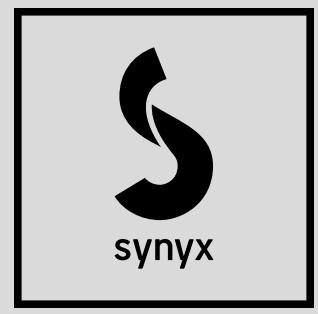


MICRO-FRONTENDS IN REACT



Denise Schäfer
[\(denise.schaefer@dm.de\)](mailto:denise.schaefer@dm.de)

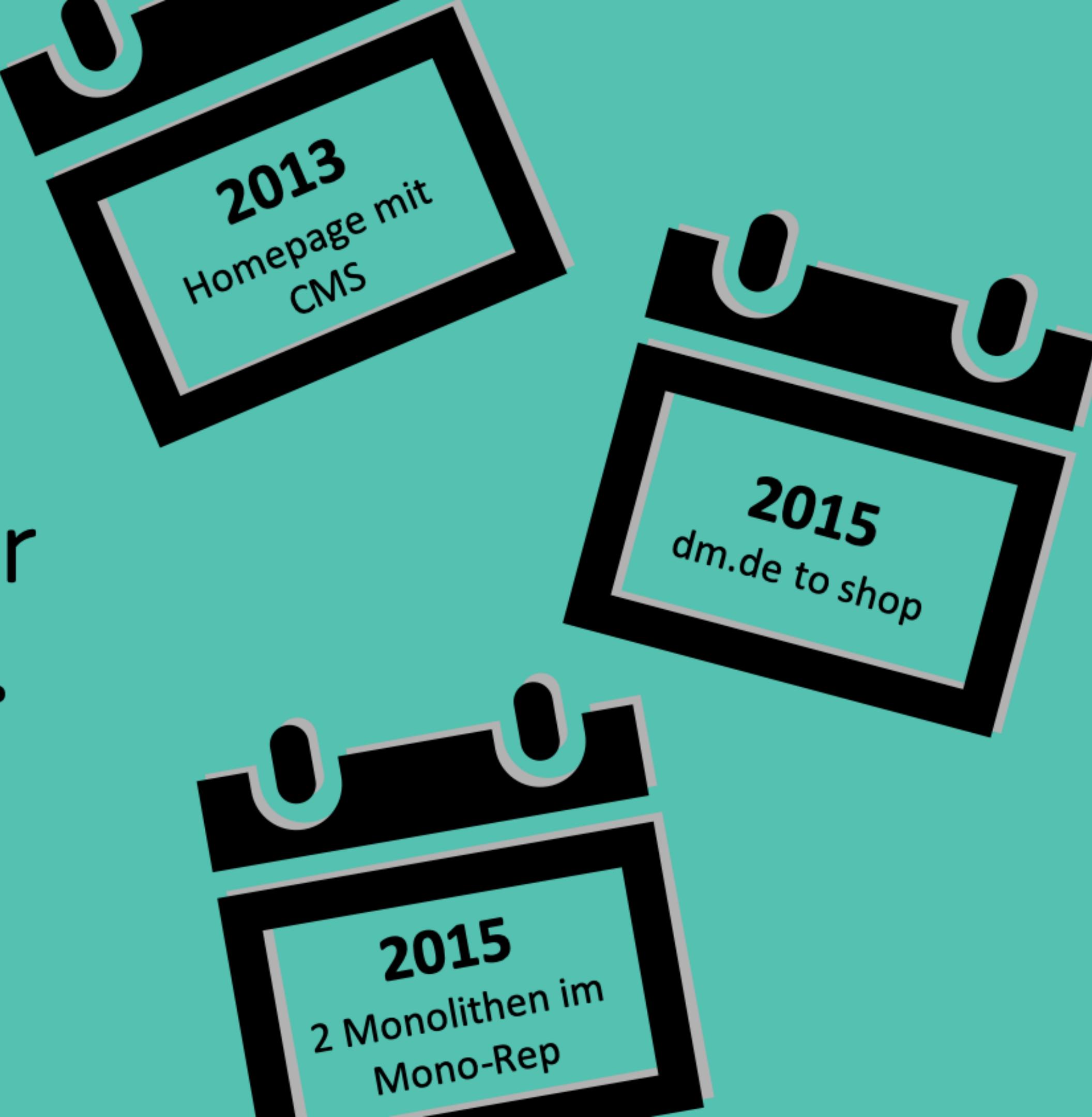


Benjamin Seber
[@_seebaer](https://twitter.com/_seebaer)



RÜCKBLENDE

Was bisher geschah...

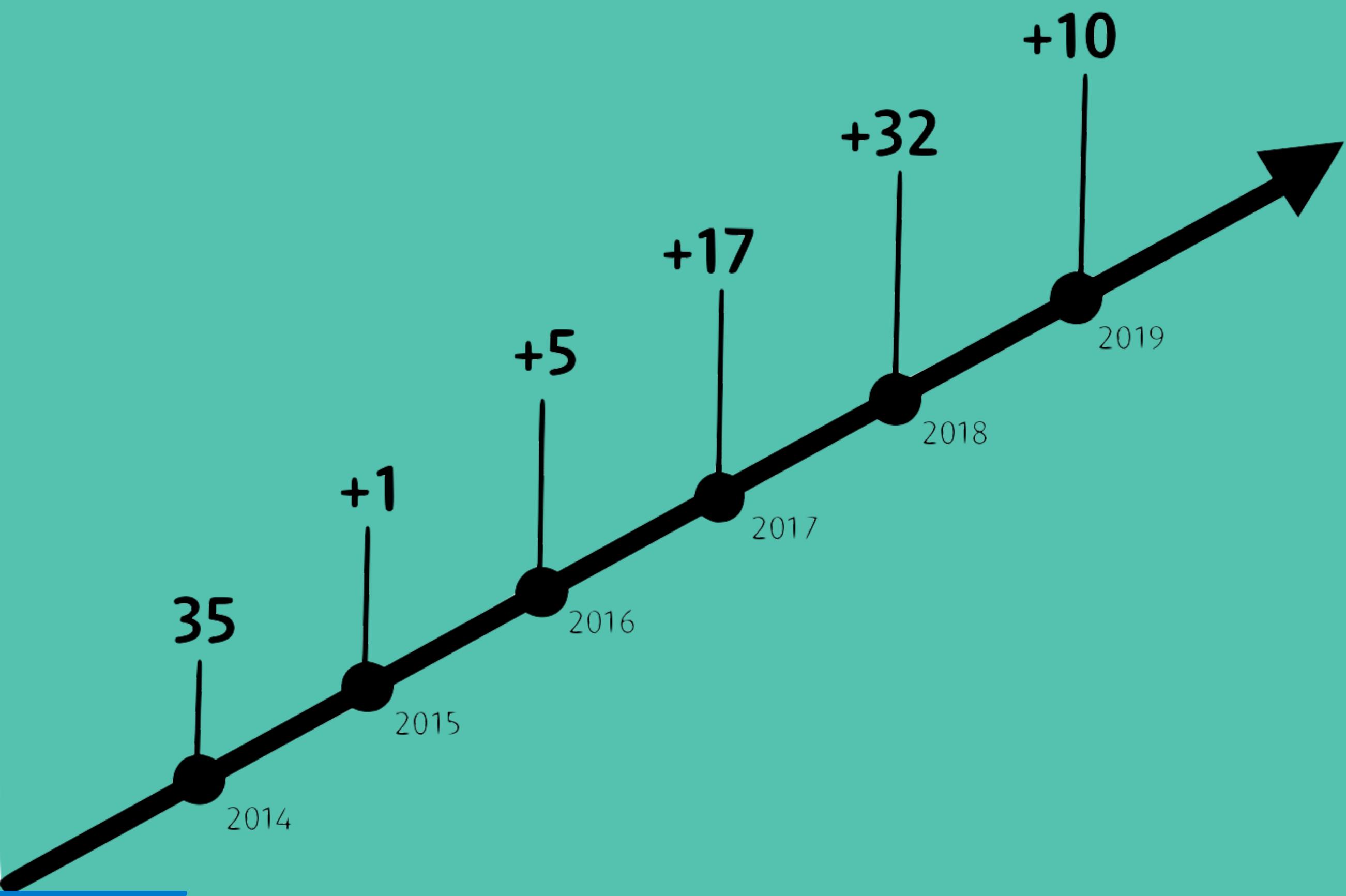


CoreMedia Git Historie

- 2013

A circular diagram with a black center and a teal outer ring. Inside the black center, there is a list of git commit logs for May 2013, arranged in a spiral pattern. The commits are color-coded: blue for most entries and orange for a few specific ones. The log entries include dates, times, and commit hashes.

- 2013-05-15 - 18:46 0e66126f4f0b3cf30555003
- 2013-05-14 - 16:46 a6283da8901558b657cb5b20ed
- 2013-05-14 - 13:17 36c12ee9120e0dcef5c43e05d0b1
- 2013-05-13 - 14:28 906b6be40bc01f17fcda2673f0c93cd
- May 2013-05-13 - 14:23 c098905fdb1c17fd8dce9593fc74a134
- May 2013-05-13 - 06:37 7f1bddbe57f5282a9239a0baacbae7dc7b
- Mon May 2013-05-13 - 06:36 0e0275dd95646c9fcb1321bf93648e82494
- Fri May 2013-05-10 - 14:38 8964f525b9726a68428e596e55b01f081882
- Fri May 2013-05-10 - 14:24 074c37b8d5d5abfb364d92725a344f87e2b45
- Fri May 2013-05-10 - 12:40 f66bc54c46d84f6665cd276cd8e2fb9a28c1
- Thu May 2013-05-09 - 13:34 01a817ecf6f88d3c59aab69ac22f0a7a3f4ceb
- * Wed May 2013-05-08 - 16:57 8d35cd896fba908835a8b5012d11966973e30a8
- * Wed May 2013-05-08 - 09:34 2778dccadd8b015c17fd27b476fa5ea03716410
- * Wed May 2013-05-08 - 08:26 44d132c640830dbdb0d4d94649ff0156f9410649
- * Tue May 2013-05-07 - 18:37 82ac7fc59309fccffd87379f0e2cdbacbb7d02e8
- * Mon May 2013-05-06 - 16:37 3b2dfae8f7c99c6b439f2b87fcaa11c885e518ac
- * Mon May 2013-05-06 - 16:08 e3156eb80840c8577e759ab21f55455701918e9
- * Fri May 2013-05-03 - 17:19 e8a3eea664464e0fc09ebdb604d9e9d413dbb2c
- Fri May 2013-05-03 - 17:16 b3d7d0c38d4ded5c56ba983ea38c07094f03202
- Fri May 2013-05-03 - 14:52 b8457c803b0e8430ab4838945867b16dd063bd
- Thu May 2013-05-02 - 17:53 4c190f4cae9346a634e6b61e118147f2d9117
- Thu May 2013-05-02 - 17:42 027f4f4a213b7b0e3b83dca239d5c637108b
- Thu May 2013-05-02 - 14:27 d0241edc44460795ef7b1d66751f3441503
- Apr 2013-04-29 - 16:19 3215bc364646d79f36def6342a3eee3a6c
- Apr 2013-04-29 - 16:18 e58c0d746dd86130d1767fe14fc5a36
- Apr 2013-04-29 - 15:53 8d6bfe2415c32d9c338bad543535aff6
- Apr 2013-04-29 - 15:00 23079093b029198af87944df37d38
- Apr 2013-04-29 - 14:57 dacaa810a76a1f237292a0443c0
- Apr 2013-04-29 - 13:05 56f83a9a9bddae49c33341b
- Apr 2013-04-29 - 10:05 b55583fa3f00f98f3590
- Apr 2013-04-21 c18407604b50b2



Anstieg der
Contributor

CoreMedia Git Historie

- 2016

Mon Mar 2016-03-07 - 15:48 3df3504089e
Mon Mar 2016-03-07 - 09:25 914f2148175cb
Mon Mar 2016-03-07 - 09:01 e5d4e4ac7db9daea
Fri Mar 2016-03-04 - 16:59 ed6cb2e9aa46ff6

Fri Mar 2016-03-04 - 16:39 6a1f69a62cdbbddb89
Fri Mar 2016-03-04 - 15:51 182d1bd2f98fcfc7665
Fri Mar 2016-03-04 - 15:51 fb3164a570d91194ca7ae
Thu Mar 2016-03-03 - 13:44 b4a3c3d645b064fb13ee2
Thu Mar 2016-03-03 - 11:06 711414ed8b11ae866d23a8
Thu Mar 2016-03-03 - 10:21 fced47ec618256e9f2ce299
Wed Mar 2016-03-02 - 17:27 f4f1bf96fb92ec2d0dc0a9f
Wed Mar 2016-03-02 - 16:13 cbcf39849c8f7df784831d2a
Wed Mar 2016-03-02 - 16:09 74211b9ae198b0852b08127b
Tue Mar 2016-03-01 - 16:17 840745404d1a375b258ed5d1
Tue May 2016-05-24 - 17:33 bcf20872da0509f4b96cb526
Tue May 2016-05-24 - 17:26 47091090faa43d9690fb9a00
Tue May 2016-05-24 - 17:19 ea1541eb3703b4e71f8eb7e4

Tue May 2016-05-24 - 09:38 a52ef03d79036a27ba3e628f1
Tue May 2016-05-24 - 09:38 df886ce07c5610e4407837de
Mon May 2016-05-23 - 17:06 3757246b187835f62f4d399
Mon May 2016-05-23 - 17:06 6ac7f2a0b952394fd9bd39
Mon May 2016-05-23 - 14:50 09b8bcdd23c25ae2b4b50
Mon May 2016-05-23 - 14:12 b4b6e6361126cd3fe095
Fri May 2016-05-20 - 12:19 9812c58a0530e1e9111
Fri May 2016-05-20 - 12:19 fff2fac332c0032eb
Fri May 2016-05-20 - 12:19 558d92606de8f66
Fri May 2016-05-20 - 12:19 a2db692ec7c76
Fri May 2016-05-20 - 09:29 3fd334436f
Thu May 2016-05-19 - 17:00 5abbd1

Thu May 2016-05-19 - 16:

Wir brauchen mehr Features!



Was war denn
Anfang 2016?

Einiges! Wo soll
ich anfangen?
Aaalso...

