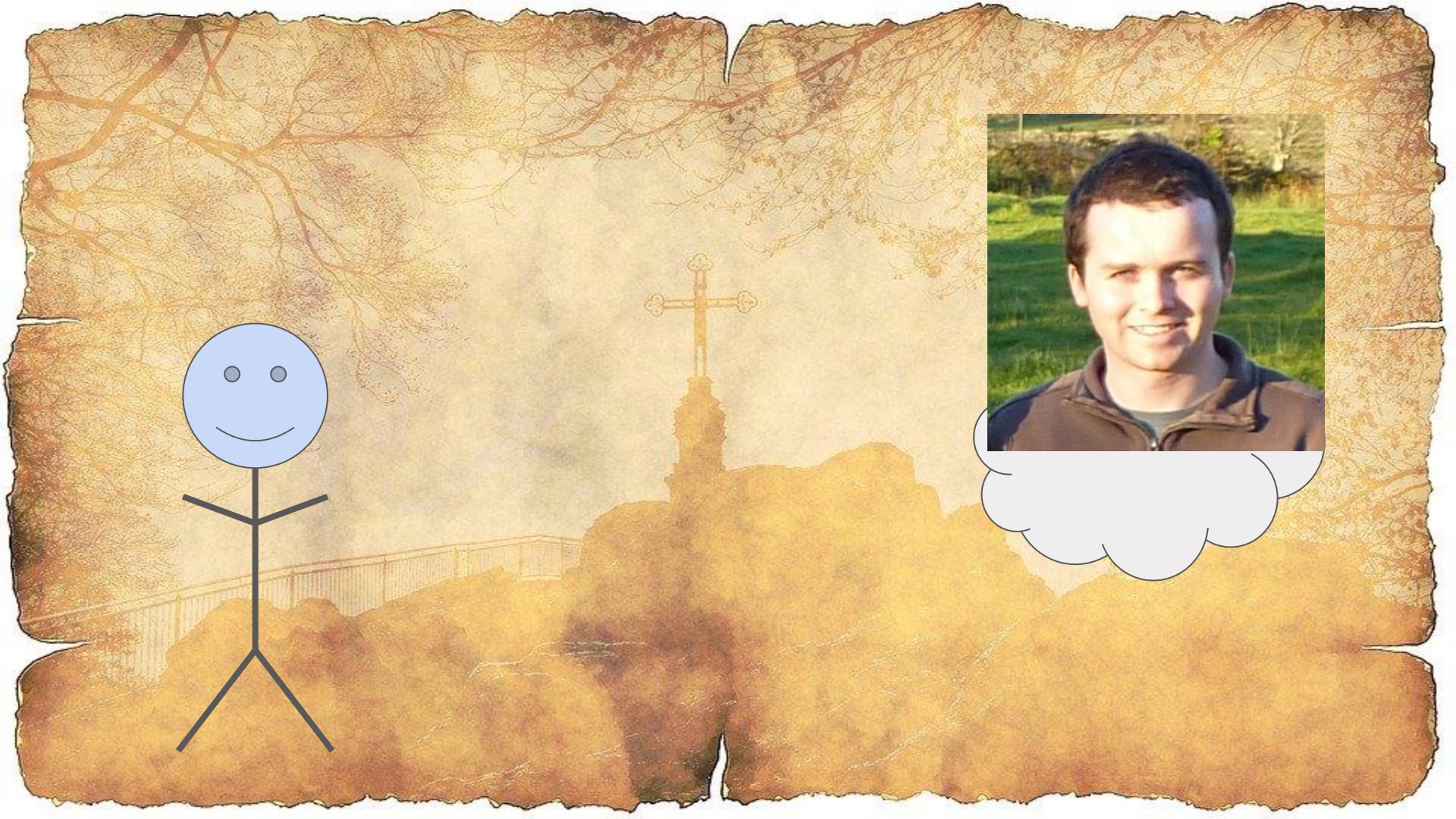


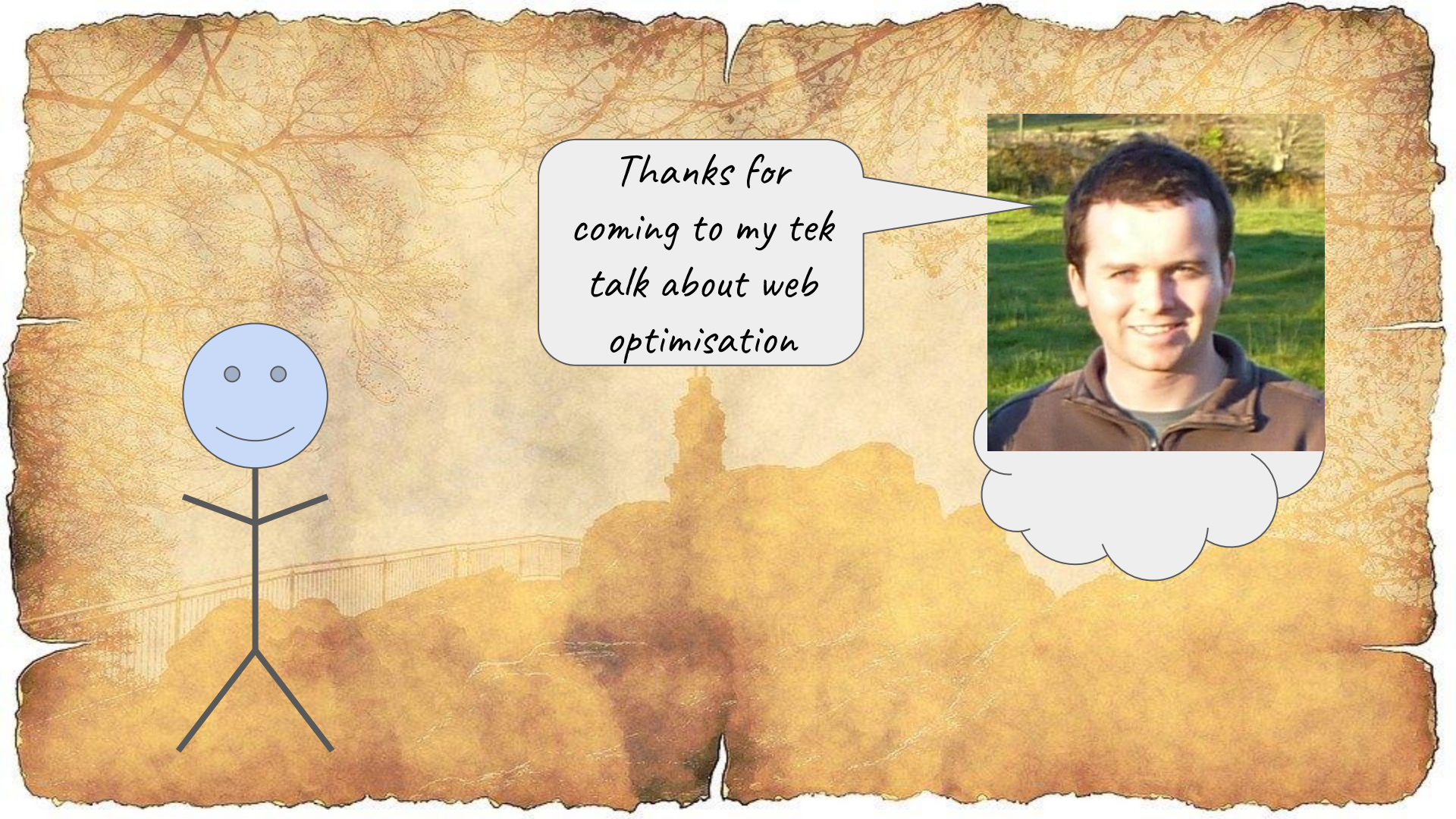
Thanks for coming to my tek talk about svelte

huh...

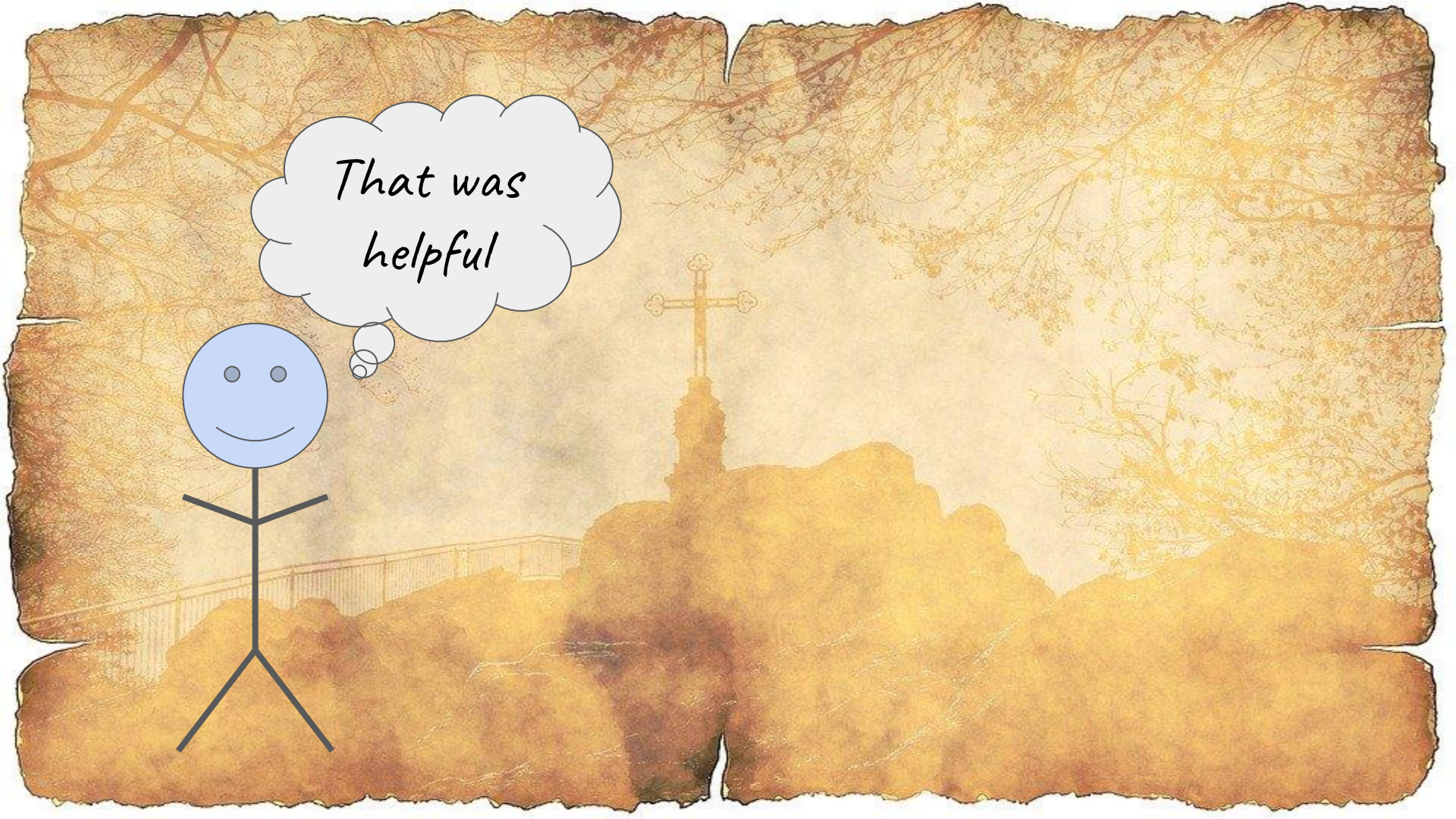

That was helpful

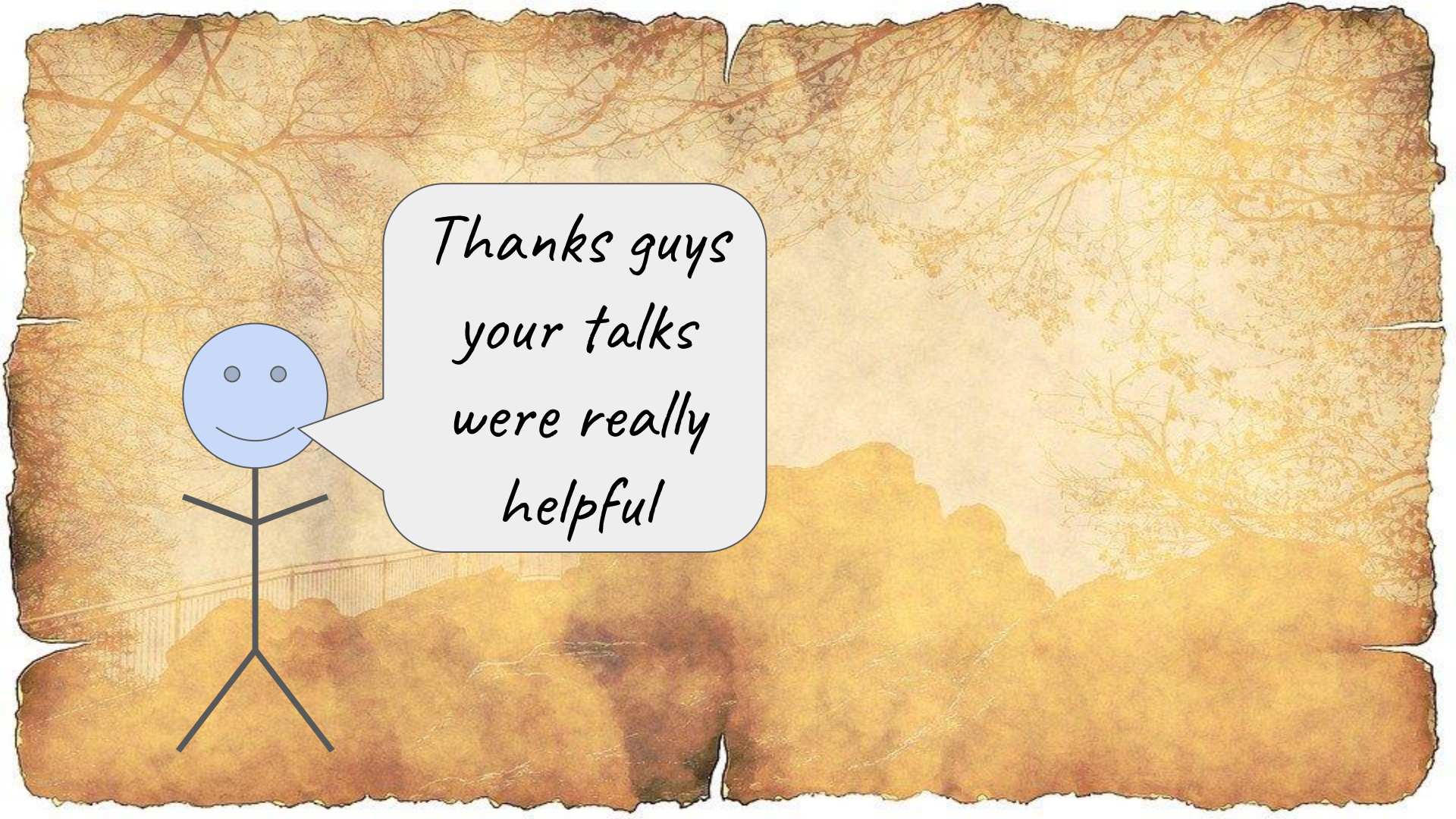


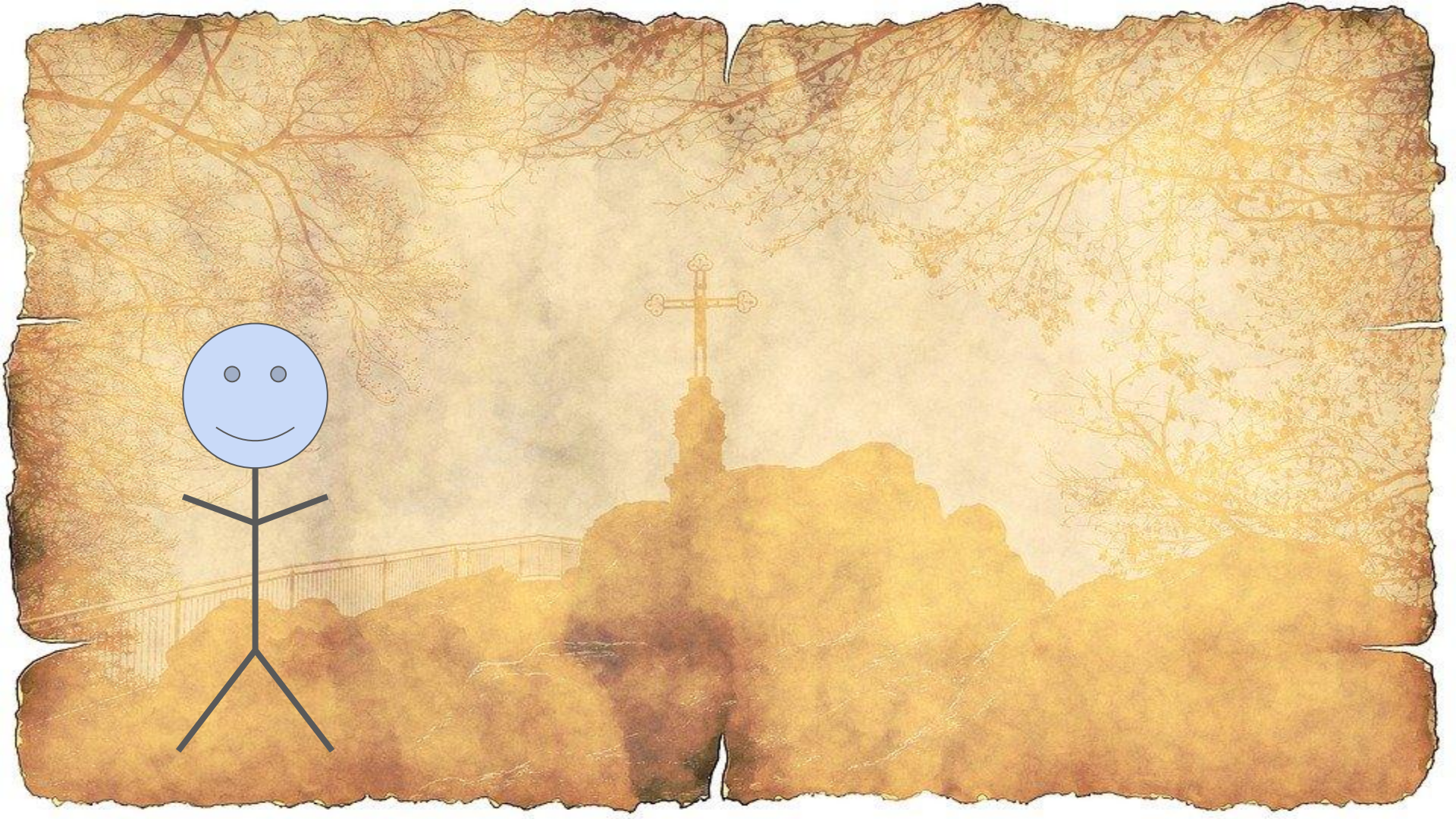



Thanks for coming to my tek talk about web optimisation

huh...


That was helpful


Thanks guys your talks were really helpful



It's time

The Plan

The Plan

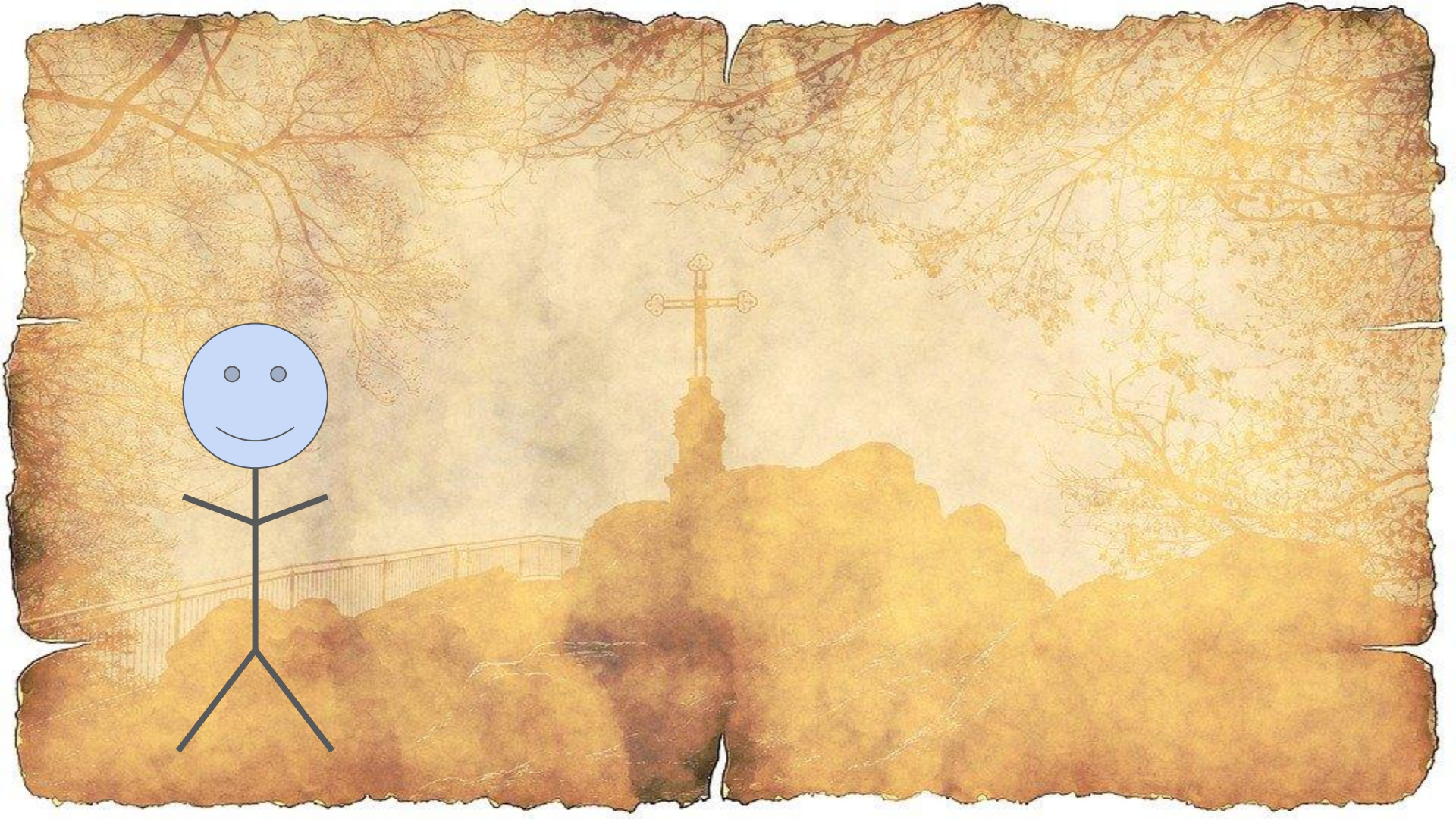
1. Reimplement the app in Svelte

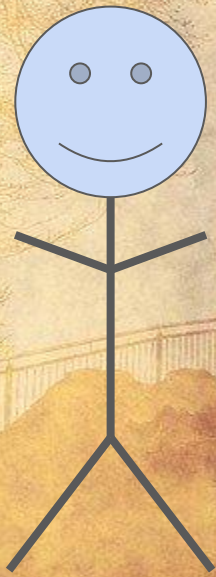
The Plan

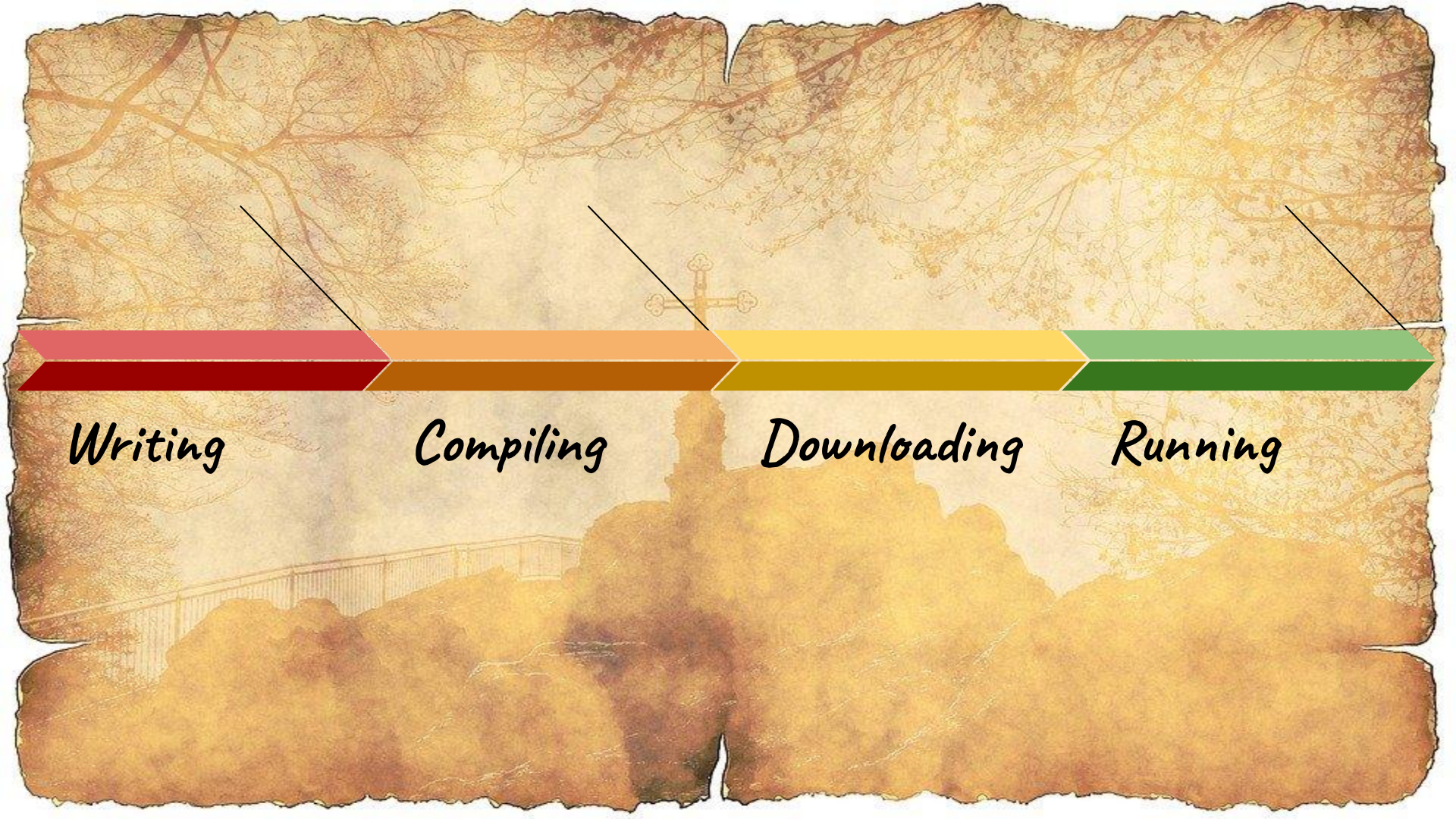
1. Reimplement the app in Svelte
2. ...

