Teach Your Bundler Users' Habits

twitter.com/mgechev

github.com/mgechev

blog.mgechev.com

rhyme

Minko Gechev

mgechev

Functional time traveler.

California, USA

http://blog.mgechev.com/

Organizations

Overview | Repositories 229 | Stars 98 | Followers 4k

angular-style-guide

Set of best practices for Angular application development

5k 744

angular-seed

Modular starter project for Angular 2 (and beyond) with statically typed build and AoT compilation

TypeScript 4.5k 1.7k

codelyzer

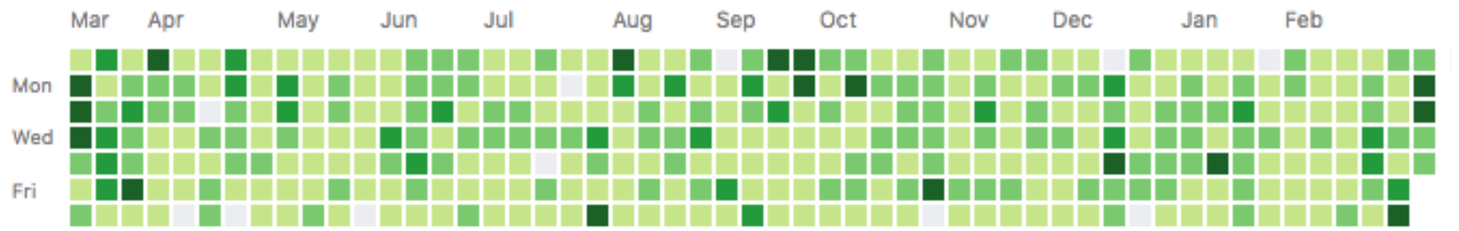
Linting for Angular projects.

TypeScript 1.5k 145

angular/mobile-toolkit

JavaScript implementation of different computer science algorithms.

TypeScript 1,104 150



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Minko Gechev
Foreword by Miško Hevery, Creator of AngularJS and Angular
Switching to Angular
Third Edition
Align with Google's long-term vision for Angular versi
and beyond
Minko Gechev

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ML-driven bundling

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Data-driven bundling

~~ML-driven bundling~~

~~Teach Your Bundler Users' Habits~~

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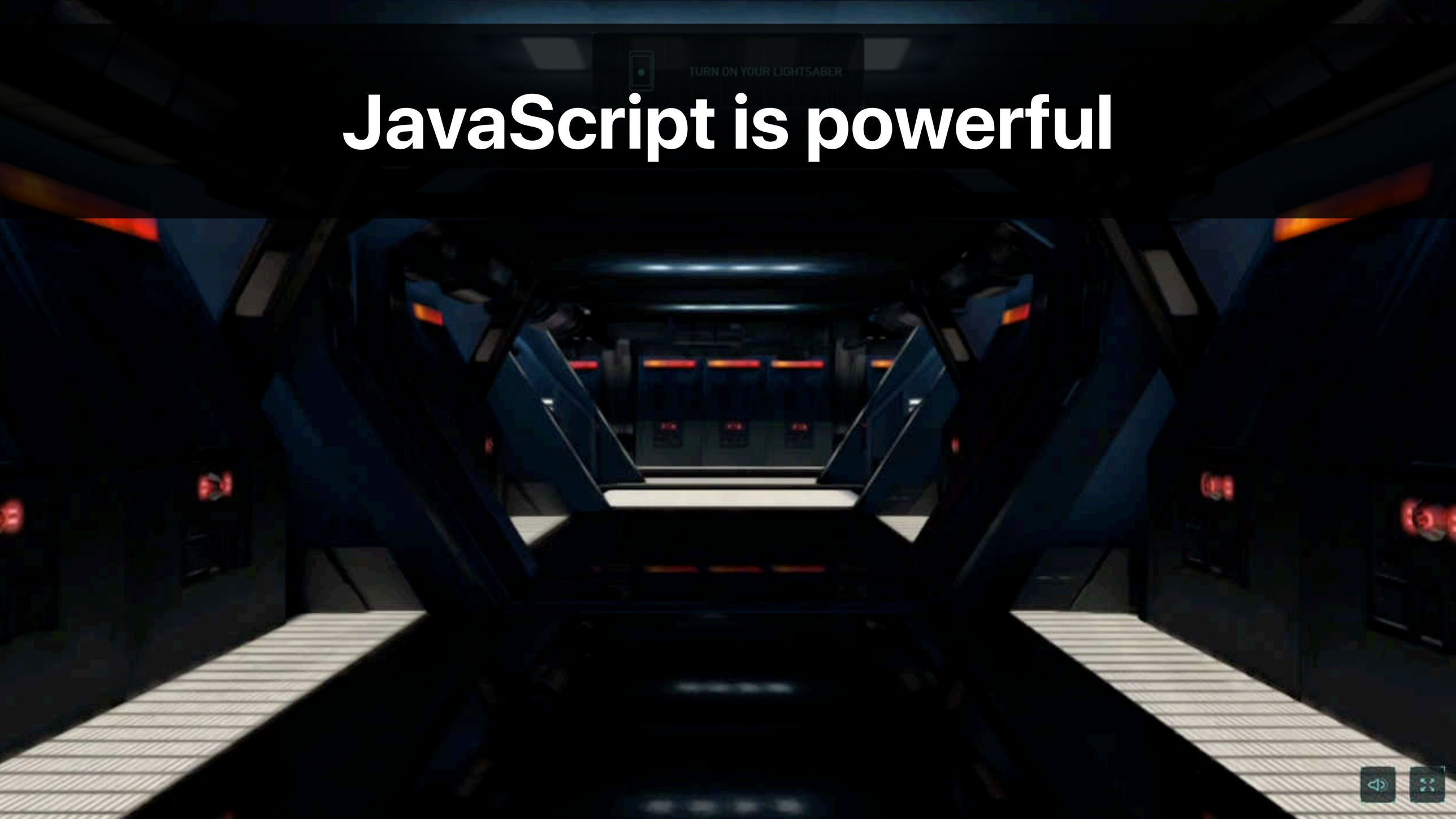
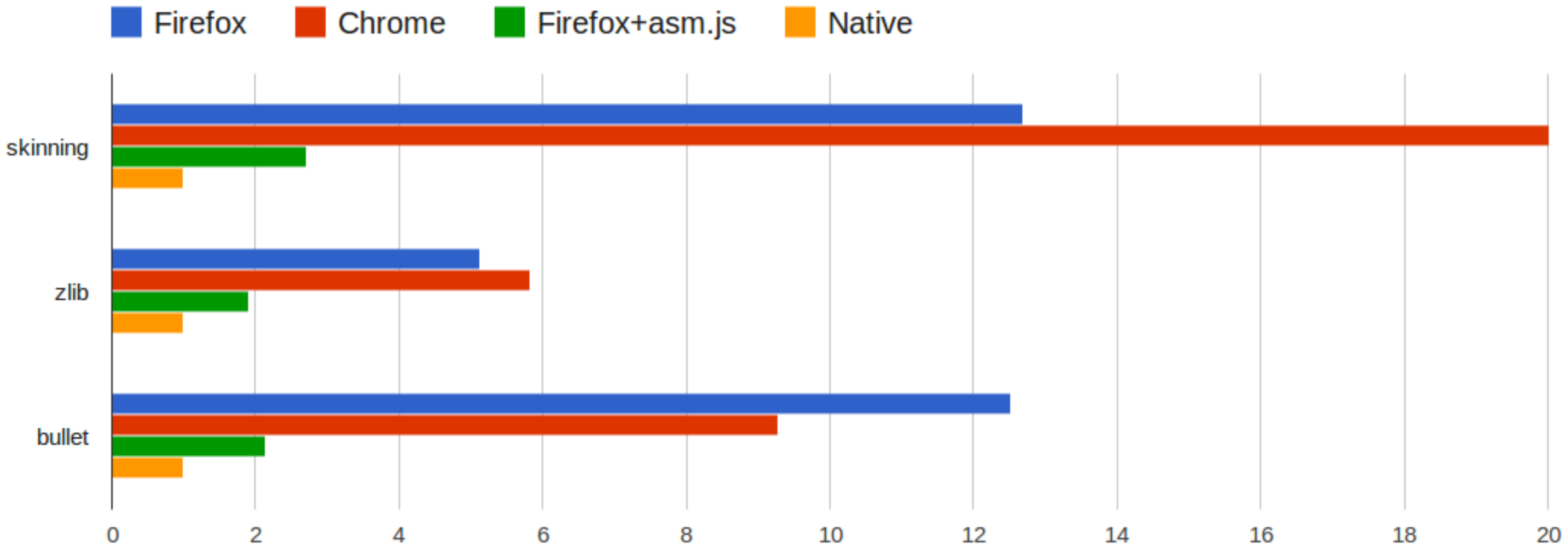
JavaScript is powerful



comparable to native



Run time normalized to Native (clang -O2), lower values are better

Everything comes with a price tag

ronan cremin
@xbs

Follow

In about 7 months average web page size will be same as Doom install image.

Well done us! Onwards & upwards!

6:48 PM - 30 Jul 2015

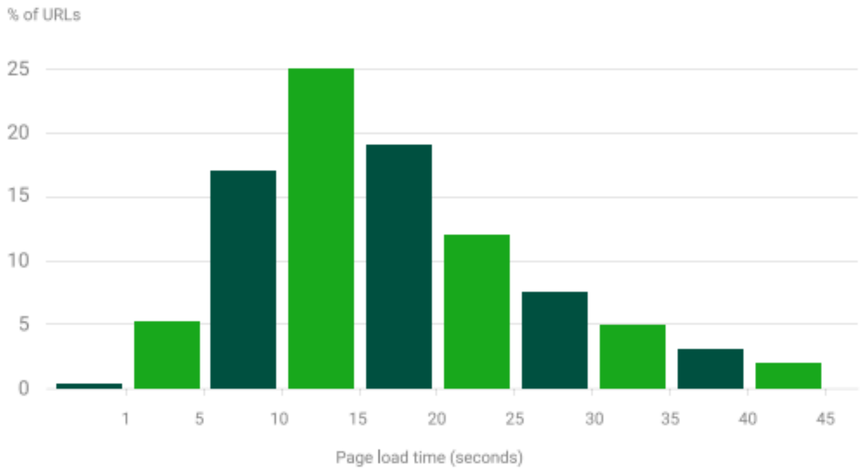
77% of mobile sites take longer than 10 seconds to load on 3G networks

19 seconds is the average load time for mobile sites on 3G networks

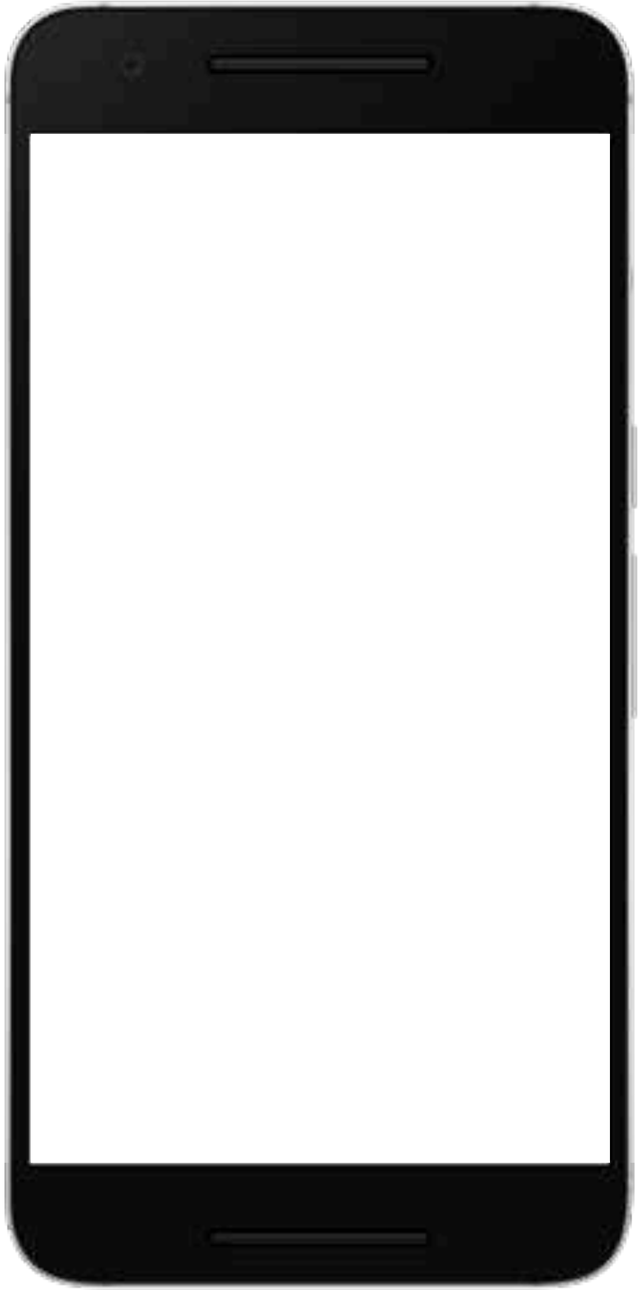
Measuring mobile sites

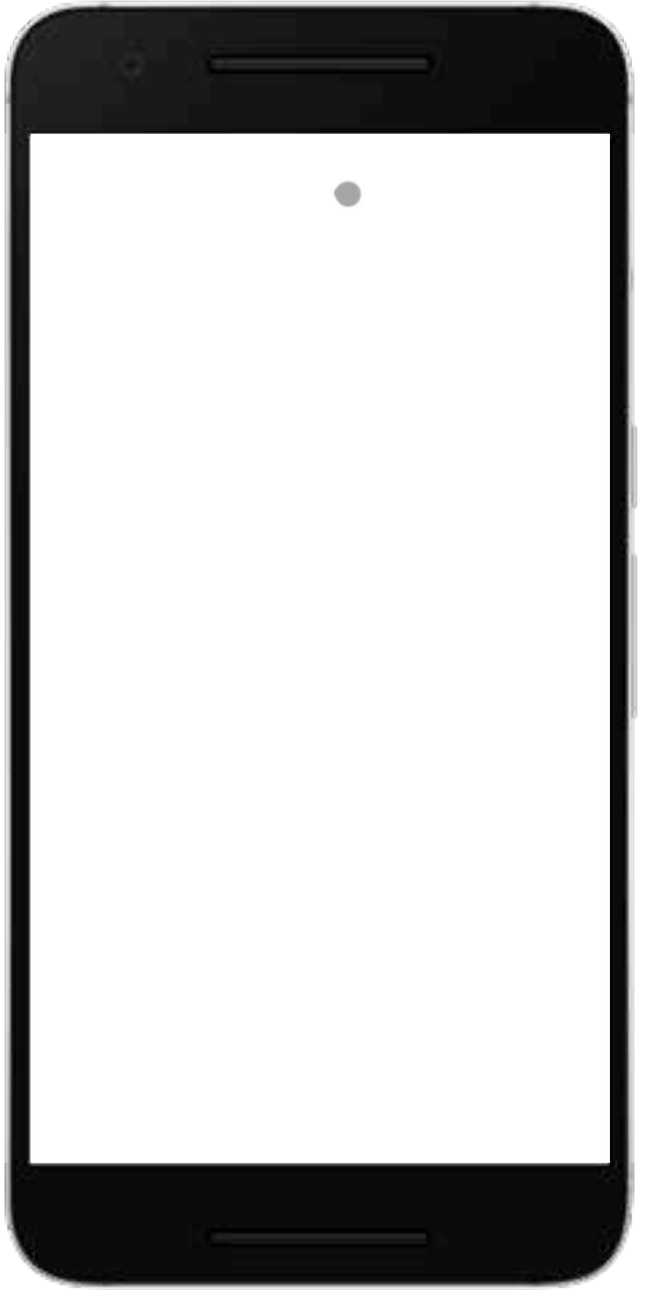
You could finish washing your hands faster than the time it takes most sites to load on a 3G or 4G connection.[7] Three out of four mobile sites we analyzed took 10 seconds or longer to load.[8] And that's just homepages. Leaf pages — which constitute the majority of web content — tend to be almost half as slow.[9]