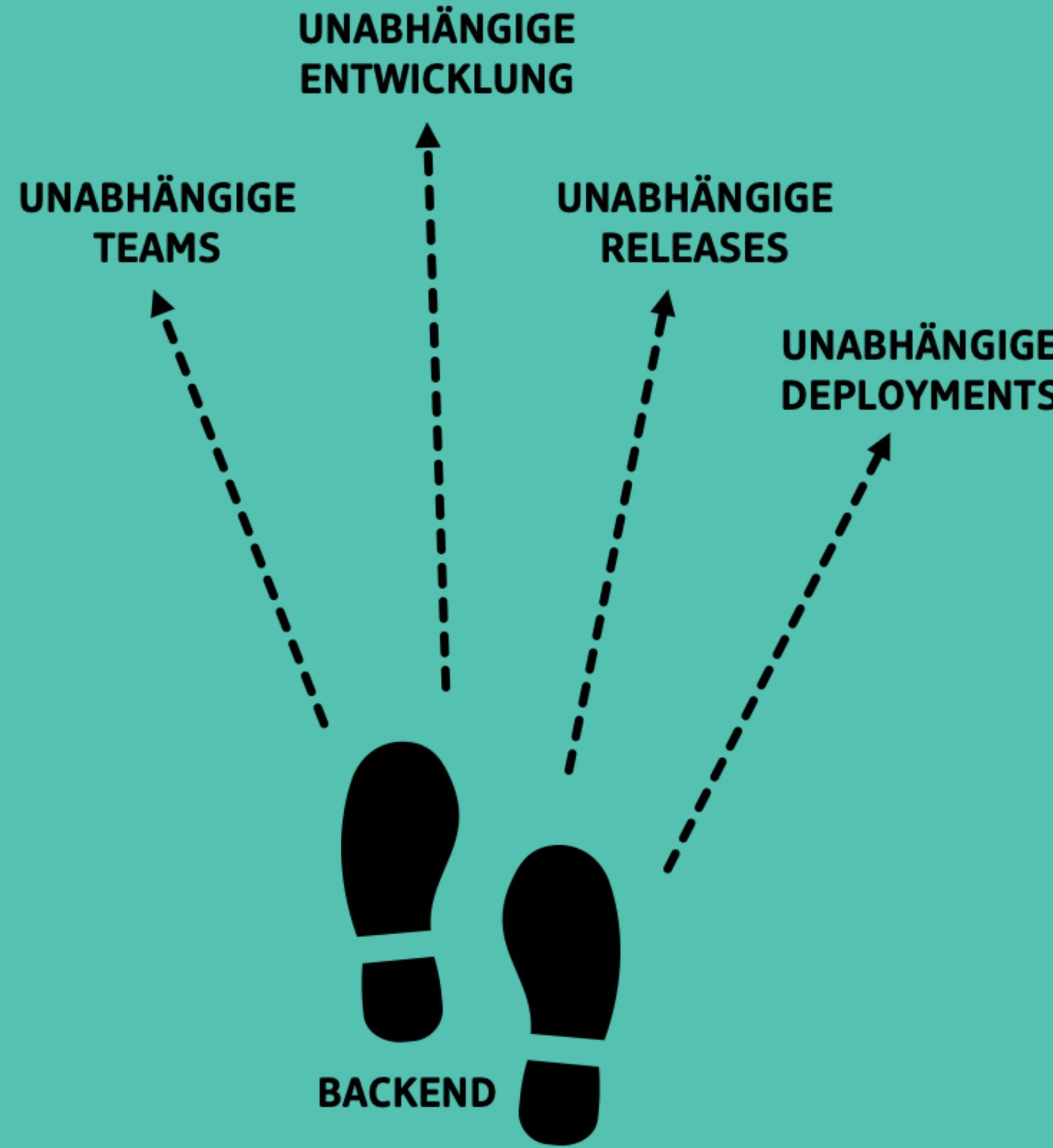




Micro-Services im Backend



Unabhängigkeit nur im Backend



Skalierung im Backend

BACKEND



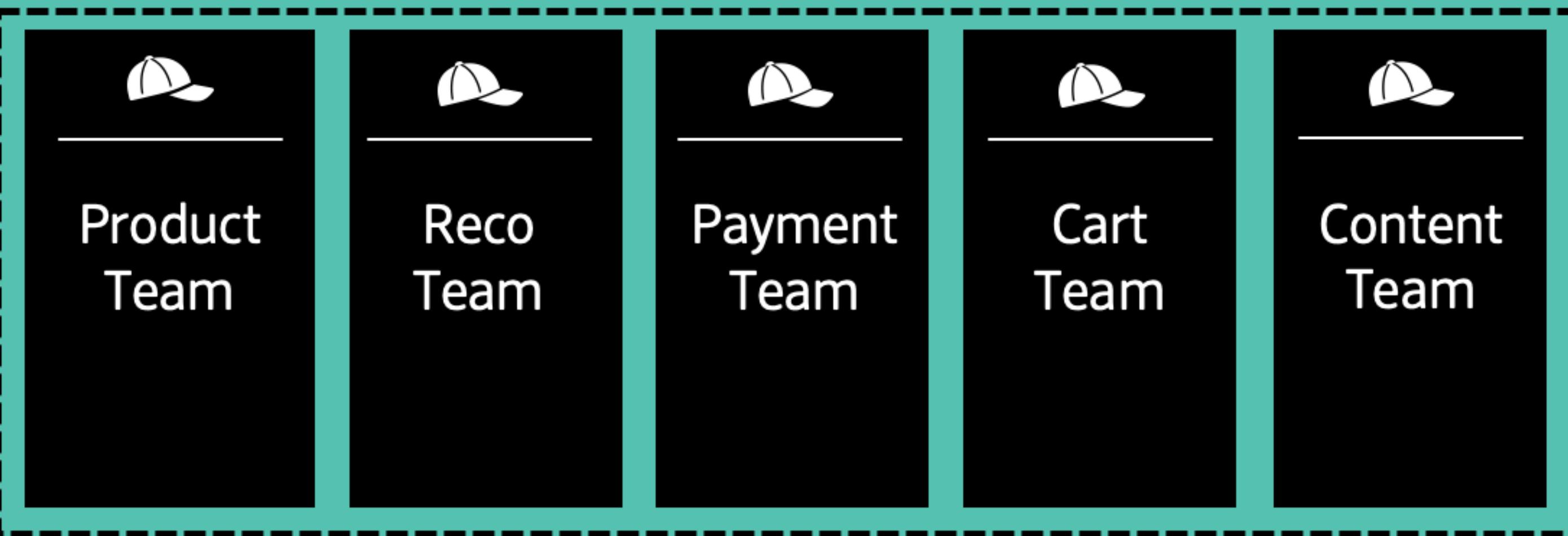
FRONTEND



Frontend-Team



Backend-Teams



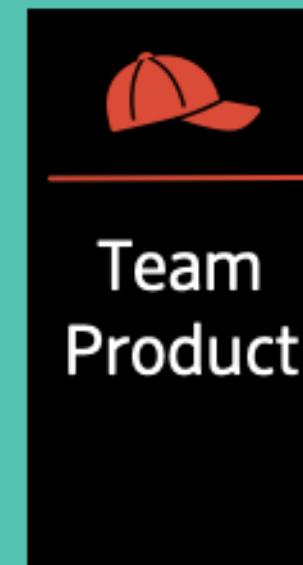
Auswirkung für den Product Owner



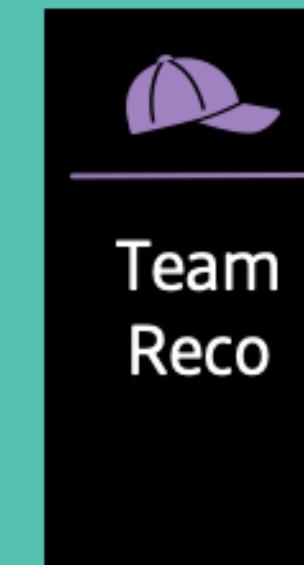


WANTED

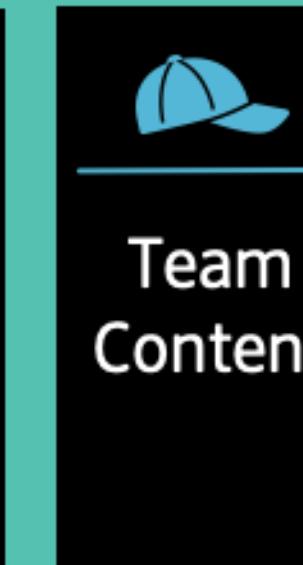
CROSS-FUNKTIONALE TEAMS



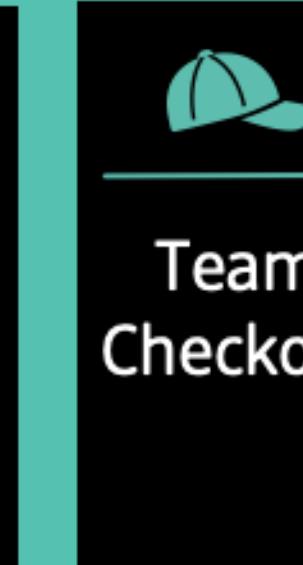
Team
Product



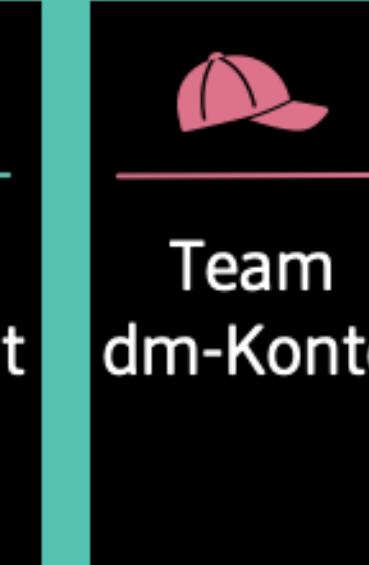
Team
Reco



Team
Content



Team
Checkout

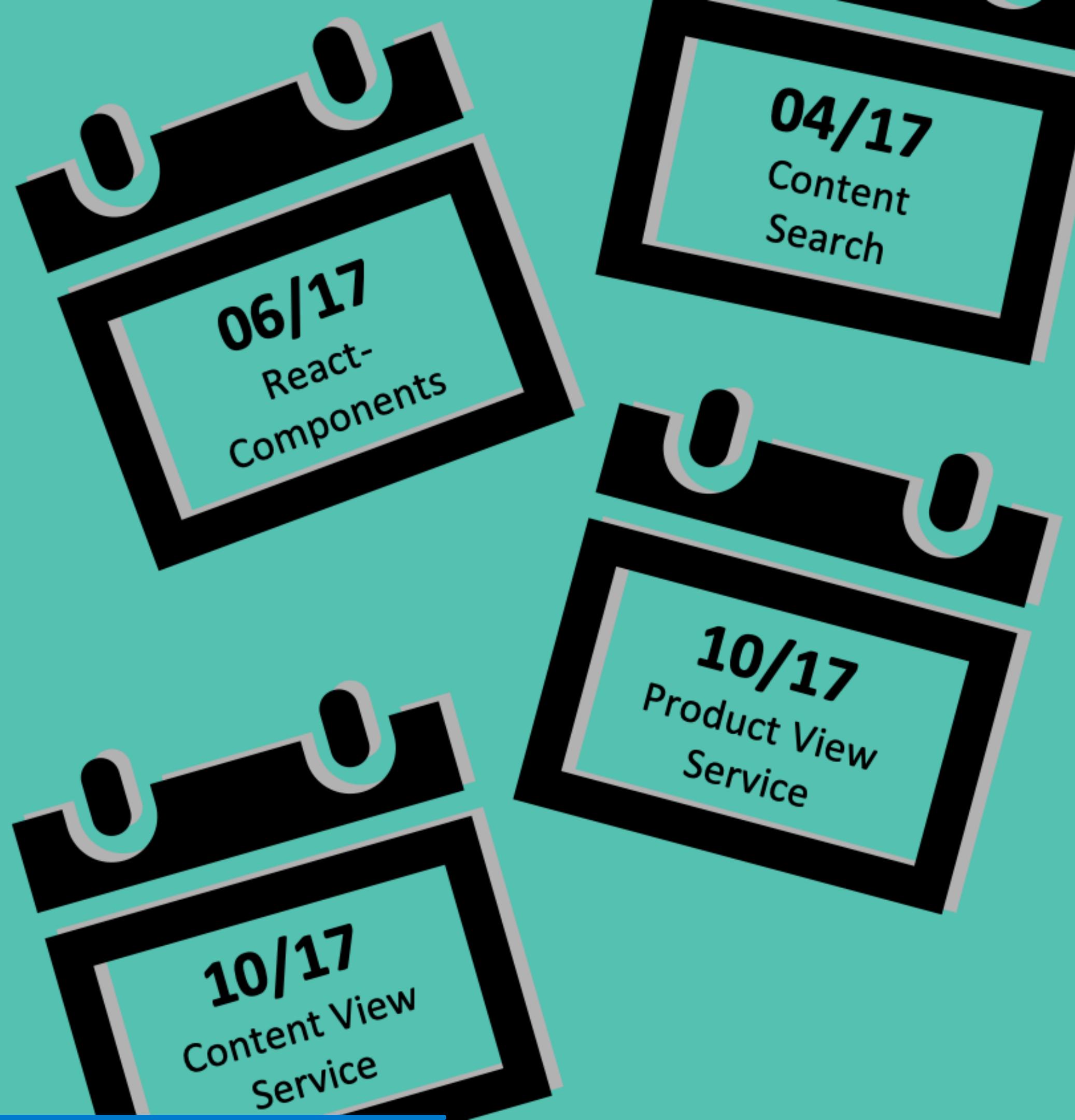


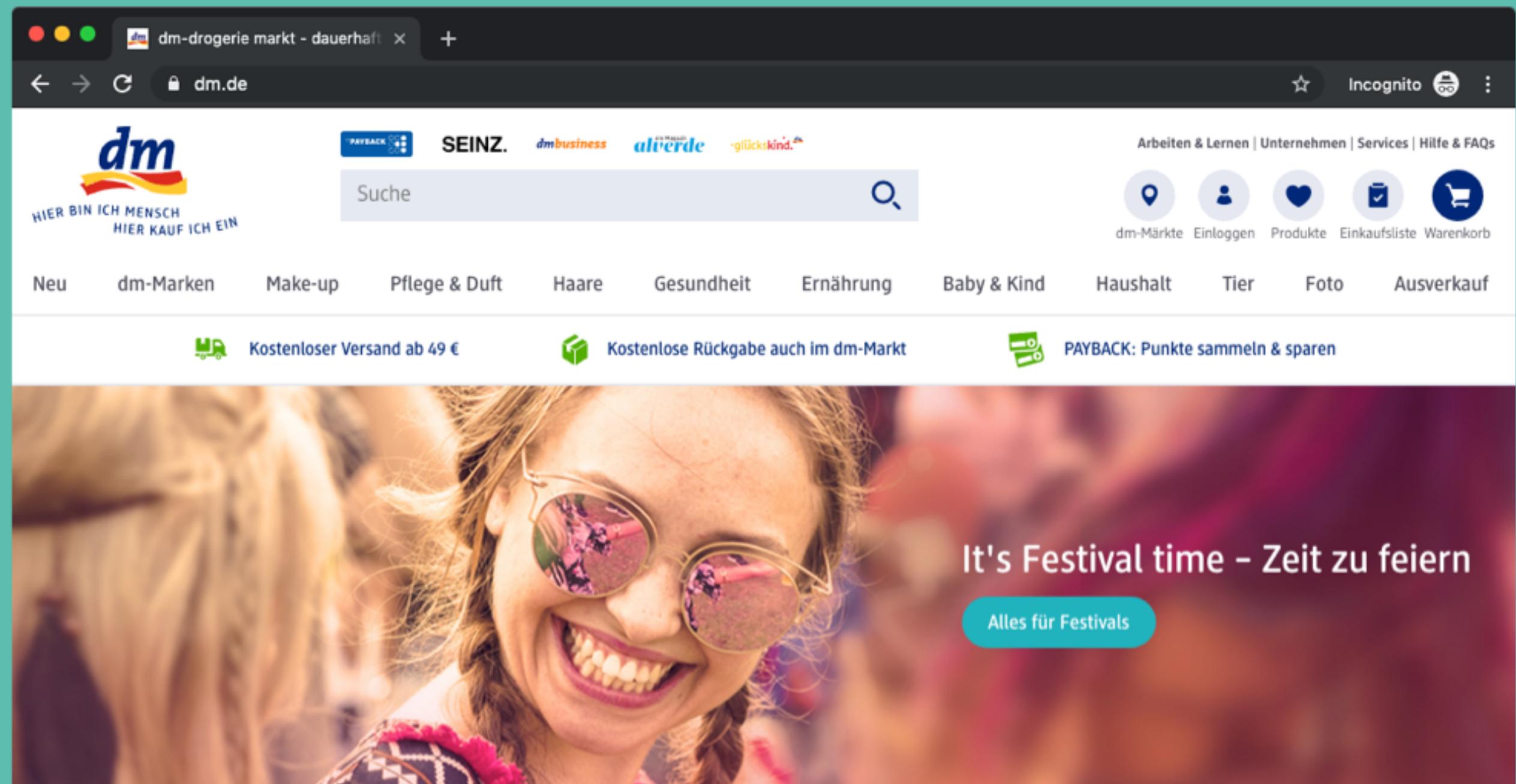
Team
dm-Konto

FRONT- & BACK-END



Versuche zur Eigenständigkeit





content-view-service



BABEL



ESLint

product-view-service



BABEL



ESLint

content-search-service



BABEL



ESLint

React Components