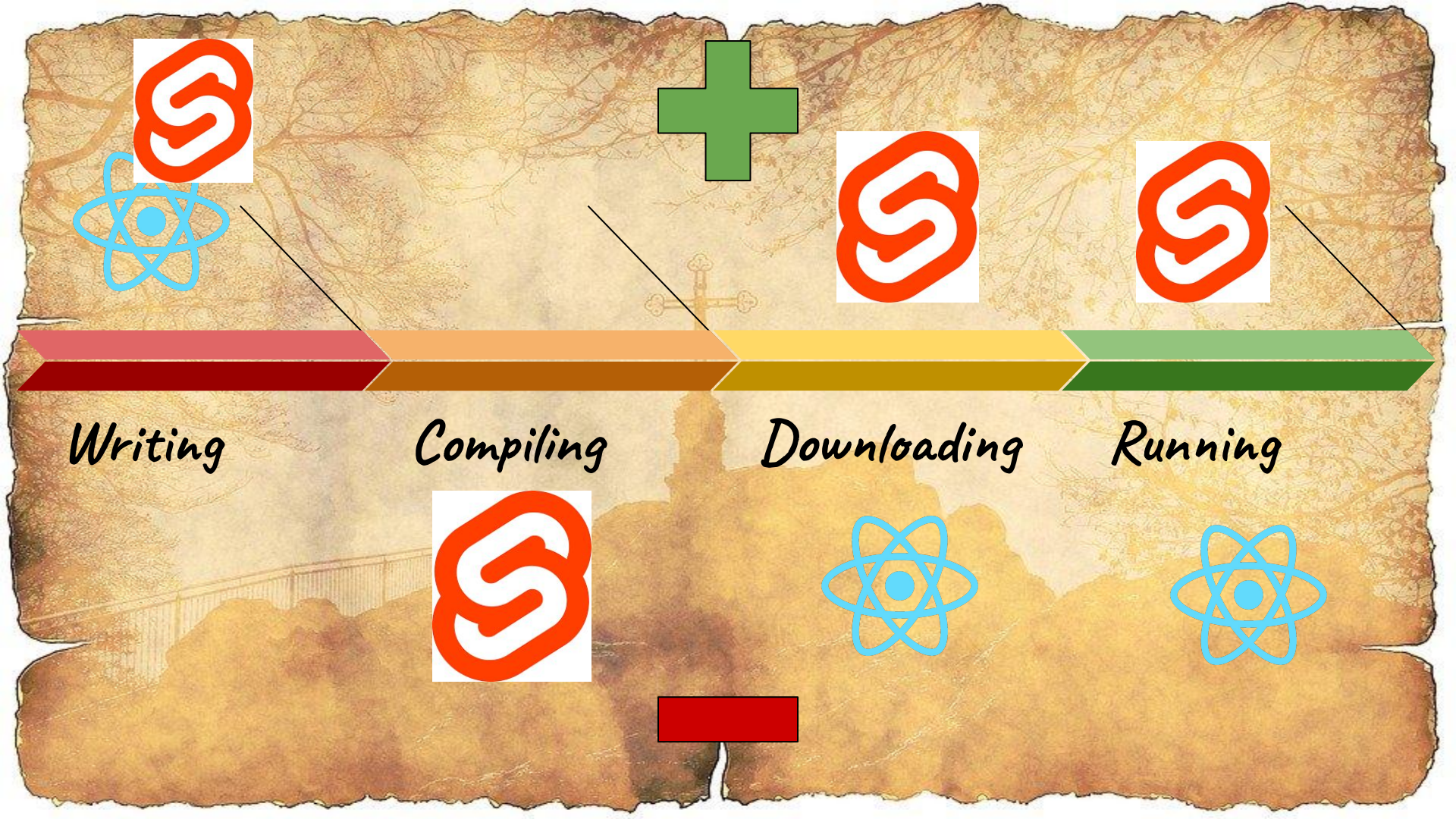
The Plan

1. Reimplement the app in Svelte
2. ...
3. Profit!



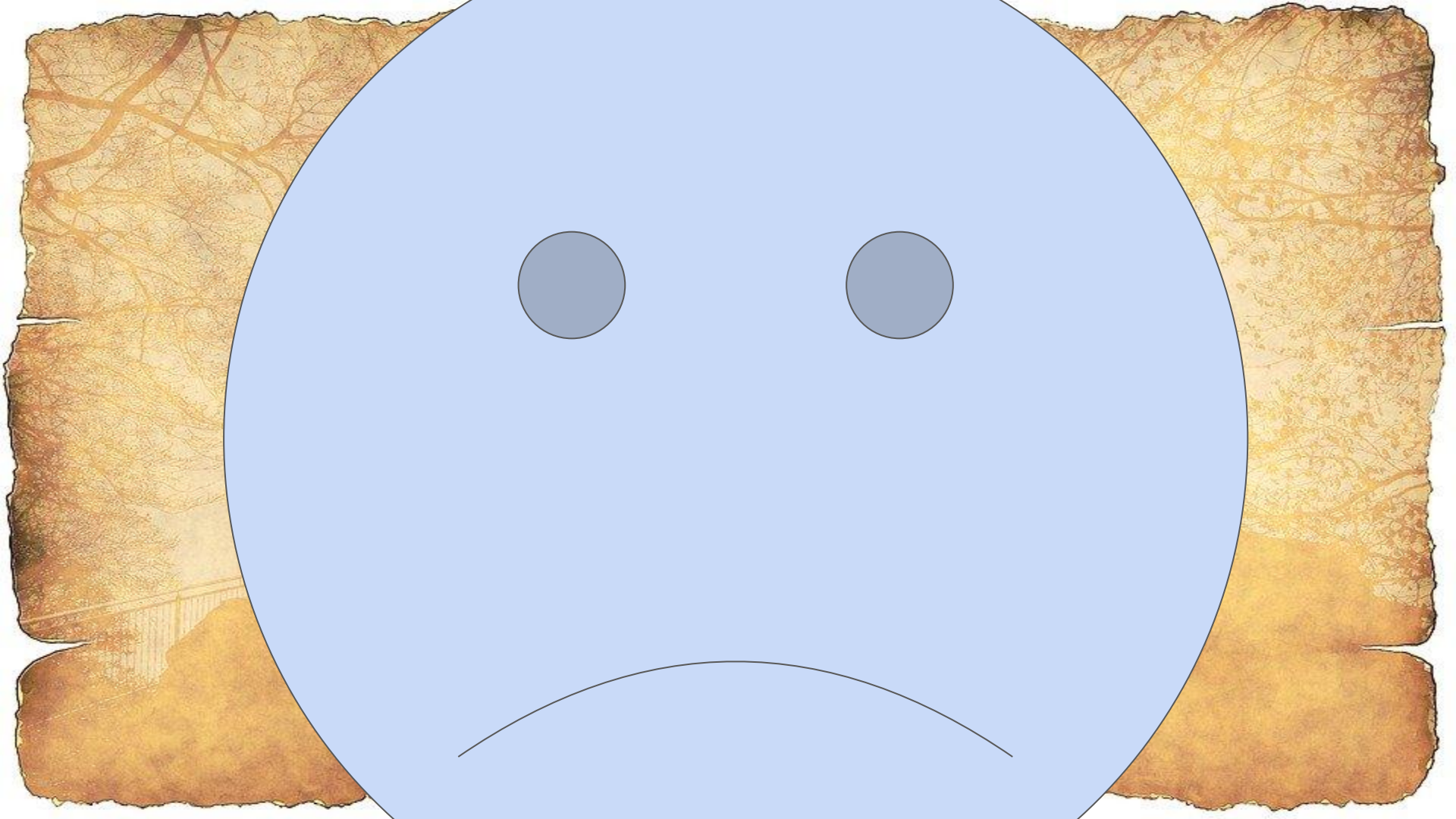



Writing
Compiling
Downloading
Running


Writing
Compiling
Downloading
Running

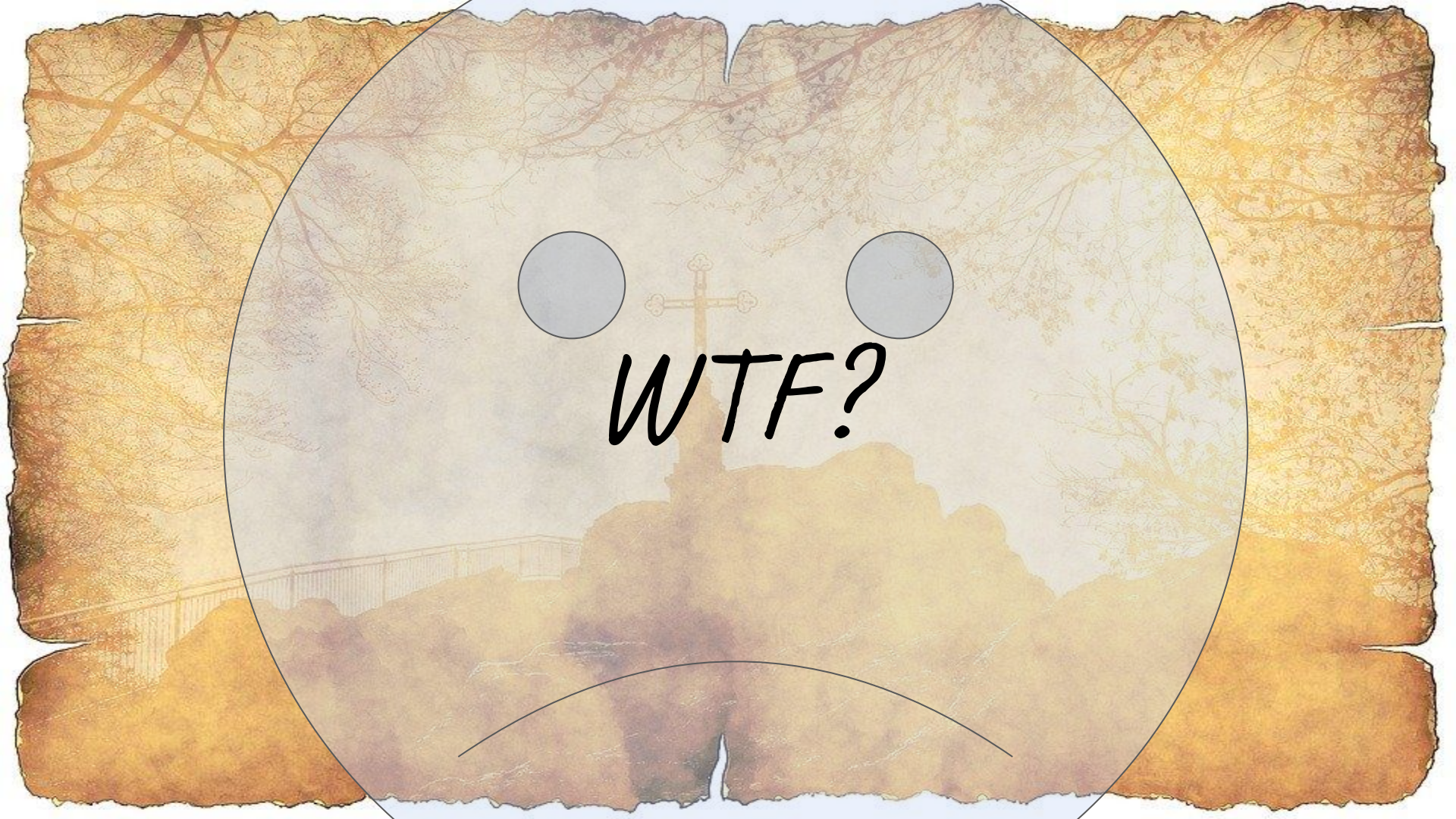
Sounds perfect

Results

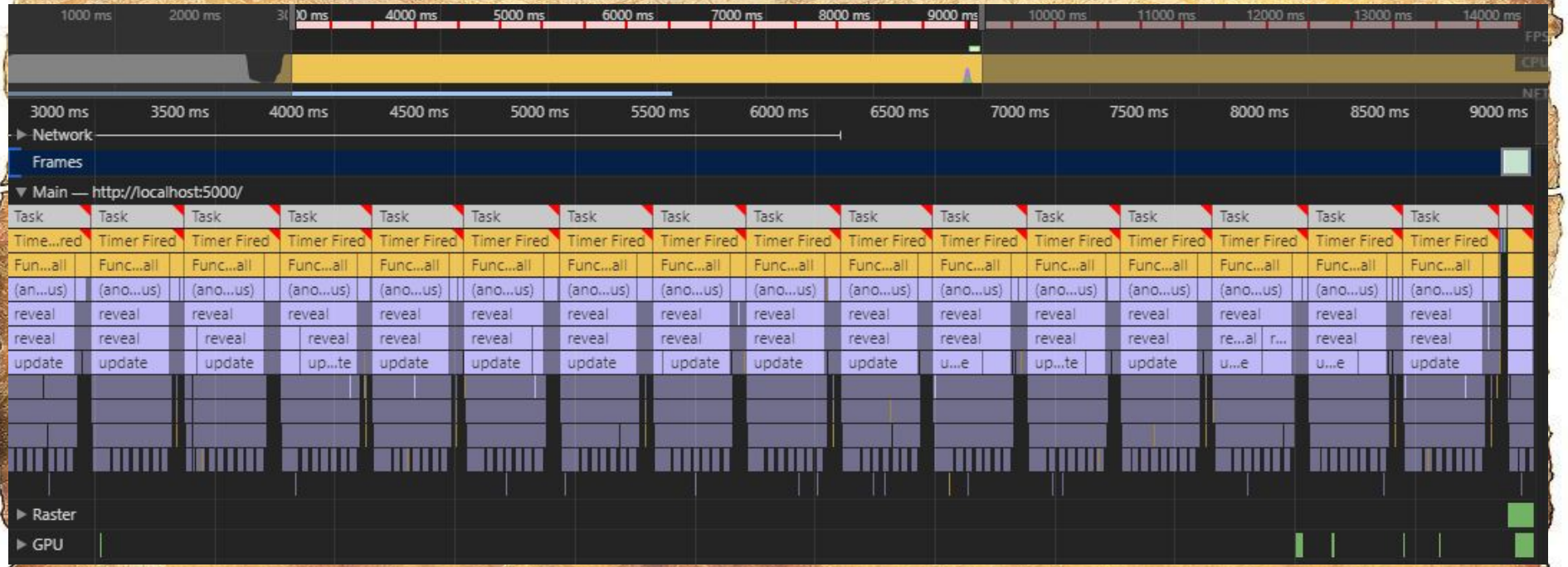


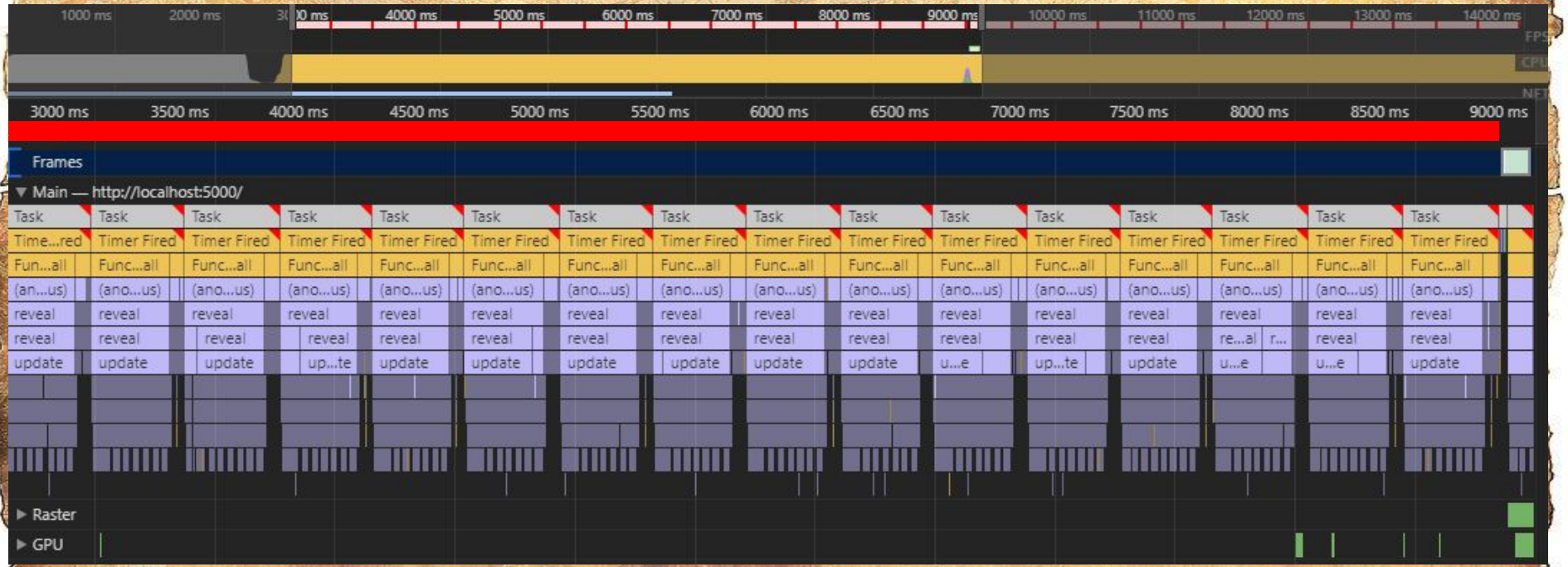
Well that's embarrassing

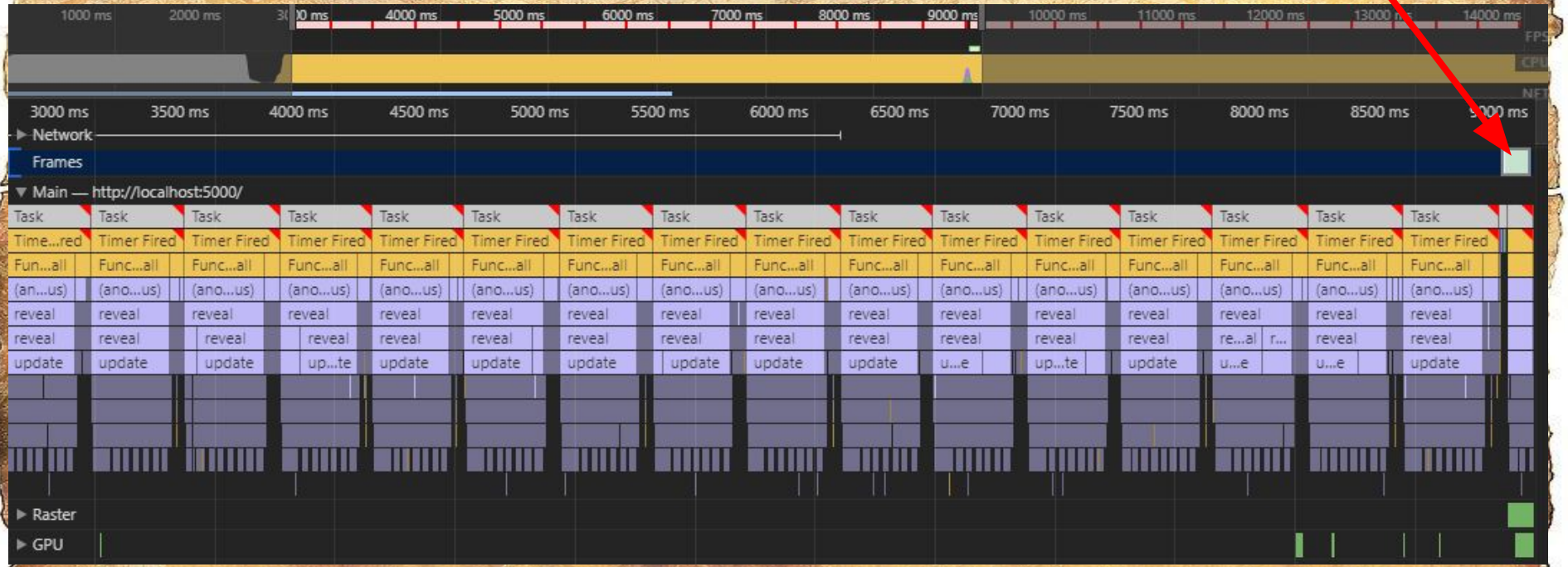
1.9 FPS


WTF?

Where Those Fps?

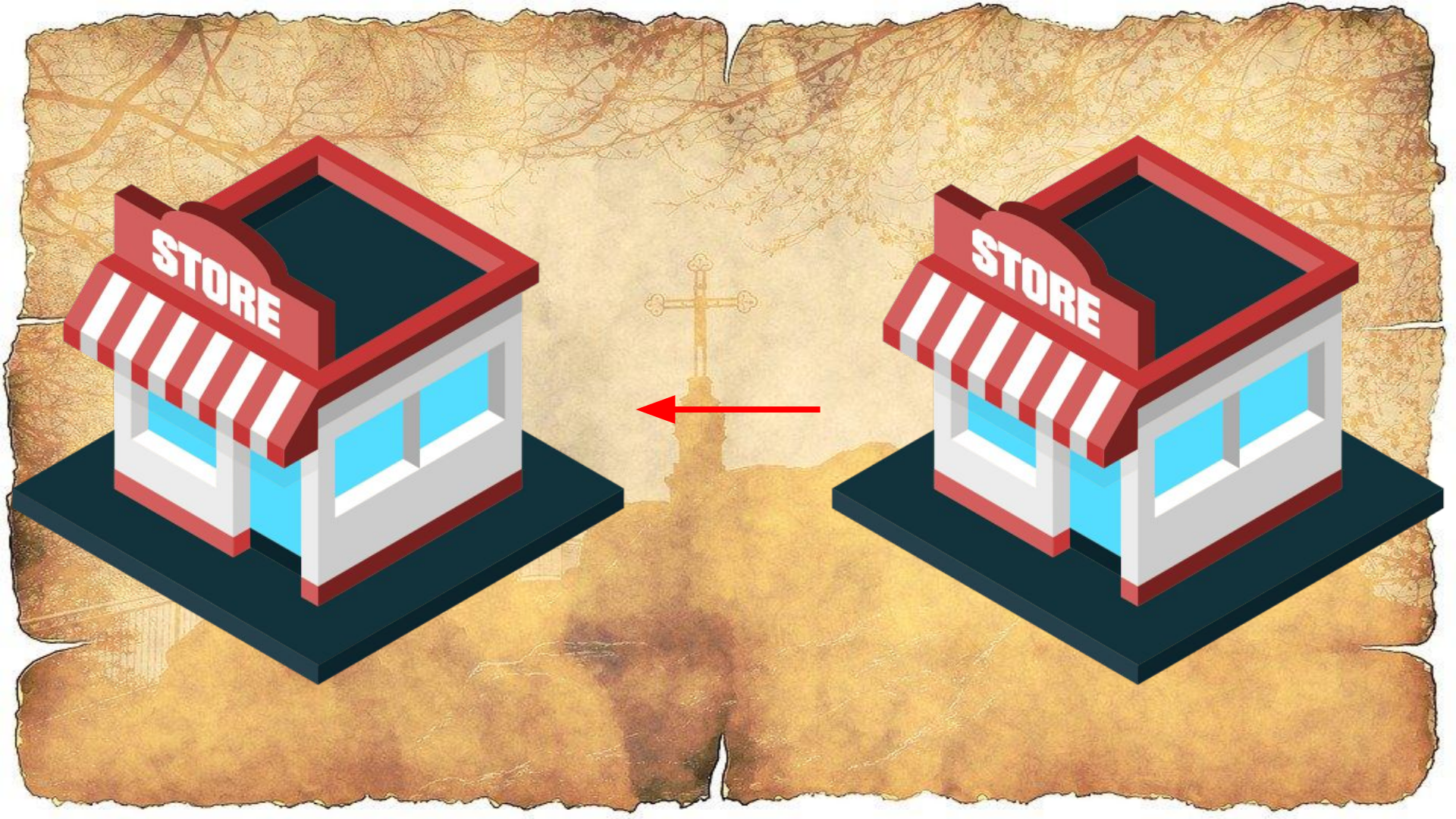

1000 ms
2000 ms
4000 ms
5000 ms
6000 ms
7000 ms
8000 ms
9000 ms
10000 ms
11000 ms
12000 ms
13000 ms
14000 ms
FPS
CPU
3000 ms
3500 ms
4000 ms
4500 ms
5000 ms
5500 ms
6000 ms
6500 ms
7000 ms
7500 ms
8000 ms
8500 ms
9000 ms
Network
Frames
Main — http://localhost:5000/
Task
Time...red
Timer Fired
Fun...all
Func...all
(an...us)
(ano...us)
reveal
update
up...te
u...e
re...al
r...
Raster
GPU


1000 ms
2000 ms
4000 ms
5000 ms
6000 ms
7000 ms
8000 ms
9000 ms
10000 ms
11000 ms
12000 ms
13000 ms
14000 ms
FPS
CPU
3000 ms
3500 ms
4000 ms
4500 ms
5000 ms
5500 ms
6000 ms
6500 ms
7000 ms
7500 ms
8000 ms
8500 ms
9000 ms
Frames
Main — http://localhost:5000/
Task
Timer Fired
Raster
GPU


1000 ms
2000 ms
4000 ms
5000 ms
6000 ms
7000 ms
8000 ms
9000 ms
10000 ms
11000 ms
12000 ms
13000 ms
14000 ms
FPS
CPU
NET
3000 ms
3500 ms
4000 ms
4500 ms
5000 ms
5500 ms
6000 ms
6500 ms
7000 ms
7500 ms
8000 ms
8500 ms
Network
Frames
Main — http://localhost:5000/
Task
Time...red
Timer Fired
Fun...all
Func...all
(an...us)
(ano...us)
reveal
update
up...te
u...e
re...al
r...
Raster
GPU

STORE

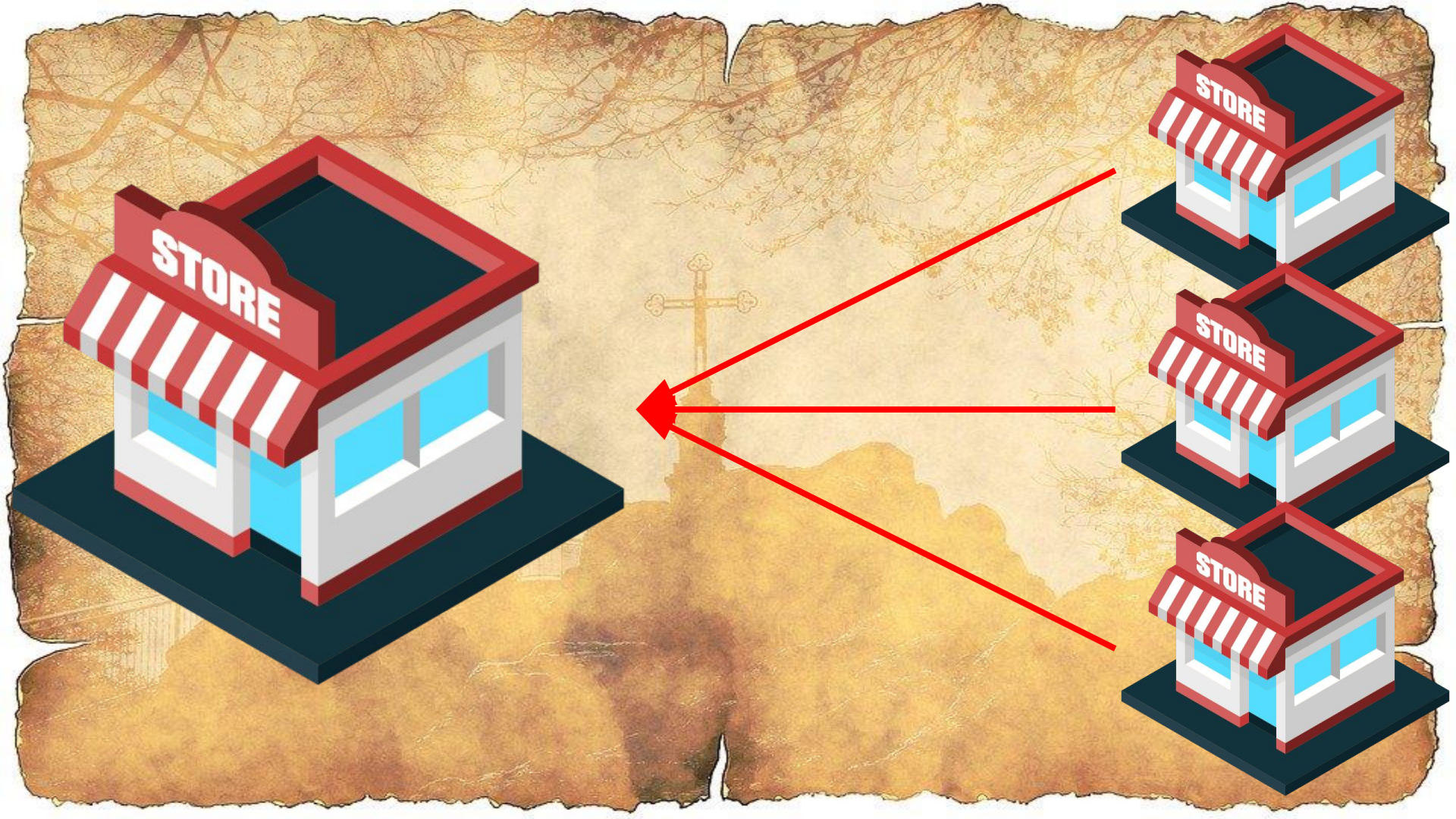
Component

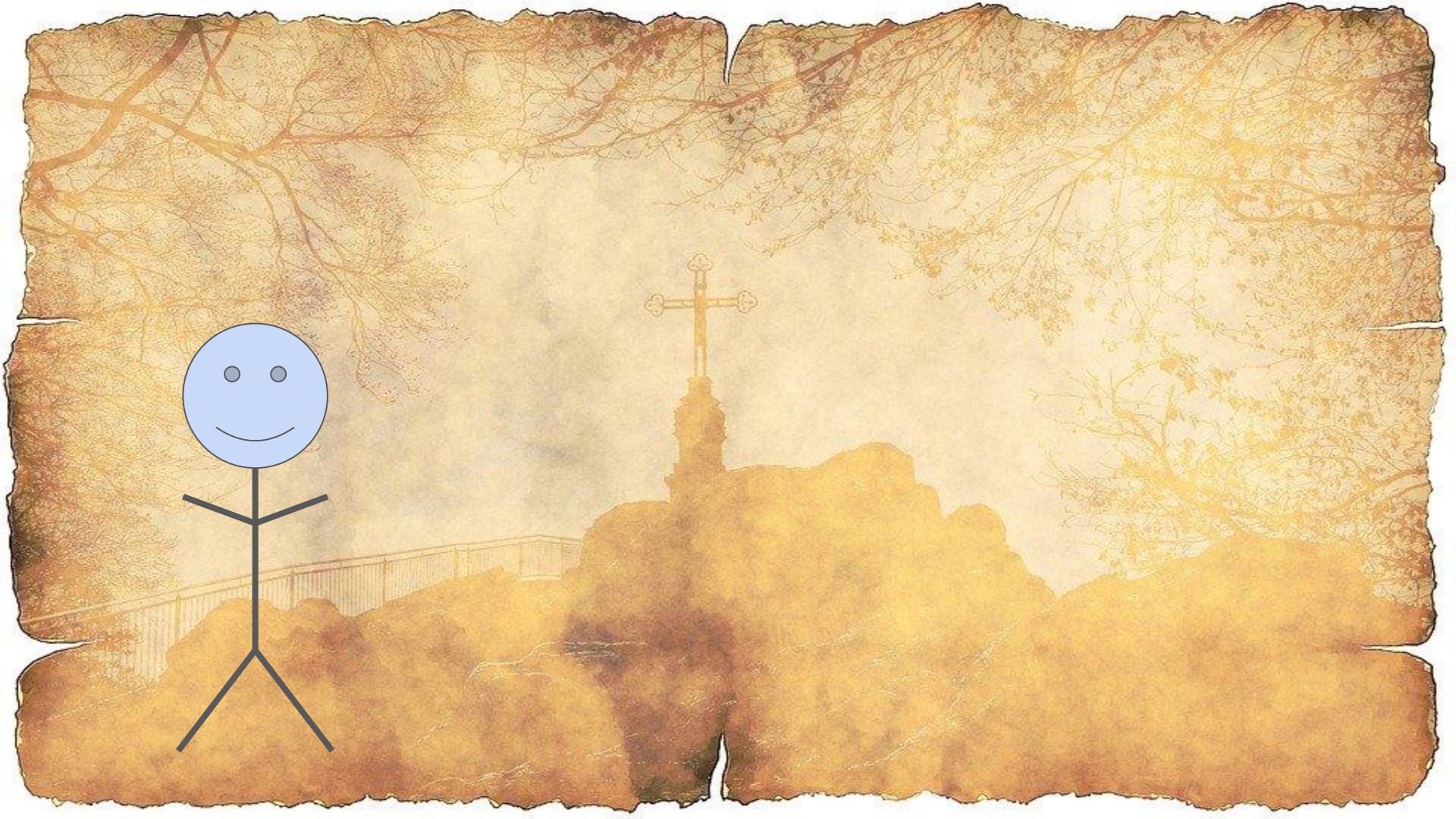

STORE
STORE

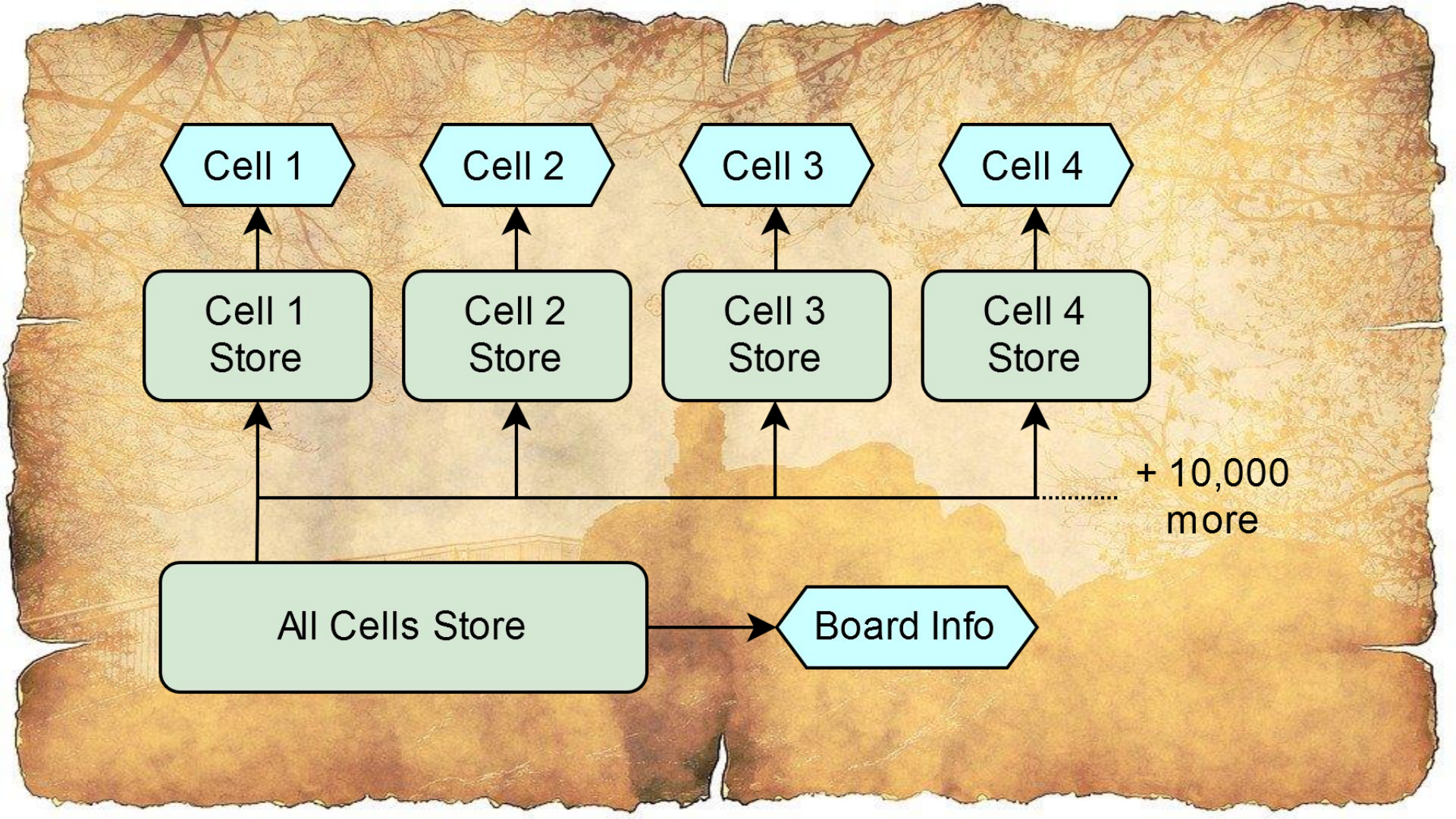
outOfStockStore

stockLevelStore

value === 0


STORE
STORE
STORE
STORE

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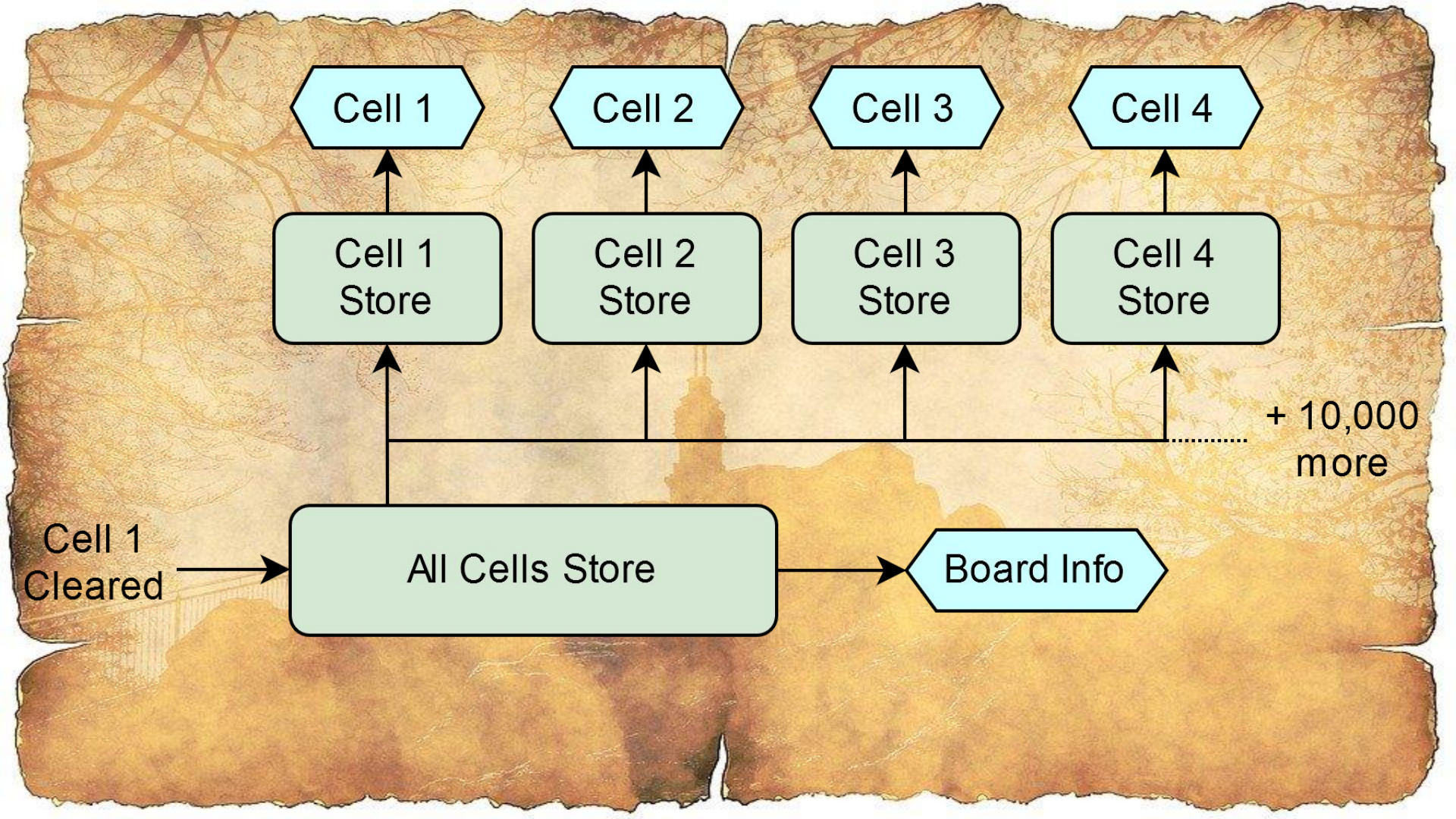
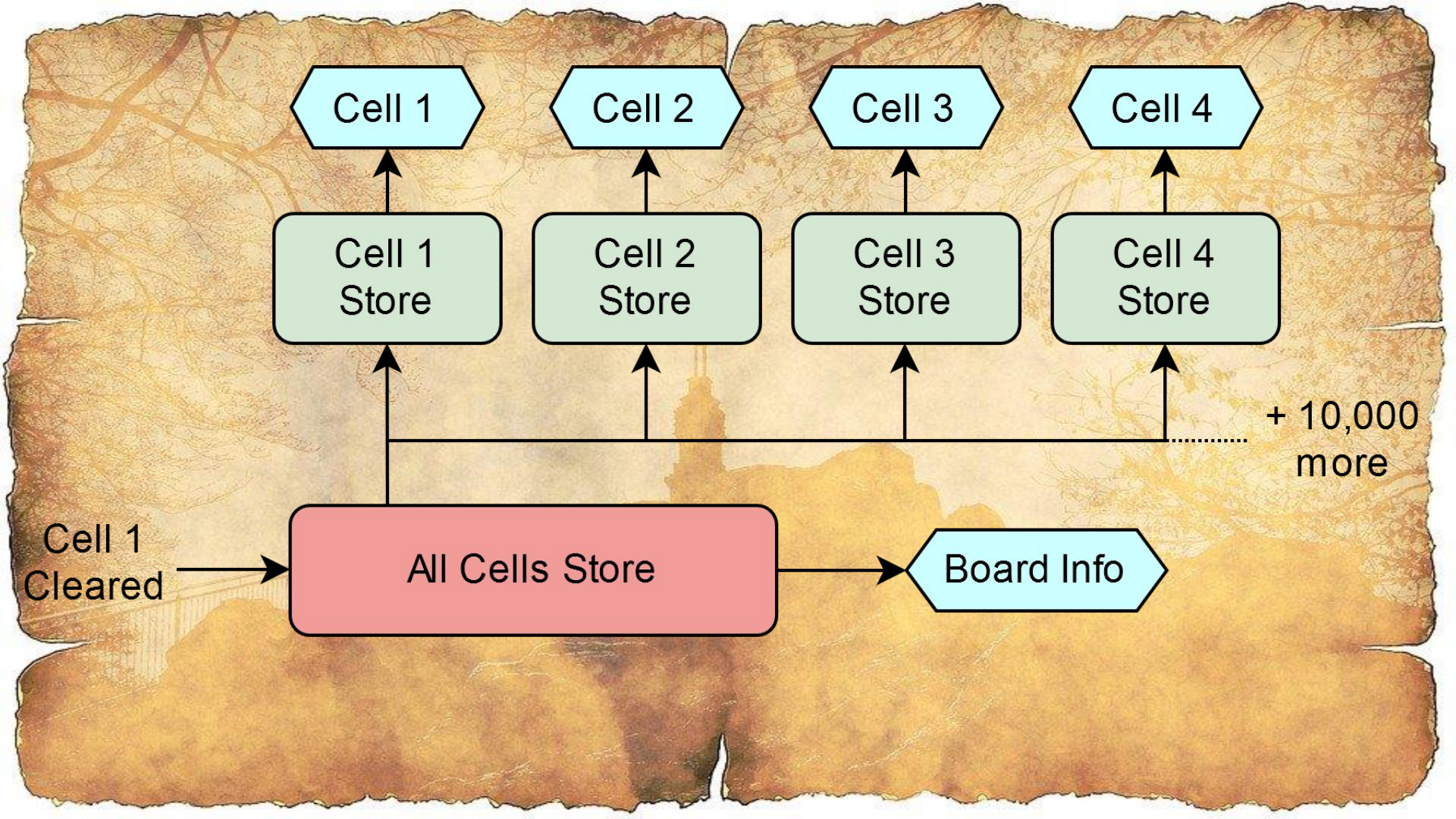
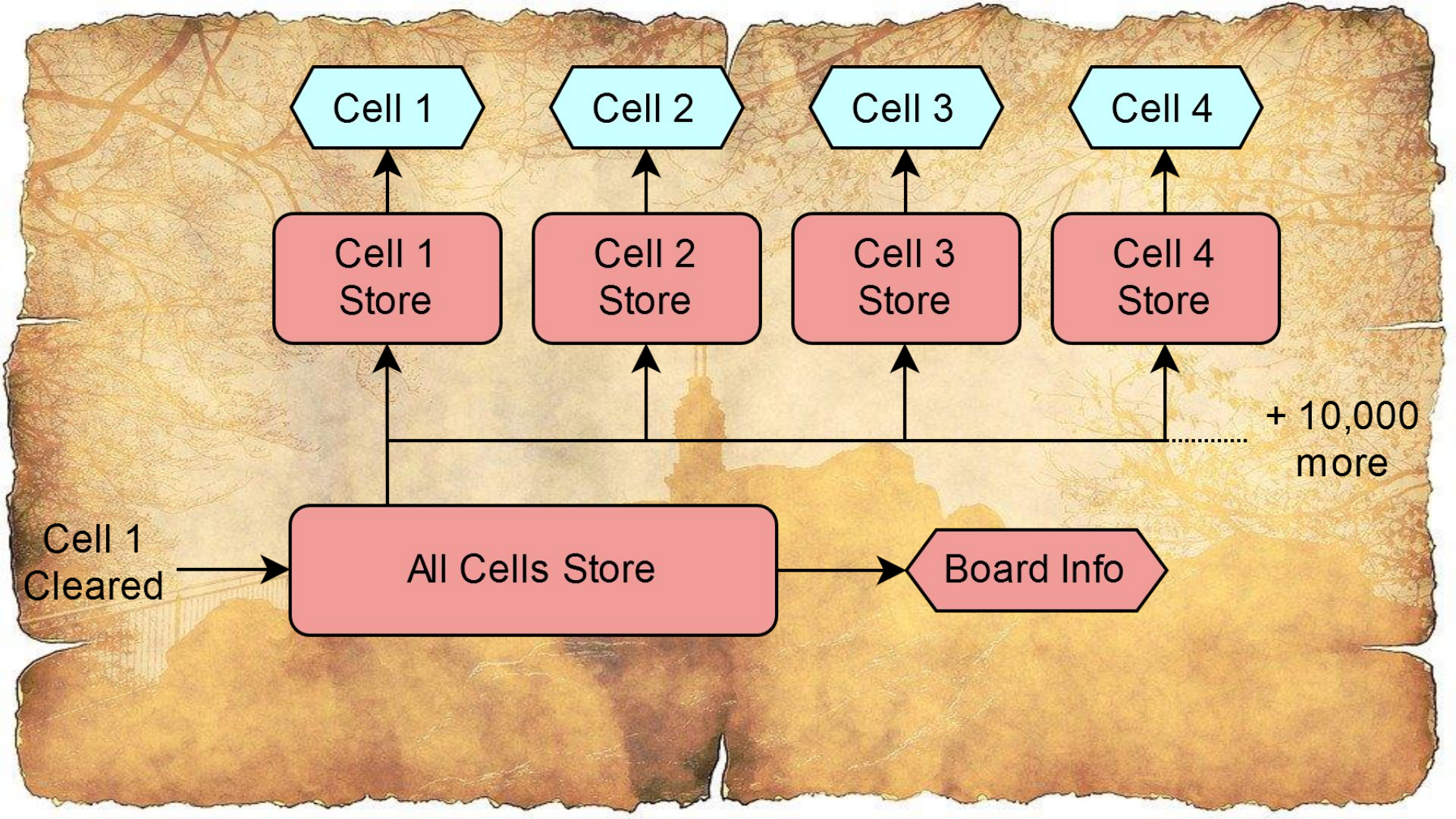
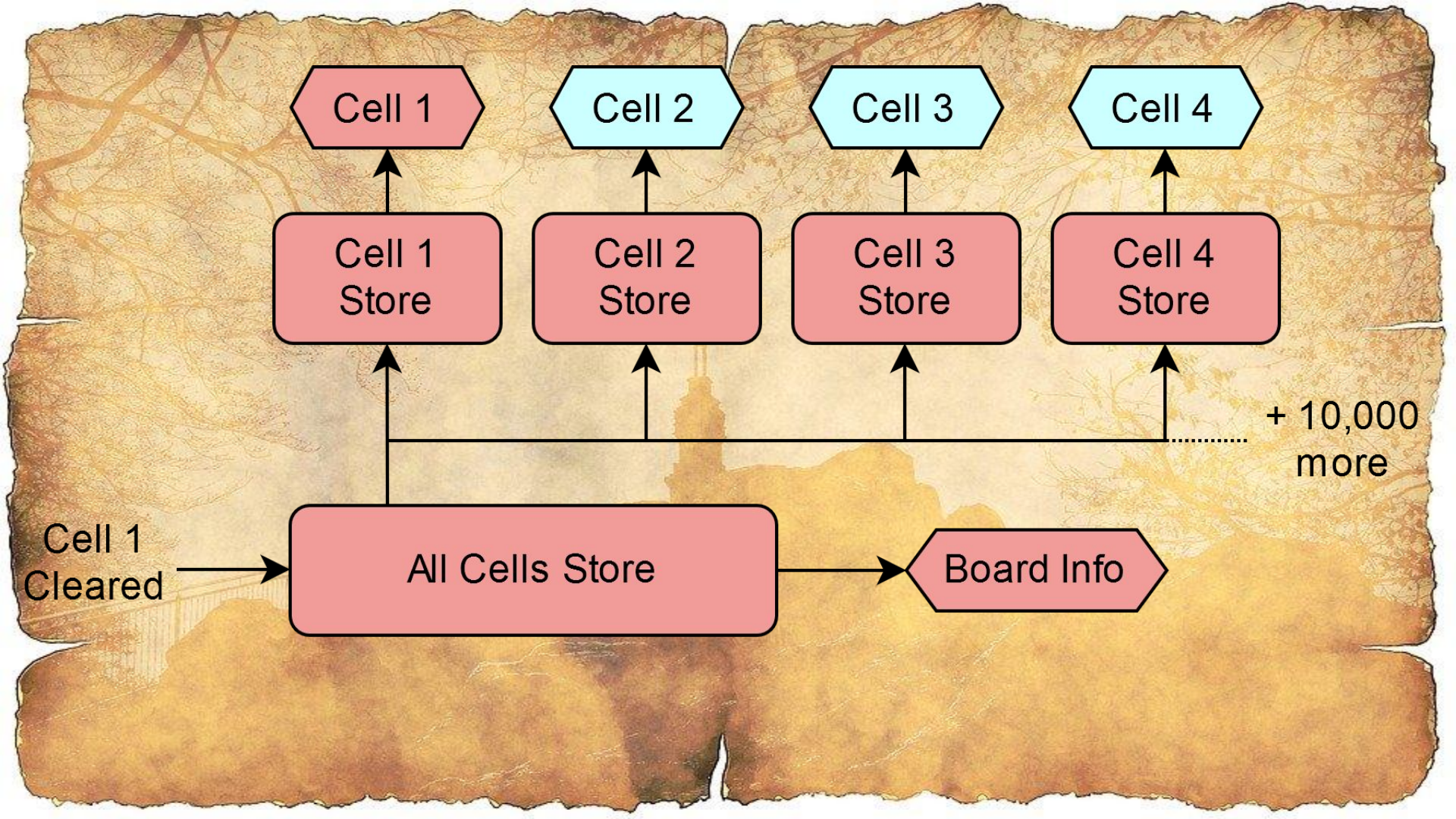
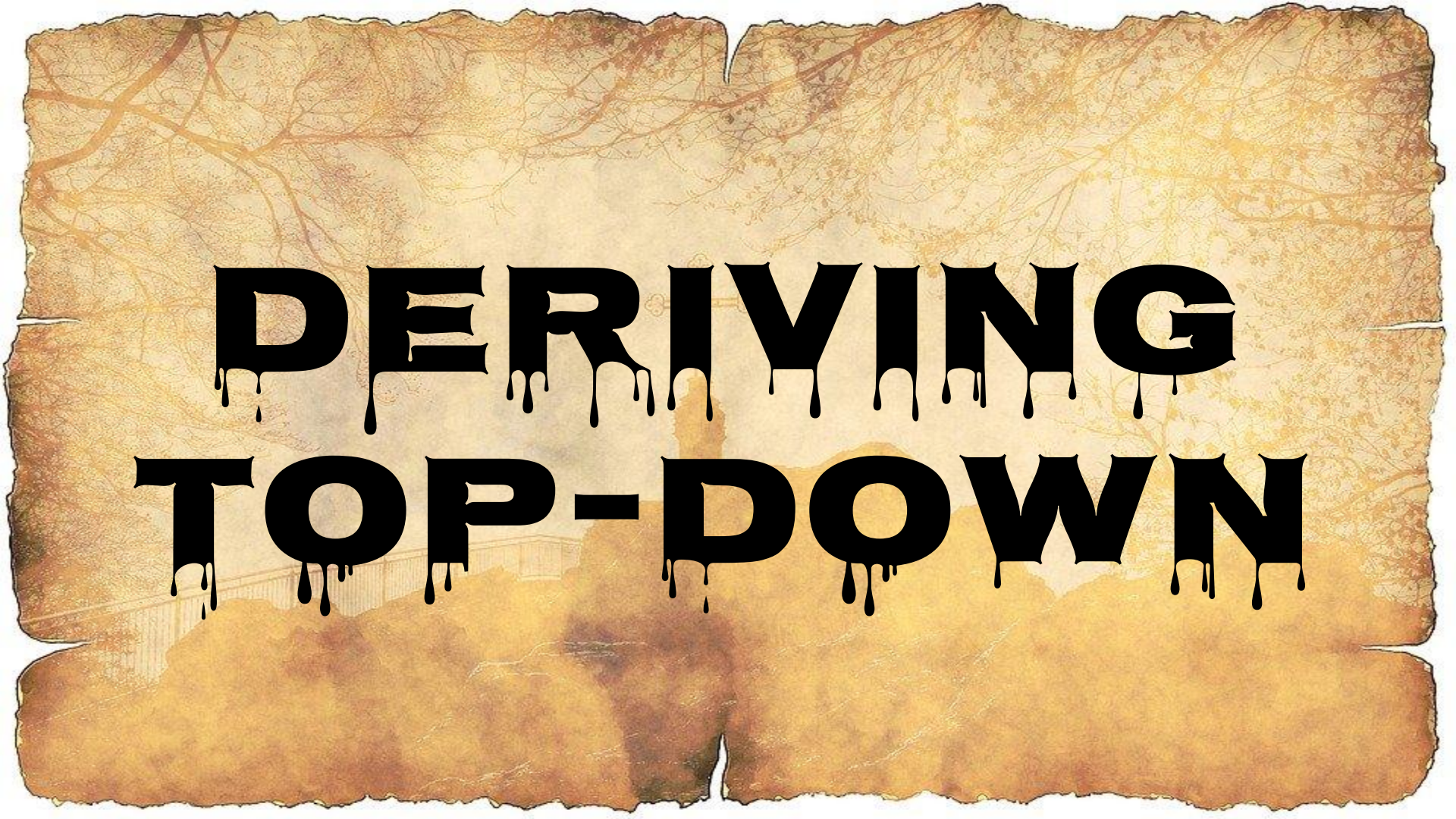
Cell 2
Cell 3
Cell 4
Cell 1 Store
Cell 2 Store
Cell 3 Store
Cell 4 Store
+ 10,000 more
All Cells Store
Board Info

