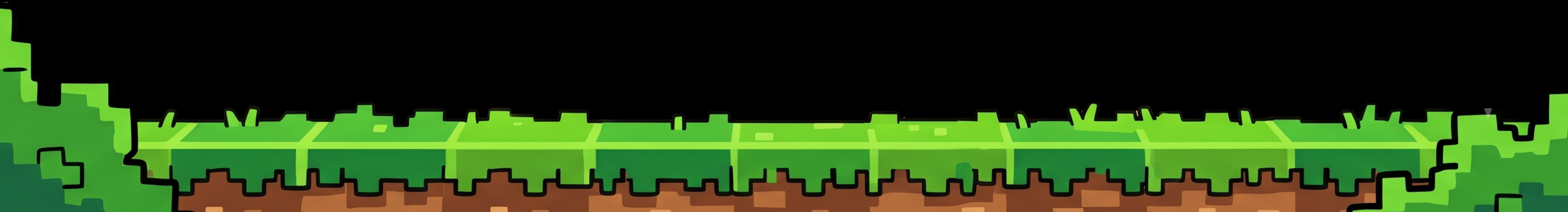


WARP PIPES AND PREFETCHING

Navigating the Web at Mario Speed









Core Web Vitals

Largest Contentful Paint

Interaction to Next Paint

Cumulative Layout Shift



Largest Contentful Paint

How fast does a website's main image or largest block of text actually appear on the screen?



Interaction to Next Paint

How long does it take for a website to visually react after you click, tap, or type something?



Cumulative Layout Shift

How much does the content of a website unexpectedly shift around while loading?





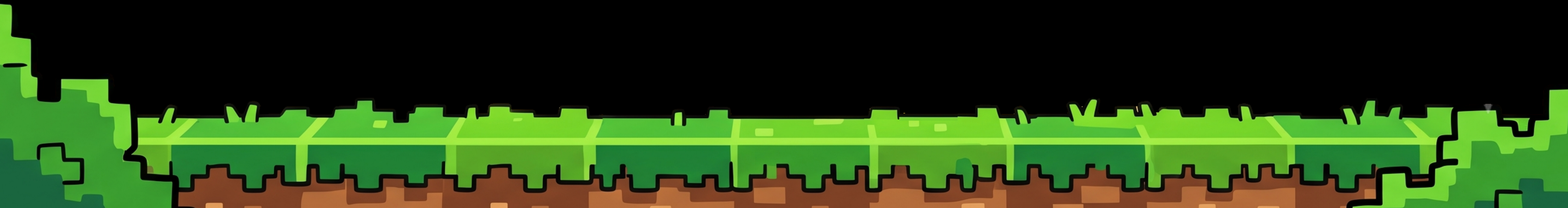
Speculation Rules API

A cheat code to tell a browser to secretly prefetch or preload a page before a user clicks the link, making it appear instantly the moment they do.

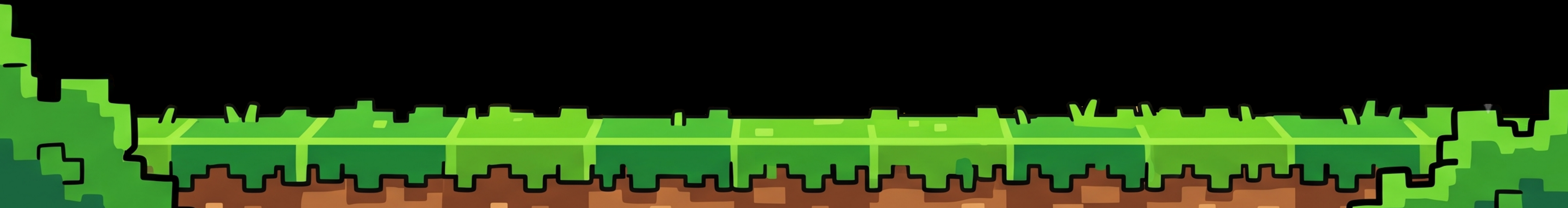


Prefetch

The browser proactively performs DNS lookups, establishes TCP connections, and downloads and caches specific web resources in memory to significantly reduce network latency for anticipated future requests.

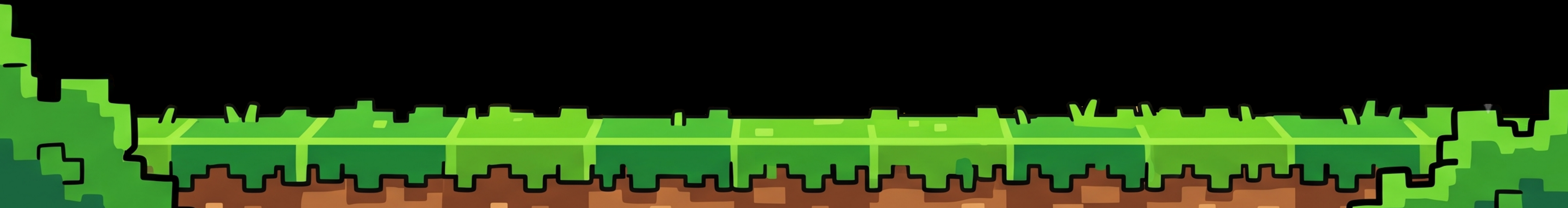



```
<link rel="prefetch" href="/mario.html" />  
<link rel="prefetch" href="/luigi.html" />
```






```
<script type="speculationrules">
{
  "prefetch": [
    {
      "urls": ["mario.html", "luigi.html"]
    }
  ]
}
</script>
```




```
<script type="speculationrules">
{
  "prefetch": [
    {
      "where": { "href_matches": "/*" }
    }
  ]
}
</script>
```



```
<script type="speculationrules">
{
  "prefetch": [{
    "where": {
      "and": [
        { "href_matches": "/*" },
        { "not": { "href_matches": "/logout" } },
        { "not": { "selector_matches": ".no-prefetch" } },
      ]
    }
  ]
}
</script>
```



```
<script type="speculationrules">
{
  "prefetch": [{
    "where": {
      "and": [
        { "href_matches": "/*" },
        { "not": { "href_matches": "/logout" } },
        { "not": { "selector_matches": ".no-prefetch" } },
      ]
    },
    "eagerness": "eager"
  }]
}
</script>
```

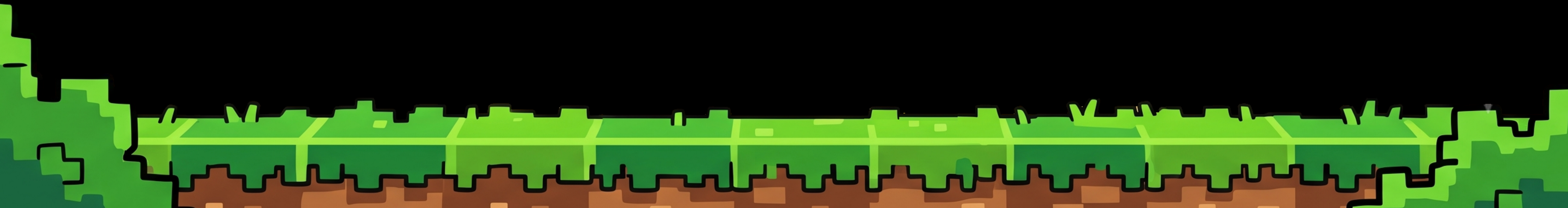

Eagerness

immediate - as soon as the page loads

eager - on hover for 10 ms

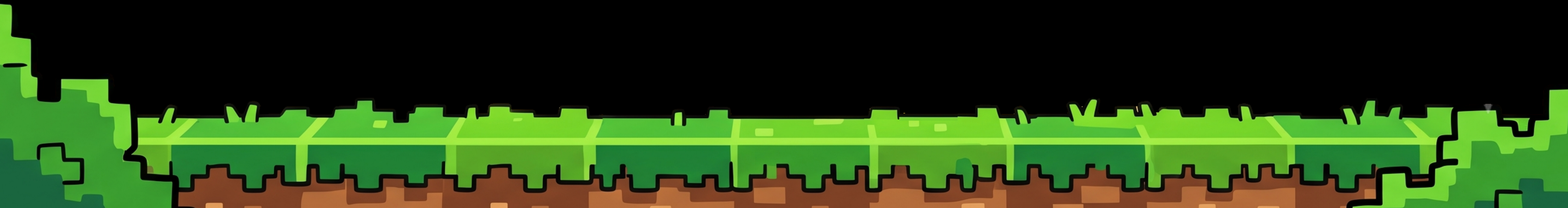
moderate - on hover for 200 ms

conservative - on mousedown



Prerender

The browser proactively fetches a designated URL and executes its entire critical rendering path, including DOM construction, layout, and JavaScript execution, in a hidden background context.




```
<script type="speculationrules">
{
  "prerender": [
    {
      "where": { "href_matches": "/*" },
      "eagerness": "moderate"
    }
  ]
}
</script>
```





```
<script type="speculationrules">
{
  "prefetch": [
    {
      "where": { "href_matches": "/*" },
      "eagerness": "eager"
    }
  ],
  "prerender": [
    {
      "where": { "href_matches": "/*" },
      "eagerness": "moderate"
    }
  ]
}
</script>
```