GitOverride: endlich hab ich die selectbox fertig

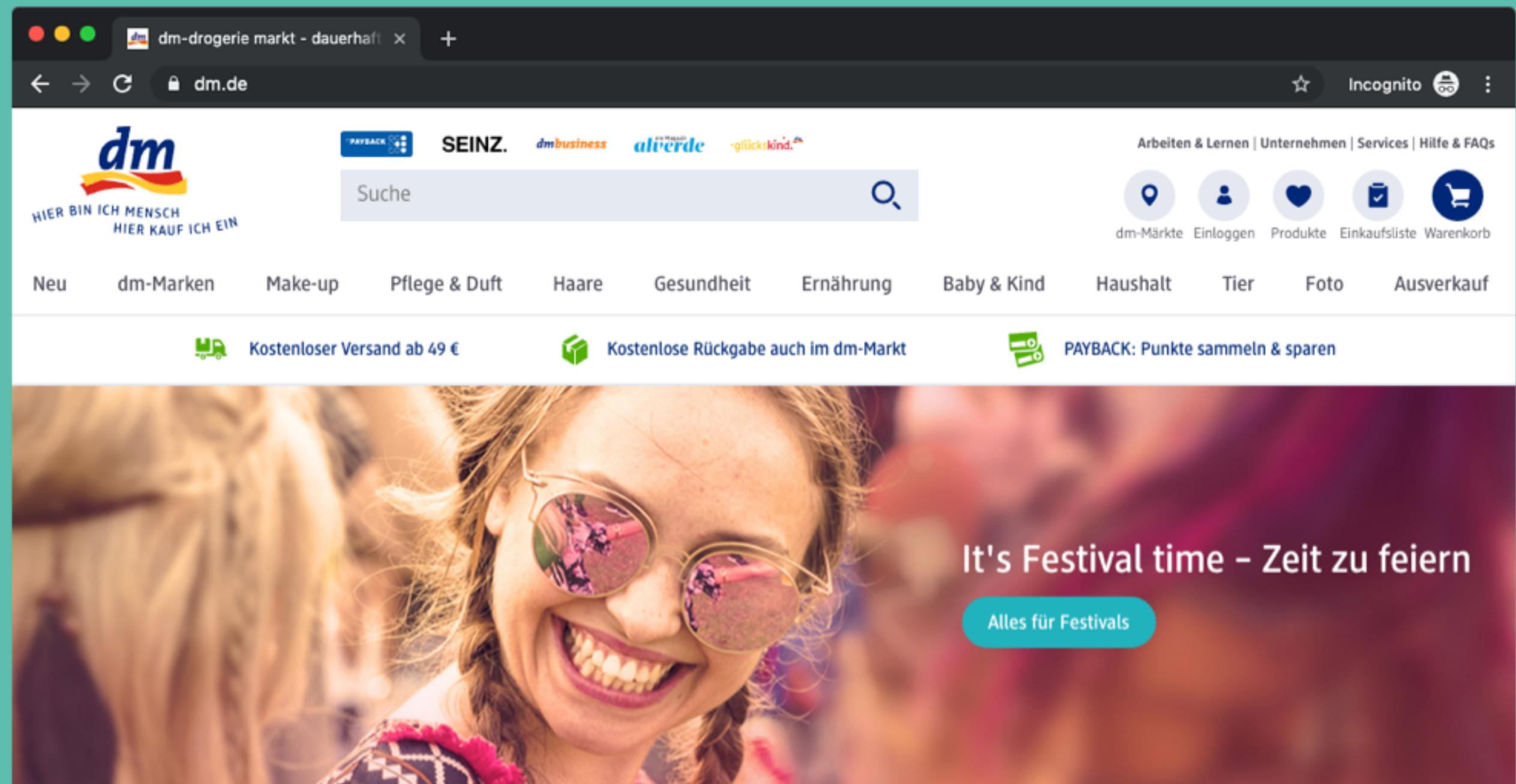
GitOverride: e(⌂ ⌂)đ

GitOverride: ganz schön viele extra features wieder...

GitOverride: nativ und gut is...

Front_Ende: was habt ihr denn gebraucht? wir hätten da was 😅

GitOverride: special styling unterschiedlich auf desktop und mobile versteht sich



content-view-service



BABEL



ESLint

product-view-service



BABEL



ESLint

content-search-service

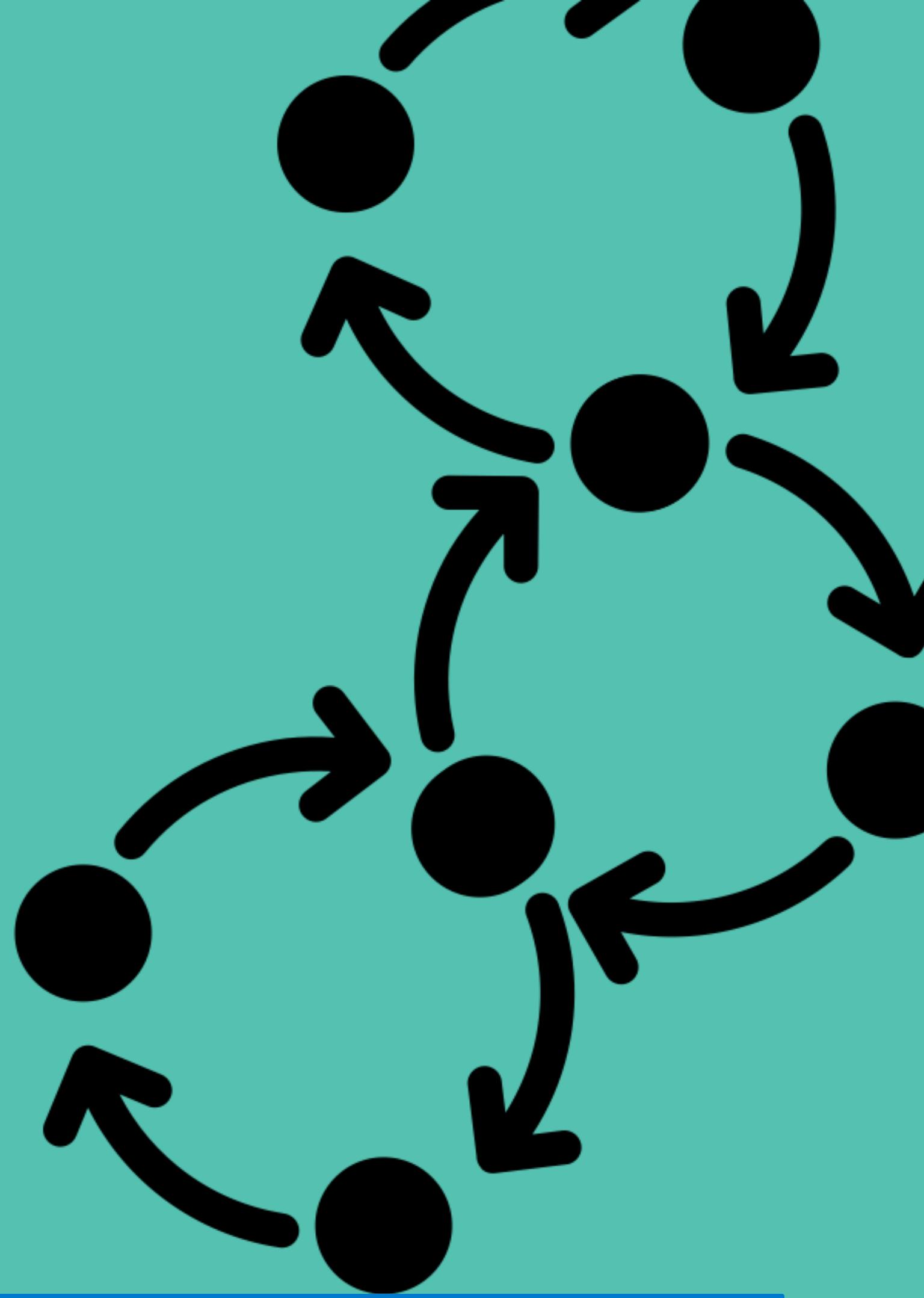


BABEL



ESLint

react-components



Aber erstes Zwischenergebnis:
Abhängigkeitszyklen
= verteilter Monolith

321 PUSH!



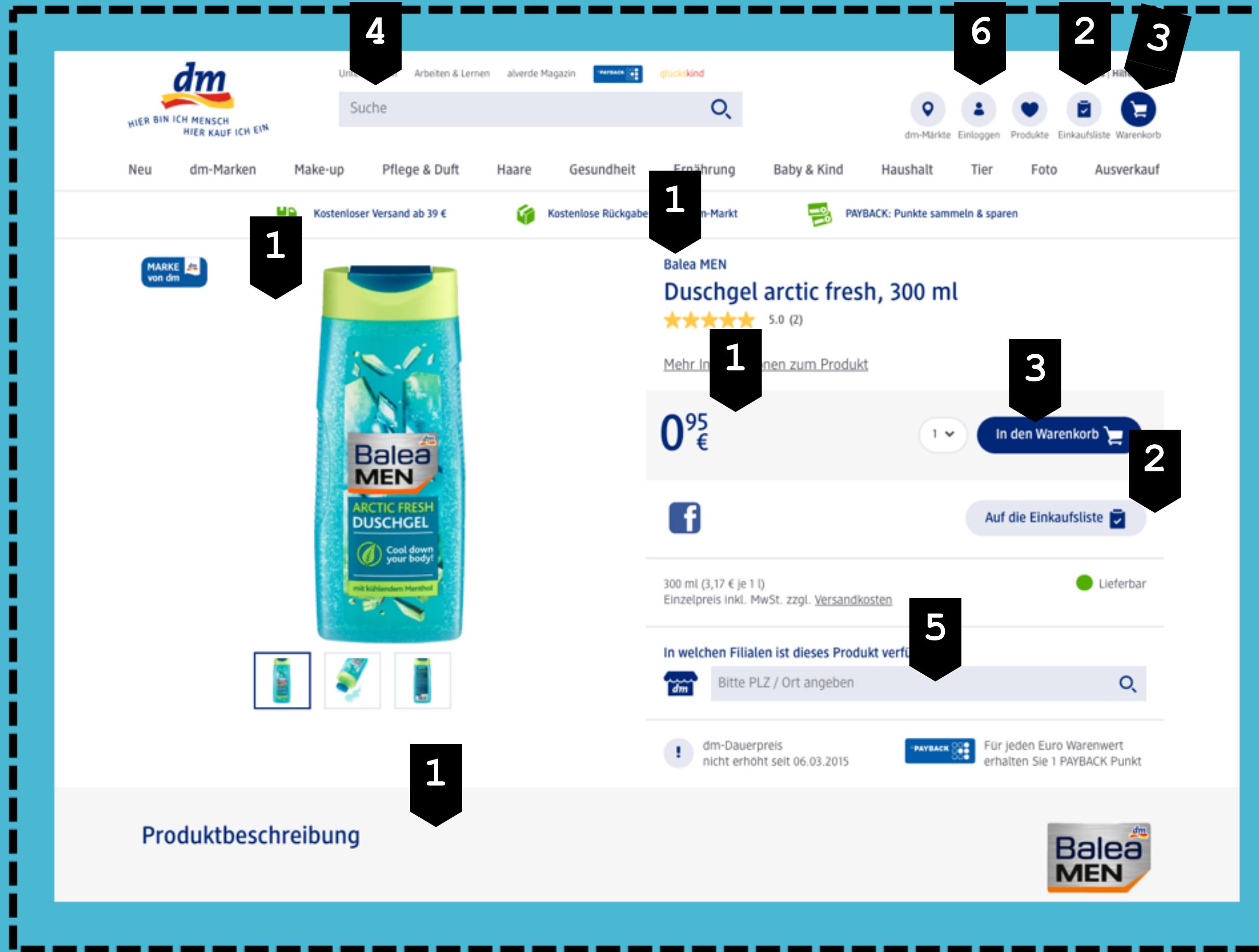
DAS RÄTSEL



**WIE TEILEN WIR
DAS FRONTEND AUF?**

Schauplatz

Detailseite



- 1 Domain Produkt
 - 2 Domain Shopping-List
 - 3 Domain Checkout
 - 3 Domain Suche
 - 5 Domain Filial Verfügbarkeit
 - 6 Domain Kundenkonto