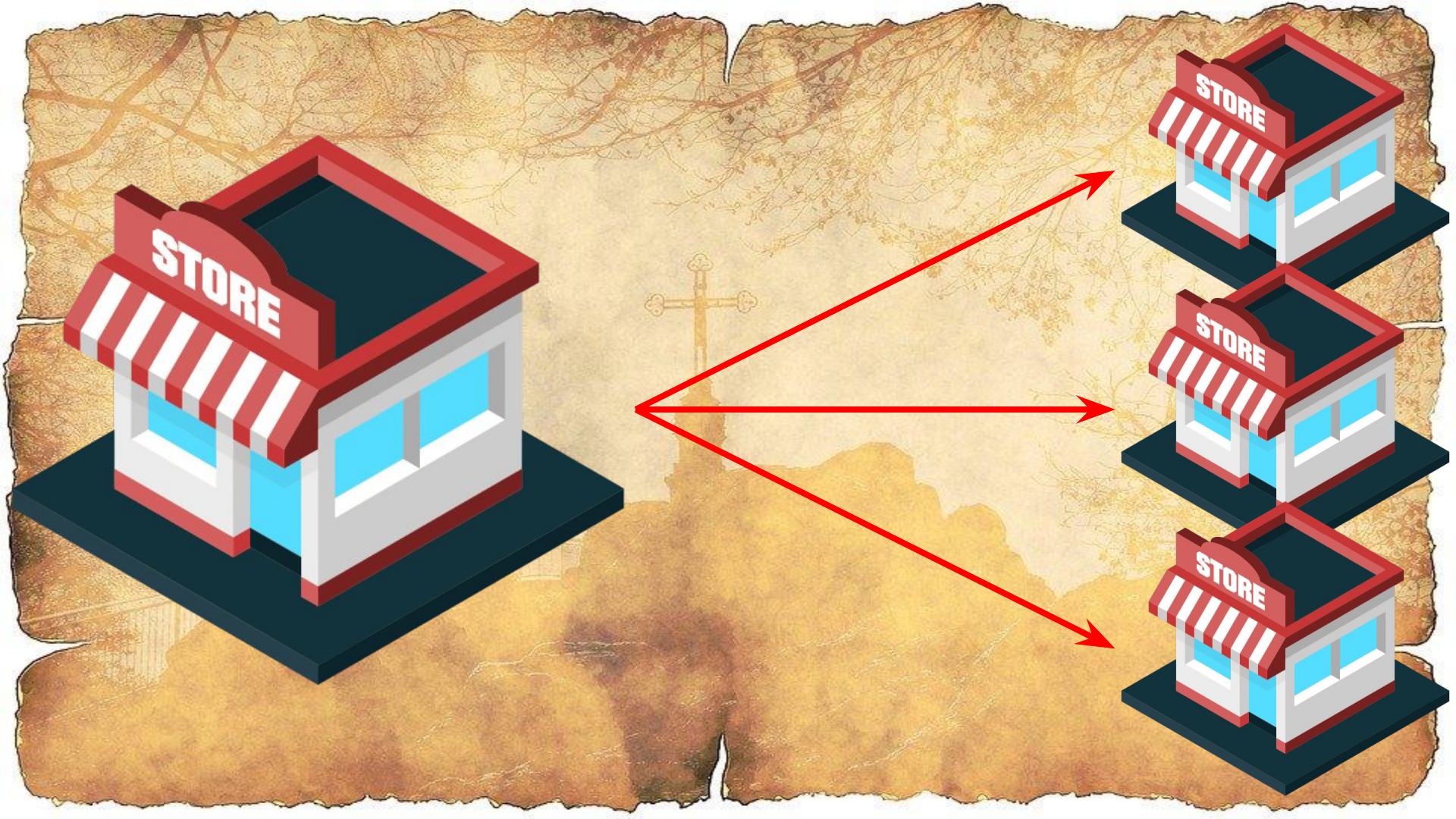

Cell 1
Cell 2
Cell 3
Cell 4
Cell 1 Store
Cell 2 Store
Cell 3 Store
Cell 4 Store
+ 10,000 more
Cell 1 Cleared
All Cells Store
Board Info


Cell 1
Cell 2
Cell 3
Cell 4
Cell 1 Store
Cell 2 Store
Cell 3 Store
Cell 4 Store
+ 10,000 more
Cell 1 Cleared
All Cells Store
Board Info

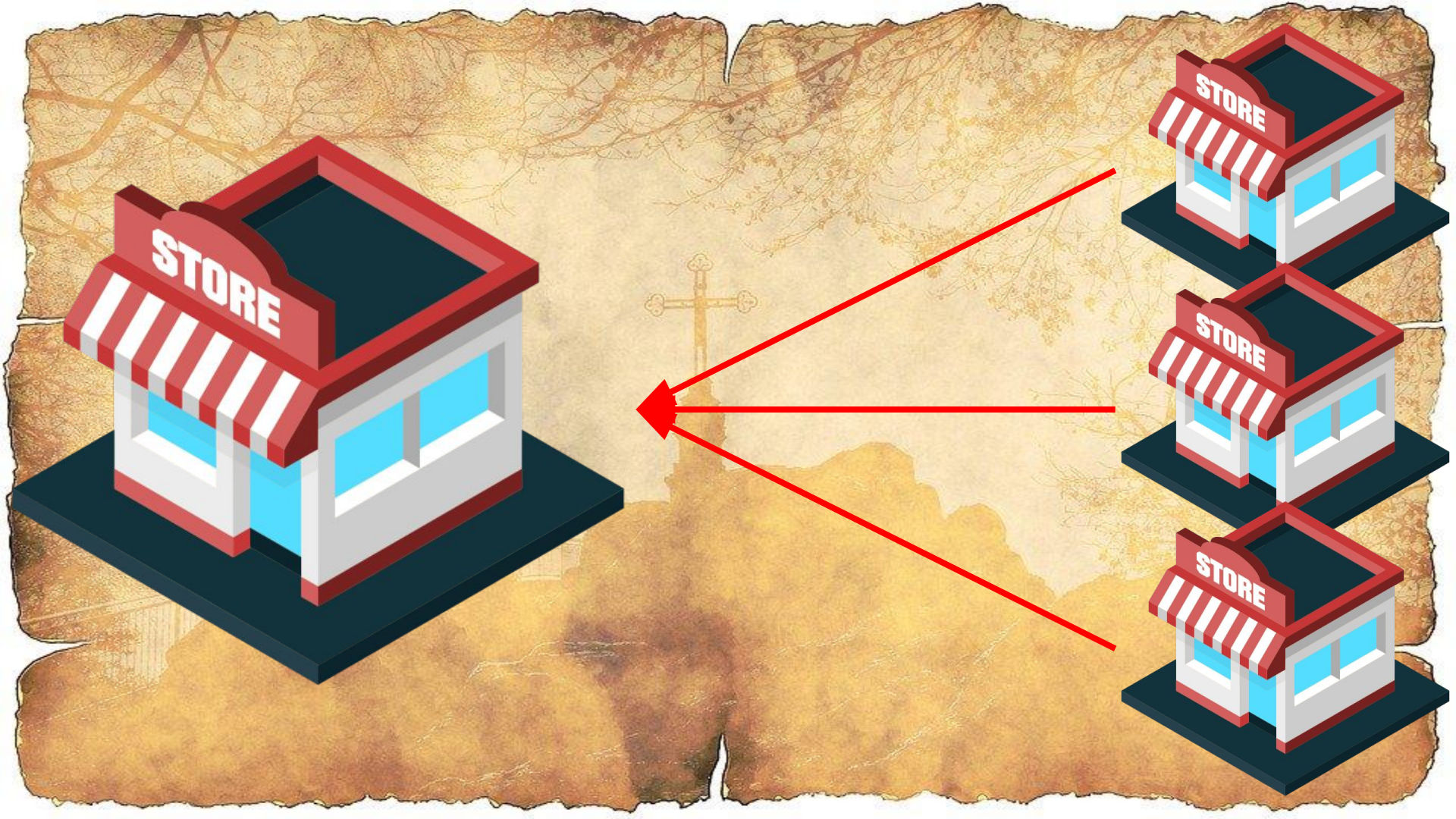

Cell 1
Cell 2
Cell 3
Cell 4
Cell 1 Store
Cell 2 Store
Cell 3 Store
Cell 4 Store
+ 10,000 more
Cell 1 Cleared
All Cells Store
Board Info


Cell 1
Cell 2
Cell 3
Cell 4
Cell 1 Store
Cell 2 Store
Cell 3 Store
Cell 4 Store
+ 10,000 more
Cell 1 Cleared
All Cells Store
Board Info


PERIVING
TOP-DOWN


STORE
STORE
STORE
STORE

Deriving Bottom-Up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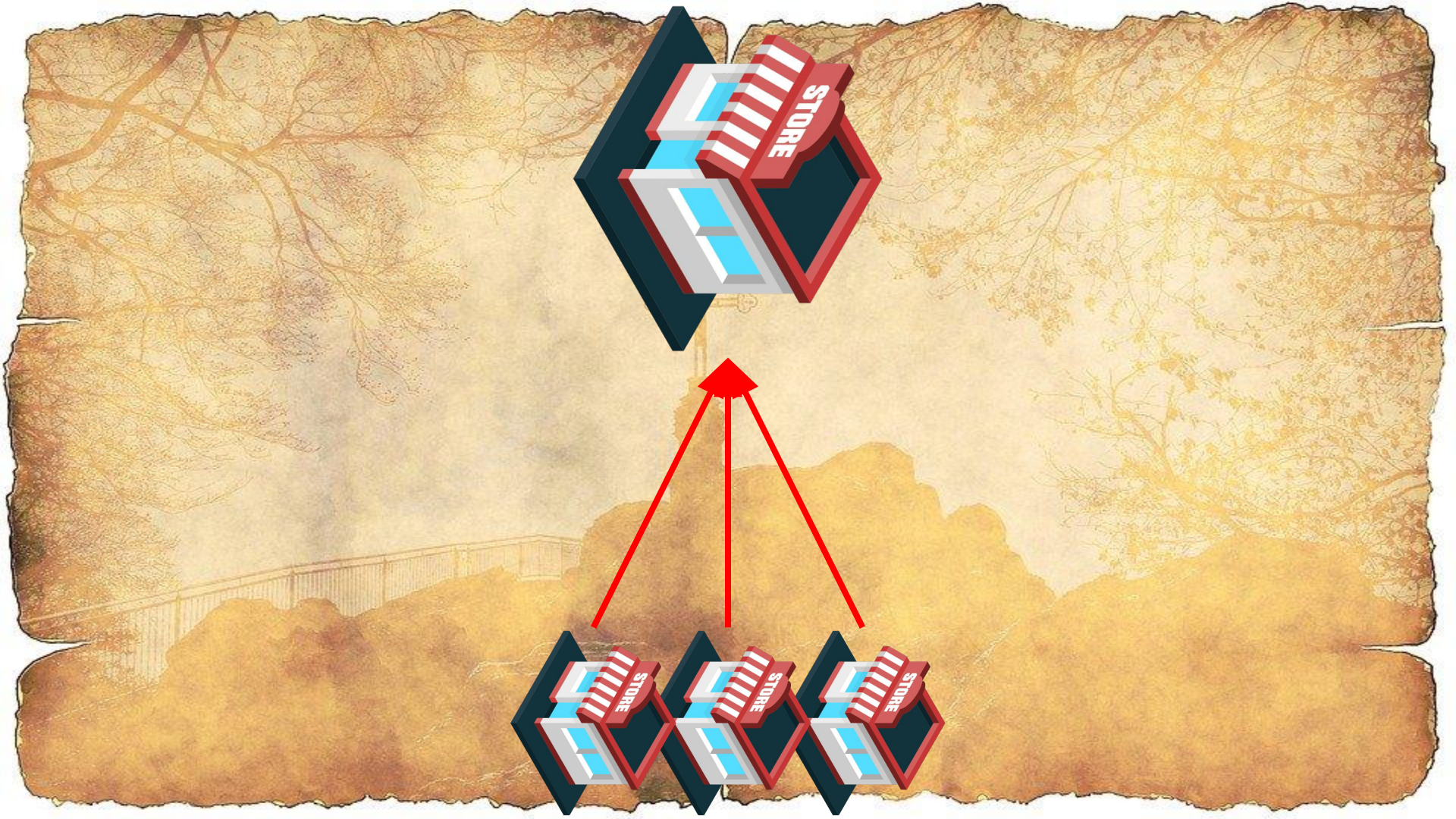
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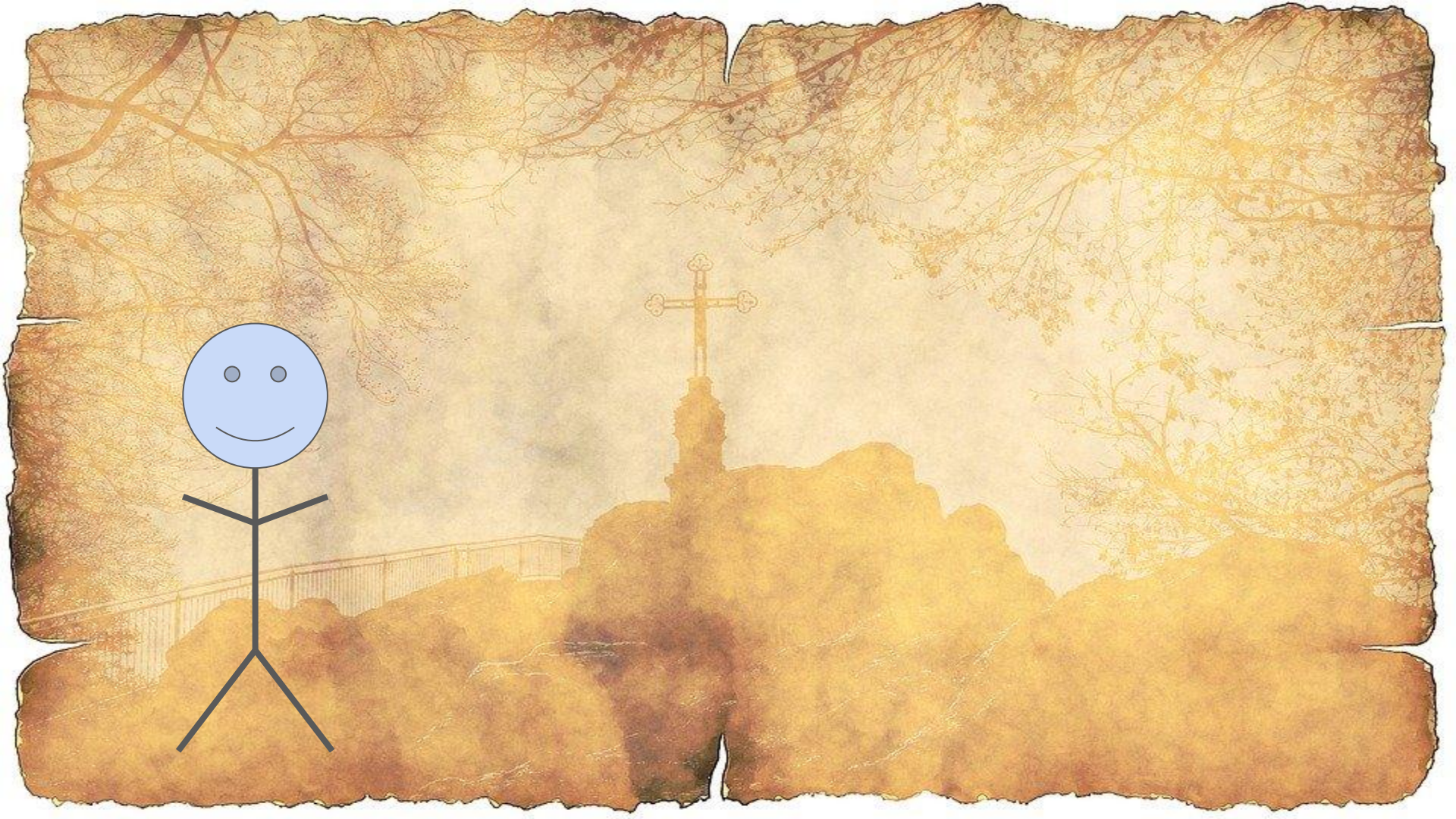
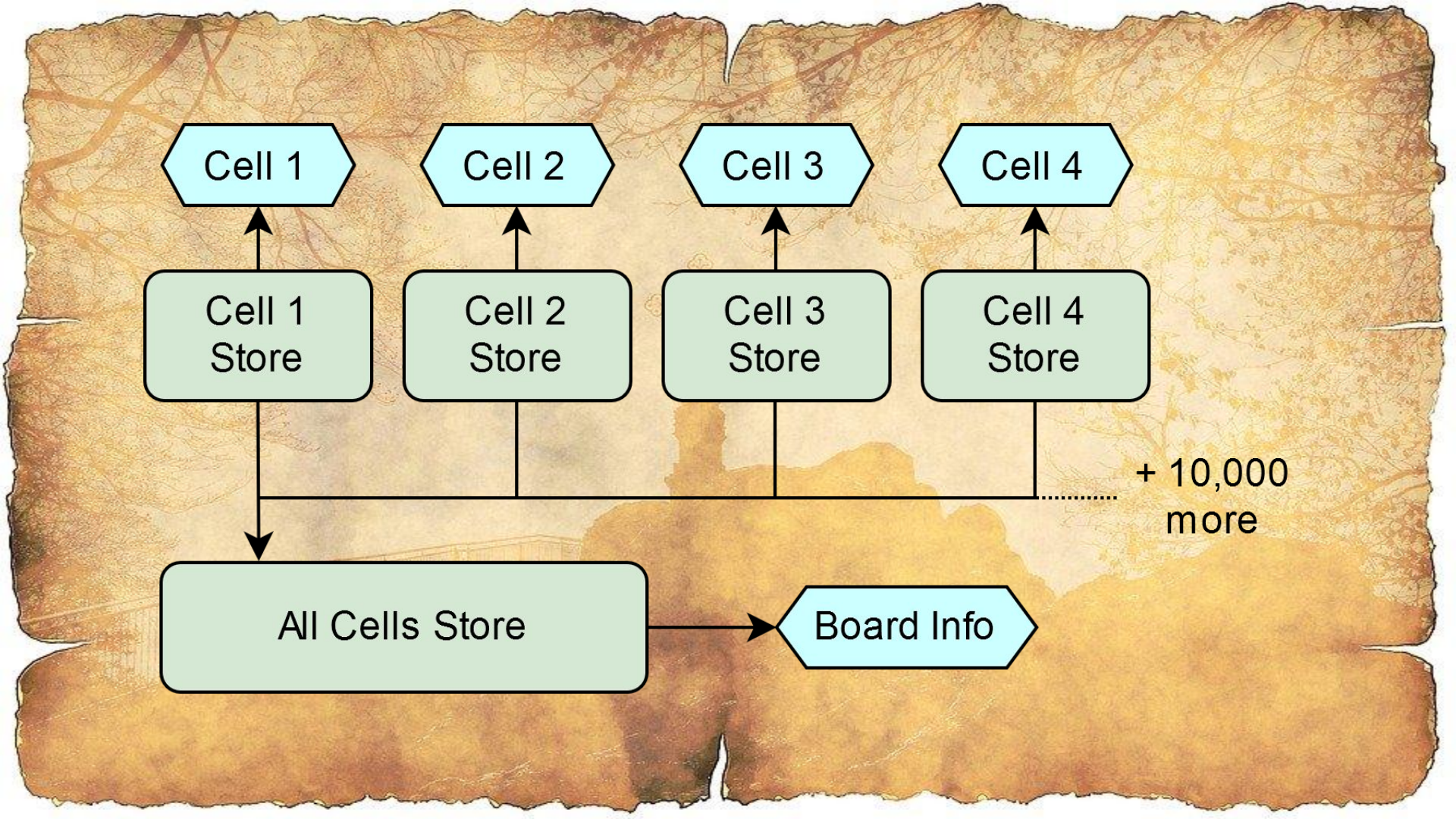
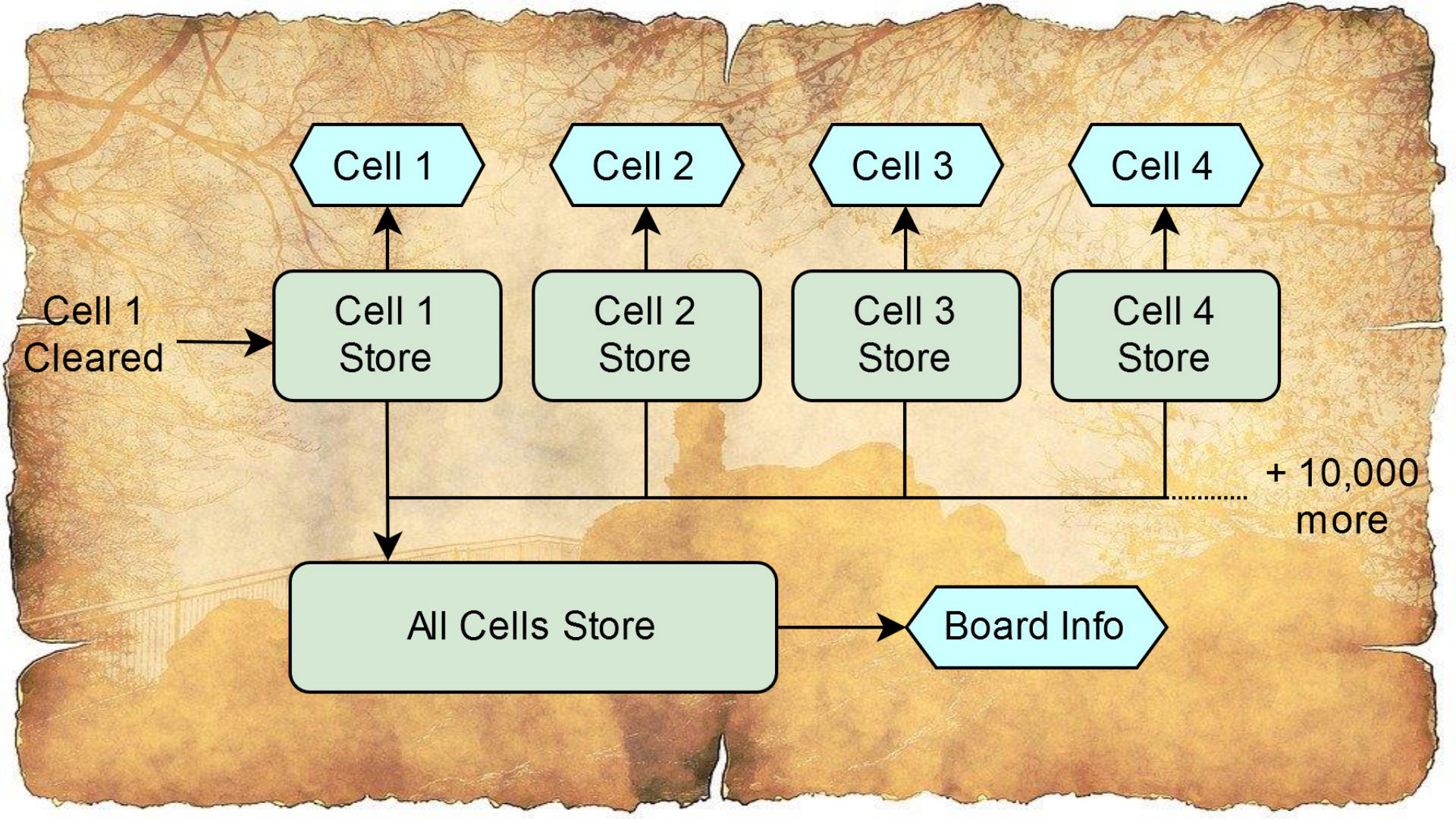
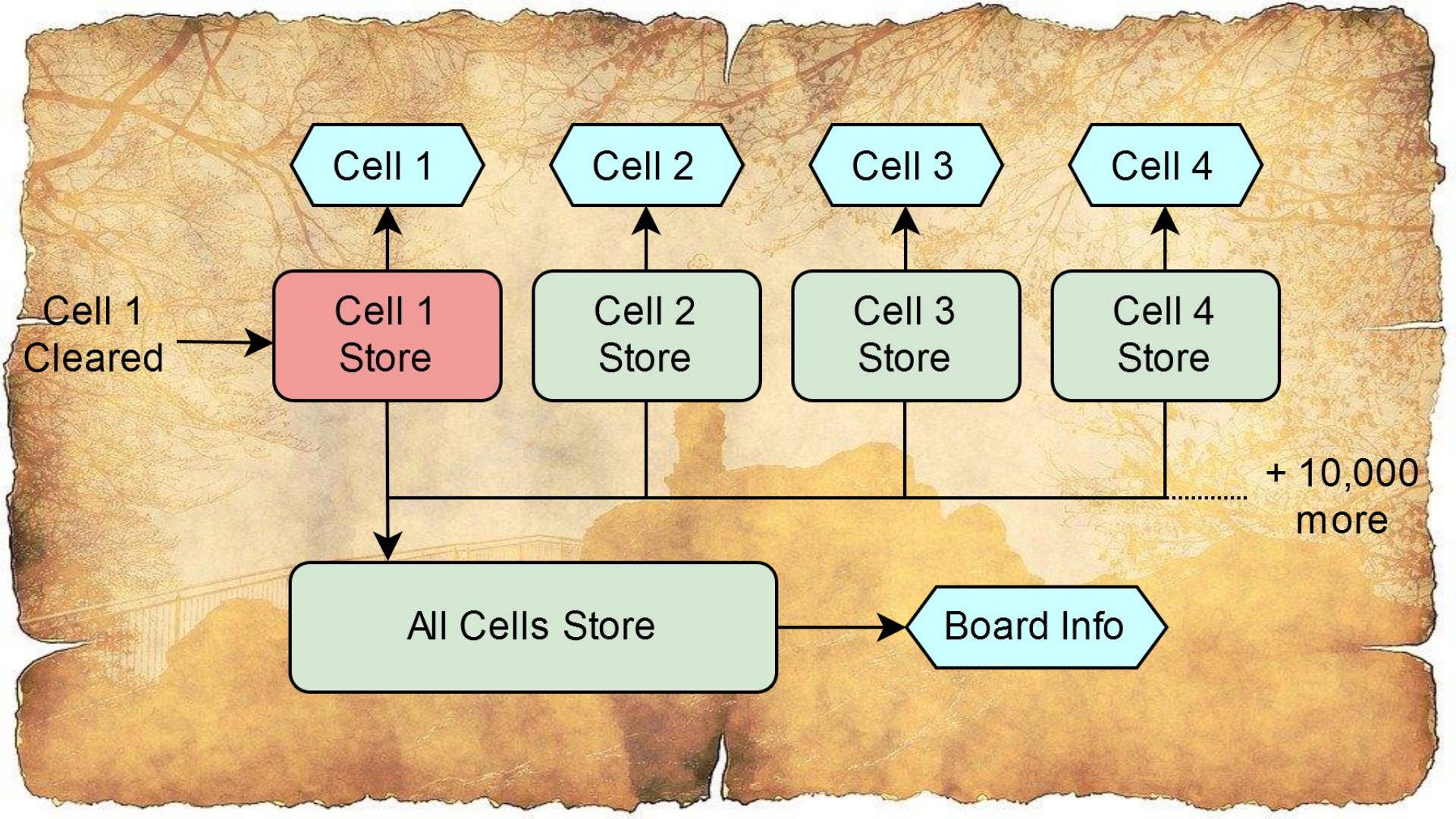
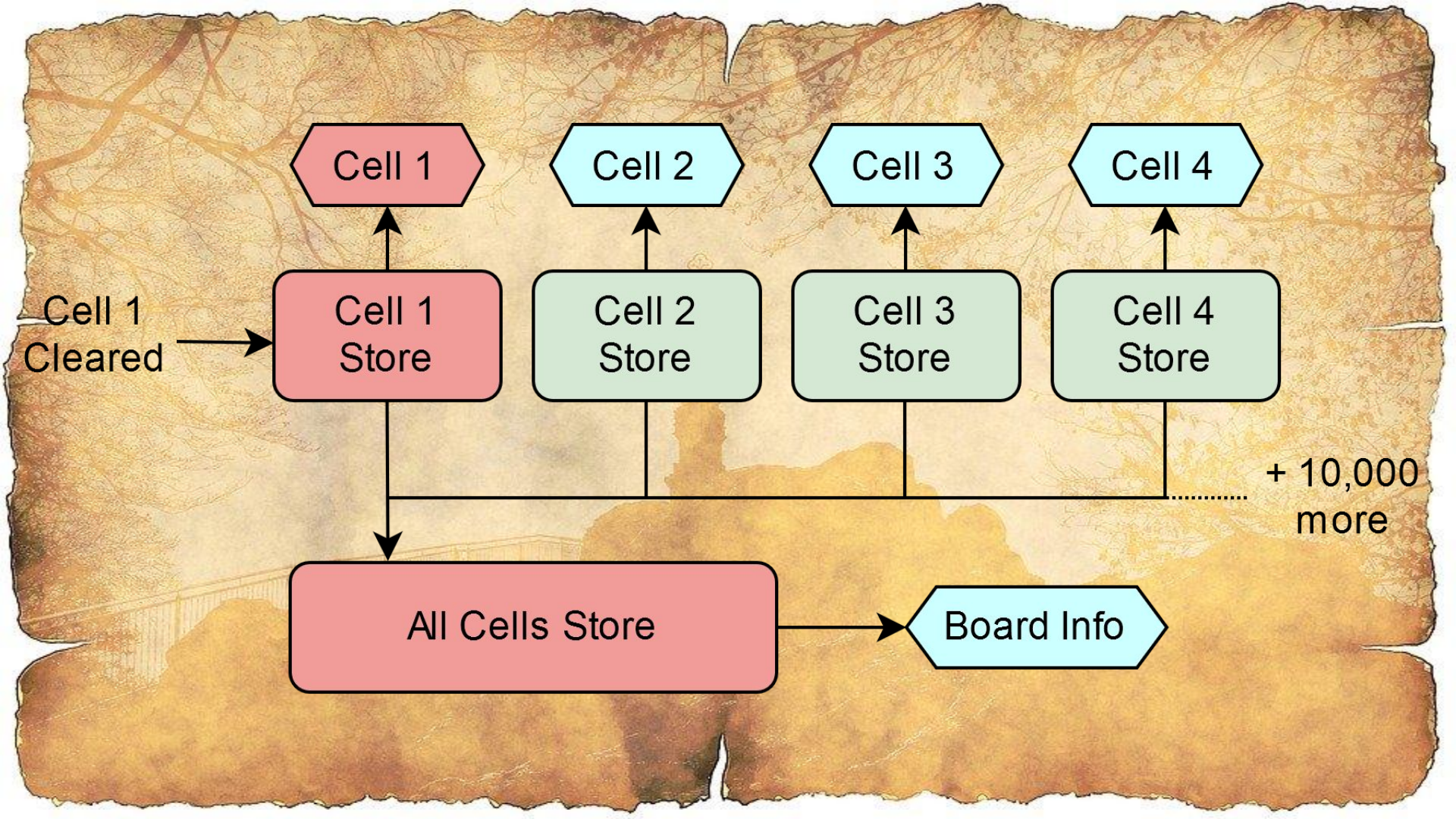
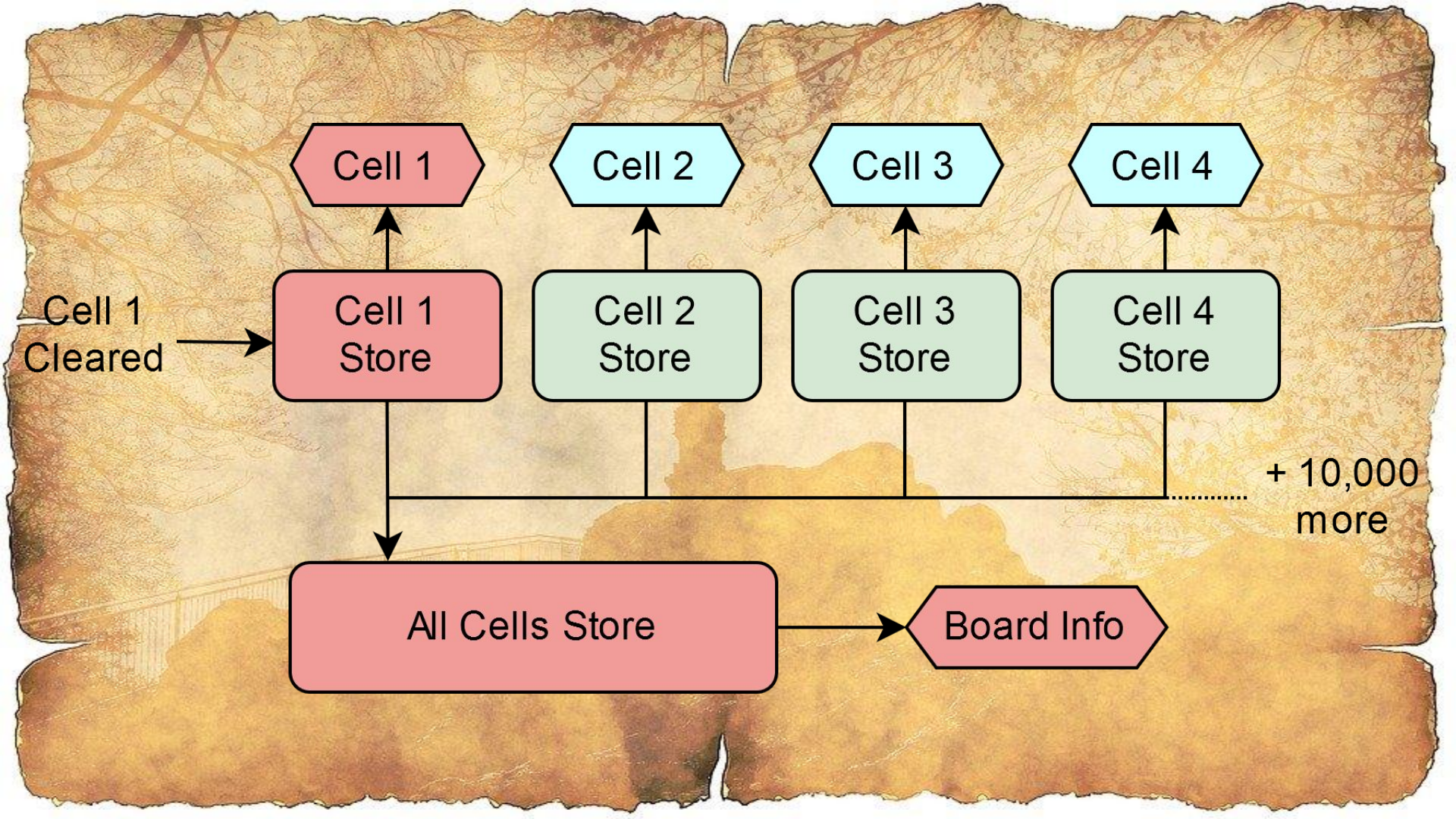


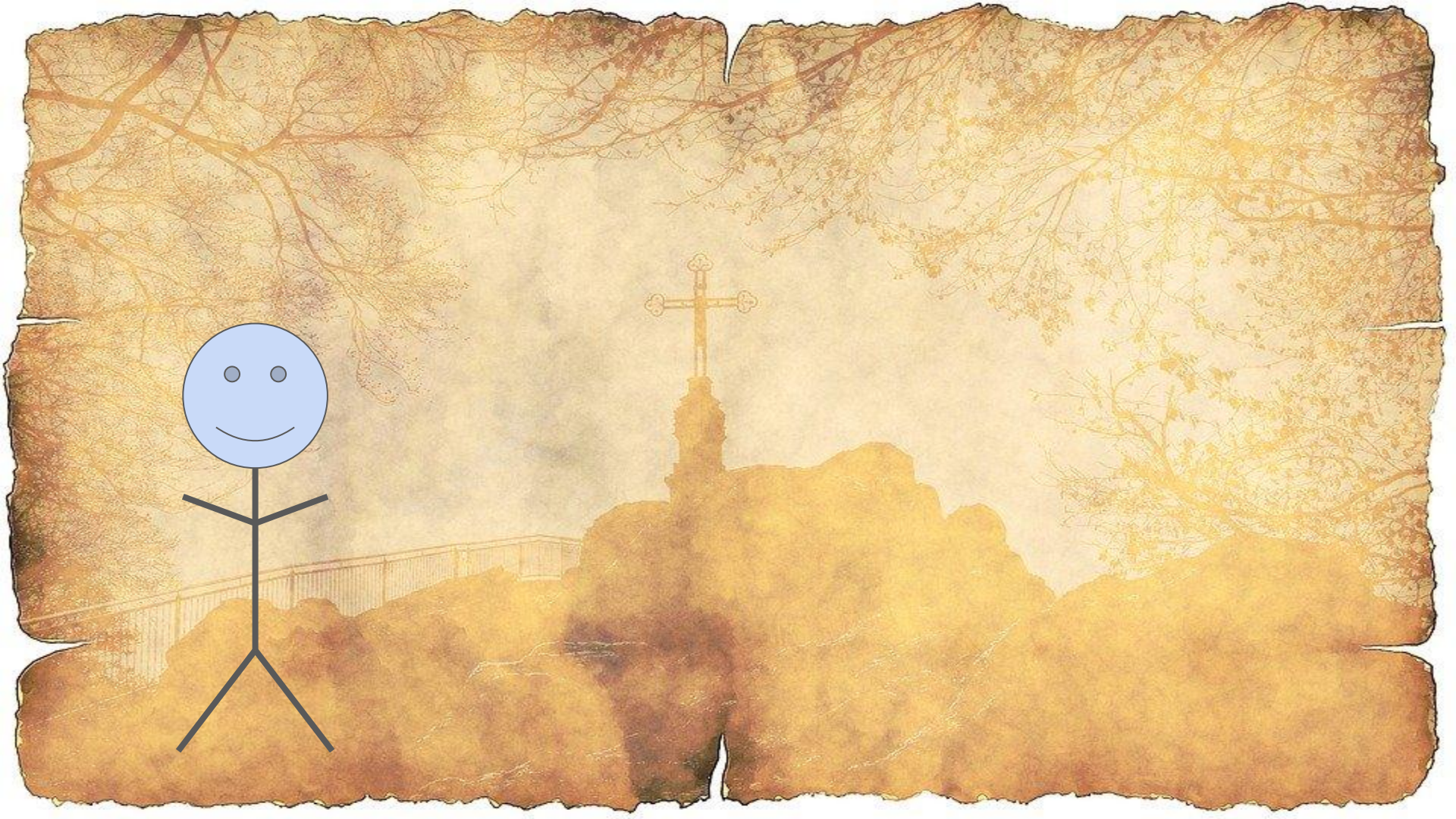

Cell 1
Cell 2
Cell 3
Cell 4
Cell 1 Store
Cell 2 Store
Cell 3 Store
Cell 4 Store
+ 10,000 more
All Cells Store
Board Info