Mario



Luigi

Elements

Console

Application >>

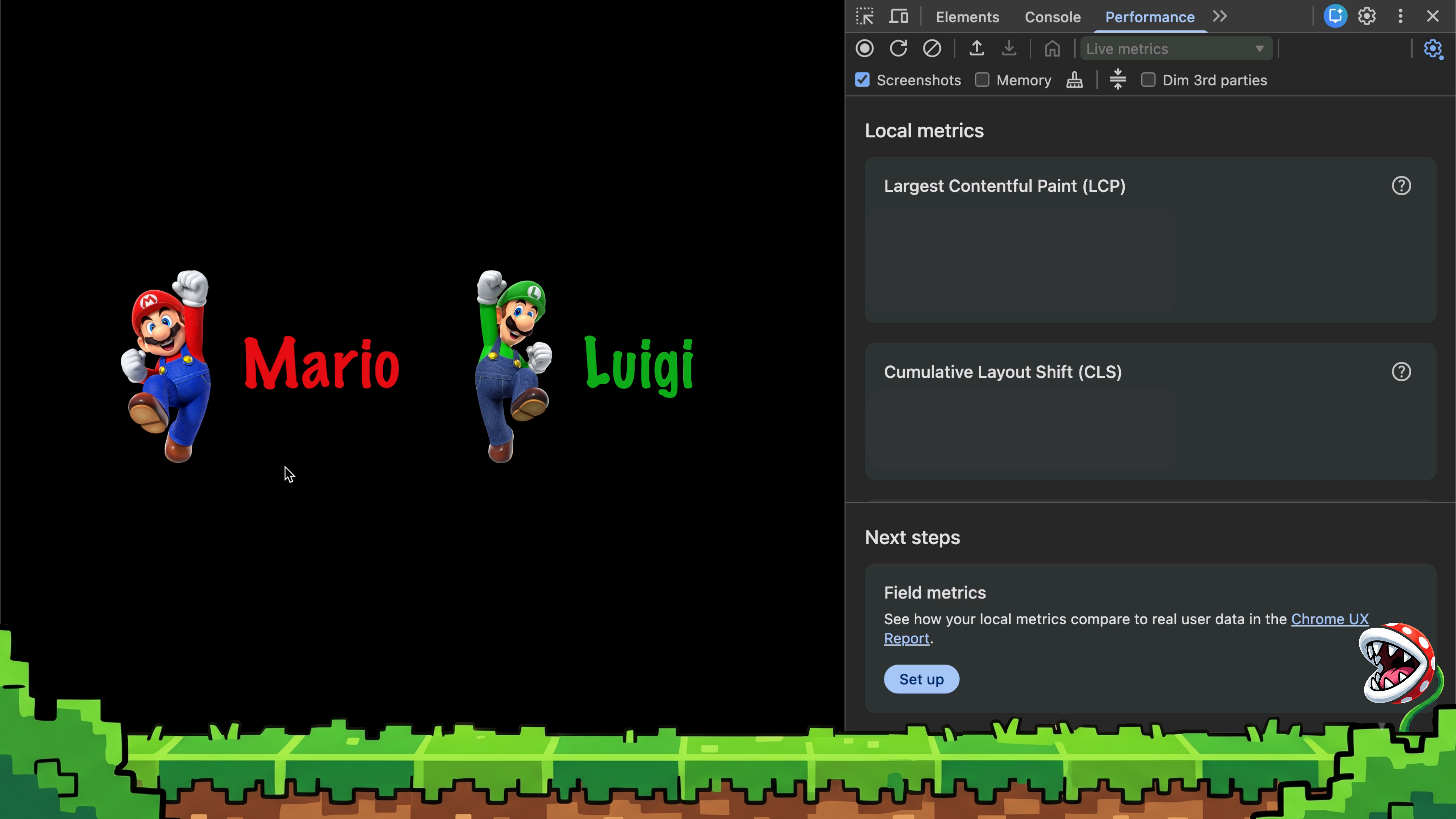
Main ▾

	Rule set	Status
<div>Storage<ul style="list-style-type: none">Local storageSession storageExtension storageIndexedDBCookiesPrivate state tokensShared storageCache storageStorage buckets</div>	index.html	2 not triggered
<div>Background services<ul style="list-style-type: none">Back/forward cacheBackground fetchBackground syncBounce tracking mi...NotificationsPayment handlerPeriodic backgroun...Speculative loadsRulesSpeculationsPush messagingReporting APIDevice bound sessi...</div>		
Frames		





The image shows the Chrome DevTools Application panel. On the left, the 'Storage' section is expanded, showing 'Local storage', 'Session storage', 'Extension storage', 'IndexedDB', 'Cookies', 'Private state tokens', 'Shared storage', 'Cache storage', and 'Storage buckets'. Below this, the 'Background services' section is expanded, showing 'Back/forward cache', 'Background fetch', 'Background sync', 'Bounce tracking mi...', 'Notifications', 'Payment handler', 'Periodic backgroun...', 'Speculative loads', 'Rules' (highlighted), 'Speculations', 'Push messaging', 'Reporting API', and 'Device bound sessi...'. The main area of the panel shows a table with two columns: 'Rule set' and 'Status'. The first row shows 'index.html' with a status of '2 not triggered'. Below this, the URL 'http://127.0.0.1:8080/index.html' is shown, followed by a JSON object representing the request. The JSON object has two main sections: 'prefetch' and 'prerender'. Both sections contain a 'urls' array with 'luigi.html' and an 'eagerness' property. The 'prefetch' eagerness is 'eager' and the 'prerender' eagerness is 'moderate'. A Yoshi character is visible in the bottom right corner.



Mario



Luigi

ElementsConsolePerformance >>

Live metrics

☒ Screenshots☐ Memory☐ Dim 3rd parties

Local metrics

Largest Contentful Paint (LCP)

?

Cumulative Layout Shift (CLS)

?