Schauplatz Suche

Domain Suche (Rahmen) 1

Domain Produkt-Suche 2

Domain Content-Suche 3

1

dm SEINZ. dm business alverde glückskind.de

Balea

Arbeiten & Lernen | Unternehmen | Services | Hilfe & FAQs

dm-Märkte Einloggen Produkte Einkaufsliste Warenkorb

Neu dm-Marken Make-up Pflege & Duft Haare Gesundheit Ernährung Baby & Kind Haushalt Tier Foto Ausverkauf

Kostenloser Versand ab 49 € Kostenlose Rückgabe am Markt PAYBACK: Punkte sammeln & sparen

Alle Sortimente

Pflege & Duft (457)

Haare (162)

Baby & Kind (3)

Beliebte Filter Anzahl 24 ▾

Marke von dm 621

Vegan 379

Ohne Silikone 114

Für Männer 85

Neu 51

Medizinische Pflege 20

Sortieren nach Beliebtheit ▾

Suche nach „Balea“

Produkte (623) Beratung (206)

2

3

Balea FUSS HORNHAUT ENTFERNER SOCKEN Feel Well

3,95 €

Balea FUSSCREME UREA verhindert Spannungsgefühle sehr trockene Füße

1,25 €

Balea DUSCHÖL für gesundes und strahlendes Hautgefühl sehr trockene Haut

1,85 €

Balea ERFRISCHENDES WASCH GEL mild schäumend mit Aloe Vera normaler und Mischhaut

0,95 €

Balea COLORNIQUE

Balea Med

Balea MEN

Balea

Balea Hornhaut

Balea Urea Fußcreme, 100 ml

Balea Duschöl 250ml, 250 ml

Balea erfrischendes Waschgel, 150 ml

2 St (1,98 € je 1 St)

100 ml (1,25 € je 100 ml)

250 ml (0,74 € je 100 ml)

150 ml (0,63 € je 100 ml)

★ ★ ★ ★ ★ (196)

★ ★ ★ ★ ★ (12)

★ ★ ★ ★ ★ (10)

★ ★ ★ ★ ★ (31)

Schauplatz Suche

Domain Suche (Rahmen) 1

Domain Produkt-Suche | 2

Domain Content-Suche 3

1

dm
HIER BIN ICH MENSCH
HIER KAUF' ICH EIN

SEINZ. dm business alverde glückskind.de

Balea 

Arbeiten & Lernen | Unternehmen | Services | Hilfe & FAQs

dm-Märkte Einloggen Produkte Einkaufsliste Warenkorb

Neu dm-Marken Make-up Pflege & Duft Haare Gesundheit Ernährung Baby & Kind Haushalt Tier Foto Ausverkauf

 Kostenloser Versand ab 49 €  Kostenlose Rückgabe  Markt  PAYBACK: Punkte sammeln & sparen

Beitragstypen

<input type="checkbox"/> Redaktionelles	93
<input type="checkbox"/> Specials	79
<input type="checkbox"/> Downloads	15
<input type="checkbox"/> Produkt-Kategorien	9
<input type="checkbox"/> dm-Marken	2
<input type="checkbox"/> Beratung & Information	1
<input type="checkbox"/> Häufige Fragen	7

Anzahl 24 

Sortieren nach Relevanz 

2

3

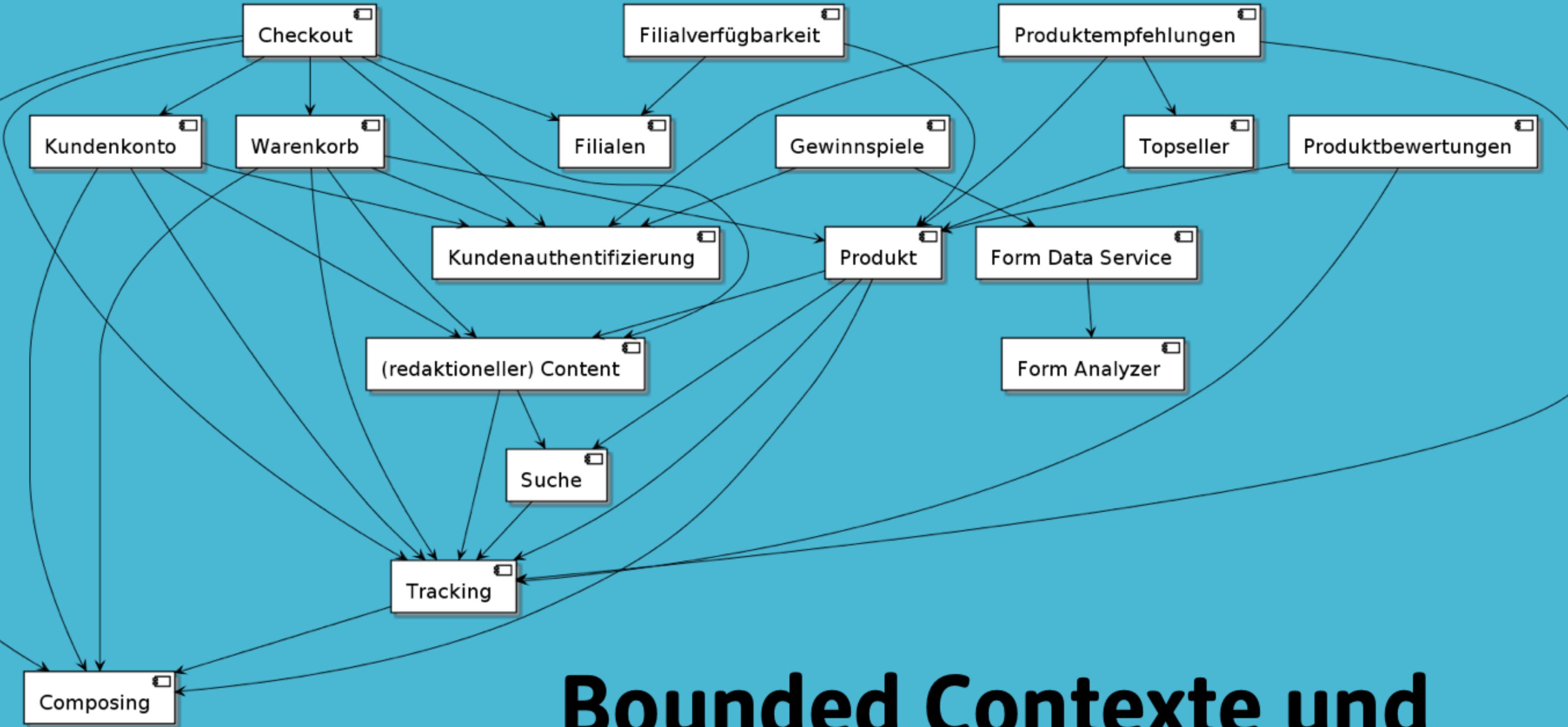
Suchantrag nach „Balea“

Produkte (623) Beratung (206)

**Balea Deo**
22.12.2017
Pflege & Duft
 Seite öffnen

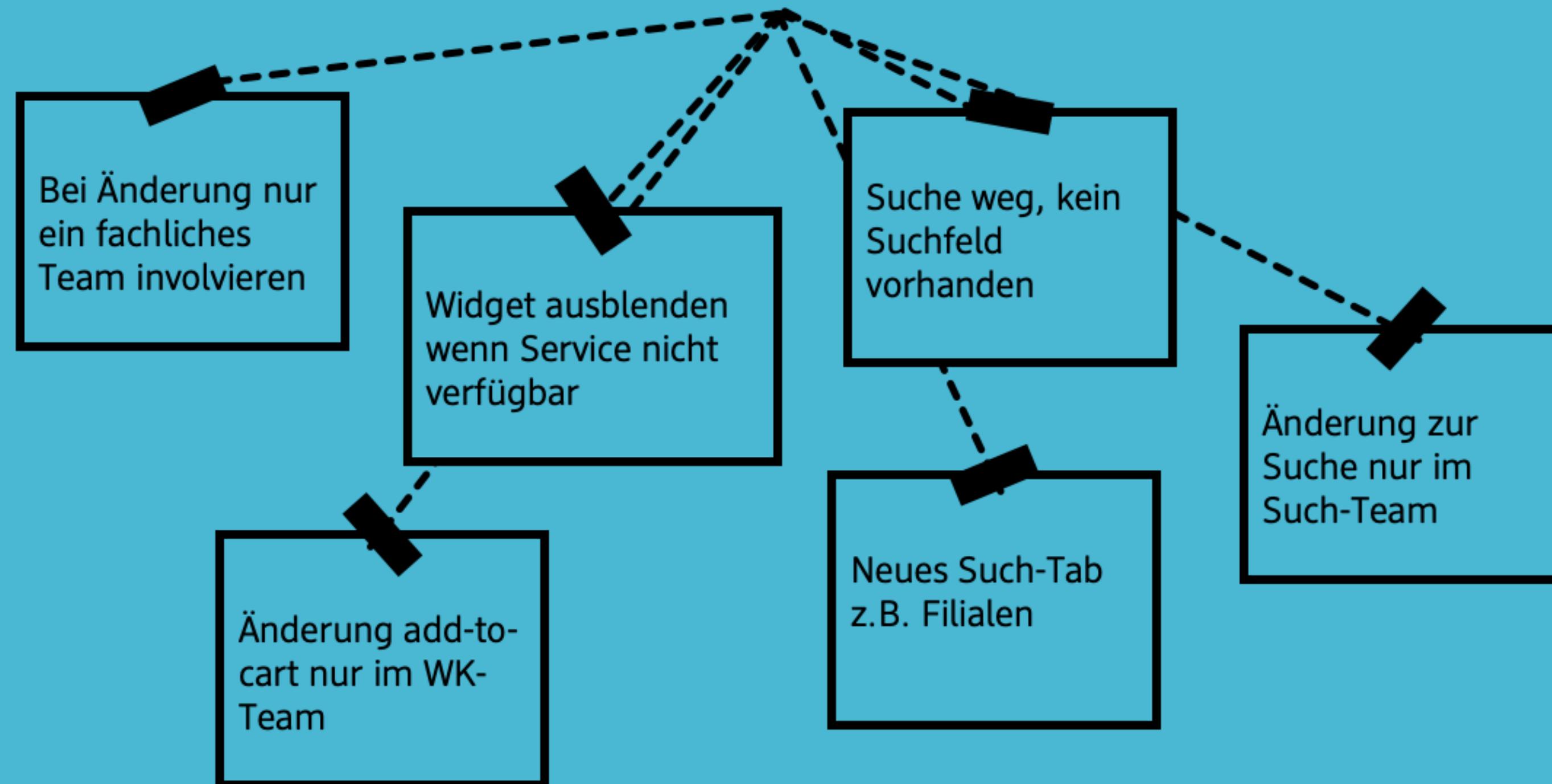
**Über Balea**
11.01.2016
Balea
 Seite öffnen

**Balea Winter**
25.10.2018
Limited Editions
 Seite öffnen

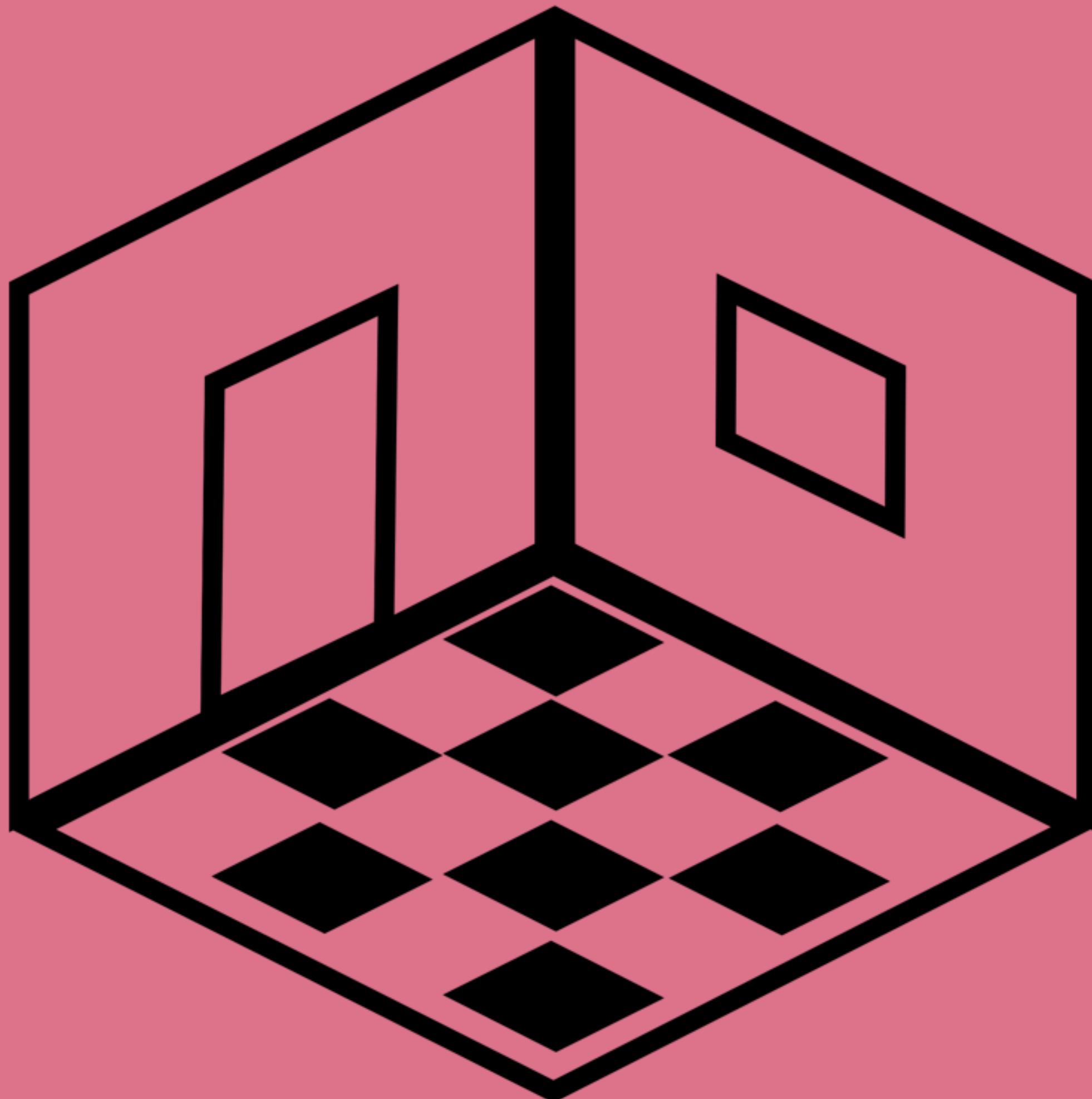


Bounded Contexte und Abhängigkeiten bei dm.de

Separations of Concerns



? ! DIE LÖSUNG



Lösungs- Rahmen

Überwiegend clientseitige
Integration

- Nur **eine** Technologie -  React
- aus Performance-Gründen nicht x Frameworks in die Seite laden
 - Synergien (Know-How, UX-Komponenten)