Cell 1
Cell 2
Cell 3
Cell 4
Cell 1
Cleared
Cell 1
Store
Cell 2
Store
Cell 3
Store
Cell 4
Store
+ 10,000
more
All Cells Store
Board Info

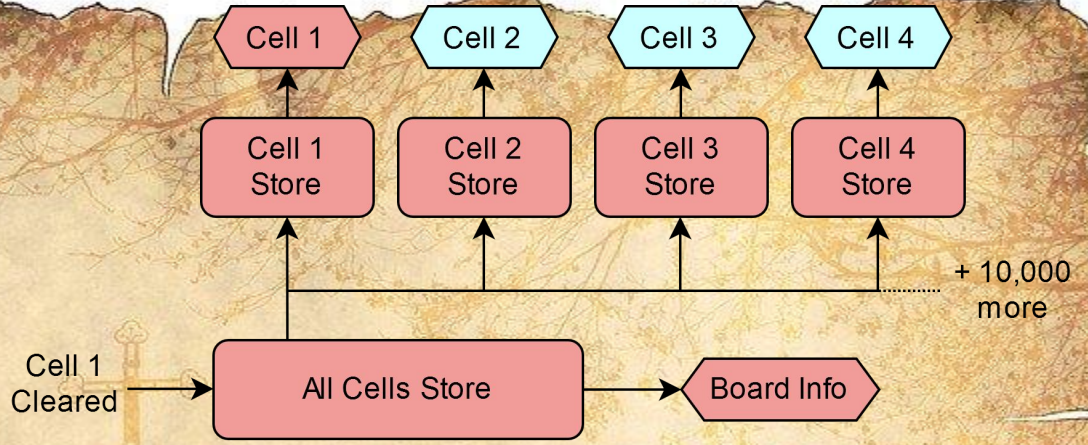

Cell 1
Cell 2
Cell 3
Cell 4
Cell 1
Cleared
Cell 1
Store
Cell 2
Store
Cell 3
Store
Cell 4
Store
+ 10,000
more
All Cells Store
Board Info


Cell 1
Cell 2
Cell 3
Cell 4
Cell 1
Cleared
Cell 1
Store
Cell 2
Store
Cell 3
Store
Cell 4
Store
+ 10,000
more
All Cells Store
Board Info

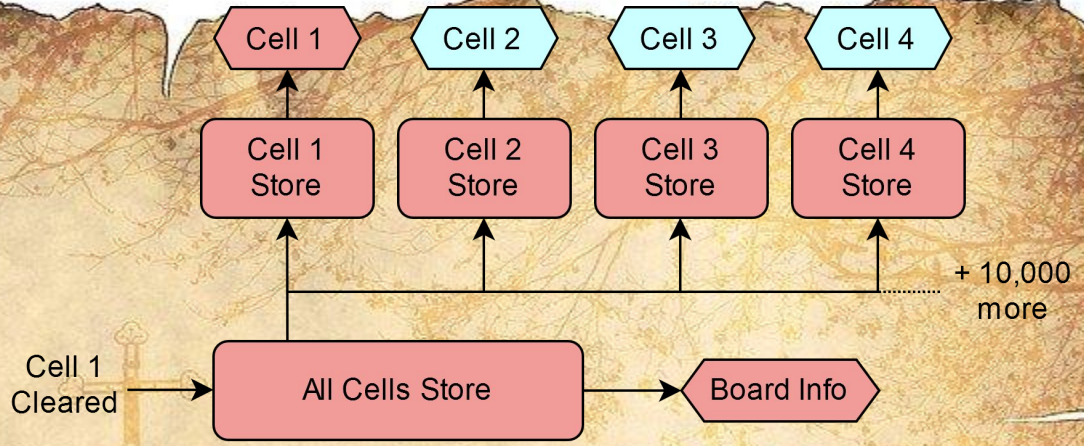

Cell 1
Cell 2
Cell 3
Cell 4
Cell 1
Cleared
Cell 1
Store
Cell 2
Store
Cell 3
Store
Cell 4
Store
+ 10,000
more
All Cells Store
Board Info



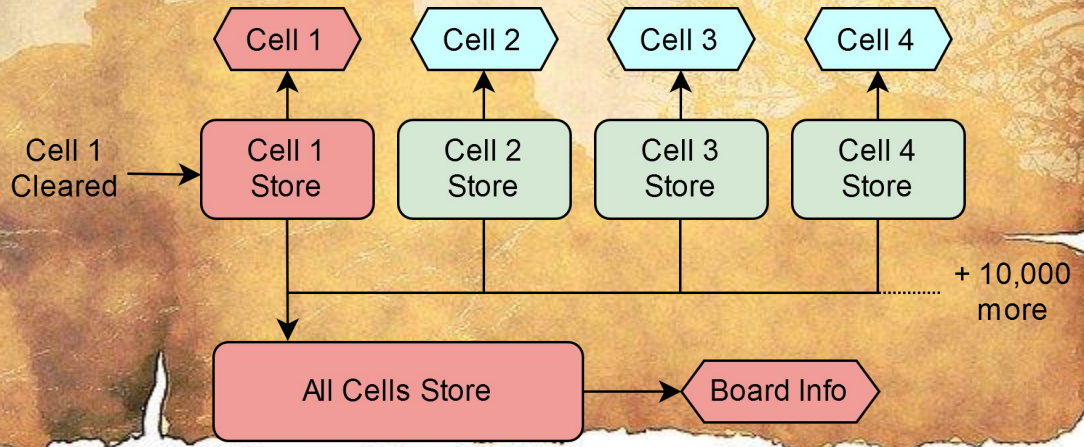
TOP-DOWN


Cell 1
Cell 2
Cell 3
Cell 4
Cell 1 Store
Cell 2 Store
Cell 3 Store
Cell 4 Store
+ 10,000 more
Cell 1 Cleared
All Cells Store
Board Info

TOP-DOWN

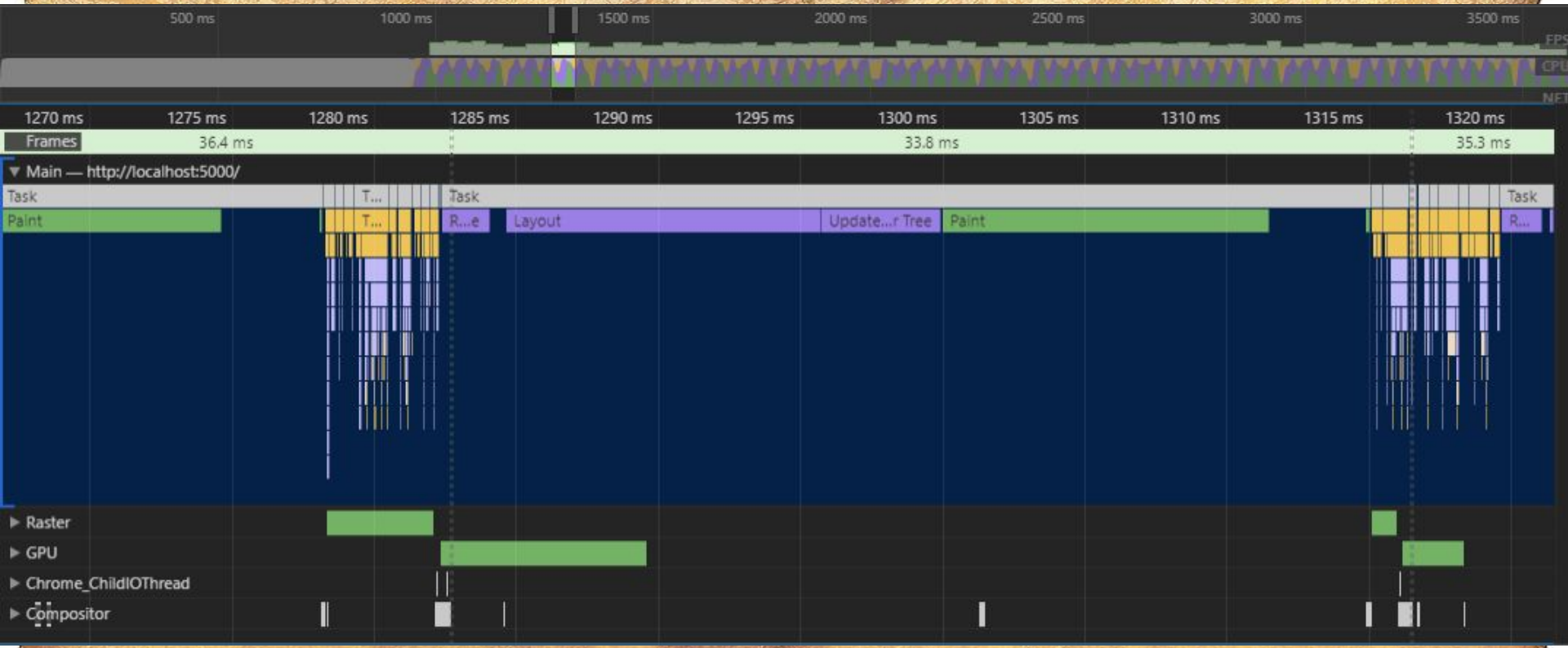


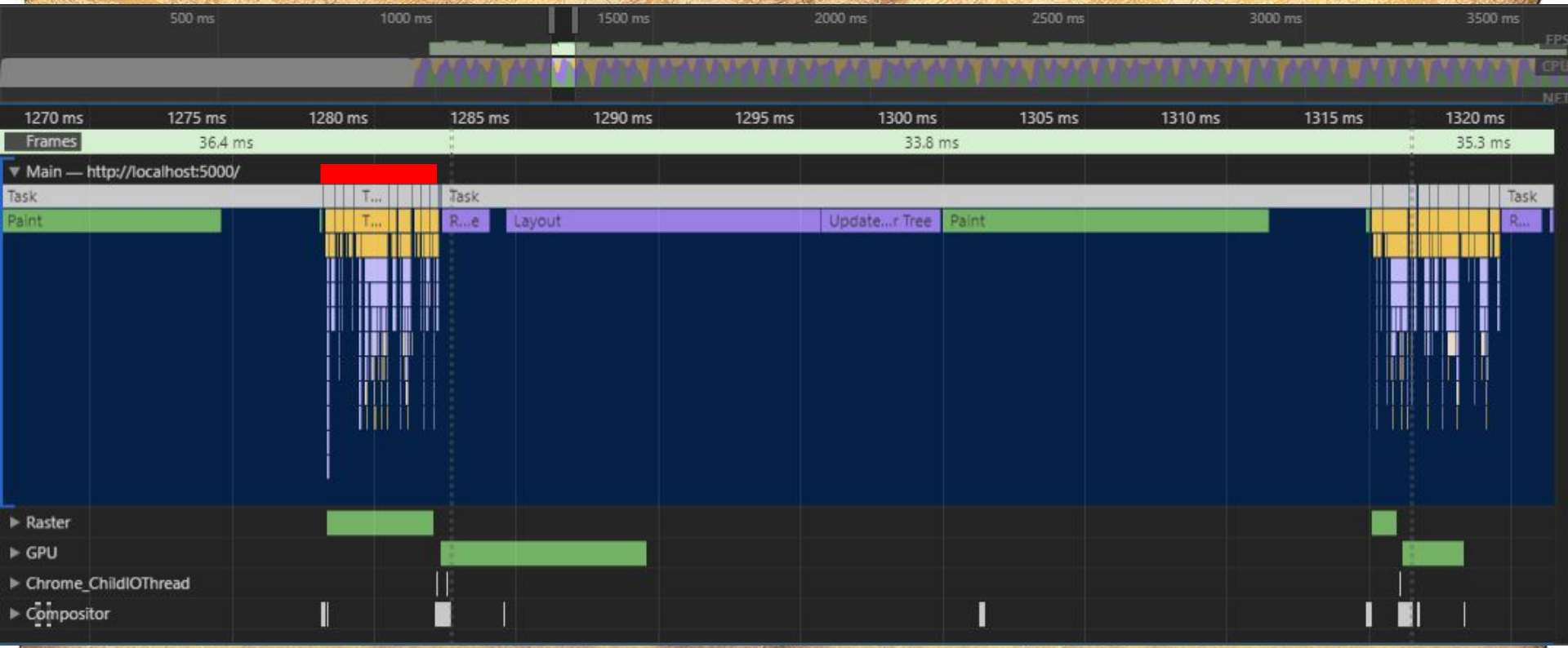
Bottom-Up



Results

23.3 fps!


500 ms
1000 ms
1500 ms
2000 ms
2500 ms
3000 ms
3500 ms
FPS
CPU
NET
1270 ms
1275 ms
1280 ms
1285 ms
1290 ms
1295 ms
1300 ms
1305 ms
1310 ms
1315 ms
1320 ms
Frames
36.4 ms
33.8 ms
35.3 ms
Main — http://localhost:5000/
Task
T...
Task
Task
Paint
T...
R...e
Layout
Update...r Tree
Paint
R...
Raster
GPU
Chrome_ChildIOThread
Compositor


500 ms
1000 ms
1500 ms
2000 ms
2500 ms
3000 ms
3500 ms
FPS
CPU
NET
1270 ms
1275 ms
1280 ms
1285 ms
1290 ms
1295 ms
1300 ms
1305 ms
1310 ms
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36.4 ms
33.8 ms
35.3 ms
Main — http://localhost:5000/
Task
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T...
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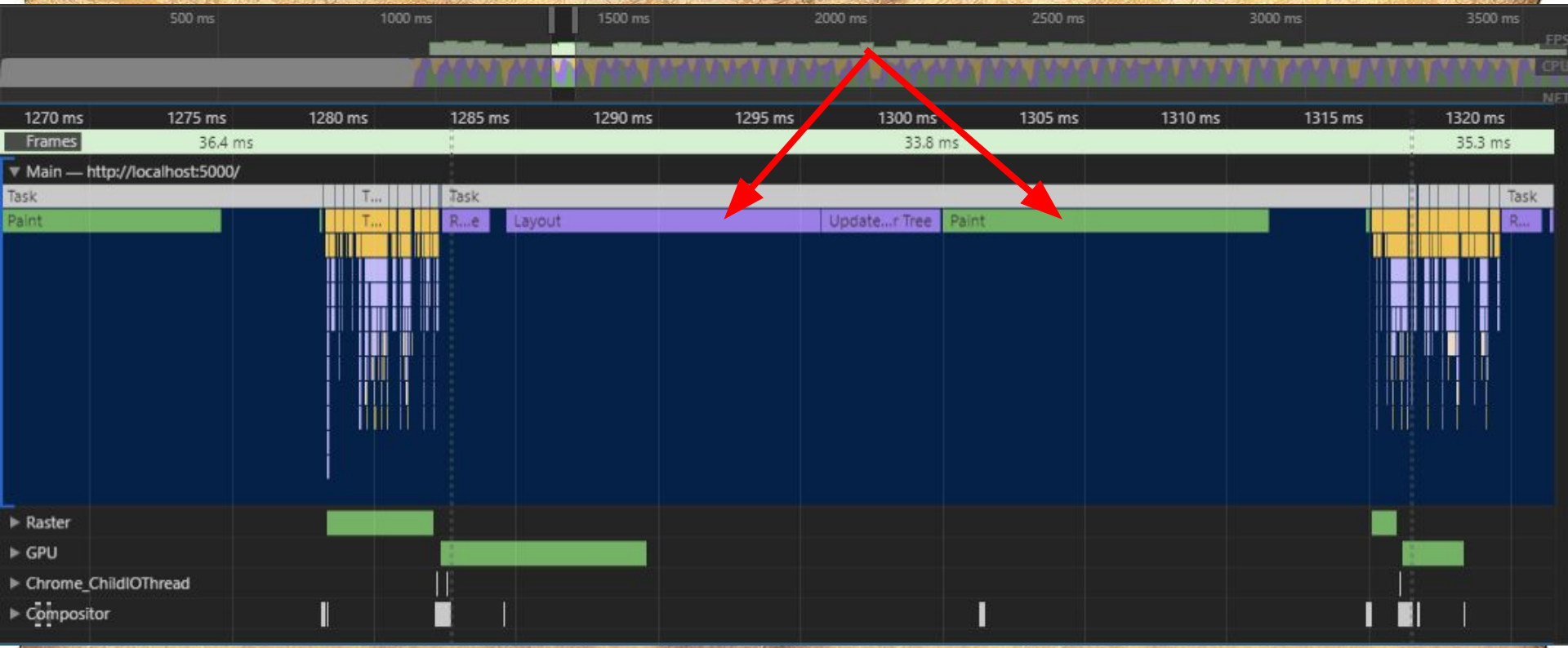
Update...r Tree
Paint
R...
Raster
GPU
Chrome_ChildIOThread
Compositor


500 ms
1000 ms
1500 ms
2000 ms
2500 ms
3000 ms
3500 ms
FPS
CPU
NET
1270 ms
1275 ms
1280 ms
1285 ms
1290 ms
1295 ms
1300 ms
1305 ms
1310 ms
1315 ms
1320 ms
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36.4 ms
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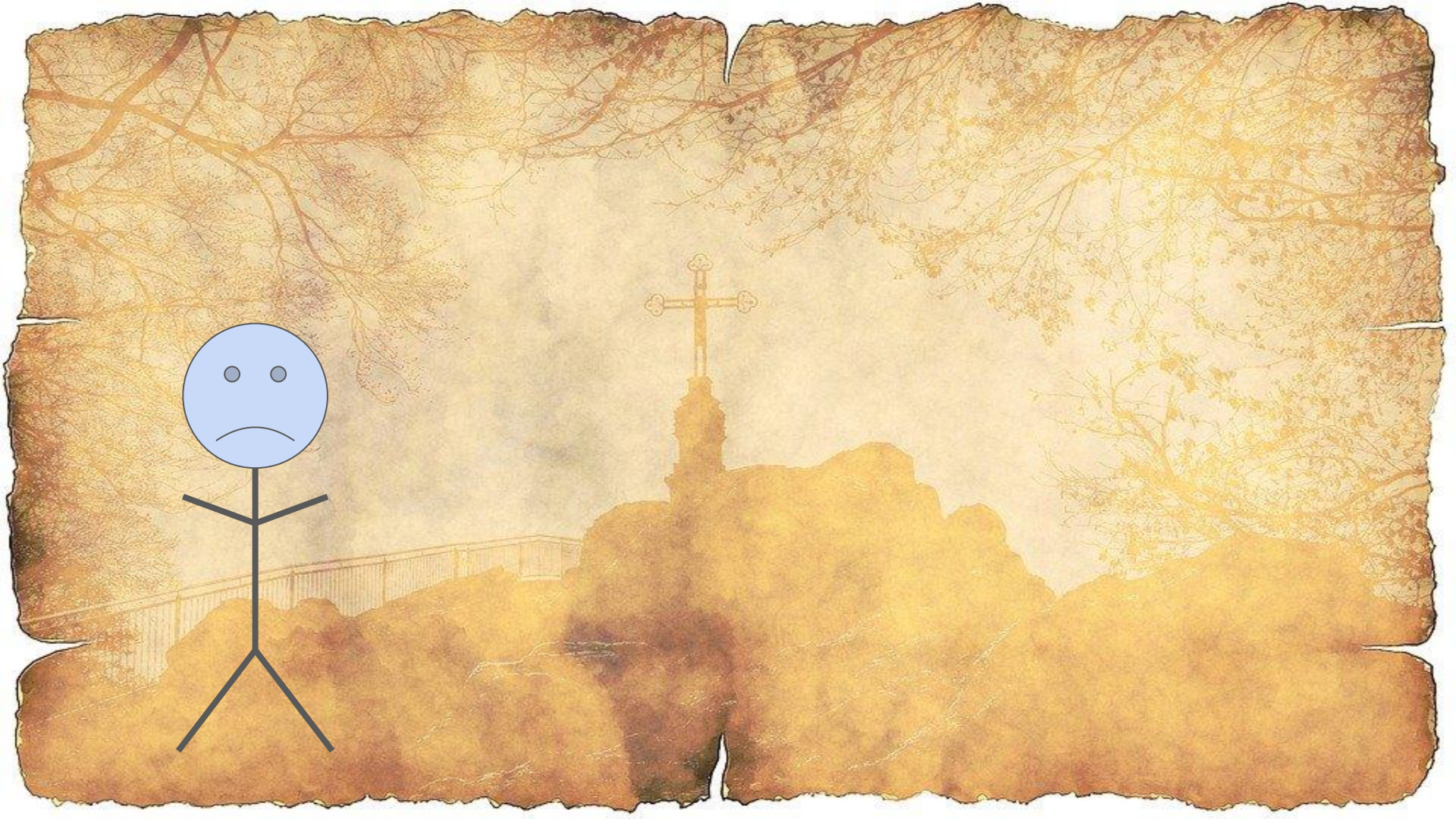
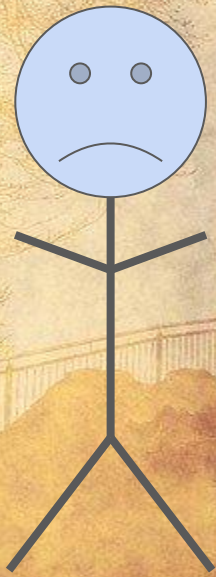
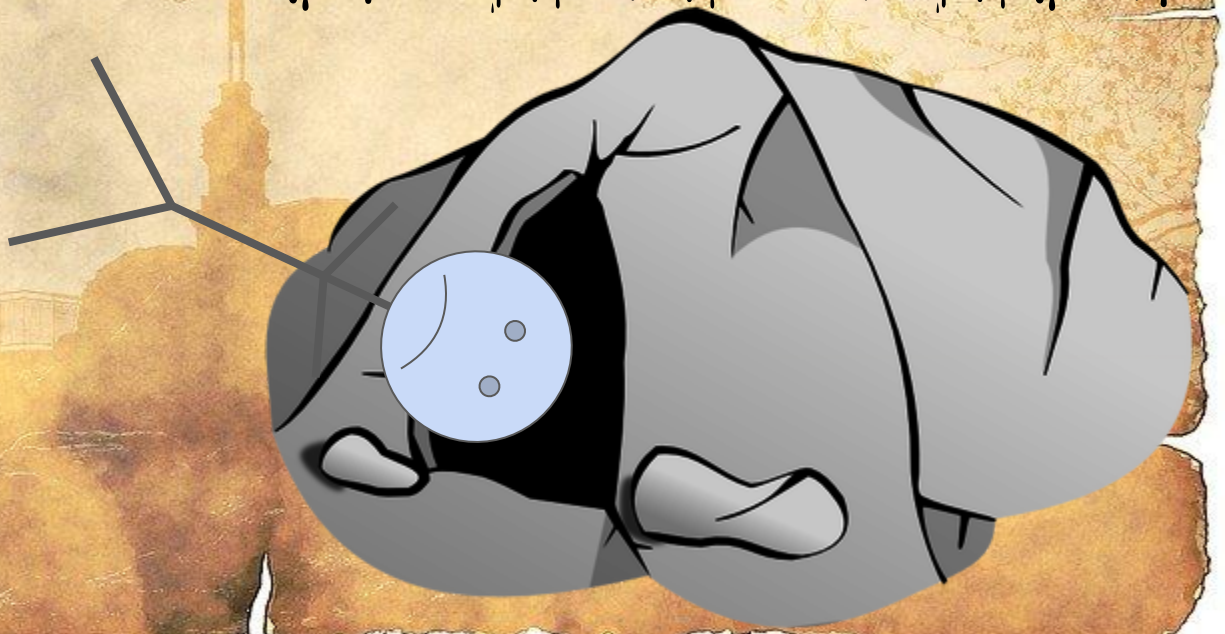
Task
T...
Task
Task
Paint
T...
R...e
Layout
Update...r Tree
Paint
R...
Raster
GPU
Chrome_ChildIOThread
Compositor

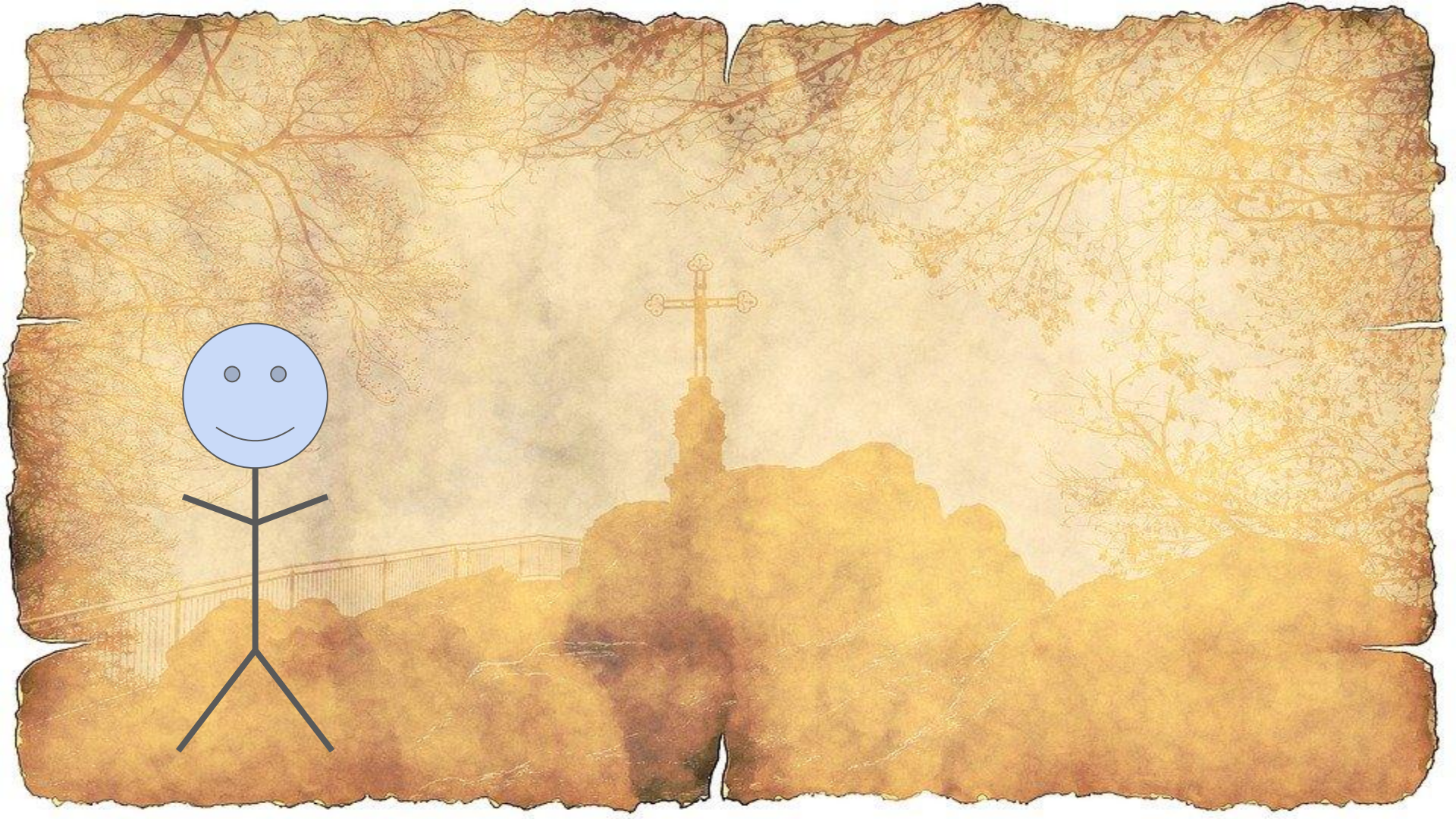


CAVE OF HTML RENDERING OPTIMISATION

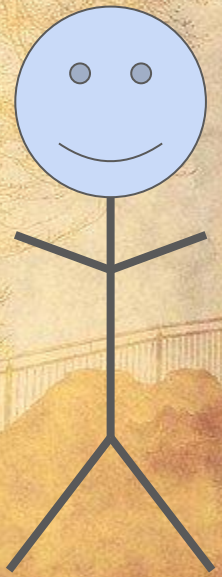


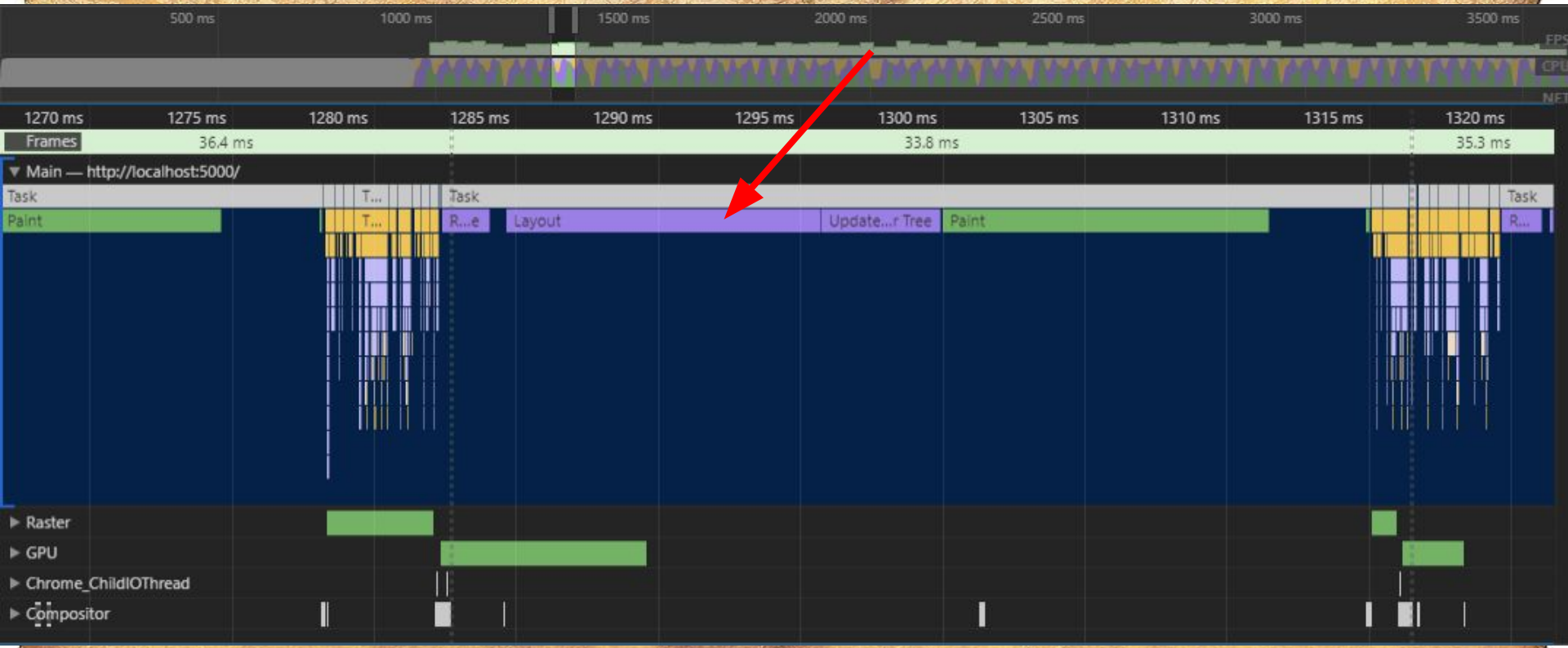
CAVE OF HTML RENDERING OPTIMISATION

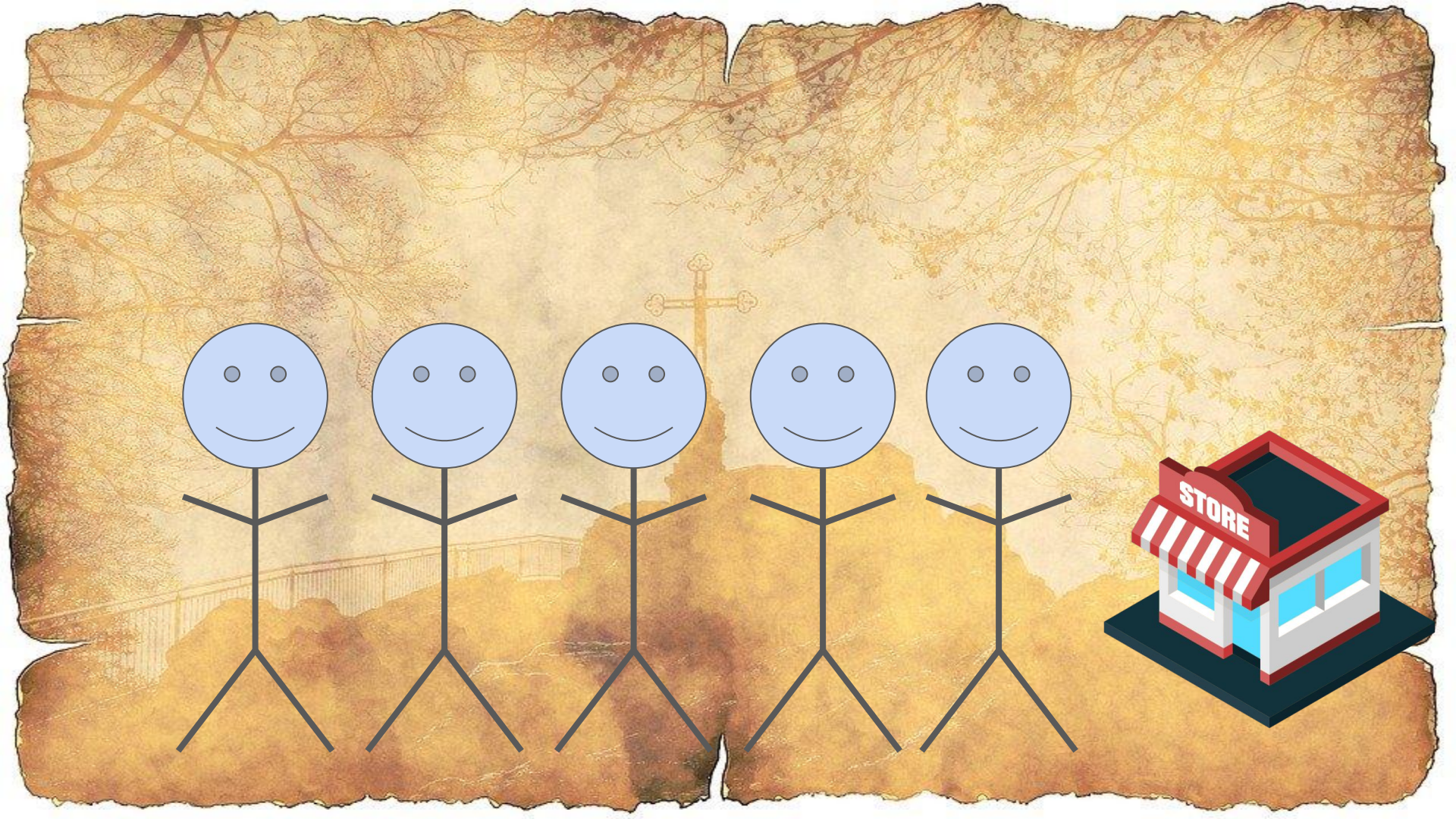


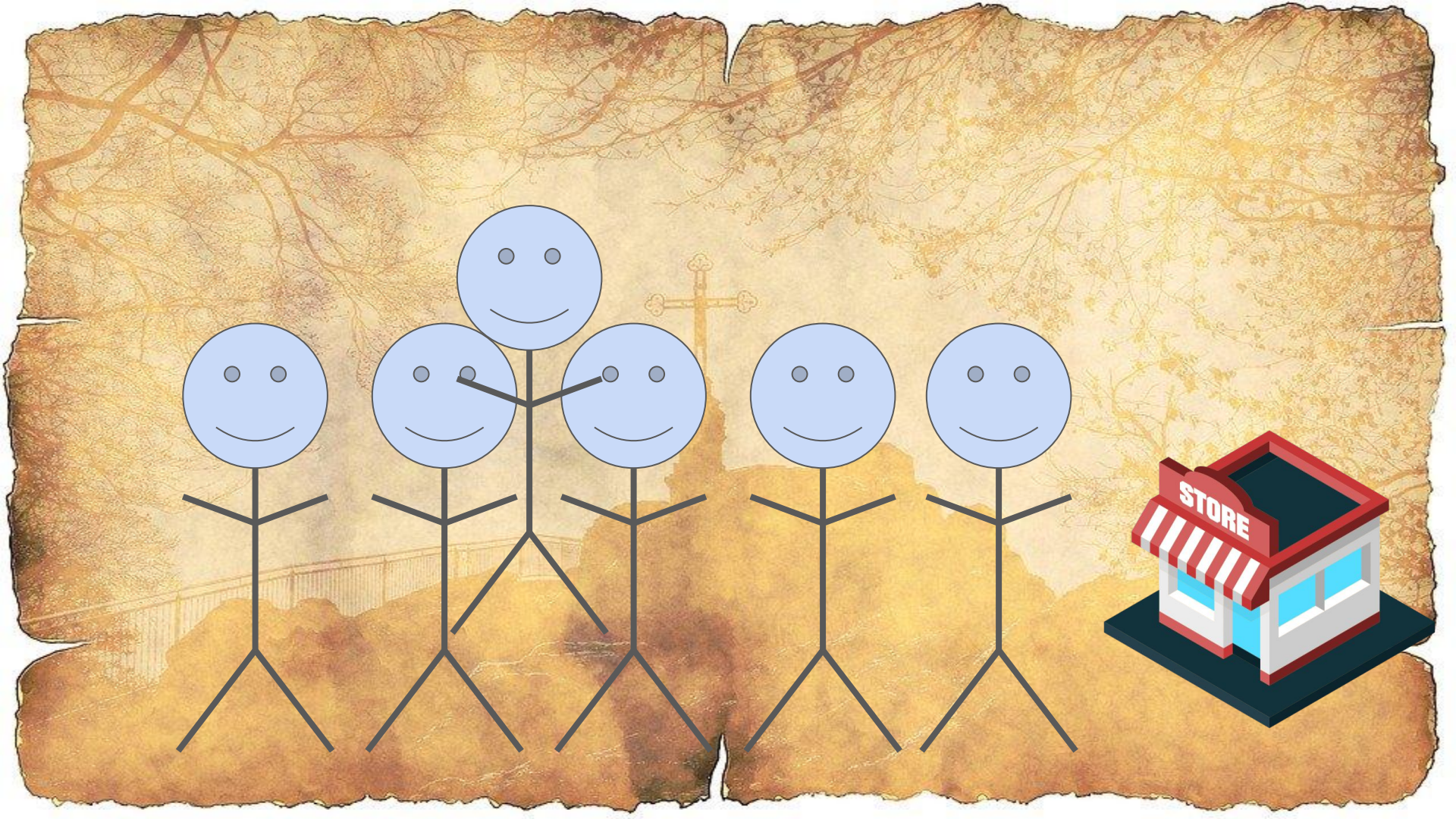


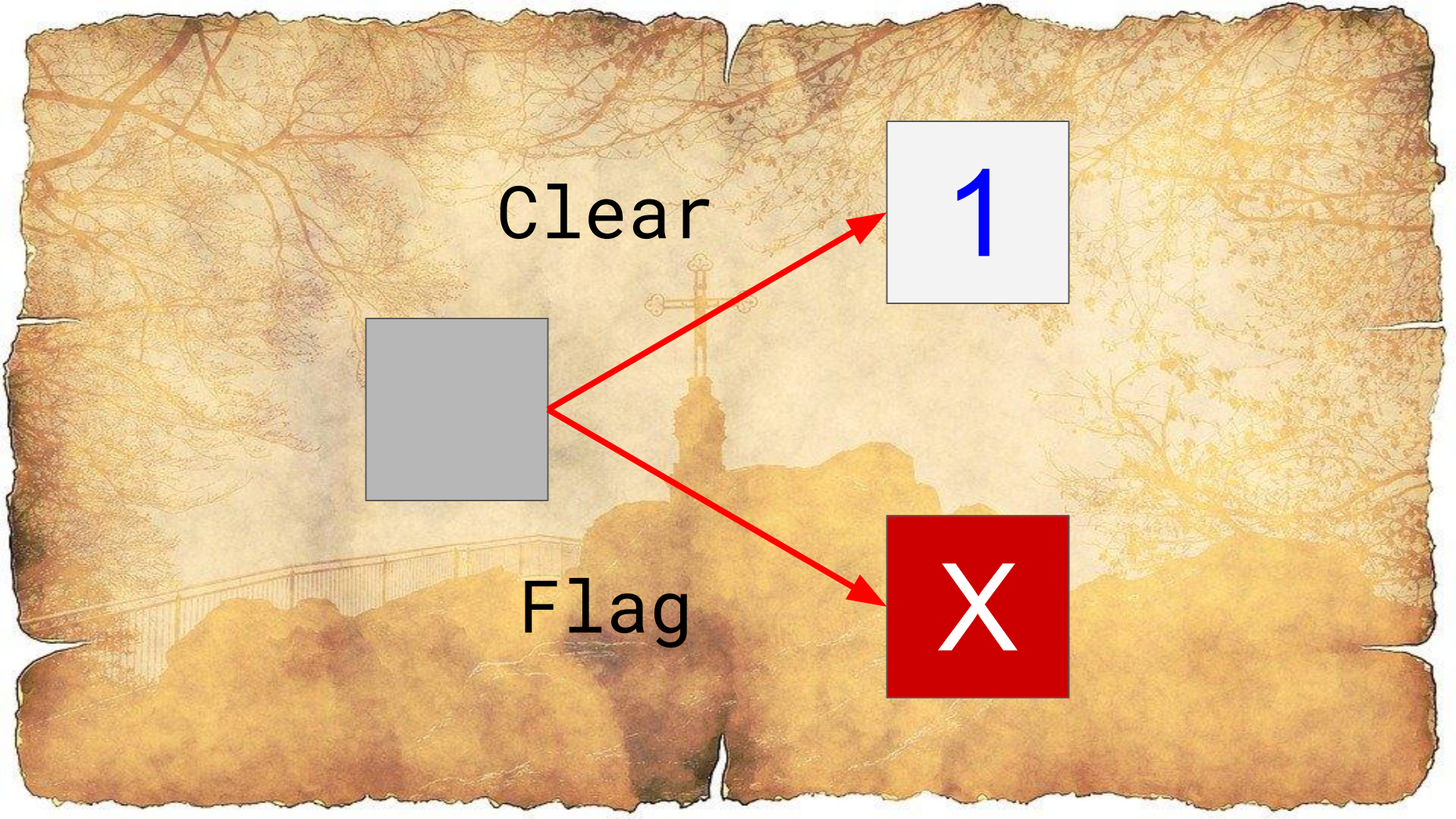
UNNECESSARY HTML LAYOUT

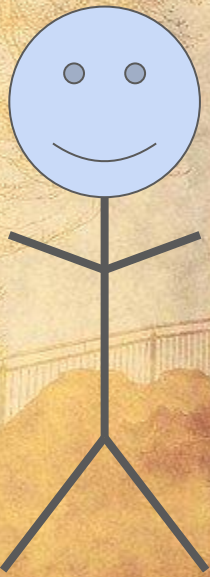



500 ms
1000 ms
1500 ms
2000 ms
2500 ms
3000 ms
3500 ms
FPS
CPU
NET
1270 ms
1275 ms
1280 ms
1285 ms
1290 ms
1295 ms
1300 ms
1305 ms
1310 ms
1315 ms
1320 ms
Frames
36.4 ms
33.8 ms
35.3 ms
Main — http://localhost:5000/
Task
T...
Task
Task
Paint
T...
R...e
Layout
Update...r Tree
Paint
R...
Raster
GPU
Chrome_ChildIOThread
Compositor