Average load times are even slower. On 3G networks, the average load time for a homepage is 19 seconds.[10] You could go up 60 floors in one of the world's fastest elevators[11] and still be waiting for a single page to load. **On a 4G network the average time isn't much better: 14 seconds.**[12]



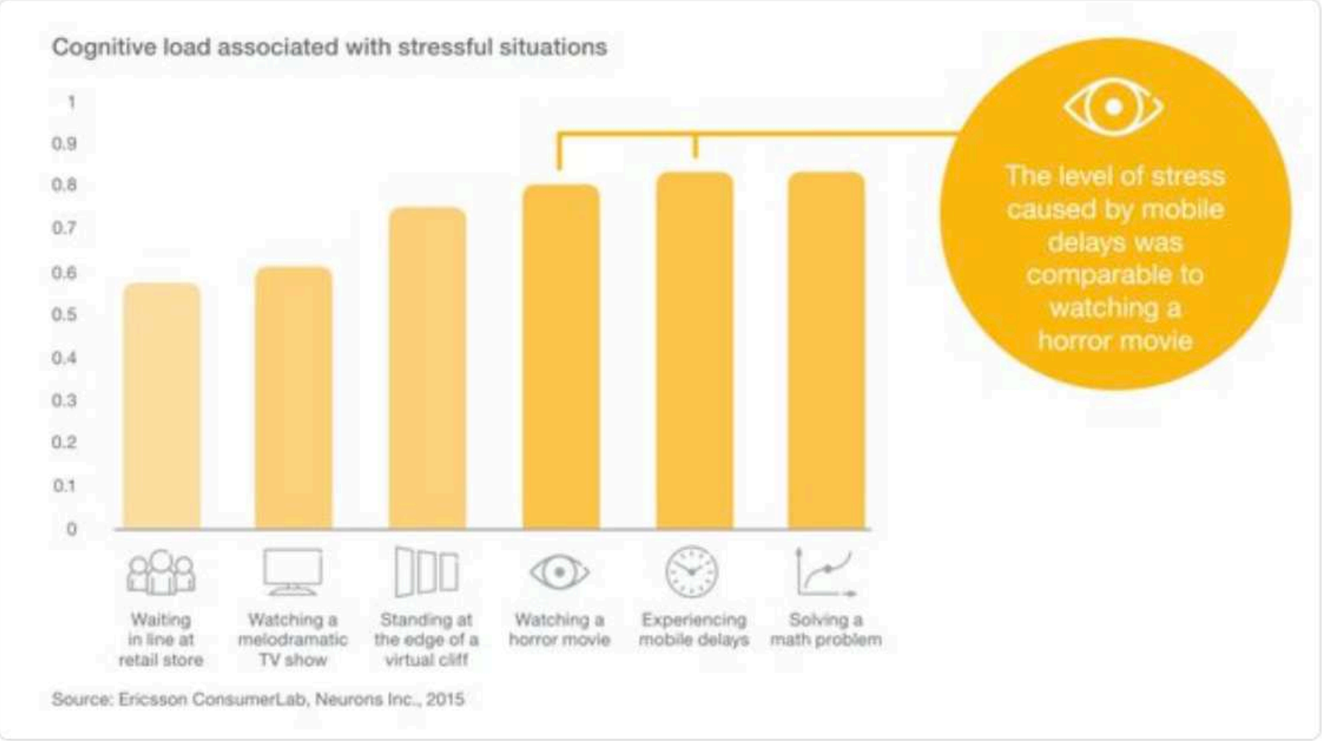
7. CBS, "95 percent of people wash their hands improperly: Are you one of them?", June 2013
8. Webpagetest.org, Sampled 11.8K global mWeb homepage domains loaded using a fast 3G connection timing first view only (no cached resources), February 2016
9. Webpagetest.org, Sampled 11.8K global mWeb homepage domains loaded using a fast 3G connection timing first view only (no cached resources), February 2016
10. Webpagetest.org, Sampled 11.8K global mWeb homepage domains loaded using a fast 3G connection timing first view only (no cached resources), February 2016
11. Business Insider, "Asian Skyscrapers Dominate A New List Of The World's Fastest Elevators", January 2013
12. Webpagetest.org, Sampled 11.8K global mWeb homepage domains loaded using a fast 3G connection timing first view only (no cached resources), February 2016





Addy Osmani
@addyosmani

Waiting for slow web pages to load is as stressful as watching a horror movie: ericsson.com/mobility-report #perfmatters



The Cost of JS

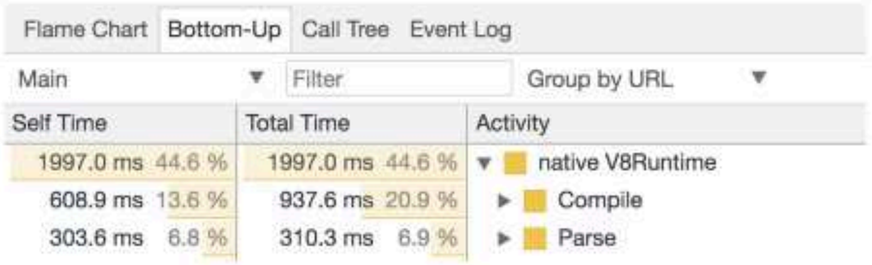
JavaScript bytes !== JPEG bytes

~170KB

~170KB

Network Transmission

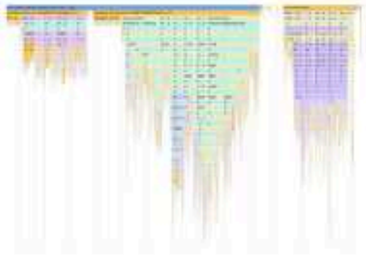
Resource Processing



~2s in Parse/Compile

0.064s in Image Decode

~1.5s in Execution

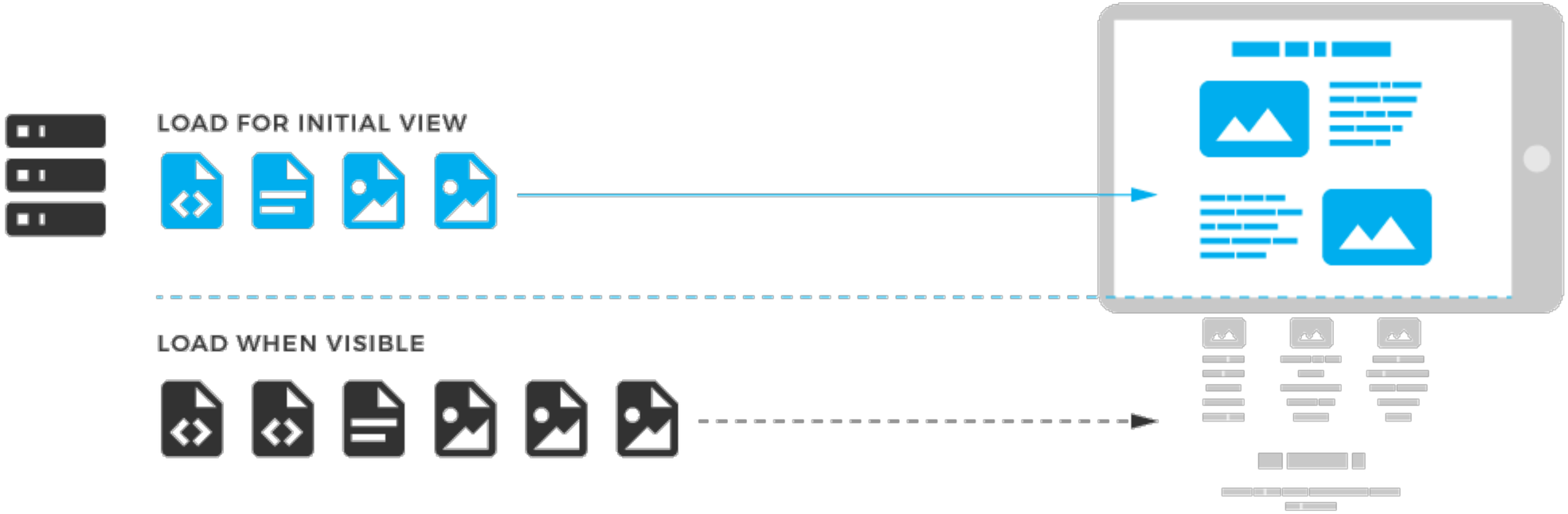


0.028s in Rasterize Paint

@addyosmani - 170KB of (compressed) JS vs. JPEG bytes over a slow 3G network on a Moto G4. JS needing parsed is even larger once decompressed.

https://medium.com/dev-channel/the-cost-of-javascript-84009f51e99e

lazy-loading

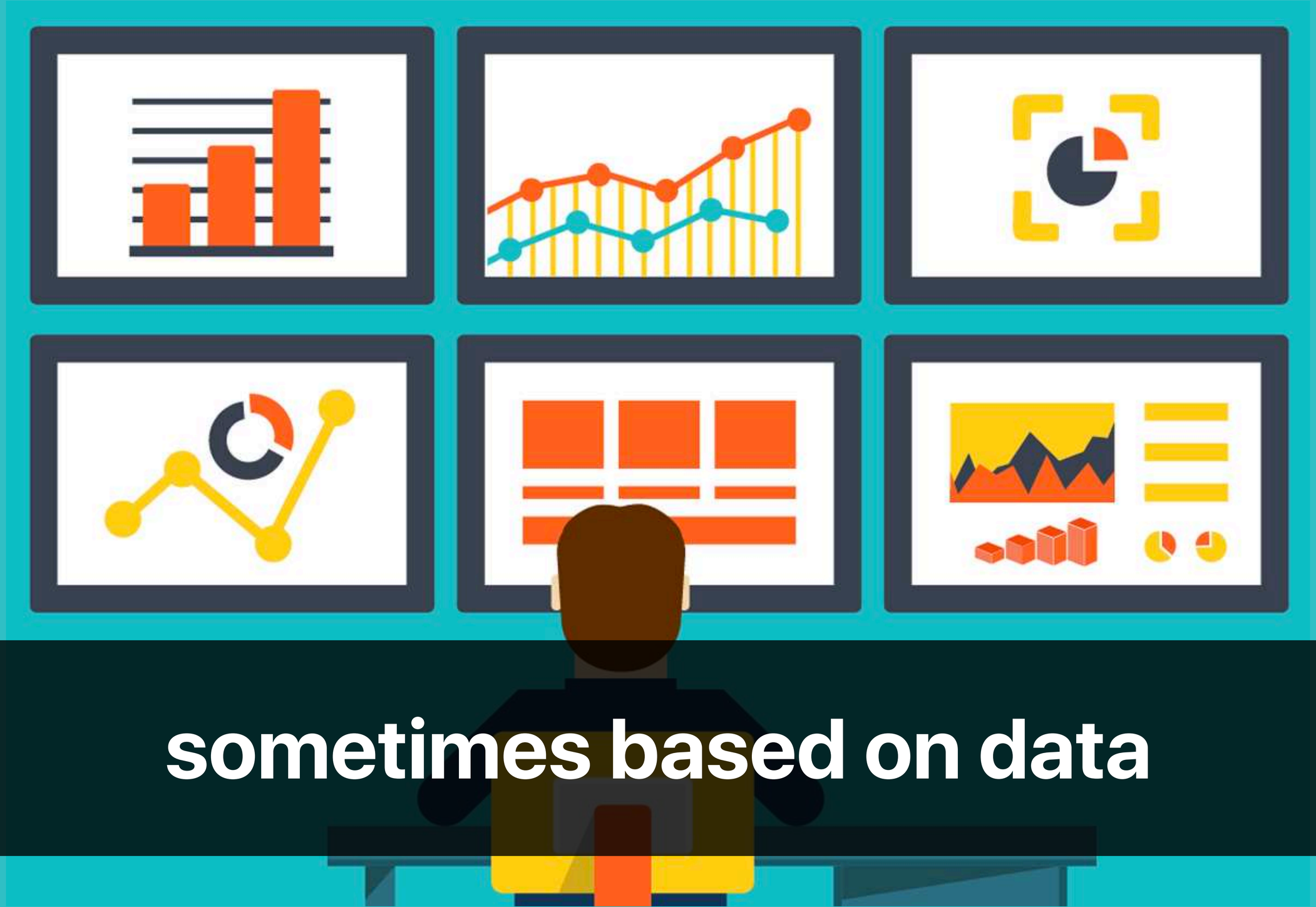


Lazy-loading strategies

- Route-Based
- Component-Based

How do we pick the split points?

often subjectively



sometimes based on data

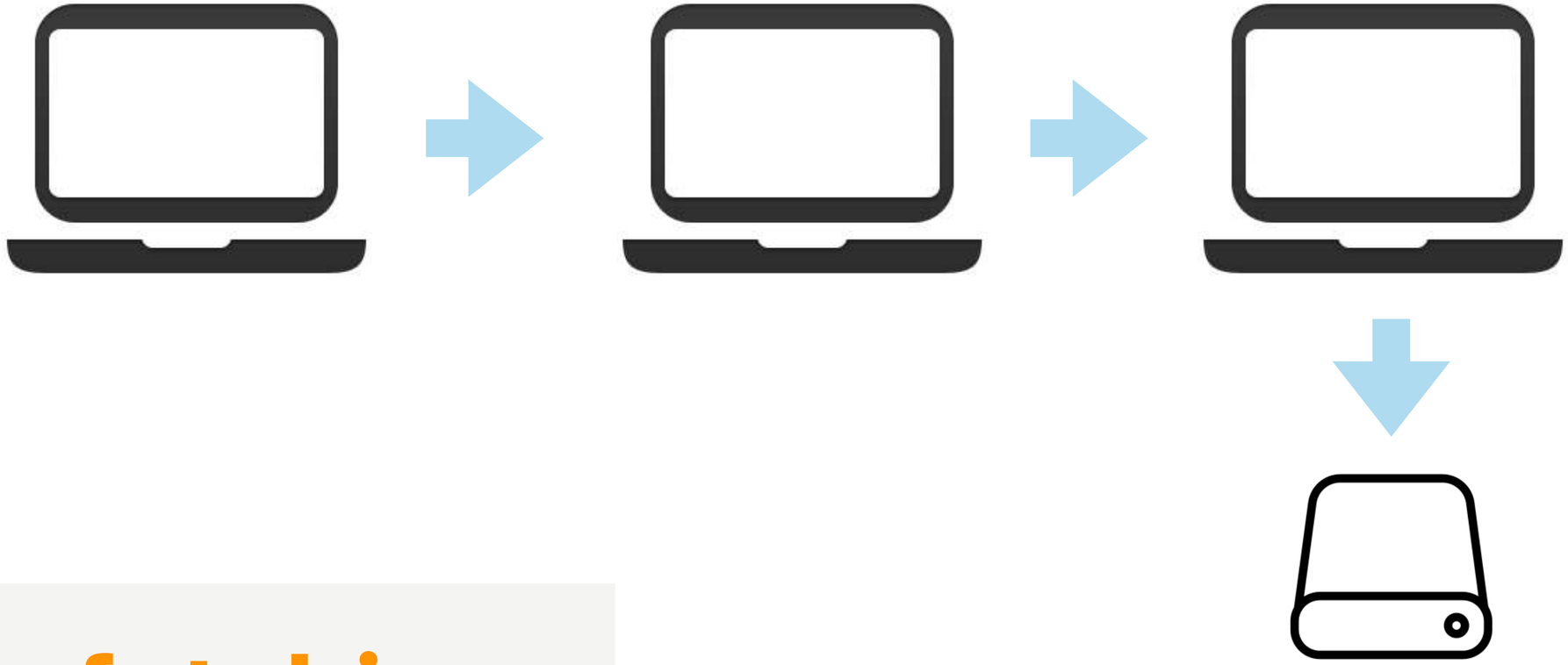
but always...