**Auf den
zweiten Blick...**

Bildquelle: <https://www.sehtestbilder.de>

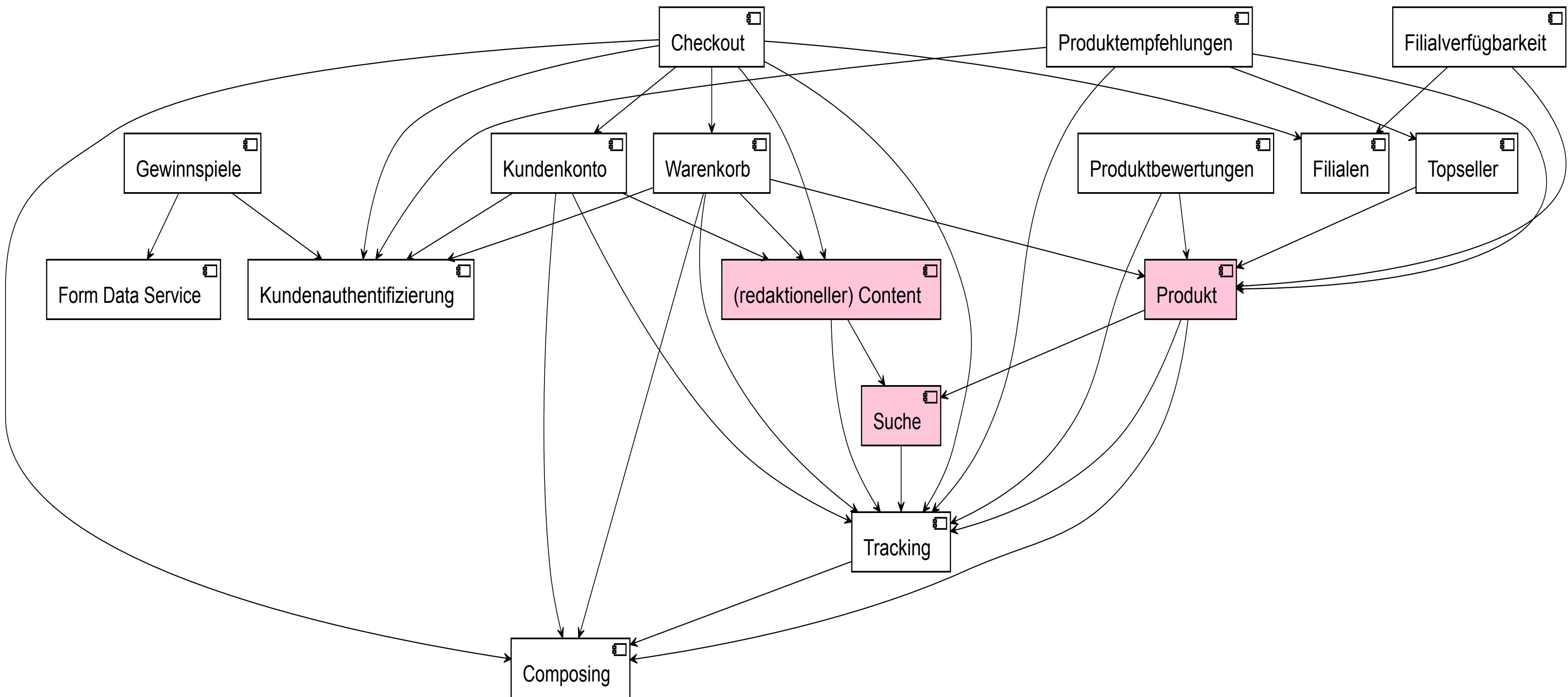


**< DEPENDENCY
INVERSION />**

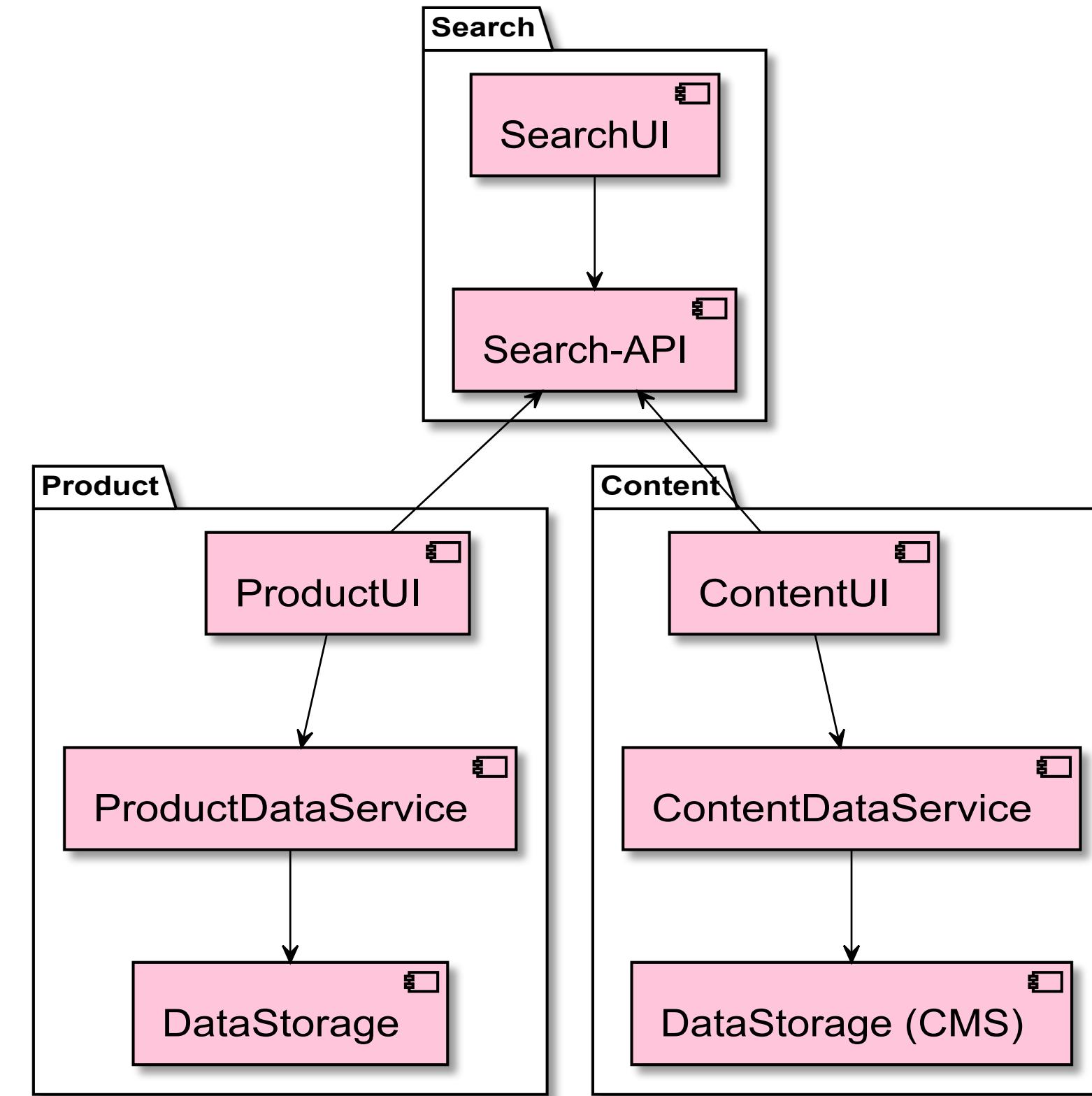
Allgemeine Module
hängen nicht von
speziellen Modulen
ab.

Spezielle Module
hängen von
allgemeinen
Modulen ab.

Dependency Inversion am Beispiel der Suche auf dm.de



Dependency Inversion - nur eine Abhängigkeitsrichtung



Demo Suche

https://www.dm.de/search/468652.html?type=product&q=balea

balea

Kostenloser Versand ab 49 €

Kostenlose Rückgabe auch im dm-Markt

PAYBACK: Punkte sammeln & sparen

Suche nach „balea“

Produkte (614) Beratung (221)

Sortieren Filtern

MARKE von dm MARKE von dm MARKE von dm

Balea FUSS HORNHAUT ENTFERNER SOCKEN Feel Well

Balea Urea Fußcreme

Balea Fuß Bimsschwamm

Balea Duschöl 250ml

3,95 € 1,25 € 0,95 € 1,85 €

We setzt technisch notwendige Cookies und Webanalyse-Technologien auf Grundlage unserer berechtigten Interessen ein. Wenn Sie uns hier darüber hinaus Ihr Einverständnis geben, nutzen wir bestimmte Marketingcookies, um Ihnen personalisierte Services und Angebote anzubieten. Ausführliche Informationen finden Sie in unserer [Datenschutzerklärung](#).

http://localhost:8080/?query=balea&searchType=product

Suche nach "balea"

Produkte (6) Beratung (3)

Suche nach "balea": 6 counts

balea product 1
3,95 €

Lorem ipsum dolor sit amet

balea product 2
1,99 €

Lorem ipsum dolor sit amet

balea product 3
8,65 €

Lorem ipsum dolor sit amet

balea product 4
2,95 €

Lorem ipsum dolor sit amet

balea product 5
8,65 €

Lorem ipsum dolor sit amet

balea product 6
2,95 €

Lorem ipsum dolor sit amet

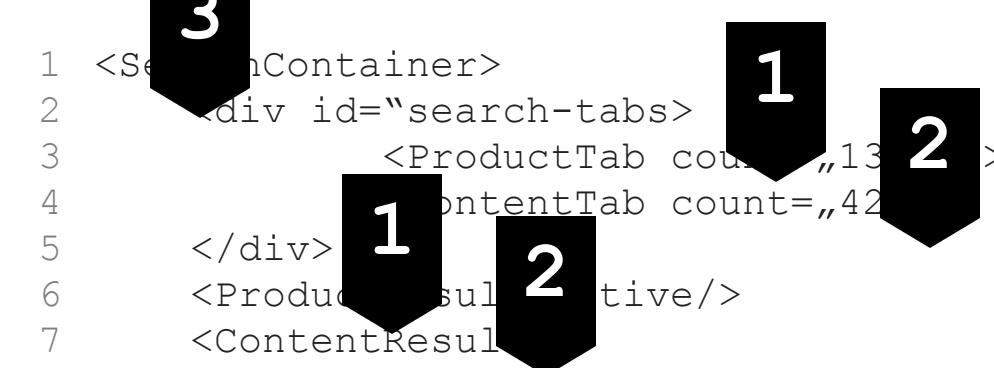
Composition vs. Dependency Inversion

- 1 Domain Produkt
- 2 Domain Content
- 3 Domain Suche

red yellow green code ~ comparison

composition is x

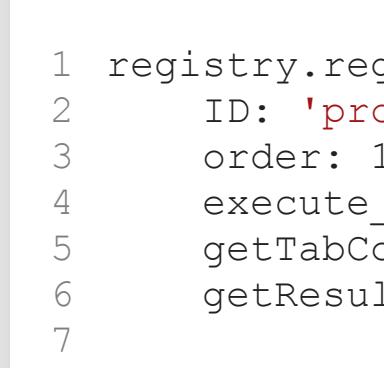
```
1 <SearchContainer>
2   <div id="search-tabs">
3     <ProductTab count="13">
4       <ContentTab count="42" />
5     </div> 1 2
6   <ProductResult active/>
7   <ContentResult />
8 </SearchContainer>
9
10 // --- everything in one repository ---
```