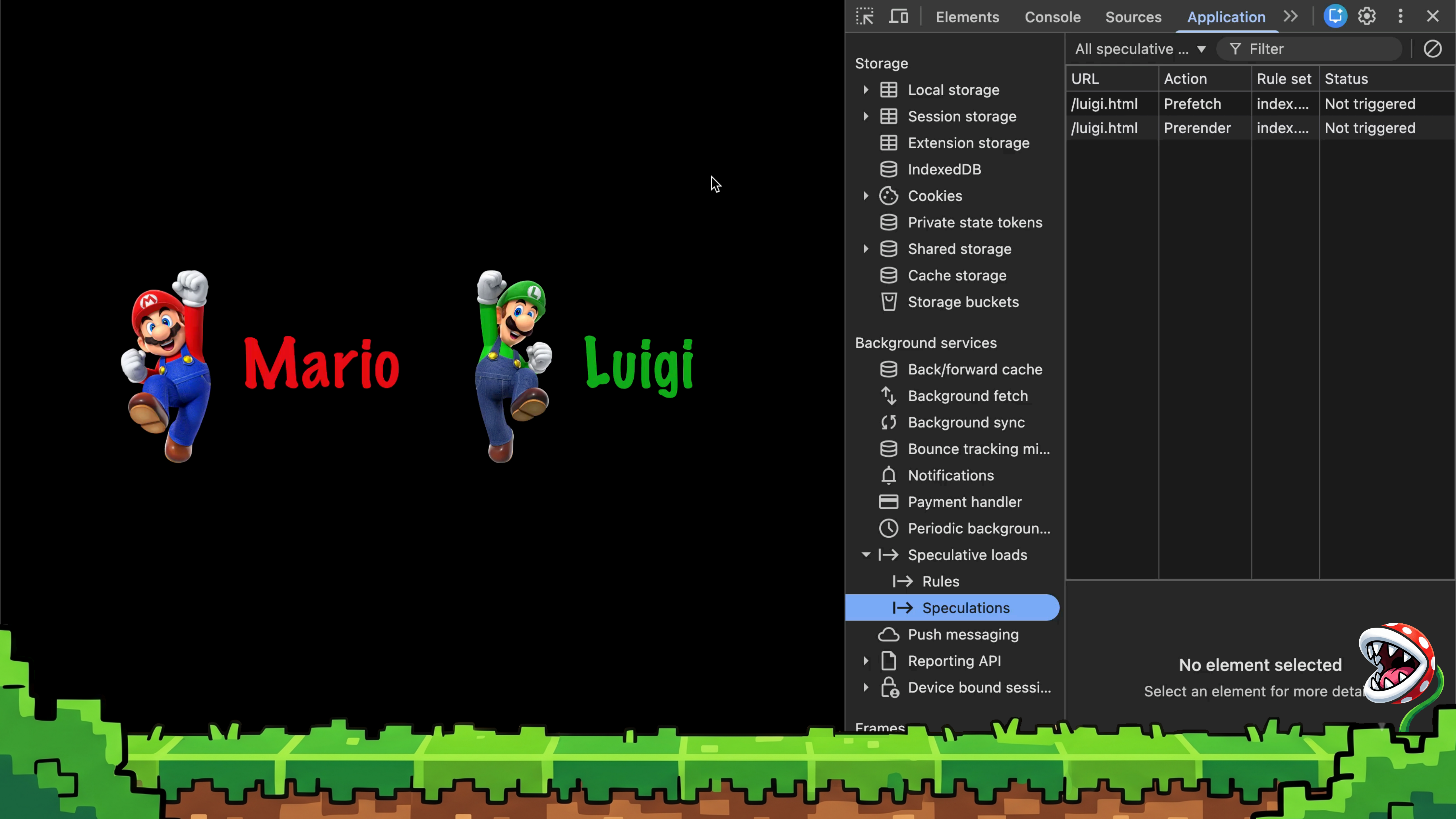
Next steps

Field metrics

See how your local metrics compare to real user data in the [Chrome UX Report](#).

Set up





Mario



Luigi

ElementsConsoleSourcesApplication>>|

All speculative ... ▾Filter|

URL	Action	Rule set	Status
/luigi.html	Prefetch	index....	Not triggered
/luigi.html	Prerender	index....	Not triggered

Storage

- Local storage
- Session storage
- Extension storage
- IndexedDB
- Cookies
- Private state tokens
- Shared storage
- Cache storage
- Storage buckets

Background services

- Back/forward cache
- Background fetch
- Background sync
- Bounce tracking mi...
- Notifications
- Payment handler
- Periodic backgroun...
- Speculative loads
 - Rules
 - Speculations
- Push messaging
- Reporting API
- Device bound sessi...

Frames

No element selected

Select an element for more details



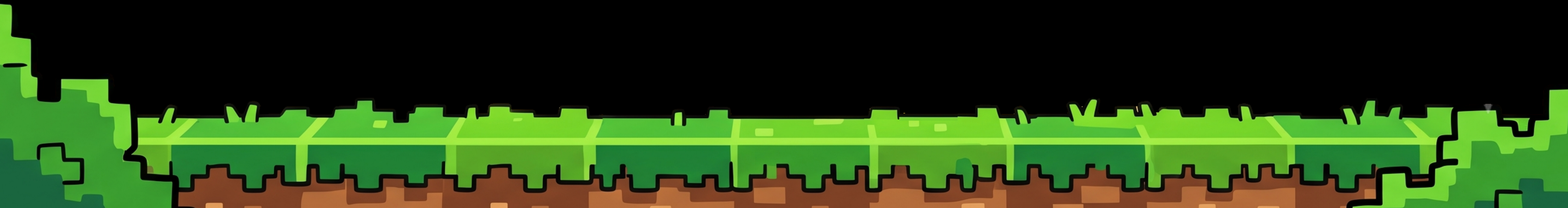
The screenshot shows the Chrome DevTools Application tab. The left sidebar is expanded to the 'Storage' panel, where 'Speculative loads' is selected. The main pane displays a table of speculative loads. The table has four columns: 'URL', 'Action', 'Rule set', and 'Status'. Two entries are visible: one for '/luigi.html' with a 'Prefetch' action and 'index...' rule set, and another for '/luigi.html' with a 'Prerender' action and 'index...' rule set. The status for the first entry is 'Ready' and for the second is 'Not triggered'. The bottom of the screen shows the 'Frames' panel with a list of frames, including 'luigi.html' and 'index.html'.

URL	Action	Rule set	Status
/luigi.html	Prefetch	index...	Ready
/luigi.html	Prerender	index...	Not triggered

No element selected
Select an element for more details

Prerender JavaScript

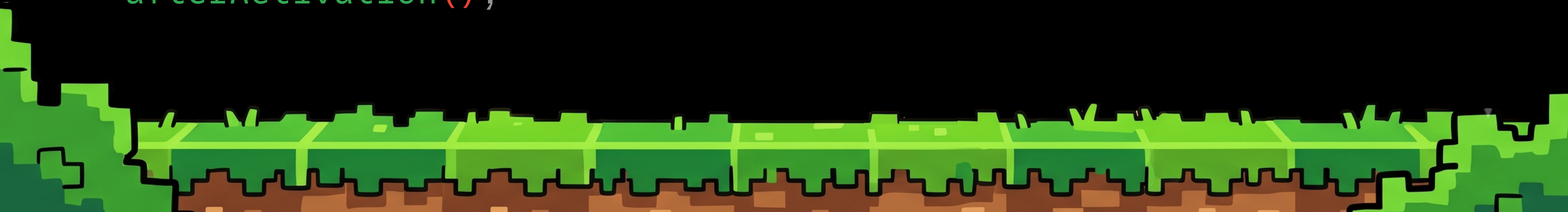
This can completely mess up your analytics by counting fake visits instead of real people, making it impossible to know how many actual humans are visiting your site, where they are from, or what they are really clicking on.



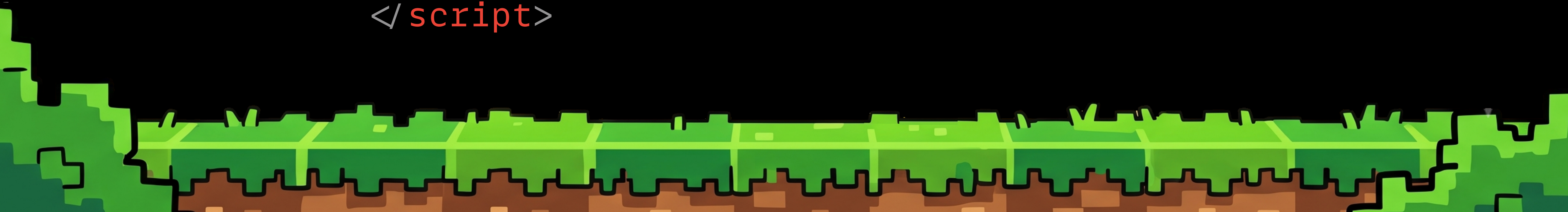

```
const isActivated = new Promise((resolve) => {  
  if (document.prerendering) {  
    document.addEventListener("prerenderingchange",  
                               resolve, { once: true });  
  } else {  
    resolve();  
  }  
});
```

```
async function afterActivation() {  
  await isActivated;  
  // initialise your analytics, ad services, etc.  
}
```

```
afterActivation();
```



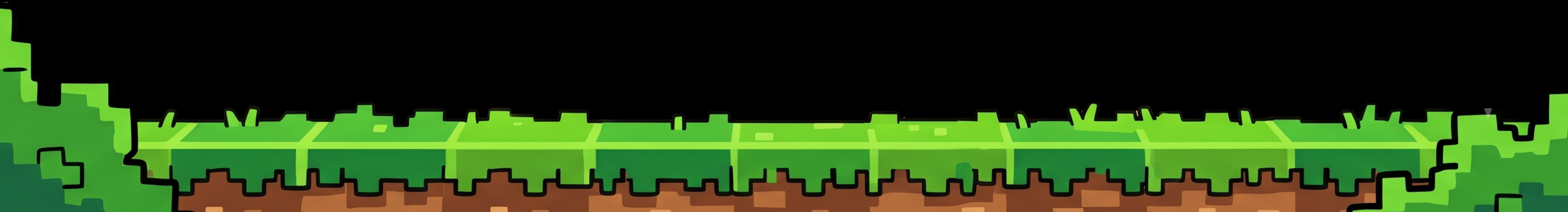

```
<script type="speculationrules">
{
  "prefetch": [
    {
      "where": { "href_matches": "/*" },
      "eagerness": "eager"
    }
  ],
  "prerender_until_script": [
    {
      "where": { "href_matches": "/*" },
      "eagerness": "moderate"
    }
  ]
}
</script>
```



async and defer

`<script>` elements without `async` or `defer` pause parsing

Put them just before `</body>`, not in `<head>`



Add speculation rules via JS

```
const scriptElement = document.createElement("script");
scriptElement.type = "speculationrules";
const speculationRules = {
  prerender: [
    {
      urls: ["princes-peach.html"],
    },
  ],
};
scriptElement.textContent = JSON.stringify(speculationRules);
document.body.append(scriptElement);
```