- Manual
- Error-Prone

Step 1: **Open https://example.com/**

Step 2: **Determine JavaScript which is likely to be required**

Step 3: **Download the chunks**



Step 4: **Store chunks in browser cache**

Pre-fetching

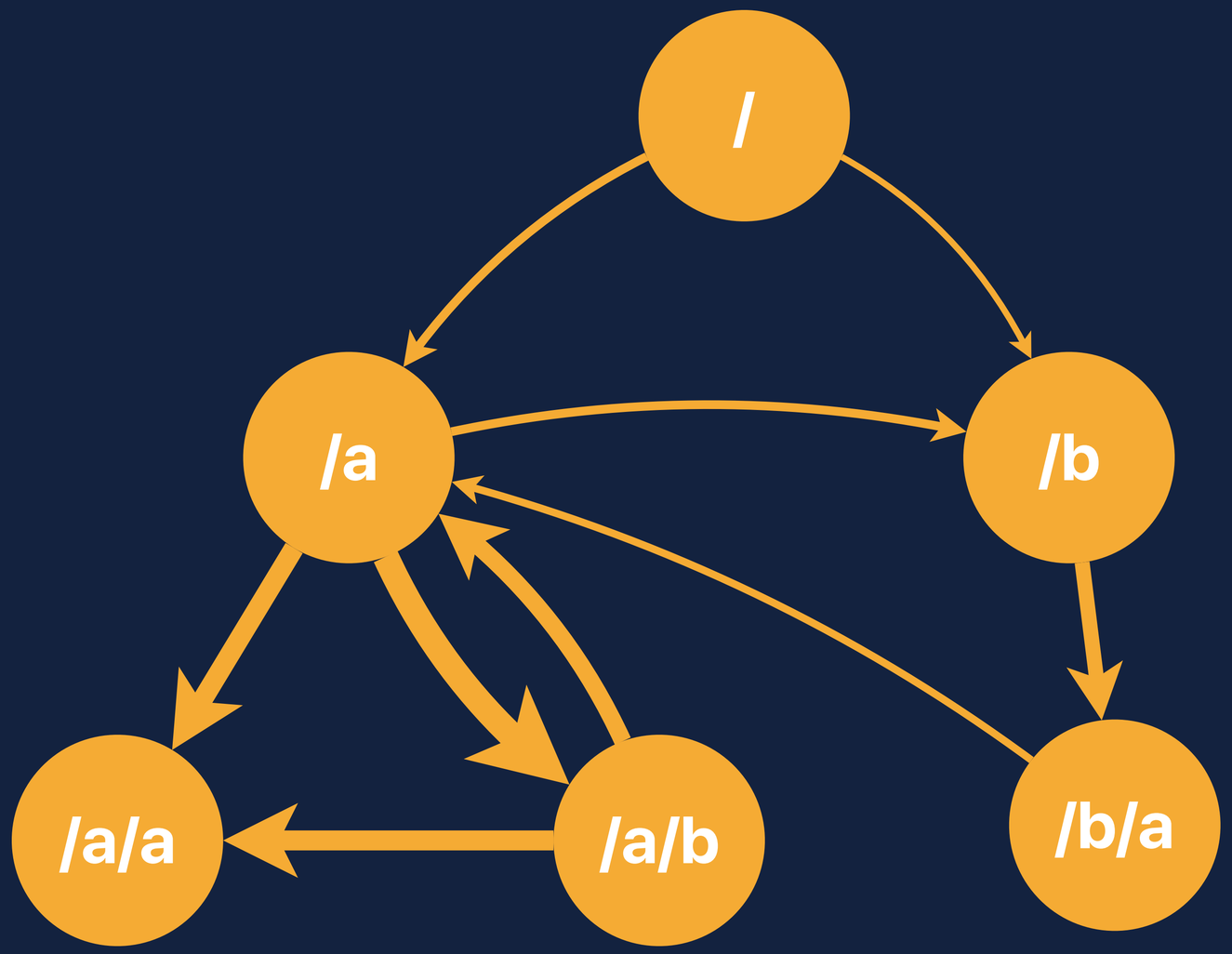
How do we pick the priorities of the bundles to pre-fetch?

Lazy-load everything!

Lazy-load everything!

...and let tooling take care of the rest

Google Analytics



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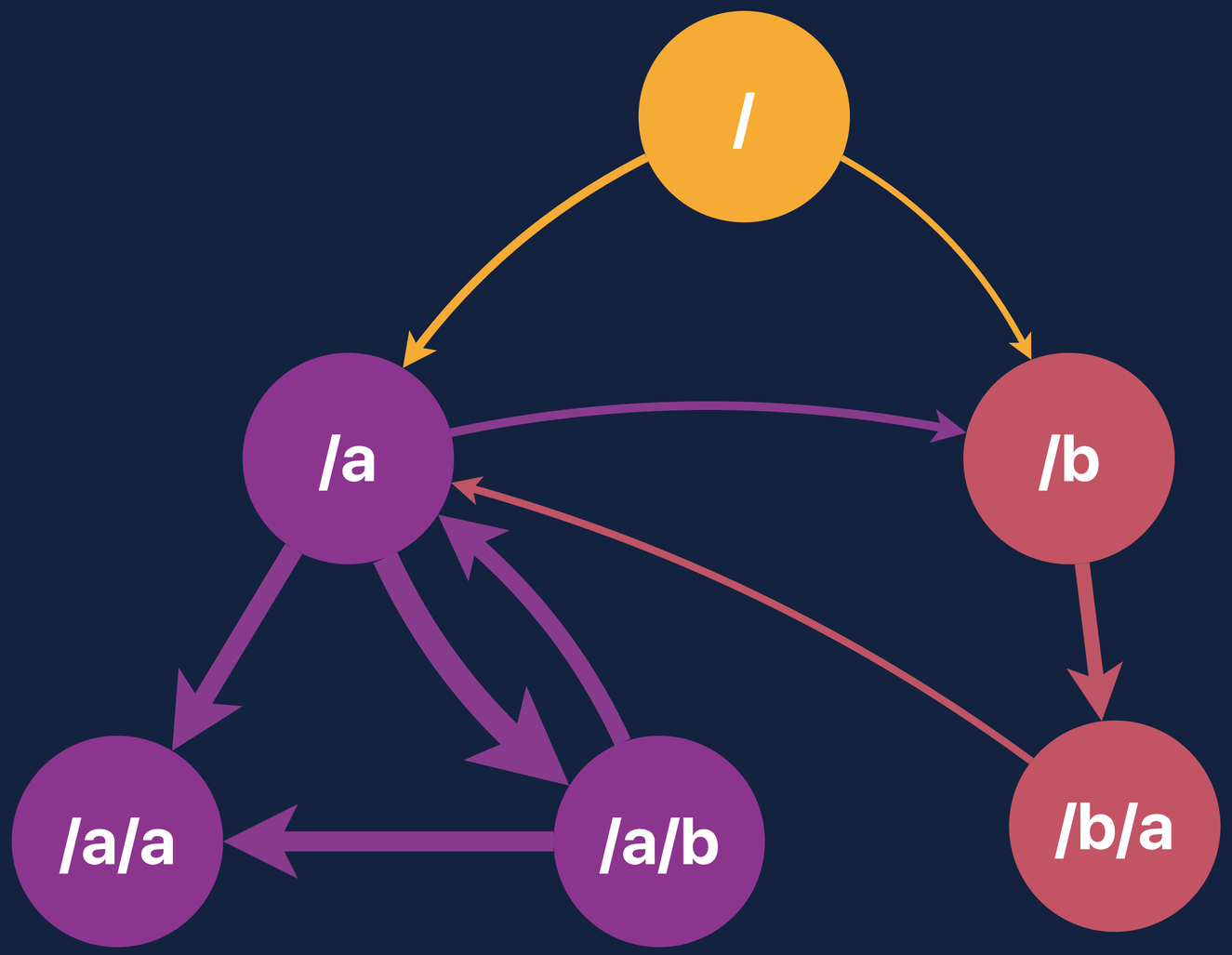
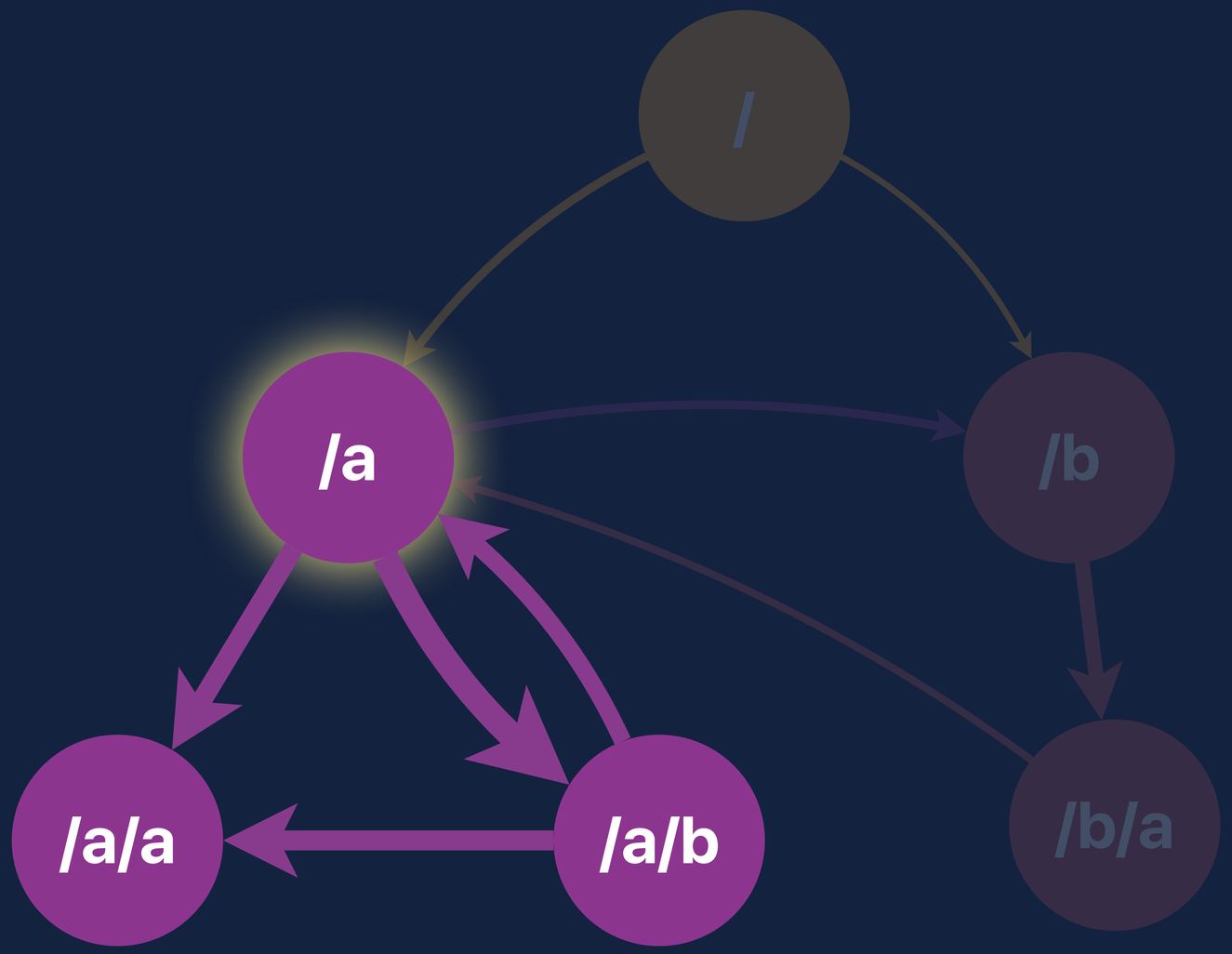
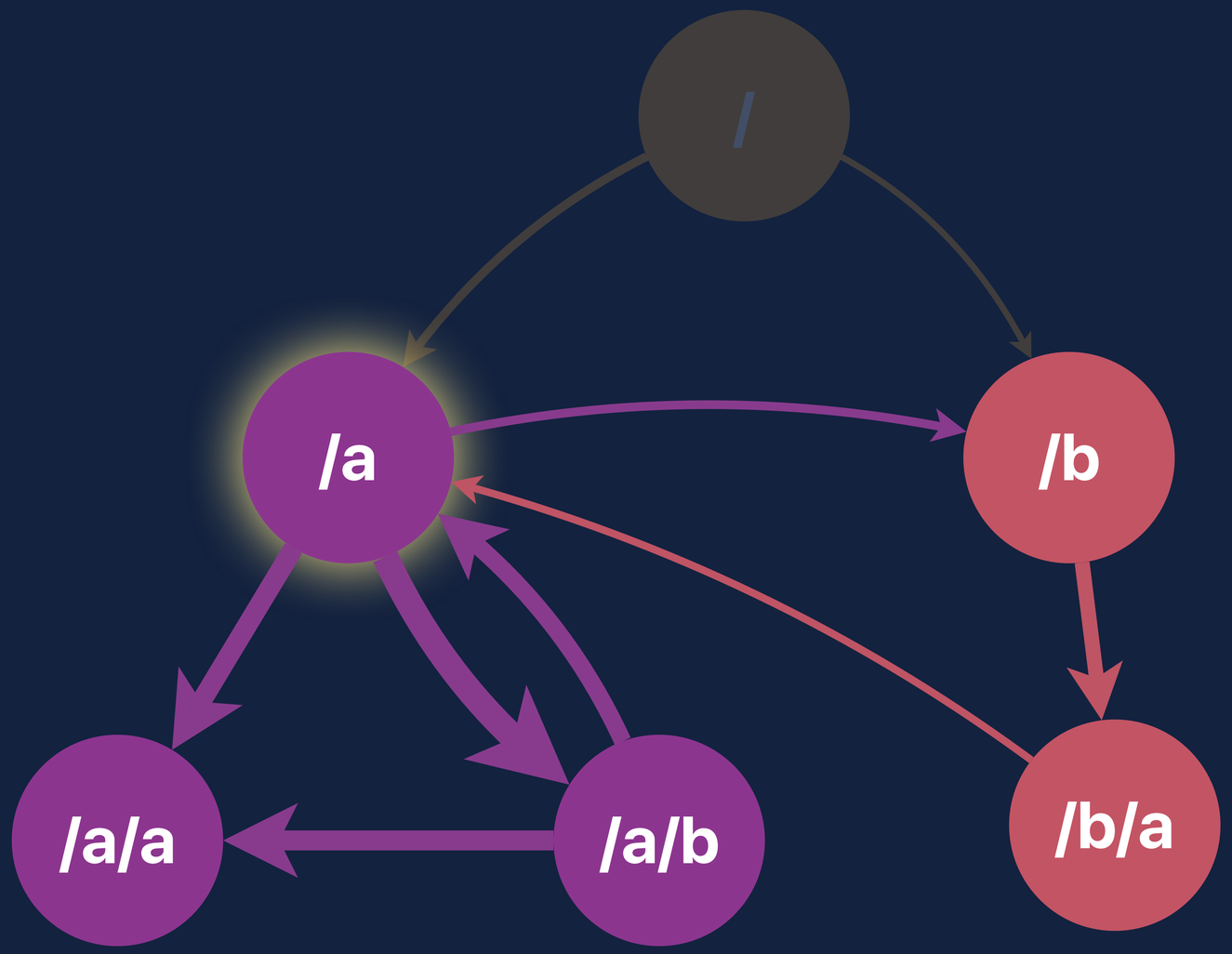