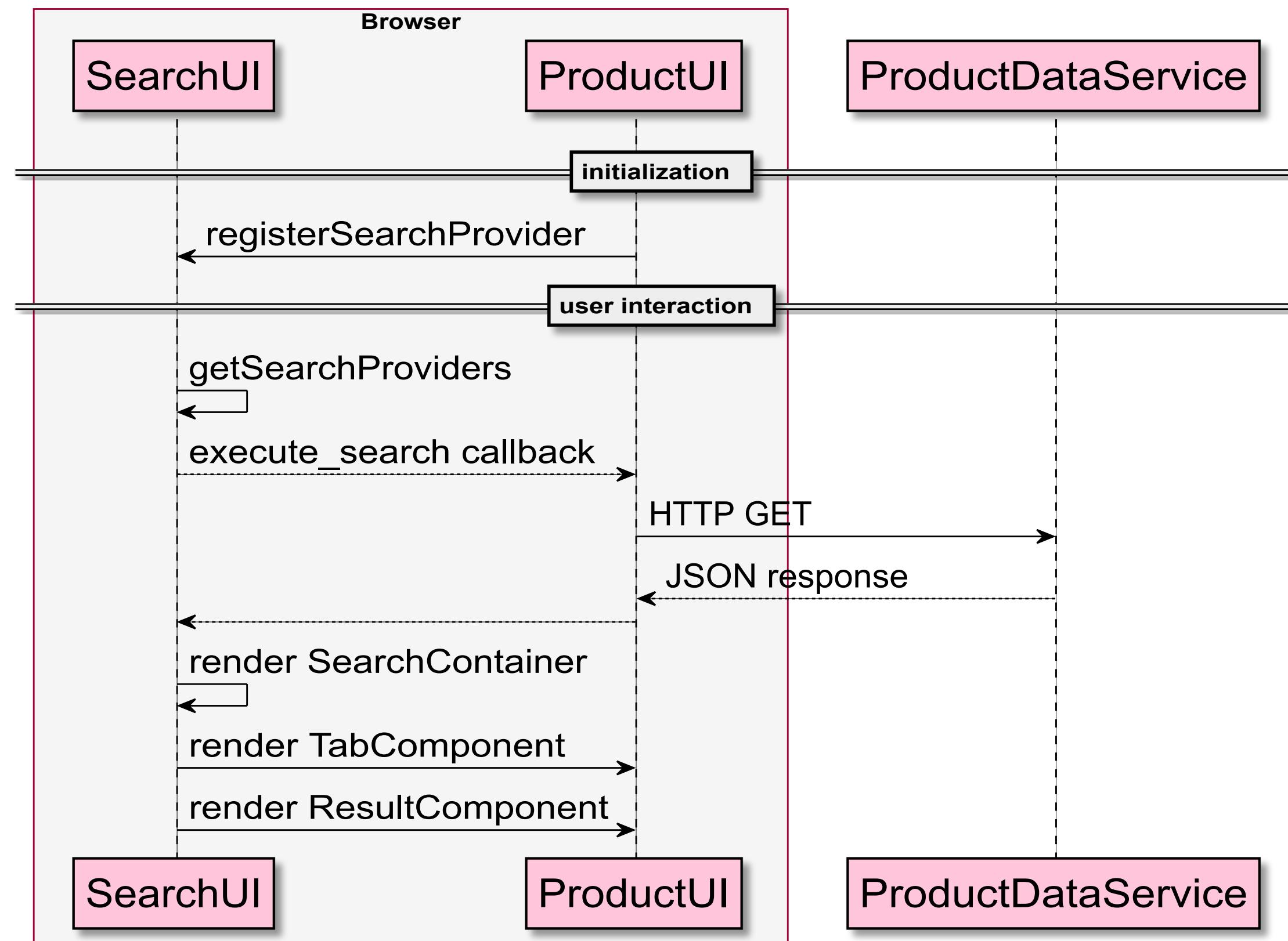
red yellow green code ~ comparison

dependencyInversion.js x

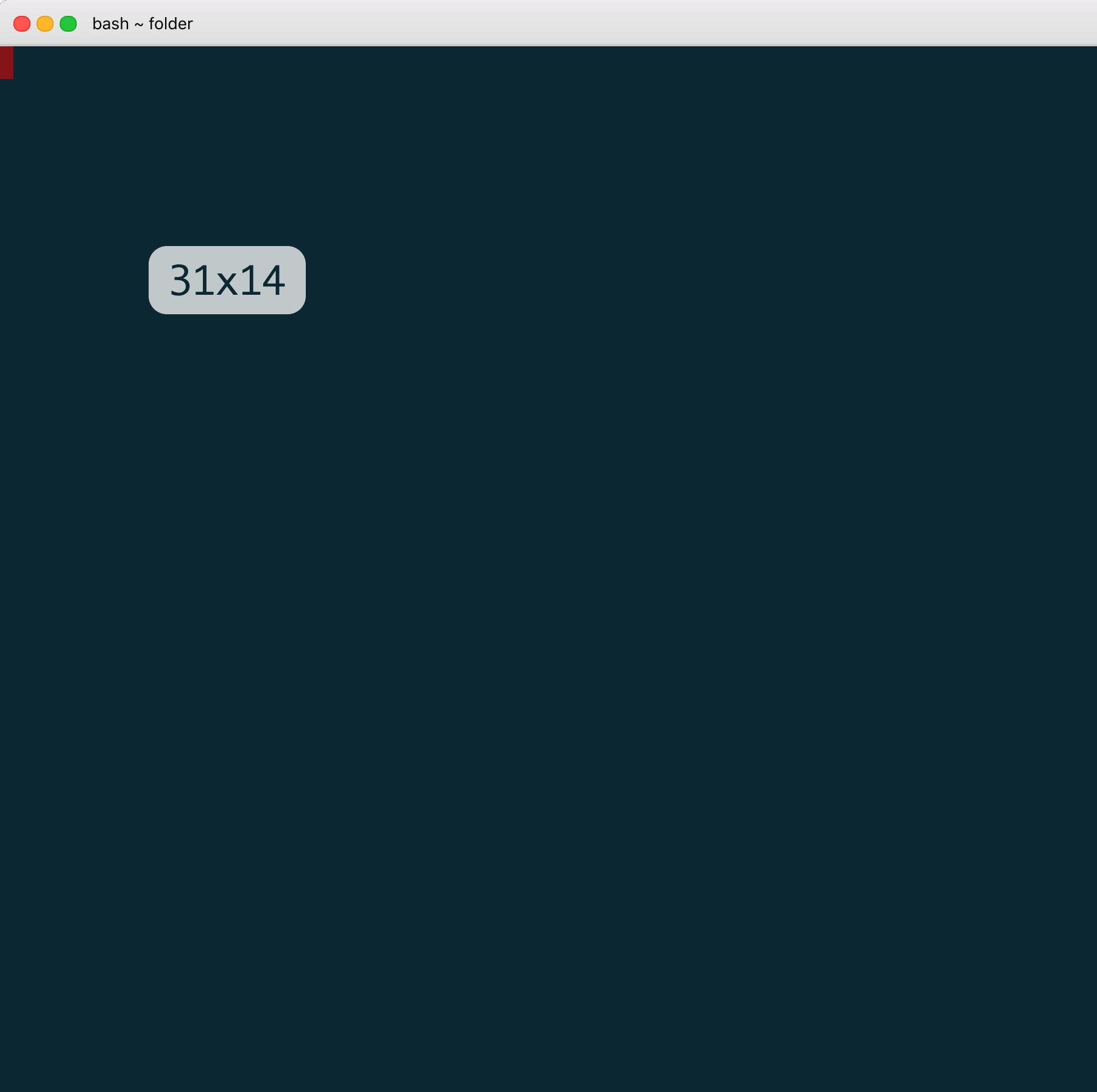
```
1 registry.registerSearchProvider({
2   ID: 'product',
3   order: 1,
4   execute_search: query => executeProductSearch(query),
5   getTabComponent: data => <ProductTab data={data} />,
6   getResultComponent: (query, data) => (
7     <ProductResult query={query} data={data} />
8   ),
9 });
10
11 // ----- ↑ Product ↑ -----
12 // --- loosely coupled micro-frontends ---
13 // ----- ↓ Search ↓ -----
14
15 const searchProviders = registry.getSearchProviders()
16 <SearchContainer>
17   <div id="search-tabs">
18     {searchProviders.map(provider => getTabFor(provider)) }
19   </div>
20   {activeProvider.getResultComponent(query, data)}
21 </SearchContainer>
```



Suche mit einem Provider für Produktsuche



Suche mit einem Provider für Produktsuche



http://localhost:8080/?query=balea&searchType=product

Suche nach "balea"

Produkte (6) Beratung (3)

Suche nach "balea": 6 counts

balea product 1
3,95 €

Lorem ipsum dolor sit amet

balea product 2
1,99 €

Lorem ipsum dolor sit amet

balea product 3
8,65 €

Lorem ipsum dolor sit amet

balea product 4
2,95 €

balea product 5
8,65 €

balea product 6
2,95 €

Dependency Inversion - Search-API

code ~ sources

search-api/src/api/registry.js x

```
1 import byOrder from './util/sort';
2 import isEmpty from './util/isEmpty';
3
4 const searchProviders = {};
5
6 export const registerSearchProvider = provider => {
7   searchProviders[provider.ID] = { ...provider };
8 }
9
10 export const getSearchProviders = () => {
11   if (isEmpty(searchProviders)) {
12     throw new Error('No SearchProvider registered!');
13   }
14   return Object.keys(searchProviders)
15     .map(key => searchProviders[key])
16     .sort(byOrder);
17 }
18
19 export const removeSearchProvider = ID => {
20   delete searchProviders[ID];
21 }
```

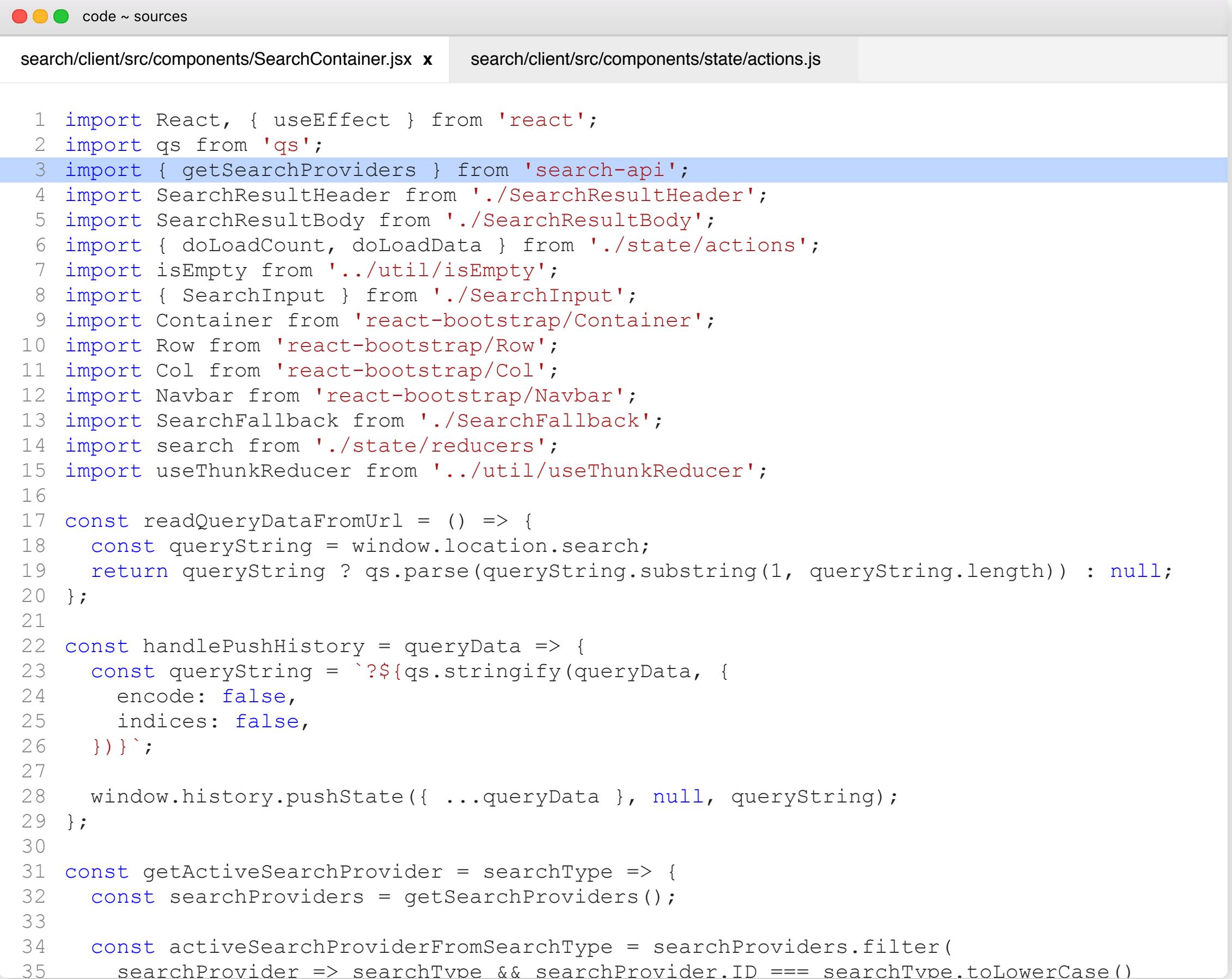
Dependency Inversion - Produkt

code ~ sources

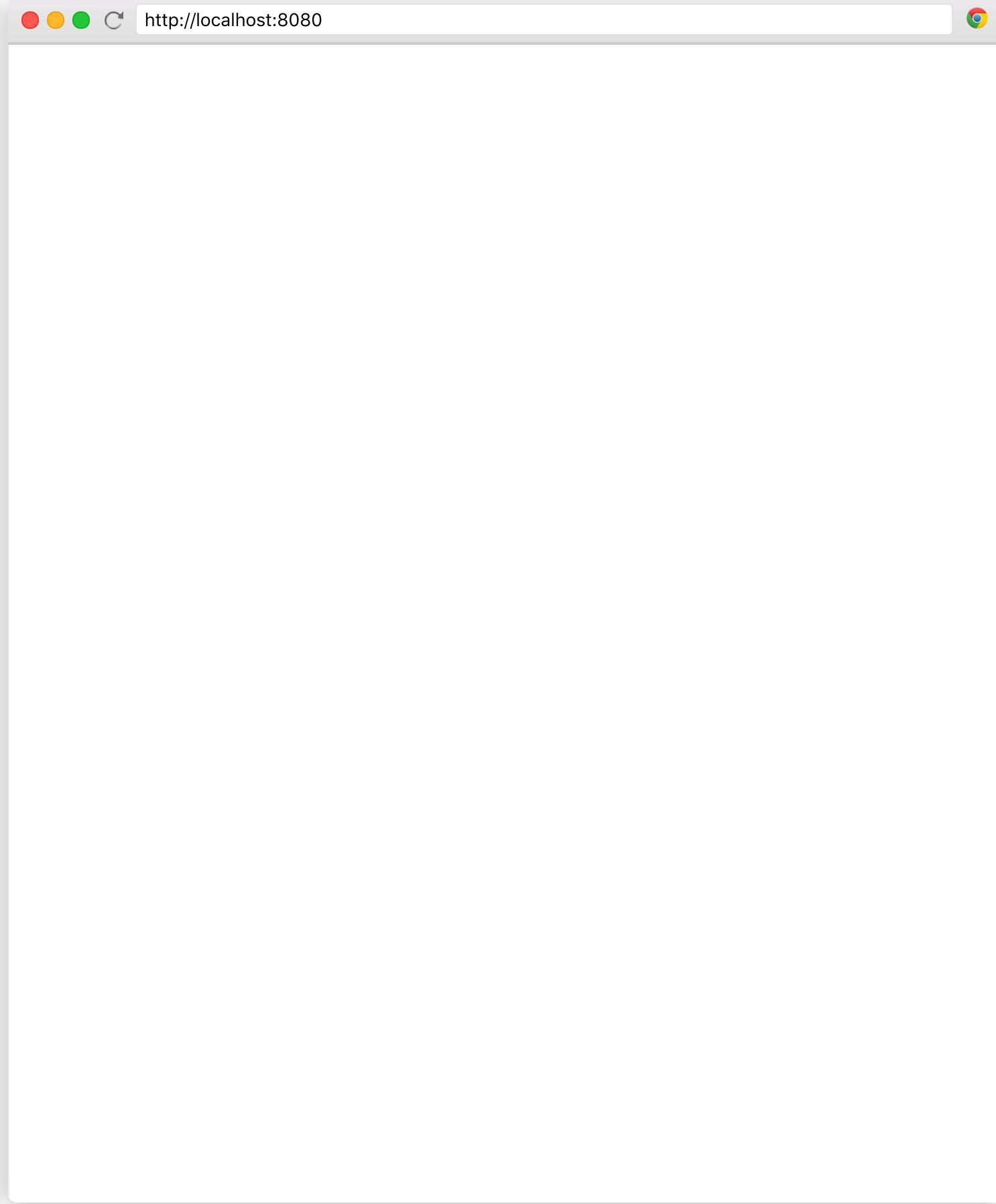
product/client/src/ProductSearchInitializer.jsx x

```
1 import React from 'react';
2 import { registerSearchProvider, removeSearchProvider } from 'search-api';
3 import { executeProductCount, executeProductSearch } from './search';
4 import ProductSearchTab from './ProductSearchTab';
5 import ProductSearchResult from './ProductSearchResult';
6
7 export const SEARCH_PROVIDER_ID = 'product';
8 const ORDER = 1;
9
10 export const initialize = () => {
11   registerSearchProvider({
12     ID: SEARCH_PROVIDER_ID,
13     order: ORDER,
14     execute_search: queryData => executeProductSearch(queryData),
15     execute_count: queryData => executeProductCount(queryData),
16     getTabComponent: data => <ProductSearchTab data={data} />,
17     getResultComponent: (queryData, data, fetchData) => (
18       <ProductSearchResult queryData={queryData} data={data} fetchData={fetchData} />
19     ),
20   });
21 };
22
23 // as soon we have health checks, we can remove search provider in case of errors
24 // search provider will disappear in search tabs
25 export const shutdown = () => {
26   removeSearchProvider(SEARCH_PROVIDER_ID);
27 };
```