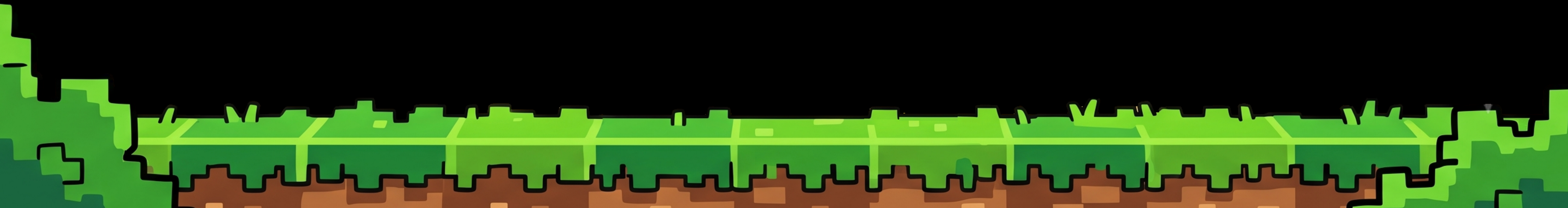
No Speculation

Save-Data

Low memory

Energy saver

Cross-origin iframes



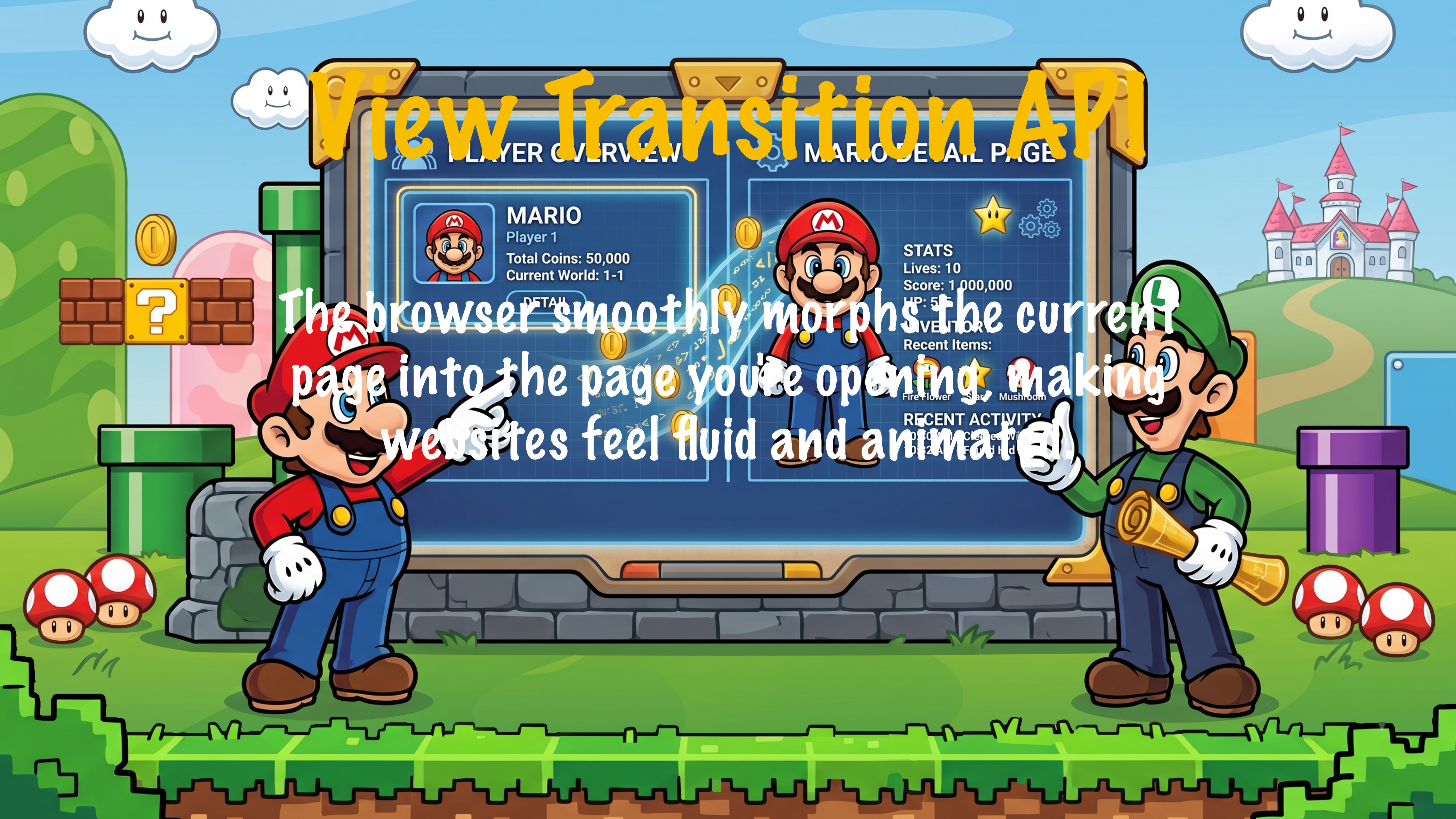
[illegible]

26.2

December 2025

View Transition API

The browser smoothly morphs the current page into the page you're opening, making websites feel fluid and animated.

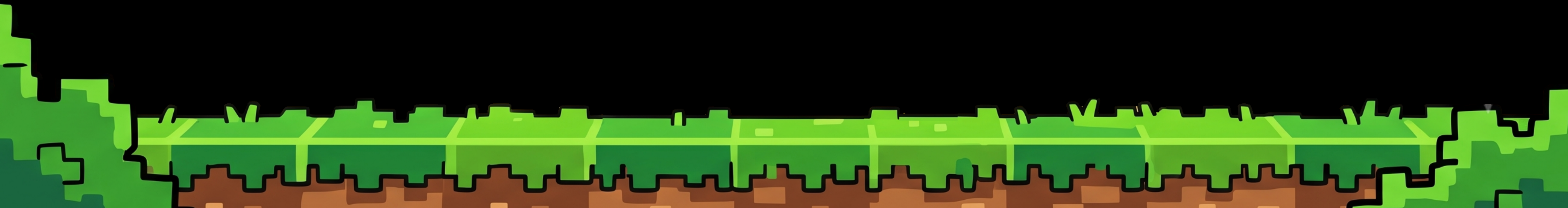


Cross-document MPA

MPA is a stupid word for website

Full page load from server (no SPA)

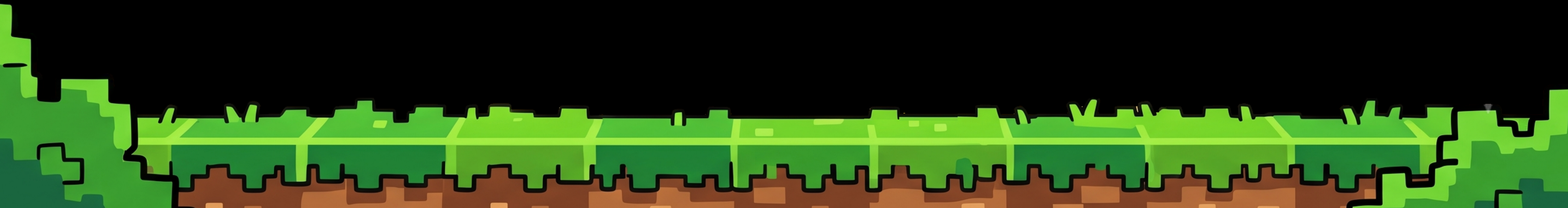
Same-origin navigation only



Same-origin

https://www.example.com:443

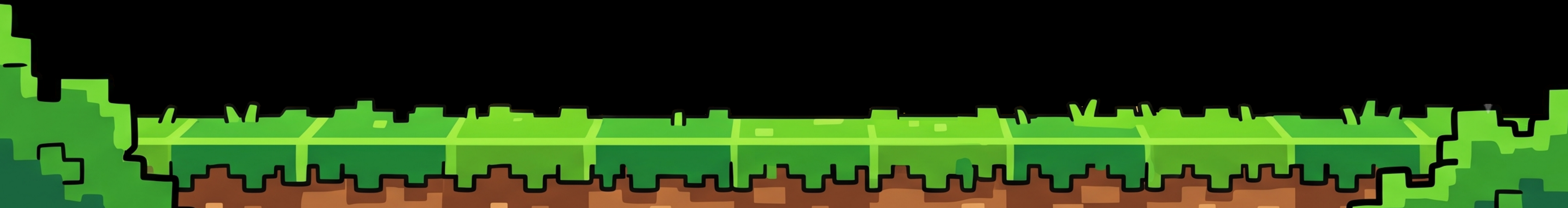
scheme hostname port



@view-transition

Default transition is cross-fade

Both pages need to opt-in



Opt-in

```
@view-transition {  
  navigation: auto;  
}
```





Mario



Luigi

1Main

ElementsConsoleSources

<!DOCTYPE html>
<html lang="en">
 <head>
 </head>
 <body>
 <main>
 <!-- Code injected by live-server -->
 <script type="text/javascript">
 </script>
 </body>
 </html>