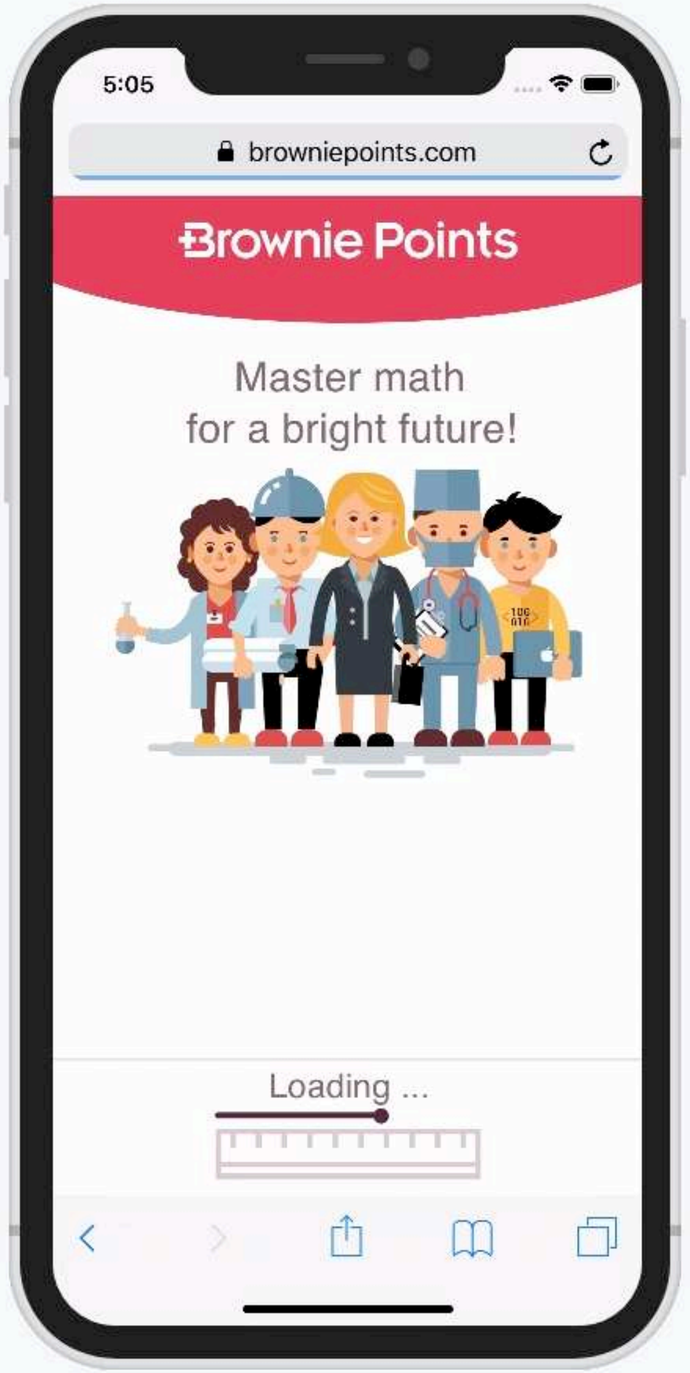
twitter.com/mgechev

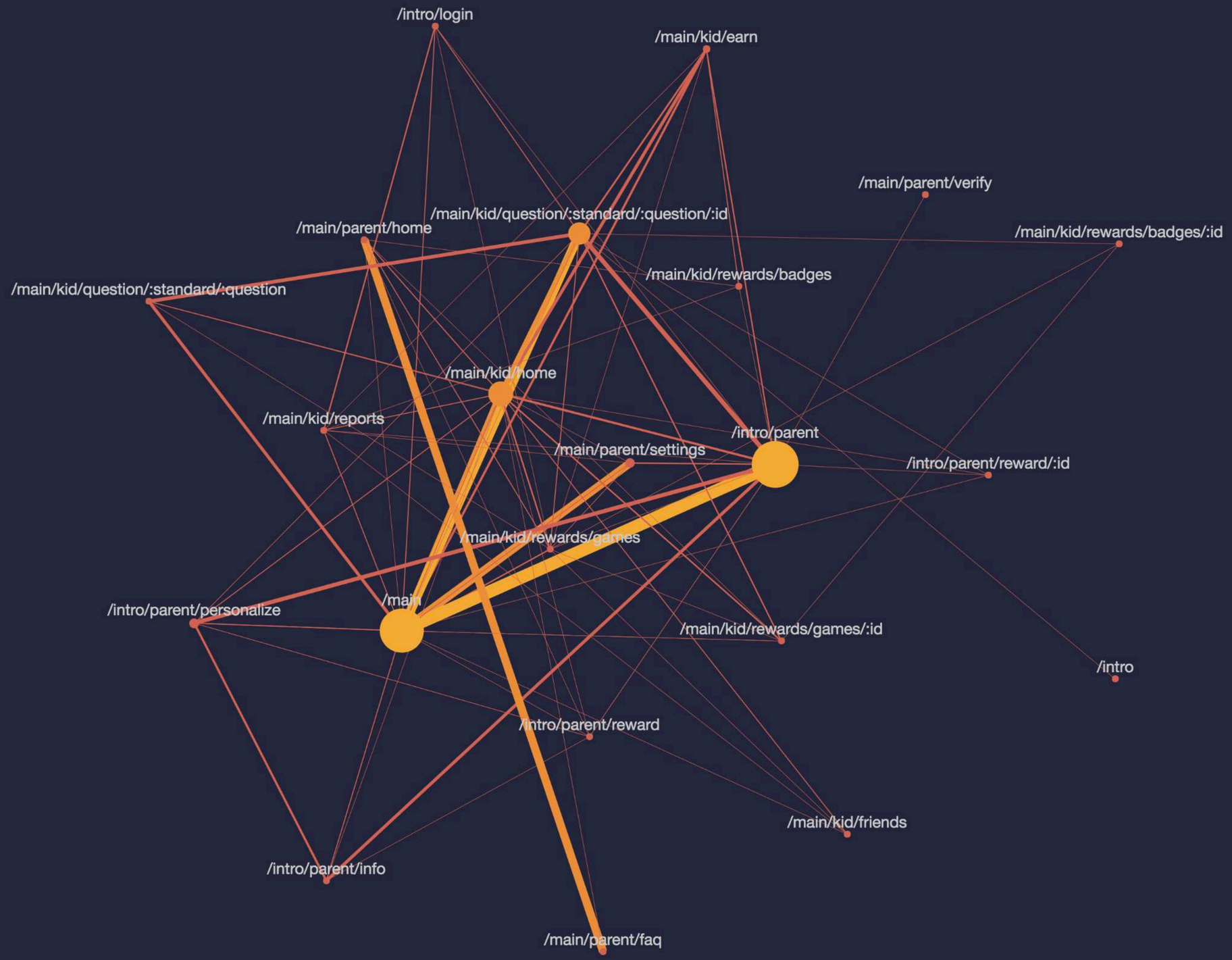


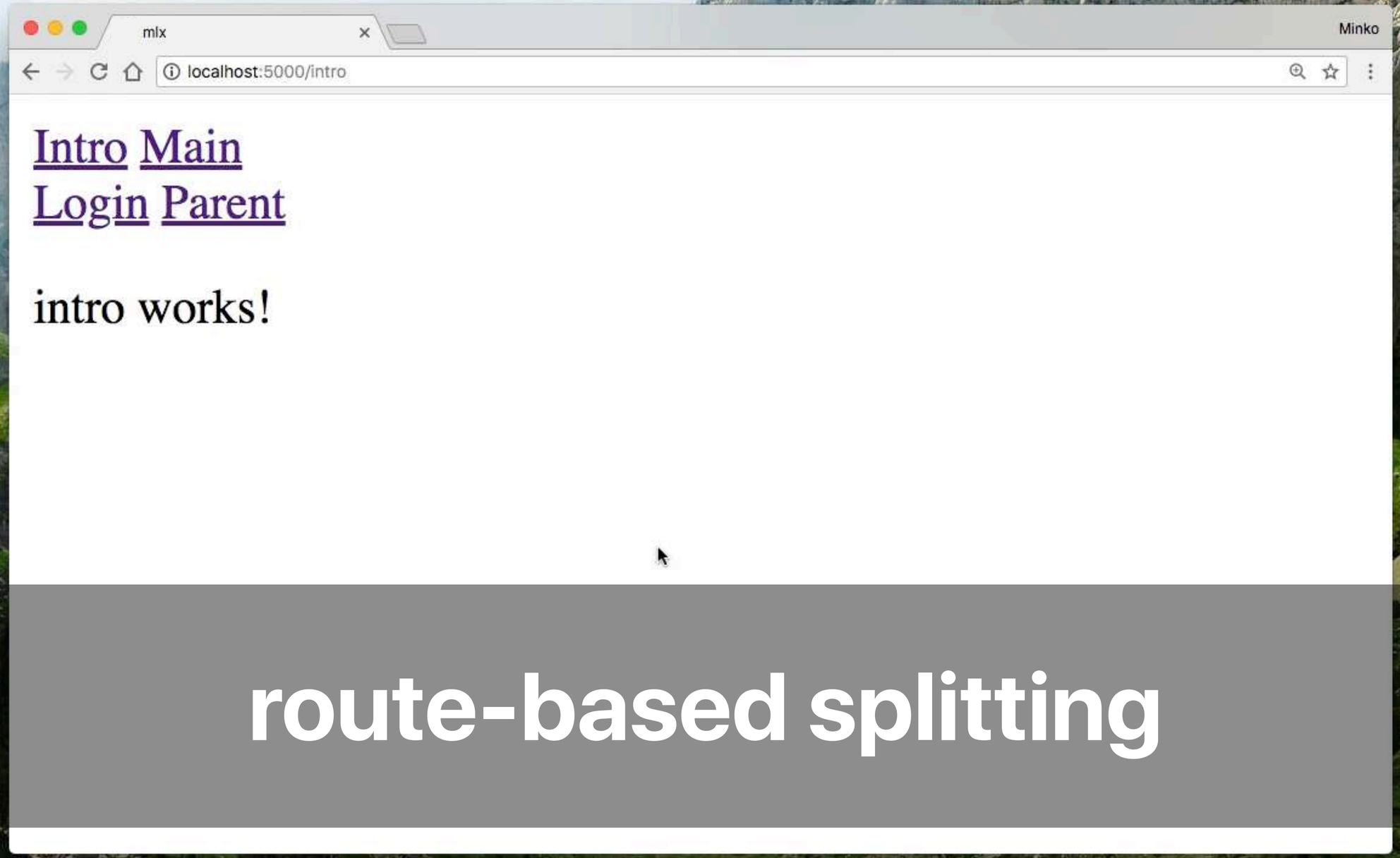
twitter.com/mgechev



twitter.com/mgechev

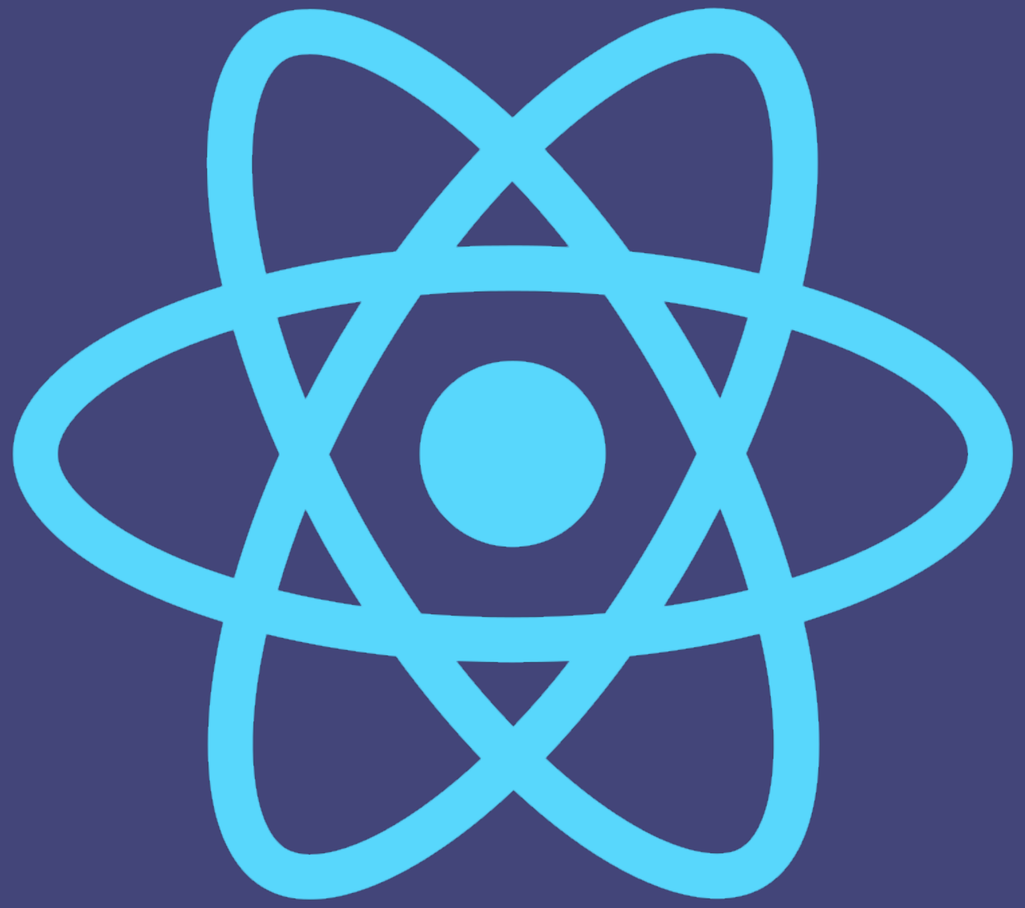

5:05
browniepoints.com
Brownie Points
Master math
for a bright future!
Loading ...


/intro/login
/main/kid/earn
/main/parent/verify
/main/kid/question/:standard/:question/:id
/main/parent/home
/main/kid/rewards/badges/:id
/main/kid/rewards/badges
/main/kid/question/:standard/:question
/main/kid/home
/main/kid/reports
/intro/parent
/main/parent/settings
/intro/parent/reward/:id
/main/kid/rewards/games
/main
/intro/parent/personalize
/main/kid/rewards/games/:id
/intro
/intro/parent/reward
/main/kid/friends
/intro/parent/info
/main/parent/faq