Dependency Inversion - Suche



```
1 import React, { useEffect } from 'react';
2 import qs from 'qs';
3 import { getSearchProviders } from 'search-api';
4 import SearchResultHeader from './SearchResultHeader';
5 import SearchResultBody from './SearchResultBody';
6 import { doLoadCount, doLoadData } from './state/actions';
7 import isEmpty from '../util/isEmpty';
8 import { SearchInput } from './SearchInput';
9 import Container from 'react-bootstrap/Container';
10 import Row from 'react-bootstrap/Row';
11 import Col from 'react-bootstrap/Col';
12 import Navbar from 'react-bootstrap/Navbar';
13 import SearchFallback from './SearchFallback';
14 import search from './state/reducers';
15 import useThunkReducer from '../util/useThunkReducer';
16
17 const readQueryDataFromUrl = () => {
18   const queryString = window.location.search;
19   return queryString ? qs.parse(queryString.substring(1, queryString.length)) : null;
20 };
21
22 const handlePushHistory = queryData => {
23   const queryString = `?${qs.stringify(queryData, {
24     encode: false,
25     indices: false,
26   })}`;
27
28   window.history.pushState({ ...queryData }, null, queryString);
29 };
30
31 const getActiveSearchProvider = searchType => {
32   const searchProviders = getSearchProviders();
33
34   const activeSearchProviderFromSearchType = searchProviders.filter(
35     searchProvider => searchType && searchProvider.ID === searchType.toLowerCase()
```



http://localhost:8080

Dependency Inversion - Suche

code ~ sources

search/client/src/components/SearchContainer.jsx x search/client/src/components/SearchResultHeader.jsx search/client/src/components/Se...

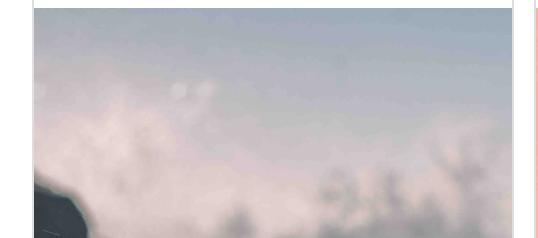
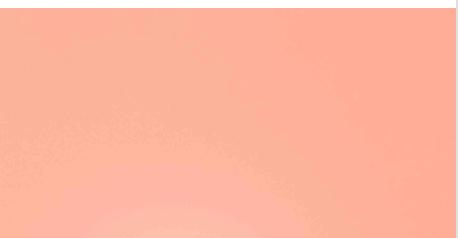
```
1 import React, { useEffect } from 'react';
2 import qs from 'qs';
3 import { getSearchProviders } from 'search-api';
4 import SearchResultHeader from './SearchResultHeader';
5 import SearchResultBody from './SearchResultBody';
6 import { doLoadCount, doLoadData } from './state/actions';
7 import isEmpty from '../util/isEmpty';
8 import { SearchInput } from './SearchInput';
9 import Container from 'react-bootstrap/Container';
10 import Row from 'react-bootstrap/Row';
11 import Col from 'react-bootstrap/Col';
12 import Navbar from 'react-bootstrap/Navbar';
13 import SearchFallback from './SearchFallback';
14 import search from './state/reducers';
15 import useThunkReducer from '../util/useThunkReducer';
16
17 const readQueryDataFromUrl = () => {
18   const queryString = window.location.search;
19   return queryString ? qs.parse(queryString.substring(1, queryString.length)) : null;
20 };
21
22 const handlePushHistory = queryData => {
23   const queryString = `?${qs.stringify(queryData, {
24     encode: false,
25     indices: false,
26   })}`;
27
28   window.history.pushState({ ...queryData }, null, queryString);
29 };
30
31 const getActiveSearchProvider = searchType => {
32   const searchProviders = getSearchProviders();
33
34   const activeSearchProviderFromSearchType = searchProviders.filter(
35     searchProvider => searchType && searchProvider.ID === searchType.toLowerCase()
```

http://localhost:8080/?query=balea&searchType=product

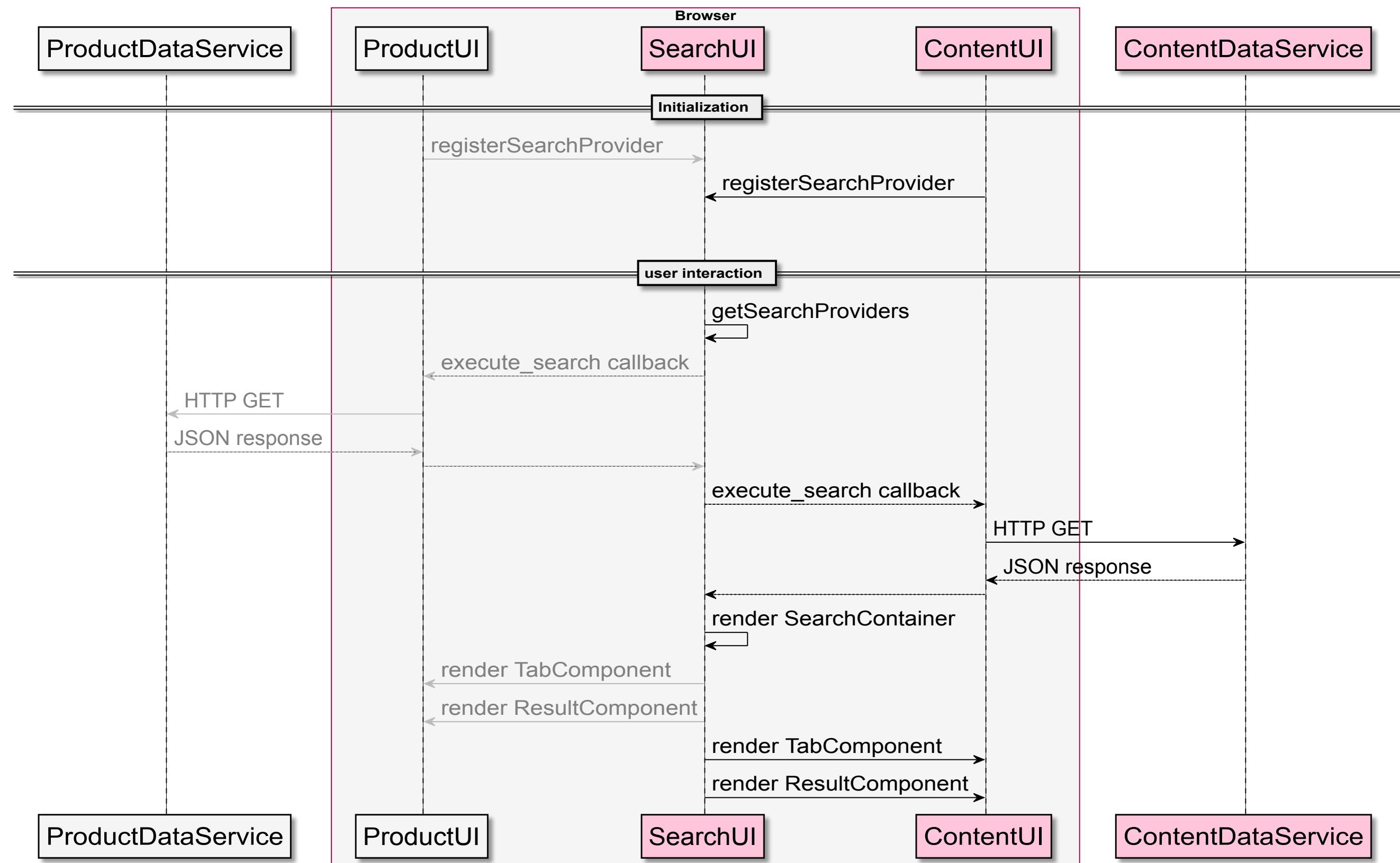
Suche nach "balea"

Produkte (6) Beratung (3)

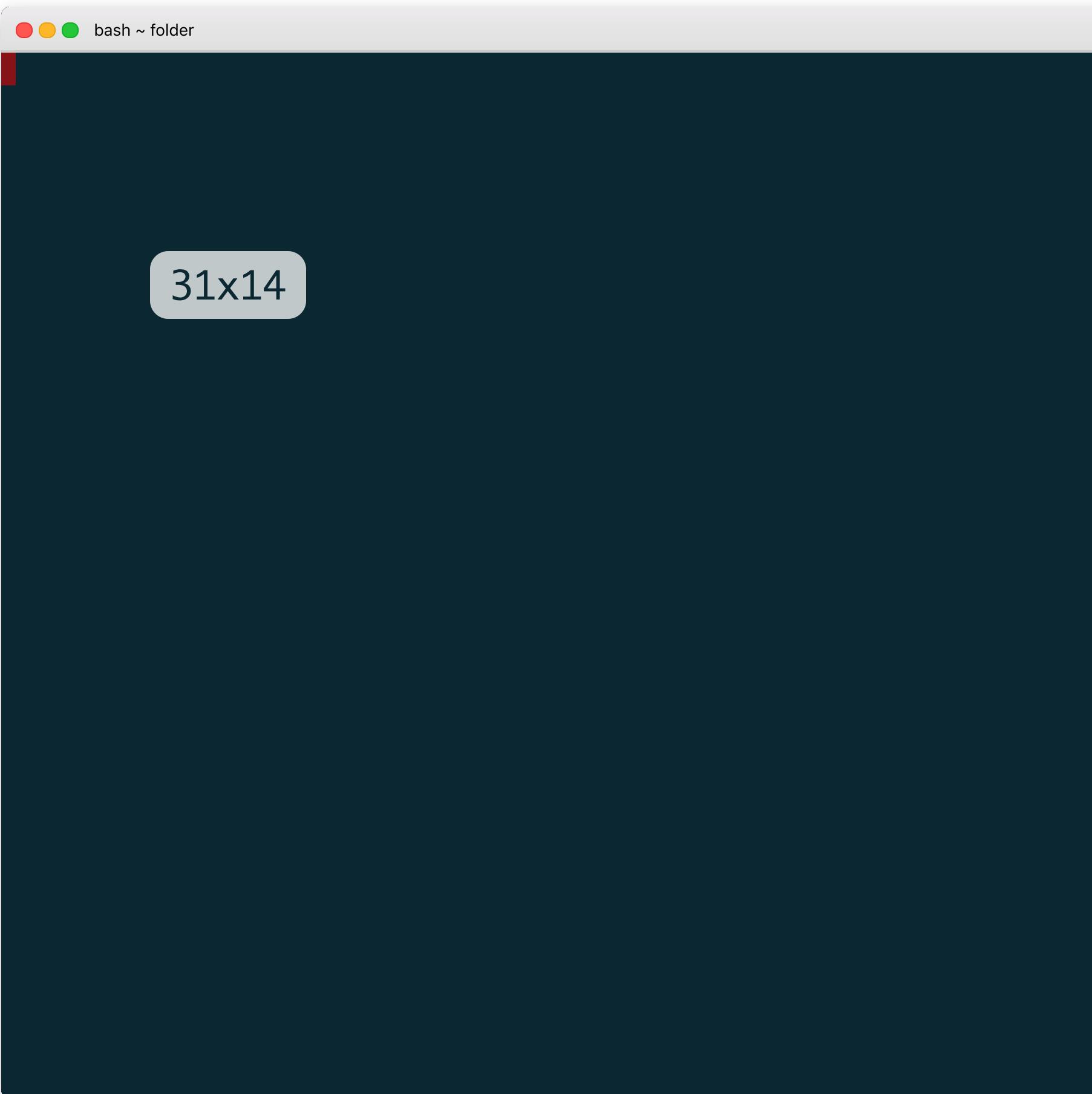
Suche nach "balea": 6 counts

balea product 1 3,95 €  Lorem ipsum dolor sit amet	balea product 2 1,99 €  Lorem ipsum dolor sit amet	balea product 3 8,65 €  Lorem ipsum dolor sit amet
balea product 4 2,95 € 	balea product 5 8,65 € 	balea product 6 2,95 € 