htmlbody

StylesComputedLayoutEvent ListenersDOM breakpointsProperties

Filter

element.style {
}

body {
 font-size: 1.25rem;
 font-family: "Marker Felt", sans-serif;
 background-color: rgb(0, 0, 0);
 color: rgb(255, 255, 255);
 line-height: 1.8;
}

body {
 display: block;
 margin: 8px;
}

margin 8
border 0
padding 0





Mario



Luigi

1Main

ElementsConsoleSources

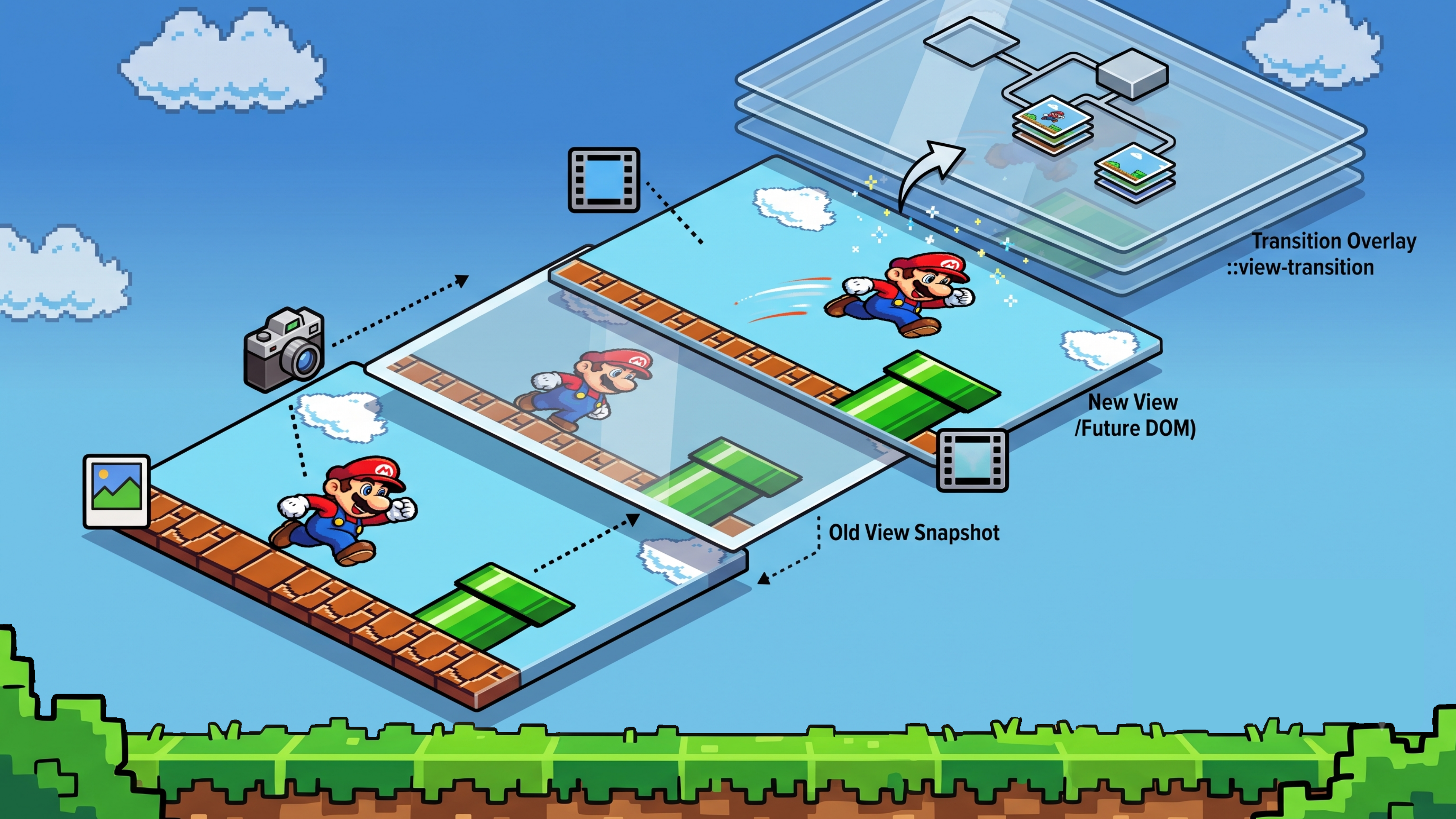
<!DOCTYPE html>
<html lang="en">
 <head>
 </head>
 <body>
 <main>
 <!-- Code injected by live-server -->
 <script type="text/javascript">
 </script>
 </body>
 </html>

htmlbody

StylesComputedLayoutEvent ListenersDOM breakpointsProperties

Filter(*) :hov .cls +
element.style {
}
body {
 font-size: 1.25rem;
 font-family: "Marker Felt", sans-serif;
 background-color: rgb(0, 0, 0);
 color: rgb(255, 255, 255);
 line-height: 1.8;
}
body {
 display: block;
 margin: 8px;
}

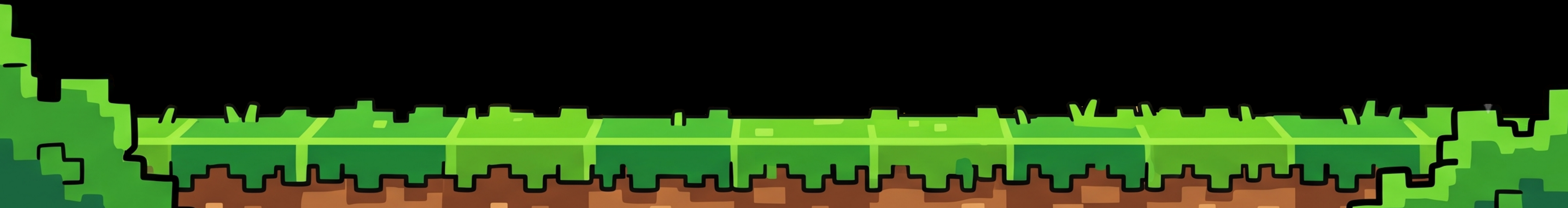
margin 8
border 0
padding 0



view-transition-name

Animate specific elements

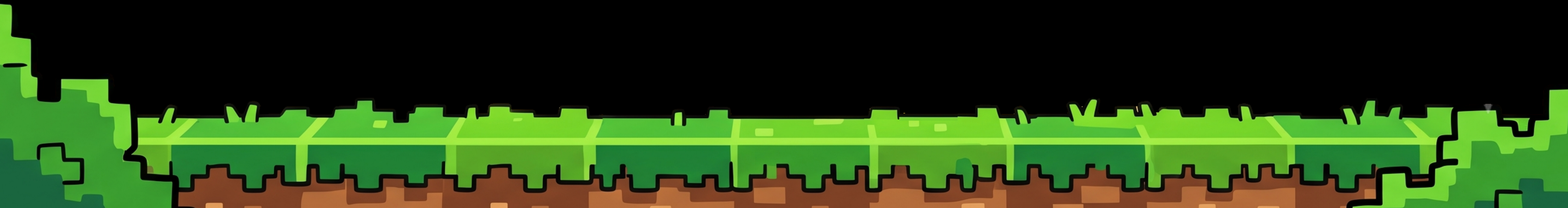
Both pages need to opt-in




```

```

```
<a class="luigi" href="luigi.html">Luigi</a>
```




```

```

```
<a class="luigi" href="luigi.html">Luigi</a>
```

```
@view-transition {  
  navigation: auto;  
}
```

```
a.luigi {  
  view-transition-name: luigi-text;  
}
```