route-based splitting

&



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```
$ npm run build

# For Create React App
$ serve -s build

# For Angular CLI
$ serve -s dist
```

Let’s emulate *really* bad conditions

mlx

Minko

localhost:5000/intro/login

Intro Main
Login Parent

intro works!

login works!

Settings

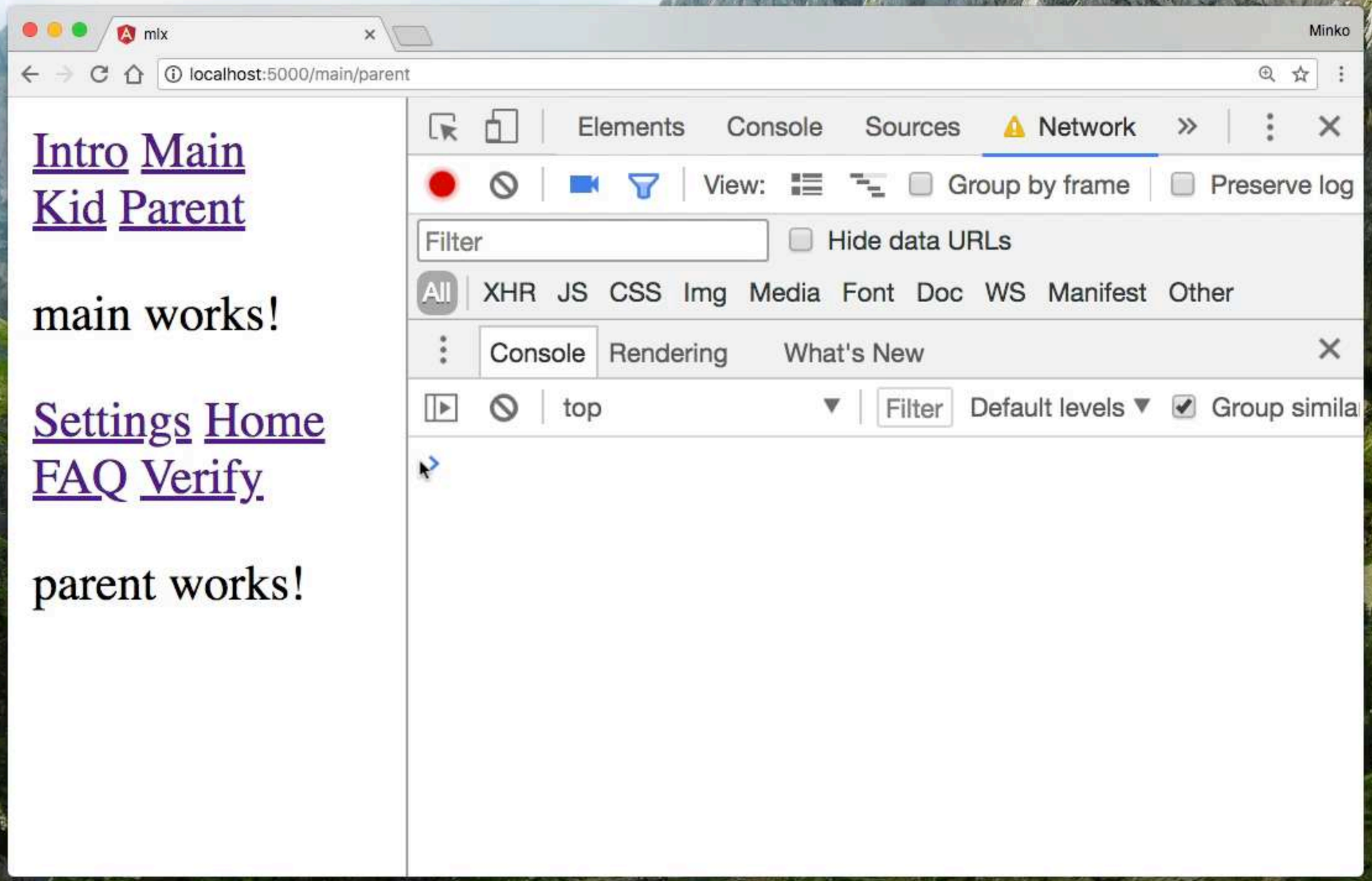
Preferences
Workspace
Blackboxing
Devices
Throttling
Shortcuts

Network Throttling Profiles

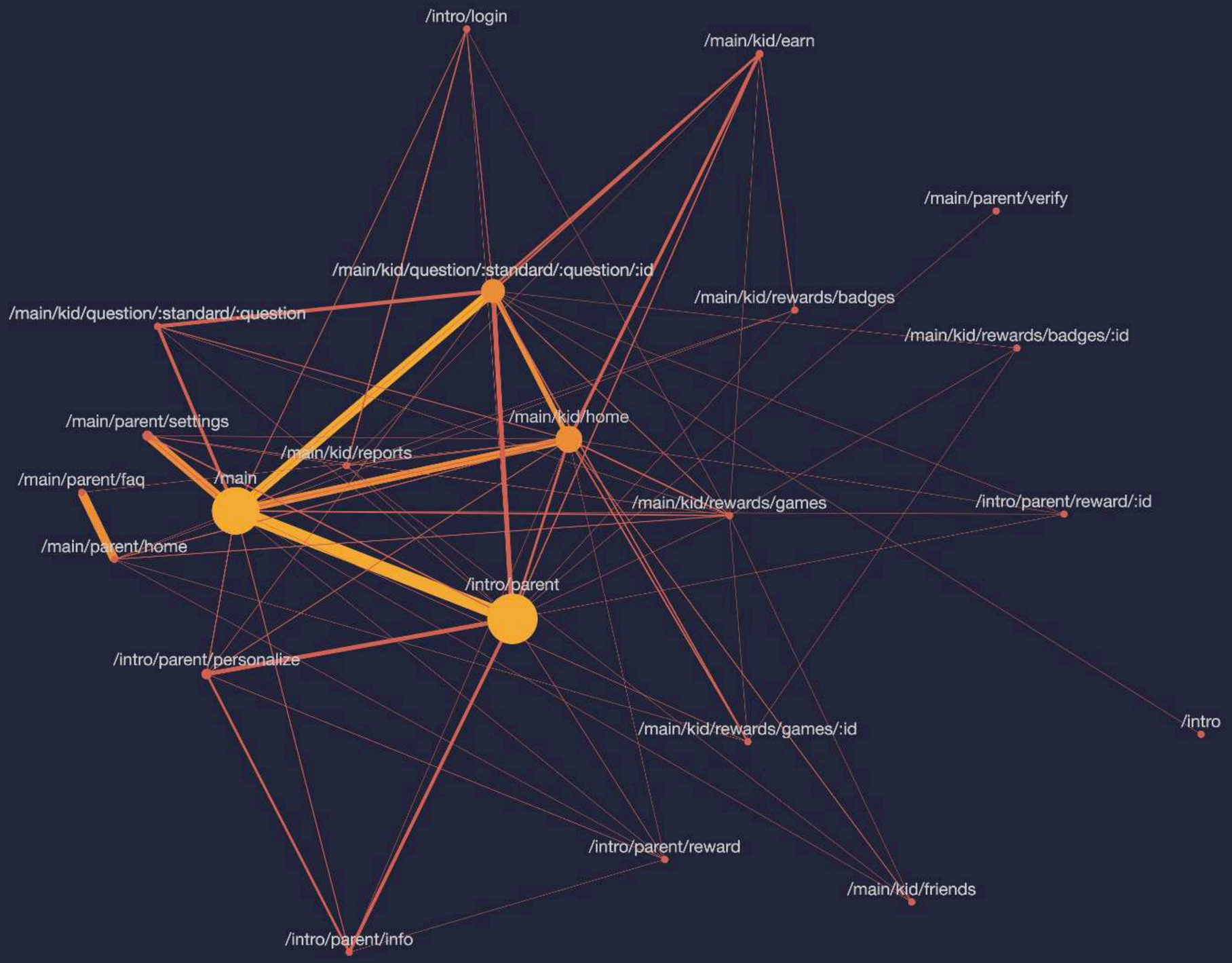
Add custom profile...

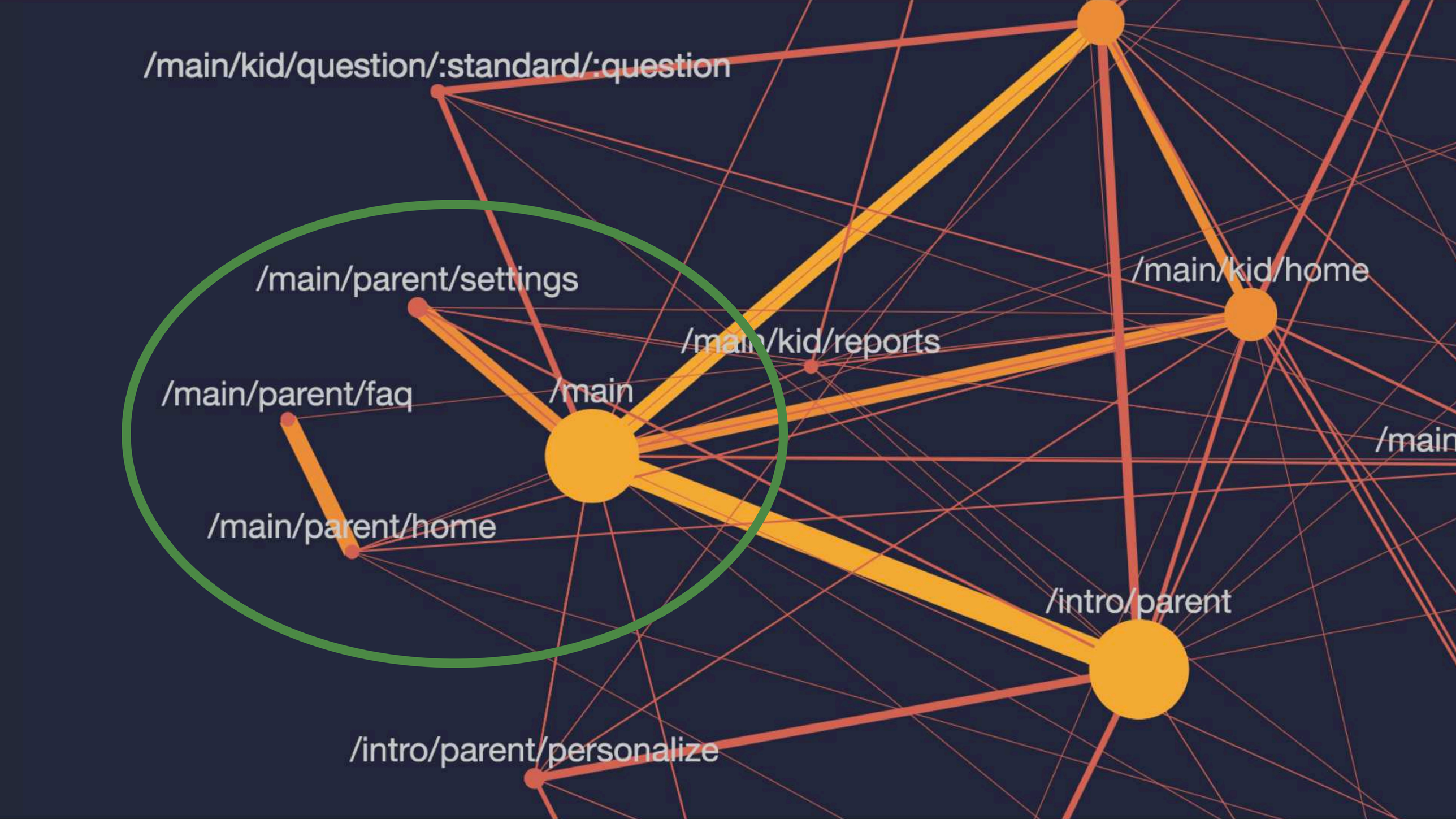
Profile Name	Download	Upload	Latency
Slow network	50	1	1500
	optional	optional	optional

Save Cancel


mlx
Minko
localhost:5000/main/parent
Intro Main
Kid Parent
main works!
Settings Home
FAQ Verify
parent works!
Elements
Console
Sources
Network
View:
Group by frame
Preserve log
Filter
Hide data URLs
All
XHR
JS
CSS
Img
Media
Font
Doc
WS
Manifest
Other
Console
Rendering
What's New
top
Filter
Default levels
Group simila

Let’s take a look at the GA graph


/intro/login
/main/kid/earn
/main/parent/verify
/main/kid/question/:standard/:question/:id
/main/kid/rewards/badges
/main/kid/question/:standard/:question
/main/kid/rewards/badges/:id
/main/parent/settings
/main/kid/home
/main/kid/reports
/main/parent/faq
/main
/main/kid/rewards/games
/intro/parent/reward/:id
/main/parent/home
/intro/parent
/intro/parent/personalize
/main/kid/rewards/games/:id
/intro
/intro/parent/reward
/main/kid/friends
/intro/parent/info


/main/kid/question/:standard/:question
/main/parent/settings
/main/kid/home
/main/kid/reports
/main/parent/faq
/main
/main
/main/parent/home
/intro/parent
/intro/parent/personalize

Possible optimizations

- Main & Settings in same chunk
  - Update of the source code
- Pre-fetch FAQ when the user is at Home
  - Custom logic

Introducing

data-driven bundling

Introducing

data-driven bundling

early preview

twitter.com/mgechev

```
$ npm run eject

# For Create React App
$ vim config/webpack.config.prod.js

# For Angular CLI
$ vim webpack.config.js
```

```
const { MLPlugin } = require('@mlx/webpack');
const data = require('./data.json');

//  ...
  plugins: [
    //  ...
    new MLPlugin({ data })
    //  ...
  ]
//  ...
```

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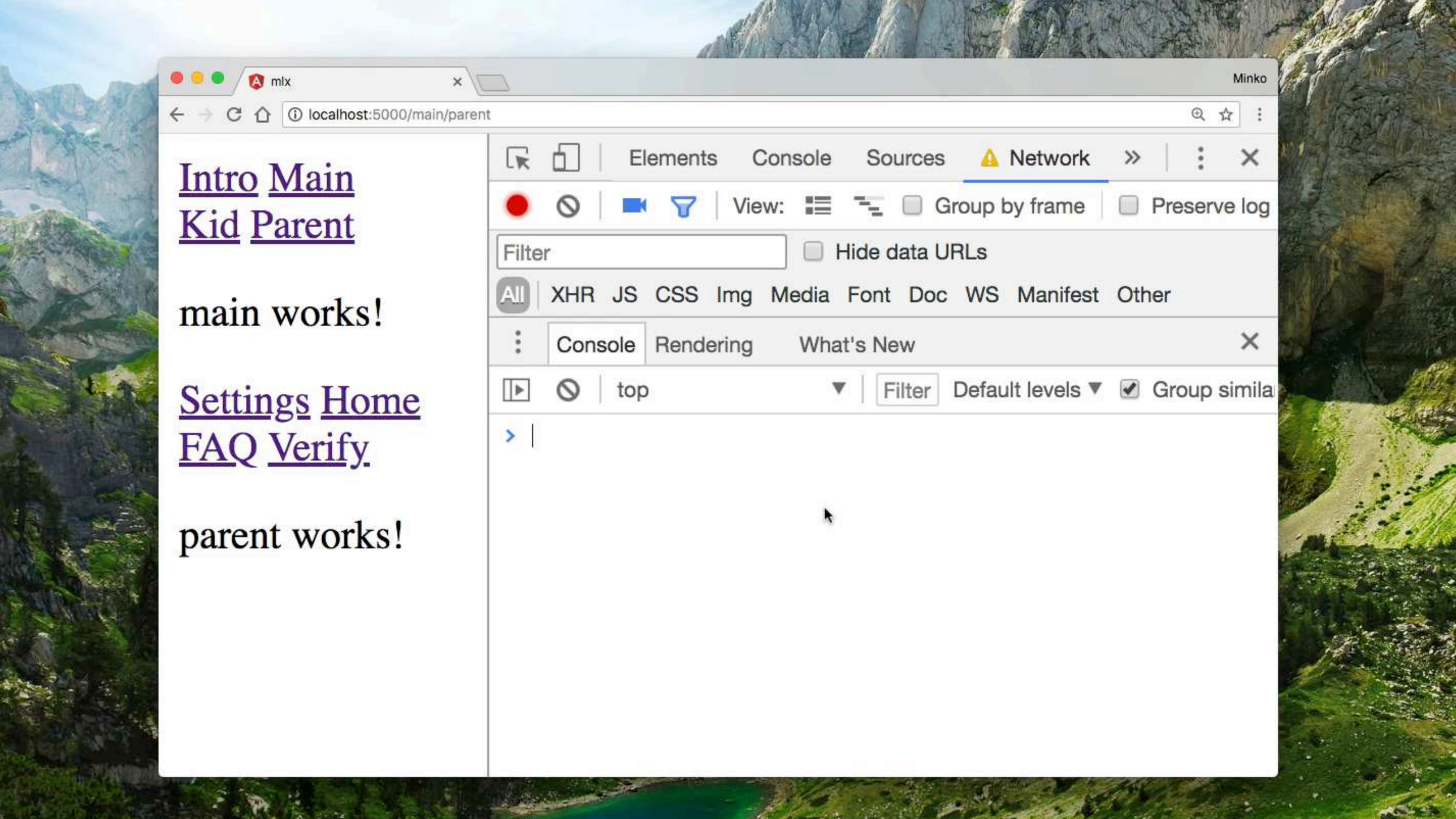
mlx
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View:
Group by frame
Preserve log
Filter
Hide data URLs
All
XHR
JS
CSS
Img
Media
Font
Doc
WS
Manifest
Other
Console
Rendering
What's New
top
Filter
Default levels
Group simila

How it works...

Tooling

Packages

- @mlx/ga
- @mlx/parser
- @mlx/webpack
- @mlx/cluster

@mlx/ga

Fetching structured data from Google Analytics

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@mlx/ga