STORE


STORE


Clear
1
Flag
X

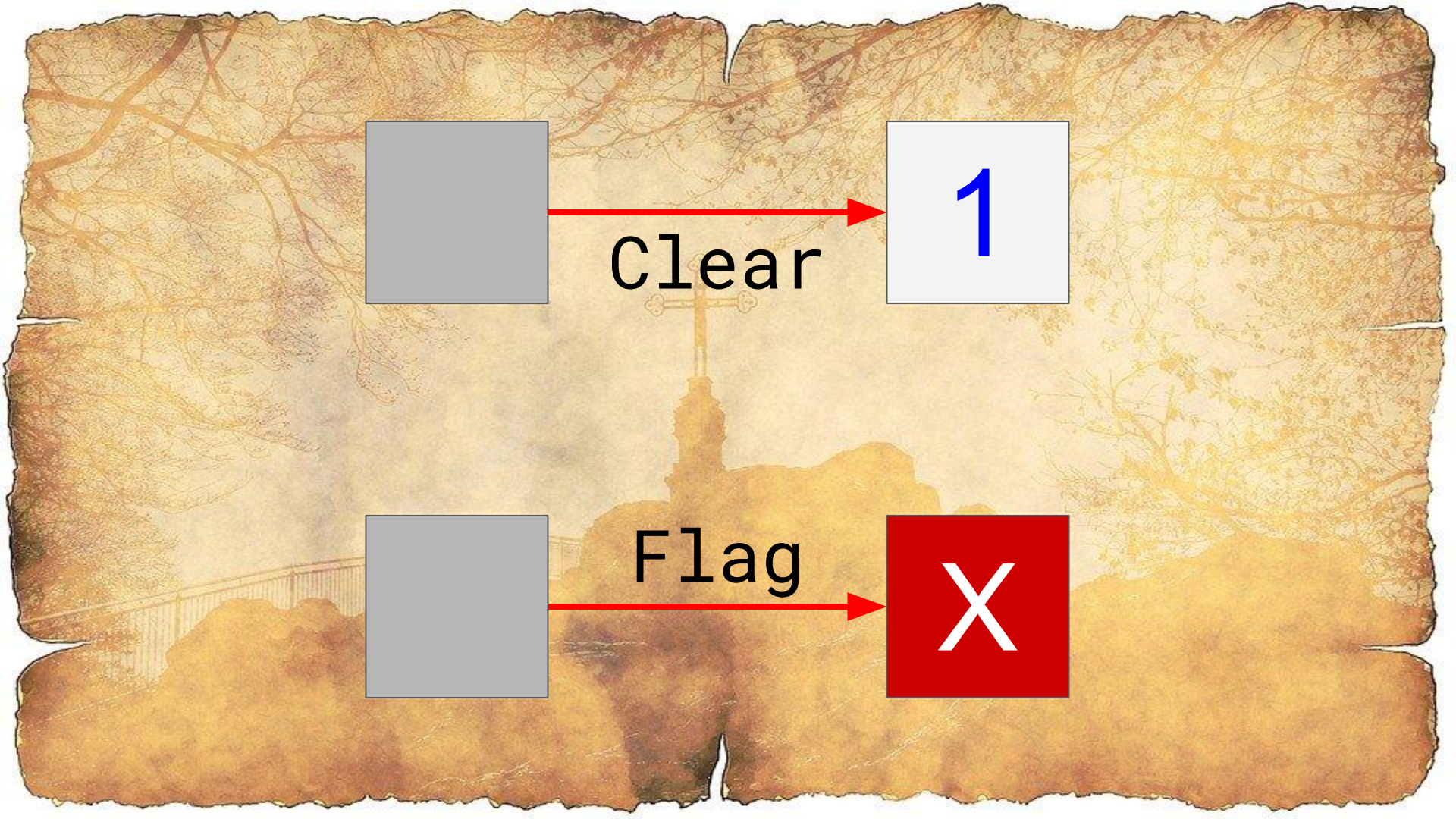


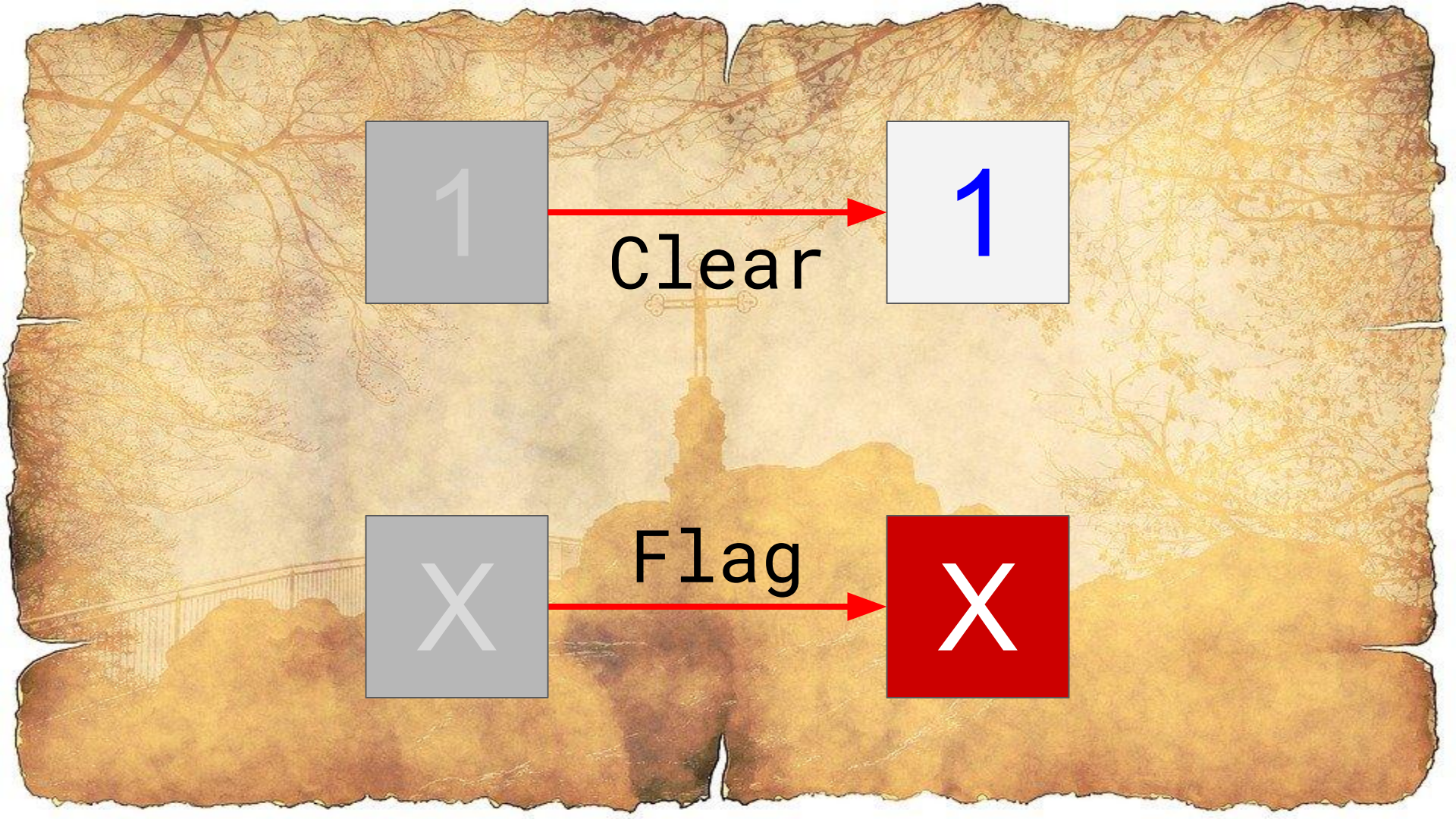
Triggering Layout And Paint

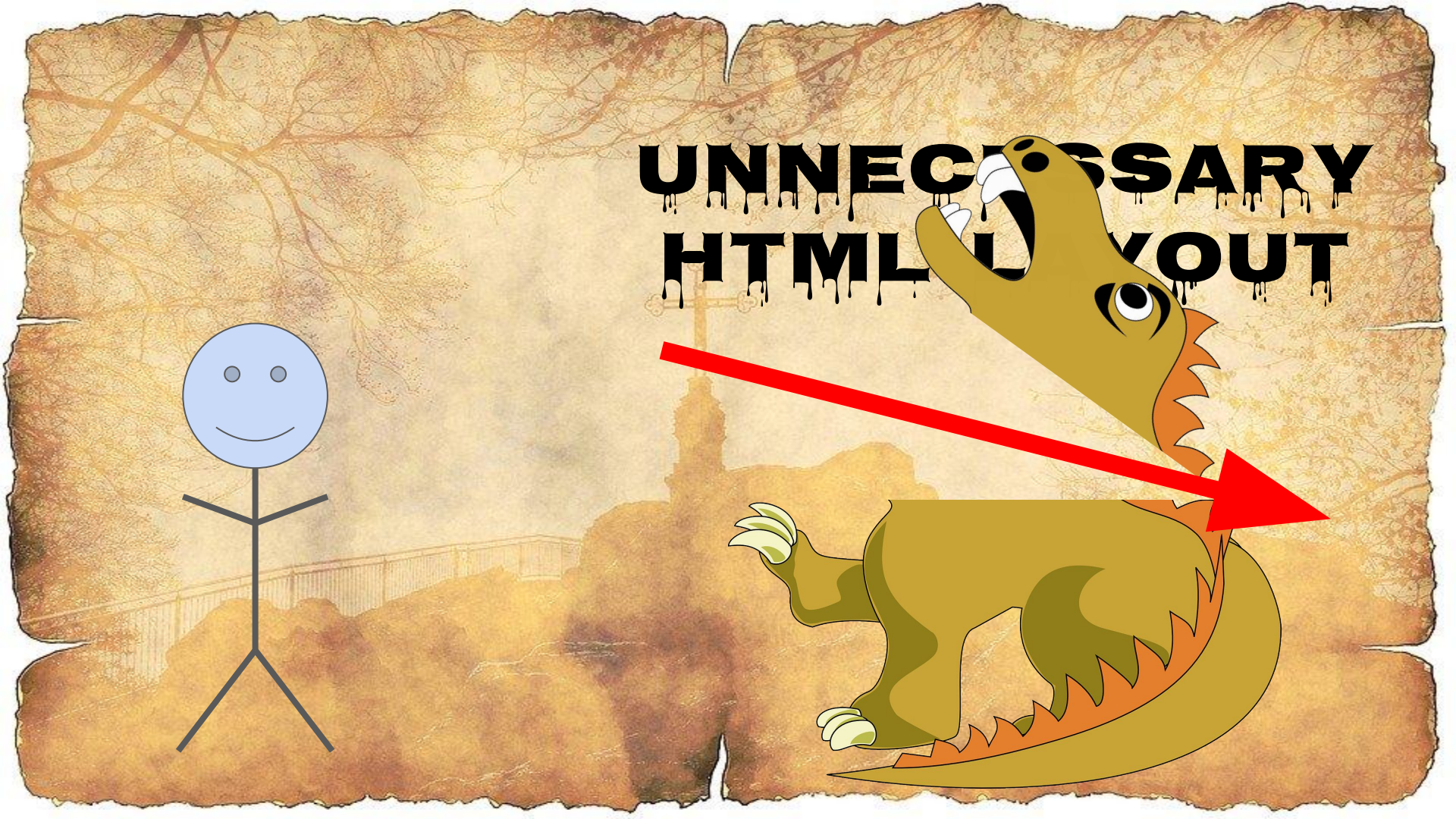
If you trigger layout, you will *always trigger paint*, since changing the geometry of any element means its pixels need fixing!

You can also trigger paint if you change non-geometric properties, like backgrounds, text color, or shadows. In those cases layout won't be needed and the pipeline will look like this:

You can also trigger paint if you change non-geometric properties, like backgrounds, text color, or shadows. In those cases layout won't be needed and the pipeline will look like this:

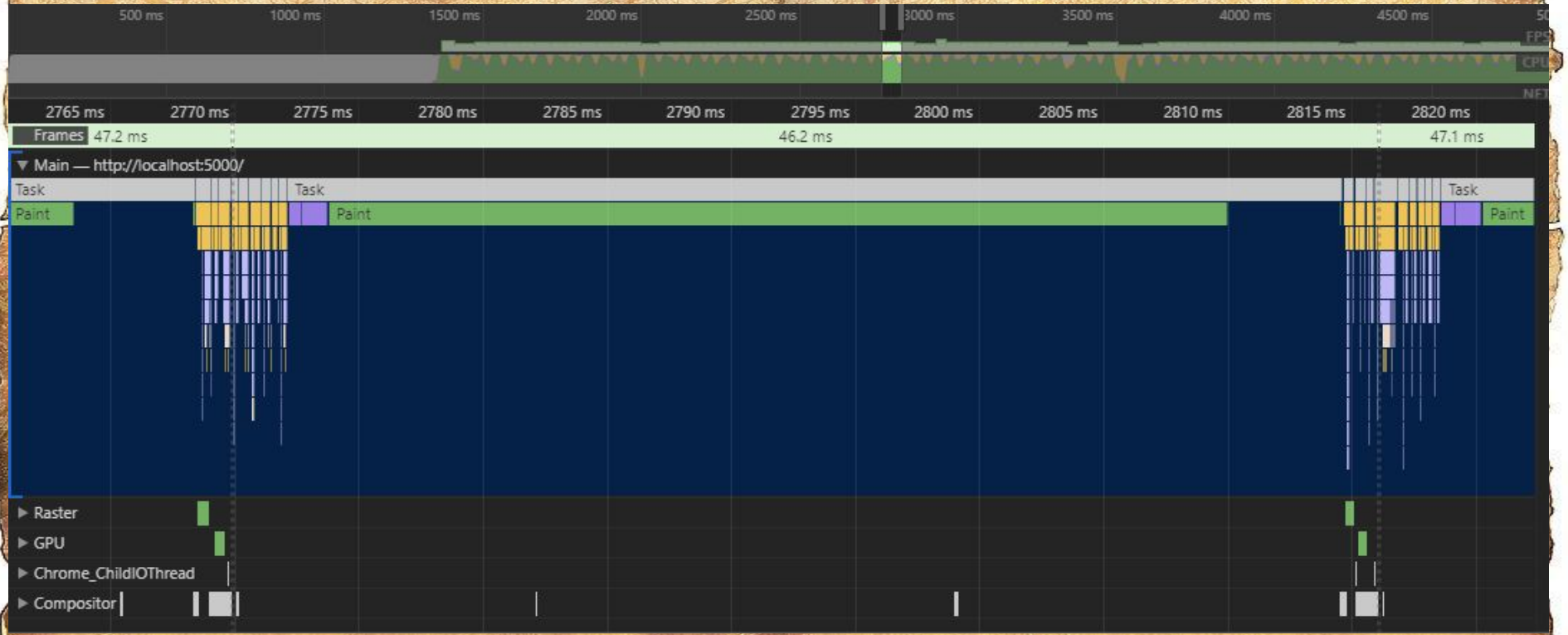

Clear
1
Flag
X

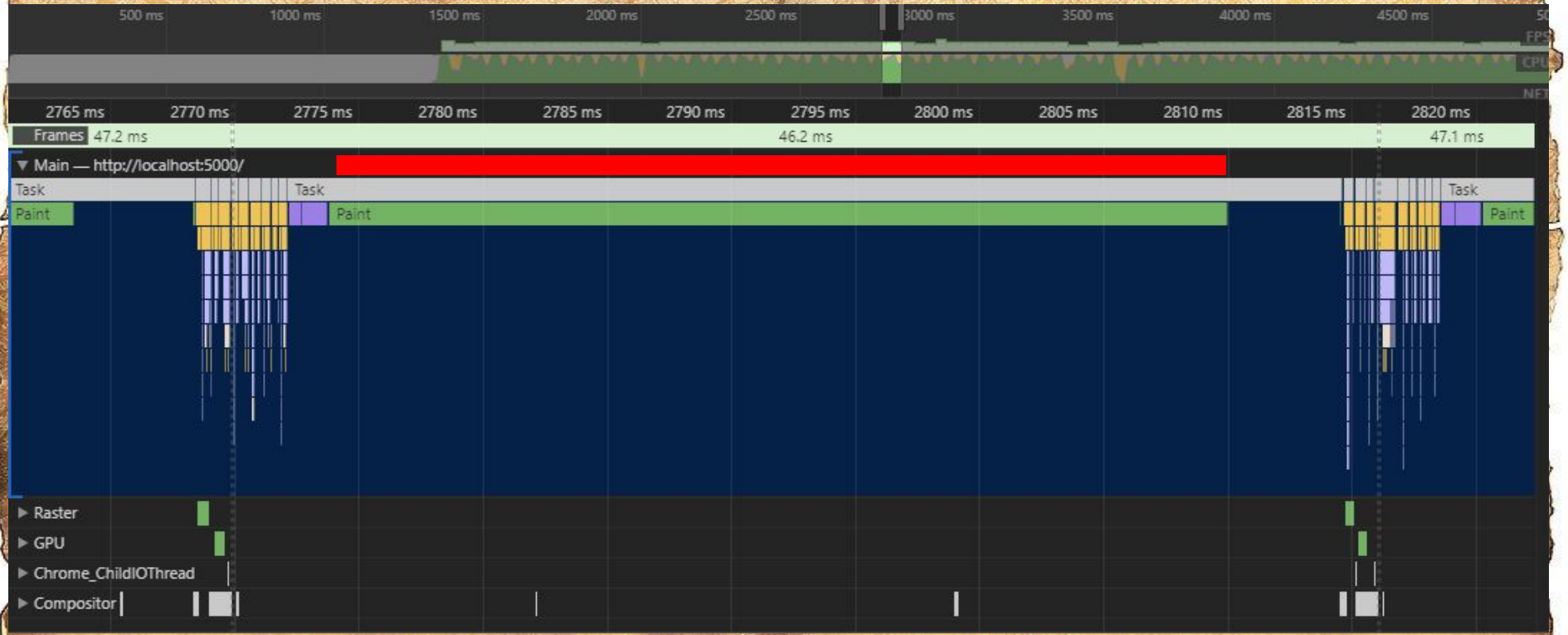

1
Clear
1
X
Flag
X

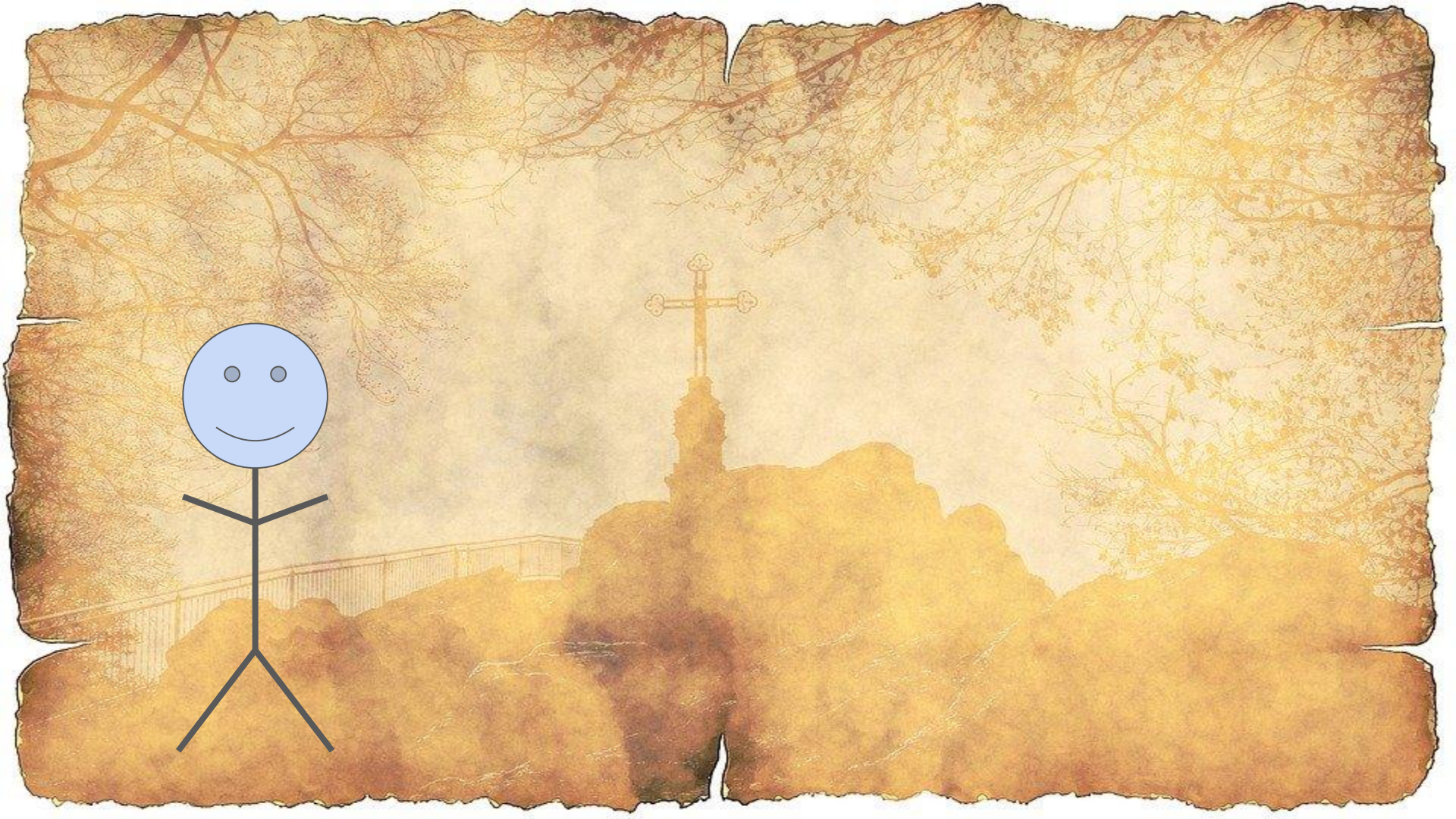

UNNECESSARY
HTML LAYOUT

Results

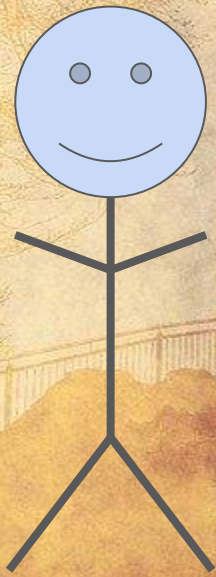
36.5 fps!

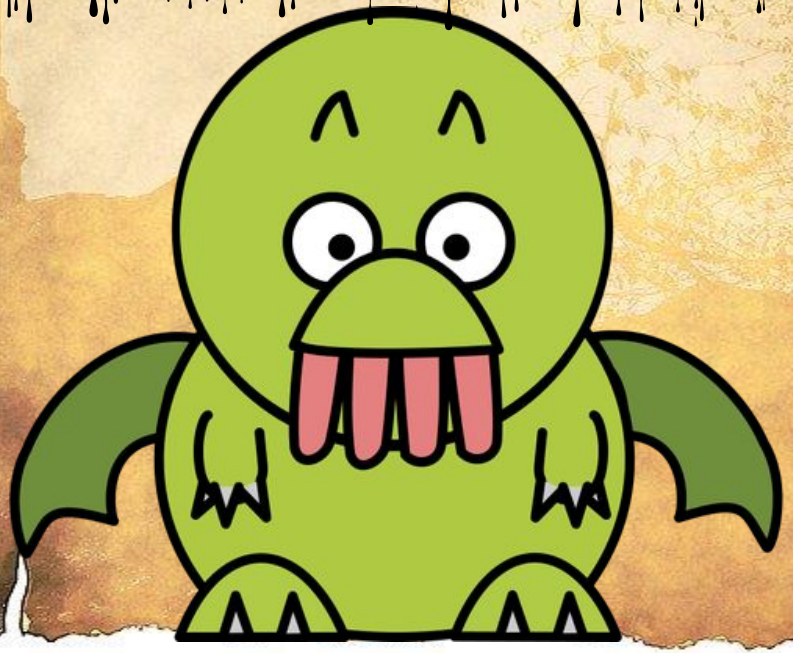

500 ms
1000 ms
1500 ms
2000 ms
2500 ms
3000 ms
3500 ms
4000 ms
4500 ms
FPS
CPU
NET
2765 ms
2770 ms
2775 ms
2780 ms
2785 ms
2790 ms
2795 ms
2800 ms
2805 ms
2810 ms
2815 ms
2820 ms
Frames
47.2 ms
46.2 ms
47.1 ms
Main — http://localhost:5000/
Task
Task
Task
Paint
Paint
Paint
Raster
GPU
Chrome_ChildIOThread
Compositor

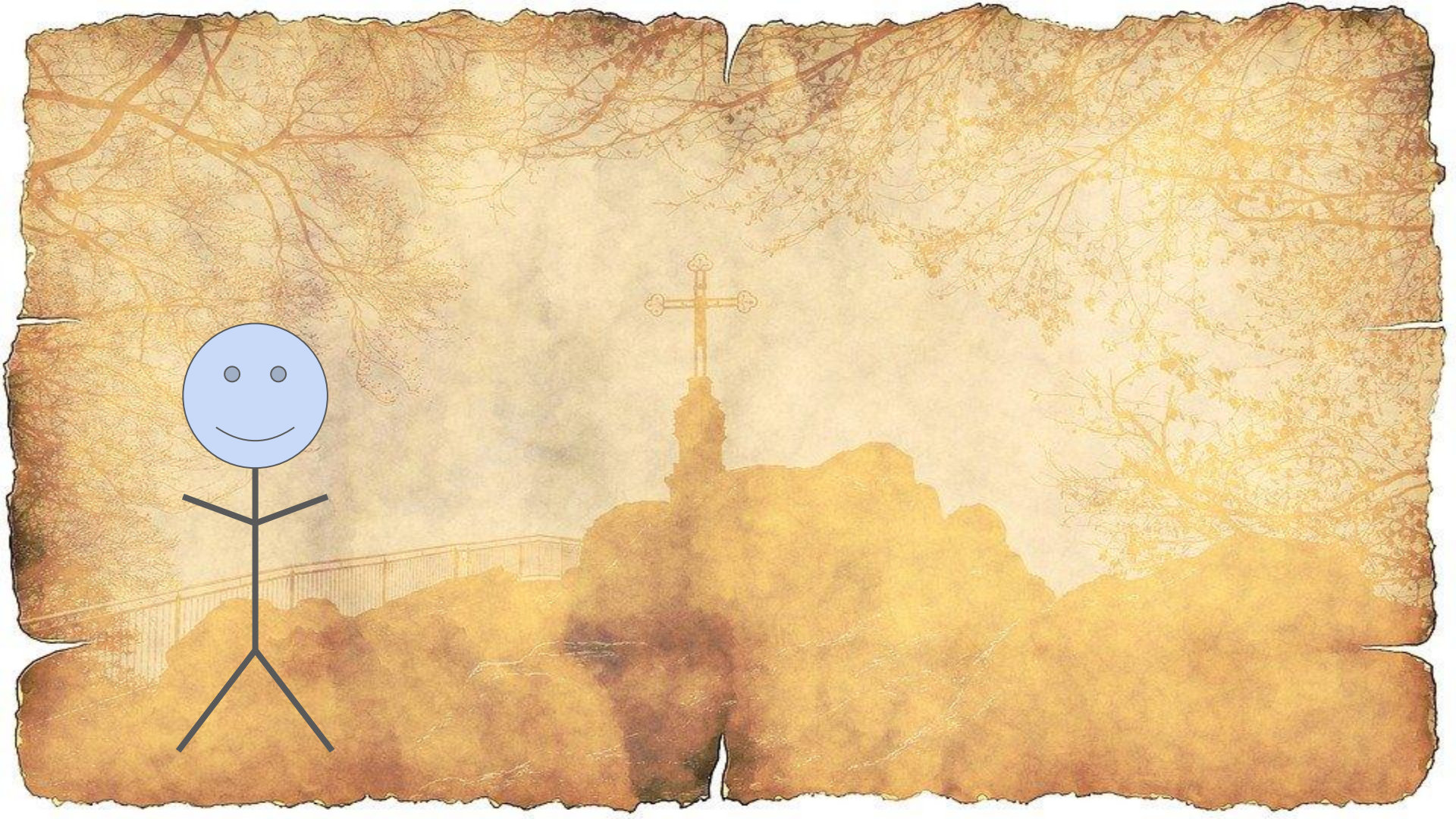

500 ms
1000 ms
1500 ms
2000 ms
2500 ms
3000 ms
3500 ms
4000 ms
4500 ms
FPS
CPU
NET
2765 ms
2770 ms
2775 ms
2780 ms
2785 ms
2790 ms
2795 ms
2800 ms
2805 ms
2810 ms
2815 ms
2820 ms
Frames
47.2 ms
46.2 ms
47.1 ms
Main — http://localhost:5000/
Task
Task
Task
Paint
Paint
Paint
Raster
GPU
Chrome_ChildIOThread
Compositor