... und jetzt noch mit Provider für Contentsuche



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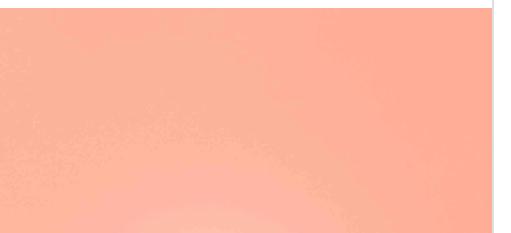


http://localhost:8080/?query=balea&searchType=product

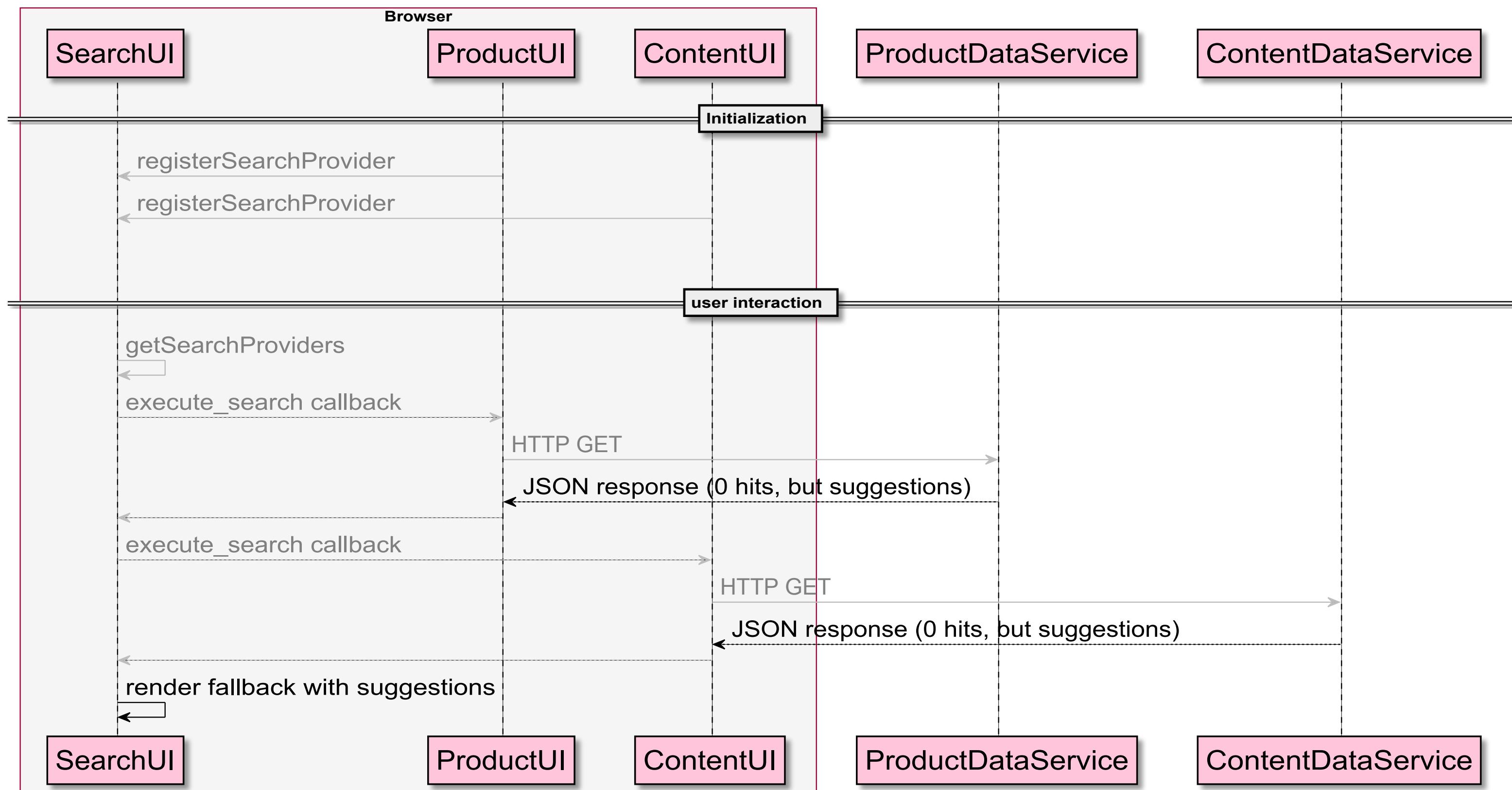
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balea product 4 2,95 € 	balea product 5 8,65 € 	balea product 6 2,95 € 

... 0-Treffer -> Fallback und Suchvorschläge

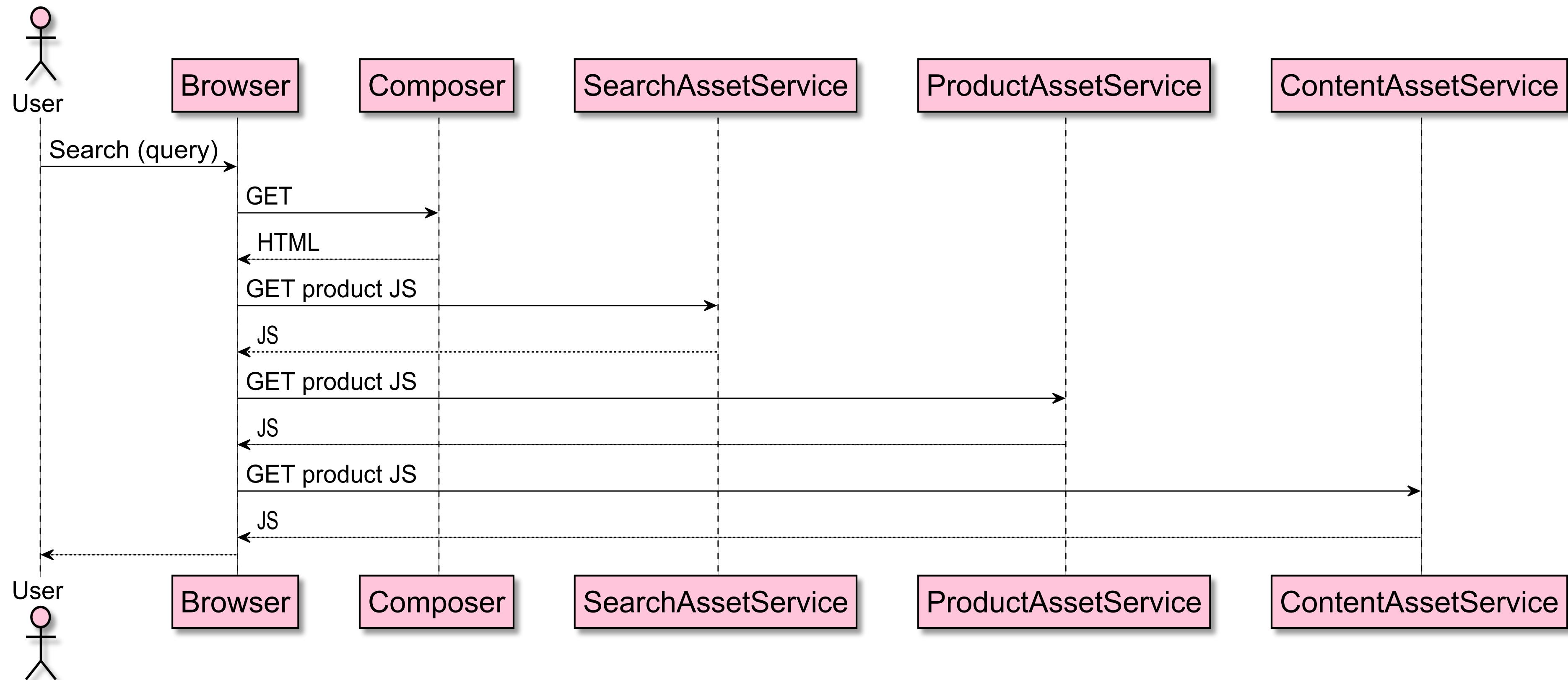


Github Repo

<https://github.com/denise-schaefer/micro-frontends>

```
.
├── composer
│   └── server
├── content
│   ├── client
│   └── server
├── product
│   ├── client
│   └── server
├── search
│   ├── client
│   └── server
└── search-api
    ├── lib
    └── src
```

HTML und JS laden





Composition

Kein unabhängiges Deployment

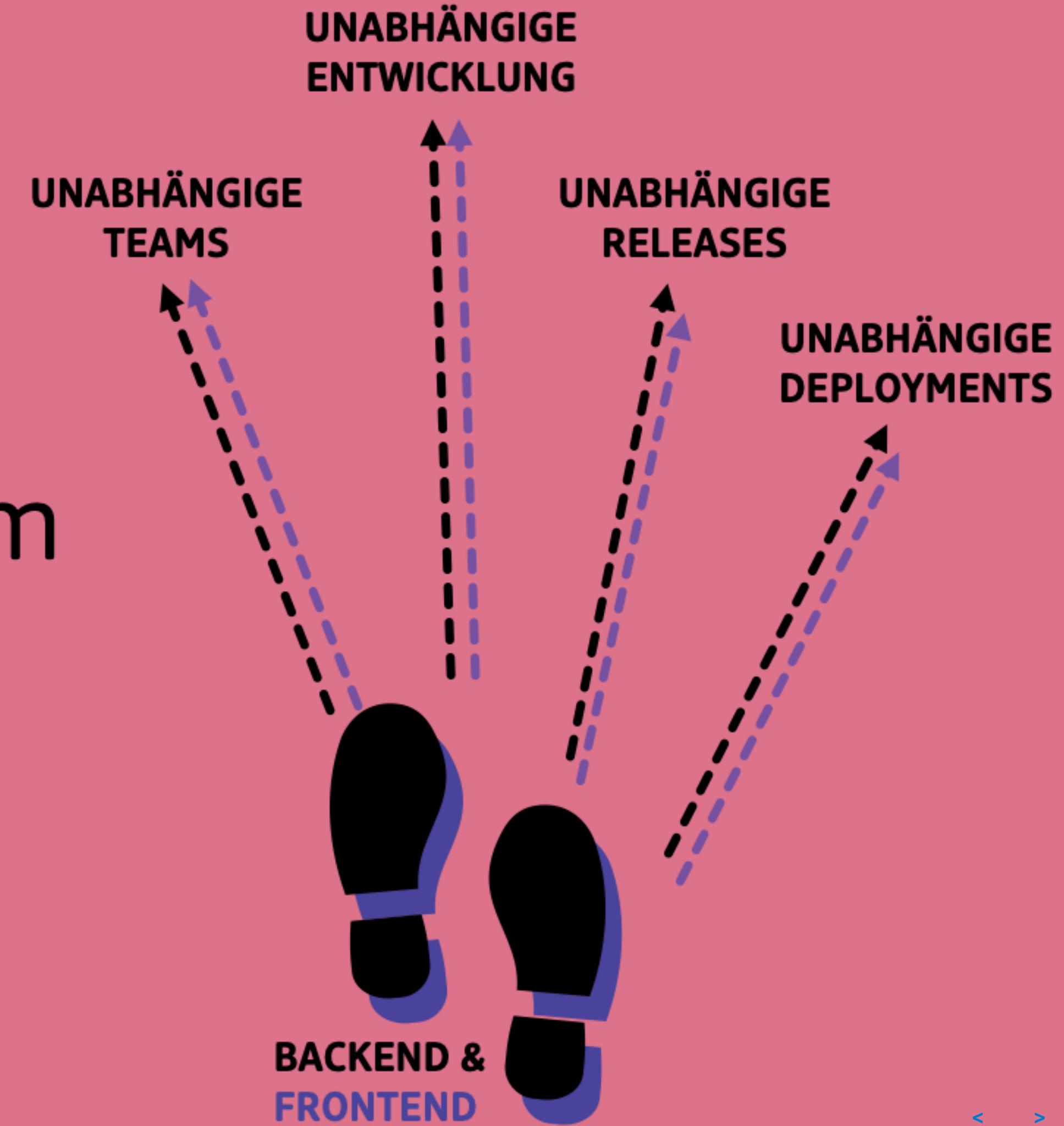


Dependency Inversion

Unabhängiges Deployment

Runtime Composition

Unabhängigkeit im Back- & Frontend





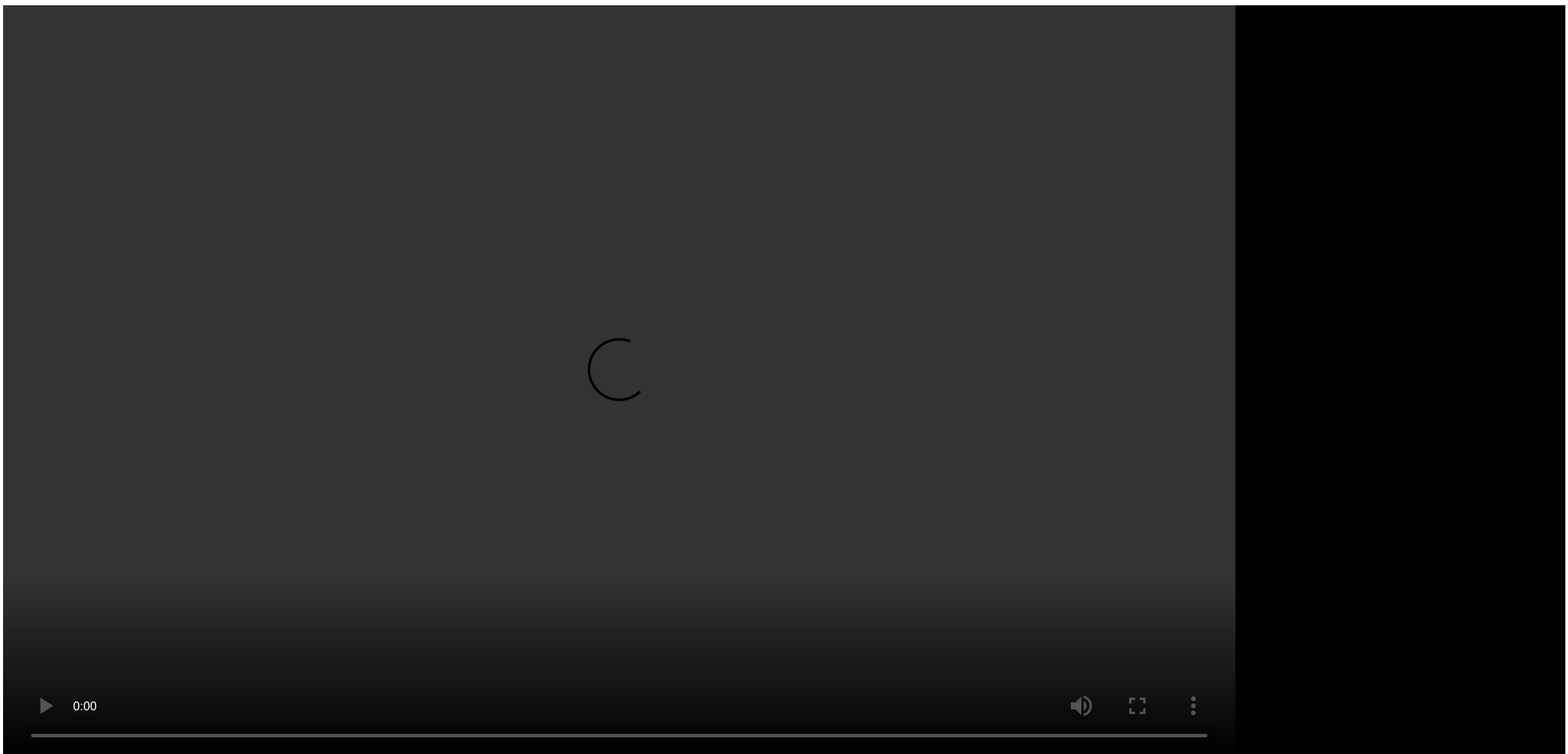
Lessons Learned

Vorteil umso größer, **je größer** das Projekt

Schnittstelle **technologiefrei** halten, z.B. kein Redux

Umdenken im Programmierparadigma fällt oft schwer

Einfache Skalierung, auch für weitere Apps - SEINZ.



Wie geht's weiter?

Ablösung CMS als Composer

SSR für ersten Seitenaufruf

Frontend-seitiges Routing für alle
Uls von dm.de

DANKE!