```
const { fetch } = require(‘@mlx/ga');

fetch({
  key: require('./c.json'),
  viewId: '000000000',
  period: { startDate, endDate },
  routes
})
.then(g ⇒ writeFileSync('data.json', JSON.stringify(g)));
```

@mlx/parser

Gets metadata by statically analyzing our app

@mlx/webpack

Set of webpack plugins which automate the build

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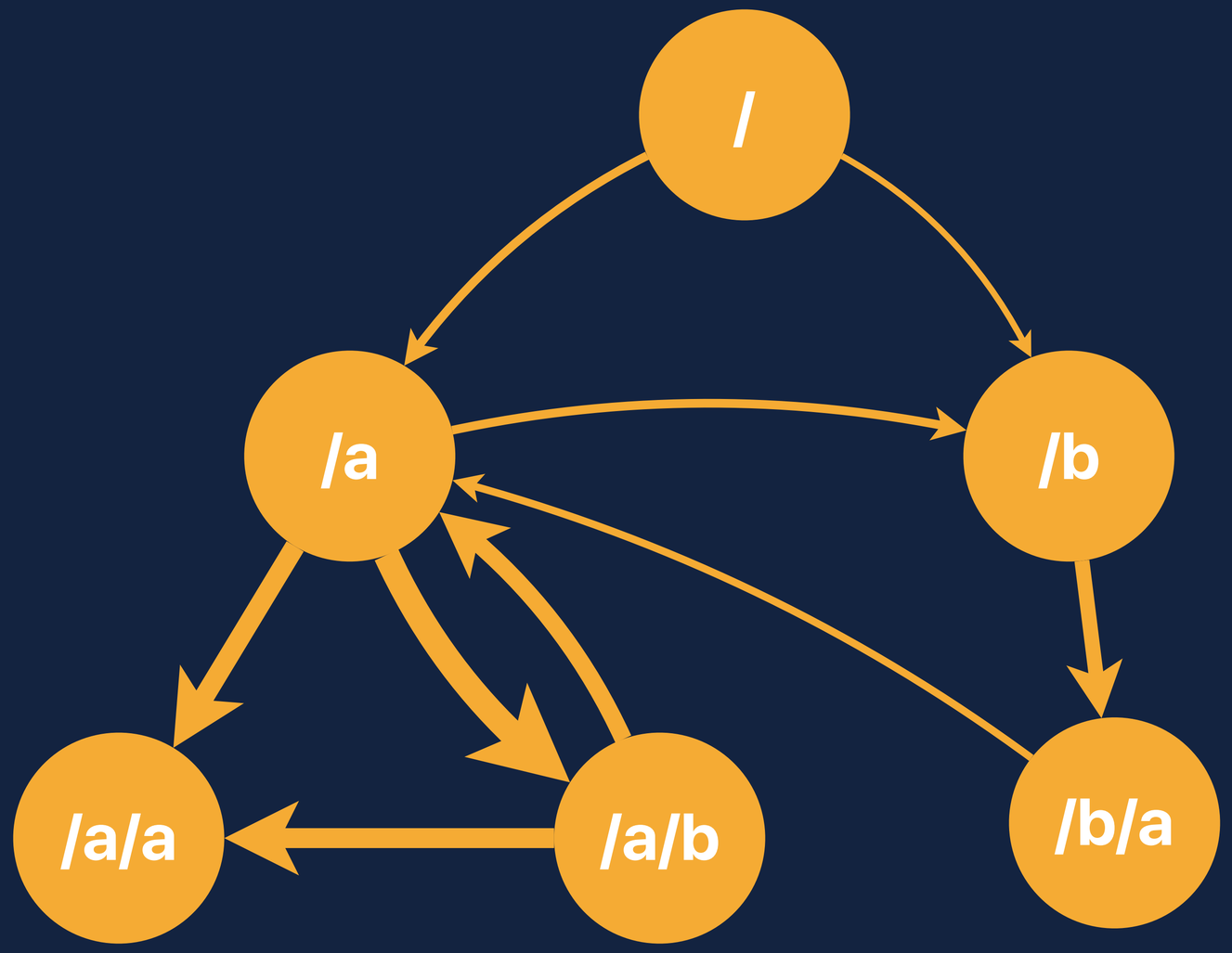
MLPlugin

ClusterChunksPlugin

RuntimePrefetchPlugin

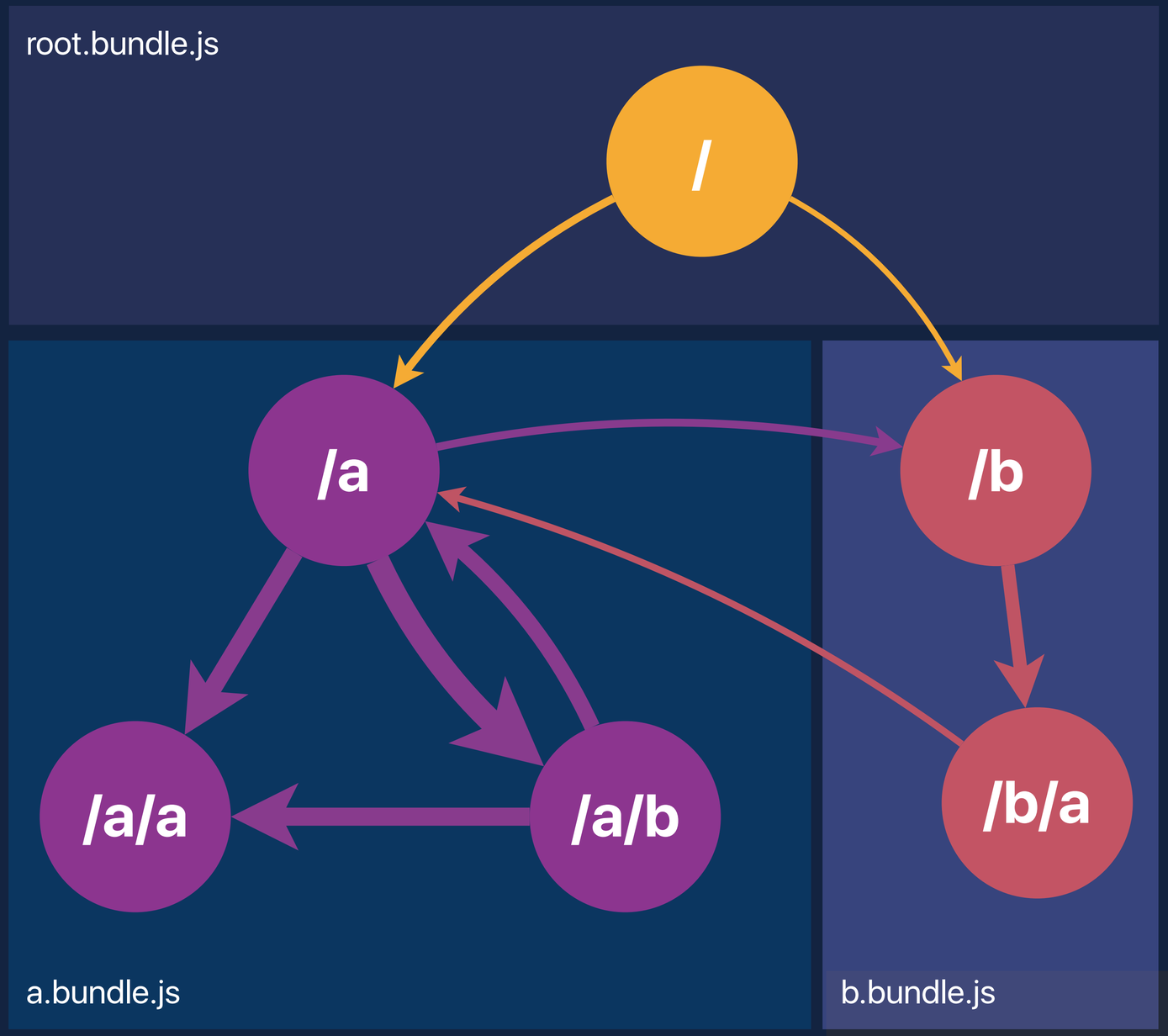
ClusterChunksPlugin



ClusterChunksPlugin

Performs clustering based on:

- GA data
- Application metadata



ClusterChunksPlugin

Performs clustering based on:

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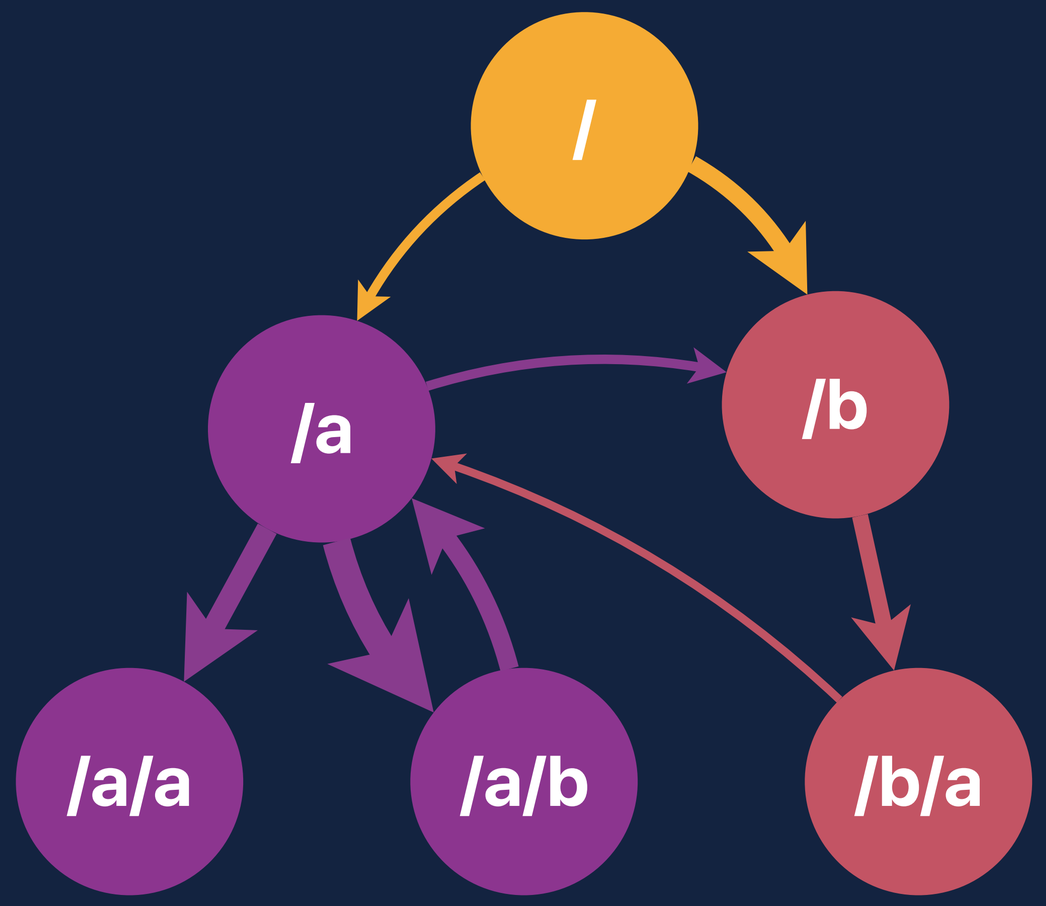
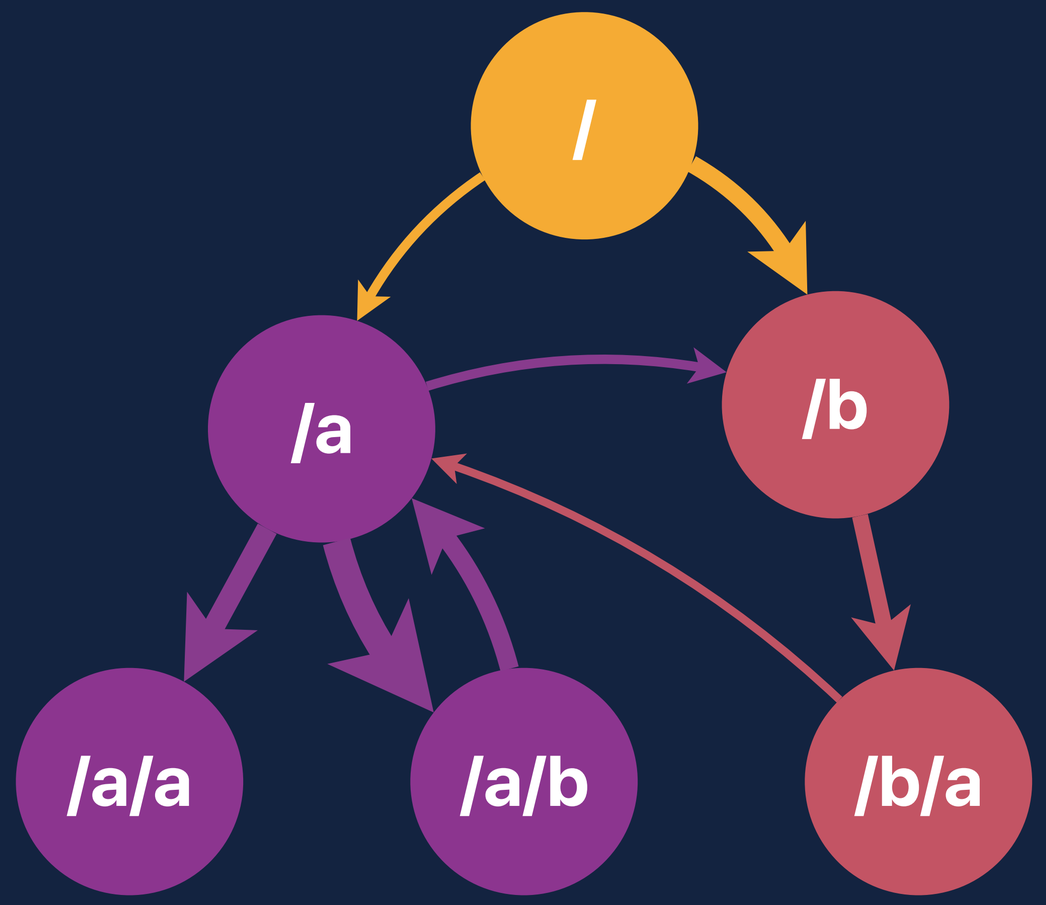
RuntimePrefetchPlugin

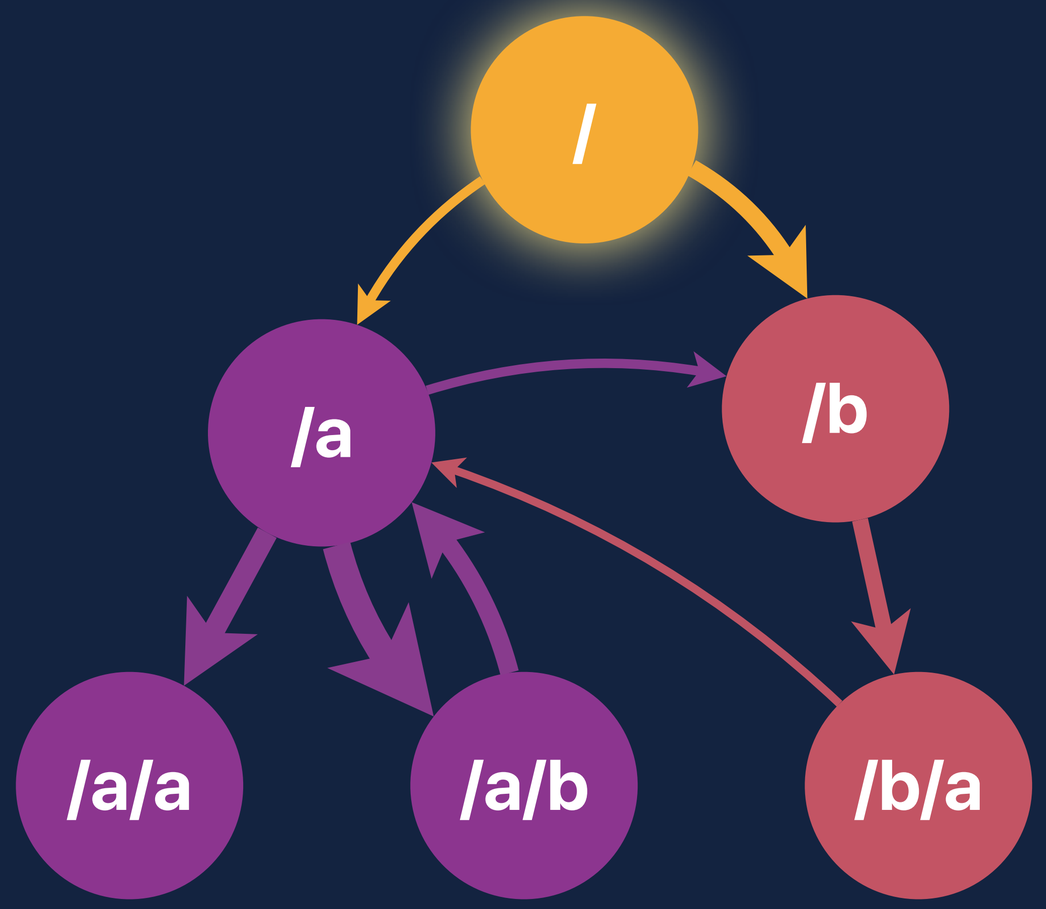

/
/a
/b
/a/a
/a/b
/b/a



Markov Chain

	/	/a	/a/:id	/b	/b/a
/	0	0.3	0	0.7	0
/a	0	0	0.9	0.1	0
/a/:id	0	1	0	0	0
/b	0	0	0	0	1
/b/a	0	1	0	0	0

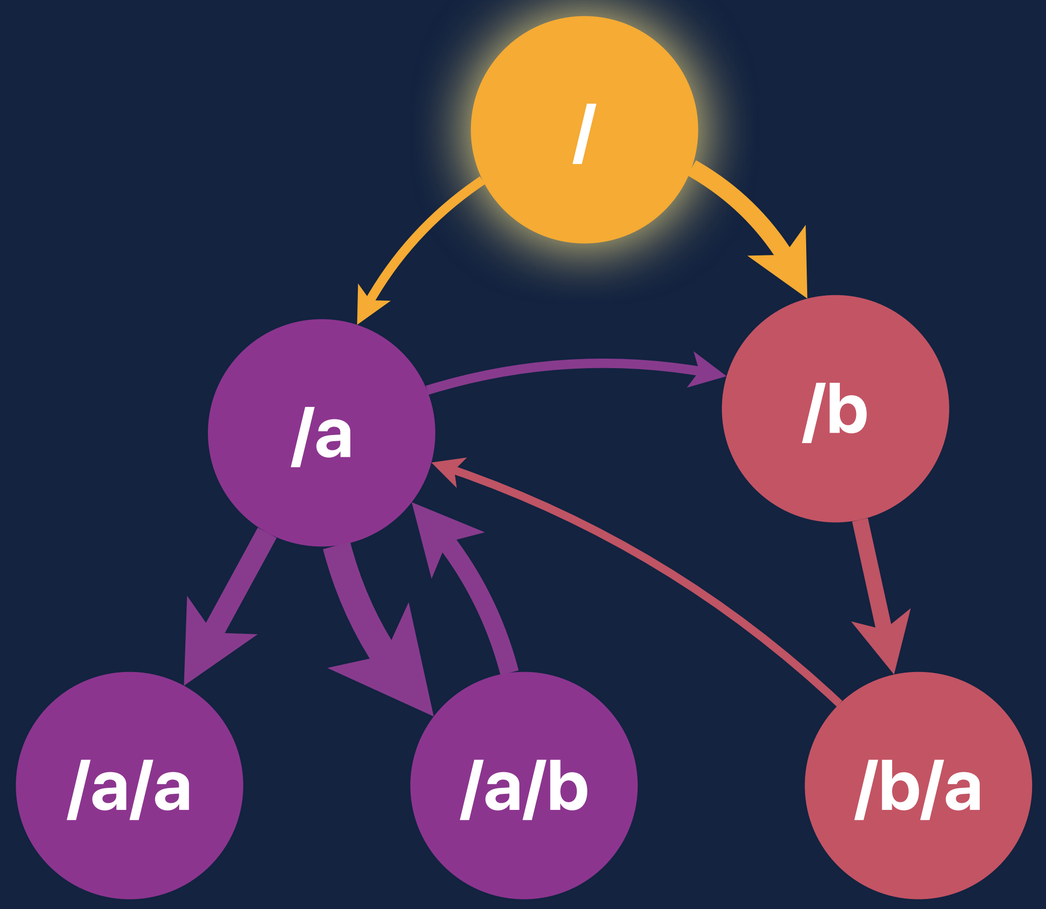
Probability threshold: 0.5



Activity:

	/	/a	/a/:id	/b	/b/a
/	0	0.3	0	0.7	0
/a	0	0	0.9	0.1	0
/a/:id	0	1	0	0	0