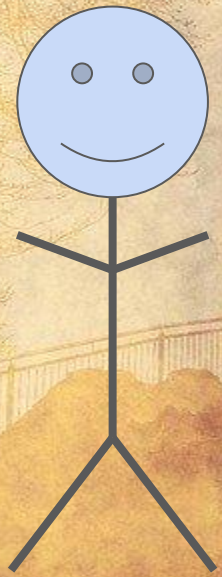
UNNECESSARY PAINT COMPLEXITY





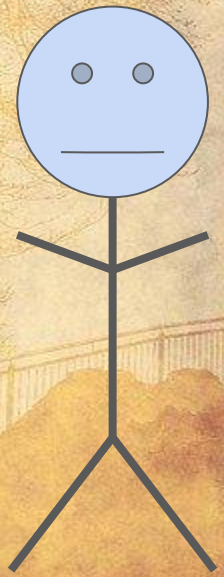


800 * 800 PX



800 * 800 PX

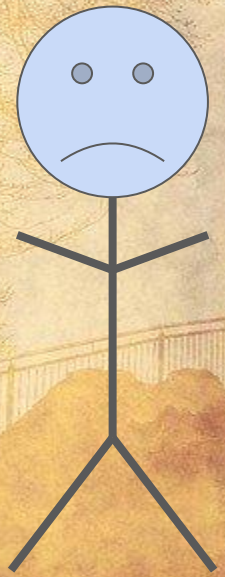
60X PER SEC



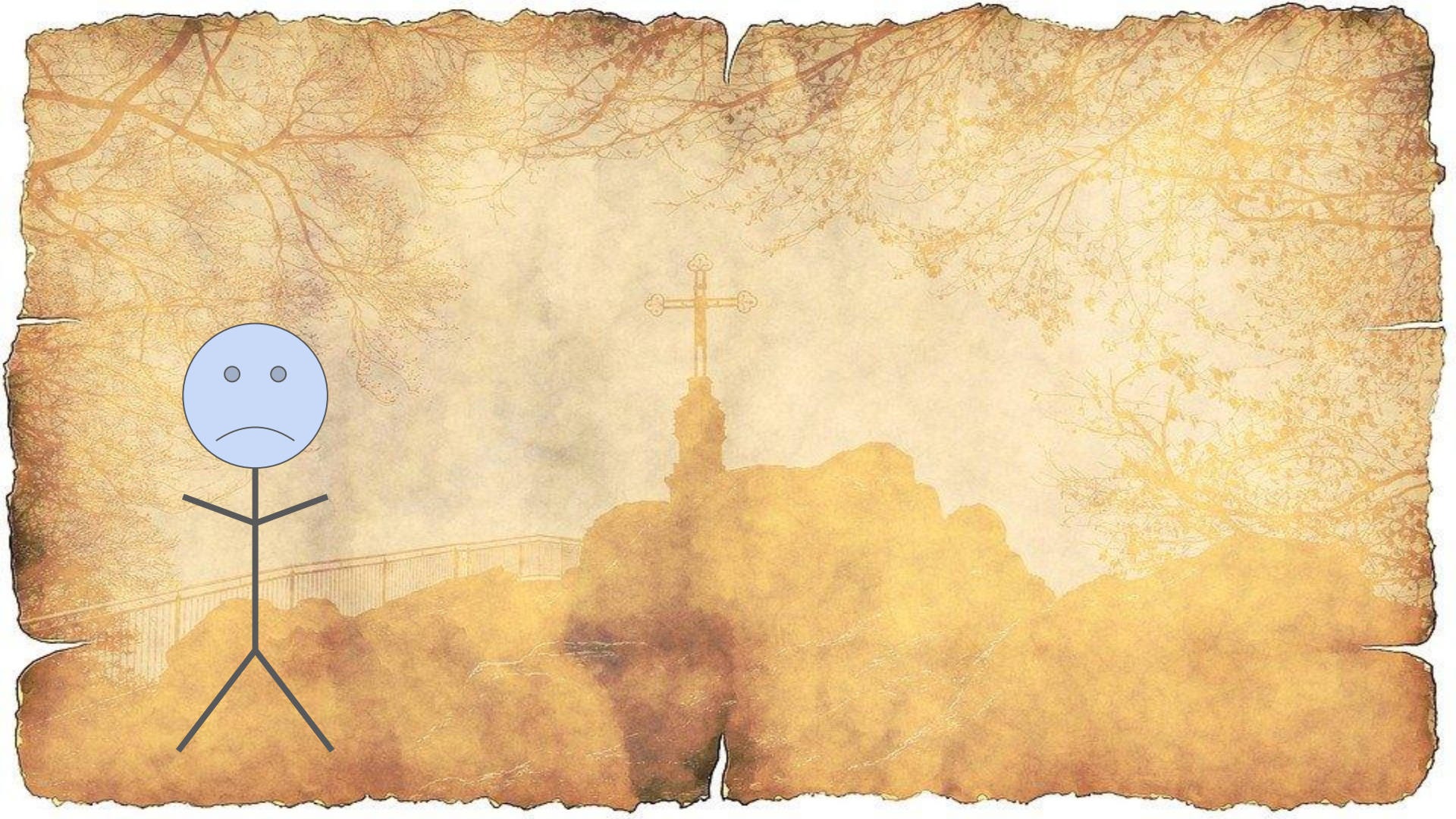
800 * 800 PX

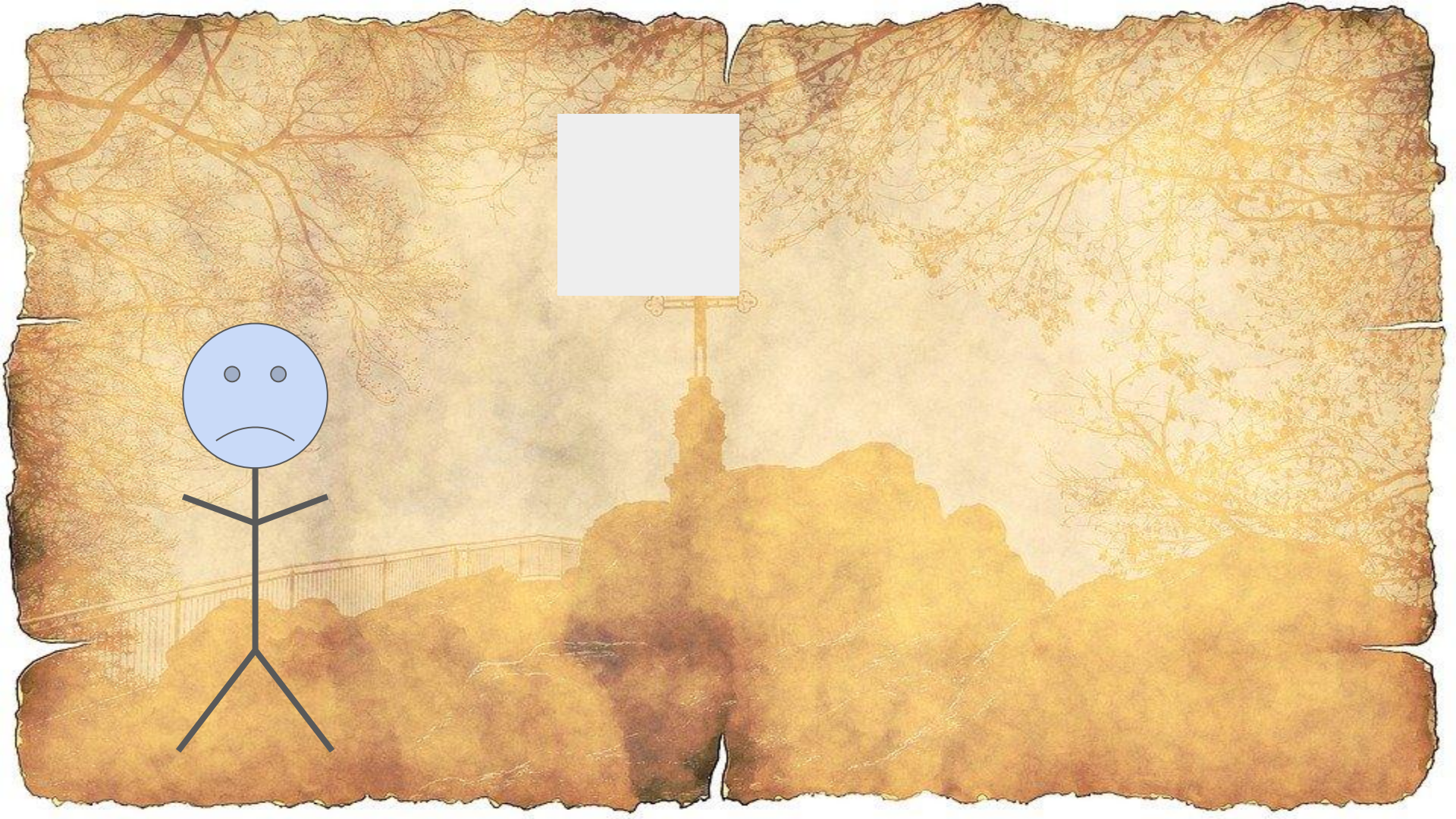
60X PER SEC

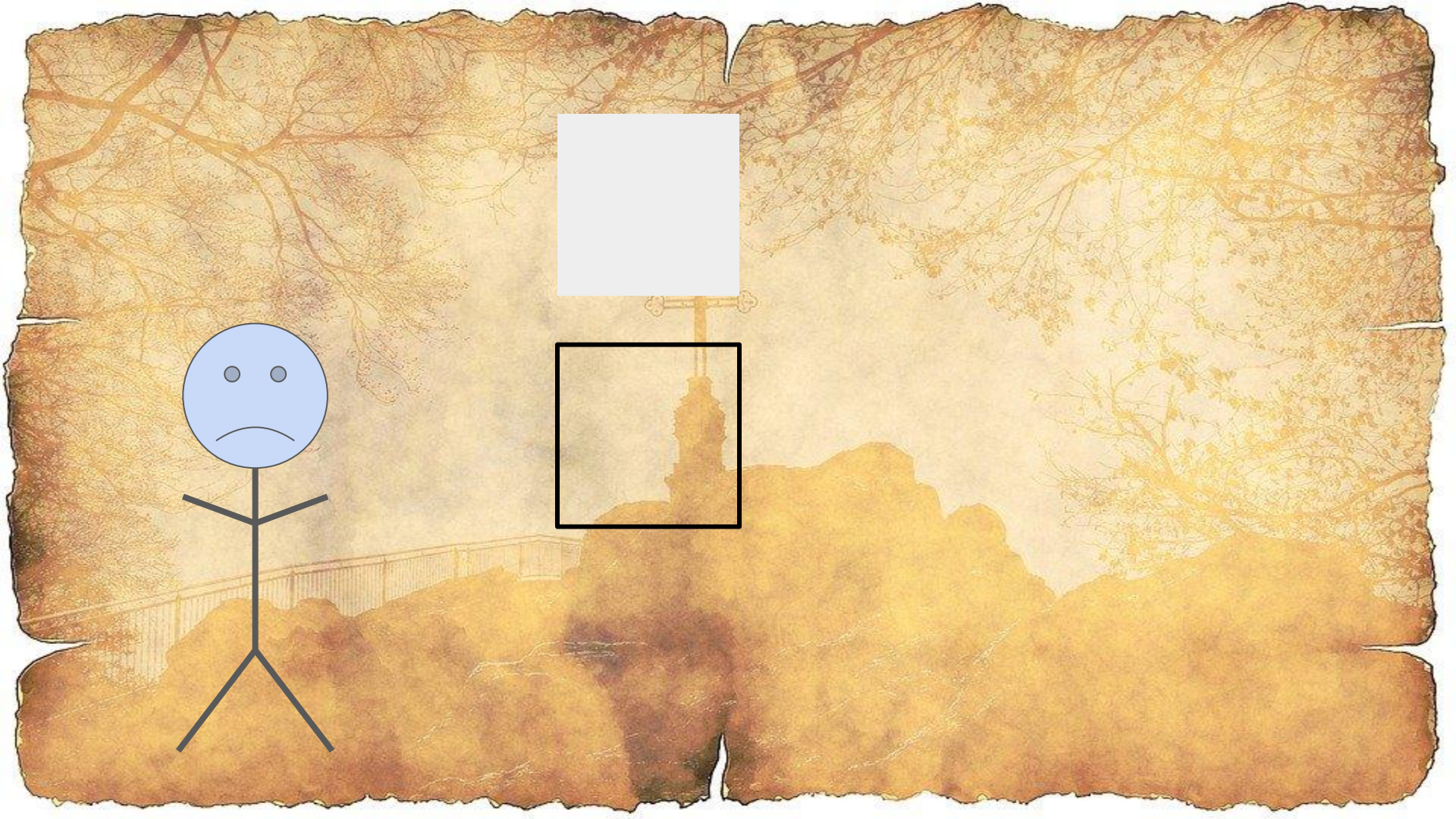
30,000 STEPS

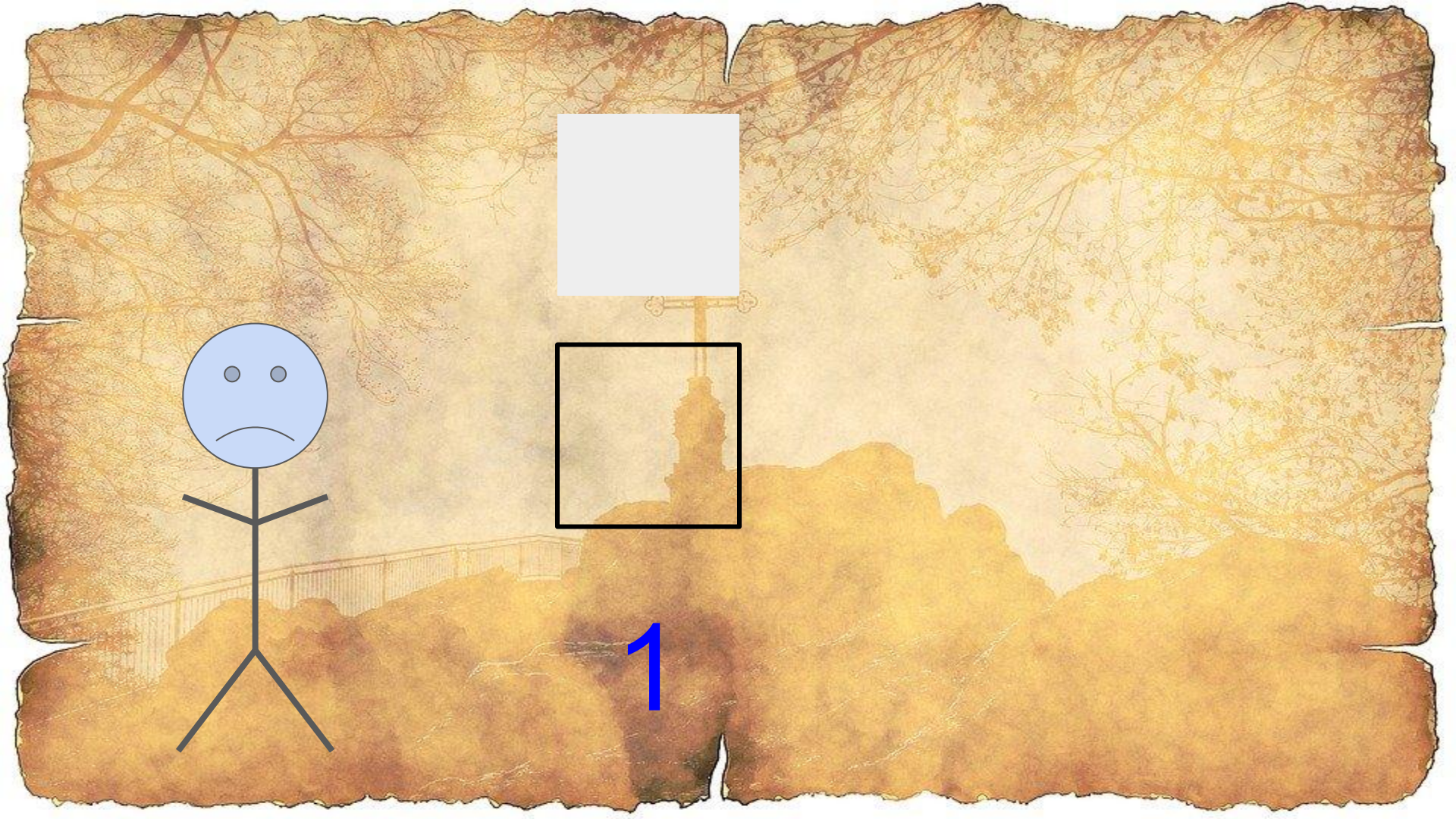


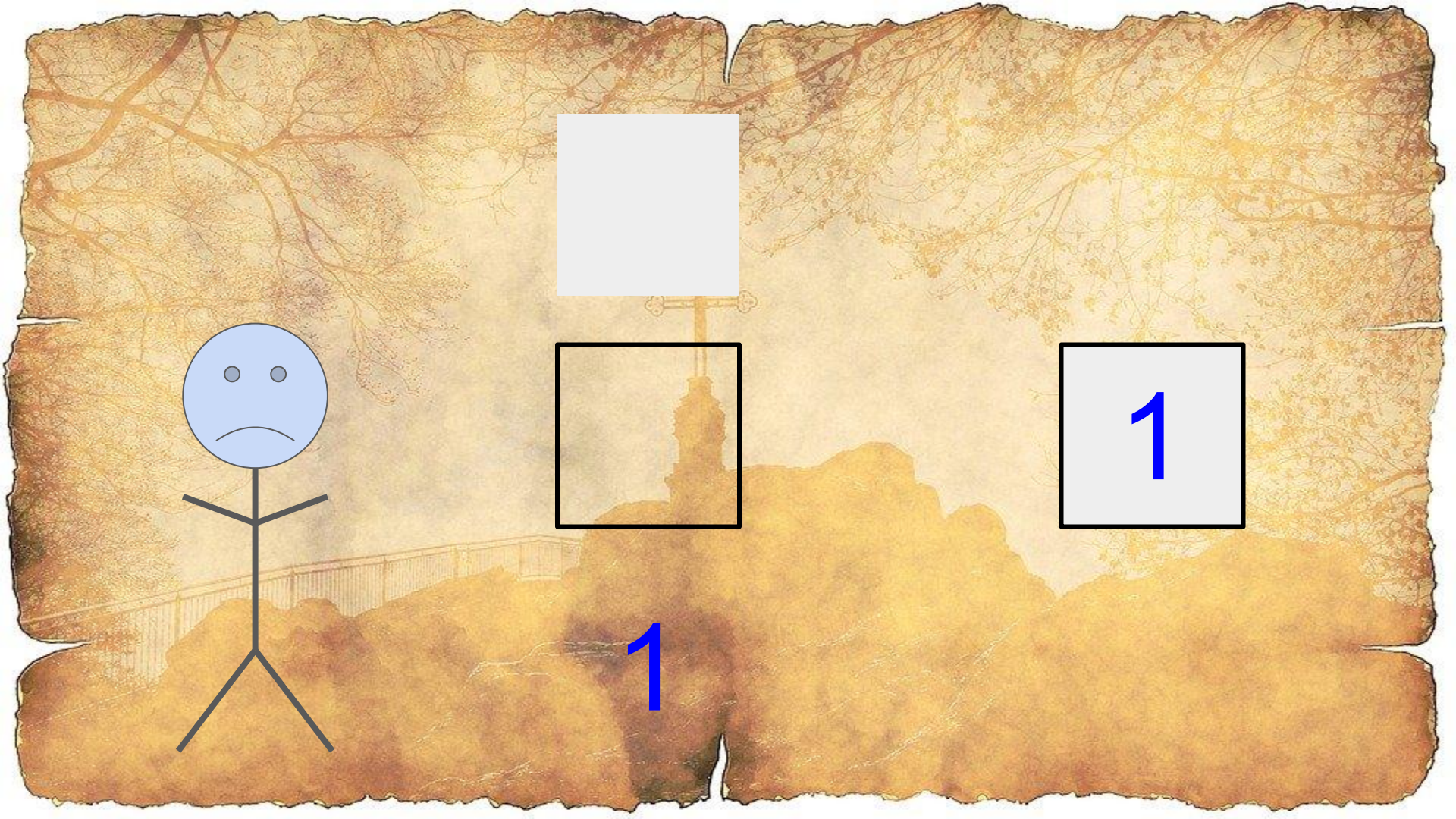
1. Do art
2. ...
3. profit!

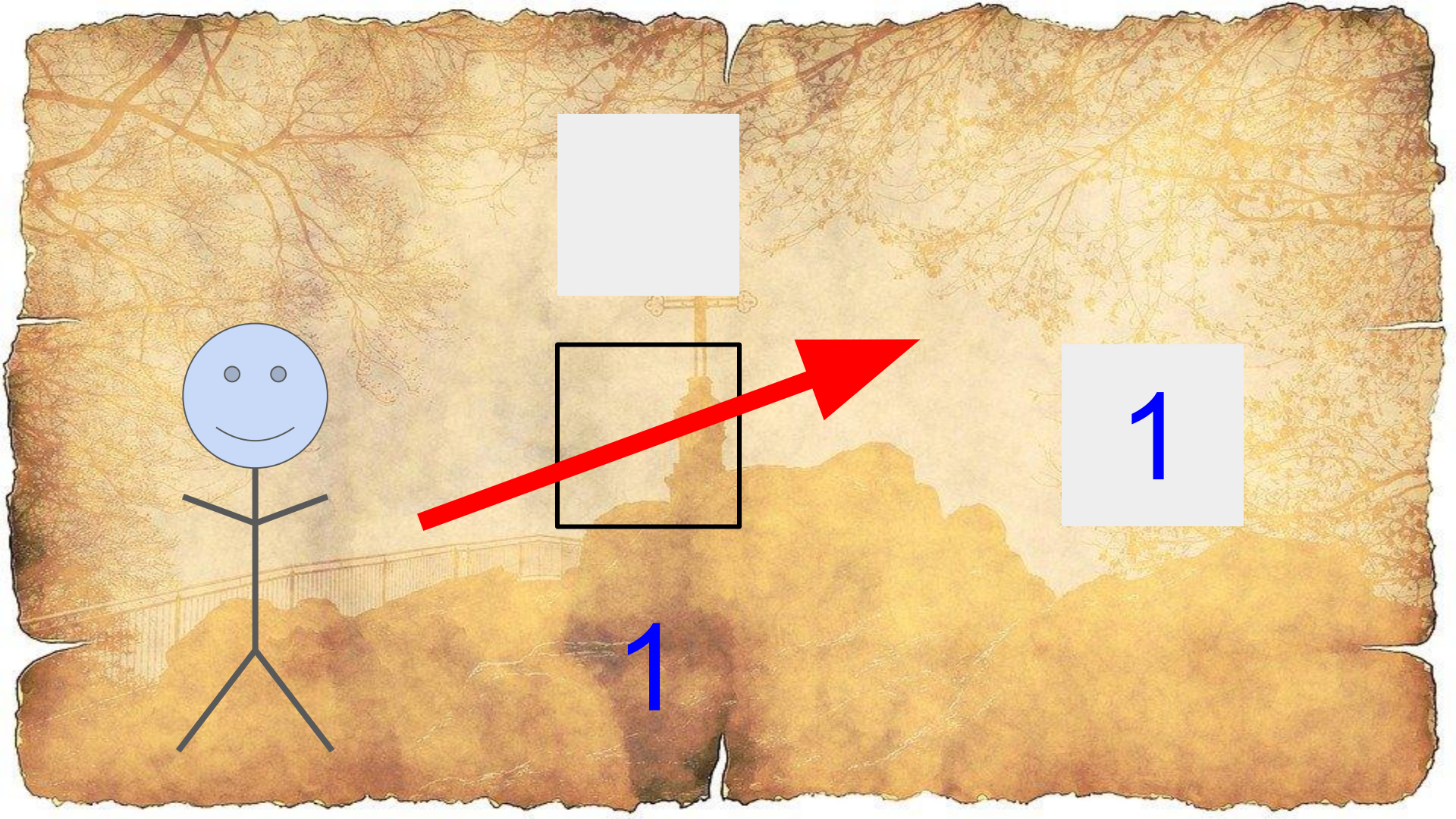




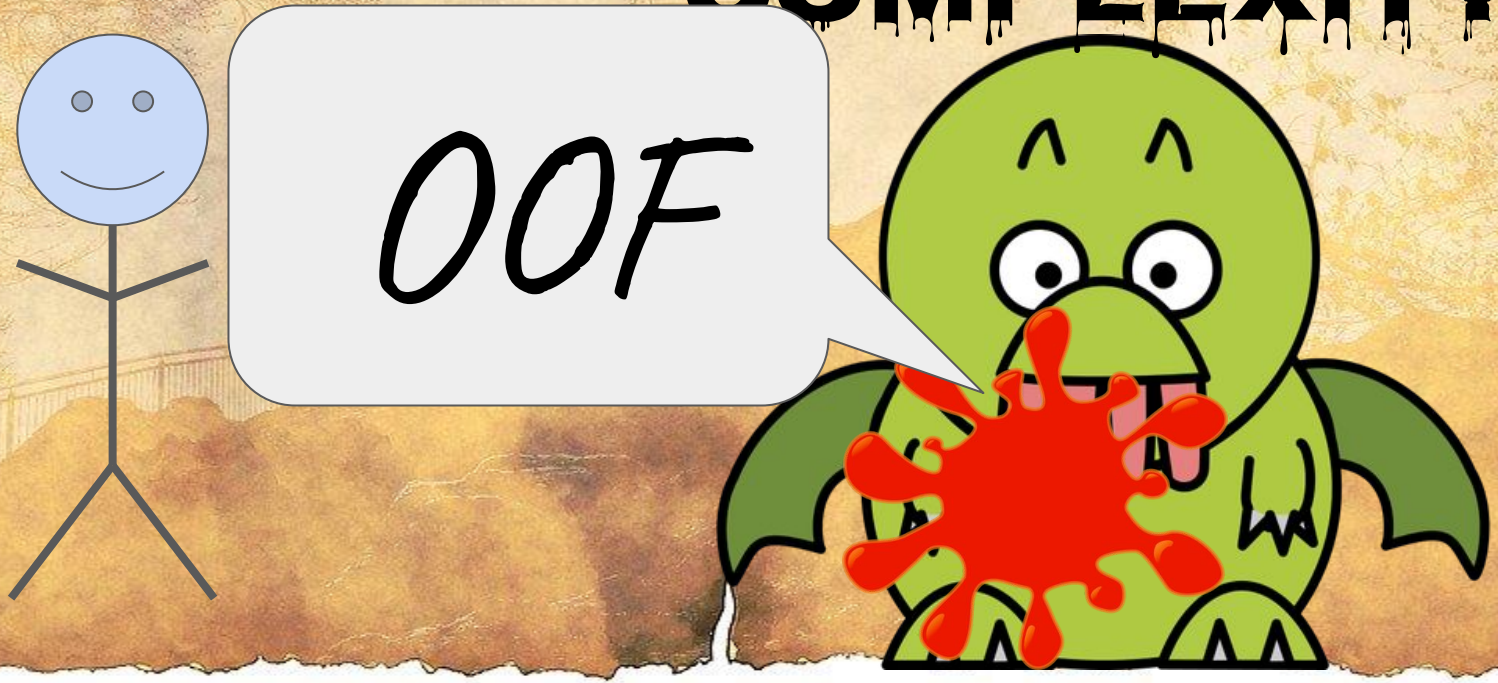



1


1
1

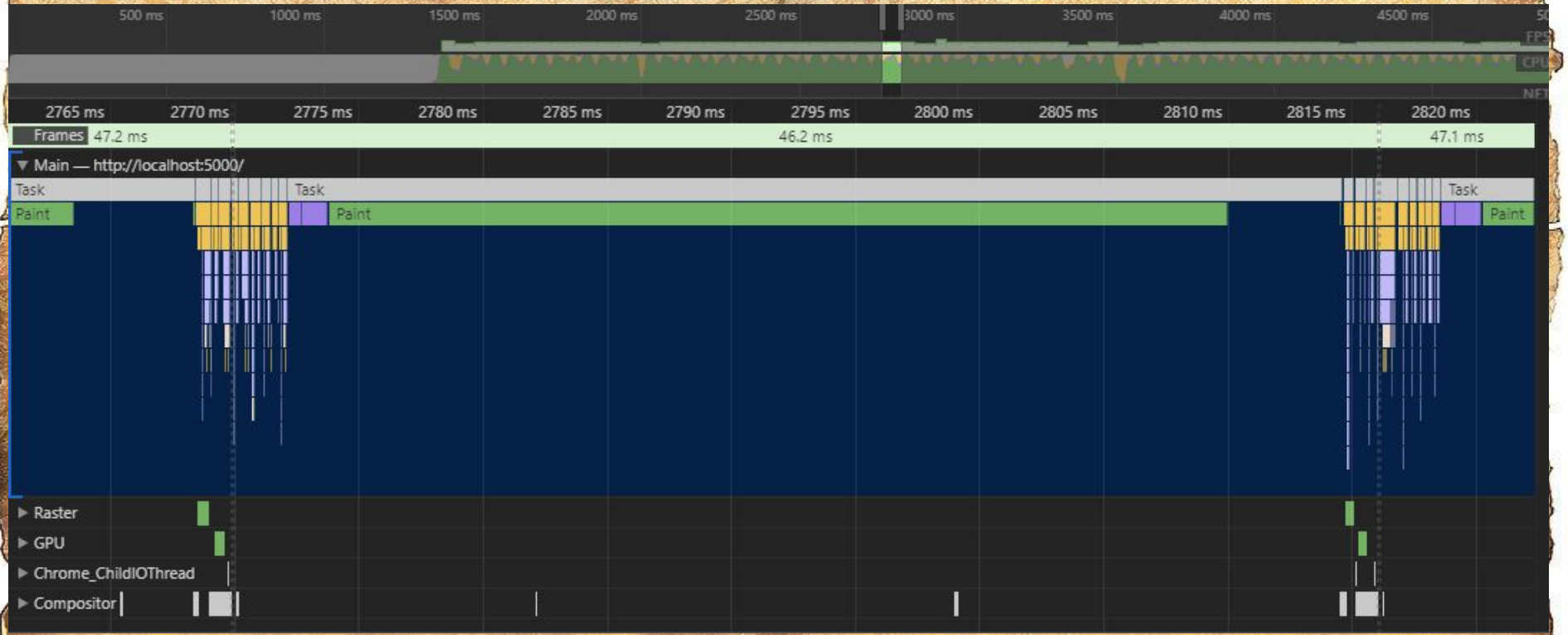

1
1

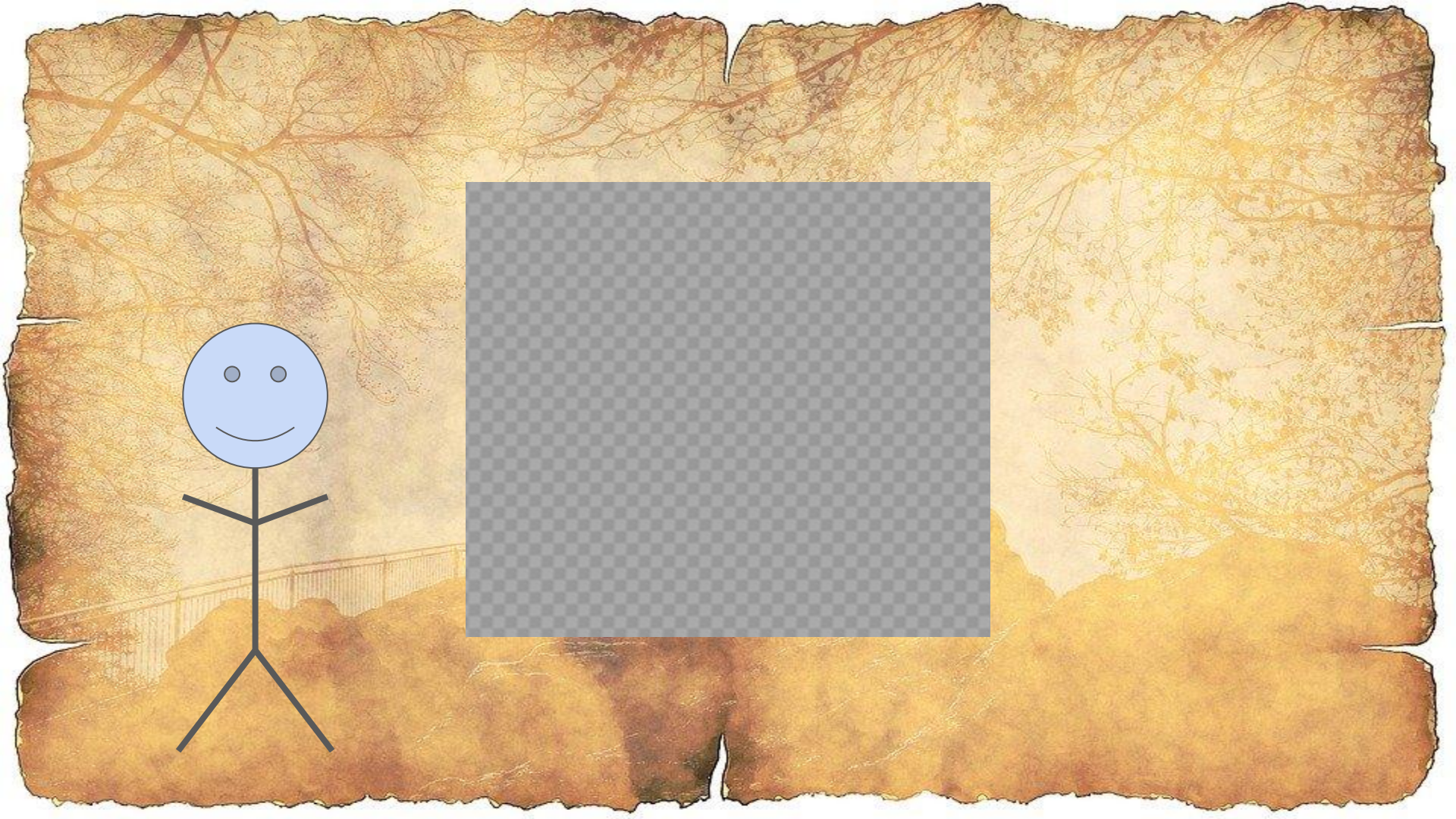
UNNECESSARY PAINT COMPLEXITY

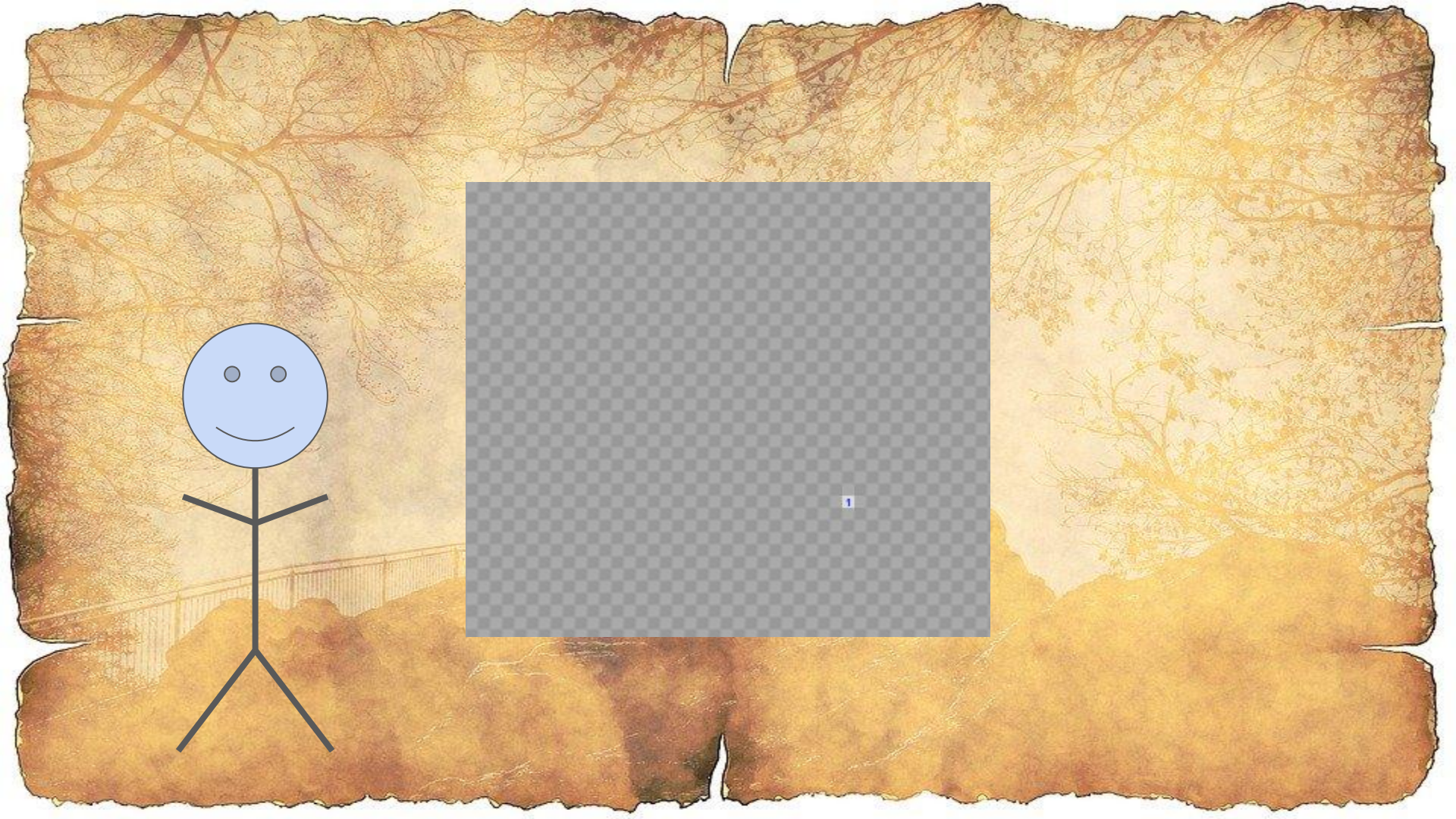


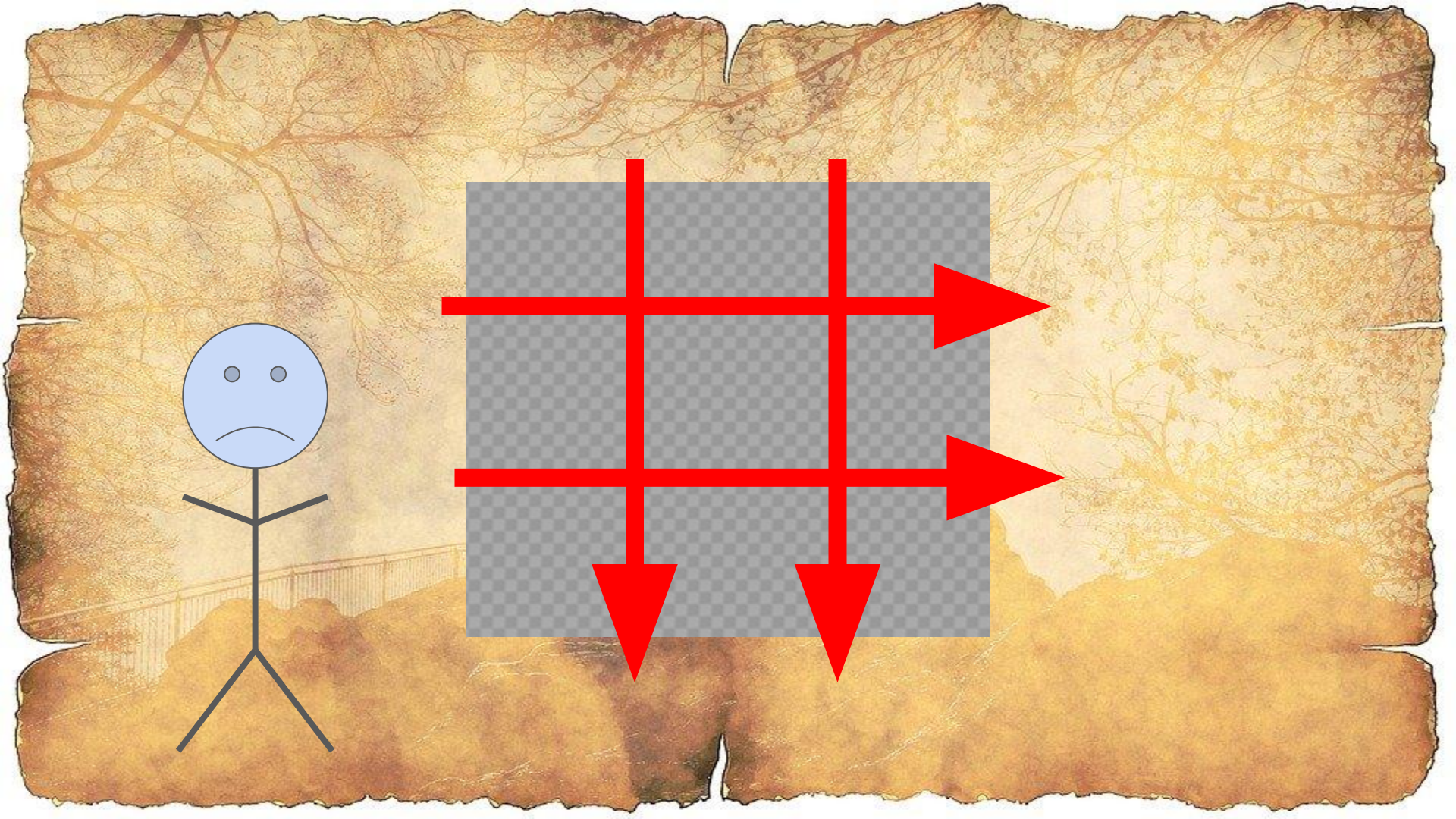
Results

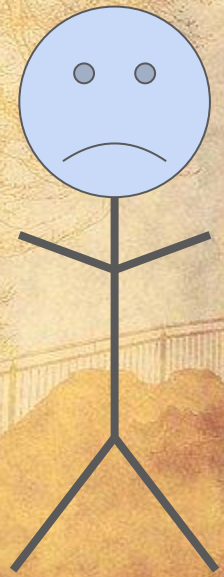
50.1 fps!