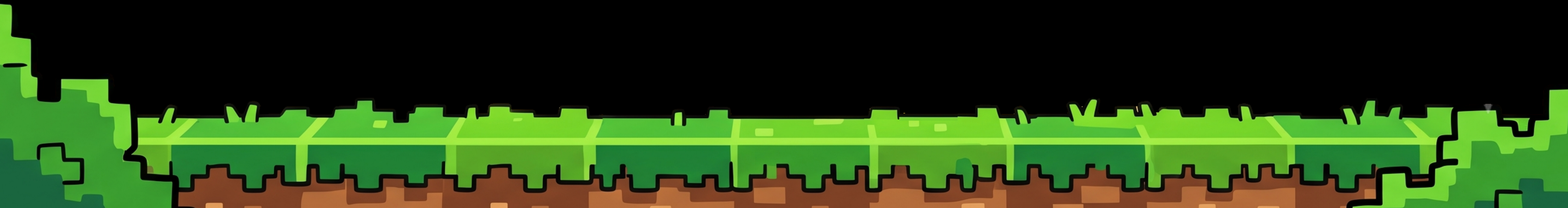
```
img.luigi {  
  view-transition-name: luigi-image;  
}
```



```

```

```
<h1 class="luigi">Luigi</h1>
```




```

```

```
<h1 class="luigi">Luigi</h1>
```

```
@view-transition {  
  navigation: auto;  
}
```

```
h1 {  
  view-transition-name: luigi-text;  
}
```

```
img {  
  view-transition-name: luigi-image;  
}
```





Mario



Luigi



Elements

Console

>>

1

Main

html

body

Styles

Computed

Layout

Event Listeners

DOM breakpoints

>>

Filter

(*)

:hov

.cls

+

element.style {

}

body {

font-size: 1.25rem;

font-family: "Marker Felt", sans-serif;

background-color: rgb(0, 0, 0);

color: rgb(255, 255, 255);

line-height: 1.8;

}

body {

display: block;

margin: 8px;

}

style.css:9

user agent stylesheet

margin 8

border 0

padding 0

8 0 0 1018x720.898 0 0 8

Console

AI assistance

Issues

Animations

100%

25%

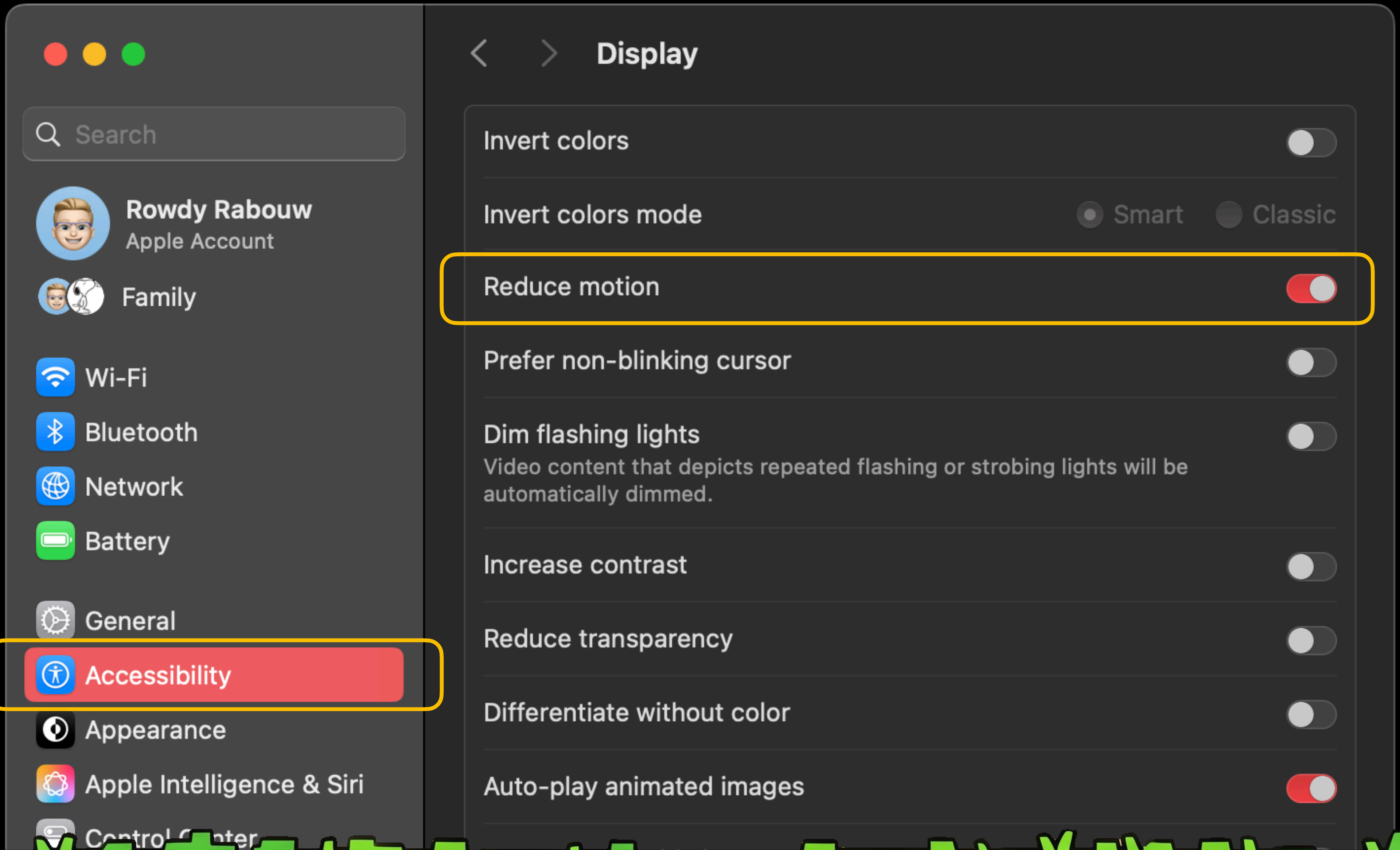
10%

0 ms

No animation effect selected

Select an effect above to inspect and modify







Settings

Gebruiker

Local Account

Home

System

Bluetooth & devices

Network & internet

Personalisation

Apps

Accounts

Time & language

Gaming

Accessibility

Privacy & security

Find a setting

Accessibility > Visual effects

Always show scrollbars

Off

Transparency effects

Make some window backgrounds slightly transparent

On

Animation effects

Off

Dismiss notifications after this amount of time

5 seconds

Related settings

Display

Monitors, brightness, night light, display profile

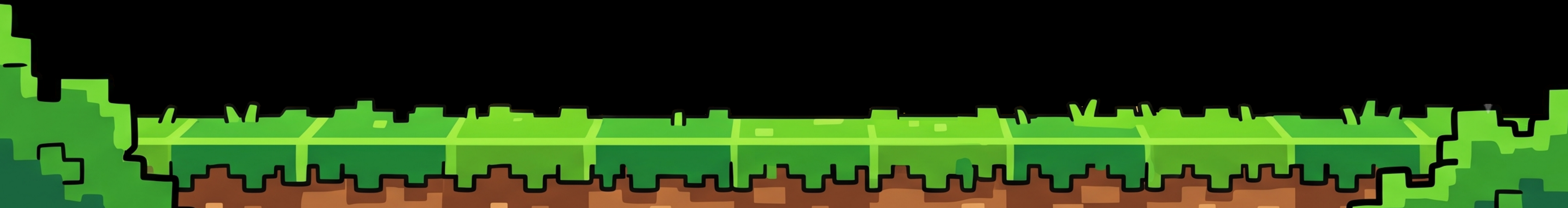
Notifications

App and system notifications

prefers-reduced-motion

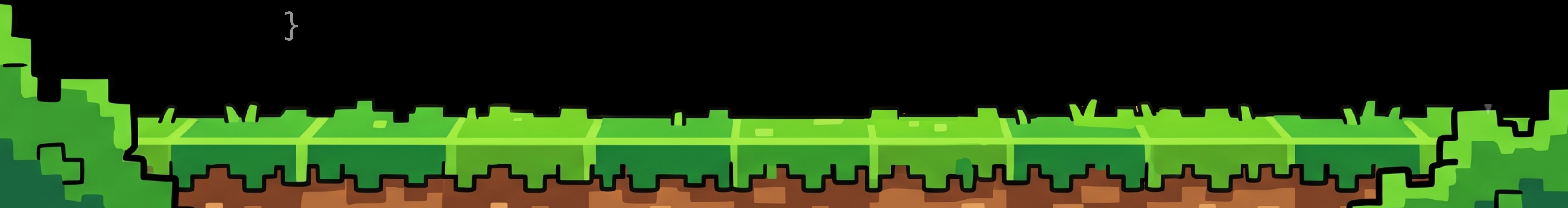
```
@media (prefers-reduced-motion: reduce) {  
  /* less motion for users who prefer reduced motion */  
}
```

```
@media (prefers-reduced-motion: no-preference) {  
  /* normal motion for users who do not prefer reduced motion */  
}
```




```
@view-transition {  
  navigation: auto;  
}
```

```
@media (prefers-reduced-motion: no-preference) {  
  
  a.luigi {  
    view-transition-name: luigi-text;  
  }  
  
  img.luigi {  
    view-transition-name: luigi-image;  
  }  
  
}
```