/b	0	0	0	0	1
/b/a	0	1	0	0	0

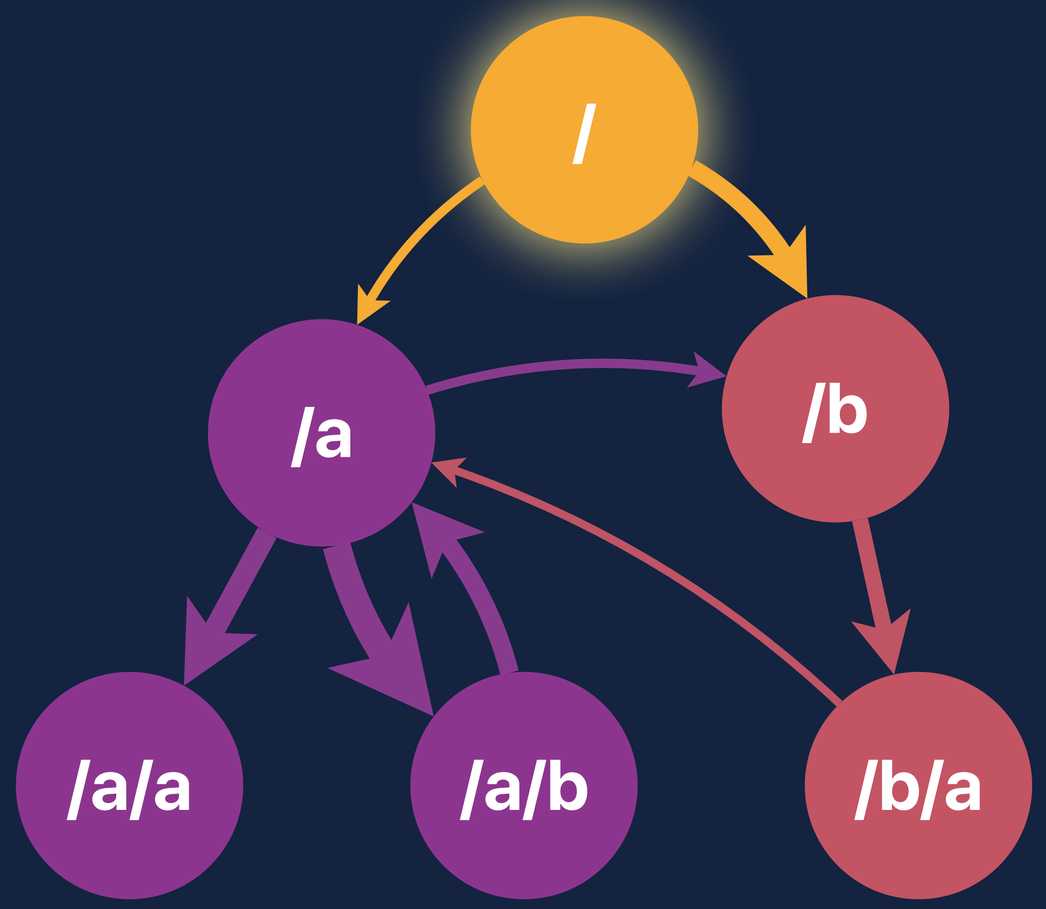
Probability threshold: 0.5



Activity:

	/	/a	/a/:id	/b	/b/a
/	0	0.3	0	0.7	0
/a	0	0	0.9	0.1	0
/a/:id	0	1	0	0	0
/b	0	0	0	0	1
/b/a	0	1	0	0	0

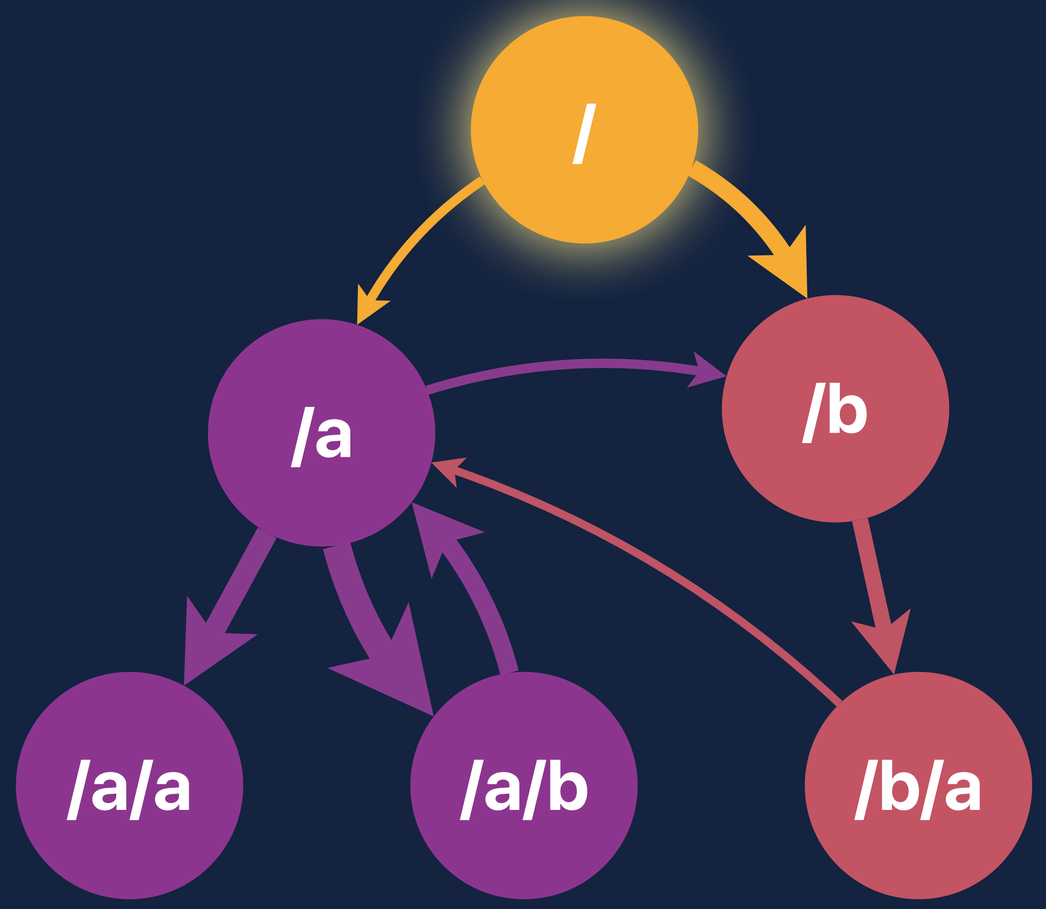
Probability threshold: 0.5



Activity:

	/	/a	/a/:id	/b	/b/a
/	0	0.3	0	0.7	0
/a	0	0	0.9	0.1	0
/a/:id	0	1	0	0	0
/b	0	0	0	0	1
/b/a	0	1	0	0	0

Probability threshold: 0.5

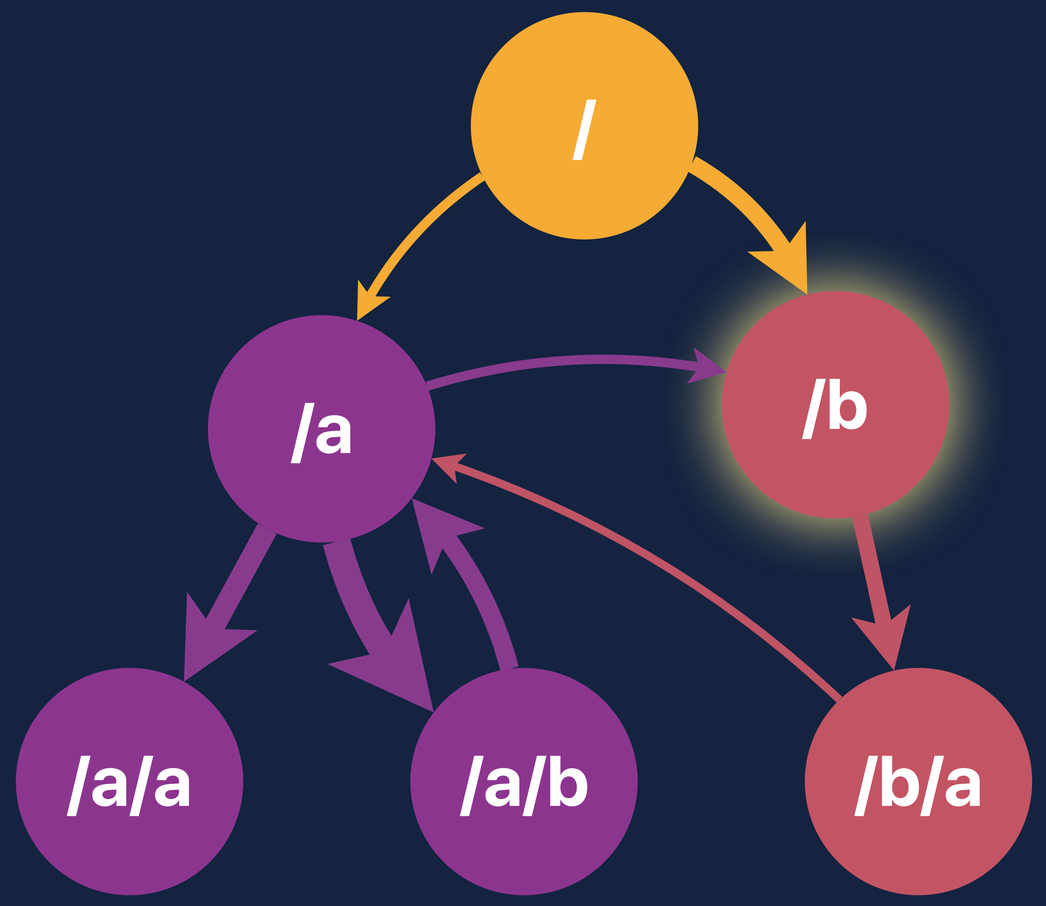


Activity:

- Download b.bundle.js

	/	/a	/a/:id	/b	/b/a
/	0	0.3	0	0.7	0
/a	0	0	0.9	0.1	0
/a/:id	0	1	0	0	0
/b	0	0	0	0	1
/b/a	0	1	0	0	0

Probability threshold: 0.5

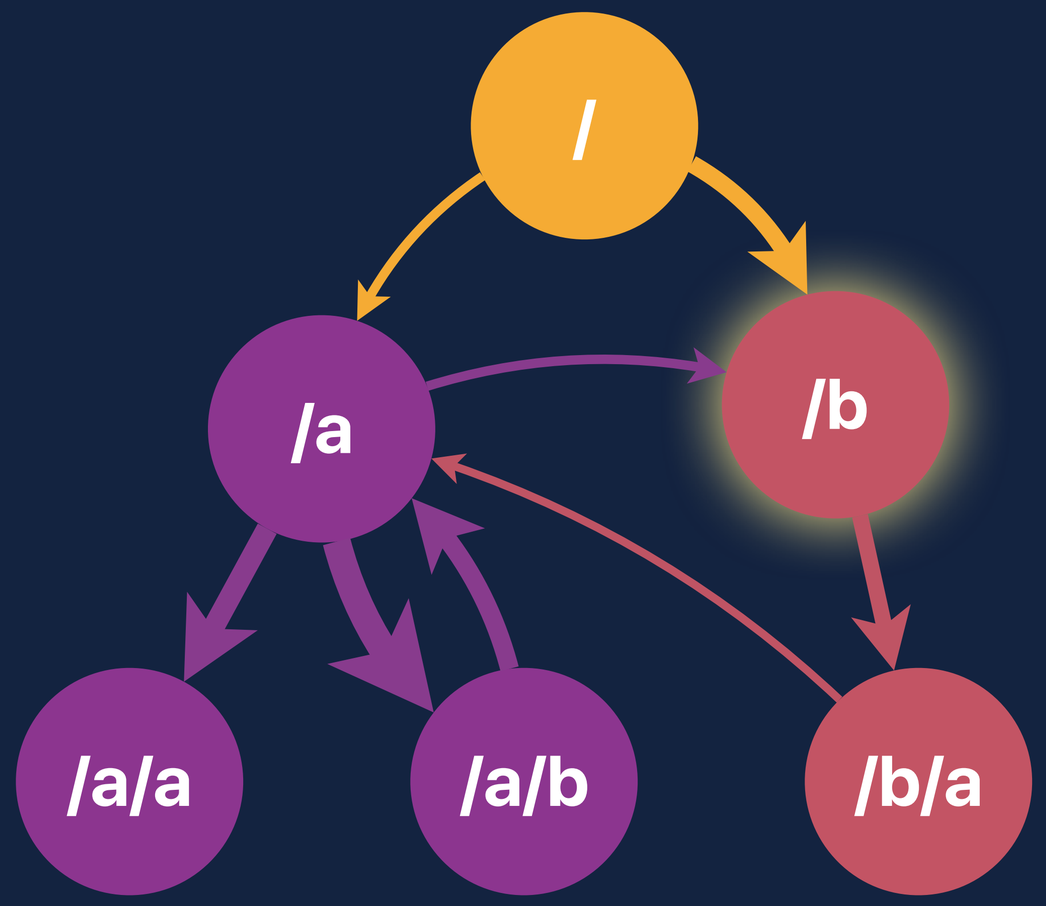


Activity:

- Download b.bundle.js

	/	/a	/a/:id	/b	/b/a
/	0	0.3	0	0.7	0
/a	0	0	0.9	0.1	0
/a/:id	0	1	0	0	0
/b	0	0	0	0	1
/b/a	0	1	0	0	0

Probability threshold: 0.5

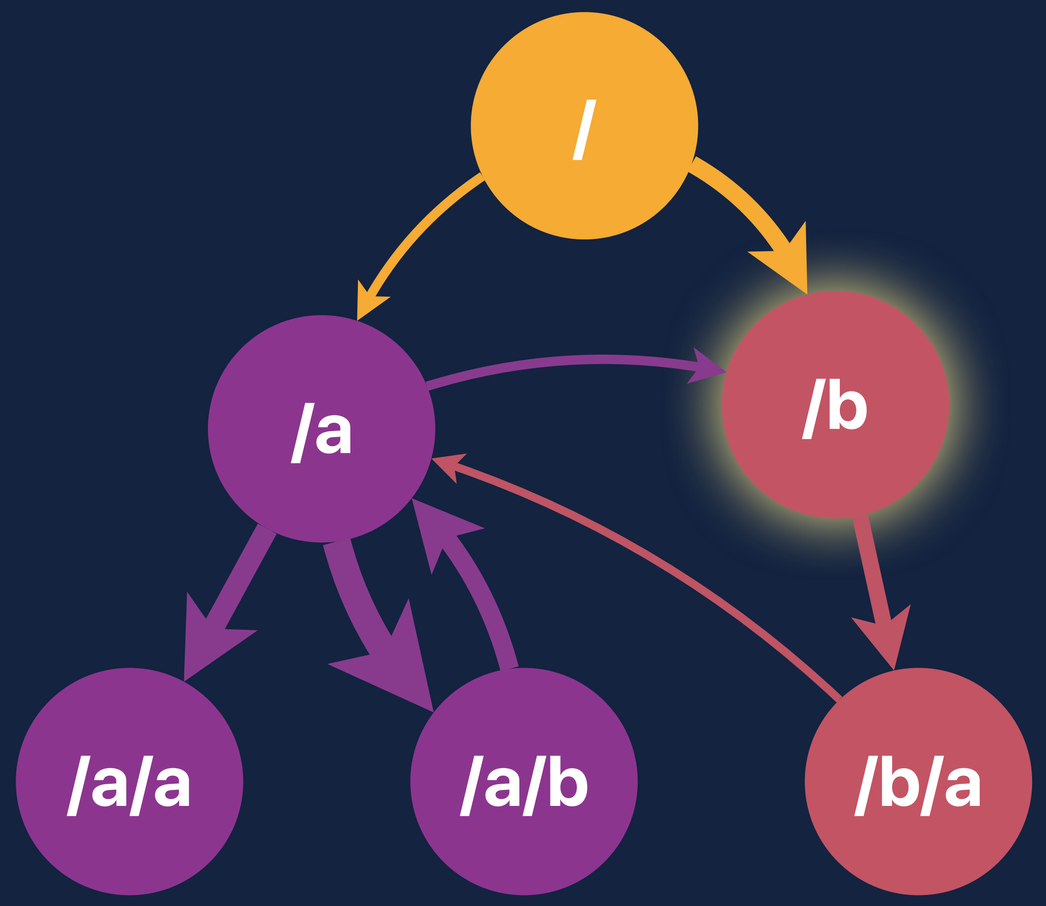


Activity:

- Download b.bundle.js

	/	/a	/a/:id	/b	/b/a
/	0	0.3	0	0.7	0
/a	0	0	0.9	0.1	0
/a/:id	0	1	0	0	0
/b	0	0	0	0	1
/b/a	0	1	0	0	0

Probability threshold: 0.5

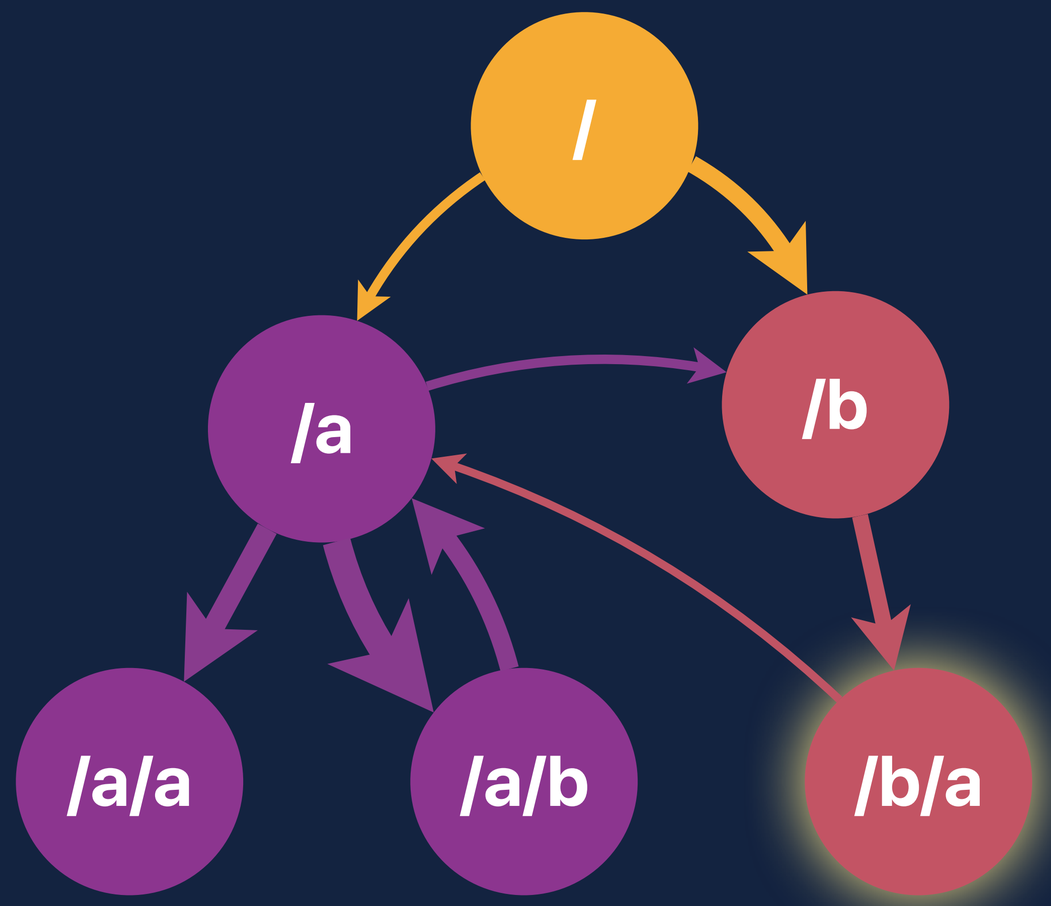


Activity:

- Download b.bundle.js
- No action

	/	/a	/a/:id	/b	/b/a
/	0	0.3	0	0.7	0
/a	0	0	0.9	0.1	0