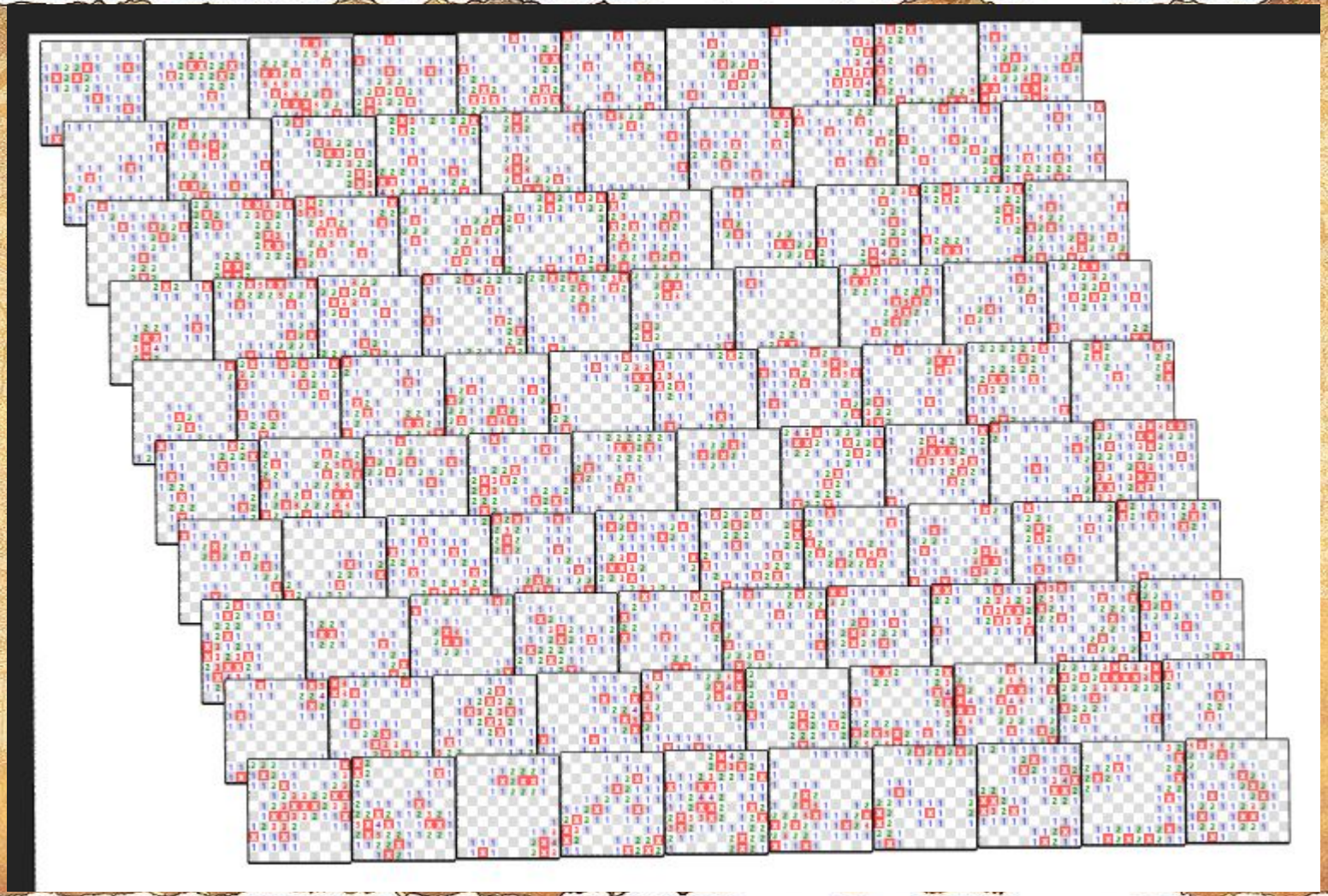

500 ms
1000 ms
1500 ms
2000 ms
2500 ms
3000 ms
3500 ms
4000 ms
4500 ms
FPS
CPU
NET
2765 ms
2770 ms
2775 ms
2780 ms
2785 ms
2790 ms
2795 ms
2800 ms
2805 ms
2810 ms
2815 ms
2820 ms
Frames
47.2 ms
46.2 ms
47.1 ms
Main — http://localhost:5000/
Task
Task
Task
Paint
Paint
Paint
Raster
GPU
Chrome_ChildIOThread
Compositor



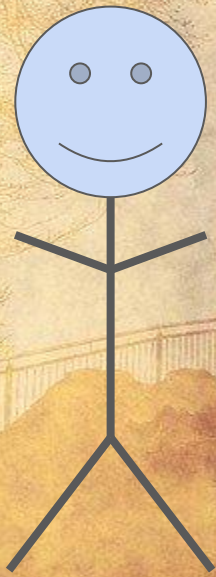


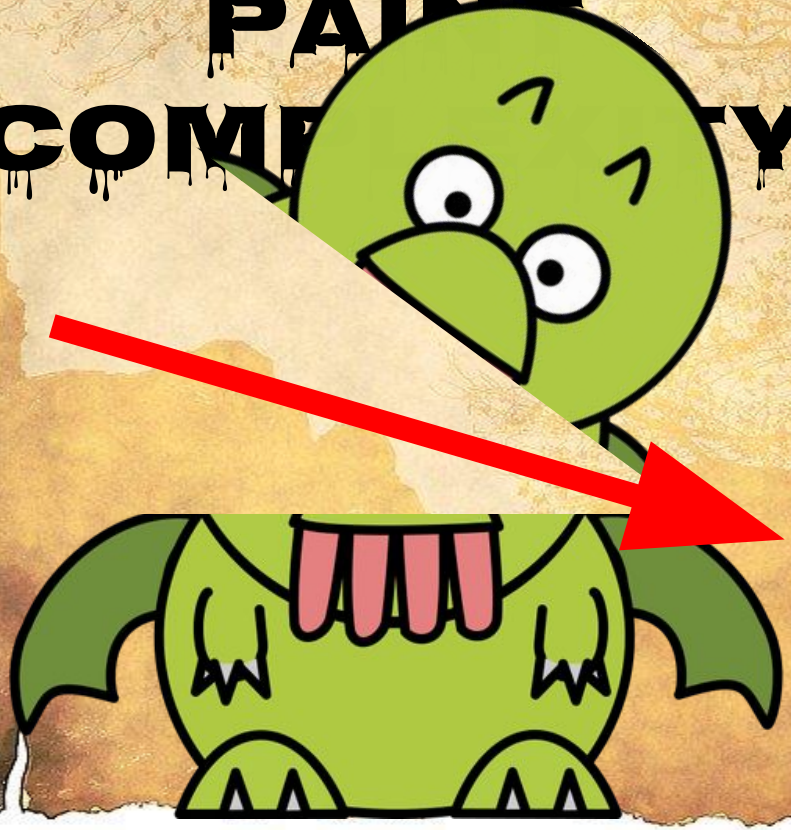




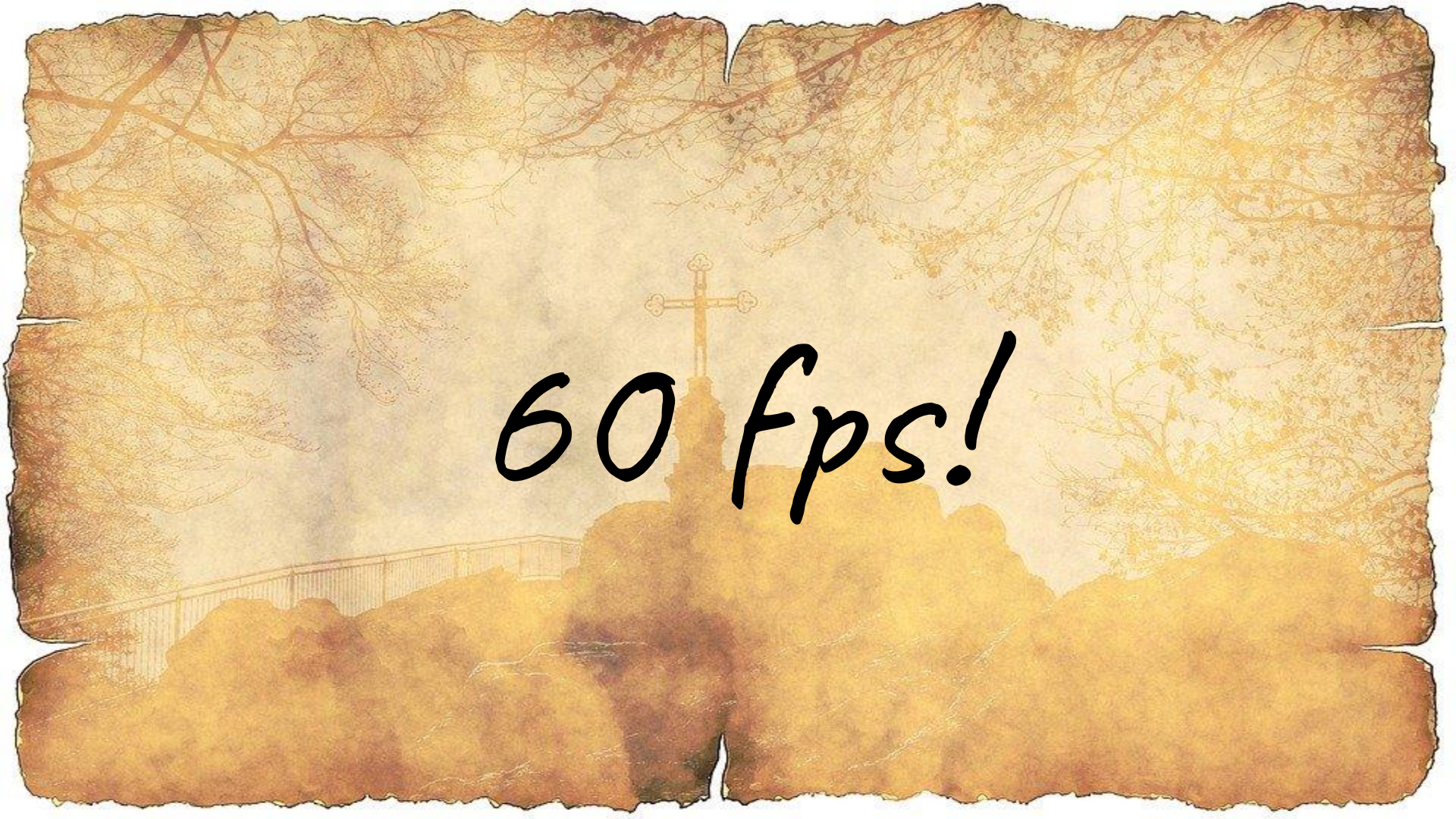


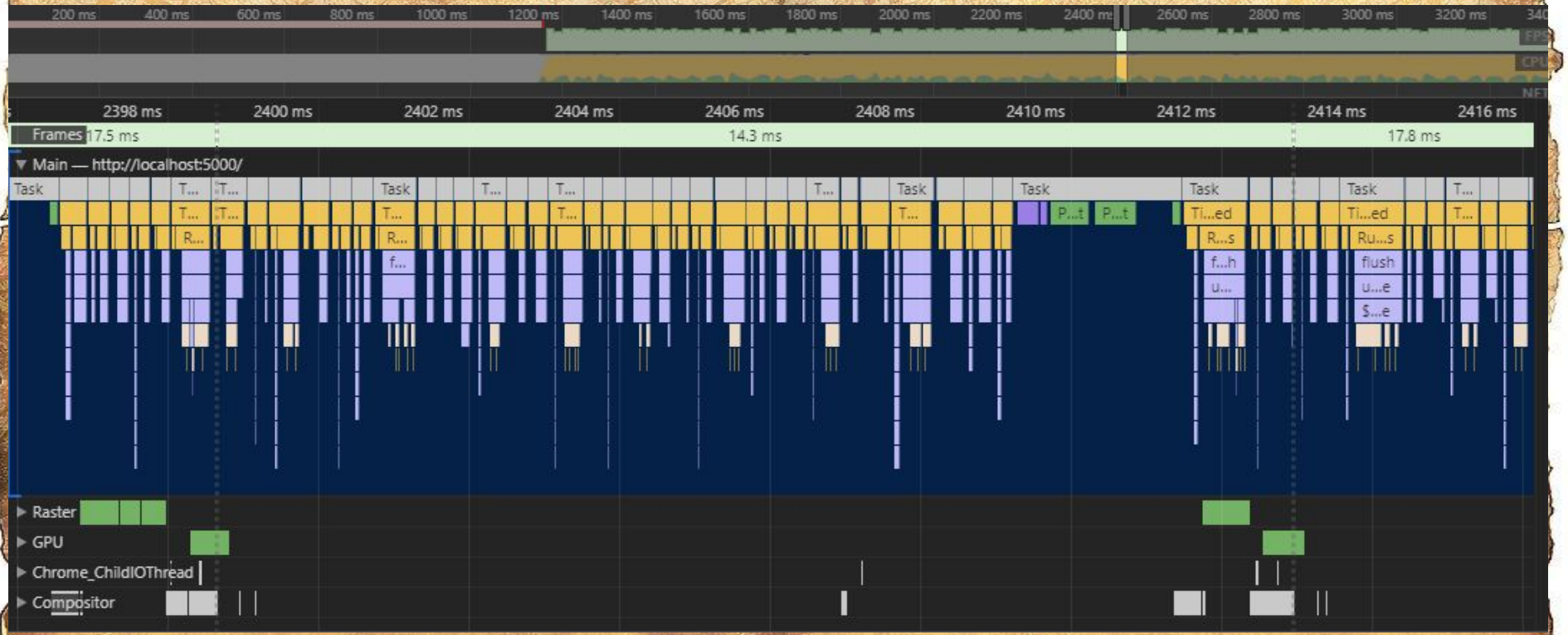
UNNECESSARY PAIN COMPLEXITY

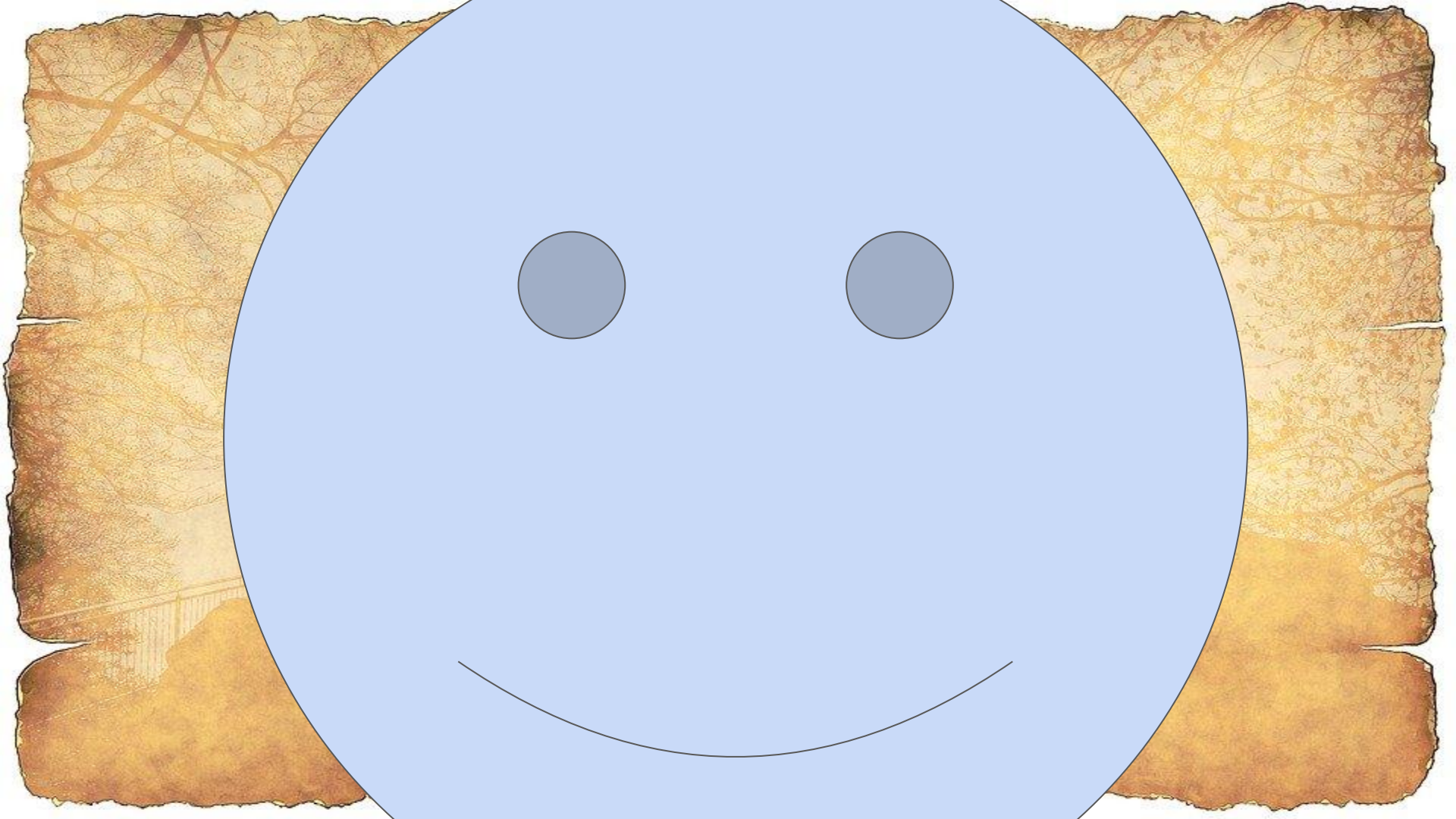




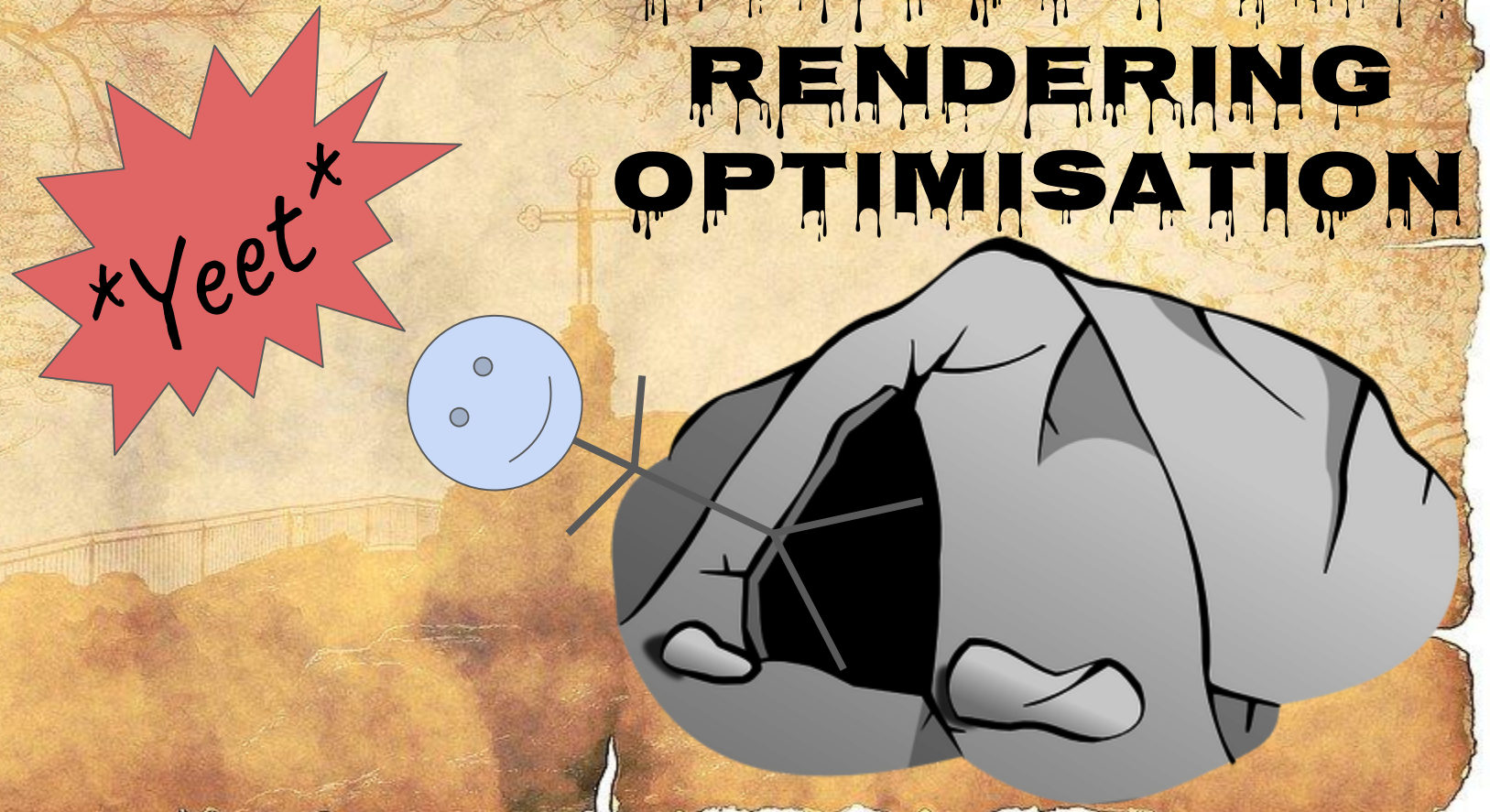
Results

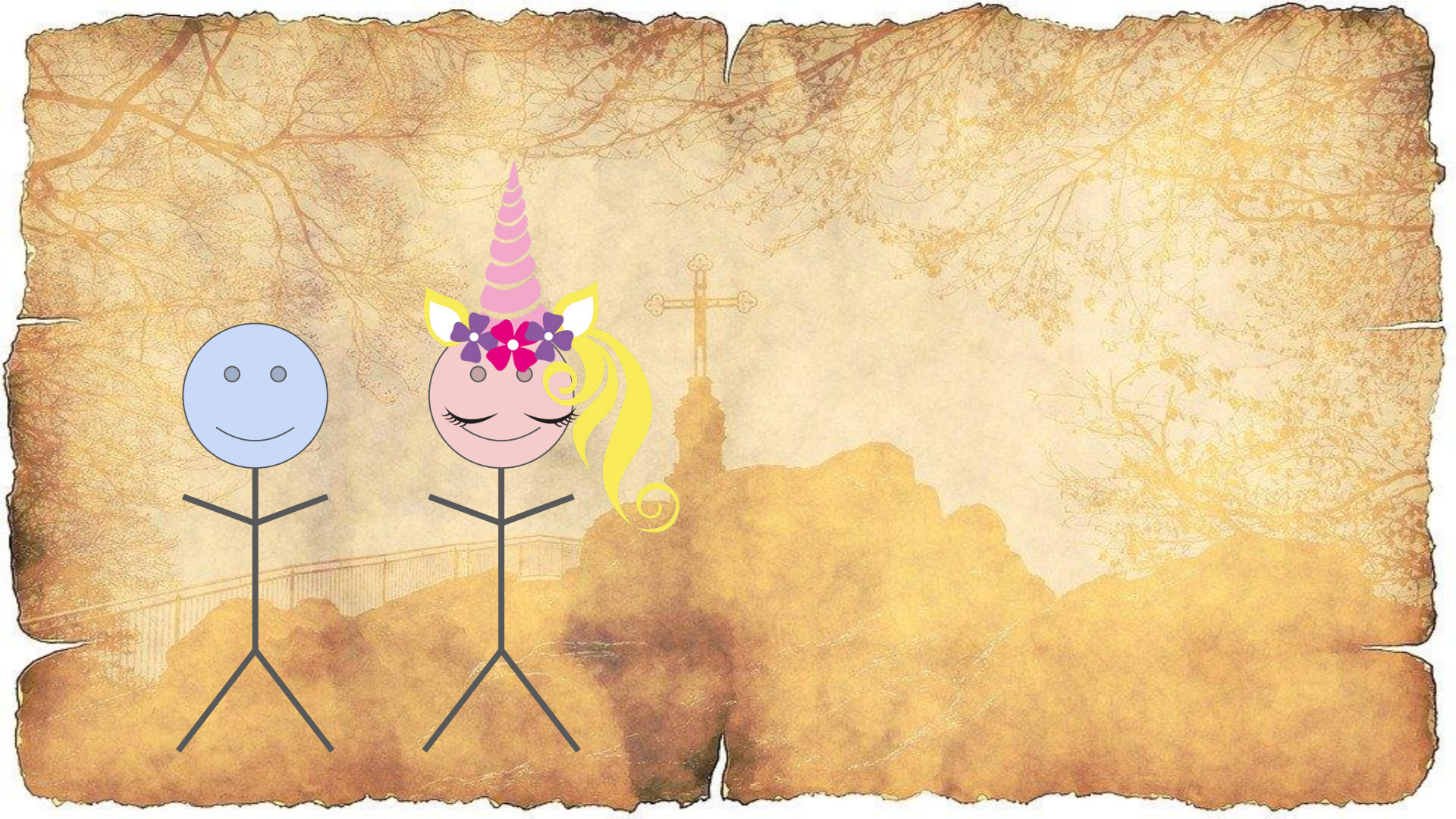

60 fps!


200 ms
400 ms
600 ms
800 ms
1000 ms
1200 ms
1400 ms
1600 ms
1800 ms
2000 ms
2200 ms
2400 ms
2600 ms
2800 ms
3000 ms
3200 ms
FPS
CPU
NET
2398 ms
2400 ms
2402 ms
2404 ms
2406 ms
2408 ms
2410 ms
2412 ms
2414 ms
2416 ms
Frames
17.5 ms
14.3 ms
17.8 ms
Main — http://localhost:5000/
Task
Raster
GPU
Chrome_ChildIOThread
Compositor



CAVE OF HTML RENDERING OPTIMISATION



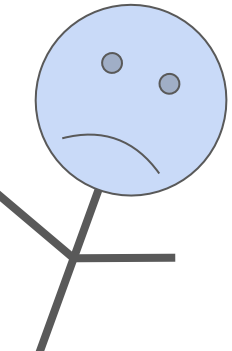


The end

Thanks

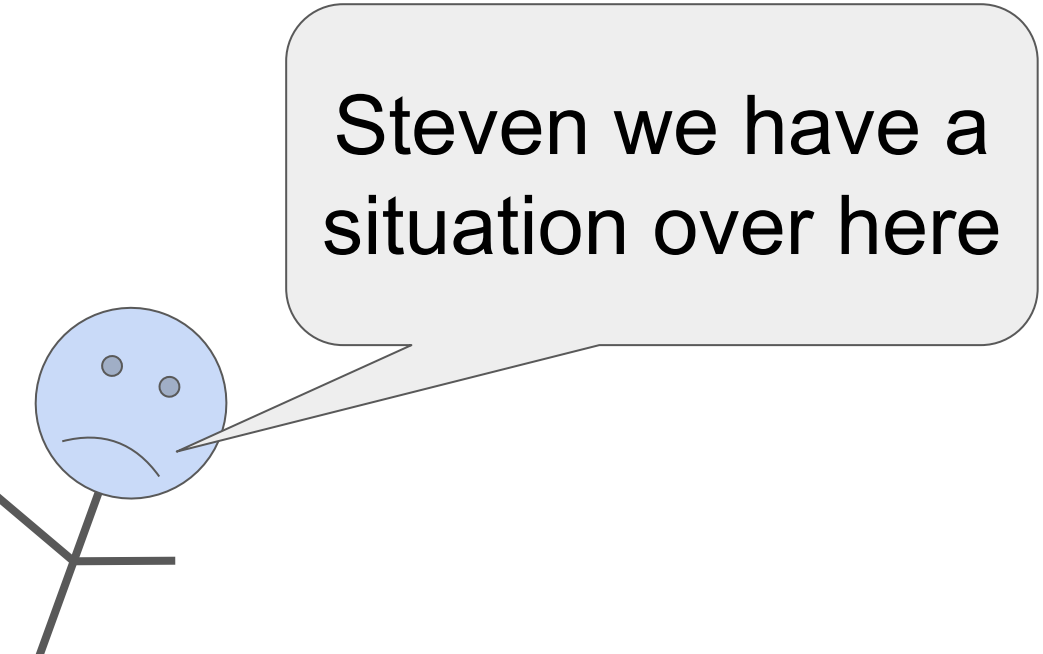
The end

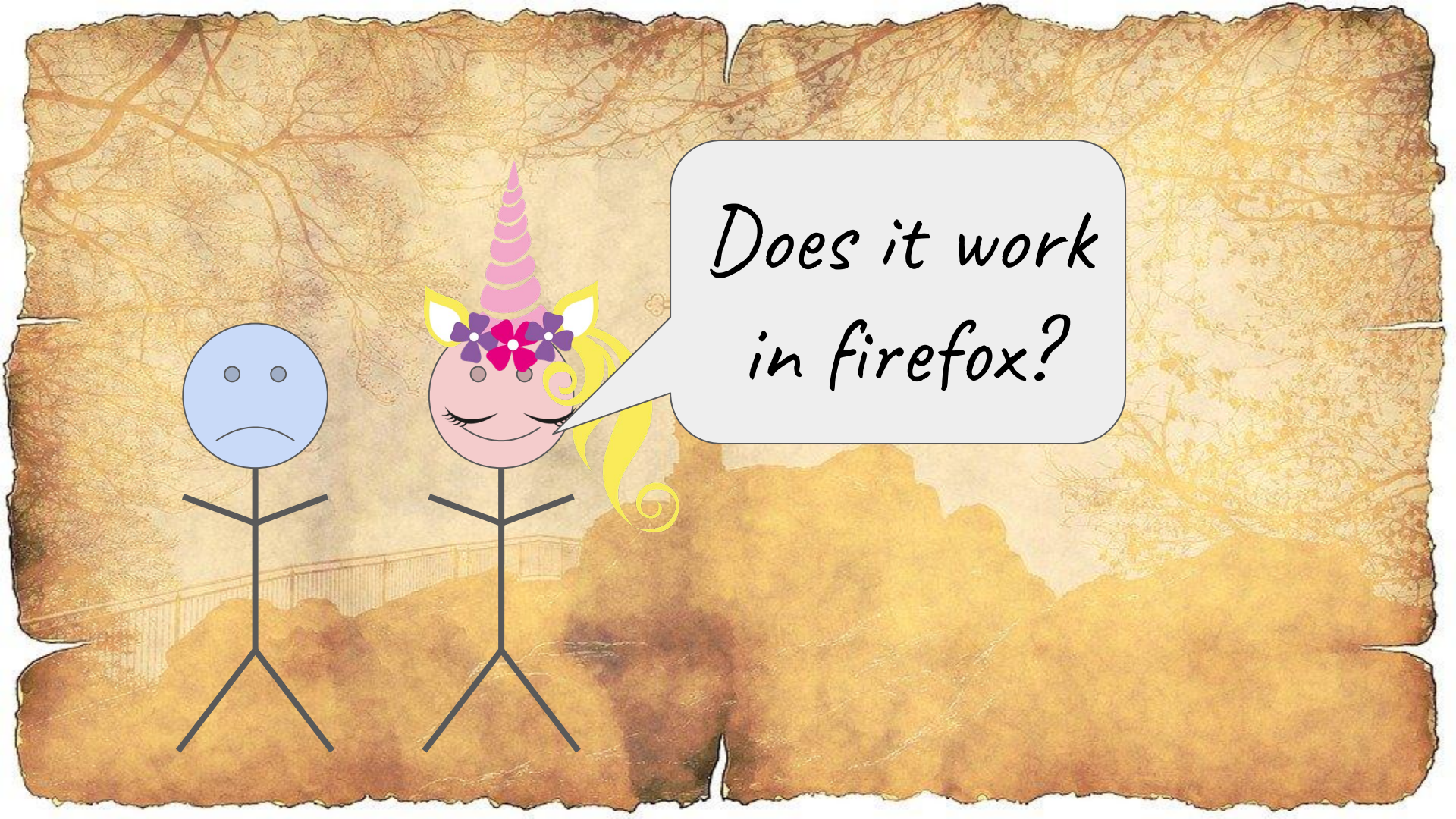
Thanks

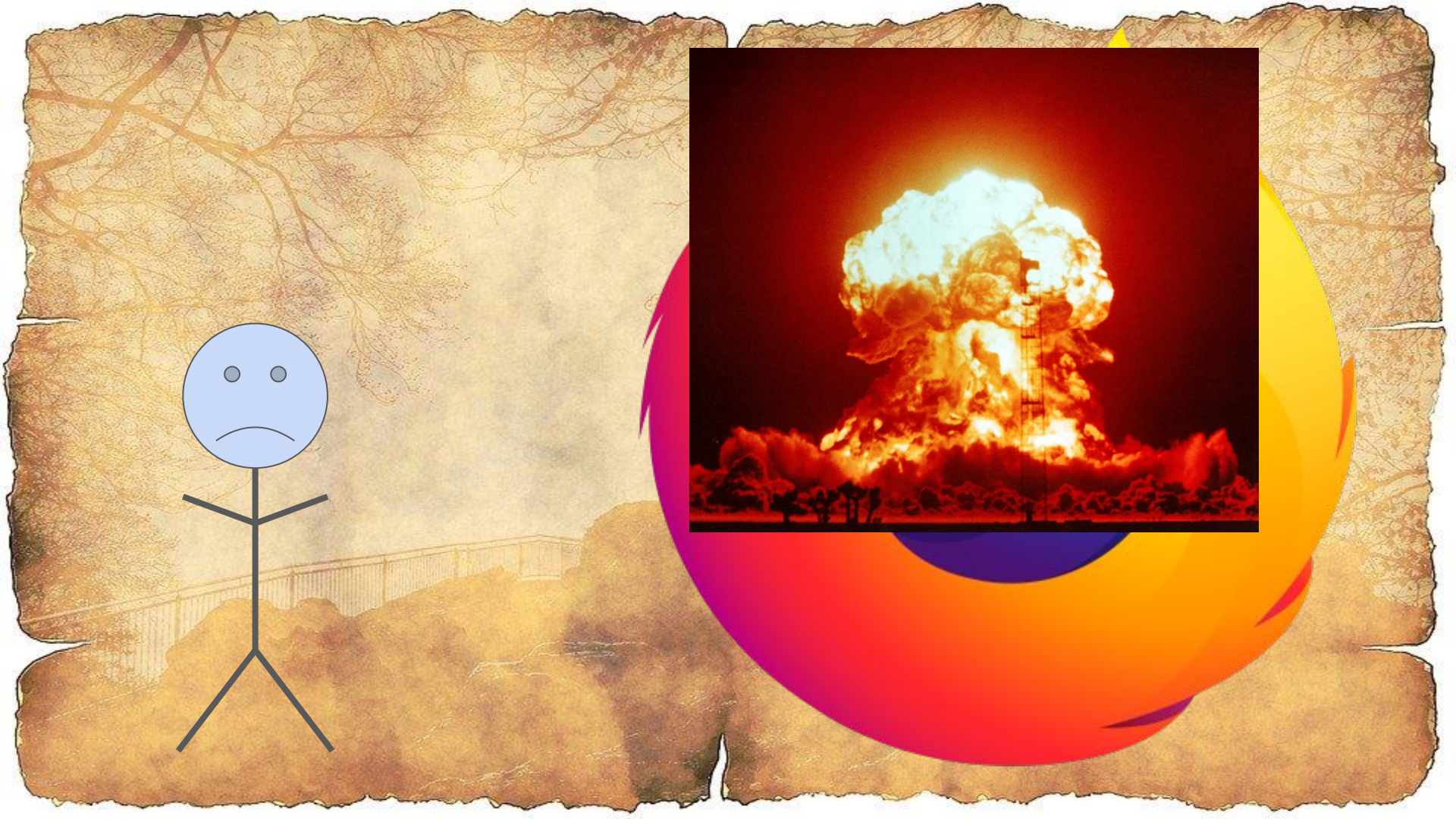


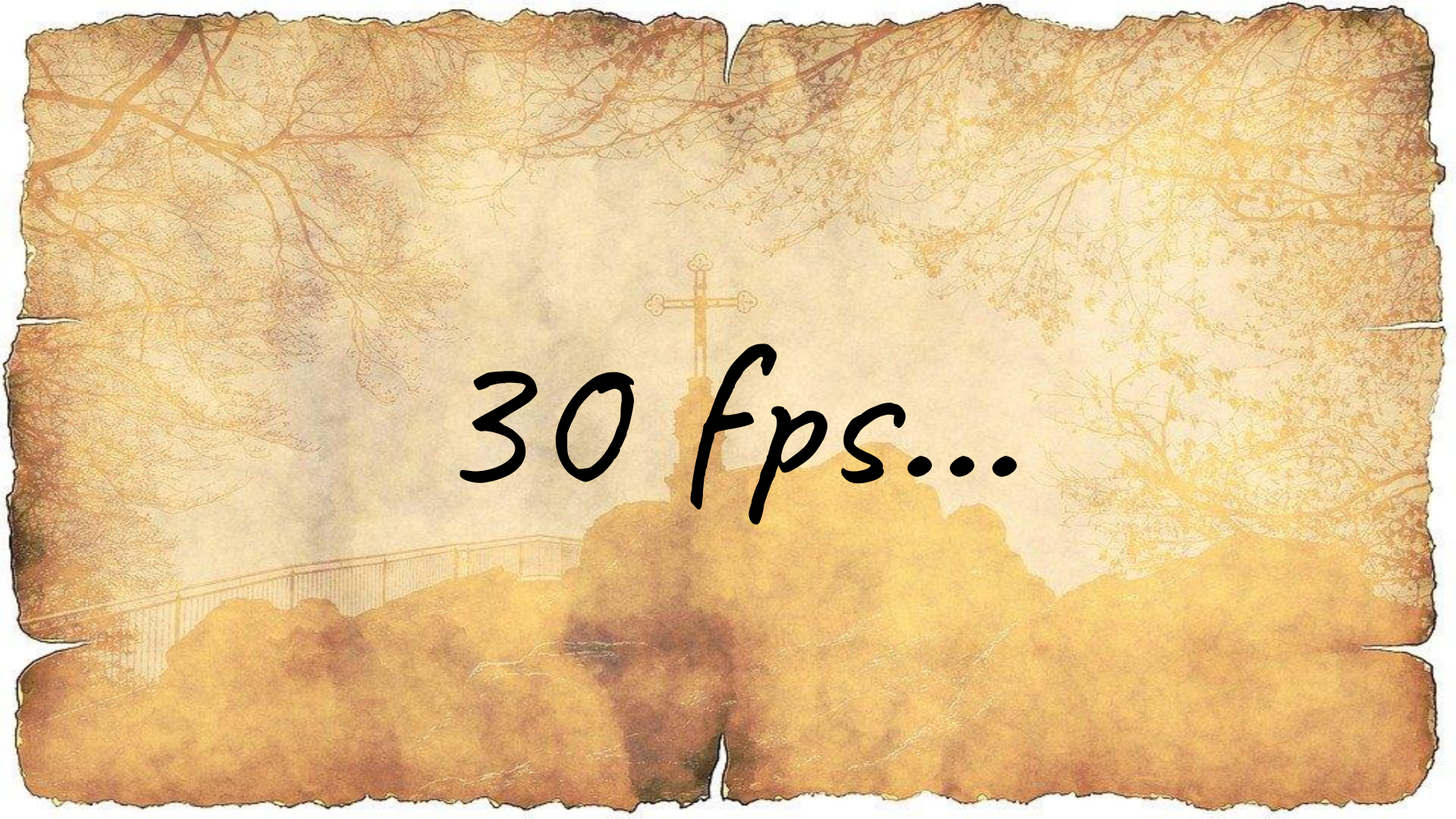
The end

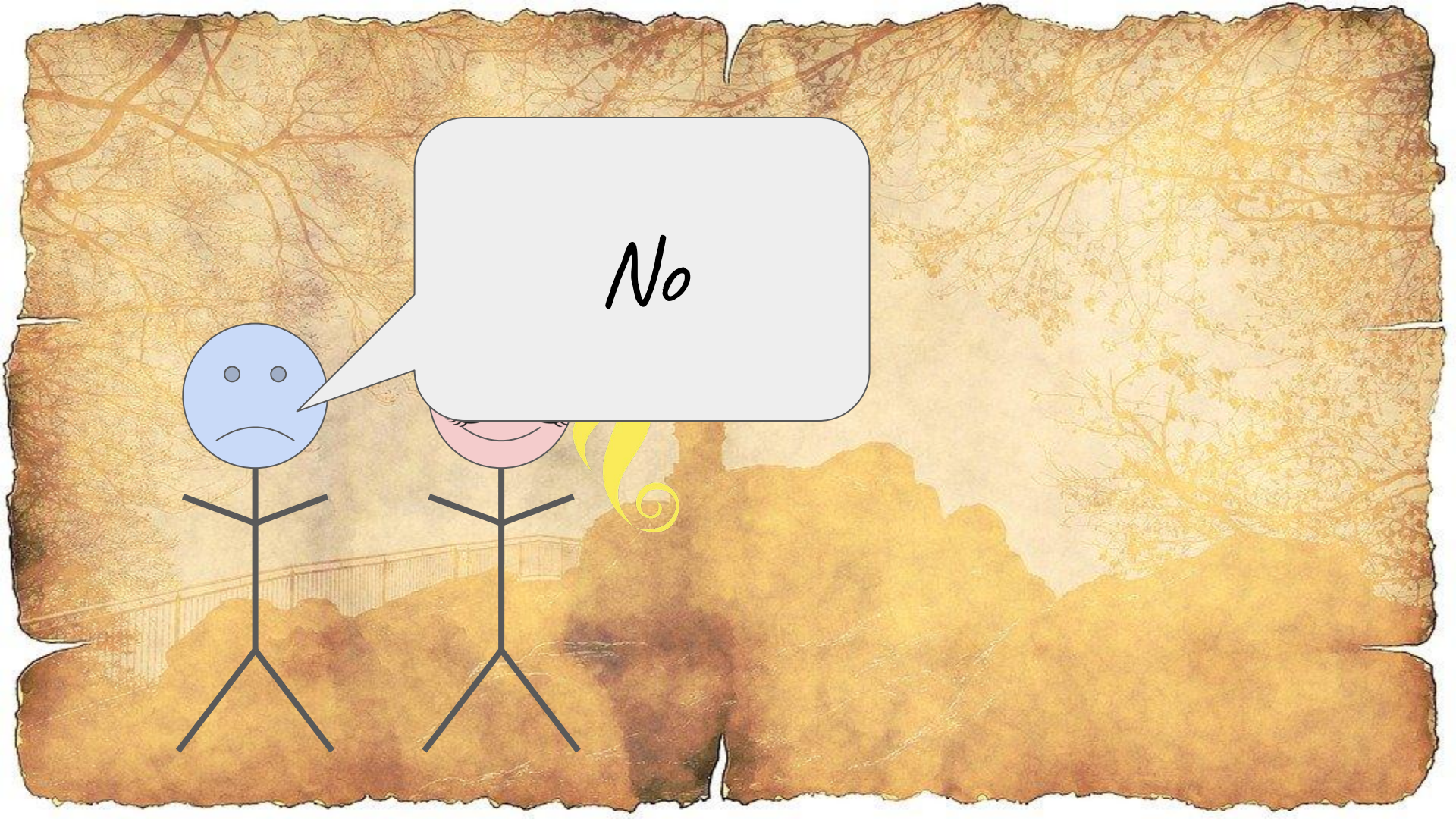
Thanks

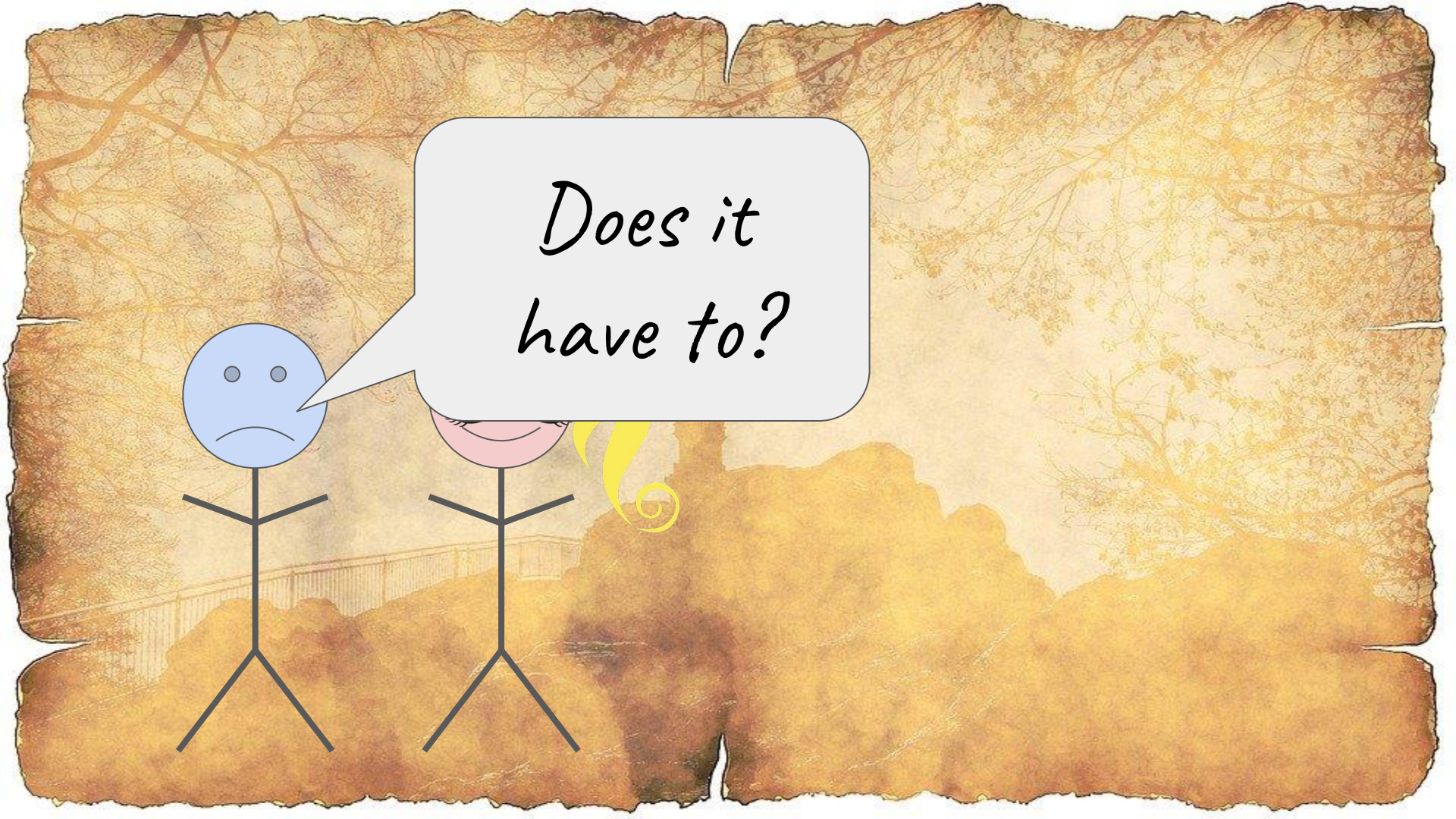


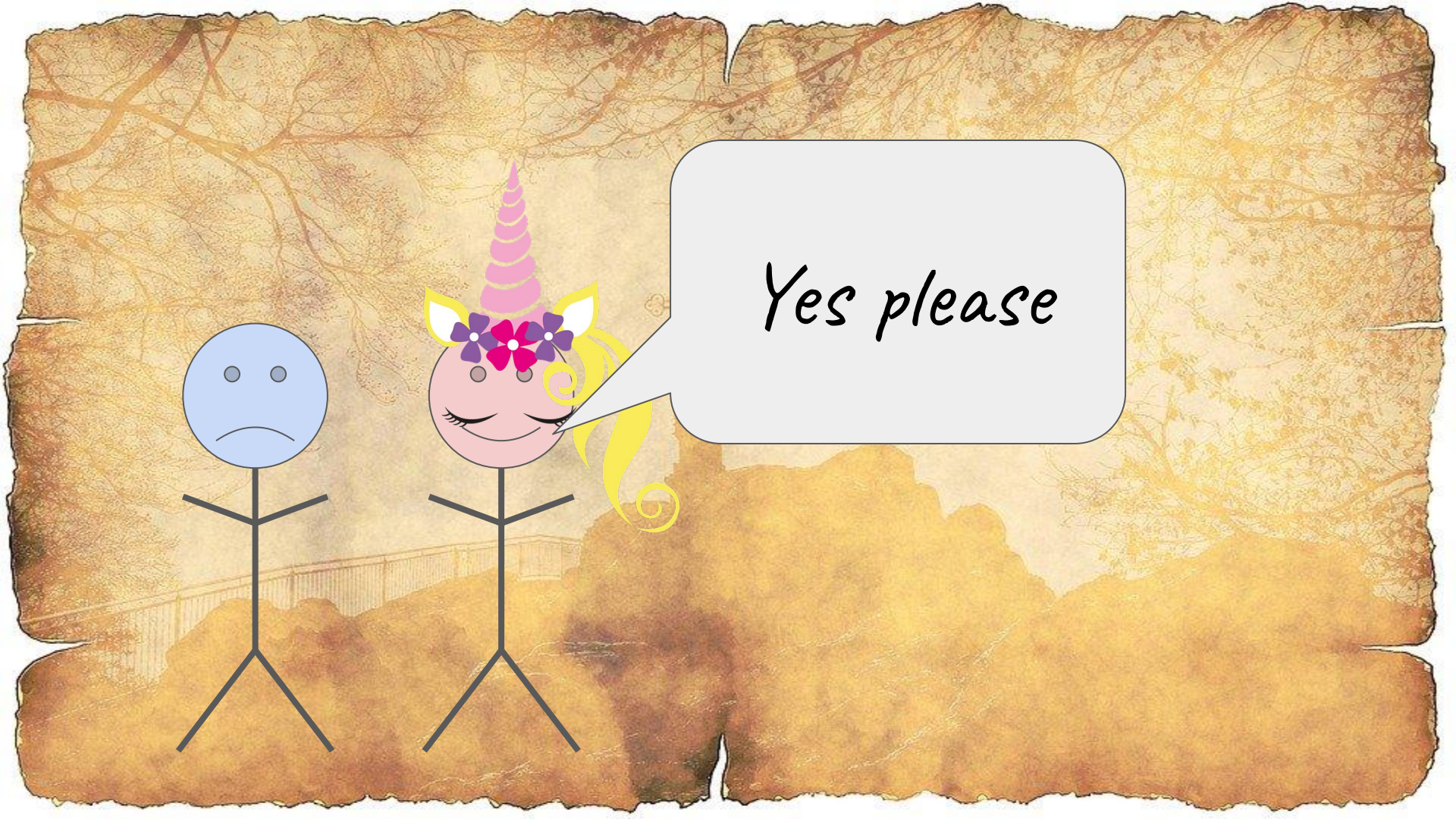

Does it work in firefox?