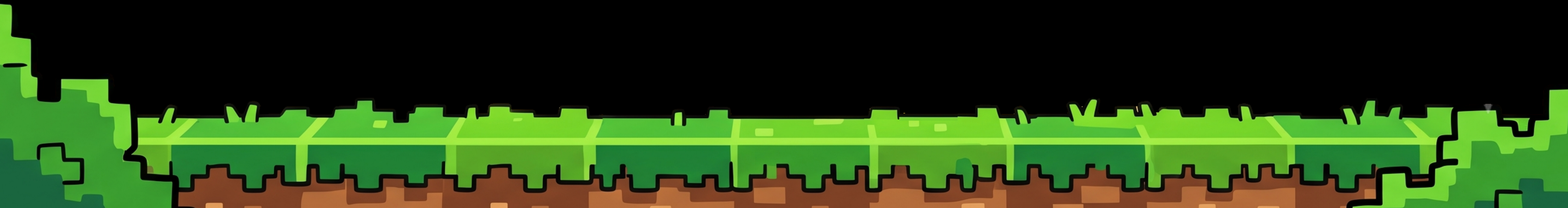



```
@view-transition {  
  navigation: auto;  
}
```

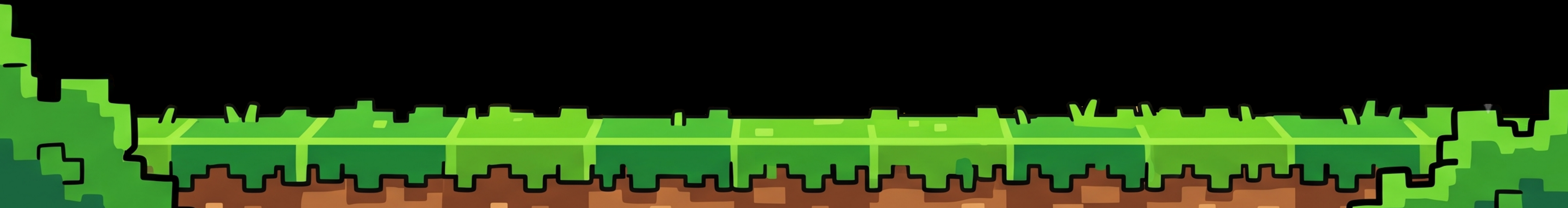
```
@media (prefers-reduced-motion: no-preference) {  
  
  h1 {  
    view-transition-name: luigi-text;  
  }  
  
  img {  
    view-transition-name: luigi-image;  
  }  
  
}
```


Overwrite default behavior

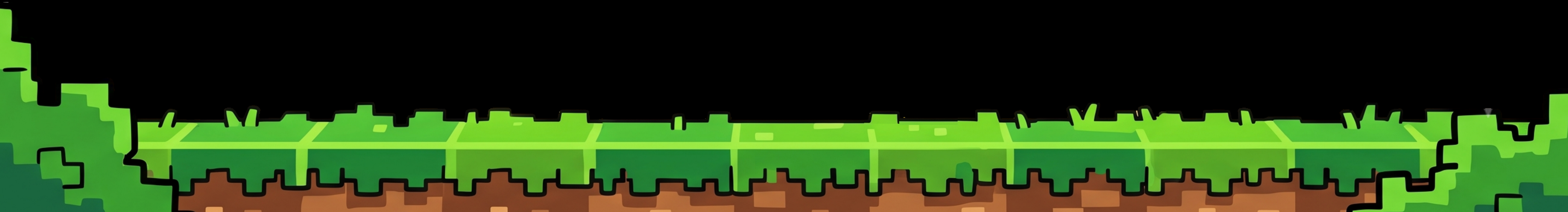
```
@view-transition {  
  navigation: auto;  
}
```




```
/* the outgoing page snapshot fading out */  
::view-transition-old(root) {  
  animation-name: -ua-view-transition-fade-out;  
  /* animates opacity from 1 to 0 */  
}  
  
/* the incoming page snapshot fading in */  
::view-transition-new(root) {  
  animation-name: -ua-view-transition-fade-in;  
  /* animates opacity from 0 to 1 */  
}
```




```
::view-transition-old(root) {  
  animation: 400ms ease-out both slide-out-to-left;  
}  
  
::view-transition-new(root) {  
  animation: 400ms ease-out both slide-in-from-right;  
}
```




```
@keyframes slide-out-to-left {  
  from {  
    transform: translateX(0);  
  }  
  to {  
    transform: translateX(-100%);  
  }  
}
```

```
@keyframes slide-in-from-right {  
  from {  
    transform: translateX(100%);  
  }  
  to {  
    transform: translateX(0);  
  }  
}
```





Mario

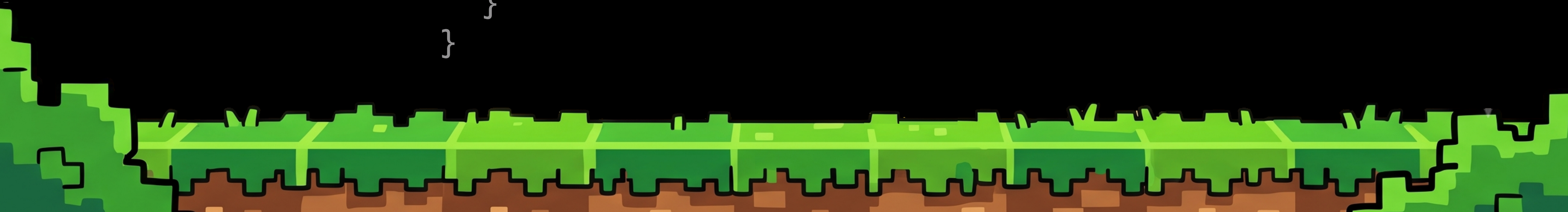


Luigi

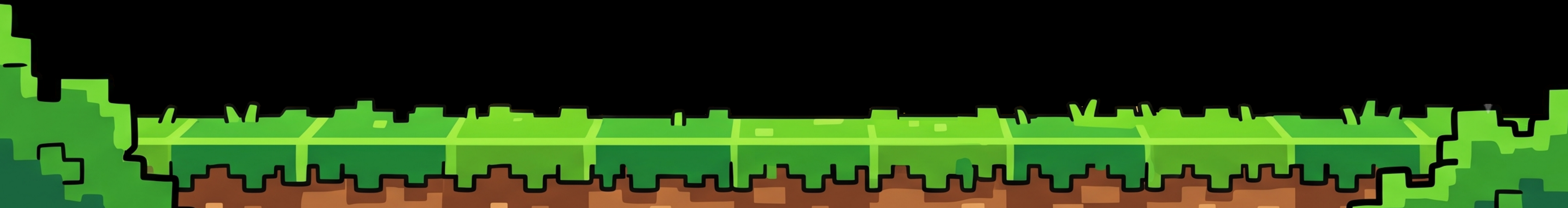



```
@keyframes slide-out-to-right {  
  from {  
    transform: translateX(0);  
  }  
  to {  
    transform: translateX(100%);  
  }  
}
```

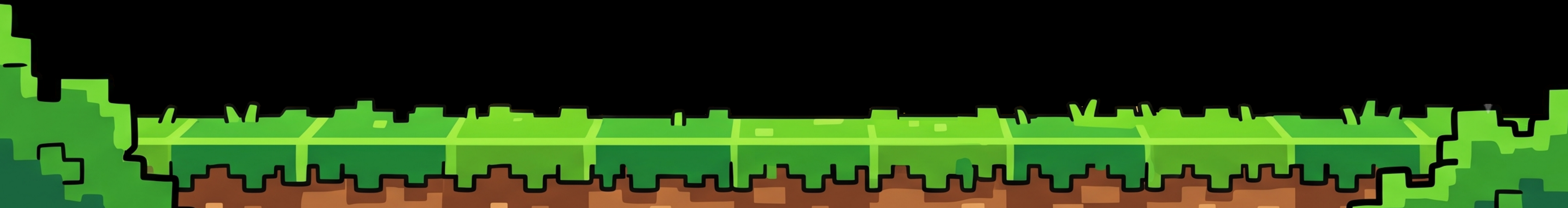
```
@keyframes slide-in-from-left {  
  from {  
    transform: translateX(-100%);  
  }  
  to {  
    transform: translateX(0);  
  }  
}
```




```
html:active-view-transition-type(back) {  
  
    &::view-transition-old(root) {  
        animation-name: slide-out-to-right;  
    }  
  
    &::view-transition-new(root) {  
        animation-name: slide-in-from-left;  
    }  
}
```