/a/:id	0	1	0	0	0
/b	0	0	0	0	1
/b/a	0	1	0	0	0

Probability threshold: 0.5



Activity:

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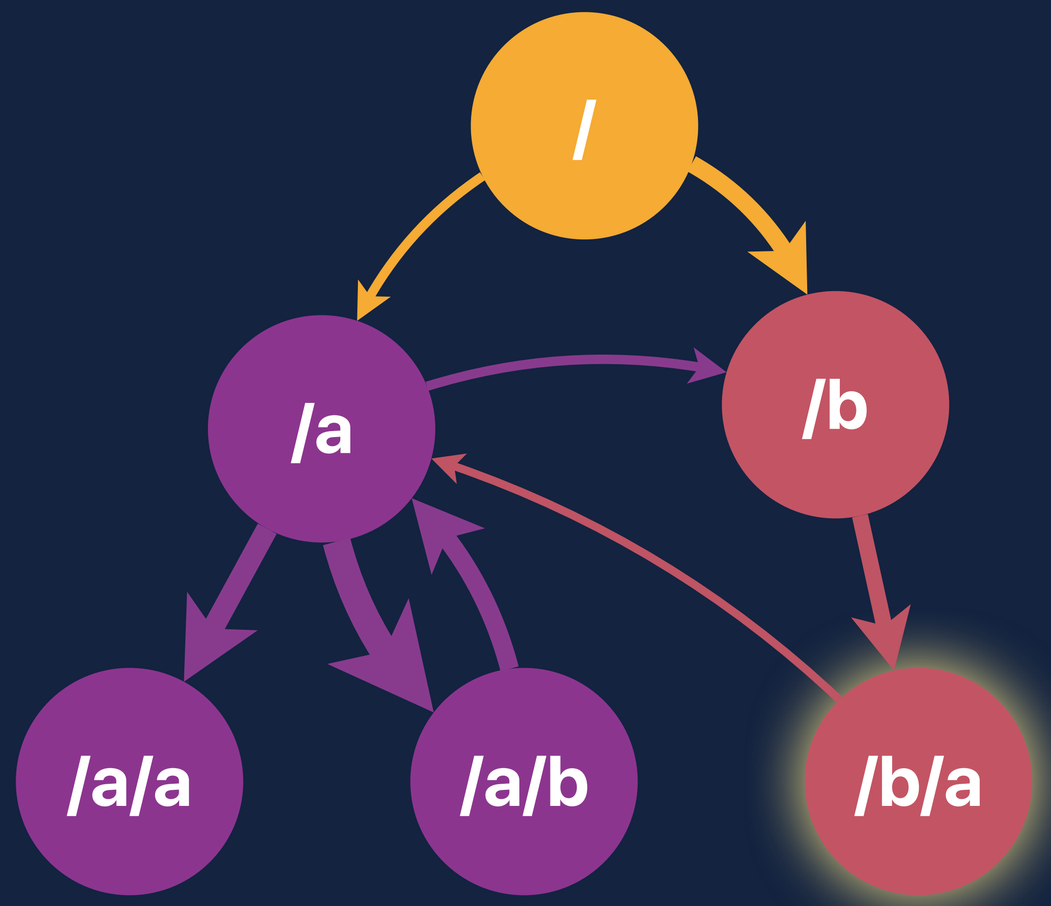
	/	/a	/a/:id	/b	/b/a
/	0	0.3	0	0.7	0
/a	0	0	0.9	0.1	0
/a/:id	0	1	0	0	0
/b	0	0	0	0	1
/b/a	0	1	0	0	0

Probability threshold: 0.5



Activity:

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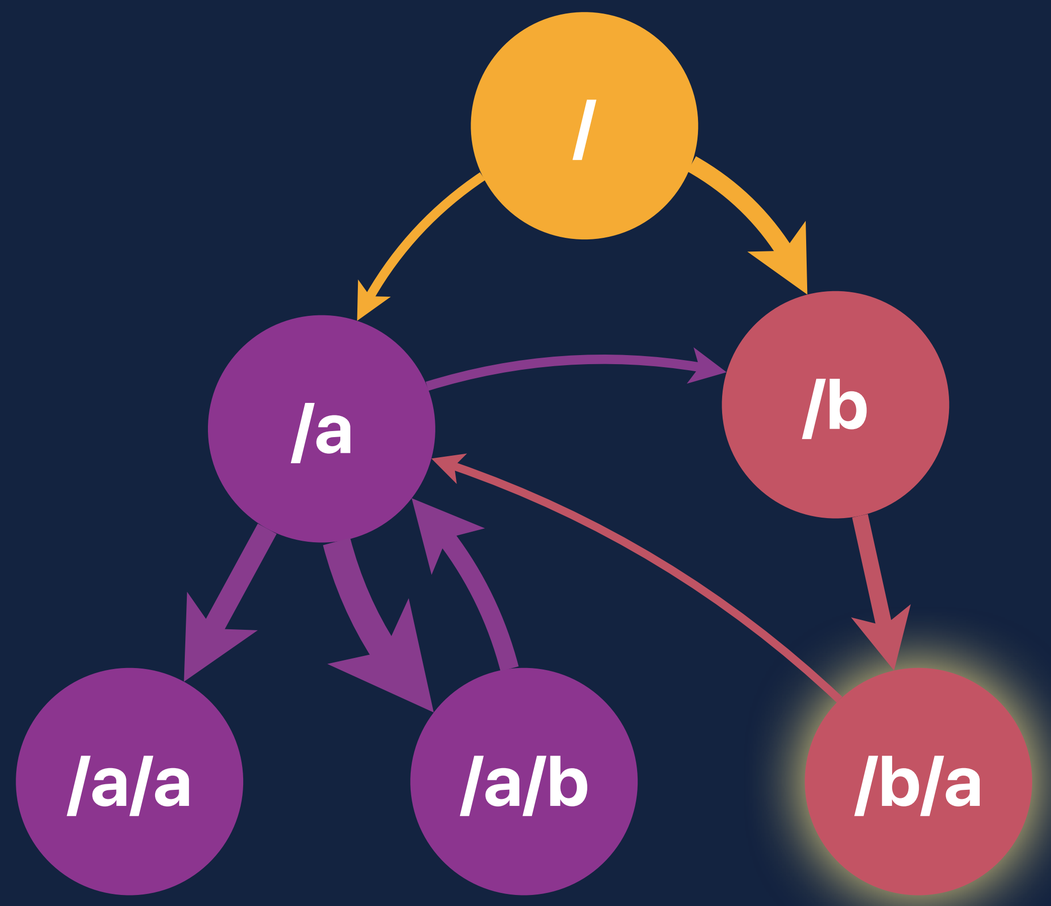
	/	/a	/a/:id	/b	/b/a
/	0	0.3	0	0.7	0
/a	0	0	0.9	0.1	0
/a/:id	0	1	0	0	0
/b	0	0	0	0	1
/b/a	0	1	0	0	0

Probability threshold: 0.5



Activity:

- Download b.bundle.js
- No action
- Download a.bundle.js

	/	/a	/a/:id	/b	/b/a
/	0	0.3	0	0.7	0
/a	0	0	0.9	0.1	0
/a/:id	0	1	0	0	0
/b	0	0	0	0	1
/b/a	0	1	0	0	0

Future plans

- Personalized bundling
- Smarter clustering
- Personalize pre-fetching
  - Reduced chunk over fetching
- More robust parsers

Minko Gechev
@mgechev

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References

- https://mgv.io/dd-bundling
- https://mgv.io/cost-of-js
- https://mgv.io/predictive-fetching
- https://mgv.io/mlx

A new wave of data-driven web tooling is up to come

Thank you!

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