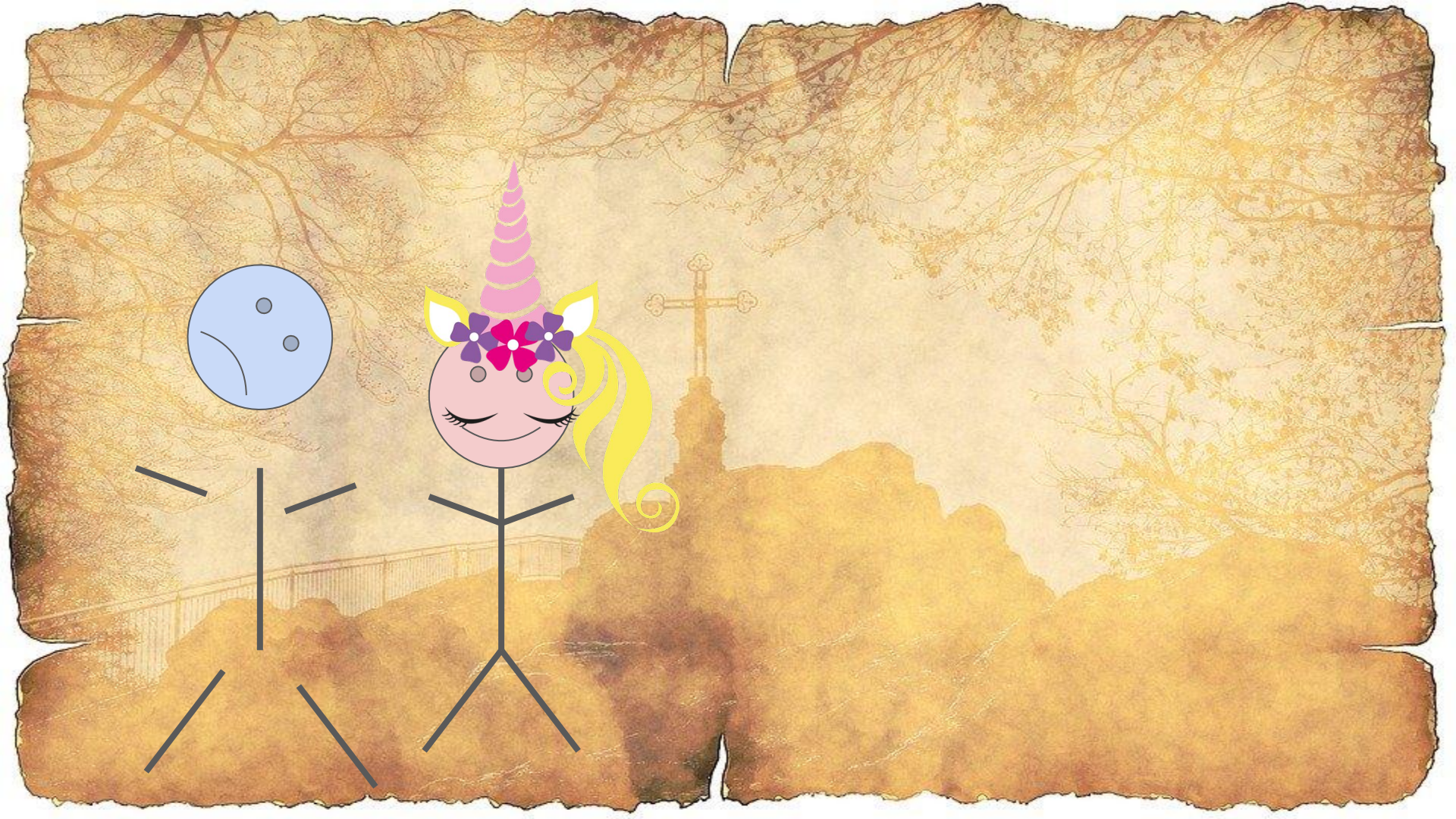

30 fps...


No

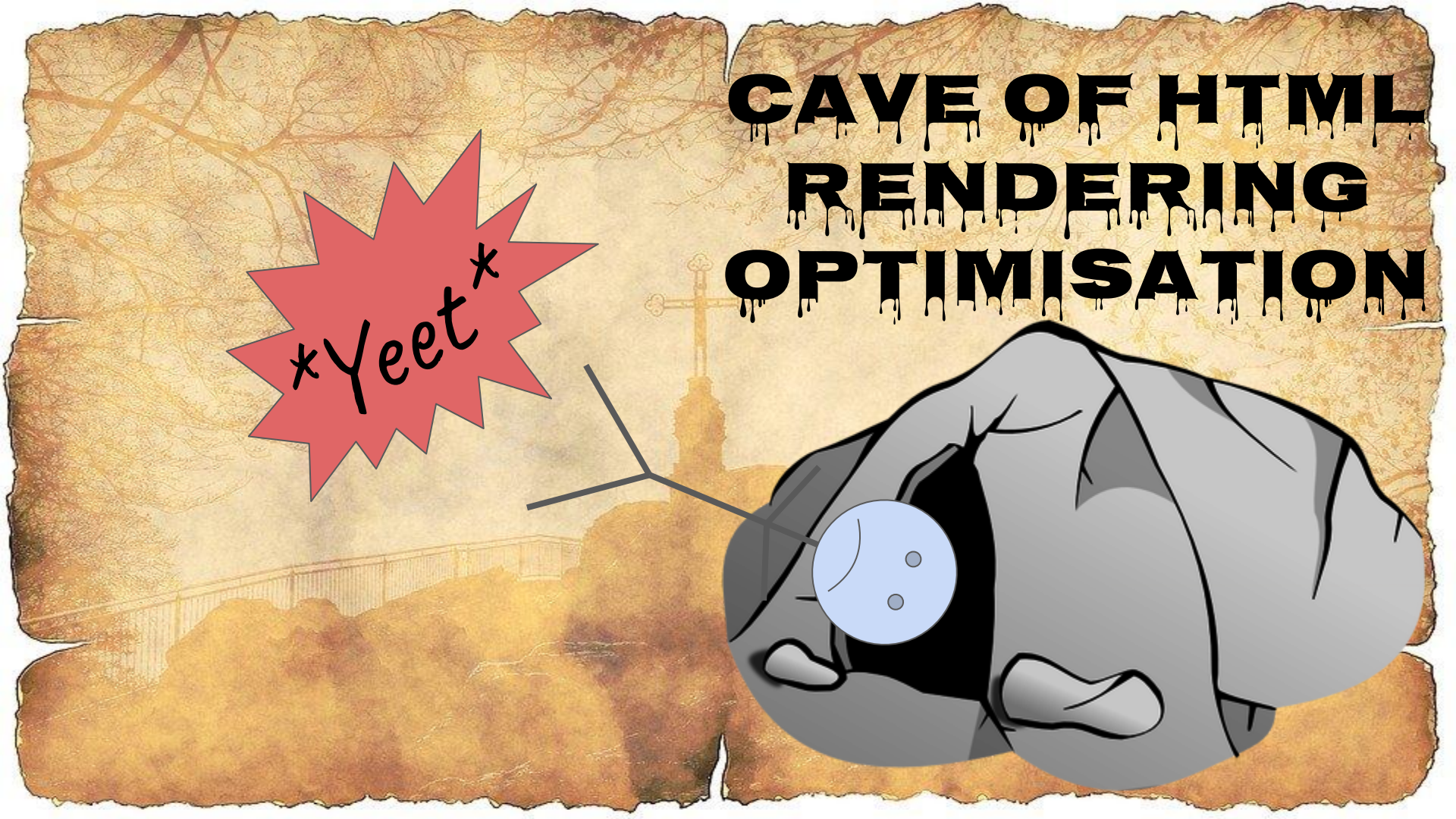

Does it have to?

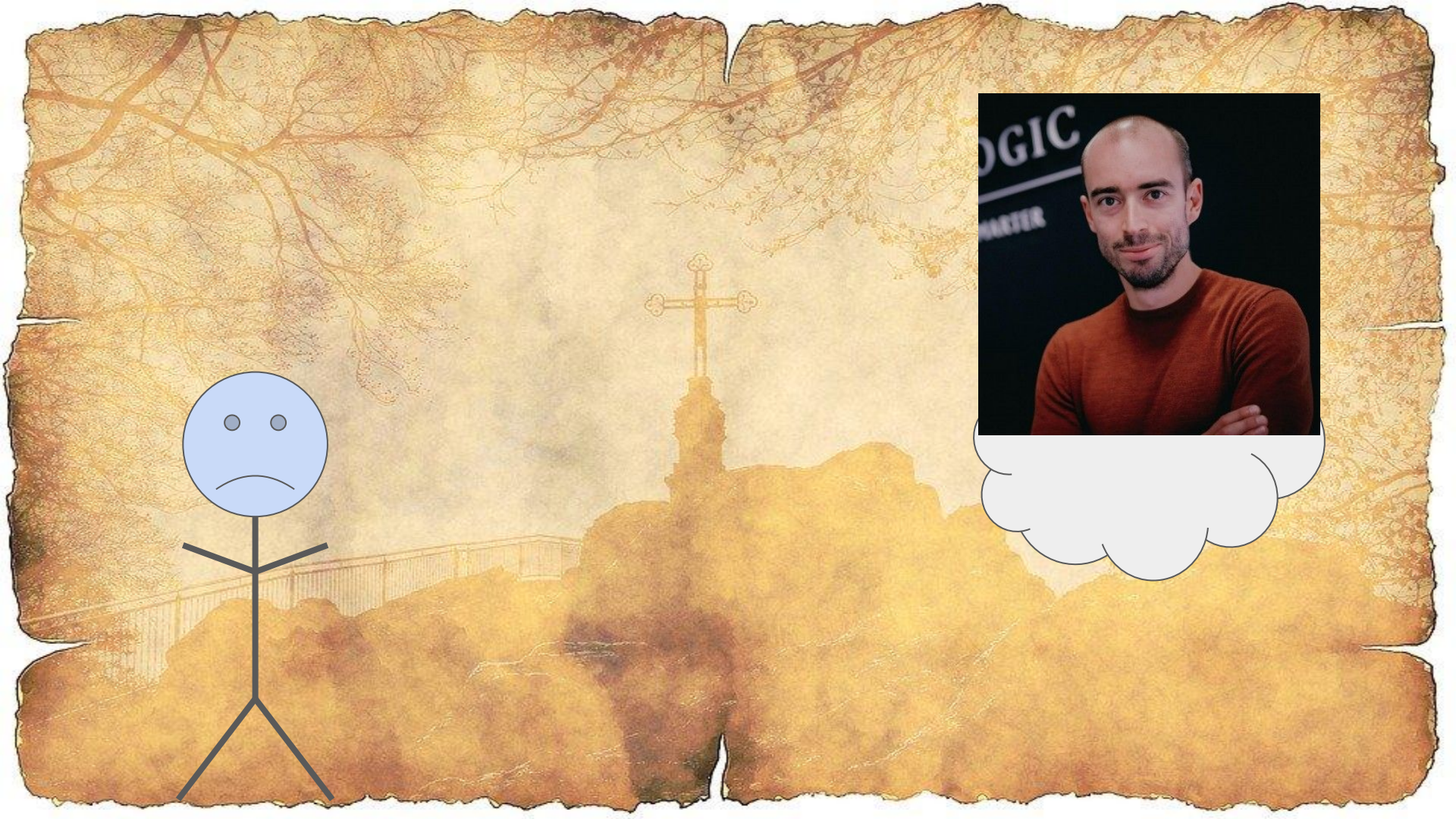

Yes please

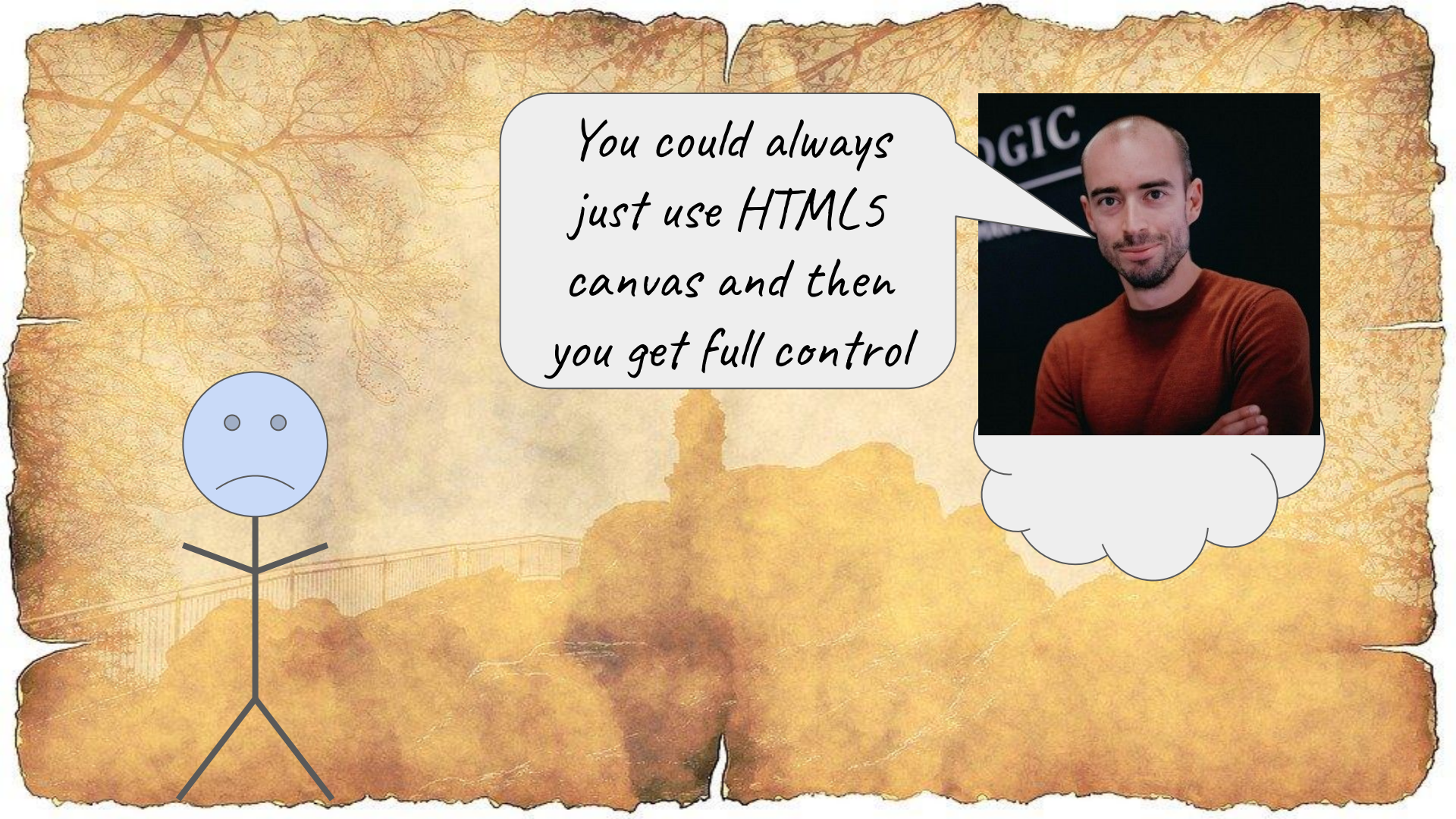
If you could that'd be gr8



CAVE OF HTML RENDERING OPTIMISATION



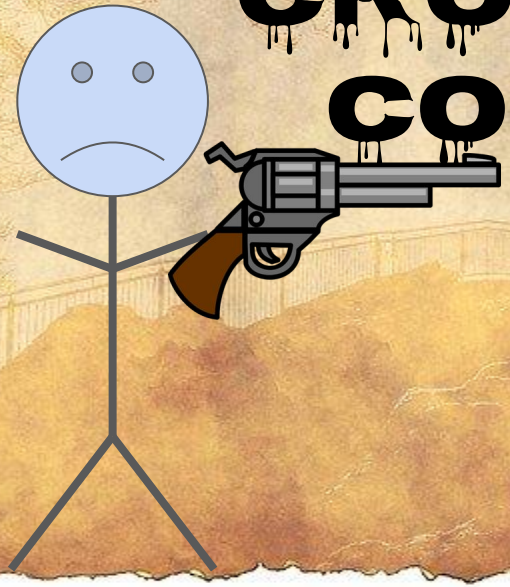

OGIC


You could always just use HTML5 canvas and then you get full control

EVIL UNICORN OF HAVING TO USE HTML5 CANVAS FOR CROSS-BROWSER COMPATIBILITY

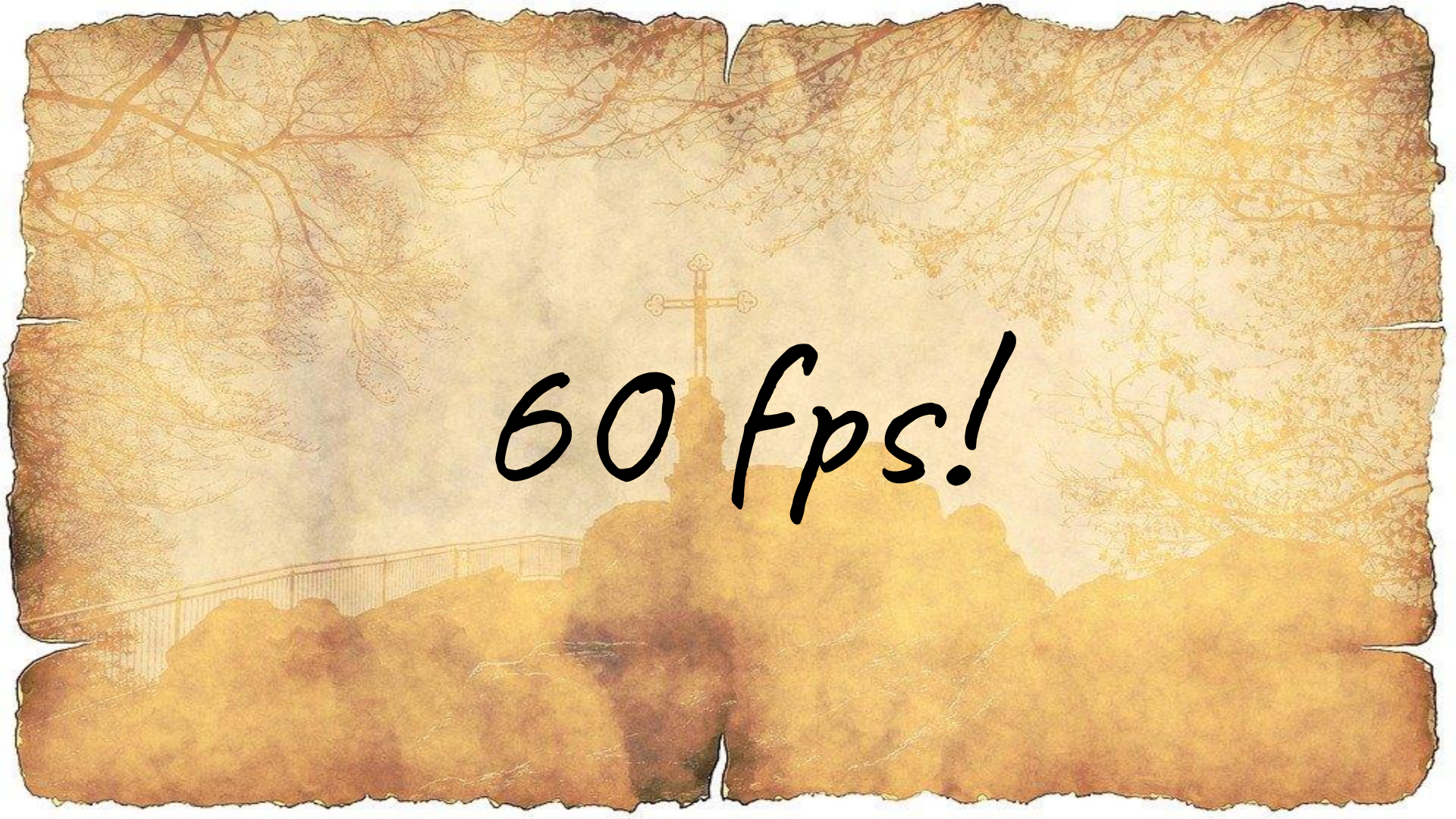
HTML

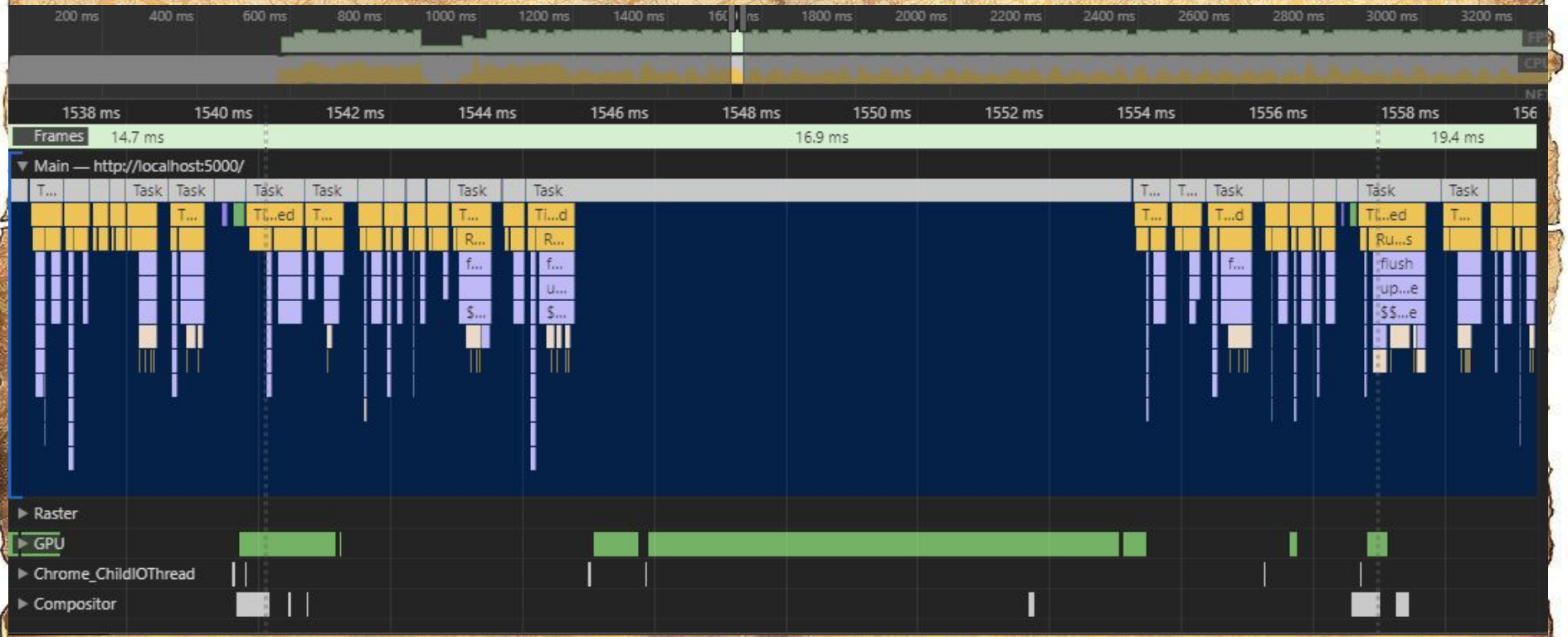
EVIL UNICORN OF HAVING TO USE HTML5 CANVAS FOR CROSS-BROWSER COMPATIBILITY



EVIL UNICORN OF HAVING TO USE HTML5 CANVAS FOR CROSS-BROWSER COMPATIBILITY

Results


60 fps!


200 ms
400 ms
600 ms
800 ms
1000 ms
1200 ms
1400 ms
1800 ms
2000 ms
2200 ms
2400 ms
2600 ms
2800 ms
3000 ms
3200 ms
FPS
CPU
NET
1538 ms
1540 ms
1542 ms
1544 ms
1546 ms
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1552 ms
1554 ms
1556 ms
1558 ms
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14.7 ms
16.9 ms
19.4 ms
Main — http://localhost:5000/
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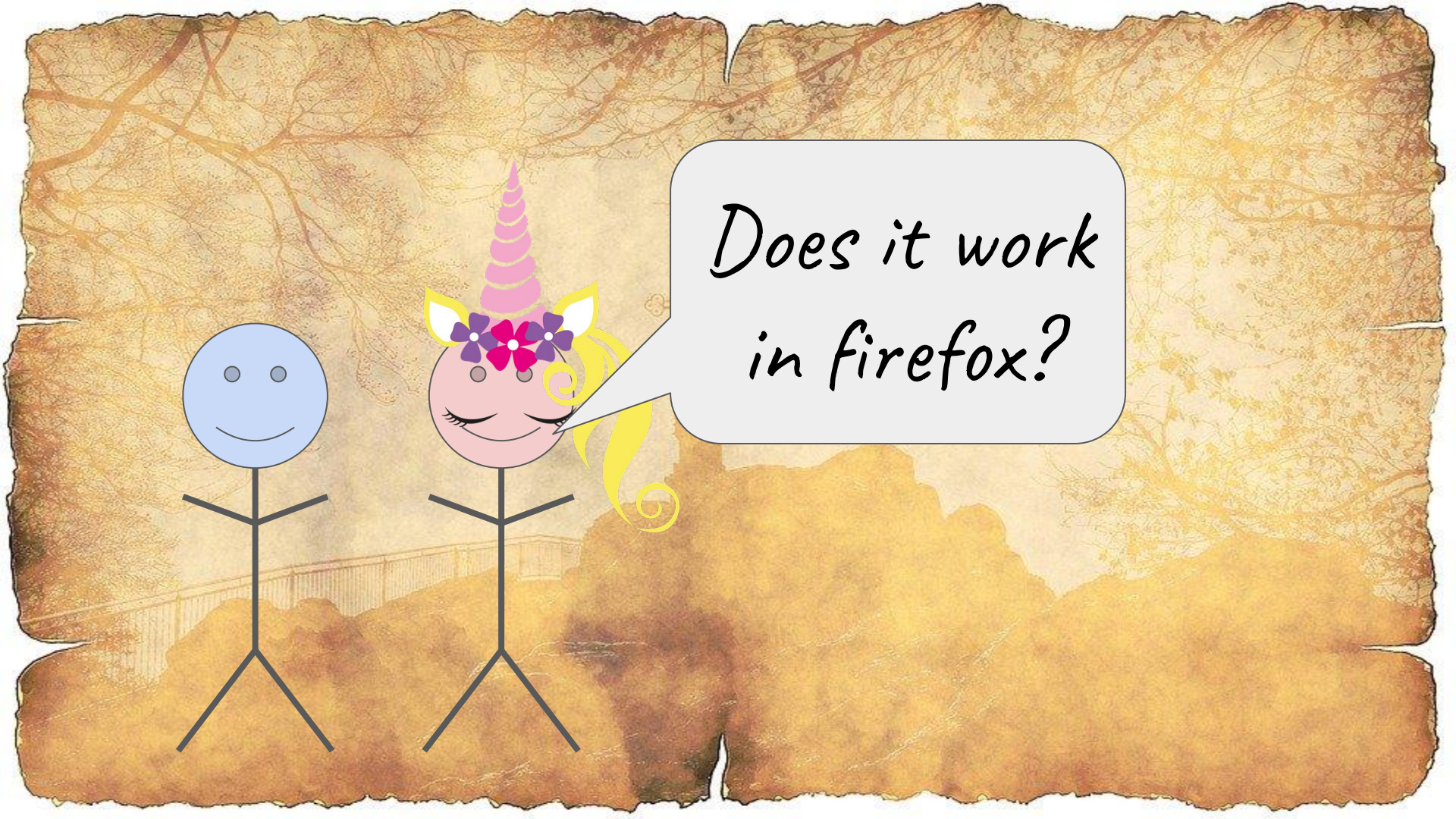
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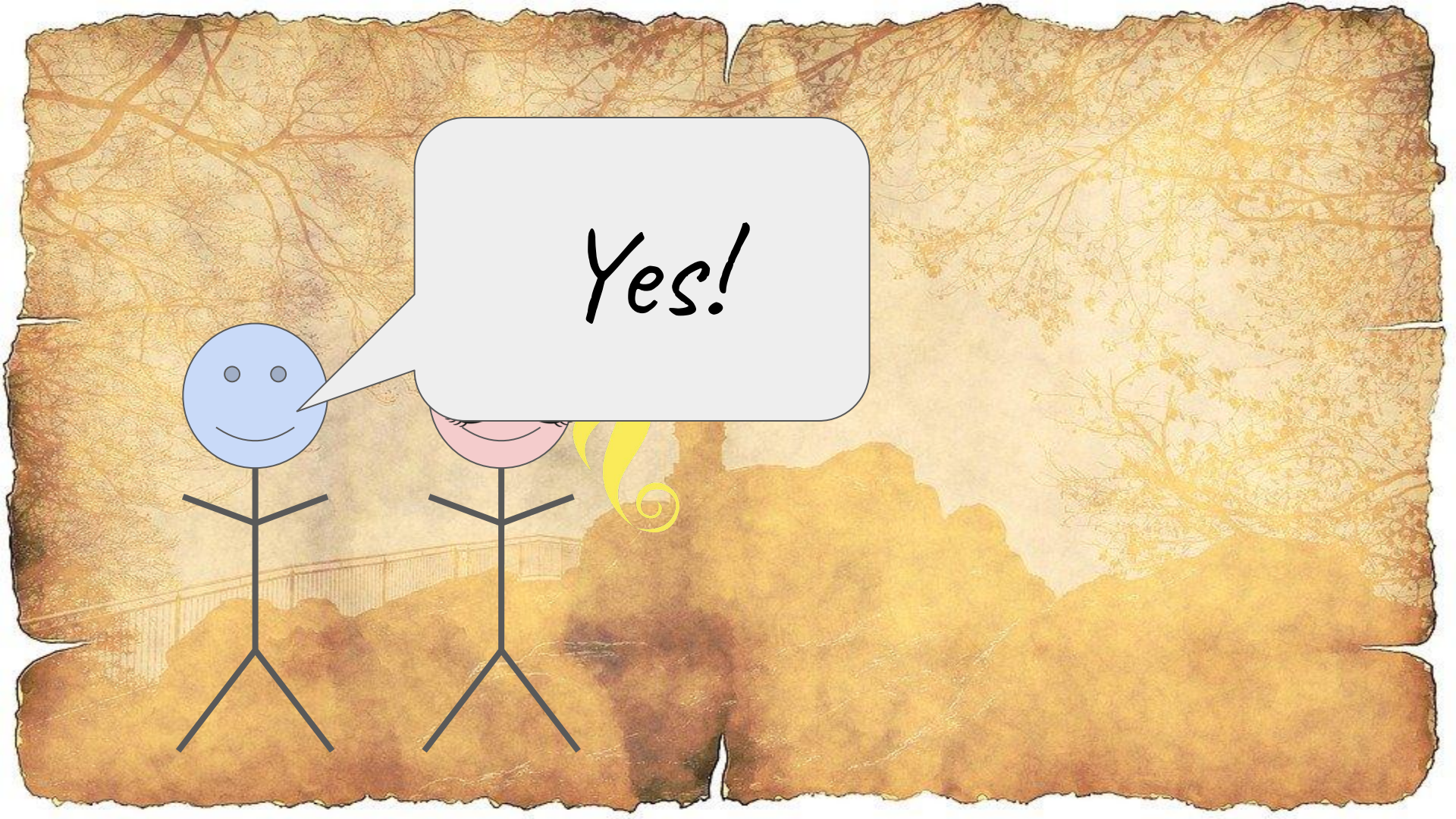
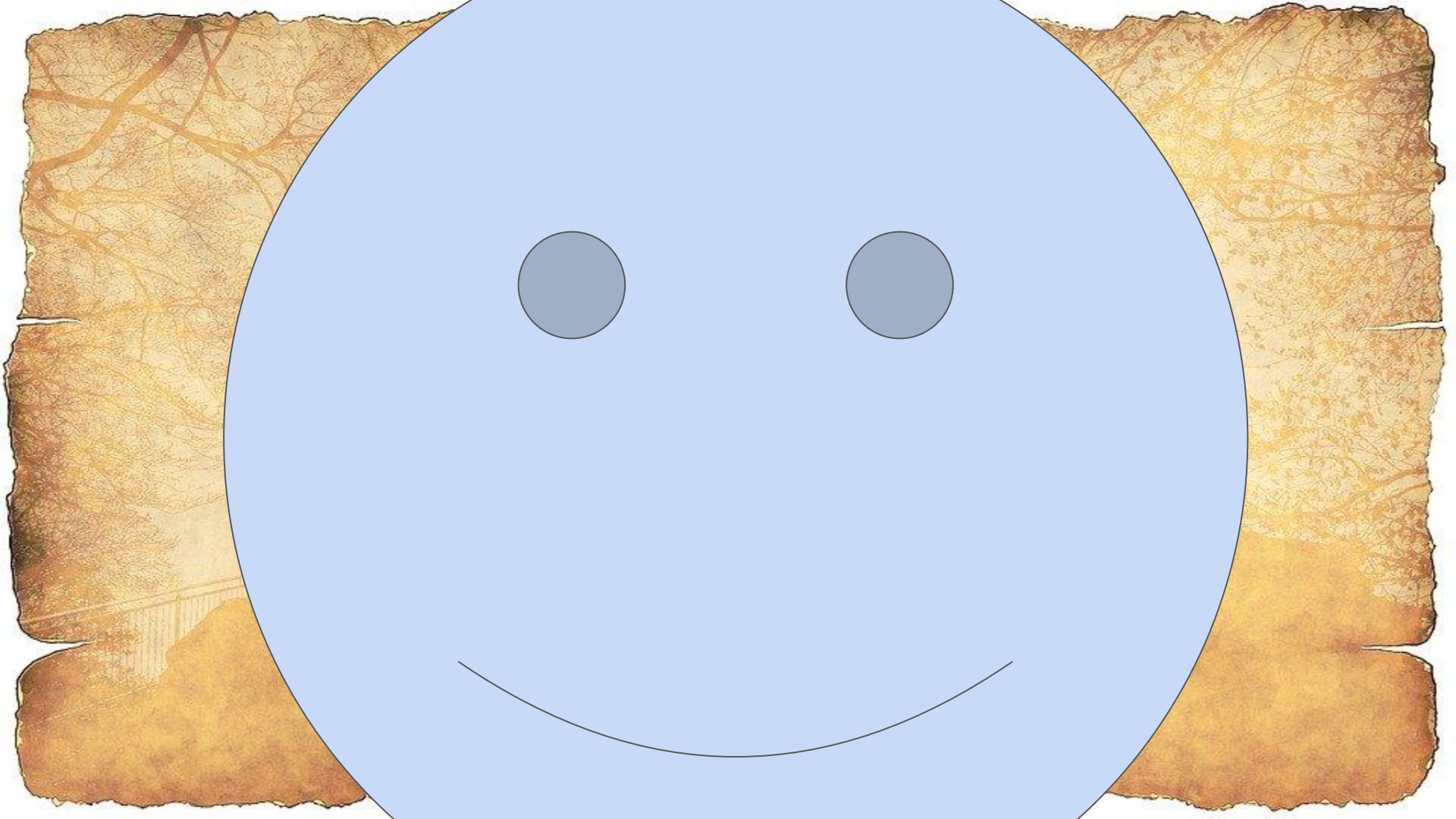

Yes!



Read the blog post

GitHub **@StevenWaterman**
Twitter **@SteWaterman**
Website **StevenWaterman.uk**

The End

Try it yourself:
optimisation.StevenWaterman.uk

P.S. Look up *The Hero's Journey*