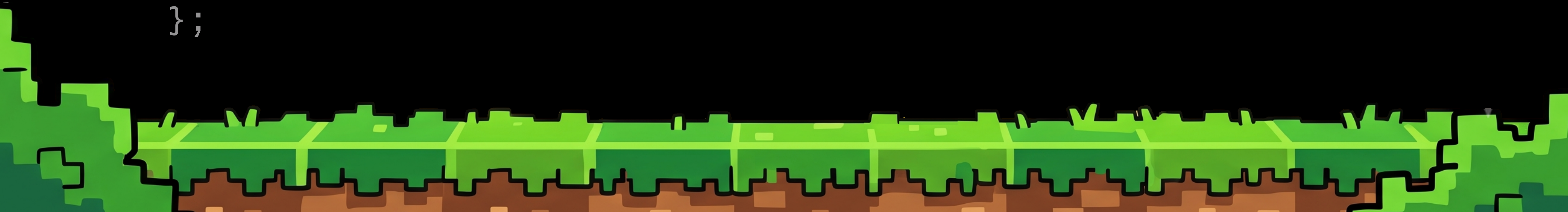



```
// fires when the new page is rendering its first frame  
window.addEventListener("pagereveal", applyTransitionType);
```




```
// fires when the new page is rendering its first frame  
window.addEventListener("pagereveal", applyTransitionType);
```

```
const applyTransitionType = (event) => {  
  if (  
    navigation.activation.from.index >  
    navigation.currentEntry.index  
  )  
  {  
    event.viewTransition.types.add("back");  
  }  
};
```




```
html:active-view-transition-type(back) {  
  
  &::view-transition-old(root) {  
    animation-name: slide-out-to-right;  
  }  
  
  &::view-transition-new(root) {  
    animation-name: slide-in-from-left;  
  }  
}
```





Mario



Luigi

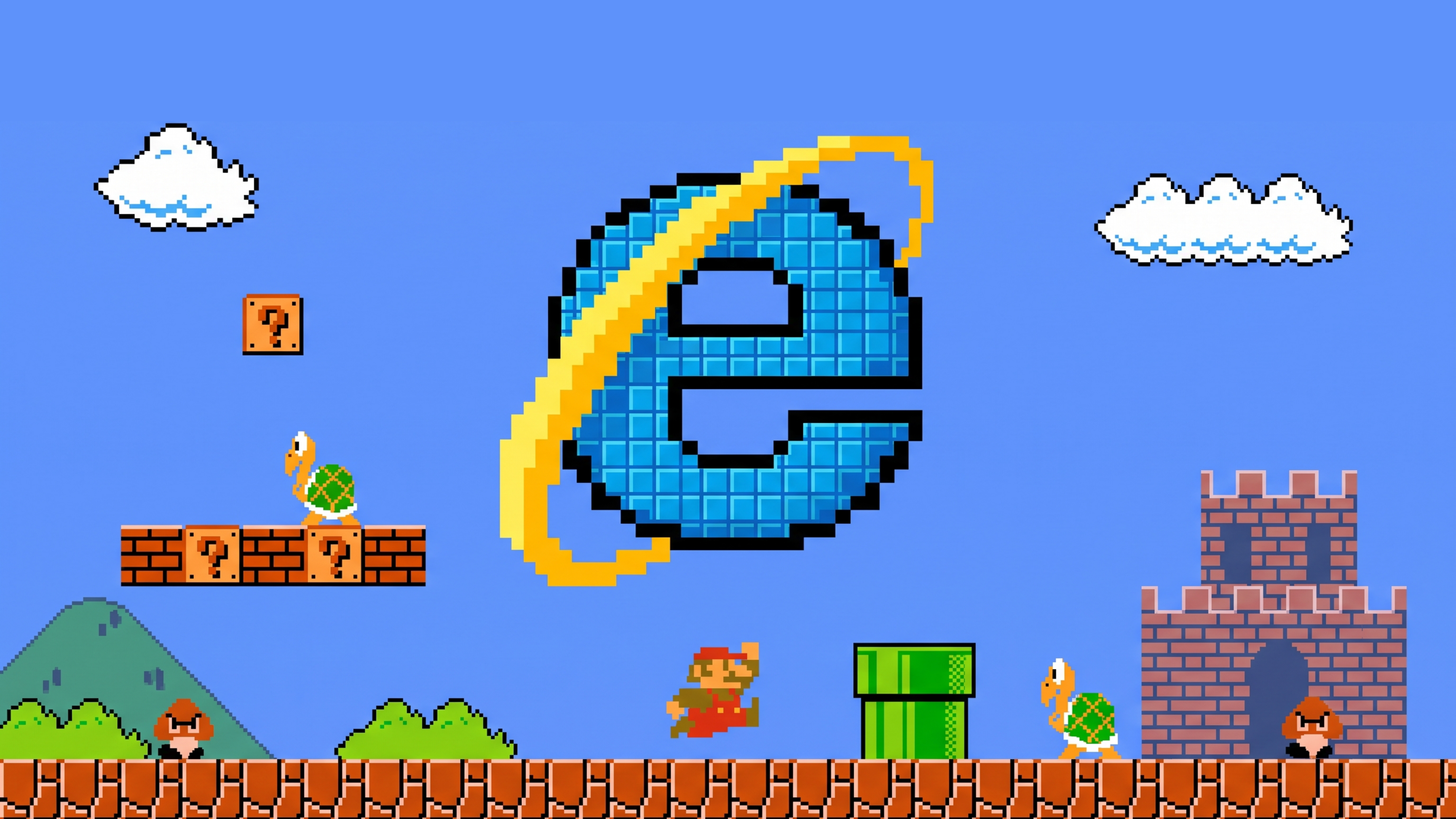


[illegible]

A circular illustration of a Super Mario Bros. fireball. The fireball is a large, glowing orange and yellow sphere with a blue brick pattern on its surface. In the center is a yellow star with a face. The fireball is surrounded by flames and has several enemies (Piranha Plants and Fire Flowers) and brick blocks on its surface.



December 2024





INTERPAGE TRANSITIONS

Transitions were implemented with meta tags placed in the head section.

The meta tag specified the transition type and whether it should occur when the new page loaded or the current page exited.



INTERPAGE TRANSITIONS

0	Box in	A rectangle shrinks towards the center
1	Box out	A rectangle expands from the center outwards
2	Circle in	A circle shrinks towards the center
3	Circle out	A circle expands from the center outwards
4	Wipe up	Horizontal wipe from bottom to top
5	Wipe down	Horizontal wipe from top to bottom
6	Wipe right	Vertical wipe from left to right
7	Wipe left	Vertical wipe from right to left
8	Vertical blinds	Blinds open vertically from left to right
9	Horizontal blinds	Blinds open horizontally from top to bottom
10	Checkerboard across	Box blinds wipe from left to right
11	Checkerboard down	Box blinds wipe from top to bottom



INTERPAGE TRANSITIONS

12	Random dissolve	A pixel fade effect (static-like dissolve)
13	Split vertical in	Vertical window opening from the middle to the sides
14	Split vertical out	Vertical window closing from the sides to the middle
15	Split horizontal in	Horizontal window opening from the middle to top/bottom
16	Split horizontal out	Horizontal window closing from top/bottom to the middle
17	Strips left down	Content revealed from the upper-left corner to the lower-right
18	Strips left up	Content revealed from the lower-left corner to the upper-right
19	Strips right down	Content revealed from the upper-right corner to the lower-left
20	Strips right up	Content revealed from the lower-right corner to the upper-left
21	Random bars horizontal	A vertical line fade effect
22	Random bars vertical	A horizontal line fade effect
23	Random	Randomly selects one of the 23 effects above



INTERPAGE TRANSITIONS

```
<meta http-equiv="Page-Enter" content="revealTrans(Duration=2.0,Transition=23)" />
```

```
<meta http-equiv="Page-Exit" content="revealTrans(Duration=2.0,Transition=23)" />
```



IE Page Transitions (MPA)

Bringing back Internet Explorer's Page Transitions thanks to the View Transition API

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Built by [Bramus](#). Just for funzies.

INTERPAGE TRANSITIONS

<https://page-transitions.style>

<https://github.com/bramus/ie-page-transitions>



Bramus

Google Chrome Developer Relations





rowdy.codes/codemotion